Identifying Strategies to Boost COVID-19 Vaccine Acceptance in the United States

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This report presents the results of a collaborative project between researchers within RAND Health Care, a division of the RAND Corporation, and the University of Michigan Acute Care Research Unit (ACRU). The project team identified recommendations for strategies to help boost COVID-19 vaccine acceptance in the United States in order to reach herd immunity and end the pandemic.

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We dedicate this report to the scientists who helped develop the COVID-19 vaccines and the patients who volunteered in clinical vaccine trials to test their safety. We appreciate your contributions to advance our collective quest to end this pandemic and curb the suffering it has caused.
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Summary

Background and Objectives

On March 11, 2020, the World Health Organization (WHO) declared coronavirus disease 2019 (COVID-19) a pandemic (WHO, 2021). The first approved vaccine against COVID-19—the Pfizer-BioNTech vaccine—received emergency use authorization by the U.S. Food and Drug Administration (FDA) on December 11, 2020 (FDA, 2020). But even before the United States started administering COVID-19 vaccines, anti-vaccine sentiments were apparent across the country.

Prior research has been conducted on hesitancy related to other vaccines in the United States and worldwide, and numerous reports have documented the ongoing challenge of COVID-19 vaccine hesitancy in the United States and its repercussions (Fridman, Gershon, and Gneezy, 2021; Khubchandani et al., 2021; Loomba et al., 2021). However, despite the number and extent of the multilevel and multimodal solutions proposed to boost vaccine acceptance, there is little understanding of the feasibility and the effectiveness of these solutions in the context of COVID-19 vaccine hesitancy.

COVID-19 vaccination has uniquely challenged our current understanding of vaccine hesitancy, both because of the use of novel vaccination technology and the unprecedented timeline of vaccine development in the setting of an evolving pandemic. Further, ongoing politicization of the public health response to the COVID-19 pandemic and widespread misinformation on social media have influenced how willing individuals have been to obtain the vaccine. How to boost vaccine acceptance among those who are hesitant based on political ideology, religious objections, conspiracy theories, or misinformation is not well understood.

In this report, we present the results of a quick-turn evaluation of the root causes of COVID-19 vaccine hesitancy to inform strategies to boost vaccine acceptance among vaccine-hesitant populations in the United States. The goals of this project were to

- examine the root causes of COVID-19 vaccine hesitancy
- seek patient, hospital-based health care provider, pre-hospital first responder, and expert perspectives to identify potential strategies to boost COVID-19 vaccine acceptance
- provide recommendations to help inform appropriate practice, policy, and research priorities and the development of tools to boost COVID-19 vaccine acceptance.

Methods

We performed an environmental scan of peer-reviewed and gray literature to understand what is known about the root causes of vaccine hesitancy (in general and with respect to COVID-19 vaccines) and strategies to boost vaccine acceptance. To further our understanding of
reasons for vaccine hesitancy and vaccine acceptance among different U.S. populations, we conducted focus groups with patients, pre-hospital first responders (e.g., emergency medical responders and police officers), and hospital-based health care providers. To augment the knowledge that we gained about COVID-19 vaccine attitudes from our focus group analysis, we conducted a social media platform sentiment analysis to review attitudes regarding the COVID-19 vaccine across a broader population. To complete the social media sentiment analysis, we relied on Meltwater, which is a comprehensive media monitoring, analysis, and social listening platform (Meltwater, undated). The sentiment analysis identified how users on Twitter, Reddit, Facebook, and Instagram feel (positive, neutral, and negative) about the COVID-19 vaccine (from April 2020 through April 2021 for Twitter, Reddit, Facebook and from April 26, 2021, through May 2, 2021, for Instagram). A total of 11.8 million comments or mentions across the four platforms met inclusion criteria for the analysis.

Finally, to understand what solutions are most actionable and grounded in existing evidence, we conducted an expert roundtable that included a pediatric emergency physician, two social scientists, a political scientist, and a behavioral scientist. During this roundtable, we reviewed the results of the above analyses and identified key recommendations for policy solutions to address vaccine hesitancy moving forward.

Results

Our mixed-methods analysis revealed common themes associated with COVID-19 vaccine hesitancy in the United States. The four methodologies employed by this study identified similar themes with respect to the root causes of COVID-19 vaccine hesitancy and regarding strategies to boost vaccine acceptance. Strategies to boost COVID-19 vaccine acceptance need to be tailored to root causes of hesitancy in different populations, including racial and ethnic minority groups, young adults, individuals hesitant because of political and/or religious beliefs, those with fixed beliefs against the use of vaccines more generally (e.g., those who may identify with the anti-vaxxer movement), and those who subscribe to prevailing conspiracy theories related to the development and nature of COVID-19 vaccines. These currently hesitant populations might be willing to obtain the vaccine if the right influencer helps to convey a recommendation to do so, including a personal physician or other trusted health care provider, a religious and/or political leader, celebrities (e.g., musicians, athletes, actors), COVID-19 patients and/or individuals who lost loved ones to COVID-19, and a personal network of family, friends, and colleagues.

Recommendations

We offer three tiers of recommendations for public health and health care officials, health care providers, policymakers, and researchers who strive to boost COVID-19 vaccination rates in the United States in order to achieve herd immunity and overcome the pandemic. As explained in
Table S.1, the three tiers of recommendations are based on how frequently the recommendation was supported in each part of our mixed-methods analysis: the environmental scan, focus groups, social media platform sentiment analysis, and expert roundtable. The full list of recommendations is provided in Table S.2.

Each of these recommendations can inform the development of a toolkit of strategies to boost vaccine acceptance that features the most effective messages, messengers, and messaging platforms among various hesitant populations in the United States. These recommendations are presented according to the WHO “three Cs” model of confidence, complacency, and convenience, which addresses trust in vaccines and the systems administering them, perceptions of being low-risk for diseases in question, and characteristics of immunization delivery services, respectively (WHO, SAGE Working Group on Vaccine Hesitancy, 2014). One limitation of the three Cs model that should be noted is that it does not incorporate hesitancy that is due to misinformation.

Ultimately, each of these recommendations should help policymakers and public health officials develop and deploy an effective COVID-19-vaccine-acceptance-boosting toolkit aimed at addressing the root causes of vaccine hesitancy among different populations that remain hesitant and enable efforts to boost vaccine acceptance to be tailored in terms of messages, messengers, and messaging platforms.

Table S.1. Guide to Recommendation Tiers

| Tier 1 recommendations are strongly supported by the analyses. These recommendations are supported by the environmental scan and social media sentiment analysis and are based on themes that were identified multiple times across the focus groups and expert roundtable. |
| Tier 2 recommendations are moderately supported by the analyses. These recommendations are supported by the environmental scan and social media sentiment analysis and/or are based on themes that were identified multiple times in at least one focus group or the expert roundtable. |
| Tier 3 recommendations may or may not be supported by the environmental scan and social media sentiment analysis but were discussed in at least one focus group or the expert roundtable and are deemed notable and/or innovative. |
Table S.2. Recommendations for Boosting COVID-19 Vaccine Acceptance

<table>
<thead>
<tr>
<th>Tier</th>
<th>Goal</th>
<th>Recommendations</th>
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| Tier 1 | Boost confidence in COVID-19 vaccines and combat complacency | 1. Increase awareness, knowledge, and dissemination of vaccination information  
- Improve penetration of accurate vaccine information among hesitant populations  
  - Develop culturally sensitive educational materials in various languages and literacy levels  
  - Explain both the purpose and value of vaccination while alleviating concerns about effectiveness and safety  
2. Communicate effectively through the use of personal narratives and stories about the “why” for vaccination  
- Communicate the need for vaccination through short, personal narratives to appeal to people’s emotions  
- Communicate the “why” of people who got vaccinated in messaging to boost vaccine acceptance |
| Tier 2 | Promote convenience | 1. Promote convenience  
- Expand vaccination access through various settings and services  
  - Arrange vaccination services through community groups, including home services, employers, neighborhood community centers, elder care centers, and religious groups |
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<th>Tier</th>
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<td><strong>Expand access to vaccination sites by employing community settings with extended operating hours and flexible scheduling (e.g., pharmacies, workplace clinics, churches)</strong></td>
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<td><strong>1. Combat conspiracy theories, misinformation, and disinformation through different media</strong></td>
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<td>• Improve the overall social media presence of health agencies and governments and foster partnerships with social media platforms to accelerate promotion of evidence-based public health strategies</td>
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<td>• Monitor online media messaging and conversations to identify and evaluate early signals of crisis and inform on the real needs of those who are truly hesitant</td>
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<td>• Use social media to track trends and map out unique concerns of different groups or populations and “micro-target” emerging issues around vaccinations</td>
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<td><strong>1. Develop and implement vaccination programs through partnerships</strong></td>
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<td>• Health systems and community-based organizations should partner with existing federal, state, and local vaccination programs</td>
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<td>• Acknowledge through government platforms that the federal response and messaging has been haphazard and the dependence on states has produced mixed results</td>
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<td>• Partner with industry/business leaders to develop and deploy COVID-19-vaccine-acceptance-boosting tools</td>
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<td>• Partner with faith leaders, use public service announcements, and create state-level partnerships while acknowledging that in some states the implementation may not be great</td>
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<td>• Partner with industry/business leaders (banks, grocery stores, gas stations, airlines) so that messages can become woven into everyday life with “captive” audiences</td>
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<td><strong>2. Develop and implement national public health campaigns and initiatives with a unified evidence-based message to counter inconsistent messaging</strong></td>
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<td>• Include provider and patient education</td>
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<td>• Use practice-based immunization “champions” to improve adult vaccine uptake</td>
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<td>• Highlight personal risks of the disease as well as community benefit when communicating to populations that are less susceptible to COVID-19</td>
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<td>• Convene experts representing different sets of stakeholders with a view to brainstorming and discussing creatively how to better support national communication campaign efforts, how to respond and build resilience in crises situations, and how to better engage with grassroots and civil society organizations that can support advocacy for vaccination</td>
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<td><strong>3. Identify strategies to combat hesitancy among the politically vaccine-hesitant</strong></td>
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<td></td>
<td>• Use health care providers as messengers for this group</td>
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<td></td>
<td>• Unify health care and public health messaging to prevent confusion and frustration</td>
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<td><strong>4. Identify strategies to combat hesitancy among members of the anti-vaxxer movement</strong></td>
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<td>• Understand the idea of “remove and replace”—i.e., replacing a hesitant patient’s reliance on a movement that gives them a sense of community with a different focus—recognizing that, within the anti-vaxxer movement, being anti-vaccine is not typically a stand-alone point of view but is part of a broader worldview and misunderstanding of science</td>
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<td>• Give members of the anti-vaxxer movement something to “replace” their current worldview</td>
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<td>5. Identify strategies to combat hesitancy among other conspiracy theorists</td>
<td>• Recognize that conspiracy theorists and purveyors of mis- and disinformation are often conflated with the politically and/or religiously vaccine-hesitant and the anti-vaxxer movement in sharing a general distrust of experts and/or the establishment and/or science</td>
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<td>6. Normalize vaccination</td>
<td>• Normalize the vaccine through messages, messengers, and platforms emphasizing that getting the vaccine is not a political or religious statement</td>
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<td>Tier 3</td>
<td>Boost confidence in COVID-19 vaccines and combat complacency</td>
<td>1. Implement vaccination policies to increase vaccination rates and decrease disease incidence</td>
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<td>• Consider legislation mandating vaccination in various settings (e.g., places of employment)</td>
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<td>• Make access to valued settings (e.g., health care facilities, large workplaces, K–12 schools, and collegiate institutions) conditional on vaccination status as a motivator for getting vaccinated</td>
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<td>2. Prioritize research, evaluation, and other targeted vaccination interventions</td>
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<td>• Research context-specific factors to inform tailored approaches to immunization</td>
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<td>• Implement processes to evaluate the drivers of hesitancy and measure the effectiveness of interventions over time</td>
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<td>3. Foster a sense of belonging, togetherness, and/or community associated with vaccination</td>
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<td>• Create a sense of belonging and community through vaccination events (rather than just through messaging)</td>
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<td>• Consider financial incentives like the lottery, prizes, rewards, and other gifts, certificates, and coupons for some communities</td>
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Chapter 1. Background and Objectives

Introduction

The World Health Organization (WHO) has identified vaccine hesitancy as one of the largest threats to public health (WHO, 2019). *Vaccine hesitancy* is defined as any degree of indecision or concern about specific vaccines, or vaccination in general, characterized by delays or refusals to accept some or all vaccines (Bedford et al., 2018; Larson et al., 2014; Larson et al., 2018).

Vaccine hesitancy has emerged as a major challenge to the ongoing coronavirus disease 2019 (COVID-19) pandemic response since the first vaccine was developed and received emergency use authorization on December 11, 2020, by the U.S. Food and Drug Administration (FDA) for individuals 16 years of age and older. On May 10, 2021, the FDA expanded the emergency use authorization for the Pfizer-BioNTech COVID-19 vaccine to include adolescents 12 through 15 years of age (FDA, 2021).

