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“Their body, their choice. Your body, your choice. Your baby, your choice.”

A Reflexive Thematic Analysis of Vaccine Access and Acceptance among U.S. Pregnant People on Reddit

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A thesis submitted to the:
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In partial fulfillment of the requirements for the degree of:
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Abstract

Compared to the general population, pregnant people and newborns are at a higher risk of contracting infectious diseases and experiencing worse adverse outcomes. Vaccines delivered during pregnancy, known as prenatal vaccines, represent a critical yet underused form of preventive care for these populations in the United States. Increasing successful prenatal vaccination uptake requires a focus on both access and acceptance, which pregnant people may experience differently than non-pregnant people due to their unique physiological and social state. Given the evolution of vaccine hesitancy following the COVID-19 pandemic, coupled with the recent expansion of the U.S. prenatal immunization schedule, this study seeks to explore elements shaping pregnant people’s experiences of access and acceptance with prenatal vaccines during the last respiratory virus season (September 1, 2023-January 31, 2024). Using reflexive thematic analysis, the current study analyzed Reddit discussion threads (59 primary posts and 2535 comments/replies) to produce themes and subthemes focused on pregnant people’s access and acceptance of CDC-recommended prenatal vaccines (flu, Tdap, COVID-19, and RSV). Four overarching themes were constructed: pressures of the biological time crunch, divergent interpretations of vaccine science, expanded ideals of pregnancy and parenthood, and external endorsements in a polarized climate. Results showed that pregnant people were intensively concerned with not only their own vaccination, but also the vaccination of their family members. Findings found that pregnant people’s experiences of access were shaped by factors concerning the introduction of the new RSV vaccine, the time sensitivity of female reproductive biology, and the utility of relationships with different healthcare providers, whereas experiences of acceptance were shaped by individual understandings of science and sexual health, the social experience of pregnancy and vaccination, and the stigmatization of vaccine uncertainty. Study findings carry actionable implications for advancing future public health research, policy, and practice: these insights are crucial for enhancing prenatal vaccine access and acceptance in the United States, particularly given anticipated introductions of new prenatal vaccines and changing attitudes in the COVID-19 context.
Acknowledgements

When I interviewed in person for a role with USAID’s Office of Maternal and Child Health and Nutrition in late February 2020, I never imagined that it would be my first and last time stepping foot inside the Global Health Bureau. Less than a month later, the World Health Organization declared COVID-19 a pandemic, and the United States started implementing shutdowns to try to prevent the spread of disease. As I started my new job remotely from my apartment in Washington, DC, I quickly learned that most of my time would be spent on a critical yet lesser-known dimension of my new office: immunization.

The following two years spent helping to safeguard global immunization access and encourage acceptance for a range of vaccines—amid a public health emergency and presidential transition—was instrumental to my growth as a public health professional. It also helped kickstart my personal fascination and zealous quest to explore the intersections of vaccine hesitancy and reproductive oppression. The urgency of such a quest remains heightened by recent U.S. Supreme Court decisions, including the 2022 Dobbs decision which overturned the constitutional right to abortion. After so many years working, I am grateful that I was able to use my time at YSPH to thoroughly investigate and respond to these phenomena in a variety of ways. This thesis emerged out of connections I saw across my combined near decade of reproductive health and immunization work, and I look forward to continuing along this path that cuts across public health research, practice, and policy. But first, I must express my gratitude to the many people who helped make this thesis a reality:

Thank you to my advising committee! Dr. Olivia Kachingwe graciously took me on as an advisee during her first year at YSPH, a prospect that was exciting given our shared kinship as “Terrapin” alumni of the University of Maryland, College Park. Her generous and thorough feedback on drafts of this thesis was invaluable to my growth as a qualitative researcher, and learning from her expertise in sexual and reproductive health justice was a privilege. Dr. Mark Schlesinger allowed me the honor of serving as a teaching fellow for his Health Policy and Health Care Systems course, which supported me to double down on my knowledge of the fundamental concerns of health policy: affordability, accessibility, and quality. His thoughtful encouragement and empathy towards students make him a role model within academia, and I am grateful to have benefited from his guidance and wisdom during this thesis.

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List of Abbreviations

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<th>Abbreviation</th>
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<tr>
<td>ACIP</td>
<td>Advisory Committee on Immunization Practices</td>
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<td>ACOG</td>
<td>American College of Obstetricians and Gynecologists</td>
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<tr>
<td>BC</td>
<td>Birth Control</td>
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<tr>
<td>CBER</td>
<td>Center for Biologics Evaluation and Research</td>
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<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
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<tr>
<td>DOI</td>
<td>Diffusion of Innovations</td>
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<tr>
<td>FDA</td>
<td>Food and Drug Administration</td>
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<td>FIL</td>
<td>Father-in-Law</td>
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<td>FTM</td>
<td>First-Time Mom</td>
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<tr>
<td>FTP</td>
<td>First-Time Parent</td>
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<tr>
<td>FWIW</td>
<td>For What It’s Worth</td>
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<tr>
<td>HBM</td>
<td>Health Belief Model</td>
</tr>
<tr>
<td>HCP</td>
<td>Healthcare Professional</td>
</tr>
<tr>
<td>HHS</td>
<td>Department of Health and Human Services</td>
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<tr>
<td>IRA</td>
<td>Inflation Reduction Act</td>
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<tr>
<td>MIL</td>
<td>Mother-in-Law</td>
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<td>MMR</td>
<td>Maternal Mortality Ratio</td>
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<tr>
<td>OB</td>
<td>Obstetrician</td>
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<tr>
<td>OP</td>
<td>Original Poster (on Reddit)</td>
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<tr>
<td>PII</td>
<td>Personal Identifiable Information</td>
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<tr>
<td>RJ</td>
<td>Reproductive Justice</td>
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<td>RMNCH</td>
<td>Reproductive, Maternal, Newborn, and Child Health</td>
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<tr>
<td>RSV</td>
<td>Respiratory Syncytial Virus</td>
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<tr>
<td>SBS</td>
<td>Social and Behavioral Sciences</td>
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<tr>
<td>SIL</td>
<td>Sister-in-Law</td>
</tr>
<tr>
<td>SMFM</td>
<td>Society for Maternal-Fetal Medicine</td>
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<tr>
<td>YSPH</td>
<td>Yale School of Public Health</td>
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Introduction

“Their body, their choice. Your body, your choice. Your baby, your choice.” Post on social media in late 2023, this quote is not about the dire and rapidly evolving landscape of abortion access in the United States—nor is it in reference to a co-opted rallying cry used by anti-science proponents in the wake of the COVID-19 pandemic. Rather, it represents a prominent justification used by pregnant people on Reddit to validate their multifaceted decision-making in favor of vaccination during pregnancy. It also illustrates the unique biological and social tensions faced by pregnant people, who are navigating vaccination choices for themselves in the context of both their developing future child and current surrounding community.

Weighing the risks and benefits of vaccination uptake on its own is incredibly complex and difficult, made more so by today’s oversaturated information ecosystem and proliferation of vaccine misinformation on social media. Online and off, existing research shows that pregnant people struggle to balance trust, accuracy, ease, usefulness, fears, cost, and a variety of other aspects when considering vaccination. Moving people along a pathway towards successful vaccination thus requires a focus on acceptance as much as it does access.

As highlighted by the opening quote, pregnant people face an illusion of choice in the United States, wherein health decisions are framed as personal responsibilities even though information and resources are inequitably distributed. Countries like the United States frequently and subtly defer decision-making to pregnant people, disproportionately burdening them with risk and blaming them for consequences. Indeed, by combining the rhetoric of two prominent scholars, Dr. Robert Brent and Dr. Jennifer Reich, existing approaches to prenatal vaccines can be seen as sitting within a crux of inaction characterized by the “risk of doing nothing” for “risky bodies.” This unfair paradox of limited vaccine evidence but higher disease stakes creates a decision-making dilemma for both pregnant people and healthcare professionals. It also speaks to the larger paradox of disease prevention outlined by Dr. Harvey Fineberg, wherein preventive care services, like prenatal vaccines, are often “celebrated in principle, resisted in practice.” It is no wonder then that the United States is experiencing an alarming and escalating but largely preventable maternal mortality crisis.

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With these considerations in mind, this study is guided by the following research question: What factors influenced experiences of access and acceptance with prenatal vaccines for pregnant people on Reddit during the most recent U.S. respiratory virus season? Because of the complexity inherent in prenatal vaccination decisions, especially in the current COVID-19 context, a qualitative study design was deemed most suitable for identifying patterns of meaning and centering the lived experiences of pregnant people. The increased susceptibility to disease and heightened risk of complications during pregnancy makes studying the vaccination experiences of this population an imperative within public health. Persistently low coverage of prenatal vaccines and rising reports of vaccine hesitancy among pregnant people mean that expanding the prenatal immunization schedule will have little impact if acceptance is not prioritized alongside access. Examining these structural and attitudinal elements can help shed light on the challenges and opportunities surrounding prenatal vaccination, as well as provide a starting point for understanding inequities documented across different demographic groups of pregnant people.

While this study does not address these disparities outright, it takes time to explicitly link prenatal vaccines to reproductive justice as a means for kickstarting creative avenues of change within public health. Vaccines carry an important but overlooked role in fostering reproductive destiny, especially for pregnant and birthing people of diverse identities and experiences. The study deliberately uses terms like “pregnant person” and “pregnant people” throughout to emphasize this inclusive and respectful approach focused on pregnancy rather than sex or gender identity. The use of these terms by members of the studied Reddit community further substantiates this choice. Ultimately, applying a reproductive justice framework to vaccination can help harness public health information and resources to not only support pregnant people in moving from choice to access, but also from access to acceptance. In pursuit of this goal, study findings contribute to the evidence base and provide concrete recommendations aimed at addressing the complex determinants driving disparities among pregnant people who represent the “moveable middle” of prenatal vaccination.

Background

Being Pregnant in the United States

Pregnancy in the United States is a dangerous condition. Pregnant people are twice as likely to die during pregnancy and childbirth than their counterparts in other high-income countries. Maternal mortality also continues to increase in the United States, even as it declines in these other countries. In 2021, the United States saw approximately 32.9 pregnancy-related deaths for every 100,000 live births, compared to 23.8 deaths in 2020 and 20.1 deaths in 2019. These trends are not due to insufficient healthcare spending; the United States spends considerably more on child birth than other high-income countries, yet achieves

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13 Razzaghi, “Influenza, Tdap, and COVID-19 Vaccination Coverage and Hesitancy Among Pregnant Women — United States, April 2023.”
14 Ross, “What Is Reproductive Justice?”
consistently worse maternal and newborn health outcomes.\textsuperscript{18} Over 80\% of these deaths are considered preventable by U.S. health experts, largely because research indicates that pervasive structural inequities and systemic racism, social determinants of health, and healthcare system financing and policy decisions disproportionately increase maternal mortality for certain population groups.\textsuperscript{19} For example, for over 100 years, Black pregnant people have been more likely to die from pregnancy and childbirth than White pregnant people, a trend that persists regardless of education or comorbidities.\textsuperscript{20} Furthermore, Indigenous and Native communities are experiencing the greatest rising risk for pregnancy-related deaths. Over a ten-year period, the median state maternal mortality ratio (MMR) more than tripled (14.0 to 49.2) for Indigenous and Native pregnant people, compared to Black (26.7 to 55.4), Hispanic (9.6 to 19.1), and White (9.4 to 26.3) pregnant people.\textsuperscript{21} Disparities also emerge based on geography; the risk of maternal mortality is higher in the U.S. South than other regions, suggesting that underlying structural risk factors differ across states.\textsuperscript{22} Given that more than 3.6 million people give birth annually in the United States, these deaths are devastating and consequential not just for pregnant and birthing people but also for millions of children and families.\textsuperscript{23}

In response to this alarming maternal mortality crisis, U.S. political, medical, and public health leaders have called for greater attention to preventive care delivered before, during, and after pregnancy.\textsuperscript{24} The Healthy People 2030 framework developed by the Department of Health and Human Services (HHS) outlines a set of data-driven national objectives to improve health and well-being in the United States and specifically acknowledges the role of the social determinants of health.\textsuperscript{25} The objectives specific to pregnancy and childbirth include a range of interventions to improve reproductive, maternal, newborn, and child health (RMNCH), including immunizations.\textsuperscript{26} Vaccinations, like other forms of primary healthcare and preventive services, play an important role in reducing the number of preventable deaths and adverse outcomes.\textsuperscript{27} Broad and timely use of these services supports early health screenings, assessment and management of risks, and regular mental, cultural, and educational support to pregnant people and their families.\textsuperscript{28} Effective delivery of vaccinations, in addition to being a direct form of preventive care, can also indirectly boost primary care services used by pregnant people and children. The two systems mutually reinforce each other by building trust early with healthcare professionals (HCPs) and increasing the number of touch points with the healthcare system.\textsuperscript{29} Prenatal vaccines, which are vaccines delivered during pregnancy, help fulfill two imperatives within RMNCH preventive care: ensuring that every pregnant person has “an optimal

\textsuperscript{19} National Academies of Sciences et al., “Systemic Influences on Outcomes in Pregnancy and Childbirth”; CDC, “Pregnancy-Related Deaths.”
\textsuperscript{22} Fleszar et al.
\textsuperscript{23} CDC, “Births.”
\textsuperscript{24} Lowe, “Birth Settings in America.”
\textsuperscript{25} HHS, “Healthy People 2030: Building a Healthier Future for All.”
\textsuperscript{26} HHS, “Pregnancy and Childbirth.”
\textsuperscript{27} Gunja et al., “Health and Health Care for Women of Reproductive Age: How the United States Compares with Other High-Income Countries.”
\textsuperscript{28} National Academies of Sciences et al., “Systemic Influences on Outcomes in Pregnancy and Childbirth.”
pregnancy, a safe delivery, and a healthy baby” and that every child has “the opportunity to survive and thrive.”

Mitigating Infectious Diseases with Prenatal Vaccines

Compared to the general population, pregnant people and newborns are at a higher risk of both contracting infectious diseases and experiencing associated adverse outcomes. Pregnancy affects the human body in a myriad of ways, including via changes to the immune, respiratory, and cardiovascular systems. Depending on the specific infectious disease and the date of illness, pregnant people are more likely to experience respiratory distress, preeclampsia, preterm delivery, miscarriage, stillbirth, hospitalization, and death. Additionally, infectious diseases are dangerous to fetuses and newborns, whose immune systems are not yet fully functional. Exposure to disease in the womb or the early weeks and months after birth increases the risk of low birth weight, respiratory distress, congenital anomalies, hospitalization, and death. Vaccination, as “the quintessence of preventive medicine,” carries an essential role in stopping and mitigating these outcomes not just for pregnant people but also their future children through passive antibody transfer during pregnancy and breastfeeding. As a result, vaccination has earned a pivotal place within public health for its ability to help avert preventable maternal and newborn deaths and provide children with a healthy start to life.