Aside from individual factors, systems that fail in providing transparent information about the vaccine, including specific information about its efficacy and safety, also affect vaccine uptake (Bogart et al., 2021). Factors leading to vaccine hesitancy can vary by vaccine type and can be complex—leading to a range of views on vaccination, spanning from cautious acceptance to outright denial (WHO, SAGE Working Group on Vaccine Hesitancy, 2014; Puri et al., 2020). Evaluation of the root causes of hesitancy toward prior vaccines can help inform our understanding of COVID-19-specific hesitancy, as many of the same factors may be pertinent in the context of the ongoing pandemic. A growing awareness of the impact of social determinants of health has changed the understanding of vaccination disparities as a form of health inequity stemming from underlying systemic barriers (U.S. Department of Health and Human Services, 2021a).

Prior research has been conducted on hesitancy related to other vaccines in the United States and globally. However, despite the number and extent of existing multilevel and multimodal approaches to reducing vaccine hesitancy that predated the COVID-19 pandemic, there is little understanding of the feasibility or effectiveness of these solutions in the context of COVID-19 vaccine hesitancy.

In this report, we present the results of a quick-turn evaluation of the root causes of COVID-19 vaccine hesitancy, to inform strategies to boost vaccine acceptance in the United States among various populations. The goals of this project were to

- examine the root causes of COVID-19 vaccine hesitancy
- seek patient, hospital-based health care provider, pre-hospital first responder, and expert perspectives to identify potential strategies to boost COVID-19 vaccine acceptance
• provide recommendations to help inform appropriate practice, policy, and research priorities and the development of tools to boost COVID-19 vaccine acceptance.

To achieve these goals, we performed an environmental scan of peer-reviewed and gray literature to understand what is known about the root causes of vaccine hesitancy (in general and with respect to COVID-19 vaccines) and strategies to boost vaccine acceptance. To further our understanding of reasons for COVID-19 vaccine hesitancy and vaccine acceptance among different U.S. populations, we conducted focus groups with patients, pre-hospital first responders, and hospital-based health care providers. To augment the knowledge we gained of COVID-19 vaccine perceptions from our focus group analysis, we conducted a social media platform sentiment analysis that included 11.8 million social media posts related to COVID-19 from Twitter, Reddit, Facebook, and Instagram. Finally, to identify which solutions are most actionable and grounded in existing evidence, we conducted an expert roundtable with subject-matter experts.

We summarize the key recommendations that emerged from each analysis according to the WHO’s “three Cs” model of confidence, complacency, and convenience, which addresses trust in vaccines and the systems administering them, perceptions of being low-risk for diseases in question, and characteristics of immunization delivery services, respectively (WHO, SAGE Working Group on Vaccine Hesitancy, 2014). However, a limitation of this model is that misinformation—which has been an ongoing challenge within the context of the COVID-19 pandemic—is not included within this established three Cs model. Further, the impact of social media on vaccine uptake has not been well elucidated in prior pandemics (Kennedy, 2020). We address these gaps through the aforementioned mixed-methods analysis and provide recommendations to inform the development of a toolkit that aims to boost COVID-19 vaccine acceptance among hesitant populations.
Chapter 2. Environmental Scan

Overview

The WHO has identified vaccine hesitancy as one of the largest threats to public health, even more prominent during the current COVID-19 pandemic (WHO, 2019). Established frameworks for understanding vaccine hesitancy, such as the WHO’s Working Group Determinants of Vaccine Hesitancy, focus on contextual factors (historical, sociocultural, environmental, health system/institutional, and economic and political factors), individual and group influences (personal perception of the vaccine or influences of the social/peer environment), and vaccine- and vaccination-specific issues. (WHO, SAGE Working Group on Vaccine Hesitancy, 2014). The social determinants of health model attributes individual health outcomes and diseases to the interaction of structural, intermediate, and health care system determinants (WHO, Commission on Social Determinants of Health, 2008; WHO, 2010); and the health belief model constructs, including perceived risk, perceived effectiveness of the vaccine, perceived barriers to vaccination, and cues to action (Becker and Maiman, 1975) are among the most important predictors of vaccination (Brewer and Fazekas, 2007; Chapman and Coups, 1999).

All of these factors fall within the WHO’s well-accepted “three Cs” model of confidence, complacency, and convenience, which addresses trust in vaccines and the systems administering them, perceptions of being low-risk for diseases in question, and characteristics of immunization delivery services, respectively (WHO, SAGE Working Group on Vaccine Hesitancy, 2014).

Misinformation, a potential key factor driving hesitancy, is not included within the three C’s model. The impact of social media on vaccine uptake has not been well elucidated (Kennedy, 2020). Additionally, while prior research efforts on vaccine hesitancy have proposed many multilevel and multimodal solutions, as of this writing there is little publicly available literature examining the feasibility and the effectiveness of these solutions in the context of COVID-19-specific vaccine hesitancy, although studies are likely to emerge in the near future in response to the pandemic.

To address these gaps, we conducted a rapid environmental scan of peer-reviewed and gray literature with the following goals:

- Identify root causes and solutions for vaccine hesitancy related to prior vaccines.
- Understand causes of vaccine hesitancy unique to the COVID-19 pandemic.
- Evaluate the impact of social media platforms on vaccine hesitancy.
- Identify potential countermeasures for promoting vaccine acceptance, including established population-based tools to increase vaccination rates.
Methods

This study was deemed exempt from oversight by the University of Michigan Institutional Review Board.

Our environmental scan included a review of peer-reviewed literature using PubMed, Scopus, and PsycINFO databases (Appendix A). Our review of gray literature included a targeted review of OpenGrey, Web of Science, the WHO website, and relevant government and academic institution websites, including those of the Centers for Disease Control and Prevention (CDC) and individual state departments of health, public health, and hospital associations for information about vaccine hesitancy.

Our environmental scan included a search strategy for all available information published in English from February 2000 through February 2021. Our search strategy included terms that would help capture literature on any human vaccine for any infectious disease, frameworks and conceptual models of vaccine hesitancy, health behavior, and social media engagement. Additional search terms aimed to capture methods of social media monitoring of vaccination and use of social media to address vaccine hesitancy. We reviewed qualitative, quantitative, and interventional studies but excluded efficacy trials, pre-clinical trial research, serologic or immunogenicity studies, and health economic studies.

This environmental scan yielded 3,087 documents (2,236 peer-reviewed literature and 851 gray literature). A team of nine researchers and assistants conducted a review of titles first to remove articles irrelevant to vaccine hesitancy, then proceeded with the same approach while reviewing abstracts, and finally the full text. A total of 381 documents (208 peer-reviewed literature and 173 gray literature) were selected for in-depth review.

Although academic pre-print repositories (e.g., OSF Preprints [osf.io/preprints/] and PsyArXiv [psyarxiv.com] are an important potential source of current research related to a dynamic situation such as the ongoing pandemic, we treated them as out of scope for this rapid analysis. Also, this environmental scan was not intended to be a formal systematic review of the literature. Rather, it was designed to be a rapid analysis of relevant studies related to vaccine hesitancy within the past two decades that might inform current strategies. We acknowledge that some of these findings may already be dated given the important contributions related to the ongoing COVID-19 pandemic and efforts to address vaccine hesitancy that are currently flooding the literature.

Root Causes of Vaccine Hesitancy

Individual factors associated with vaccine hesitancy in general include knowledge, attitudes, and behavior related to demographic characteristics (Peterson et al., 2020; Jarret et al., 2015). In prior studies related to other vaccine-preventable diseases, there was heterogeneity in demographic factors, based on context and country, that affected vaccine uptake. Uptake has varied based on age—with older individuals being more likely to get the flu vaccine, for example.
(Bish et al., 2011; Collange et al., 2016; Kohlhammer et al., 2007; Nagata et al., 2013; Nowak et al., 2015; Nowak et al., 2017)—and gender, with women more likely to get vaccinated (Bish et al., 2011; Brien, Kwong, and Buckeridge, 2012; Collange et al., 2016; Ferrer et al., 2014; Nagata et al., 2013). A higher degree of vaccine acceptance is associated with individuals with a higher level of education (Adeloye et al., 2017; Brien, Kwong, and Buckeridge, 2012; Larson et al., 2014), those in health care professions (e.g., physicians, nurses, medical students) (Bish et al., 2011; Brien, Kwong, and Buckeridge, 2012), and those in certain non–health care occupations (e.g., administrative assistants) who work in a health care setting. Certain racial and ethnic groups, including Hispanic/Latinx and African American populations, have disproportionately higher prevalence of vaccine hesitancy (Kessels et al., 2012; Rutten et al., 2021). Similarly, social and religious beliefs, values, or norms can directly lower the rate of vaccination among tight-knit communities (de Munter et al., 2020; Ferrer et al., 2014; Joshi, Chaudhari, and Chaudhari, 2020; WHO, 2021). For instance, some conservative religious groups have endorsed beliefs that vaccination against human papillomavirus (HPV) leads to increased engagement in sexual activity (Fisher et al., 2013). Socioeconomic status and income level also play a significant role in vaccine hesitancy (Larson et al., 2014; Nagata et al., 2013), with variation by region, urbanicity, and household characteristics (Brien, Kwong, and Buckeridge, 2012; Nagata et al., 2013; Santhanes et al., 2018).

Given that the drivers of vaccine hesitancy differ among distinct populations, past research highlights the importance of engaging existing federal, state, and community-based organizations that may have knowledge of issues related to each population to identify ways to bolster COVID-19 vaccine acceptance among both previously hesitant and currently hesitant groups. Community-based organizations are important health system stakeholders, as they provide essential primary health care and various other programs and services to their communities (Gulzar and Henry, 2005; Jareg and Kaseje, 1998). Community-based organizations are well positioned to provide such services because they understand their local communities and are connected to the groups they serve (Chillag et al., 2002). Such information can help expand targeted initiatives to identify and implement successful strategies for addressing vaccination needs of marginalized, disadvantaged, and stigmatized populations such as Black, Indigenous, and people of color (BIPOC); children; older adults; immigrants; refugees; and lesbian, gay, bisexual, transgender, queer, or questioning (LGBTQ+) individuals (American Psychological Association, 2020). Moreover, community-based organizations often play important advocacy roles, with the aim of strengthening the health systems in which they work (Blas et al., 2008; Carey and Braunack-Mayer, 2009). They collaborate with health system decisionmakers and stakeholders in the development of research, policy, programs, and services (WHO, Civil Society Initiative, 2001; Oxman et al., 2009). Involvement of community-based organizations has been shown to increase the likelihood that policies will be appropriate, acceptable, and effective (Popay et al., 2008).
As of summer 2021, the U.S. Department of Health and Human Services (HHS), with funds from the American Rescue Plan (Pub. L. 117-2), has awarded $125 million to support organizations in all 50 states plus the District of Columbia, Puerto Rico, Guam, and the Freely Associated States to develop and support a community-based workforce that will engage in tailored efforts to underserved communities. These community-based efforts will focus on hiring and mobilizing community outreach workers, community health workers, social support specialists, and others to increase vaccine access through on-the-ground outreach to educate and assist individuals in getting the information they need about vaccinations and bolster vaccination uptake (U.S. Department of Health and Human Services, 2021a).

The WHO recommends segmentation of target populations that share similar beliefs, attributes, and behavioral patterns in order to best shape interventions tailored to each segment (Lin, Tu, and Beitsch, 2020). Specific combinations of messages, messengers, and audience segments might be effective in motivating particular audiences to receive COVID-19 vaccines and comply with nonpharmaceutical interventions (NPIs) (Matthews et al., 2021). For example, the perception of risk can be leveraged to induce vaccination and NPI use; linking prior protective behaviors to NPIs and COVID-19 vaccination messages may be effective for some populations. Such approaches can succeed by emphasizing rule-following and the good of the group over individual liberty and by addressing hesitancy rooted in real historical maltreatment or misinformation. Unfortunately, much of vaccine hesitancy is associated with mistaken beliefs about risk and benefits, leading to misconceptions and further mistrust of research, health promotion policy, and basic health-related science (Crescitelli et al., 2020; Wheelock et al., 2014). Many of the aforementioned individual factors and influential contextual factors—both general and specific to certain vaccines—likely contribute to COVID-19 vaccine hesitancy. We explore these factors within the WHO’s three C’s model below.

**Confidence**

Individual trust in a vaccine, its development, and its administration can vary considerably. We found that doubts about a vaccine’s safety and its manufacturing process are frequently cited concerns among the vaccine-hesitant (Schaffer DeRoo, Pudalov, and Fu, 2020). Misinformation about an unfounded link between autism and the vaccine against measles, mumps, and rubella has perpetuated distrust in vaccine composition (Jourdain, 2020; Crescitelli et al., 2020; McClure, Cataldi, and O’Leary, 2017; Rossen et al., 2019). Expanding from the specific vaccine, trust in the health system and physician recommendations (or lack thereof) can significantly affect vaccine acceptance (Guzman-Holst et al., 2020). Higher rates of vaccine hesitancy have been seen in the Black community, which may relate to a degree of distrust in institutions emerging from Black Americans’ lived experiences of racism and mistreatment, such as the Tuskegee syphilis study (Bogart et al., 2021; CDC, 2021d). There is also significant fear of side effects and concerns about risks to health and well-being (Burnett et al., 2012; Chen et al., 2020; Crescitelli et al., 2020; Praveen, Ittamalla, and Deepak, 2021; Di Gennaro, 2021; Fisher et al.,
Previous negative experience with a vaccine (due to side effects or perceived low efficacy) also decreases overall trust in other vaccines (Kenny et al., 2020). Perceived efficacy to prevent disease influences vaccine hesitancy, especially with personal or a friend/family member’s experience with contracting an infection after receiving the requisite vaccine (Bish et al., 2011; Nowak et al., 2015; Nowak et al., 2017; Santhanes et al., 2018; Sokol and Grummon, 2020). The COVID-19 vaccine has been no exception; despite vaccinations helping to prevent all serious cases, many sources overly emphasize that an individual can still contract COVID-19, albeit a mild or asymptomatic case, adding to the confusion about vaccine efficacy (Thompson et al., 2021). Prior studies have found that increased vaccination knowledge leads to increased adoption of a vaccine (Brewer and Fazekas, 2017; Chhabra et al., 2007; Gomensoro, Giudice, and Doherty, 2018; Jarret et al., 2015; Vikram, Vanneman, and Desai, 2012). Educational materials in various languages and literacy levels that explain both the purpose and value of vaccination, and are sensitive to culturally appropriate contexts, can alleviate concerns about effectiveness and safety and increase vaccine uptake (Wilson et al., 2018). However, such education may not be enough to change behavior among all hesitant populations (McClure, Cataldi, and O’Leary, 2017). Paralleling previous concerns about the safety and efficacy of new vaccines (Fisher et al., 2013), the rapid development and rollout of the COVID-19 vaccines have also contributed to ongoing vaccine hesitancy. In a nationally representative poll, the Kaiser Family Foundation found that 62 percent of respondents believed that sociopolitical pressures led to premature approval of COVID-19 vaccines without adequate safety and efficacy data (Kaiser Family Foundation, 2020; Khubchandani et al., 2021). Despite more than 70,000 voluntary participants in the Pfizer and Moderna clinical trials, many still perceive these vaccines as being too new and have waited for more data on safety and efficacy (Fitzpatrick, 2021). This lack of confidence is only heightened by the uncertainty and evolving body of knowledge of COVID-19 virology and duration of immunity with the vaccine (Rutten et al., 2021). Even the name of the vaccine rollout plan, “Operation Warp Speed,” used a term that may suggest overly rapid development without
attention to quality or safety (Kramer, 2021). Communication about vaccine information can either facilitate or undermine vaccine acceptance, depending on the messenger, message, and messaging platform. For example, in high-income countries with well-resourced vaccination programs, inadequate or poor immunization program communication can increase vaccine hesitancy; in low- and middle-income countries, scarce communication resources limit the capacity to counter negative information on vaccines and to gain community support for vaccination programs (Gualano et al., 2019).

The messenger or messaging platform can also bolster an individual’s trust in the vaccine (Larson et al., 2015), especially if the message is received in a familiar or trusted health care setting (Brewer and Fazekas, 2007; Larson et al., 2014; Larson et al., 2018; Stout et al., 2020). However, the literature also notes how the reverse can be true if there is a suboptimal interaction: Distrust or previously poor health care experiences can interfere with a current or future medical recommendation for vaccination (Hornsey, Lobera, and Diaz-Catalán, 2020; Kang, Culp, and Abbas, 2017; Lacombe-Duncan, Newman, and Baiden, 2018; Lahijani et al., 2021; Cobos Munoz et al., 2015; Pența and Băban, 2014; Santibanez et al., 2020; Wiley et al., 2020; Yaqub et al., 2014). Historical issues affecting trust and perceived or real inequity in health responses for specific at-risk groups further exacerbate vaccine hesitancy (WHO, 2021; Bogart et al., 2021).

However, confidence in a vaccine goes beyond the individual health care setting, as trust can be politically nuanced (Ferrer et al., 2014; Nagata et al., 2013) or nationally biased, with some countries having more skepticism toward COVID-19 vaccines than the United States does (Praveen, Ittamalla, and Deepak, 2021; Rutten et al., 2021). Vaccine hesitancy is further increased by mistrust in systematic health promotion policies (Crescitelli et al., 2020) and the belief that vaccine rollouts are profit-motivated (Burnett et al., 2012; Rutten et al., 2021), especially with the associated distrust of pharmaceutical companies (Kose et al., 2021; Praveen, Ittamalla, and Deepak, 2021) and their relationship with the government (Crescitelli et al., 2020; Yaqub et al., 2014). Trust in pharmaceutical companies and the government regarding vaccines may vary by race, age, and institution and be related to the public’s perception of pharma’s or the government’s competency, motives, and racialized history (Jamison, Quinn, and Freimuth, 2019). In a nationally representative survey in 2015, African American respondents were more likely to distrust vaccines, especially if endorsed by the government, than were White respondents because of the United States’ history of medical racism and discrimination. African American respondents were also less trusting than White respondents of all institutions involved in vaccine production, including pharmaceutical companies, the FDA, and the CDC (Freimuth et al., 2017).

During the COVID-19 pandemic, a lack of confidence in the vaccine has also been driven by overt politicization of the public health response, including widespread misinformation related to COVID-19 vaccination spread through social media. Though such politicization is not unique to COVID-19 (e.g., other public health campaigns, such as water fluoridation, as well as prior vaccination campaigns, have been politicized), the unparalleled scope of the COVID-19
pandemic, combined with rising social media use, has showcased the important challenge of politicization of public health threats, with prevention efforts (e.g., mask wearing) (Kahane, 2021) and vaccination campaigns becoming partisan wedge issues. For instance, voters affiliated with the Republican party have higher rates of vaccine hesitancy than Democrats, in part because of Republicans’ greater mistrust in government and/or the belief that the COVID-19 pandemic threat was exaggerated by scientists (Bentzen and Smith, 2020).

**Complacency**

Vaccine hesitancy is strongly connected to a person’s view of the seriousness of a given infection and personal assessment of perceived risk and benefit (Larson et al., 2015; Schmid et al., 2017). Those who resist or reject vaccines may personalize or individualize risk, emphasizing how the risk of disease reflects an individual’s own mix of genetic, environmental, social, and lifestyle risk factors (Hobson-West, 2007; Poltorak et al., 2005). Without these risk factors or specialized health conditions warranting vaccine (Bish et al., 2011; Brien, Kwong, and Buckeridge, 2012; Kohlhammer et al., 2007; Nagata et al., 2013), many believe that they are not at risk for vaccine-preventable diseases (Brewer and Fazekas, 2007; Collange et al., 2016; Gesser-Edelsburg, Shir-Raz, and Green, 2016; Nowak et al., 2015; Rutten et al., 2021; Sheldenkar et al., 2019). For example, some older adults refuse the influenza vaccine because they believe that they are not at risk (Prior, 2003) because of their healthy constitutions, healthy lifestyles, lack of risky behaviors, conferred “immunity” because of previous illness, or adherence to avoidance strategies (Evans and Jackson, 2008; Kenny et al., 2020; Nowak, Shen, and Schwartz, 2017).

Others perceive a lower risk of contracting disease because of overall lower disease incidence attributable to vaccination program success (Gkentzi et al., 2013). Alternatively, elevated disease incidence in the setting of vaccine campaigns can be distorted by media reports of case numbers that include unvaccinated individuals, supporting the false belief of vaccine ineffectiveness (Burnett et al., 2012). In the case of the COVID-19 pandemic, some believe that the risks of COVID-19 infection are grossly exaggerated (Praveen, Ittamalla, and Deepak, 2021). Further, some parents believe that there is low COVID-19 disease risk or lower disease severity for children (Fournet et al., 2018), which has been reinforced by low rates of disease transmission among children and very low rates of multi-inflammatory syndrome during the COVID-19 pandemic (Rubens et al., 2021).

Vaccines are a preventive public health strategy for everyone at risk of disease (Armstrong, 1995) and a tool for individual benefit to keep safe from vaccine-preventable diseases (Reich, 2020). However, lower full immunization coverage has been found among wealthier countries, consistent with the emergence of vaccine hesitance in these countries, where there is a perceived lack of need for vaccines because of higher access to health services (Cata-Preta et al., 2021). Clinicians and parents who object to mandatory childhood vaccinations perceive required vaccinations as outdated, opting instead for shared decisionmaking about whether or not to
vaccinate a child that is individually based and informed by a decision process between the health care provider and the patient or parent/guardian (CDC, 2020; Gualano et al., 2019). In order to have successful vaccine uptake, effective messages need to be delivered by trusted messengers and account for these strongly held beliefs (Kirzinger, Muñana, and Brodie, 2021).

**Convenience**

Competing challenges related to social determinants of health often take precedence over vaccination (Kang et al., 2017). Low-income households and rural communities endorse more hesitancy (Santhanes et al., 2018), attributable to challenges with accessing vaccination sites, including unreliable transportation, long distance to vaccination centers (Lacombe-Duncan, Newman, and Baiden, 2018), actual or perceived cost of vaccination in underinsured communities (Joshi, Chaudhari, and Chaudhari, 2020; Nagata et al., 2013; Santhanes et al., 2018), missing work or being forced to use time off for vaccination appointments or recovery from side effects (Rubenstein Reiss and Caplan, 2021) and/or lack of time or competing priorities for full-time workers or working parents (Peterson et al., 2020; Sporton and Francis, 2001; Wagner et al., 2021). Similarly, additional challenges include both perceived and actual limited access to vaccines (Adeloye et al., 2017; Lacombe-Duncan, Newman, and Baiden, 2018; Larson et al., 2014; Cobos Munoz et al., 2015) or to health care services as a whole (Kose et al., 2021), or financial constraints (Brewer and Fazekas, 2007; Chen et al., 2020; Fisher et al., 2013; Kang, Culp, and Abbas, 2017; Lacombe-Duncan, Newman, and Baiden, 2018; Larson et al., 2014; Cobos Munoz et al., 2015; Nowak et al., 2017).

The initial COVID-19 vaccination rollout in the United States involved mass vaccination centers that were not always accessible by public transportation, web-based appointment schedulers with varying levels of navigation complexity, and long lines even with an appointment, all of which created challenges to getting vaccinated (Wagner et al., 2021). As of summer 2021, in order to enhance convenience, many pharmacies, retailers, and other companies across the United States are offering on-site COVID-19 vaccination without an appointment (CDC, 2021e). Moreover, the Federal Emergency Management Agency (FEMA) is partnering with federal, state, local, tribal, and territorial partners to support and accelerate the deployment of mobile vaccination centers (FEMA, 2021), which can be in public spaces, religious venues, or social services centers. Increased local availability may enhance accessibility for hard-to-reach populations (Wagner et al., 2021).

**Impact of Social Media on Vaccine Hesitancy**

Our environmental scan underscored the need to expand the three C’s model to include social media as a key mediator in all areas. In a study that examined social media posts about immunizations, negative tweet frequency seemed to be unrelated to national and international campaigns promoting vaccinations. This finding suggests that most users separate out into
groups sharing similar views, serving only to reinforce previous beliefs in their “echo chamber” (Piedrahita-Valdes et al., 2021). Interestingly, anti-vaccination messaging from groups in highly resourced countries can influence media reports, give the appearance of legitimacy to local efforts by linking in U.S. anti-vaccination websites, and fuel further misinformation in other countries around the world, as seen in South Africa with the increased refusal of the MMR (measles, mumps, rubella) vaccine due to the propagated false link to autism (Burnett et al., 2012). The growth of social media has hastened the breadth and depth of misinformation with uncontrolled and unchecked dissemination (Jourdain, 2020).

People often fail to consider the accuracy of content when deciding what to share on social media, and people who are more intuitive or less knowledgeable about science are more likely to believe and share misinformation. Prompting people to think about the accuracy of a headline through accuracy nudges on social media platforms can improve subsequent choices about what COVID-19 news to share (Pennycook et al., 2020).

Regular surveillance of online media messaging and conversations can help capture possible signals of a crisis and, at the same time, help understand the root causes of hesitancy. Such data can aid in improved mapping and study of the main drivers of misinformation around and negative sentiment toward vaccination (WHO, 2020).