The emergence of health crises in the United States and the suffering of pregnant people and children have helped prompt the development and recommendation of a variety of vaccines over time. The excessive deaths of pregnant people during events like the 1918 “Spanish flu” pandemic and the horrific, audible suffering of hundreds of thousands of infants with pertussis “whooping cough” infections during the late 1920s likely contributed to the quest for effective vaccines. During the 1957 flu pandemic, influenza was the leading cause of death for pregnant people, accounting for a fifth of all maternal deaths. More recently, the harnessing of mRNA technology and the warp speed development of successful COVID-19 vaccines demonstrates how quickly the scientific community can innovate in response to novel health threats. The 2023 approval of a new RSV vaccine represents another potential gamechanger, given its ability to tackle the leading cause of infant hospitalizations. The collective burden of these diseases within these populations is enormous and costs the health system billions of dollars. Consequently, the United States and other countries are increasingly looking to develop new prenatal vaccines as part of their public health

33 Brent, “Risks and Benefits of Immunizing Pregnant Women.”
34 Brent; Gruber, “Maternal Immunization”; Bednarek and Laskowska, “Vaccination Guidelines for Pregnant Women.”
35 Mackin and Walker, “The Historical Aspects of Vaccination in Pregnancy.”
36 Mackin and Walker; Saag, “Development of COVID-19 Vaccines—An Unanticipated Moon Shot Achieved at Warp Speed.”
38 Brent, “Risks and Benefits of Immunizing Pregnant Women.”
strategies. In the United States, four vaccines are currently recommended during pregnancy: Flu, Tdap, COVID-19, and RSV. Each of these vaccines differ across a variety of dimensions ranging from their approval timeline to their level of efficacy (see Table 1), and uptake during pregnancy is optional.

Vaccine Development and Approval Process

In the United States, multiple government agencies share regulatory and policy responsibility for vaccines, including those recommended for pregnant people. The Center for Biologics Evaluation and Research (CBER) of the Food and Drug Administration (FDA) regulates the vaccine development process, the Advisory Committee on Immunization Practices (ACIP) makes vaccination recommendations for specific population groups, and the Centers for Disease Control and Prevention (CDC) determines the final approval and sets the official public health guidance for use. Significant amounts of safety and efficacy data from rigorous pre-clinical and clinical trials, often accumulated over decades, underscore these decisions by the FDA, ACIP, and CDC. Safety considerations are central to this process, and both the FDA and CDC have systems in place to continue monitoring safety once vaccines are available to the public. Like all forms of medicine, vaccines carry some risk of side effects and even serious adverse outcomes. However, the approval and recommendation for use of prenatal vaccines represents an expert determination that the protective benefits to pregnant people and their newborns far outweigh any risks of vaccination.

For a vaccine to be approved for use in pregnant people, numerous medical and public health experts must have determined that the vaccine is safe and effective when delivered during pregnancy; the disease targeted by the vaccine poses a significant health risk to the pregnant person, fetus, and/or newborn; and the likelihood of infection is high in the absence of vaccines. The complexity of these considerations means that unless a vaccine is specifically intended for use during pregnancy, pregnant people are often excluded from the clinical trial process. As a result, vaccine research in pregnant people has historically been primarily retrospective, occurring after a vaccine has already been approved and used by non-pregnant people (see Table 1). More broadly, ethical tensions, feasibility, and cost have made the exclusion of pregnant people the norm within health research studies and discoveries. Unfortunately, this means that healthcare professionals (HCPs) and pregnant patients often have little to no evidence on which to base their medical decisions and may feel they cannot make effective risk-benefit assessments. For vaccine-preventable diseases, pregnant people often face an unfair paradox of limited vaccine evidence but higher disease stakes. Research has shown that such a decision-making dilemma can lead to greater numbers of

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40 CDC, “Vaccines During and After Pregnancy.”
41 CDC.
42 CDC, “How Vaccines Are Developed and Approved for Use.”
43 Panagioti et al., “Prevalence, Severity, and Nature of Preventable Patient Harm across Medical Care Settings”; Wu et al., “Disclosing Adverse Events to Patients.”
45 Gruber, “Maternal Immunization”; CDC, “How Vaccines Are Developed and Approved for Use.”
vaccine-preventable maternal deaths by delaying or discouraging vaccination.⁴⁹ For example, experts knew early on that pregnant people with COVID-19 infections during delivery were 14 times more likely to die than those without infections, yet the CDC, American College of Obstetricians and Gynecologists (ACOG), and Society for Maternal-Fetal Medicine (SMFM) hesitated to recommend COVID-19 vaccines to pregnant people due to their exclusion from the clinical trials.⁵⁰ This delay made pregnant people the only population group without a COVID-19 vaccine recommendation, occurred even though no indications existed for adverse events from COVID-19 vaccines during pregnancy, and likely contributed to preventable maternal deaths during the early months of the pandemic.⁵¹ Indeed, Dr. Robert Brent’s 2006 article outlining the “risk of doing nothing” for building the public health evidence and practice base for prenatal vaccines continues to loom ominously over the scientific and medical community today.⁵²

Turning Vaccines into Vaccinations

The uptake of recommended vaccines during pregnancy remains suboptimal in the United States despite their importance to the health and well-being of pregnant people and newborns. CDC data for the 2022-2023 respiratory virus season estimates that immunization coverage for pregnant people is 55.4% for Tdap, 42.5% for flu, 27.3% for COVID-19 bivalent, and 25.6% for Tdap and flu combined.⁵³ Preliminary data for the newly introduced RSV prenatal vaccine first available during the 2023-2024 respiratory virus season indicates that coverage is around 17.8%.⁵⁴ These dismal coverage rates mean that a significant majority of U.S. pregnant people and newborns are at heightened risk of life-threatening but preventable disease outcomes. Additionally, since vaccines work to not only protect vaccinated individuals but also to reduce the spread of disease within populations (vaccinated and unvaccinated), the risk of disease during pregnancy increases when overall vaccination coverage rates are low.⁵⁵ For U.S. adults in 2022, flu coverage was 46.9% and COVID-19 bivalent coverage only 21.1%.⁵⁶ Because most countries, including the United States, direct their health programs and policies towards vaccinating infants and young children, public health immunization efforts targeting adults (pregnant and non-pregnant) often do not have the same infrastructure, resources, or incentives.⁵⁷ Adult vaccination coverage, then, largely hinges on ordinary individuals recognizing the value of vaccination without much policy or programmatic support.

⁵² Brent, “Risks and Benefits of Immunizing Pregnant Women.”
⁵³ Razzaghi, “Influenza, Tdap, and COVID-19 Vaccination Coverage and Hesitancy Among Pregnant Women — United States, April 2023.”
⁵⁴ CDC, “RSV Vax View.”
⁵⁵ Dassarma et al., “Challenges in Establishing Vaccine Induced Herd Immunity through Age Specific Community Vaccinations”; Nandi and Shet, “Why Vaccines Matter.”
The decision to get vaccinated is a “complex and context specific phenomenon, varying across time, place and vaccines.”

Moving people along a pathway towards successful vaccination requires a focus on both access (availability, affordability, and convenience of vaccination) and acceptance (degree of hesitancy towards vaccination).

Examining these structural and attitudinal barriers can help shed light on the challenges surrounding prenatal vaccination, as well as explain why inequities might emerge between different demographic groups of pregnant people. For example, White women are 2.2 times more likely than Black women to have received both the Tdap and flu vaccines during pregnancy (26.6% and 12.0% respectively), and women ages 35-49 are 1.6 times more likely than women ages 18-24 (32.5% and 20.7% respectively). These disparities by race/ethnicity and age are statistically significant and persist over time. Additional prenatal vaccination disparities have been documented along the dimensions of education, employment, poverty, area of residence, insurance coverage, and HCP recommendation. Notably, due to their unique physiological and social state, pregnant people may experience both access and acceptance differently than non-pregnant people, including themselves pre-pregnancy.

**Vaccine Access**

Fostering baseline access to vaccines during pregnancy requires a variety of health system investments, including political will and sustainable financing; health workforce staffing and training; integration with prenatal care and RMNCH services; frequent exposure to prenatal care; and facility-based births. Vaccination is often part of prenatal care, so ensuring access to prenatal care helps ensure access to vaccines. Unfortunately, even if vaccines are widely available in the United States, prenatal care is often limited for some groups of pregnant people. Black and Indigenous pregnant people are 15-20% less likely to have access to first trimester prenatal care compared to White and Asian pregnant people. White pregnant people also receive more than double the number of prenatal care visits received by Black and Hispanic pregnant people. Additionally, many different social determinants of health—like insurance coverage and costs, proximity to healthcare services, availability of maternity care professionals, transportation options, health literacy and education, housing, employment, and time off work—can intersect to influence individual access to prenatal care and thus vaccines. Furthermore, a long history of abuse by the field of obstetrics and gynecology towards marginalized groups and direct experiences of racism within the healthcare system may discourage pregnant people of harmed identities from accessing any form of institutional care during pregnancy.

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58 Bedford et al., “Vaccine Hesitancy, Refusal and Access Barriers.”
59 Attwell et al., “Recent Vaccine Mandates in the United States, Europe and Australia”; Bedford et al., “Vaccine Hesitancy, Refusal and Access Barriers.”
60 Razzaghi, “Influenza, Tdap, and COVID-19 Vaccination Coverage and Hesitancy Among Pregnant Women — United States, April 2023.”
64 Howell, “Reducing Disparities in Severe Maternal Morbidity and Mortality.”
pregnancy. Access to prenatal care is also foundational to increasing vaccination uptake in pregnant people given that HCP recommendations for prenatal vaccines consistently influence their acceptance.

**Vaccination Acceptance**

Because prenatal vaccines are optional forms of preventive care, vaccination acceptance remains an important component of successful uptake. Vaccination acceptance pertains directly to vaccine hesitancy and refusal, two incredibly complex issues within medicine and public health. While refusers outright reject vaccines, those who are vaccine hesitant represent a sort of “moveable middle” that experience indecision around getting vaccinated. Understanding vaccine hesitancy as a dynamic spectrum rather than binary decision helps explain why some pregnant people may readily accept all vaccines, others may accept some but not others, and still others may ultimately not accept any. The most common reasons for prenatal vaccine hesitancy found in a narrative review included fears surrounding vaccine side effects or adverse events, suspicion of vaccine safety, low perception of disease risk, and absence of vaccination prior to pregnancy. Other less frequent reasons involve spousal vaccine hesitancy, low perception of vaccine benefits, and belief in vaccine myths and misinformation. Still, another systematic review found that feelings of personal responsibility, use of other disease prevention measures, trust in healthcare professionals and biotechnology, and lack of desired health information also played a role.

Side effect and safety concerns are often linked to pregnant people’s worries about potential harm to their reproductive system, developing fetus, or future child, illustrating the distinctive biological state and function of pregnancy. Such preoccupation with harm avoidance also reflects an emerging duality for health decision-making, that of an individual and a parent. This intense and new awareness of the implications of their health decisions may increase the vulnerability of pregnant people to vaccine disinformation. Additionally, if they have regular access to prenatal care, pregnant people will be repeatedly exposed to the individual opinions and attitudes of healthcare professionals, who themselves may be vaccine hesitant. With these motives in mind, it becomes clear why studying the complexities of vaccine hesitancy is even more challenging for pregnant people. Thus, more research is needed to understand the factors impacting vaccine decision-making during pregnancy, especially when considering the broader COVID-19 context of evolving vaccination attitudes and rampant online misinformation.

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69 Bedford et al., “Vaccine Hesitancy, Refusal and Access Barriers”; Omari et al., “Characteristics of the Moveable Middle.”


72 Truong et al., “What Factors Promote Vaccine Hesitancy or Acceptance during Pandemics?”

73 De Brabandere et al., “Influence of the COVID-19 Pandemic and Social Media on the Behaviour of Pregnant and Lactating Women towards Vaccination.”

74 Mitchell, Schulkin, and Power, “Vaccine Hesitancy in Pregnant Women.”

75 Cox et al., “A Mother’s Dilemma.”
**Seeking Information in the Digital Age**

Pregnancy initiates a novel phase of life for many people, changing one’s physical body as well as social expectations. Such a dynamic state creates an intense pressure for pregnant people to develop new knowledge about themselves and their future child. As a result, they actively seek information to help them navigate unfamiliar health-related experiences, decisions, and responsibilities—including vaccination. Access to adequate and reliable information during pregnancy helps reduce stress and anxiety while increasing self-esteem and self-confidence. Inadequate or unreliable information, in contrast, has the opposite effect. However, the ability of information to meet the health and care needs of pregnant people is not solely tied to its availability, but also to its perceived accuracy and usefulness. Pregnant people evaluate information across different sources to determine accuracy, and then they apply it to the context of their life to determine usefulness. Inconsistencies across either or both dimensions can produce a sense of a loss of control and constrain decision-making.

Today’s oversaturated information ecosystem makes determining accuracy and usefulness difficult, even if the desired information is regularly available. Pregnant people are exposed to many different sources of information, most commonly from HCPs, family and friends, and the internet. The quality of this information often varies substantially across these sources; rarely do authority, clarity, detail, customization, trustworthiness, objectivity, and other potential evaluation criteria align in ways that generate perfect uniformity. The regular exclusion of pregnant people from vaccine clinical trials further contributes to an information quality problem. As was seen with the COVID-19 pandemic, a lack of clear safety data and nebulous vaccine recommendations for pregnant people created an evidence gap that increased susceptibility to misinformation, even among HCPs. Longer delays occurred between general approval and pregnancy recommendation with the flu and Tdap vaccines, leaving pregnant people unnecessarily vulnerable to vaccine-preventable diseases for decades (see Table 1).

The modern-day ubiquitousness of the internet within people’s lives has significantly complicated matters. Pregnant people have seemingly endless options for seeking out health information online, and thus many opportunities to “fact check” information provided by HCPs, family, and peers. Even if online information is perceived to be less trustworthy than other sources, it remains in high use due to its “easy accessibility

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76 Ghiasi, “Health Information Needs, Sources of Information, and Barriers to Accessing Health Information among Pregnant Women”; Cox et al., “A Mother’s Dilemma.”

77 Vogels-Broeke et al., “Sources of Information Used by Women during Pregnancy and the Perceived Quality.”

78 Ghiasi, “Health Information Needs, Sources of Information, and Barriers to Accessing Health Information among Pregnant Women”; Vogels-Broeke et al., “Sources of Information Used by Women during Pregnancy and the Perceived Quality.”