Learning from the Literature: Strategies to Counter Vaccine Hesitancy

In our environmental scan, we found that the most effective interventions to combat vaccine hesitancy employ multiple strategies directed at more than one level of engagement, including individual-, community-, organizational-, and policy-level targets. In Chapter 6, we synthesize these key takeaways from the environmental scan with emerging findings from the other components of this broader study (including the focus groups, social media sentiment analysis, and expert roundtable) to arrive at recommendations to boost vaccine acceptance in the United States.

In our environmental scan, which predominantly included literature from prior public health vaccination efforts, we identified the following key approaches relevant for the ongoing COVID-19 pandemic for overcoming vaccine hesitancy:

1. directly target specific unvaccinated or undervaccinated populations with tailored messaging (Gualano et al., 2019; Stitzer et al., 2010)
2. increase vaccination knowledge and awareness (Spleen et al., 2012)
3. improve convenience and access to vaccination (Wang et al., 2007)
4. target specific populations, such as health care workers, to increase overall vaccine adoption (Al-Tawil, El-Gohary, and El-Sahed, 2013)
5. mandate vaccination or sanctions against nonvaccination (Harris et al., 2011)
6. engage religious or other influential leaders to promote vaccination (Kondji, 2006).

Campaigns to influence value assessments of adult vaccination should be personalized to the target populations using trusted voices from their communities, helping to mitigate individual
and contextual barriers to vaccine acceptance. By focusing on outcomes and priorities important to the targeted group(s), and by conveying how recommended actions (e.g., getting vaccinated or making adult immunization a higher priority) are related to the targeted group’s desires or aspirations, confidence in vaccine utility and importance can be increased (Nowak et al., 2017).

Interventions to reduce vaccine hesitancy can be implemented at various levels—ranging from approaches that individuals can implement on their own to approaches implemented by the broader community or the health system, the government (including through legislation), or the research community. Below, we describe a number of interventions aiming to reduce vaccine hesitancy. These are organized according to who would implement (not develop) the intervention.

Individual Level

Personalized initiatives can be effective in improving adult vaccine uptake at the individual level. Campaigns to encourage individuals to get a COVID-19 vaccine should consider highlighting personal risks from contracting the disease and, when communicating to populations that are less susceptible to COVID-19 (e.g., younger individuals), the impact of community benefit (Chu and Liu, 2021).

Effective communication about vaccine safety and efficacy, along with greater transparency about the process of vaccine development and distribution, including cost aspects, are necessary to boost individual confidence (Khubchandani et al., 2021). Such efforts need to be culturally sensitive (i.e., accounting for historical experiences and beliefs of various individuals) at the level of education/health literacy of the targeted individuals. These efforts should also be personalized to the concerns of most importance to individuals in a particular group, leveraging trusted stakeholders already embedded in the community, especially when trust in the health care system is compromised (Khubchandani et al., 2021).

Prior studies have noted the importance of overcoming individual hesitancy by ensuring positive interactions with health care providers (Ferrer et al., 2014; Gkentzi et al., 2013; Gualano et al., 2019; Nagata et al., 2013; Rutten et al., 2021; Santhanes et al., 2018; Vlahov et al., 2012; Yaqub et al., 2014). Clinician efforts have resulted in higher vaccination rates (Darden and Jacobson, 2014; Ylitalo, Lee, and Mehta, 2013), in part because they remain patients’ most trusted sources for accurate information and personalized recommendations (Gust et al., 2008; Jackson et al., 2019), especially with COVID-19 infection (Bogart et al., 2021). Direct patient-clinician communications to address specific misconceptions, discuss risk for infection, and aid in overcoming barriers to accessing vaccination have been identified as avenues to increase vaccine acceptance (Chen et al., 2020).

Efforts to encourage individual action should also leverage technology as the platform for vaccine engagement. Text-message-integrated platforms and other electronic forms of messaging have been shown to improve vaccination acceptance in prior campaigns (Morris et al., 2015). Cell-phone-based communication has the potential to reach a diverse audience, as these devices
have been shown to be widely available among low- and high-resources communities (Salhi, Abir, and Salhi, 2021). Safety and efficacy information disseminated through social media and websites has been shown to increase vaccination rates, especially for parents (Glanz et al., 2017). Visible personal signage (e.g., stickers or pins) and social media campaigns to advertise personal immunization can help to shape individuals’ perceptions on vaccination, similar to “I Voted” profile frames on Facebook or hashtags notifying social circles of first vaccination (Sanyal and Nundy, 2021; Volpp, Loewenstein, and Buttenheim, 2021).

Community Level

Community support of vaccination efforts has a long history of success, especially in vaccinating hard-to-reach populations (Coady et al., 2008). In New York City, members of the Harlem Community and Academic Partnership leveraged a community-based participatory research approach to develop interventions at the individual, neighborhood, and community-based organization levels to increase influenza vaccination rates (Coady et al., 2008). Further, a major contributor to increased vaccination rates in Hong Kong during the 2005–2006 influenza season was vaccination services arranged by community groups, including home services, employers, neighborhood community centers, elder care centers, and religious groups (Sheldenkar et al., 2019).

In addition to partnering with community leaders, peers and local groups can be a resource for support and information dissemination for vaccination. In Washington State, a community-based intervention involving parent advocates reduced vaccine hesitancy. Through this intervention, parents who value immunization were mobilized and provided with tools to engage in positive dialogue about immunization in their communities (Schoeppe et al., 2017). Trusted messengers can also include local authority figures who can address and personalize responses to vaccine hesitancy beliefs, especially in rural communities, where the community doctor is trusted for information approximately 20–30 percent more than government agencies and officials (Kirzinger, Muñana, and Brodie, 2021). Magnifying the voices of these leaders and health experts in the community via social media and online information channels such as YouTube has increased community engagement with vaccination rollout (Institute of Development Studies, 2020). We discuss the role of health providers in greater detail in the next subsection.

Though not necessarily located in the immediate local community, “social influencers” with many followers on social media or trusted websites can be collaborators to promote accurate information about vaccination (Institute of Development Studies, 2020). Similarly, albeit on a different platform, journalists can help disseminate information about vaccine safety and efficacy, which may help reduce misinformation or sensationalist media reports (WHO, 2021).

Health System and/or Organizational Level

Institutional factors that facilitate vaccination adoption typically center around addressing both convenience in accessing vaccination services and confidence in the vaccine. Expanded
access to vaccination sites by employing community settings with extended operating hours and flexible scheduling has been shown to increase vaccination rates (Kang, Culp, and Abbas, 2017). Health care settings, such as pharmacies and home-based primary care visits, as well as nontraditional settings, such as pop-up workplace clinics and churches, can be utilized to both increase access and normalize vaccination for local communities (Bach et al., 2019; Chen et al., 2020). Leveraging transportation networks and subsidizing ride-share platforms can enhance the likelihood that people can access vaccines without financial burden or increased time away from work or other responsibilities (American Psychological Association, 2020). Use of technology via mobile devices for appointment scheduling and reminders has been shown to directly increase vaccination rates (Bach et al., 2019).

Multifaceted approaches in health care settings, such as the 4-Pillars Practice Transformation Program (convenience and easy access; patient communication; enhanced vaccination system; and motivation; Lin et al., 2016) can help health care teams promote vaccination using evidence-based practices to provide convenient and easy access to vaccination, improve patient-provider communication, incorporate assessment of vaccination as a routine part of the office visit, and use motivational interviewing for behavior change (University of Pittsburgh Medical Center Western Psychiatric Hospital, 2021; Gomensoro, Giudice, and Doherty, 2018). The program implements express vaccination services and extends vaccination season beyond the traditional period of August through January, instead beginning vaccinating as soon as supplies arrive and continuing to vaccinate as long as flu is circulating in the community. Further, medical charts are reviewed at every visit to notify individuals about their vaccination status and the availability of vaccines and the risks of vaccine-preventable diseases. In addition, an immunization champion is designated by the program to foster commitment to improving vaccination rates and maintain motivation for the effort.

As noted in the discussion of community-level interventions, clinician endorsement and personal confidence in vaccines is vital to promote increased vaccination in their communities (Bish et al., 2011; Karafillakis and Larson, 2018). Health care provider education (with or without the support of designated immunization champions), use of clinical decision support, and collaboration with public-private stakeholders have all been shown to successfully address provider/practice-related barriers, leading to increased immunization rates among the communities that providers and practices serve (Bach et al., 2019; Rutten et al., 2021).

Health system–level interventions should take account of community and individual preferences and concerns. For example, during the 2019 measles outbreak in New York City, nurses became champions for immunization in the Orthodox Jewish community by using a culturally competent approach known as Engagement in Medical Education with Sensitivity Initiative. Nurses sought to understand the causes of hesitancy among this community through dialogue with parents and community members. Prominent factors leading parents to withhold vaccination of children were related to lack of evidence-based information and parents’ concerns regarding vaccine safety. Hence, the initiative used a flexible and multipronged approach:
providing evidence directly to parents about vaccine safety and vaccine-preventable diseases; teaching parents how to discern information from misinformation, including how to read studies and evaluate data; hosting workshops for providers to improve communication with patients and to counter common vaccine myths; and offering training to community members interested in learning how to combat anti-vaccine misinformation (Marcus, 2020). A similar approach can be taken by health care providers with the COVID-19 vaccines, bringing customized fact sheets and employing motivational interview–based communication to address vaccine concerns (Dempsey, 2019). Because of cultural heterogeneity, each approach should be tailored to specific communities. A customised, multifaceted approach should offer easy access to vaccination, engage in communication mediated through health care workers or other trusted messengers, and account for the specific reasons for hesitancy (Jacobson et al., 2015).

**Government Level**

Mandated vaccination is sometimes perceived as impinging on personal freedoms, but these policies have improved rates of vaccination for numerous diseases and are endorsed by the majority of health care personnel (Gualano et al., 2019; Omer, Betsch, and Leask, 2019). Some authorities are responding to waves of hesitancy by considering changes in legislation or other direct or indirect measures aimed to increase vaccination coverage rates, such as making vaccination mandatory and regulating exemptions. Making vaccinations against childhood diseases mandatory for school enrollment has led to substantial increases in vaccination rates and decreases in disease incidence (Brewer and Fazekas, 2007; Immunization Action Coalition, 2021; Signorelli and Odone, 2019). The WHO has also recommended mandatory vaccination for children and high-risk groups, with the use of required masking for the non-vaccinated during the pandemic (WHO, Ethics and COVID-19 Working Group, 2021). In the ongoing COVID-19 pandemic, the United States is already witnessing attempts by local jurisdictions and employers (e.g., health care facilities, K–12 and collegiate institutions, large workplaces) to make entry or return to work conditional on vaccination status, which, in turn, may increase vaccine adoption (Blad, 2021; Smith and Nagele-Piazza, 2021).

However, prior mandatory vaccination programs have met public resistance, with the adverse effect of reducing uptake of other vaccines (Omer, Betsch, and Leask, 2019). Government-supported promotional campaigns and funds to support health care workers to engage with vaccine-hesitant individuals and parents have helped to alleviate some of the resulting resistance to vaccination (Rey et al., 2018).

In the United States, people with medical conditions that prevent them from receiving a vaccine are granted a medical exemption. People without medical conditions who choose not to be vaccinated for religious or philosophical reasons are granted nonmedical exemptions in some parts of the United States (CDC, 2017). Both limiting nonmedical exemptions through legislation and partnering with medical professional organizations for expert endorsement have had mixed effects in improving vaccine uptake in California (Nyathi et al., 2019). With COVID-19,
consistent messaging from the scientific community and public health leadership helped counter contradictory messaging circulating among the public on topics ranging from the efficacy of using masks to efficient treatments (Nagler et al., 2020). During the COVID-19 pandemic, the National Medical Association (NMA) (the United States’ largest organization of Black physicians) created an independent task force to review the clinical trial data for COVID-19 vaccines, look for data discrepancies that could disproportionately affect the Black community, and address concerns raised by the Black community with vaccine manufacturers. The NMA COVID-19 Task Force advocated for the Black community, then shared guidance and vaccine support via local meetings and webinars organized with churches and universities, increasing community trust in vaccinations (Boodman, 2021).

Governments can also improve their overall social media presence and foster partnerships with social media platforms to promote evidence-based public health strategies (Puri et al., 2020; Yaqub et al., 2014). In addition, regulatory oversight for social media and news outlets would likely reduce misinformation and disinformation. This could take the form of an analog to the U.S. Federal Communications Commission’s Fairness Doctrine (1967–1985) (Stefon, 2021), which required broadcasters to set airtime to present controversial issues of public importance and to do so in a manner that was honest, equitable, and balanced in news coverage (Klein, 2020). Some people have also advocated for governments to dismantle foreign disinformation campaigns and exert pressure on social media companies to flag and/or block content damaging public health and confidence in vaccination against COVID-19 (Cuan-Baltazar et al., 2020; Pennycook et al., 2020; Wilson and Wiysonge, 2020).