82 Caplan and Purser, “Qualitative Inquiry Using Social Media.”

Social Media Use

Within the landscape of the internet, social media represents a novel avenue for pregnant people to connect online through shared experiences, to offer social and emotional support, and to exchange information. Social media is a broad term that represents a variety of online platforms focused on peer-to-peer communication through written and visual content. More than 80% of U.S. adults use the most popular social media platform, YouTube, followed by Facebook (68%) and Instagram (47%). About one-in-five U.S. adults (22%) use the less popular but still well-known platforms of X (formerly Twitter) and Reddit. Across these platforms, numerous accounts, pages, forums, and groups exist that seek to aggregate people and information on topics of interest, including pregnancy. The social focus on these spaces often allows pregnant people to directly engage with one another, which in turn helps build a sense of community even when anonymity is present. People are no longer restricted to forming social ties with those geographically nearby; many now also actively participate in personal, social, cultural, and professional communities online. Like the internet more broadly, social media provides pregnant people with timely, tailored, interactive, free, and convenient places to fill their health information needs. However, social media may make such information feel more personal, and therefore perhaps more compelling, because it presents first-person, user-generated, and community-focused content. As such, social media gives pregnant people another medium and opportunity to learn about their health choices during pregnancy and the potential benefits and risks that accompany those choices.
However, such broad use of social media by the public creates challenges for public health professionals, notably the rapid expansion of health misinformation (defined as false, inaccurate, and/or deliberately misleading information that differs from expert consensus). Both global and national working groups have identified addressing health misinformation on social media as a top priority, particularly in relation to vaccines. Vaccine misinformation has the potential to change behavior, create misjudgment, and spread doubt in ways that result in negative health outcomes. Pervasive misinformation also makes it harder for people to discern which information is accurate and trustworthy, and distrust of HCPs is positively correlated with belief in vaccine misinformation. Indeed, numerous studies have documented the harmful role that social media played during the COVID-19 pandemic by creating an environment of confusion and hesitancy towards vaccines. At the same time, the documented influence of interpersonal relationships to pregnancy decision-making means that online communities and actors could also be harnessed as a means for improving prenatal vaccine confidence. Research shows that best practice for building public trust in vaccines requires public health to “communicate in meaningful ways, crowding out misinformation.” In response, public health practitioners are increasingly turning to social media as a cost-effective and timely way to share evidence-based health resources and educational videos and visuals. Researchers, too, are seeking out social media to study people's attitudes, knowledge, and experiences in real-time, thereby helping to generate more responsive and effective health interventions.

**Calling for a Reproductive Justice Approach**

Reproductive justice (RJ) is both a framework and a movement concretized by 12 Black women members of the Women of African Descent for Reproductive Justice organization in 1994. RJ calls for “the complete physical, mental, spiritual, political, social, and economic well-being of women and girls, based on the full achievement and protection of women’s human rights.” It goes beyond abortion and contraception to look at an expansive continuum of care surrounding reproductive destiny, including the right to decide if, when, and how to become a parent and to raise children in safe, sustainable, and healthy

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98 Skouteris and Savaglio, “The Use of Social Media for Preconception Information and Pregnancy Planning among Young Women”; Schoch-Spana et al., “The Public’s Role in COVID-19 Vaccination.”
97 Galvin et al., “Quality over Quantity.”
96 Herdea et al., “Vaccine Hesitancy Phenomenon Evolution during Pregnancy over High-Risk Epidemiological Periods—‘Repetitio Est Mater Studiorum.’”
104 Onwuachi-Saunders, Dang, and Murray, “Reproductive Rights, Reproductive Justice.”
105 Ross, “What Is Reproductive Justice?”
environments. Vaccination, as a cornerstone of public health, supports this vision by safeguarding reproductive, maternal, newborn, and child health; reducing the risk of infectious diseases; and contributing to the overall well-being of individuals and communities. Prenatal vaccinations play a unique role in protecting the health of both pregnant people and their newborns during a time when they are more vulnerable to complications from disease and inequity.

Because RJ focuses on the collective end goal of building better lives for women, gender-expansive people, families, and communities rather than pursuing siloed solutions, it serves as a powerful tool within public health. Using an RJ framework, public health can more effectively recognize oppressions across intersecting issues and identities as well as challenge systems of social and structural inequity. This includes acknowledging that reproductive decision-making is shaped by unequal access to power, resources, and information—and that optimal self-determination and collective well-being hinges on the unconditional provision of necessary government services and supports. Within the United States, escalating numbers of maternal deaths and cascading attacks on reproductive rights demand swift public health action for pregnant people, especially given deepening disparities across a variety of identity-based dimensions. An RJ approach centers solutions that meet the intersecting needs of the most marginalized pregnant people—including those who are Black, Indigenous, transgender, queer, disabled, young, immigrants, incarcerated, or low-income.

Choice, Risk, and Responsibility

A central organizing tenet of RJ is moving beyond the concept of individual choice to consider the conditions that surround collective access. An overemphasis on choice masks inequities of information and resources that can constrain choice and sometimes remove it altogether. Additionally, the expectation that individuals navigate their own health choices disproportionately burdens them with the consequences of risk, even if it also confers them the benefits of action. Such an ethic of personal responsibility unfairly requires marginalized individuals and communities to meet ideal standards for “family, health, and well-being,” while concurrently obscuring the role and responsibility of governments and society in creating discriminatory and unequal conditions. Those who are unable to overcome these stacked conditions to meet desired standards are seen as having made “bad choices” and are indirectly and directly punished.

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106 Ross.
107 Rodrigues and Plotkin, “Impact of Vaccines; Health, Economic and Social Perspectives”; Plotkin, Orenstein, and Offit, Vaccines.
112 Ross, “What Is Reproductive Justice?”
113 Ross.
115 Ferrer and Klein, “Risk Perceptions and Health Behavior.”
116 Zacharias et al., “Reproductive Justice After the Pandemic.”
117 Solinger, “The Incompatibility of Neo-Liberal ‘Choice’ and Reproductive Justice.”
Individual choice rhetoric overlaid on health and well-being ultimately “effaces the impacts of low wages, the housing crisis, the lack of medical care, racism, under-funded educational systems, racialized incarceration, war, and other factors that shape the context of reproduction [including pregnancy and parenting] differently for different groups of women.” RJ pushes back against choice by emphasizing the role of access to shared and equitable resources in realizing reproductive dignity and safety.

Prenatal vaccines, as an optional form of preventive healthcare, embody this concept of neoliberal choice within the United States. The choice to get vaccinated lies with pregnant people, and pregnant people bear the responsibility for risk. Countries like the United States frequently and subtly defer decision-making to pregnant people for a range of RMNCH interventions by delivering contradictory messages, offering insufficient evidence, or limiting alternative health and social supports. For pregnant people, their vaccination choice, risk and responsibility is biologically and socially unique; pregnant people must weigh factors like health, necessity, and risk in the context of two futures—their own and their newborn’s. Indeed, people’s “decisions and choices before, during, and after pregnancy all present risk to their future children, with medical management and self-control the touted remedies.” Prenatal vaccine choices are “wrong” or “bad” when they result in negative maternal or newborn health outcomes, regardless if such consequences correlated with vaccination or not! These personal pregnancy pressures alongside social parenting pressures shape pregnant people’s subjective perceptions of risk and in turn their refusal, hesitancy, or acceptance of prenatal vaccinations. Thus, applying a RJ framework to vaccination requires harnessing public health information and resources to not only support pregnant people in moving from choice to access, but also from access to acceptance.

The COVID-19 Context

Urgent RJ action to support the health and well-being of pregnant people cannot occur without considering the reverberating challenges of the COVID-19 pandemic. Since the emergence and rapid global spread of SARS-CoV-2 in 2019, mountains of scientific evidence and lived experiences have demonstrated the pandemic’s negative impacts on RMNCH. National lockdowns, healthcare worker and resource shortages, and widespread fear of infection led to severe disruptions in essential preventive and primary care services, including routine immunizations, in the early weeks and months of the public health emergency. Early on, the severe impacts of the disease in pregnant people became apparent; COVID-19 infection during pregnancy significantly increases the risk of preterm birth, preeclampsia, stillbirth,
hospitalization, and death. In the United States, deaths from pregnancy and childbirth increased by 33.3% after the domestic onset of the pandemic in March 2020, compared to a 22.9% increase in overall excess deaths across the broader population. Among pregnant people, the largest relative increase within underlying causes of death was due to indirect causes like viral diseases (2374.7%), respiratory system diseases (117.7%), and circulatory system diseases (72.1%). Increases in maternal mortality were highest for Hispanic and Black pregnant people compared to White pregnant people, further underscoring a vital need to view pregnancy-related pandemic deaths through a structural equity and justice lens.

In response to the global threat of SARS-CoV-2, vaccines took center stage as a potential solution to slow the spread of disease and help reduce morbidity and mortality. While such scientific efforts proved remarkably successful, unexpected consequences have emerged in the pandemic’s wake. The political polarization of vaccines and other public health measures created an environment of mixed messaging from different government leaders. Combined with the rapid spread of misinformation online, vaccine hesitancy and refusal have unsurprisingly increased. What is most alarming, however, is that this hesitancy has increased among people who previously trusted vaccines. Additionally, some people now view vaccine refusal as a form of their social identity, rather than a personal healthcare decision. Since 2020, people in the United States now associate vaccination status more strongly with beliefs of political ideology, personal freedom, and bodily autonomy. While vaccine hesitancy and refusal are not new phenomena, their ties to the spread of misinformation online, declining public trust in science, and new outbreaks of preventable diseases raise significant concerns. Specifically among U.S. pregnant people, this growing problem may be contributing to lower prenatal vaccination coverage rates and higher prenatal vaccine hesitancy than was observed pre-pandemic. Such trends are also worrisome because they may indicate that pregnant people are experiencing a vaccine “spillover effect,” whereby hesitancy towards COVID-19 vaccines is fueling hesitancy towards other, historically uncontroversial, prenatal vaccines like flu and Tdap.

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128 Thoma and Declercq, “All-Cause Maternal Mortality in the US Before vs During the COVID-19 Pandemic.”

129 Thoma and Declercq.

130 Saag, “Development of COVID-19 Vaccines—An Unanticipated Moon Shot Achieved at Warp Speed.”


136 Lunz Trujillo et al., “COVID-19 Spillover Effects onto General Vaccine Attitudes.”
Methods

Research Purpose and Design

Given the evolution of vaccine hesitancy following the COVID-19 pandemic, coupled with the recent expansion of prenatal vaccine recommendations amidst persistently low coverage, this study seeks to explore elements shaping pregnant people’s vaccination experiences in the United States. The study is guided by the following research question: What factors influenced experiences of access and acceptance with prenatal vaccines for pregnant people on Reddit during the last U.S. respiratory virus season? It responds to an existing research gap surrounding how pregnant people make vaccination-related decisions, especially in the COVID-19 context. Focusing on pregnant people as a population is important within public health research given that pregnancy is a unique biological and social state as well as a time when the risks of vaccine-preventable diseases are heightened.

This study used reflexive thematic analysis to generate themes and subthemes from Reddit discussion threads (59 primary posts and 2535 comments/replies) focused on the four CDC-recommended prenatal vaccines (flu, Tdap, COVID-19, and RSV). Only discussion threads from a pregnancy-specific subreddit (a topic-focused forum on Reddit) posted during the last U.S. respiratory virus season (September 1, 2023, to January 31, 2024) were analyzed. This subreddit represents an online community of more than 650,000 individuals, who are presumably pregnant or who hold close relationships with people who are pregnant. The subreddit community guidelines specifically note that it is a “pro-choice, pro-science, and pro-vaccine space” that disallows misinformation and encourages source citations. The subreddit moderation team professors to remove content that violates these terms, thereby encouraging and enforcing these community norms. Review of the data confirmed these standards; the moderation team was active in deleting comments and replying. “Your contribution has been removed for misinformation. This subreddit believes in science and data.” Therefore, the dataset of this study primarily captured the experiences of pregnant people who are open to prenatal vaccination but may have additional needs or concerns surrounding access and acceptance.

Theoretical Foundation

Consistent with other social and behavioral sciences (SBS) studies of vaccination, this study uses the Health Belief Model (HBM) as the primary theoretical framework for examining pregnant people’s experiences with prenatal vaccine access and acceptance. The HBM and other SBS theories bring together diverse disciplines like psychology, sociology, anthropology, and political science to better understand and address public health challenges at individual and systemic levels. The HBM model recognizes that people undergo internal decision-making processes when considering health behaviors such as vaccination. This risk-benefit analysis may be influenced by a variety of conscious and unconscious factors. Applied to prenatal vaccination, the HBM theorizes that vaccine-related decisions of pregnant people will be based on subjective considerations of 1) their susceptibility to vaccine-preventable diseases, 2) the severity of consequences from infection, 3) the benefits of getting vaccinated during pregnancy, 4) the barriers to getting vaccinated during pregnancy, 5) exposure to factors that prompt vaccination, and 6) feelings of confidence towards successful vaccination. These six HBM constructs are uniquely complicated for pregnant people, who often are not only weighing the implications of vaccination decisions for themselves but also for their developing fetus and future child. Using the HBM lens provides a baseline for identifying the complex and intersecting factors that shape the vaccination experiences of pregnant people, capturing both external considerations linked to access and internal perceptions linked to acceptance.

137 Cox et al., “A Mother’s Dilemma.”
138 Piltch-Loeb and DiClemente, “The Vaccine Uptake Continuum.”
139 National Cancer Institute, “Theory at a Glance.”
140 Cox et al., “A Mother’s Dilemma.”
The Diffusion of Innovations (DOI) Theory also underpins this study to better understand how perceptions of “newness” may affect the vaccine access and acceptance among pregnant people in the United States. Investigating such perceptions is critical given that the number of recommended prenatal vaccines has doubled in the past four years (see Table 1), and the 2023-2024 respiratory virus season was the first time that RSV vaccines and related technologies (monoclonal antibodies) were available to pregnant people, newborns, and older adults (ages 60+). Specifically, the DOI Theory helps examine the process by which ideas about the RSV vaccine (the innovation) were communicated on Reddit (the channel) during the initial rollout (the adoption time) among members of the pregnancy subreddit (the social system). In their vaccination-related decisions, pregnant people may consider such DOI attributes as the superiority of the RSV vaccine over other available protective measures (relative advantage), its appropriate “fit” during pregnancy (compatibility), the ease of its access and acceptance (complexity), its ability to be tried before uptake (trialability), and its ability to produce successful and tangible results (observability). Because the DOI Theory recognizes the significant role that social networks play in influencing health decisions, it is particularly suited for understanding the interpersonal dimensions present in online discussions between pregnant people. Considering the real-time diffusion of information and the adoption characteristics of different pregnant people helps public health practitioners more effectively tailor strategies to increase the uptake of newly recommended prenatal immunizations, like the RSV vaccine.

Reflexive Statement
This study is based at the Yale School of Public Health located in New Haven, Connecticut. It was completed as the thesis requirement for 2024 matriculation from the two-year Master of Public Health program in the Social and Behavioral Sciences department. The study represents a culmination of skill development in qualitative analysis, social and behavior change theory, and public health ethics as well as deepened subject matter expertise in immunization and RMNCH. The author is a cisgender White woman in her early thirties who is chronically ill and electively childfree. Her inspiration for this study arose from her personal experience seeking answers online related to vaccine adverse events and from hearing about the numerous challenges facing friends navigating pregnancy during the pandemic. Her professional background in storytelling for change draws her to qualitative research, and she ardently believes that the role of public health is to move evidence to action for justice. Like the selected subreddit community, she is also pro-choice, pro-science, and pro-vaccine. These personal identities and experiences undoubtedly influenced the study analysis and findings, aligning with the values of reflexive thematic analysis whereby the researcher’s subjectivity actively informs meaning making.

Data Selection
The social media platform Reddit is the data source for the study. The platform was selected due to its allowance of long-form content posting, organization into topic-focused communities called “subreddits,” strong online content moderation culture, and emphasis on user anonymity. Taken together, these characteristics of Reddit offered an expansive and rich qualitative dataset inherently designed to protect participant identity while remaining openly accessible and searchable. Given the study focus on pregnant people and vaccines, using an anonymous online data source helped minimize risk associated with privacy and confidentiality while expanding access to hard-to-reach population data. Furthermore, research demonstrates that online qualitative methods change the way in which a researcher interacts with their study participants.

141 National Cancer Institute, “Theory at a Glance.”

Perotto
participants, helping to reduce researcher influence during data generation and revealing more realistic participant perspectives. Use of the internet as a research medium has also been shown to be effective for gathering information on sensitive, politicized, or stigmatized topics. Studies find that the lack of a corporeal presence during internet use and perceived levels of anonymity by online users may increase their honesty while decreasing their fears of repercussion. Other research has found that for topics perceived to be socially undesirable or uncomfortable, self-disclosure increases in anonymous spaces, especially when users have some sort of social tie to their online audience or community. The study focus on vaccinations in the COVID-19 context and among a population that may feel intense social pressure surrounding their health decisions reinforced the appropriateness and usefulness of selecting a study design that collects and analyzes anonymous social media data.

About Reddit

Based on the latest 2024 data, 48% of Reddit users are from the United States, 25.8% are women, and 71% are politically left leaning. The average Reddit user is subscribed to 37 subreddits, and 65% of users access the site daily. Unlike other social media platforms, Reddit users have less limitations on the length of their content, which allows them to post in detail about shared interests or activities. Users can create primary posts on a topic of their choosing, or comment on and reply to existing posts. This conversational structure (primary post, comments, and replies) is collectively known as a discussion thread. To ensure that likeminded individuals see and engage with their content, Reddit users typically subscribe and post to subreddits that align with the focus of their queries or contributions. The visibility of content within a subreddit is then determined by a user-driven voting system that ranks posts on a home page, though individuals can also search for specific content by using key terms, selecting engagement criteria, and/or defining time periods. Content on subreddits is moderated by volunteers, typically five per subreddit. These moderators have significant control over their specific subreddit, including the ability to set guidelines, remove posts, use an AutoModerator bot, and mute/ban users. New moderators are typically selected by existing moderators based on a variety of criteria, such as community engagement, rule following, or formal application. Reddit culture encourages both subreddit moderators and users to operate under anonymous pseudonyms.

Data Collection

Data were gathered from a pregnancy-specific subreddit using Communalytic, a social science research tool for studying online communities and discourse. On February 10, 2024, the most recent 200 subreddit primary posts and their corresponding comments and replies (i.e., discussion threads) were pulled into Communalytic using relevant search terms selected for the study (vaccine, vaccines, vaccination, vaccinated, vax, vaxx, vaxxed, vaxmer, vaxxers, shot, shots, booster, boosters, boosted). The dataset was downloaded as an Excel file and filtered to only include discussion threads initiated during the last respiratory virus season (September 1, 2023, and January 31, 2024). After review, nine additional threads were excluded because their focus fell outside of the study scope, i.e., primary posts were made by a pregnant person’s partner, by a non-U.S. individual, or on a non-applicable topic like childhood vaccines.

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144 Anderson and Clarke, “Disgust, Shame and the Psychosocial Impact of Skin Picking”; McDermott and Roen, “Youth on the Virtual Edge”; “Successful Qualitative Research; a Practical Guide for Beginners.”
145 McDermott and Roen, “Youth on the Virtual Edge”; Ma, Hancock, and Naaman, “Anonymity, Intimacy and Self-Disclosure in Social Media.”
146 Ma, Hancock, and Naaman, “Anonymity, Intimacy and Self-Disclosure in Social Media”; Choudhury and De, “Mental Health Discourse on Reddit”; Christopherson, “The Positive and Negative Implications of Anonymity in Internet Social Interactions.”
147 Lindner, “Must-Know Reddit User Statistics [Demographics & Trends].”
149 Gruzd and Mai, “Communalytic: A Research Tool For Studying Online Communities and Online Discourse.”
Automatic comments on each primary post from the AutoModerator bot, reminding users of the subreddit rules and values, were removed from the final dataset.

Data Sample
In total, 59 discussion threads were purposively sampled from U.S. pregnant people discussing prenatal vaccines during the study period (primary posts, n=59; comments/replies, n=2535). Among the primary posts, approximately 72.9% (n=43) related to vaccination of the self while 27.1% (n=16) related to vaccination of family members (a public health strategy known as cocooning). Across these posts, the flu vaccine was referenced 15.8% of the time (n=15), the Tdap vaccine 24.2% (n=23), the COVID-19 vaccine 22.1% (n=21), and the RSV vaccine 34.7% (n=33). The primary posts were overwhelmingly from individuals seeking advice or asking questions (81.4%, n=48), with others offering guidance or resources (10.2%, n=6), going on a rant (5.1%, n=3), or expressing excitement (3.4%, n=2). Primary posts largely determined the focus of the resulting comments and replies within the overall discussion thread, although deviations sometimes occurred within larger threads. Comments/replies per primary post ranged from 1 to 255 responses (M=43.0).

TABLE 2: Characteristics of primary posts.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>% of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccine Recipient Discussed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant Person</td>
<td>43</td>
<td>72.9%</td>
</tr>
<tr>
<td>Family (Cocooning)</td>
<td>16</td>
<td>27.1%</td>
</tr>
<tr>
<td>Prenatal Vaccine Referenced*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Specified</td>
<td>3</td>
<td>3.2%</td>
</tr>
<tr>
<td>Flu</td>
<td>15</td>
<td>15.8%</td>
</tr>
<tr>
<td>Tdap</td>
<td>23</td>
<td>24.2%</td>
</tr>
<tr>
<td>COVID-19</td>
<td>21</td>
<td>22.1%</td>
</tr>
<tr>
<td>RSV</td>
<td>33</td>
<td>34.7%</td>
</tr>
<tr>
<td>Post Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advice/Question</td>
<td>48</td>
<td>81.4%</td>
</tr>
<tr>
<td>Guidance/Resources</td>
<td>6</td>
<td>10.2%</td>
</tr>
<tr>
<td>Rant</td>
<td>3</td>
<td>5.1%</td>
</tr>
<tr>
<td>Excitement</td>
<td>2</td>
<td>3.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>M (SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comments/Replies</td>
<td>43.0 (55.3)</td>
<td>1-255 responses</td>
</tr>
</tbody>
</table>

*More than half of the primary posts (57.6%) referenced multiple prenatal vaccines.

Analysis
Data were analyzed using a process of reflexive thematic analysis as described by Braun and Clarke. The six phases of reflective thematic analysis were used as a foundational guide for thoughtfully engaging with the Reddit data, flexibly but systematically coding interesting and broad patterns of meaning surrounding vaccine access and acceptance, and building creative themes rooted in the lived experiences and stories of pregnant people in the United States.

150 These descriptive categories represent tags (known as “flairs” on Reddit) that were assigned to primary posts within the pregnancy subreddit by users or the moderation team.

**[Familiarization]** The data were read initially to screen out non-applicable primary posts, and then re-read for baseline orientation. The initial reading revealed two types of conversations surrounding vaccination-related decisions during pregnancy: those regarding the vaccination of pregnant individuals themselves and those regarding the vaccination of family members in proximity to pregnant people (cocooning).

**[Generating codes]** The inductive coding process sought to adapt to the conversational nature of the dataset, treating the primary posts as “anchors” framing the broader discussion threads. First, interesting features and short phrases from the primary posts were coded chronologically. Second, a random selection representing a third of the discussion threads was read and analyzed holistically to ensure that the codes developed from the primary posts were applicable across the broader conversations. Third, comments/replies were coded in a similar manner to the primary posts, with relevant and repeating codes rolled up into a summary for each discussion thread. Detailed memos were used throughout to outline these initial impressions, take notes on emerging patterns, and reflect on the researcher’s assumptions. Excel was the primary software used for the coding process given its ability to efficiently filter and sort large amounts of data.

**[Constructing themes]** The codes generated were arranged and rearranged repeatedly into different categories based on perceived shared meaning. Themes and subthemes were generated based on these categories of codes, with the researcher regularly revisiting and reviewing quotes from the dataset. Colored sticky notes were used throughout this process to visually map out layers of thinking and connections across codes, subthemes, and themes.

**[Revising themes]** Thematic mapping and tables were repeatedly used to identify connections and boundaries between themes and subthemes. Such visuals were also helpful in guiding discussions with other YSPH-affiliated faculty, students, and alumni to test assumptions and interpretations of the themes and push critical thinking and meaning making forward. Thematic maps were hand-drawn on a dry erase board and pieces of printer paper; tables were made in Excel.

**[Defining themes]** Final themes were concretized during the thesis writing process, both through the explicit construction of arguments as well as the pulling of illustrative quotes for substantiation. Final reviews and conversations with the YSPH thesis advisors helped to transform the themes into their final forms that meaningfully reflected the lived experiences of pregnant people included in the dataset.

**Ethical Considerations**

The Institutional Review Board (IRB) at Yale University reviewed the study and determined the research to be exempt under IRB Category 4(i) of 45 CFR § 46.104. Informed consent was not sought given that the data for analysis were determined to exist within a publicly available online forum; Reddit profiles, posts, and comments are viewable to anyone on internet.\(^{152}\) The chosen subreddit is easily searchable and accessible without requiring a Reddit account or password. Such terms for user data are clearly stated in the Reddit Privacy Policy.\(^ {153}\) Furthermore, Reddit terms allow the use of its data for research purposes if the use is exclusively academic and published results are anonymized. Because Reddit norms discourage using real names or identifying information, much of the initial dataset in this study did not contain personal identifiable information (PII). Any remaining PII was redacted. The name of the subreddit is deliberately excluded from this study to further protect privacy.


\(^{153}\) “Reddit Privacy Policy.”
Results

Informed by discussions among pregnant people on the selected subreddit during the last U.S. respiratory virus season, four overarching themes related to prenatal vaccine access and acceptance were constructed: pressures of the biological time crunch, divergent interpretations of vaccine science, expanded ideals of pregnancy and parenthood, and external endorsements in a polarized climate. Multiple subthemes were identified within each core theme, underscoring the complexity of factors shaping pregnant people’s experiences with vaccination in the current context.

TABLE 3: Summary of themes and subthemes.

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Theme One: Pressures of the Biological Time Crunch

Pregnant people fixated on the temporal aspects of pregnancy when experiencing vaccine access and acceptance. They felt constrained by the changing biological process of pregnancy, whereby the ability to get vaccinated had to occur within a defined “timeline” and before an unavoidable “deadline” (i.e. childbirth). Pregnant people viewed prenatal vaccines as a critical task to prepare for their newborn’s arrival, using real or imagined milestones to help them track progress towards this endpoint. They also believed that vaccines needed two weeks to activate, which further shortened their timeframe for action. Pregnant people carried these pressures for themselves but also for others (via cocooning efforts). Juggling these timelines was complicated by an awareness that due dates are only estimates for when a baby will be born. As a result, pregnant people struggled to plan for the “right time” and felt unsettled by the unpredictability of childbirth. This theme was developed to illustrate this pressure to get vaccinated within an evolving and limited biological time crunch, with three distinct subthemes: navigating narrow windows, assessing fetal vulnerability, and managing energy reserves.

Subtheme 1a: Navigating Narrow Windows

When seeking out the new RSV vaccine, pregnant people described vaccination experiences characterized by feelings of distress and exasperation. Unlike the other three prenatal vaccines (flu, Tdap, and COVID-19), the CDC recommends the RSV vaccine for uptake only during weeks 32-36 of pregnancy due to the slight increased risk for preterm birth (see Table 1). This narrow window of opportunity created a “now or never” mentality among pregnant people who had to decide relatively quickly if they wanted to add this new option to their suite of prenatal vaccines. Some individuals sought out last minute advice on how to overcome their feelings of RSV vaccine hesitancy, posting questions like “Hi everyone, what are your opinions on the RSV vaccination for pregnant women. Time flew by and I now only have a few days left to get my RSV vaccine. I’m a little unsure with it being so new but RSV is so scary and I’m really worried about it. I am not anti-vax and have received every shot recommended I’m just a bit nervous.” In these
cases, pregnant people’s feelings of vaccine nervousness, disease susceptibility, and deadline pressure collided to create an internal tension that immobilized decision-making until the last minute.

On the other hand, even those who decided early on to get the RSV vaccine ended up experiencing time-driven tension, whereby their desire to get vaccinated conflicted with bureaucratic barriers to access. People noted how they had “jumped through hoops to do it” or had “to wait and essentially play the lottery.” Pregnant people were frustrated, angry, and stressed out by the U.S. healthcare system for adhering to a strict time limit on RSV vaccination but then creating additional delays. People described being turned away from pharmacies or having a hard time getting insurance coverage. For example, one person shared, “My clinic just got it in and I’ll be getting mine next week. Before they had it, I was scrambling because CVS said they won’t give it to me even if I had a prescription. So stressful. I’ll be 35 weeks when I get it so definitely cutting it close.” And yet another ranted, “Yeah my insurance messaging portal was a disaster to talk to. They were just like ‘Does your doctor feel it's necessary? Then it will be covered.’ Ok thank you for the condescending explanation of how insurance SHOULD work, now how about the myriad examples of insurance denying coverage for extremely necessary procedures and medications 😞.” In response to these challenges, pregnant people emphasized the necessity of advanced planning to “save you lots of stress in the future.” As one person explained:

“Sharing for my fellow US-based third trimester folks. I had to really put in some time to find this one, and with upcoming pharmacy strikes/walkouts, it may take even more planning. I managed to get my Abrysvo RSV vaccine at Costco pharmacy because my OB office doesn’t have it yet and I didn’t want to be scrambling trying to get it before 36 weeks if it didn’t come in. You do need your doctor to send a prescrip. Costco is one of the only places in my area that has it in stock. Arexvy is the vaccine for adults 60 and over. Costco said with an Rx for off-label use, they could do that one if Abrysvo wasn’t available. My doctor wouldn't send that Rx, but luckily it didn't matter.”

Detailed posts like this one demonstrate not only the numerous barriers that pregnant people needed to anticipate and overcome for RSV vaccination but also highlight the utility of proactive and real-time online information to facilitate timely access to a new vaccine.