**Researcher Level**

In addition to implementing interventions to reduce vaccine resistance directly, there is a continued need to research context-specific factors to identify strategies to boost vaccine acceptance, as the end-user perspective remains underresearched and understanding this perspective would enable the development of tailored approaches to immunization (in line with WHO recommendations). Ongoing research in this space includes important contributions made by those studying COVID-19 misinformation and how social science can address its spread in the era of social media.

Moreover, evaluations of interventions to overcome vaccine hesitancy are key and should be implemented both ex ante—to listen to and understand real drivers of hesitancy and enable relevant practice —and ex post—to measure the effectiveness of interventions in a timely manner. Ultimately, regardless of whether mandated or recommended, countries should promote and actively offer the vaccines that have been proven to be safe, effective, and make a positive public health impact (WHO, 2020). Understanding and effectively leveraging the communication ecosystem (including social media) to boost vaccine acceptance requires more robust research, integrating social science and psychological considerations, health communication principles,
and a fundamental understanding of the structure and key players of current communication systems (Institute of Development Studies, 2020; Nowak et al., 2017).

Transparency around vaccine development, regulatory processes, and the financial relationships between public and private sectors will aid in addressing concerns during the COVID-19 pandemic over rapid vaccine rollout and evolving (and sometimes contradictory) governmental recommendations. More public dissemination of the science behind vaccine development and vaccine trial results, similar to that used for breast cancer research, may help boost vaccination acceptance (Mitchell et al., 2015). Ongoing monitoring of community concerns on online platforms is necessary but requires human analysis or supervised computer algorithms to avoid missing alarmist messaging and misinformation (Smith, Cubbon, and Wardle, 2020).

We also need experts representing different sets of stakeholders to brainstorm and discuss creatively how to better support national communication campaign efforts, how to respond and build resilience in crisis situations, and how to better engage with grassroots and civil society organizations that can support advocacy for vaccination (WHO, 2020).

Key Takeaways

Our rapid environmental scan of peer-reviewed and gray literature identified lessons from prior vaccination efforts and how they may relate to ongoing COVID-19 vaccine hesitancy. Findings from the scan suggest that vaccine acceptance increases in response to multisector and community-based partnerships that address the three major domains of vaccine hesitancy—confidence, complacency, and convenience—at the individual, community, health system/organizational, government, and researcher levels.

The following are key takeaways from our environmental scan, which focused on prior vaccination campaigns, that can inform contemporary strategies to boost COVID-19 vaccine acceptance in the United States. We have grouped these recommendations according to the actor (individual or organization) most likely to use the recommendation, although we recognize that some recommendations might apply to more than one entity:

- **Individual level** (to reduce complacency and support individuals in reducing their own vaccine hesitancy and in encouraging others to get vaccinated):
  - Highlight personal disease risks of COVID-19 and potential community benefits of individuals’ vaccination.
  - Manage expectations about vaccine side effects.
  - Improve individuals’ vaccine education through greater relatability and data transparency.
  - Emphasize the social benefits of an individual’s vaccination at the personal, family, community, and society levels.
  - Encourage individuals to spread vaccine confidence within their social circles (e.g., sharing personal vaccination status).
– Create educational materials in various languages to accommodate individuals’ different literacy levels and ensure sensitivity to cultural contexts, explaining both the purpose and value of vaccination while alleviating concerns about its effectiveness and safety.

• Community level (to support communities in sharing vaccine information, addressing community concerns, and increasing convenience)
  – Promote vaccination as a social norm.
  – Create a welcoming and familiar environment to encourage vaccination:
    ▪ Utilize community settings (such as pharmacies and home-based primary care visits, as well as nontraditional settings, such as pop-up workplace clinics and churches) with extended operating hours and flexible scheduling for vaccinations.
    ▪ Use social networks to disseminate information through communities and social groups.
    ▪ Set up transportation networks and subsidize ride-share platforms.
    ▪ Arrange vaccination services by community groups, including home services, employers, neighborhood community centers, elder care centers, and religious groups.
    ▪ Involve trusted members within communities, including religious or other influential leaders, in vaccine messaging.
  – Develop community-specific approaches to address hesitancy and lack of trust:
    ▪ Engage with hesitant communities and their leaders to better understand and address concerns and identify ways to promote vaccination in ways that are more relatable and acceptable to those communities.
    ▪ Disseminate recommendations, narratives, or positive stories by vaccinated family and friends within hesitant communities.
    ▪ Directly target specific unvaccinated or undervaccinated populations with tailored messaging based on the root causes of the population’s hesitancy.
    ▪ Engage in rumor tracking, community feedback, and media monitoring for more rapid countering of misinformation.

• Health system and/or organizational level (to boost confidence in the health system and increase convenience):
  – Build trust in the health system and address concerns about vaccines among both patients and providers:
    ▪ Capitalize on the positive and trusting relationships between health care workers and their patients.
    ▪ Increase clinician knowledge about the vaccine development and approval process to address clinician doubts and concerns regarding vaccine safety and efficacy, and thus facilitate both their own vaccination and their advice to their patients and society.
    ▪ Publicize clinician endorsement to boost confidence in vaccinations.
  – Improve the convenience of vaccination:
    ▪ Develop clinical decision support and technology solutions to aid clinicians in vaccine promotion during visits.
- Increase the ease and transparency of scheduling vaccination appointments.
- Use multiple modes for appointment scheduling and reminders, such as mobile technology (e.g., SMS messaging, phone calls), paper-and-pencil signups, and walk-in appointments.
- Send personalized notifications in the days following vaccination to reinforce the importance of full vaccination and the need for a second dose.

- Improve health provider messaging around listening and responding to the public’s questions and concerns:
  - Encourage providers to state the core facts simply and avoid debunking myths and misinformation (which should be targeted at the population level through public health campaigns and other broad efforts to combat misinformation).
  - Encourage providers to acknowledge concerns and avoid scientific jargon.
  - Suggest that providers use storytelling approaches with personal anecdotes.
  - Improve the social media presence of clinicians.
  - Provide information to help providers address confirmation bias—i.e., people’s tendency to only accept evidence supporting prior beliefs and to dismiss evidence that disproves their beliefs.

- **Government level** (to boost vaccine confidence, combat complacency, and promote convenience in general):
  - Consider the potential value of mandating vaccinations for certain settings (e.g., childcare, attending schools in person, health care workplaces).
  - Create government campaigns targeting safety and efficacy concerns.
  - Eliminate loss of income or time off due to employee absenteeism because of a vaccination appointment or recovery from vaccine side effects.
  - Make social media companies responsible for taking down anti-vaccination content.
  - Engage the following stakeholders in public health campaigns to help increase public trust in vaccines:
    - public health researchers
    - scientists developing vaccines
    - health care organizations
    - government agencies and policymakers
    - pharmaceutical companies.

- **Researcher level** (to inform efforts to reduce vaccine hesitancy):
  - Conduct analysis of social media platforms to inform policymakers and researchers of the most current concerns over vaccines to better combat hesitancy.
  - Optimize search engine algorithms to improve the visibility of information from verified sources and deprioritize unverified sources.
  - In coordination with the CDC, implement surveillance to combat misinformation through social media.
  - Develop automated early-warning systems to monitor disinformation campaigns.
  - Utilize the internet to disseminate vaccine information and social media interventions.
In Chapter 6, we synthesize these individual chapter findings with those found in the other analyses completed in this study (i.e., focus groups, social sentiment analysis, and expert roundtable) to provide tiered recommendations for bolstering COVID-19 vaccine acceptance.
Chapter 3. Focus Groups

Overview

We conducted focus groups to better understand the specific drivers of COVID-19 vaccine hesitancy and to explore potential strategies to boost vaccine acceptance. The focus groups were conducted in April and May 2021 with a range of stakeholders, including patients, health care providers, and pre-hospital first responders in the state of Michigan, where most of the project team members are located. Michigan is a state with diverse political affiliations and geography, including both urban and rural areas. Further, in large cities such as Detroit and Flint, the demographic diversity allows for an understanding of a broad range of drivers of COVID-19 vaccine hesitancy. Finally, in the weeks leading up to the focus group discussions, Michigan had the highest COVID-19 test positivity rate in the nation despite wide vaccine availability (CDC, 2021b; Bosman, 2021).

Methods

We conducted four two-hour focus groups in April–May 2021 using the Zoom virtual platform: two patient focus groups, one hospital-based health care provider focus group, and one pre-hospital first responder focus group. Individuals were recruited through a snowball sampling approach (Parker, Scott, and Geddes, 2019). Recruitment was completed by the University of Michigan Acute Care Research Unit in partnership with the Office of Patient Experience, health care providers, and pre-hospital first responder stakeholders. Focus groups included 6–12 participants. The patient focus group participants were recruited with help from Michigan Medicine’s Office of Patient Experience. We sought to include Latinx and African-American patients in the patient focus groups. Given the quick-turn nature of the project, the hospital-based and pre-hospital care provider focus group participants were recruited from a pool of participants from prior studies. The resultant participant pools for each focus group included male and female participants with some representation from racial/ethnic minority groups that are likely to be representative of patient and provider populations in other states in the United States.

A semistructured guide was used to moderate the discussion (see Appendix C), which was led by two researchers trained in qualitative methods. The guide was informed by the findings from the project’s environmental scan. Topics included why respondents opted or declined to be vaccinated and the influence of social circles, politics, and social media on their COVID-19 vaccine decisionmaking process. Respondents were also asked about perceived reasons for vaccine hesitancy, including access barriers, politicization, and potential short- to long-term adverse effects of vaccination. Lastly, individuals were asked about recommendations for how to boost vaccine acceptance.
The focus groups occurred shortly after administration of the Johnson & Johnson vaccine was temporarily paused on April 13, 2021 (Weiland, LaFraniere, and Zimmer, 2021) and prior to the CDC’s announcement on May 13, 2021 (CDC, 2021c) that mask requirements should be lifted (in most cases) for vaccinated individuals. Our team reviewed the transcripts generated from Zoom audio recordings to remove any potential identifiers. One or two study team members then analyzed the transcripts manually in Microsoft Word using a rapid qualitative analysis technique to identify emerging themes (Watkins, 2017). After the first focus group, a data template was developed for capturing key themes and direct quotations. This template was refined after each subsequent focus group based on identified themes and subthemes.

Results

Patient Focus Groups

The majority of patient focus group respondents in this study were vaccinated, in part because we were concerned about the ability to recruit participants for these focus groups if we limited participation to unvaccinated individuals. There were a total of 20 patient respondents; 16 were female, 11 were older adults (above the age of 62 or referenced being retired), six were middle-aged adults (ages 40–61), three were younger adults (ages 20–39), six were patients with a chronic disease or other health condition, five were from minority groups (three African American, two Asian American), two noted having a disability, two were caregivers of children and/or of child-bearing age, and one was a rural patient. The following themes describe either their personal reasons for hesitancy prior to obtaining the vaccine or their perceptions of their family’s, acquaintances’, and/or social circles’ reasons for hesitancy.

We acknowledge that a limitation of this analysis is that the majority of the respondents were indeed vaccinated, thereby suggesting some selection bias for the focus groups. An important caveat regarding the focus groups is that while some responses clearly note that a respondent is sharing their personal story or perspective in relation to the COVID-19 vaccine, we also explored their attitudes, perceptions, and beliefs as to why their families, acquaintances, co-workers, or people in general may be hesitant about obtaining the COVID-19 vaccine. These secondhand perceptions of the root causes of vaccine hesitancy may not always be accurate.

Motivators for Vaccine Acceptance

Motivators for personal vaccine acceptance endorsed by the patient focus groups included fear of COVID-19 illness and death, a desire to protect themselves or their families, preexisting health conditions that made them feel more susceptible to severe illness, societal responsibility, long-standing trust in science, and health care professionals’ recommendations to obtain the vaccine. Some representative quotes from focus group participants include the following:
... if you’re on Medicare you have a PCP [primary care physician] and you see your PCP and you probably see you know one or two other doctors as well, when your doctor gets involved with your care and says no, you must do this, people will listen. They will listen. And do what you ask them to do, which is get a vaccine.

Yes, I’ve been vaccinated by mid-February and my why is ... to protect my children and be a role model to my children. ... This was a good way to kind of teach them to be a responsible citizen.

Trying to manage the sheer number of bodies that were coming into our funeral home was terrifying and people, most who were elderly ... but otherwise healthy. [They] were passing away, and that’s what scared me. ... I definitely said okay when the vaccine became available.

**Reasons for Vaccine Hesitancy**

Key drivers of vaccine hesitancy that emerged from the patient focus groups center on some participants’ personal reasons for being hesitant to obtain the vaccine (even if currently vaccinated), as well as beliefs as to why others may continue to be hesitant. These include (1) characteristics of the vaccine (e.g., eligibility/access, the novelty of the vaccine, the rapid development of the vaccine, concerns regarding near- and long-term side effects) and (2) theories of hesitancy related to institutions (e.g., the politicization of COVID-19, lack of trust in scientific research, government, media) and sources of influence (e.g., social circles, media, social media):

There’s one particular group I get together with on Zoom once a month for non-dinner, we used to get together in person. And I was hearing a lot of the topic was ... where [are] the vaccines being given, how do you get on the list, how do you get an appointment and as more and more of my friends were getting appointments and I wasn’t, because I was waiting to be called by [Hospital 1], I started feeling like gee I really want to be getting this vaccine. Why aren’t they calling me?

**Vaccine Characteristics**

**Eligibility and Access Barriers**

Some patient respondents shared that they faced access and eligibility issues at the onset of the vaccine rollout. For example, some patients noted how they were relying on neighbors, family, and friends to help them find seemingly scarce and hard-to-obtain vaccine doses in the community when the vaccine rollout first started. There was only one example that emerged regarding concerns for eligibility: One patient respondent explained that her primary reason for not getting the vaccine at the time that the focus groups were held was related to an unclear contraindication (she had a prior vaccine allergy and was breastfeeding). As a result, even her health care providers were not able to fully endorse whether or not she should get the vaccine, and so she remained unvaccinated at the time of the focus group:

Yes, I have not gotten the vaccine. And my reasoning behind that is because I have a drug allergy, as well as being a person who is still of childbearing age and
still breastfeeding, and whenever I ask my OB-GYN doctors, when I go to the research there’s never enough to say yes, and never enough to say no. Well kind of like well, I have the drug allergy, on top of still being [of] reproductive age, on top of still breastfeeding, and I know breastfeeding with COVID, if you are exposed or whatever the antibodies are [transmitted] through the breast milk to my child as far as long-term effects on breastfeeding, and supply . . . that is unknown.

**Vaccine Development Process**

Patient respondents shared that some people did not trust the speed of vaccine development in part because of a lack of understanding of the research process and the adjustments that were made for Project Warp Speed. This conversation prompted questions related to how the country can and should deliver concrete, understandable information to people who are anxious that the vaccine was developed too quickly.

Further, patients reported hearing claims from religious groups that the vaccine would alter one’s DNA. Though none of the respondents endorsed personal beliefs in these theories, they noted that they had heard of them from family, social circles, or through social media. Individuals noted that they felt the speed of the vaccine development helped to fuel many conspiracy theories that were being promoted through social media and related to the perceived novel nature of the vaccine technology. Several respondents shared the view that the public’s limited understanding of vaccine development permitted these conspiracy theories to further gain traction:

> I have talked to religious people, and quite a few of them, and I’ve even had some religious organizations say that the reason why they haven’t gotten vaccinated is because it will change your DNA.

**Concern for Short- and Long-Term Adverse Effects**

Among the patient focus groups, some individuals with preexisting conditions or prior chronic illness had initially been hesitant but were reassured of the COVID-19 vaccine’s safety through discussions with health care providers. Because of this, they were willing to obtain the vaccine and went on to share their stories with their colleagues and acquaintances to encourage them to get vaccinated:

> I was going to wait for maybe another year to go by and then I would consider doing it, but when I went to see my doctor, I said yeah I’m pretty hesitant about this vaccine and he said “oh no, you’re getting the vaccine” and I’m like okay I threw my hands up in the air and I surrendered, and now I tell everybody, if [they’re] somebody who’s hesitant, I asked them, have you talked to your doctors, [has] your doctor suggested that you should get the vaccine, because if the doctor says you need to get it, you need to get it.
Institutions and Influencers

**Role of Social Circle**

Patients reported that their personal social circles, including family and friends, played an important role in their decision-making process to obtain the vaccine. Many stated that they hoped to “lead by example” and encourage their families and colleagues to obtain the vaccine by showing them that it was safe. Some respondents stated that individuals have a responsibility to their loved ones and community to reach out to people and promote vaccine uptake. They felt this approach may be effective because of an established trusting relationship:

My social network definitely had a huge impact on my decision to get vaccinated, you know, helping my sister out at a funeral home, my sister and brother-in-law . . . that had a significant impact. . . . How my social network impacted my decision was the number of direct family members who became ill. I had a cousin who’s the same age (I’m sorry, he’s one year older than me) who contracted COVID and was on a ventilator; his father also contracted COVID, was on a ventilator and didn’t make it.

**Role of Politics**

Politicization was felt to have a prominent role in vaccine hesitancy. Some respondents indicated that perceived infringement on individual freedom and choice may be driving hesitancy for some. In some of these focus group discussions, it was challenging to disentangle comments related to politicization versus the media and other sources that can amplify misinformation with political spin, thereby demonstrating the interconnectedness of these broader domains:

It was kind of, “Okay, this is coming from a political place not from a science place and I don’t want to hear the political place, I want to come to you for the science side of it.

Like there is a couple of, I don’t know exactly who they are, but a couple of representatives at the national level, who themselves have medical degrees and how could they be arguing against what we need to be doing to lower the effect of this pandemic?

**Role of Media**

A number of respondents shared that they felt the news media coverage of COVID-19 has negatively impacted vaccine uptake. They noted that the Johnson & Johnson vaccine controversy and its temporary discontinuation was framed in the “disaster news or negative news cycle” that invoked more fear than understanding. Patients also expressed concern with the politicization of the media and how this can promote conspiracy theories about the vaccine:

I think that the politicization extends to which TV shows, which websites, which radio you listen to, and what you hear on or see on those media, and so I think that’s one way that politics plays a role and another thing is that the behavior may be in line with other health behaviors relating to this pandemic, such as
wearing a mask or socially distancing and so vaccination may be in line with that behavior and whether that’s also in line with your politics is, I think, quite likely.

**Role of Social Media**

A number of the patient respondents expressed concern that social media was propagating misinformation about the vaccine. They also noted that social media is the primary information medium among younger generations, and that this can make young people more susceptible to “conspiracy theories and nonsense”:

> The other part of media now is social media, which is huge, absolutely huge, and more people get information from social media [than] from the news, the regular news stations, and channels, and methods. So, social media spreads lot of wrong information.

**Lack of Trust in Institutions**

Several respondents noted that inconsistency in official public health recommendations or “moving goal posts” were contributing to hesitancy:

> It’s very difficult for people to find a resource that they trust. . . . How do you know who’s telling the truth, and you know I’ve worked for two state governments and the federal government and you know, I’ve seen some mistruths put to the public, so you know it definitely is a concern.

**Population-Specific Issues**

Hesitancy among two specific patient populations—BIPOC and migrants—was discussed heavily in the patient focus groups and attributed to, in the BIPOC community, long-standing mistrust of medical research stemming from prior harms and, among migrants, fear of interacting with government-related entities. Respondents felt that these groups could be particularly challenging-to-reach populations. In particular, some respondents stated that the Black community feels mistrustful of interactions between the political system and the medical/research system during the pandemic, and respondents further cited racialized, dangerous statements made by political leadership that had created a “seed of distrust” and potential apathy with regard to the vaccine:

> Well I’ll [speak] to the African American community as well. That’s going to be a challenge, because you’re asking people who have a history of reasons not to trust, to trust. And I’ve seen some really well-intended bad attempts, where we had some, you know, Black leaders there, you know, going out and saying, yes, I got my vaccine, you should too. Yeah, that works to a degree. . . . There are pastors that have a lot of influence in that space and that works to a degree, but to reach those that are outside of that community. So, what happens if you don’t go to church on a regular basis? Or your pastor doesn’t have that level of influence? And that’s still the large segment of the community.

> I, myself, and, a lot of Blacks, [feel that] Trump made this a racial issue. His negative comments against Asians. And having grown up in this country at the
time when I was still told this, you can only go so far, that left a bad impression on a lot of people. Whether Trump meant to do that, I really don’t know, but he’s caused a lot of fear in people when he would make his negative comments about Asians and call it the Asian disease. So people just say no, I don’t want nothing to do with this, I don’t trust the man, and I don’t want to be bothered with it.

In addition to the above themes, participants stressed the need for community-specific messages that appeal to people’s emotions and lived experiences:

No community is a single community—need to have a broad range of nuanced messages and messengers to improve vaccine uptake. Including religious leaders, athletes, and celebrities. The messages should be emotional in nature, story-driven, rather than statistical or fear driven.

Health Care Provider Focus Groups

The following sections summarize results from the hospital-based health care provider focus group and the pre-hospital first responder focus group (emergency medical providers and police officers). All hospital provider respondents were vaccinated. Approximately half of those in the pre-hospital first responder focus group were vaccinated. Hospital-based health care providers included one family medicine physician, one nursing director, one visiting nurse, one social worker, one physical therapist administrative manager, and one physical therapist. Frontline health care providers included three police officers, two paramedics, and one firefighter. The primary goal of these focus groups was to obtain the perspectives of health care providers and learn if they encountered hesitancy personally, among colleagues, and/or among patients. We viewed first responders as an important stakeholder group because these individuals are responding to calls within people’s homes and at the local level and were able to provide insight into how they viewed the COVID-19 vaccine personally, among their own social circles, and within their local communities.

Motivators for Vaccine Acceptance

Motivators for vaccine acceptance among both hospital-based health care providers and pre-hospital first responders included leading by example and protecting their own health as well as the health of their family, colleagues, and patients:

I felt a general responsibility to society at large and who I am around, both being in the health system and in general. I felt responsible to model that for my own community that I’m in, and also for my family and my kids.

—hospital-based health care provider

Reasons for Vaccine Hesitancy

Similar to the patient focus groups, the following key themes, and their contributions to vaccine hesitancy, were explored with health care providers: (1) characteristics of the vaccine and (2) theories of hesitancy related to institutions and beliefs.
Vaccine Characteristics

Vaccine Development Process

Hospital-based health care providers and pre-hospital first responders noted that they perceived the vaccine development process to be a driver of vaccine hesitancy. They acknowledged that this may be secondary to a lack of education about the vaccine development process.

Some of the pre-hospital first responders who had not received the vaccine cited that they felt there was insufficient data or studies to ensure the vaccine’s safety:

> Basically, for me, just reluctant because of the short [time frame]—from the time that the vaccine came out to where they’re pushing it.
> —police officer

> If the coronavirus is mutating and we’re getting different strands of it, is the vaccine gonna work against that—that strand? And you’ve had people get the flu shot, and six months later, they end up with a different strand of the flu.
> —police officer

Concern for Near- and Long-Term Adverse Effects

Hospital-based health care providers noted that some of their patients have endorsed false claims related to the long-term side effects, and cited frustration with the inability to effectively overcome these false claims:

> It seems that [another health care provider respondent] has given an example of most of the conspiracy theories that are out there, because these are many of the same things I have heard - from people’s sterilization or inability to conceive for women is a completely false narrative that seems to have a lot of uptake on social media and the internet. So that is what I’ve heard from multiple people, and I do my best to try to tell them it’s not true. The shedding of particles, and this is not quite the microchip being put in by Bill Gates, but that is altering DNA, again not true. I find it very disheartening and frustrating to know that these fears are not fears that you can combat with sort of common sense and good science because they’re based on a false narrative and false science and they’re being pushed by bad people. And unfortunately the mistrust in government seems to overrule things.
> —hospital-based health care provider

Among the pre-hospital first responders, some of the emergency medical services providers noted that they had concerns about vaccine side effects based on patients for whom they had cared. For some, these short-term effects had reinforced their desire to not obtain the vaccine. Some of the pre-hospital first responders suggested that their individual risks associated with COVID-19 infection were more tolerable than the risks of the vaccine:

> I’ve had, like I said, I work in Emergency Medical Services (EMS), so I’ve had an opportunity to see a couple different ways that it has reacted. I’ve dealt with a couple patients with uncontrolled nausea, vomiting, and diarrhea. I’ve also dealt
with one who had almost an instant allergic reaction, almost like an anaphylactic reaction that you would have with bees.

—paramedic

Further, both male and female providers in the pre-hospital first responders focus group noted their concerns about unknown or long-term reproductive harm related to the vaccine. Individuals were not able to cite specific supporting data but commented that each had reviewed trusted sources to determine their comfort level with the vaccination:

Another one that I’m concerned about is my husband and I would like to have children someday, and I’m concerned that it could cause some reproductive harm that’s not been tested, or what they have tested—it’s not very definitive.

—paramedic

Institutions and Influencers

Role of Social Circle

In general, health care provider participants felt that personal decisions regarding vaccinations were not influenced by their social circles, though, in one instance, a pre-hospital first responder suggested that they were influenced by their military background and desire to lead by example. While some stated that they did not feel that their decision influenced others within their social circles, others felt that their decisions actively influenced those around them, and one participant shared their experience within their social circle:

Well, they’re pushing it. I mean on the military side, it’s getting to the point where it’s not mandated, yet, but strongly encouraged. But then it’s also leading by example and just doing it.