Subtheme 1b: Assessing Fetal Vulnerability

Across all four prenatal vaccines, pregnant people expressed concerns tied to vaccination timing, including both sequencing and spacing, that was subtly linked to fetal vulnerability assessments. Unlike for the RSV vaccine, CDC guidance on vaccination timing for flu, Tdap, or COVID-19 during pregnancy is vague (see Table 1). This motivated pregnant people to conduct their own research (“I have read mixed literature some saying get it anytime, some saying wait till 2nd trimester and some saying atleast wait till 6 weeks”) or look to HCPs for guidance (“My obgyn suggested getting one vaccination a week, which is what I did. I’ve had TDAP, covid, flu, and RSV over the last month”). Such decentralized efforts, however, exposed pregnant people to conflicting information that confused and unsettled them. Individuals were “worried about getting the flu shot and Covid booster too close together” and wondered “if anyone waited till after [the] first trimester or even longer or decided against [vaccination]?” Additionally, even the specificity of the RSV vaccine recommendation did not assuage all anxieties, for example:

“I’m considering getting the RSV vaccine but read that a possible side effect is going into early labor. I’m currently 32 weeks pregnant with my second child. I went into spontaneous labor with my first child and had her at 36 weeks pregnant. Given my history, I’m so afraid of having another premature baby. I’ve considered waiting until I hit the 36 week mark to get the vaccine, but I read that it’s only effective if you get it at least two weeks prior to giving birth and I’m not sure I’ll make it to 38 weeks with this pregnancy. I’m so torn on what to do.”

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Underlying all these considerations was the perception, real or unfounded, that vaccination timing could potentially affect the health and development of a fetus. As exemplified above, pregnant people struggled to weigh the uncertainties of side effects, protective benefits, and personal health histories along a biologically volatile timeline. In the case of flu, Tdap, and COVID-19, pre-pregnancy vaccination experiences also influenced these calculations. Fevers were of particular concern because pregnant people knew that “fevers can be really dangerous when pregnant” and they had often experienced fevers with prior vaccination. As a result, pregnant people frequently decided that spacing out and delaying vaccination until later in pregnancy would be “less risky” for the developing fetus. For example, one person shared, “I’m probably going to wait until later, I get fevers from these shots so I think it’ll be safer to give baby some time to get stronger before then.” These beliefs on the evolution of vaccine risk and fetal vulnerability over time were deeply entrenched. Quotes like “I will not get into a vaccine debate with you. This is not my opinion it is standard medical guidance” demonstrated the challenge and frustration of encouraging timely uptake in the absence of clear standardized recommendations.

Subtheme 1c: Managing Energy Reserves

When thinking about vaccination more broadly, pregnant people viewed time as a precious resource demarcating their physical and mental energy levels. Pregnant people operated under the mindset that the closer they were to childbirth, the less energy they would have to make vaccination decisions for themselves and their family. Such an anticipated energy decline was seen to be linked to real physiological changes occurring over the course of pregnancy, as exemplified by quotes like “Luckily I’ve been staying in my home and not leaving because I’m too big to move” and “that shit took me OUT-especially on top of the already severe fatigue that this pregnancy has presented with.” As such, pregnant people felt like they needed to manage their time, and in turn energy, efficiently before it became virtually non-existent following childbirth. As one pregnant person explained:

“In the moment, when you're tired and flooded with emotions, and your sister starts laying the guilt on you about not letting her hold the baby (or [she removes] the mask because she ‘is uncomfortable’ or ‘can't breathe’ or ‘has been wearing it for hours and it's an unreasonable expectation’) are you going to be able to say no and stick to your guns? Like, actually? Or are you going to make more compromises and put your baby at risk because she's being manipulative? Because you're already letting her push boundaries when you're not in a vulnerable, emotional, life-changing position and it's already causing you a ton of stress.”

These sentiments spoke to how pregnancy and childbirth is not only physically taxing, but also psychologically and emotionally draining. Pregnant people’s awareness of their declining energy reserves affected how they dedicated their time to vaccination. For some, this meant that enforcing vaccination for others was not feasible. As one individual explained, “Adding a different opinion- my husband and I will have updated vaccines. We are not requiring it of any family or friends. We won't have the time or energy to police that honestly.” It also meant that pregnant people were frustrated and disappointed when non-pregnant people caused them to use their energy and time inefficiently. One person shared, “It’s up to OP to care, but that was energy wasted on her part that she could have placed somewhere more beneficial to her life, and wasted energy in of itself annoys me, especially when I was pregnant as my energy was much more limited.” Undoubtedly, these diminishing physical and mental reserves over time underscored many aspects of pregnant people’s experiences with vaccination.

Theme Two: Divergent Interpretations of Vaccine Science

Pregnant people interpreted the complex scientific and medical mechanisms behind vaccines in differing ways, which in turn affected their experiences with access and acceptance. While some individuals had an unquestioning reverence for vaccines, most pregnant people critically analyzed the practice of introducing a biotechnological product into their body. This intensive analysis was directly driven by an awareness that
they were considering vaccination under novel biological terms (i.e., their pregnancy). Additionally, as non-experts, pregnant people often came to subjective conclusions based on what felt “good” or “bad” about vaccines. However, their active role in interpreting scientific information was reinforced by the COVID-19 context, a time characterized by broad public exposure to the process of new vaccine development, testing, approval, and implementation. This theme was created to capture these divergent interpretations of vaccines as advanced scientific biotechnologies, with four separate subthemes: defining vaccine newness, viewing physical discomfort, valuing limited effectiveness, and evaluating proximal risk.

Subtheme 2a: Defining Vaccine Newness

When determining their acceptance of individual vaccines, pregnant people were heavily concerned with the concept of “newness.” Some pregnant people interpreted newness as the first time something was widely available, considering how many other people had been vaccinated before them. As one person empathized, “I understand your fears. No one wants to be first, as things, even with massively safe vaccines, are discovered earlier on in their widespread use. (Again, they are overwhelmingly still safe, though).” Specifically, the first-time availability of the RSV vaccine caused pregnant people to hesitate because they wanted it to be “out for a while, tested and tried.” Some pregnant people welcomed its inaccessibility because it took away their perceived burden of decision-making responsibility. For example, one person shared, “I won’t make the cut to get it anyways, so it takes out the decision to make, and is honestly kinda a relief. Hopefully by the time baby #2 is on the way, there will be way better info on it! I’d feel more confident getting it next pregnancy.” For many others, however, fears of disease outweighed discomfort with early adoption: “I’m not typically the type of person to run out and get the newest vaccines, but I have asked my OB if they’d be getting these in and finally last week was able to get it...RSV is hospitalized babies left and right. To me it was worth it and my doctor was very excited that it was now available to us.” Almost universally, pregnant people believed RSV to be a significant danger and saw value in a new vaccine option even if they personally chose to delay.

Alternatively, some pregnant people defined newness based on the type of vaccine technology. This logic meant that the RSV vaccine was not itself new, only its availability was because “the only new part of the RSV vaccine is that it's being actively advertised.” Pregnant people used this perspective to increase their comfort with the RSV vaccine and almost always contrasted it against their knowledge of the COVID-19 vaccine. As one person outlined, “Im pretty pro vaccine myself. But I will say, something that made me feel better about the RSV vaccine versus COVID was RSV has been around for a long time, and vaccine developments for it began in the 60s. So there has been a lot more time, research, and development that went into this one versus the COVID shot.” Some individuals even spoke with apparent ease to the complexities of different vaccines and vaccine technology, making statements like “The RSV vaccine is part of the family of subunit, recombinant, polysaccharide, and conjugate vaccines. Hep B, shingles, HPV, and whooping cough vaccines are also in this category. So while it’s been adapted to treat RSV, it’s not “new” technology like the mRNA COVID vaccine.” Notably, such differentiation based on technology helped pregnant people justify why they readily accepted the RSV vaccine but continued to decline the COVID-19 vaccine. For example, someone declared, “I will be getting the RSV vaccine and not the covid booster. They have been working on the RSV vaccine for decades and have a lot of data, whereas the covid vaccine is still new and there is a lot of contradictory data.”

Still, other perceptions of newness emerged that seemed to be connected to how widely recognized and trusted a particular vaccine was within the public consciousness. One pregnant person explained how they had decided that the “RSV vaccine was not right for our family at this time” because scientists had “been trying and failing for decades to get said vaccine right.” This same person, however, felt comfortable with the “TDAP and Flu shots [because they] are well known... and are highly recommended.” In this case, both the newer availability and older technology of the RSV vaccine were drivers of hesitancy. In contrast, another person categorized vaccines based on their links to “older” childhood diseases versus “newer”
infectious diseases. As exemplified in the ask, “Is the anti vax for all vaccines or just the newer (flu, Covid, RSV?) If it’s just the newer illness vaccines, wait until the seasons are over where there’s less chance… If it’s they’ve never had any of the typical vaccines, fuck that. It’s not worth the risk… that your kid get measles because aunt Susan doesn’t believe in vaccines.” Such varied delineations demonstrate how malleable the concept of vaccine “newness” was among pregnant people, and in turn, how personal definitions informed and justified different vaccine categorizations and decisions.

Subtheme 2b: Viewing Physical Discomfort

Pregnant people evaluated vaccines based on their associated side effects, anticipated or realized: “You can be pro-vaccine while deciding to not get certain ones because of side effects.” However, deeper meanings were assigned to these experiences that went beyond a basic aversion to physical discomfort. Some pregnant people viewed side effects through a practical and lifestyle-focused lens, making decisions on vaccination linked to other responsibilities and needs. Everyday considerations were important to pregnant people, such as, “I have to get them in my right arm always because I carry our toddler in my left so my right hand is free to do whatever I need” and “I forgot about much the flu vaccine causes arm soreness 😔 Do yourself a favor my fellow third trimester friends, and get your shot in your right arm so you're not trying to sleep while laying on all that soreness 😞”). Comparing and contrasting physical discomfort across vaccines also played a role in pregnant people’s decisions surrounding acceptance. This was essential for the RSV vaccine since pregnant people could not base their decisions on pre-pregnancy experiences nor trial the vaccine before committing. Instead, they relied on reports from other pregnant people, who posted rankings like, “Just got it two days ago! My arm is slightly sore. I was feeling tired and sore yesterday and couldn't figure out why, then realized it was probably the vaccine. But it hasn't been as bad as the flu shot, and definitely not as bad as the Covid vaccine. I would definitely get it if you can.” In contrast, others used physical discomfort as a proxy for interpreting vaccine effectiveness, side effect safety, or symptom controllability. Some pregnant people viewed side effects as a good thing, because it gave them physical proof that the vaccine was doing something. As one person shared, “FWIW I read a recent study that found that having side effects after vaccination is indicative of a more robust immune response, so hopefully that makes you feel (psychologically) better in the event you do have symptoms.” Side effects were also seen as a legitimate cause for concern, however, and some pregnant people were annoyed when these concerns were dismissed. One person argued, “it’s inappropriate for people to keep stating that it’s totally safe and she should get it. The vaccine IS safe but side effects are a real possibility.” Depending on the severity of side effects, pregnant people perceived some vaccines to be safer than others, posting comments like “I’m very pro other shots though. Those don’t have the same side effects.” Still others argued that even if vaccine side effects were severe, they were predictable and manageable in ways that infectious diseases are not. One individual explained, “Get the vaccine if your OB suggests it: you’ll be able to monitor for a fever after and will get immediate medical care for it. On the other hand, getting COVID later down the line without the booster may take more time to get attention [depending] on how your symptoms display and you’d probably wind up with a fever anyways.” Such a range of descriptions illuminates the subjective dimension of physical discomfort with vaccines and the resulting influence on their uptake.

Subtheme 2c: Valuing Limited Effectiveness

Pregnant people recognized that “vaccines aren’t 100% in general” but understood the implications of such limited effectiveness differently. They also were aware of vaccine alternatives, like “no kissing, good hand hygiene and limiting out of the home exposures,” to prevent the spread of infectious diseases. Some pregnant people decided that because vaccines were not a guarantee against infection, they would use them in conjunction with other measures. One person offered a helpful analogy:
“No I of course understand there is always a risk even with a vaccine. Heck I have all my COVID shots but still got COVID twice. It [is] more about being as safe as we possibly can be. The best example I can think to explain it is protection, so say the girl is on BC and the guy wears a condom still there is the risk of pregnancy as nothing is 100% a guarantee. But at least they did everything to protect themselves. I just want to be as cautious as possible is all. That way if it unfortunately does happen at least I can say I gave it my full effort and tried my hardest. Life is always unpredictable.’’

In the face of uncertainty, these individuals valued giving their “full effort” to prevent infectious disease, including accepting vaccines. Getting vaccinated provided them with a sense of control and self-efficacy; even if infection occurred, they were better prepared to manage it physically (through vaccine-induced disease mitigation) and emotionally (with proactive action reducing regret). However, pregnant people anticipated that such nuanced conversations surrounding effectiveness could be seen as an argument against vaccines. Vigilance and pragmatism characterized their efforts to champion vaccines alongside other measures, as in examples like “Also not to downplay the importance of getting vaccinated, because it truly does help protect against severe disease and provides a bit of protection against infection, but the best way to avoid getting infected during times of high transmission is to wear a high quality mask/respirator. I just say this so people don’t count on the booster to be a silver bullet against getting sick- it’s an important tool but it’s not the only one!”

Precautionary statements like the above were deemed necessary because some pregnant people did not believe in the value of vaccines given their limited effectiveness. This “all or nothing” attitude often stemmed from pregnant people’s past experiences getting vaccinated but still getting sick. For example, one person shared, “Same boat. I’ve gotten a flu shot every year since I was in middle school. Every year I get sick from the shot itself, and then later in the year I always catch it. I hate needles so I figured since it wasn’t doing much I took it off my list lol.” To these individuals, the likelihood of dealing with both vaccine side effects and the disease itself was enough to discourage vaccination, especially given alternative options. This perspective extended to cocooning conversations as well. As one individual asserted, “Me, and everyone else I know that has gotten COVID was vaxxed. I wouldn’t trust that alone to protect your baby from possibly getting it. It can very easily be spread, vaxxed or not. I think the best tactic is to just have them tested and make sure they are negative before visiting. No vax needed.” Direct experiences with limited effectiveness were most salient for COVID-19 and flu (“But no vaccine is perfect, and that’s especially true for COVID and flu shots”) compared to RSV and Tdap (“But me and my baby will get the other shots required”). Again, these different beliefs in and experiences with limited effectiveness contributed to pregnant people’s willingness to get all, some, or no vaccines.

Subtheme 2d: Evaluating Proximal Risk
Pregnant people measured their infectious disease risk differently based on who would be around them during pregnancy, childbirth, and the early weeks after delivery. These risk evaluations almost always were focused on family. Pregnant people did not anticipate others meeting their newborns during this time, and their fears of exposure started to decline once the childhood immunization schedule progressed. To try to mitigate proximal risk, pregnant people frequently issued ultimatums requiring family members to get vaccinated. As one pregnant person explained:

“We’re only letting immediate family meet the baby (I don’t need friends meeting baby during the thick of flu/rsv/Covid season) and they all are getting their flu and TDAP vaccines prior to meeting her. If they didn’t want to, I couldn’t *make* them, however they wouldn’t be meeting the baby until SHE was vaccinated and had immunity. You can’t control what people do, but you can control if they have access to your child without it.”
Still, pregnant people were forced to reckon with the knowledge that familial expectations of gathering, like celebrating holidays or “meeting the baby,” could put their pregnancy or their newborns at risk. Pregnant people struggled to manage this risk the most when they perceived those in their lives to be “anti-vax.” They expected these family members to push back on their vaccination requests because of the intractable nature of beliefs associated with both “lifelong” and “politically motivated” anti-vaxxers. One person commented, “The main issue is that the only person that I really see having an issue getting vaccinated is my FIL who is currently living with myself and my husband. He has become staunchly anti-vax over the years (to the ‘vaccines are evil’ extent).” They also suspected that these family members would be dishonest if vaccination requests were made, asking questions like “Did you ask people for proof that they actually got the vaccines? I worry that my SIL/her husband would lie about having gotten any vaccines we request but I’m not sure if asking for proof is going too far.” The inflexibility of the anti-vax identity alongside deeper concerns related to honesty and trust led some pregnant people to decide vaccine refusal by family members was unequivocally too much risk. These individuals shared sentiments like, “Never. It’s not safe for *adults* to be around others who are not vaccinated. We each make those decisions for ourselves… but personally there’s no one on earth that I’d risk my child for.”