—police officer

Role of Media

Both hospital-based health care providers and pre-hospital first responders noted that the media played an important role in delivering information about COVID-19; however, they simultaneously acknowledged concerns with media polarization and the risk that important information may not be accurately conveyed to the public:

So all in all, I think we have an obligation to do our part to start correcting the false narratives and calling out the folks who are somehow—we had an employee at our office actually telling a patient about these false narratives, and the patient complained. That’s how I found out about it, otherwise I never would have known. And I was appalled and embarrassed, but I think a lot of it is about education and it’s bigger than us and higher than us, and we have to get our organizations on board. And newspapers and TV stations and politicians and all the way up.

—hospital-based health care provider
My social circle is the news, CDC, federal government press releases. Pretty much multiple sources; anywhere between, you know, from credible, I use that term loosely, to, you know, just word of mouth and information being passed on.

—police officer

For all of that, give us the information, the facts, and let us digest it. Telling us what to think or feel about it is making the news outlets less credible.

—paramedic

Role of Social Media

The prevalence of conspiracy theories and widespread dissemination over various social media platforms was discussed among focus group participants. They noted the importance of social media platforms as influencers among younger populations, and as a source for propagating conspiracy theories. Though none personally endorsed these conspiracies, they were aware of many of them (e.g., microchips being incorporated into the vaccine, mRNA vaccines altering DNA):

That [younger] population is getting all their information from social media. And that, I think, you have with the younger population, it’s more about meeting them where they are versus who is providing that information.

—hospital-based health care provider

YouTube. I mean there’s some, you know, crazy conspiracy theories that are out there, and, you know, some of them have been around for 20 years when it comes to microchip[ping] the population of the US, so.

—police officer

Role of Politics

No individuals who endorsed personal vaccine hesitancy attributed their sentiments to their supported politicians or politics. In particular, the respondents who were unvaccinated among the pre-hospital first responder group felt that personal autonomy should be supported and that everyone was entitled to make an independent choice on vaccination, free of political influence:

I’m sorry, if you’re asking me what would help, just be transparent; leave the political climate out of it. We [would] rather see it straight, you know, straight information. Everything seems to be for profit or political spin, so that’s why I think [there’s] a lot of mistrust. We talked earlier about the, you know, these different companies making these medications now everybody in the world needs it, who’s—who’s making profit off of that, you know.

—police officer

. . . there are some folks that just are so neck deep in the conspiracy world that it’s going to be very difficult to reach them, regardless. I wonder if somehow the messaging can be reframed to tie it to personal freedoms or something that aligns with another health value.

—hospital-based health care provider
**Lack of Trust in Institutions**

Pre-hospital first responders also commented on the lack of consistency in messaging from health experts and were skeptical of the vaccine effectiveness, particularly with guidance recommending ongoing mask use despite vaccination. They said that more data and time will be needed to determine vaccine effectiveness.

**Strategies to Bolster Vaccine Acceptance**

Across all of the focus groups, respondents were asked about potential strategies for boosting vaccine acceptance among those who remain unvaccinated. An emerging theme from this discussion, depicted in Figure 3.1, was a framework for how to conceptualize individuals in terms of their willingness to obtain the vaccine. Respondents stated that certain individuals may never be able to be convinced about the vaccine’s merits, regardless of the data presented.

**Figure 3.1. Conceptual Model: To Whom Should Boosting Messages Be Directed?**

**Vaccine-Readiness Groups**

In the focus group discussions, there were three vaccine-readiness groups that emerged, similar to prior literature regarding the continuum of vaccine hesitancy (Puri et al., 2020; WHO, SAGE Working Group on Vaccine Hesitancy, 2014):

- never willing to get the vaccine, because of
  - medical contraindications
- deeply held personal liberty/religious/political/ideological beliefs
- other insurmountable factors associated with reaffirming hesitancy

• persuadable, could be convinced by
  - more data (especially for those of reproductive age)
  - their social network (may be “against” vaccination but willing to get vaccine if it means being able to reunite with family)
  - trusted health care providers (e.g., those who were initially hesitant until their physician, provider, local pharmacist encouraged them to get the vaccine)

• already received the vaccine/do not require further convincing.

For those who endorsed personal hesitancy, many felt that it would take “more time and more data” to help convince them that the vaccine may be safe for them. They also felt that it was difficult for them to believe that getting the vaccine would help improve the quality of their life, as (up to that point) vaccination had not changed major recommendations for how groups could interact with one another. Of note, these focus groups occurred prior to the CDC’s efforts to lift the mask mandate for fully vaccinated individuals in May 2021 (CDC, 2021c).

The focus group analysis identified the following strategies to boost acceptance among individuals in the “could be convinced” category:

1. having health care providers and other trusted members of the individual’s community convey the benefit of the vaccine to unvaccinated members
2. encouraging family members/social networks to demonstrate the benefit of the vaccine as a motivator for resuming social gatherings
3. tailoring community-specific messages/messaging platforms to improve vaccination rates for specific groups. These groups include racial/ethnic minorities, immigrants/non-English speaking populations, those with disabilities (e.g., hearing impairment), and those experiencing homelessness
4. reframing the delivery of the vaccine as a patriotic act/duty.

Key Takeaways

The key findings from the focus group analysis highlight the multiple drivers of vaccine hesitancy and acceptance. Understanding the reasons why individuals have decided to be vaccinated and using those drivers can inform strategies to boost vaccine acceptance. Conversely, understanding the many drivers of vaccine hesitancy remains essential. Vaccine hesitancy should be addressed by focusing on individual groups (e.g., racial and ethnic minorities, undocumented immigrants, individuals experiencing homelessness, individuals with disabilities, individuals with substance use disorders, and individuals with different political affiliations) as opposed to using a one-size-fits-all approach.

The patient, hospital-based health care provider, and first responder perspectives indicate that messaging for vaccine acceptance should be tailored and championed by trusted sources. Trust in the safety and efficacy of novel vaccine technology can likely be best established if messaging is
from already trusted sources. These trusted sources may not necessarily be official health organizations, such as the CDC, but rather trusted community members (e.g., personal physicians or local pharmacists), who may play a significant role in boosting vaccine acceptance for those initially hesitant to get vaccinated. Focus group findings also highlight the importance of establishing access to local health care. Other trusted sources may also include prominent figures such as celebrities for younger individuals; physicians, scientists, and religious leaders for minority groups; and political figures, talk show hosts, and religious figures for politically conservative groups.

The focus group results highlight the following as key aspects of vaccine-acceptance-boosting strategies, which are further synthesized along with the other components of this broader study in Chapter 6 of this report:

- To **promote convenience** in COVID-19 vaccines:
  - Remove barriers to vaccine access (e.g., transportation, location, ease of scheduling an appointment).

- To **boost confidence** in COVID-19 vaccines and **combat complacency**:
  - Conduct surveillance of misinformation on social media platforms on an ongoing basis and respond with targeted counter-messaging based on evidence-based facts and science.
  - Highlight people’s “why” for getting the vaccine.
  - Incorporate clear information about vaccine safety and/or efficacy, including long-term effects into messaging.
  - Address concerns about vaccine development (speed, technology, brand).
  - Highlight the benefits of vaccination as a way to return to pre-pandemic life.
Chapter 4. Social Media Sentiment Analysis

Overview

Vaccine hesitancy fueled by vaccine misinformation is not a new phenomenon. Much of the anti-vaccine discourse has remained unchanged over the past 30 years, but the rise of social media has facilitated rapid dissemination of misinformation and subsequent distrust of vaccines (McClure, Cataldi, and O’Leary, 2017). Social media is a powerful tool in discourse about vaccines (Succi, 2018), partly because social media users can rapidly create content without the oversight associated with traditional news outlets (Puri et al., 2020). Further, individuals often look to social media when there is a gap in information (Finnegan et al., 2018). This has been the case throughout the COVID-19 pandemic, during which information has been constantly evolving and sometimes lacking. Social media use has also been shown to be associated with vaccine refusal (Chadwick et al., 2021; Melovic et al., 2020).

Prior research on the impact of social media on vaccine hesitancy has demonstrated that anti-vaccination social media posts focus on the harmful effects of vaccines and play into public distrust of pharmaceutical companies. Additionally, the anti-vaccine movement appeals to individuals’ emotions by sharing stories of harm (Ortiz-Sanchez et al., 2020).

Social media may also be used as a tool to promote vaccine uptake, but evidence for this is limited (Odone et al., 2015). In a study of pregnant women in Colorado, those exposed to a website with information on childhood vaccines were more likely to have their infants fully vaccinated at 200 days (Glanz et al., 2017). Another study examining the impact of social media influencers on influenza vaccine uptake found that exposure to such posts was associated with significant increases in positive beliefs about the flu vaccine (Bonnevie et al., 2020). With the novel COVID-19 vaccine, public health officials are looking to social media to increase vaccine uptake, but the effectiveness of these efforts has not yet been studied rigorously (Evans and French, 2021).

Anti- and pro-vaccine messaging on social media related to COVID-19 has not been well evaluated. To develop effective messaging to counter vaccine hesitancy, we need to understand the current social media landscape, including trends in message type, common sentiments and themes, and influential social media messengers. To build this understanding, we conducted a social media sentiment analysis using Meltwater, a comprehensive media monitoring, analysis, and social listening platform to evaluate how the U.S. population talks about and conceptualizes COVID-19 vaccination and, more specifically, COVID-19 vaccine hesitancy (Meltwater, undated).
Methods

Social Media Monitoring Platform and Data Sources

To complete the social media sentiment analysis, we reviewed posts related to COVID-19 and the vaccine across four major social networking sites: Twitter, Reddit, Facebook, and Instagram. Utilizing Meltwater, we collected data from social networking sites and feeds through the search engine and our prespecified search terms (Meltwater, undated). Meltwater can collect data from social media sites except for content from private accounts/pages. Our analyses of these social media platforms were limited to users in the United States and content in English. For data from Twitter, Reddit, and Facebook, we included content posted from April 26, 2020, through April 26, 2021. Per Facebook terms and Meltwater limitations, the data from Instagram follows a rolling seven-day period; our sample included content posted from April 26, 2021, through May 2, 2021. Data from Facebook and Instagram can only be collected from public social channels and from verified accounts, respectively.

We iteratively generated a list of words, phrases, and Boolean operators to include in the social media analysis, informed by our environmental scan. These are listed in Appendix B.

After data collection, all data captured in languages other than English and user posts containing only URLs were removed from the final dataset. Any publicly available data that were captured related to user identification were de-identified before storing in the dataset. To determine the location of the data, we used the geolocation data linked to a user post along with user-reported locations when available.

Social Media Data Extraction

Data collected from Twitter included the following: (1) the number of unique Twitter handles that the post mentions (i.e., users); (2) the total volume of all tweets (i.e., mentions); (3) the total number of followers (i.e., impressions) for all tweets; and (4) an estimate of the total follower count for all unique Twitter handles (i.e., reach, or an estimate of the potential total audience of the tweets) over our study period. We additionally identified the keywords and emojis that appeared most frequently in the search results, as well as the top Twitter authors, top hashtags, and most retweeted tweets. These metrics from Meltwater are unique to Twitter and do not apply to the other social media platforms we analyzed.

Also using Meltwater’s search engine, we collected the total volume of all mentions or references to keywords in Reddit. For Facebook and Instagram, we searched for relevant posts and collected the total volume of all comments. Again, data from Facebook and Instagram can be collected only from public social channels and from verified accounts, respectively. In addition, Meltwater required the creation of an authenticated business account to collect social media content from Facebook and Instagram. For these four social networking sites, we then selected vaccine-related content and hashtags relevant to our preselected words/phrases. For each data
point, we collected date of publication, reshare status (posts that are reposted or forwarded), number of reshares, number of “favorites” or likes, number of replies, user geolocation data (when available), and user-reported profile location.

**Social Media Sentiment and Data Analysis**

We identified “peak,” or high-volume, days of content on Twitter, Reddit, and Facebook for analysis. For Instagram, we analyzed the entire seven-day dataset. We also performed sentiment analysis, a systematic approach to interpret and classify text by emotion for all the platforms using Meltwater’s proprietary natural language processing algorithm and categorized content as neutral, negative, positive, or not rated in relationship to the COVID-19 vaccine. A tweet, mention, post, or comment is categorized as not rated if it does not have enough text to analyze its sentiment. For each social media platform dataset, we pulled up to ten exemplary quotes per platform associated with COVID-19 vaccine hesitancy and acceptance by date and sentiment. No specific limit of content was analyzed per social media platform. Sentiment analysis continued until enough quotes were captured to highlight the various perspectives from users and ensure that the content was supportive and representative of the themes. In total, 307 exemplary quotes were pulled from the Twitter sentiment analysis, 234 exemplary quotes from Reddit, 93 exemplary quotes from Facebook, and 83 exemplary quotes from Instagram. We rapidly analyzed the most shared and a random selection of less frequently shared tweets, mentions, posts, and comments to assess for theme saturation. We identified themes/descriptions for each quote using a preliminary template developed from the environmental scan and focus group results. A team of three researchers examined the content to make judgements about the themes. Limitations to Meltwater include a text-only sentiment analysis algorithm for deciphering overall tone, whereas interpreting sentiments correctly involves the accurate detection of emotions and polarity regarding vaccine hesitation or acceptance (e.g., humor, sarcasm, intent, handling negation, comparisons, context, and meaning).