Other pregnant people, however, felt that it was “not realistic to keep... away... all anti vaxxers. You limit what you can and hope for the best after that.” Pregnant people who knew they were going to be around unvaccinated family members used it as a motivator for increasing their own vaccine confidence. One person explained, “I’m pro vaccines but was nervous because I am sensitive to them. My OB and I talked about it and because a good chunk of my fam and husbands fam are unvaccinated we felt it was important for me and baby to have those extra immunities. It ended up being so easy.” To them, the impossibility of keeping family members away meant they had to manage risk in other ways. In addition to motivating their own vaccination, these pregnant people employed other measures to lessen their own worries of risk, describing strategies like “My in-laws are antivax and I had a hard time being around them, but two would mask and I felt safe with that.” While limiting family visits to reduce exposure risks for babies was “not unheard of even before covid,” some pregnant people felt like the pandemic had changed beliefs and behaviors because their family members were not “always anti-vaccine.” As such, weighing proximal risks in this context was newly challenging for pregnant people, who struggled to calculate the true risk of disease exposure from unvaccinated relatives.

Theme Three: Expanded Ideals of Pregnancy and Parenthood

Pregnant people experienced vaccine access and acceptance through the identity-based lenses of pregnancy and parenthood. Being pregnant was a consciousness-raising time, whereby people gained new awareness for the health of their developing future child and forthcoming role as a parent. Even if pregnant people believed in prenatal vaccines and had been vaccinated pre-pregnancy, they had to revisit these ideas under the social conditions and expectations of pregnancy. As a result, pregnant people conferred deeper meaning to the act of vaccination beyond its intended medical and public health goal of preventing infection. On physical, emotional, and informational levels, vaccination symbolized ideals like selflessness, sovereignty, and self-education for child health and well-being. Pregnant people then used these ideals to drive their own vaccination efforts, as well as set vaccination rules and boundaries for their social and familial networks. This theme was produced to highlight these identity-based elements of pregnancy and parenthood underscoring vaccination, with three notable subthemes: making personal sacrifices, asserting parental rights, and embracing knowledge responsibilities.

Subtheme 3a: Making Personal Sacrifices

Pregnant people viewed vaccination acceptance as “a very easy sacrifice” for their future child’s health and well-being. These sacrifices were often painful, either physically or emotionally, for pregnant people. However, the experience was ultimately seen as “worth it” if vaccination protected their child from harm.

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Pregnant people rarely regretted their sacrifices and often asserted that they “would do it again” for their baby’s benefit. For example, one person shared:

“I’m about 30 mins away from getting a combo Dtap and flu shot @ 27 weeks. Am I concerned I might get a sore arm, or some nausea or be tired and feel a little under the weather afterwards? Absolutely... Part of being pregnant is doing everything you can to make sure that your (in my case) baby girl has the best start to life and to protect her and keep her safe, getting vaccinated is one of the things I can do, right now, to protect her.”

Regardless of the physical consequences, pregnant people were prepared to “take one for the team” and “suffer [because] it’ll mean me and the baby will have better protection.” They saw vaccination as aligning with their larger pursuit of good parenthood, which involved sparing their child from hardship and removing unnecessary burdens. Such a perspective was especially apparent for RSV protection because pregnant people had two options: receive a vaccine themselves during pregnancy or allow their child to receive an injection of monoclonal antibodies after birth. For example, one person mentioned, “I was particularly motivated to get the RSV when I learned that it was one less shot for baby to get. They recommend either mom or baby get vaccinated so I was happy to take the jab to protect him from birth.” Pregnant people described strong feelings of relief and gratitude at this option “to take the vaccine myself.” Such a preference for personal sacrifice was reinforced by pregnant people who described the disturbing visuals of the alternative: “Missed out on the RSV [deadline] as it was literally introduced the two weeks before I delivered. Def would have gotten it because the RSV shot for the baby is thick as hell and it left a knot on my baby’s leg for like two days.”

Beyond the literal physical sacrifice of receiving an injection, pregnant people described moments where they felt compelled to give up their close personal relationships for the safety of their child. These interpersonal sacrifices occurred most often when pregnant people perceived unvaccinated family members to be a risk to their pregnancy or their newborn. The emotional strain of these deliberations was palpable. As one person shared, “We lost our mom who was my best friend to cancer five years ago, and my sister is the closest thing I have to my mom and I want her at the hospital... I’m trying to find a way to not ruin my relationship with my sister but also try to keep my baby girl safe.” Still, many pregnant people decided to accept the heartbreaking consequences: “I just feel sad... partially for myself but mostly for my husband... nobody can come to the hospital, we won’t be going to family thanksgiving or christmas... it’s just sad. another thing is they basically said they were okay with not seeing babe until 6mos?? why would I want them to be around my baby [then]... I could just be being sensitive because of hormones but it just feels so crappy.” These sacrifices were incredibly sorrowful for pregnant people not only because they involved temporary moments of separation during times of celebration but also because they represented potentially enduring fractures between family members. Pregnant people saw vaccination decisions as pivotal junctures, testing their own and their family’s capacity for love, trust, support, and togetherness in the context of protecting the new baby.

Subtheme 3b: Asserting Parental Rights

Pregnant people’s experiences motivating vaccination for themselves and their family members were tied closely to their assertion of their parental rights. They fervently believed in the idea of “Your baby, your rules” and defended each other when non-pregnant people challenged it. As one person wrote, “People can talk shit all they want, but it’s YOUR baby and you can do what you want. They will have to get over it. It might be easier said than done, but don’t ever feel guilty about doing what you think is best as the parent for the safety of your child.” Pregnant people also saw vaccine decisions as the first of many challenges faced during parenthood and encouraged one another to establish strong boundaries early: “Stand your ground. This is the first time of fighting for your child’s wellbeing.” They also knew that their rights were
indisputable, which gave them leverage over unvaccinated family members: “At the end of the day, everyone wants to see the baby. But none of them have a right to the baby.”

Pregnant people passionately reminded each other of these rights because they were regularly infringed upon by non-pregnant people. They were frustrated and angered by others who thought they had a say surrounding vaccination because of familial relationships. One person ranted, “Honestly I’m tired of the entitlement people feel towards newborns. I don’t care if you gave birth to me/the spouse, you’re not the newborns parent. Same goes to any other family member.” These claims by family members were regarded as comical and even delusional, especially when considering the raw physical intensity of childbirth: “Oh my god- not the ‘our baby’. I would have absolutely lost it 😱 didn’t know all of them were getting sliced open on an operation table and dealing with recovery when YOUR baby comes.. that’s interesting.” Or alternatively, another person commented, “Is your FIL pushing a baby out of his vagina? No? Then he doesn’t get a say- plain and simple.” For first-time parents especially, enforcing their vaccination rights and requests among family members marked a significant shift from being a child of a parent to the parent of a child.

This shift in mindset was also experienced with people outside of the family. In reference to the risks of unvaccinated people in general, one pregnant person shared a parallel: “Similarly, if someone believed seatbelts were too restrictive for themselves and their children, my child would never be in the car with them, as I don’t want my child to see this belief in action until they are old enough to truly make the decision for themselves. This belief also makes me wonder if they have other unsafe vehicle practices, and I would keep my child out of a car they control as long as I possibly can.” Because of the social and legal protections of their parental identity, pregnant people recognized that they had rights to enforce vaccination to protect their child’s safety in a variety of situations. Notably, some pregnant people, like the above individual, realized that this authority would eventually expire once their child was old enough to assert their own autonomy. Until that time came, however, pregnant people were prepared to firmly maintain their decisions and boundaries related to vaccination.

Subtheme 3c: Embracing Knowledge Responsibilities
Alongside other positive health behaviors encouraged during pregnancy, learning about vaccination helped pregnant people understand their new child health responsibilities, which in turn supported their vaccination efforts. People spoke about being in a phase of active learning throughout their pregnancy, with first-time parents starting off with almost zero knowledge (“This is our first child and honestly we know nothing still. 😳”). The process of seeking and analyzing vaccine information not only helped fill their knowledge gaps, but it also helped them understand their role in shaping their child’s well-being. As one person explained, “I’m still learning about everything but as I do more research, I definitely agree the most important thing is keeping my child safe and healthy.” Pregnant people felt motivated to learn and make decisions about vaccination because of this greater goal, even if they encountered challenges or push back. In these difficult moments, pregnant people envisioned the potential long-term child health implications related to vaccination. For example, one person pointed out, “A lot of times it can be hard to really truly realize, as a FTP, that the baby you are about to deliver is going to grow up to be a person... but I found it easier when I asked myself how my relationship to my child would be if she got some permanent damage from getting ill really young.” As such, pregnant people came to understand that diligently building their vaccine knowledge was an essential parental responsibility, rather than a discretionary personal choice.

Pregnant people’s responsibility to build their vaccine knowledge was also reinforced through interactions with HCPs. One pregnant person described their own learning experience, sharing:

“My MIL’s sister is a nurse and told me that I should look into getting the RSV vaccine just yesterday. I’m not an anti vaxxer but knowing my baby’s life depends on my decisions makes me...”

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As in this instance, pregnant people sometimes felt nervous about taking on vaccine decision-making responsibility for their child. The awareness of their own lack of expertise coupled with the importance of their decision was both a significant new burden and opportunity for shaping their future child’s life. As noted above, the resulting course of action was often to seek out information from HCPs. Pregnant people expected HCPs to proactively fulfill this role, and they became upset when their HCPs blamed them for their lack of health knowledge. One person expressed feeling bewildered by their HCP’s expectations, sharing: “I told her I had no idea I was supposed to! No one (including her) ever told me to…The only thing I’ve taken is prenataals everyday and the flu vaccine.” Another person recounted a similar experience, sharing “I asked one of my midwives at 34 weeks about what vaccines I needed…It bothered me that I had to bring it up though! As if I, as a FTM, should automatically know there’s a very short window for getting them!” Such negative interactions with HCPs affirmed pregnant people’s beliefs that they were the ultimate arbitrators of health knowledge for themselves and their future child. Thus, they felt it was their responsibility as a pregnant person and parent to actively research and educate themselves about vaccination.

**Theme Four: External Endorsements in a Polarized Climate**

Pregnant people sought affirmation for their experiences related to vaccine access and acceptance from two distinct groups: health experts and other pregnant people. However, receiving such support and validation through interpersonal exchanges was difficult given that vaccines were perceived to be a highly polarized topic, with “extremists” on both sides. Given this context, pregnant people highly scrutinized the advice and intentions of experts but still found it challenging to pursue vaccination without their approval. Additionally, pregnant people gave significant credence to the first-person stories, tips, and reassurances offered by other pregnant people. Yet even within the anonymity of Reddit, they anticipated that strong views towards vaccination would make polite and respectful discussions difficult. As a result, pregnant people approached communicating about vaccination with caution in both offline and online spaces. This theme was built to demonstrate this experience of seeking external endorsements within a highly polarized climate for vaccines, with two important subthemes: evaluating expert advice and trusting lived experiences.

**Subtheme 4a: Evaluating Expert Advice**

Pregnant people considered the advice of experts (institutions and individuals) when making vaccination decisions, but they evaluated such information and interactions with a high level of scrutiny. Pregnant people often trusted their own instincts (“you know what’s best for you.”) as much as the advice of experts (“They have medical degrees and understanding of how to read data that i don’t.”). In navigating this balancing act, they were most motivated to accept vaccines when their HCPs clearly and confidently recommended them. For example, one individual recounted, “I was strongly recommended to get Tdap, flu, Rsv, and Covid vaccines! I spaced them out a little but was glad to have access to them all! I get anxiety about vaccines but decided to trust in my providers and ACOG recommendations.” Furthermore, expert advice resonated most strongly when accompanied by further explanation, as in “She did stress though that the Tdap and RSV were the most important ones. Covid and Flu will help protect baby. But Tdap and RSV cover baby for some very serious illnesses.” Notably, HCPs often recommended the same suite of prenatal vaccines for eligible family members (i.e. cocooning), which pregnant people welcomed. However, they were frustrated that they could not “find any pamphlet or webpage from a .org/.edu/.gov site to back it up” because they needed an official justification to make requests or set boundaries with vaccine hesitant and anti-vax family members.
Because pregnant people were carefully examining expert advice, they became irritated or confused when they sensed any amount of indifference, indecision, or omission. Pregnant people described interactions with HCPs where they were told to make their own decisions, forced to proactively bring up vaccination, or recommended to get some but not all prenatal vaccines. For example, one person shared, “I was also told by my Dr that the reason for my loss last year was most likely due to my high fevers when I got Covid. So this year I asked her about getting [the vaccine] and she said if it were her, that she wouldn’t. Which really confuses me. I mean I don’t know what to do/who to believe here!... She wants me to get flu, RSV and Tdap though. It’s so scary being pregnant during the height of all this crap.” These types of interactions undermined people’s trust in their HCPs and made them worry about unknown causes for concern. Even if they believed in their own judgment, moving forward without personalized expert advice was not ideal: “I wanted their medical support with my decision to be vaccinated, but I guess I’ll just have to stick to my guns and get it done without their support.” Pregnant people did not like the idea of abandoning their HCPs with whom they had built relationships, even if long-term they knew it might be the right choice. As one person suggested, “Good time to start exercising your medical autonomy because these would be the same people delivering baby and then seeing you afterwards so, it’s a long journey to have an OB you’re unsure of.” HCP vaccine hesitancy, as well as “OB practitioners (and pediatricians and everyone in between) [outright] telling patients NOT to get vaccinated,” were unfortunately not uncommon experiences.

Many pregnant people had little empathy for HCPs who seemed to “approach guidelines with skepticism at best and flout them at worst.” Comments like “Pretty sure your doc is a closeted anti vaxzer” were frequent. Pregnant people felt that vaccine indecision and omission represented experts choosing their “personal,” “religious,” or “political” beliefs “over science” and went against their professional responsibilities to protect and inform their patients. However, others advocated on behalf of HCPs, who they felt were doing their best within a polarized context. Some people suspected that HCPs might be changing the way they communicated about vaccines because of their own fears of patient backlash. One pregnant person explained: “You can be for vaccines and also understand that they have side effects and adverse effects sometimes. People have become quite afraid to take a nuanced stance when it comes to vaccines because they are afraid of the antivaxx label. Your midwives were informing you so that you could consent with that information. Informed consent is how all medical decisions should be made, so they did their job.” For both parties, the polarization of vaccines in the current context made it difficult to work together towards vaccination, especially given pregnant people’s heightened scrutiny of expert advice and communications.

Subtheme 4b: Trusting Lived Experiences

Even if they had the support of both experts and evidence, pregnant people highly valued engaging with other pregnant people when it came to pursuing vaccination. Pregnant people trusted each other’s lived experiences because they provided them with practical guidance and emotional support often missing from the healthcare system. For example, one person shared, “I got TDAP, flu, COVID and RSV shots while pregnant. You can get them all at your local pharmacy or PCP. The RSV one might be hard to find but I had luck at Costco. You should also ask your family members or anyone who plans to spend extended time with baby prior to their 2 month vaccinations to get TDAP and flu shots at minimum, ideally covid as well. If they’re over 60 I’d also suggest the RSV vaccine to them.” Pregnant people took time to share detailed information, operating from a place of goodwill and wishing each other “Good luck! ❤️” on their vaccination journeys. Given the shared experience of pregnancy, they could also uniquely anticipate the concerns and needs that each other might be facing and respond based on what had worked best for them.

Pregnant people also sought to propose solutions to situations they had not directly encountered by outlining their own thought processes. As one individual offered, “The way I would frame it is ‘My sister has the opportunity to get a safe and effective vaccine to protect my newborn. She won’t. Do I feel comfortable with
the risk of my newborn catching flu or whooping cough so that I can have her there? “My personal opinion is no, that I would not be comfortable with that risk. But only you can decide what feels right for you and what risk level you can tolerate.” The gratitude across these exchanges was palpable, especially when pregnant people felt neglected or abandoned by their HCPs. One person gushed, “Wow- I am amazed at the response and support yall have given. I can't keep up with all the comments but am trying to read through them. I truly appreciate everyone's insight and am so glad I asked. I'm REALLY glad I have an appointment today and can speak with another Dr. I will follow my gut and protect myself and baby!” Furthermore, in vulnerable moments, pregnant people stepped in to validate each other’s vaccination decisions by sharing similar stories rooted in empathy. Pregnant people often received messages like “You are not being unreasonable 💖 My own mother and brother will not meet baby until he's 6mos old because they both refuse to get the TDAP, flu shot, and covid vaccines” and “No. They don't know what causes preeclampsia (I had super low blood pressure my whole pregnancy until one day it skyrocketed)...Getting the RSV vaccine was the smart and responsible choice. You did well.”

Across their discussions, pregnant people recognized the power of narratives for motivating successful vaccination, both for other pregnant people (“If you are on the fence about getting the RSV vaccine, and your doctor okays it, I'm here to tell you it was a great decision for me and my newborn. Story time:”) and family (“To try and convince him, I'd find stories of babies dying from pertussis/whooping cough.”). Indeed, one pregnant person posted an explicit request for stories, stating “Anyone in their first trimester get the updated Covid vaccine and baby doing great? I need the push and anecdotes to know it’s safe.” However, pregnant people feared being labeled a “crazy antivaxxer,” which sometimes discouraged them from asking questions or expressing concerns related to vaccination. Online, these reservations manifested via the use of content disclaimers, such as “I need some advice. *I want to preface this by asking this **not** become a vaccine/anti-vax debate.*” Pregnant people anticipated interpersonal conflict or backlash within their conversations due to polarized vaccination views. Indeed, some people were upset about how people reacted to their posts, observing “I always get downvoted like crazy for sharing which is frustrating cause I’m just sharing my personal experience.” Many individuals felt that the pandemic had exacerbated the vaccine polarization issue, causing people to “only see things in black and white.” Similar to HCPs, some pregnant people changed how they communicated about vaccines with other pregnant people. For example, one person shared, “I am very pro vaccine, and I don’t wish to discourage anyone from getting a flu vaccine - they are recommended in pregnancy for a reason and I believe they are important. That said, I’ve had some crazy strong immune response to it and I have been so unwell for days!” In this context, pregnant people regularly found it difficult to balance accuracy and truth with unintended consequences, especially given their awareness of how trusting people were towards lived experiences with vaccination.

Discussion

Key Findings

This study aims to explore factors influencing pregnant people’s experiences of access and acceptance with prenatal vaccines in the United States during the last respiratory virus season. To the researcher’s knowledge, it is the first qualitative study to examine pregnant people’s vaccination experiences on the social media platform Reddit, as well as the first to comprehensively look at the updated 2023 adult immunization schedule for pregnant people (flu, Tdap, COVID-19, and RSV). The study responds directly to recommendations for additional research into how pregnant people make vaccination decisions as well as how vaccination attitudes may be changing following the COVID-19 pandemic.154 Findings from the

study align with existing research showing that pregnant people view vaccination differently than non-
pregnant people due to their unique biological and social state.\textsuperscript{155} Using a process of reflexive thematic
analysis, the study found that pregnant people’s vaccine access and acceptance experiences were primarily
shaped by four themes: pressures of the biological time crunch, divergent interpretations of vaccine science,
expanded ideals of pregnancy and parenthood, and external endorsements in a polarized climate.
Additionally, results demonstrated that pregnant people are highly concerned not only with their own
vaccination, but also with that of their family members (via cocooning) across all thematic domains—a new
observation that seems to be connected to the COVID-19 pandemic context and the increasing polarization
of vaccine viewpoints.

**Accessing Prenatal Vaccines**

Pregnant people’s experiences of vaccine access (i.e., affordability, availability, and convenience) were
shaped by factors concerning the introduction of the new RSV vaccine, the time sensitivity of female
reproductive biology, and the utility of relationships with different HCPs. Study findings highlight the
complexity of vaccine access for certain populations even in countries like the United States where vaccines
are generally widely available. Existing research looking at structural and social factors that shape access
to care for pregnant people and other vulnerable populations has showcased similar complications. For
example, adult vaccine cost-sharing for enrollees in Medicare Part D and the Medicaid pregnancy pathway
was not eliminated until the enactment of the Inflation Reduction Act (IRA) in 2023. Previously, individual
states could decide which prenatal vaccines to cover for pregnant people on federal public health insurance,
which led to documented coverage gaps.\textsuperscript{156} State-level disparities were also observed during the “last mile”
rollout of the COVID-19 vaccines, with some states better resourced to balance supply and demand when
prioritizing and delivering vaccines to different vulnerable populations.\textsuperscript{157} Additionally, convenience is a
known concern for pregnant people when accessing healthcare services; structural barriers, like long wait
times, clinic hours and location, child-friendliness, and service costs, often delay or prevent pregnant people
from accessing desired care.\textsuperscript{158}

Within the current study findings, pregnant people’s experiences with the introduction of the new RSV
prenatal vaccine help inform challenges to access. Other than the COVID-19 vaccine, the last time a new
prenatal vaccine was introduced in the United States was more than a decade ago (see Table 1). Thus, most
pregnant people’s prior experiences with a new prenatal, and maybe even adult, vaccine were based on an
emergency outlier. Pregnant people expressed frustration at bureaucratic hurdles they encountered across
the U.S. healthcare system, ranging from HCP apathy to pharmacy refusals to insurance denials. They did
not understand why a CDC-recommended vaccine was not immediately accessible, especially since they
had already seen pharmaceutical advertisements for it. Pregnant people spent significant amounts of time
and energy trying to access the RSV vaccine: calling different pharmacies to check shipments, paying
hundreds of dollars out-of-pocket, and even considering driving across state lines. Because supply did not
meet demand, many pregnant people turned to Reddit for assistance with access. Pregnant people relied on
each other to share details, such as the role of disaggregated corporate policies in creating delays,
prescription workarounds for stubborn pharmacists, and early successes with local pharmacies and Costco.
Examined through the DOI Theory lens, Reddit (and likely other social media) was a critical medium for

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\textsuperscript{155} Cox et al., “A Mother’s Dilemma”; Yuill et al., “Women’s Experiences of Decision-Making and Informed Choice about Pregnancy and Birth Care.”

\textsuperscript{156} Pfister, Polaris, and Itzkowitz, “Prenatal Vaccines in Medicaid and CHIP: Coverage, Reimbursement, and State Policy Solutions to Increase Access”; “Medicare Part D Enrollee Savings from Elimination of Vaccine Cost-Sharing.”

\textsuperscript{157} Tewarson, Greene, and Fraser, “State Strategies for Addressing Barriers During the Early US COVID-19 Vaccination Campaign.”

\textsuperscript{158} Phillippi, “Women’s Perceptions of Access to Prenatal Care in the United States.”
people to disseminate health innovation information in addition to serving as a space for them to troubleshoot barriers to early access.

Pregnant people’s experiences seeking vaccination reveal the time sensitivity associated with certain female reproductive processes, as well as how indifferent the U.S. healthcare system is to such concerns. The timing of vaccine access mattered to pregnant people because they were juggling complex calculations surrounding sequencing and spacing, trying to ensure that vaccination would ensure optimal protection but avoid fetal harm. Pregnant people felt pressured by strict deadlines limiting their access, like with RSV, but were also distressed by vague guidance liberating their choices, like with flu, Tdap, and COVID-19. These reproductive-based time pressures echo the experiences of individuals seeking abortions in the United States. Pregnancy, as a biological process unique to the female reproductive system, requires time-sensitive interventions that are neither emergency nor routine. Yet, the U.S. healthcare system is not designed around such needs, unduly burdening pregnant people—whether they are seeking vaccines or abortions. Both the lived experiences documented in the current study and prior research demonstrate how insufficient access to such services has negative consequences for health and well-being.159

Lastly, pregnant people’s experiences with access raise interesting questions about the utility of relationships with different HCPs. Traditionally, obstetrician-gynecologists or pediatricians have played the primary role in recommending and offering vaccines to pregnant people and their families (cocooning). Indeed, ACOG underwent concerted efforts to increase the promotion of immunization by its members during prenatal care visits.160 While pregnant people in the current study continued to champion the importance of these HCPs to prenatal care and complex health situations, they also emphasized the availability and convenience of vaccination at their local pharmacy. Many pregnant people described experiences getting vaccinated at pharmacies, especially Costco, because of supply chain, cost, or location advantages. Pharmacies as points of vaccine access were particularly important when pregnant people were not able to reach their primary HCP with questions or needed to circumvent their HCP due to perceived hesitancy. The ability of pharmacies to deliver prenatal vaccines could potentially help promote a sense of personal reproductive autonomy among pregnant people while also increasing the convenience of vaccination. Such benefits have been documented for other maternal and reproductive health services, like medication abortion, emergency contraception, and birth control.161 Furthermore, because pharmacies are widely accessible throughout the United States, with 95.5% of individuals living within 10 miles of one, they may also represent a promising avenue for adjusting the U.S. healthcare system to meet the time-sensitive needs of more than 65 million individuals of reproductive age.162

Implications for Access
Both the HBM and DOI Theory provide frameworks for understanding vaccine access: the HBM emphasizes perceived barriers and behavioral nudges for vaccines, whereas the DOI Theory focuses on information channels and structural convenience for health innovations. Given pregnant people’s


160 Jones et al., “Efforts to Improve Immunization Coverage during Pregnancy among Ob-Gyns.”


experiences of access related to the introduction of the new RSV vaccine, the time sensitivity of female reproductive biology, and the utility of relationships with different HCPs, recommendations for public health action include the following:

- **Research** Further studies should investigate the time-sensitive needs unique to the female reproductive system and the design of the healthcare system in relation to those needs. Specifically, community pharmacies should be studied as integrated access points not only for prenatal vaccines, but also for other reproductive and maternal healthcare services with ties to bodily autonomy.

- **Policy** CDC recommendations for prenatal vaccines should be adjusted to provide more specific guidance regarding the sequencing and spacing of vaccines during pregnancy, similar to the specificity of the childhood immunization schedule. Guidance should make clear that catch-up vaccination is available to those who miss recommended milestones.

- **Practice** During the initial rollout of new prenatal vaccines, state and local public health departments should plan well in advance to offer and sustain tailored, up-to-date resources concerning vaccine availability, affordability, and convenience for pregnant people. This information should be disseminated widely on social media in addition to via other means (e.g., community flyers or radio announcements).

### Accepting Prenatal Vaccinations

Pregnant people’s experiences of vaccination acceptance (i.e., degree of hesitancy) were shaped by factors concerning their individual understandings of science and sexual health, the social experiences of pregnancy and vaccination, and the stigmatization of vaccine uncertainty. Study findings elevate the importance of centering the lived experiences of certain populations to better understand their complex and evolving attitudes towards vaccination. Existing research examining vaccination acceptance during pregnancy has established that pregnant people make decisions with a dual lens, considering the health implications for themselves as well as for their developing future child.\(^{163}\) For example, researchers are creating new models of vaccine decision-making to try to capture this unique health duality present during pregnancy. One proposed model, the 5-P Mother’s Dilemma Model, expands on the HBM and anchors all prenatal vaccination considerations to the central concern of “balancing pros/cons for mother and fetus.”\(^{164}\) Separately, the COVID-19 pandemic has spurred significant amounts of research investigating vaccine hesitancy and refusal in the context of online misinformation, declining public trust in science, and new disease outbreaks.\(^{165}\) Such research has found that vaccine hesitancy is increasing among people who previously trusted vaccines, and that COVID-19 vaccine “spillover effects” may be affecting vaccine attitudes more generally.\(^{166}\)

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Considering the current study findings, pregnant people’s experiences with vaccine acceptance expose a need to focus on the irregularity of individual understandings of science and sexual health. Extensive research shows that because of misplaced policies and funding, sexual health education in U.S. schools does little to equip people with evidence-based knowledge or skills related to their sexual and reproductive health. Additionally, approximately 88% of adults do not have adequate health literacy levels to effectively navigate the U.S. healthcare system. Possibly due to a confluence of these two factors, pregnant people expressed wildly different understandings of the scientific and medical mechanisms behind vaccines during pregnancy. Personal perceptions of newness, physical discomfort, limited effectiveness, and proximal risk affected how pregnant people made decisions regarding vaccination. Surprisingly, vaccine newness was a malleable concept for pregnant people, who defined it based on availability, technology, or public recognition. Other studies have found that vaccine technology is a new concern tied to the introduction of novel, mRNA-based vaccines during the COVID-19 pandemic. Across these parameters and others, pregnant people tried to weigh the risks and benefits surrounding their own prenatal vaccination and cocooning efforts. However, they were preoccupied with avoiding fetal harm and often overestimated the risk of vaccines to their reproductive system and baby’s development. These misinterpretations of vaccine science and sexual health occurred even though pregnant people recognized that they were in an intensive phase of active learning linked to their expected knowledge responsibilities as parents.

Pregnant people’s vaccination pursuits elevate the significance of the social dimensions of pregnancy and vaccination with regard to acceptance. While previous research has focused on interpersonal sources of information shaping prenatal vaccination, with HCPs, family, and peers playing influential roles, no existing studies could be found looking at the vaccination status of family members as a concern for pregnant people. However, the current study findings showed that pregnant people were highly preoccupied with cocooning efforts, especially since the same suite of prenatal vaccines available to them was also available to most of their relatives, with the exception of the RSV 60+ age requirement. Like with their pursuit to access the RSV vaccine, pregnant people spent significant amounts of their time and energy worrying about and enforcing familial vaccination acceptance. Family members who were staunchly “anti-vax” and lived in proximity were of the highest concern for disease risk, but pregnant people differed in how they managed such risk. Some were confident in asserting their rights as parents, abiding by the “my baby, my rules” philosophy and even sacrificing existing family ties to protect new ones with baby. Others relied upon the limited effectiveness of vaccines, their own energy reserves, or non-vaccine disease mitigation measures to dampen their anxieties about unvaccinated family. These cocooning tensions facing pregnant people, wherein individual autonomy conflicted with community-centered protection, mirror broader ethical challenges within public health that seek to balance health, fairness, and freedom.

Lastly, pregnant people’s experiences with acceptance underscore the urgency of addressing the stigmatization of vaccine uncertainty in the COVID-19 pandemic context. Pregnant people wanted support and validation when pursuing vaccination, but they found it difficult to communicate concerns or nuance because they anticipated interpersonal backlash. This stigmatization was more prevalent for vaccine

167 Rabbitte and Enriquez, “The Role of Policy on Sexual Health Education in Schools.”
168 Lopez, Kim, and Sacks, “Health Literacy in the United States.”
171 Jamrozik, “Public Health Ethics.”
viewpoints characterized by complexity and uncertainty; many pregnant people felt dismissed or attacked by those on both ends of the spectrum, pro and anti-vaccine alike. Even within the anonymous subreddit community, pregnant people felt they had to add content disclaimers to try to suppress polarized vaccine debates and were frustrated when their multifaceted lived experiences with vaccines were downvoted. This disregard for lived experiences was particularly offensive because pregnant people highly valued first-person stories as a way to feel confident in their vaccination decisions. These intense online exchanges between pregnant people were concerning, and so was stigmatization occurring in healthcare settings. Pregnant people described times when they decided not to discuss vaccine concerns with their HCPs for fear of being perceived as anti-vax, as well as moments when they suspected their HCPs were allowing personal, political, or religious beliefs to interfere with their provision of care. Even though pregnant people overwhelmingly still wanted advice from health experts, as has been previously established in the literature, in the current context they scrutinized such expertise for indifference, indecision, or omission. On some fundamental level, the polarization of vaccine attitudes and stigmatization towards nuance fostered distrust towards healthcare interactions. These suspicions and reservations potentially help explain why research shows that up to 33% of pregnant people remain unvaccinated even after receiving an HCP recommendation.

Implications for Acceptance

Both the HBM and DOI Theory provide frameworks for understanding vaccine acceptance: the HBM emphasizes subjective considerations related to disease susceptibility and severity, vaccine benefits, and decision-making confidence, whereas the DOI Theory focuses on the relative advantage, fit, trialability, and tangible success of new vaccination. Given pregnant people’s experiences of acceptance related to their individual understandings of science and sexual health, the social experiences of pregnancy and vaccination, and the stigmatization of vaccine uncertainty, recommendations for public health action include the following:

- [Research] Further studies should investigate the relationship dynamics before, during, and after pregnancy between family members with differing vaccination attitudes. Specifically, research should explore the psychosocial impact of vaccine hesitant and anti-vaccine family members on the mental well-being and trauma experiences of pregnant people who desire cocooning. Research should also consider the influence of diverse health and social support systems, as well as disparities in information and resources, on familial vaccination experiences for different groups of pregnant people.

- [Policy] Federal and state policies should target investments towards developing and delivering evidence-based vaccine science and health education curriculums to schools and communities. Curricula should cover topics like vaccines across the life course, vaccine development and approval processes, and community-level responsibilities and protective benefits. Prenatal vaccines should also be included as part of comprehensive sexual education policies, with curricula focusing on evaluating vaccine and disease risk during pregnancy, dispelling fetal vulnerability myths, and balancing personal wellness decisions during pregnancy and parenthood.

- [Practice] Community-based and healthcare interventions focused on destigmatizing vaccine conversations and communications should be urgently implemented to mitigate fracturing

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relationships between pregnant people and HCPs. Furthermore, such interventions should heavily emphasize and incorporate personal narratives to foster empathy, respect, and realism concerning vaccination acceptance.

Limitations
The study experienced several methodological limitations that should be considered when reviewing the results. Because of the anonymous culture and structure of the social media platform Reddit, it was impossible to confirm that participants were pregnant and birthing people and that they were from the United States. However, frequent references to one’s gestational age, comments about the U.S. healthcare setting, and even one explicit assertion that the subreddit was “American centric” reinforced the study’s intended focus on U.S. pregnant people. Additionally, the focus on a pro-vaccine subreddit, as well as the active removal of vaccine misinformation by moderators, limited the applicability of findings to this specific context; the study did not capture perceptions or dynamics that might be present in online spaces where users do not have to adhere to such norms. Because pregnant people self-reported their experiences to the online community, the data may have been influenced by recall bias and social desirability bias. The use of secondary data also meant that successful vaccine uptake could not be verified. Furthermore, the online social media dataset excluded individuals without the desire, resources, or ability to use the internet, social media, and related technology. As such, the study was under-inclusive and not representative of the diverse range of U.S. identities and experiences with prenatal vaccination.174 Given documented disparities across both access and acceptance, further studies are warranted that look specifically at how individual demographics and structural inequalities influence experiences with prenatal vaccines in the COVID-19 context. This is particularly important in order to continue elevating prenatal vaccines as a critical component of reproductive justice.

Conclusion
This qualitative study offers deeper insight into the lived experiences of U.S. pregnant people on Reddit who were navigating prenatal vaccine access and acceptance during the 2023-2024 respiratory virus season. The study findings reinforce the notion that because pregnancy is a unique physiological and social state, pregnant people experience both access and acceptance differently than non-pregnant people. Findings showed that factors like the pressures of the biological time crunch, divergent interpretations of vaccine science, expanded ideals of pregnancy and parenthood, and external endorsements in a polarized climate intersected to influence pregnant people’s vaccination decisions. Across these thematic domains, pregnant people’s experiences of access were shaped by factors concerning the introduction of the new RSV vaccine, the time sensitivity of female reproductive biology, and the utility of relationships with different healthcare providers, whereas experiences of acceptance were shaped by individual understandings of science and sexual health, the social experience of pregnancy and vaccination, and the stigmatization of vaccine uncertainty. Notably, pregnant people were intensively concerned with not only their own vaccination, but also that of their family members; a shift potentially linked to increased vaccine polarization in the wake of the COVID-19 pandemic. Continued use of Reddit and other social media platforms by public health professionals may be helpful for understanding and responding to real-time elements influencing health decision-making. Studying social media also represents an important avenue for identifying the role of online communities in diffusing information on health innovations—including future prenatal vaccines.

Declaration of Conflicting Interests
The author declared no potential conflicts of interest with respect to the research, authorship and/or publication of this thesis. The author received no financial support for the research, authorship and/or publication of this thesis.

174 Lunnay et al., “Ethical Use of Social Media to Facilitate Qualitative Research.”
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Matsuo, Koji, Jessica M. Green, Sarah A. Herrman, Rachel S. Mandelbaum, and Joseph G. Ouzounian. “Severe Maternal Morbidity and Mortality of Pregnant Patients With COVID-19 Infection During the Early


## TABLE 1: Vaccines recommended during pregnancy in the United States for the 2023-2024 respiratory virus season.

<table>
<thead>
<tr>
<th>Vaccine Name</th>
<th>Flu vaccine (inactivated influenza vaccine)</th>
<th>Tdap vaccine (whooping cough vaccine)</th>
<th>COVID-19 vaccine</th>
<th>RSV vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Date of FDA Licensing for Use</strong></td>
<td>1945(^i)</td>
<td>December 1991(^{ii})</td>
<td>December 2020(^{iii})</td>
<td>August 2023(^{iv})</td>
</tr>
<tr>
<td><strong>First Date of CDC Recommendation for Pregnant People</strong></td>
<td>April 1997(^v)</td>
<td>October 2010(^{vi})</td>
<td>July 2021(^{vii})</td>
<td>September 2023(^{viii})</td>
</tr>
<tr>
<td><strong>Current CDC Website Topline Recommendation</strong></td>
<td>“If you are pregnant during flu season”</td>
<td>“During each pregnancy”</td>
<td>“If you are pregnant and not up to date on your COVID-19 vaccine”</td>
<td>“If you are 32 through 36 weeks pregnant during September to January”</td>
</tr>
<tr>
<td><strong>Vaccine Effectiveness</strong></td>
<td>Varies seasonally, estimated 40-60% reduction in risk of illness for adults(^x)</td>
<td>Varies based on vaccine type, estimated 78% reduction in risk of illness for infants younger than 2 months of age(^x)</td>
<td>Varies based on vaccine type, estimated 54% reduction in risk of illness for adults receiving updated monovalent vaccine(^{xi})</td>
<td>Estimated 57% reduction in risk of hospitalization for infants during the first 6 months of life(^{xiii})</td>
</tr>
<tr>
<td><strong>Protection Conferred to Newborns via Maternal Antibody Transfer</strong></td>
<td>Yes(^{xiv})</td>
<td>Yes(^{xv})</td>
<td>Yes(^{xvi})</td>
<td>Yes(^{xvii})</td>
</tr>
<tr>
<td><strong>Possible Vaccine Side Effects</strong></td>
<td>Redness, swelling, or soreness at injection site</td>
<td>Redness, swelling, or pain at injection site</td>
<td>Redness, swelling, or pain at injection site</td>
<td>Pain at injection site</td>
</tr>
<tr>
<td></td>
<td>Headache</td>
<td>Headache</td>
<td>Headache</td>
<td>Headache</td>
</tr>
<tr>
<td></td>
<td>Fever</td>
<td>Fever</td>
<td>Fever</td>
<td>Nausea</td>
</tr>
<tr>
<td></td>
<td>Nausea</td>
<td>Fatigue</td>
<td>Fatigue</td>
<td>Muscle pain</td>
</tr>
<tr>
<td></td>
<td>Muscle aches(^{xviii})</td>
<td>Vomiting, diarrhea, or stomachache(^{xix})</td>
<td>Nausea</td>
<td>Nausea</td>
</tr>
<tr>
<td><strong>Severe Side Effects Are Rare</strong></td>
<td>Yes(^{xxii})</td>
<td>Yes(^{xxiii})</td>
<td>Yes(^{xxiv})</td>
<td>Yes(^{xxv})</td>
</tr>
<tr>
<td><strong>Infectious Disease Targeted by Vaccine</strong></td>
<td>Influenza</td>
<td>Pertussis(^{xxvi}) and Tetanus/Diphtheria</td>
<td>COVID-19</td>
<td>Respiratory Syncytial Virus</td>
</tr>
<tr>
<td><strong>Primary Means of Disease Transmission</strong></td>
<td>Respiratory Droplets(^{xxvii})</td>
<td>Respiratory Droplets(^{xxviii})</td>
<td>Respiratory Droplets(^{xxix})</td>
<td>Respiratory Droplets(^{xxx})</td>
</tr>
<tr>
<td><strong>Increased Risk of Hospitalization or Death with Disease (for Pregnant Person and/or Newborn)</strong></td>
<td>Yes(^{xxi})</td>
<td>Yes(^{xxii})</td>
<td>Yes(^{xxiii})</td>
<td>Yes(^{xxiv})</td>
</tr>
</tbody>
</table>

**Note:** Some healthcare providers may also recommend these vaccinations for eligible family and friends who will be in close proximity to a pregnant person and their newborn, a public health strategy called cocooning that seeks to reduce the risk of exposure among populations vulnerable to infectious diseases.\(^{xxv}\)
TABLE 1: References

1 Mackin and Walker, “The Historical Aspects of Vaccination in Pregnancy.”
2 Committee on Infectious Diseases, “Acellular Pertussis Vaccines”; Klein, “Licensed Pertussis Vaccines in the United States.” The United States switched from using a whole cell pertussis vaccine to an acellular pertussis vaccine during the 1990s; whole cell pertussis vaccines were licensed in the United States as early as 1914.
4 Commissioner, “FDA Approves First Vaccine for Pregnant Individuals to Prevent RSV in Infants.”
5 Mackin and Walker, “The Historical Aspects of Vaccination in Pregnancy.” The CDC was almost 40 years delayed in endorsing the flu vaccine for pregnant people; U.S. public health authorities first recommended prioritizing pregnant people for flu vaccination in 1960.
6 Mackin and Walker. The CDC first recommended Tdap vaccination for pregnant people who had not previously been vaccinated in 2010, before updating their recommendation to apply to every pregnancy in June 2011.
7 Grunebaum and Chervenak, “Physician Hesitancy to Recommend COVID-19 Vaccination in Pregnancy as a Cause of Maternal Deaths - Robert Brent Was Prescient.”
8 Fleming-Dutra, “Use of the Pfizer Respiratory Syncytial Virus Vaccine During Pregnancy for the Prevention of Respiratory Syncytial Virus–Associated Lower Respiratory Tract Disease in Infants.”
9 CDC, “Vaccines During and After Pregnancy.”
x CDC, “Vaccine Effectiveness.”
xii CDC, “COVID-19 Vaccine Effectiveness.”
xiii CDC, “RSV Vaccination for Pregnant People.”
xiv Mackin and Walker, “The Historical Aspects of Vaccination in Pregnancy.”
xv Klein, “Licensed Pertussis Vaccines in the United States.”
xvi CDC, “COVID-19 Vaccines While Pregnant and Breastfeeding.”
xvii Fleming-Dutra, “Use of the Pfizer Respiratory Syncytial Virus Vaccine During Pregnancy for the Prevention of Respiratory Syncytial Virus–Associated Lower Respiratory Tract Disease in Infants.”
xviii CDC, “Flu Vaccine Safety and Pregnancy.”
xx CDC, “Getting Your COVID-19 Vaccine”; CDC, “COVID-19 Vaccines While Pregnant and Breastfeeding.”
xxi CDC, “RSV Vaccination for Pregnant People.”
xxii CDC, “flu Vaccine Safety and Pregnancy.”
xxiv CDC, “COVID-19 Vaccines While Pregnant and Breastfeeding.”
xxv CDC, “RSV Vaccination for Pregnant People.”
xxvi Mackin and Walker, “The Historical Aspects of Vaccination in Pregnancy.” The Tdap vaccine offers combined protection against tetanus, diphtheria, and pertussis.
xxvii CDC, “How Flu Spreads.”
xxviii CDC, “Pertussis Causes and How It Spreads.”
xxix CDC, “COVID-19 and Your Health.”
xxx CDC, “RSV Transmission.”
xxi CDC, “Flu Vaccine Safety and Pregnancy.”
xxii CDC, “COVID-19 Vaccines While Pregnant and Breastfeeding”; CDC, “COVID-19 and Your Health.”
xxiii CDC, “RSV Vaccination for Pregnant People.”