**Results**

Across the four platforms, a total of 11.8 million comments/mentions regarding the COVID-19 vaccine met our inclusion criteria for analysis within the timeframes noted above (April 26, 2020–April 26, 2021, for Facebook, Twitter, and Reddit, and April 26, 2021–May 2, 2021, for Instagram).

**Twitter**

We identified 1,914,334 unique Twitter users that posted content related to our pre-specified COVID-19-related search terms with a reach of 1,085,184,251 Twitter users (i.e., an estimate of the potential total audience of the tweets based on the total number of followers for each unique Twitter handle). There were spikes in COVID-19 vaccine-related impressions in May 2020,
corresponding to when lockdown orders were lifted in many states and when Moderna first announced that its vaccine appeared to produce an immune response (“COVID-19 restrictions: Map of COVID-19 case trends, restrictions and mobility,” 2021; Branswell, 2020); mid-July 2020, when COVID-19 infections hit 3.5 million and the United States entered the second pandemic surge; mid-August 2020, when Russia registered the first COVID-19 vaccine (Grove, 2021); mid-October 2020, when Congress failed to pass a coronavirus relief bill; and November 2020, when Pfizer first announced the results of its phase 3 COVID-19 vaccine trial (Pfizer, 2020). There was a sustained peak in December 2020, when recommendations were first made for health care workers and residents of long-term care facilities to receive the vaccine and when these populations started to receive the vaccine (Stieg, 2020). Mentions remained at a higher baseline prior to the announcement of vaccination recommendations. There was another spike in April 2021, when President Biden announced that all adults would soon become eligible for a COVID-19 vaccine and when administration of the Johnson & Johnson vaccine was paused (Treisman, 2021; Marks, 2021).

Of the tweets in our sample, 77 percent were neutral, 15 percent were negative, 7 percent were positive, and 2 percent were not rated. The top keywords in all analyzed tweets included “country,” “appointment,” “side effects,” “Trump administration,” and “blood clots.” Top keywords appearing in positive sentiment results included “huge news,” “history,” and “great news.” Top keywords for negative sentiment results included “side effects” and “inability.” Top emojis for all Tweets are shown in Figure 4.1, representing various sentiments (e.g., face with tears of joy, thinking face, persevering face, crying face, and man facepalming) toward COVID-19 and the vaccine. These were collected through a widget from Meltwater that shows the top emojis from Twitter. This analysis found that the top three emojis used in Twitter were (1) the syringe, (2) the backhand index finger pointing down, and (3) the American flag.

Figure 4.1. Social Media Sentiment Analysis: Top Twitter Emojis
Depicted in Table 4.1 are the top Twitter handles with the highest follower count that appear in our search results, including the handles of Barack Obama, Britney Spears, Jimmy Fallon, Bill Gates, the *New York Times*, and the president of the United States.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Tweets</th>
<th>Followers</th>
</tr>
</thead>
<tbody>
<tr>
<td>barackobama</td>
<td>1</td>
<td>129,195,501</td>
</tr>
<tr>
<td>britneyspears</td>
<td>1</td>
<td>56,078,548</td>
</tr>
<tr>
<td>jimmyfallon</td>
<td>1</td>
<td>51,873,193</td>
</tr>
<tr>
<td>billgates</td>
<td>1</td>
<td>50,195,805</td>
</tr>
<tr>
<td>nytimes</td>
<td>566</td>
<td>49,899,373</td>
</tr>
<tr>
<td>potus</td>
<td>7</td>
<td>32,716,386</td>
</tr>
<tr>
<td>hillaryclinton</td>
<td>1</td>
<td>30,007,985</td>
</tr>
<tr>
<td>joebiden</td>
<td>1</td>
<td>28,754,773</td>
</tr>
<tr>
<td>conanobrien</td>
<td>2</td>
<td>28,685,396</td>
</tr>
<tr>
<td>whitehouse</td>
<td>71</td>
<td>26,138,832</td>
</tr>
</tbody>
</table>

In our sentiment analysis, we identified several important themes in the positive, negative, and neutral tweets. Tweets that were generally positive emphasized the importance of understanding the “why” of those who have been vaccinated to boost acceptance, the role of health care providers in encouraging vaccine uptake, the role of other trusted figures in encouraging vaccine uptake, the impact of social circles on vaccine acceptance, and the influence of social and traditional media on vaccine acceptance or hesitancy.

Tweets that were negative focused on conspiracy theories and reflected the politicization of the vaccines. Negative tweets also highlighted the impact of lack of trust in the medical system and medical research as a deterrent to getting vaccinated, discomfort with the speed of vaccine development, unease with the new technology of the vaccines, and concern for side effects, adverse effects, and long-term effects. For example, one writer tweeted,

>This is from the Pfizer v-a-c-c-i-n-e. Please understand these shots cause harm. Injury is REAL and not rare. It’s a shame these poor people are being gaslighted, and social media giants are censoring them.

Negative tweets also highlighted the role of barriers to access to the vaccine.

The neutral tweet themes resembled those of the positive and negative tweets but also specifically addressed the concerns of subpopulations. One writer highlighted the relationship between vaccine hesitancy and systemic racism:

>Let’s be honest. Many Black [people] will refuse to take this COVID vaccine be most of us don’t trust that white people or the government mean us any good. And when that happens, know that the hesitance is not some baseless paranoia. It is completely rational. Let me explain.
Examples of the most retweeted tweets are in Table 4.2.

**Table 4.2. Social Media Sentiment Analysis: Twitter Most Retweeted**

<table>
<thead>
<tr>
<th>Match</th>
<th>Sentence</th>
<th>Sentiment</th>
<th>Retweets</th>
</tr>
</thead>
<tbody>
<tr>
<td>The mRNA vaccines (Pfizer and Moderna) are kind of brilliant at a science level. I’ve had a few people in my real non-Twitter life ask me to explain how it works so I’m going to try my best here in this thread while I’m waiting for a patient to show.</td>
<td>Positive</td>
<td>110,339</td>
<td></td>
</tr>
<tr>
<td>My boyfriend got his covid vaccine yesterday and I can tell you the most prominent side effect is the inability to shut up about getting the covid vaccine</td>
<td>Neutral</td>
<td>98,980</td>
<td></td>
</tr>
<tr>
<td>We live in a system where the people who most fervently denied and downplayed the coronavirus are among the first to receive the vaccine. This is so despicable.</td>
<td>Negative</td>
<td>59,779</td>
<td></td>
</tr>
<tr>
<td>How you can force a vaccine but cant force a mask</td>
<td>Neutral</td>
<td>58,483</td>
<td></td>
</tr>
<tr>
<td>I am 70. Have a chronic medical problem. I do not mind waiting for my turn for the COVID vaccine. Many others need to go first. But seeing those politicians who refused to wear a mask and called COVID-19 a hoax getting theirs before me (and millions of others)- Infuriating</td>
<td>Negative</td>
<td>52,412</td>
<td></td>
</tr>
<tr>
<td>Damn, we got a COVID vaccine before Flint got clean water 😅</td>
<td>Neutral</td>
<td>47,747</td>
<td></td>
</tr>
<tr>
<td>Here I describe a brief overview of how the Pfizer/BioNTech or Moderna mRNA vaccines work. Taking a vaccine is one’s personal choice, and I hope this video can help someone make that decision rooted in science.</td>
<td>Neutral</td>
<td>46,218</td>
<td></td>
</tr>
<tr>
<td>HUGE NEWS: Thanks to the public-private partnership forged by President @realDonaldTrump, @pfizer announced its Coronavirus Vaccine trial is EFFECTIVE, preventing infection in 90% of its volunteers.</td>
<td>Positive</td>
<td>18,157</td>
<td></td>
</tr>
<tr>
<td>received dose 1 of the pfizer vaccine yesterday. i feel fine and i’m more enthusiastic about the microsoft family of products than ever.</td>
<td>Positive</td>
<td>12,837</td>
<td></td>
</tr>
<tr>
<td>DeSantis says that Florida has no Vaccines because of Production problems with Pfizer, Pfizer immediately does a press release contradicting DeSantis, saying there is no problem but that Florida hasn’t ordered any vaccines</td>
<td>Negative</td>
<td>11,423</td>
<td></td>
</tr>
<tr>
<td>This is your daily reminder that under no circumstances will I be getting any #coronavirus vaccine that becomes available. Ever. No matter what. 🇩🇪 The vaccine is the product of a German-American partnership. Germany's BioNTech, founded by two children of Turkish immigrants, partnered with America’s Pfizer, led by a Greek-born CEO, to produce the coronavirus vaccine. Glad to help.</td>
<td>Negative</td>
<td>10,165</td>
<td></td>
</tr>
<tr>
<td>Reddit</td>
<td>Positive</td>
<td>8,518</td>
<td></td>
</tr>
</tbody>
</table>

We identified 2.05 million Reddit mentions that met our inclusion criteria. Reddit trends had spikes in early May 2020, when lockdown orders were lifted in many states and Moderna first announced that its vaccine appeared to produce an immune response (“COVID-19 restrictions: Map of COVID-19 case trends, restrictions and mobility,” 2021; Branswell, 2020); mid-July, corresponding to the time of the second pandemic surge (Lodha, 2021); and early November 2020, when Pfizer announced the results of its clinical trial (Pfizer, 2020). Activity remained elevated after that time, with another spike in December 2020 when health care workers and residents of long-term care facilities were recommended to receive the vaccine and when they started to receive the vaccine (Stieg, 2021). There were additional spikes in January 2021, corresponding to the date of the U.S. Capitol insurrection and the presidential inauguration.
(Leatherby et al., 2021). As with Twitter, there was an additional peak in April 2021, when it was announced that all adults would become eligible for the COVID-19 vaccine and when administration of the Johnson & Johnson vaccine was paused (Treisman, 2021; Marks, 2021).

Of the mentions in our sample, 73 percent were neutral, 20 percent were negative, 6 percent were positive, and less than 1 percent were not rated. Top emojis for all mentions from most to least used included love, joy, fear, anger, surprise, and sadness. The top Reddit discussion boards with the most mentions were (1) r/Coronavirus/, (2) r/worldnews/, (3) r/politics/, (4) r/news/, (5) r/conspiracy/, (6) r/AskReddit/, (7) r/CovidVaccinated/, (8) r/Canada/, (9) r/ukpolitics, and (10) r/CoronavirusUK/. Using sentiment analysis, we identified similar themes in the positive, negative, and neutral Reddit mentions. In addition to the themes identified on Twitter, Reddit mentions included several posts of individuals writing about their own experiences getting the vaccine. These mentions were personalized to specific populations (e.g., those with certain comorbidities). For example, one user posted,

My covid vaccine experience while on antibiotics for Lyme and toxic mold exposure: Hearing others experiences really helps to make a decision on getting a covid-19 vaccine. At this point I still want to wait . . .

Several of the negative mentions discussed the role of religion in addition to conspiracy theories. For example, one user posted,

Fresno bishop tells Catholics not to get Covid-19 vaccine, citing use of stem cells in its development: Spreading needless worry that will result in people not getting the vaccine, which will cost lives. He’s basically trolling for clicks . . .

Others demonstrated concerns over side effects and distrust of health care, public health, and governmental institutions.

The neutral mentions were often centered around concerns about the side effects of the vaccine while trusting the efficacy of the vaccines. For example, one user posted this after the Johnson & Johnson pause:

J&J vaccination program paused by the SAMRC [South African Medical Research Council] - Sisonke Phase 3b study temporarily paused until US FDA reviews 6 cases of rare clotting disorder in vaccine recipients: clots. I’m not saying we shouldn’t use them, get vaccinated, it’s our best hope against the virus. But we do need to understand why this is.

Examples of additional exemplary quotes from Reddit mentions are in Table 4.3.
Table 4.3. Social Media Sentiment Analysis: Exemplary Reddit Mentions

<table>
<thead>
<tr>
<th>Match Sentence</th>
<th>Sentiment</th>
</tr>
</thead>
</table>
| Headline: Trump says U.S. has reached deal with Moderna for 100 million doses of coronavirus vaccine  
Hit sentence: If it’s both safe and effective, rich people will get it. If they aren’t sure how safe it is, poor people will. | Negative  |
| Headline: Conspiracy theory Christians are going to get people killed . . .  
Hit sentence: There’s a conspiracy theory that the Covid vaccine is the mark of the beast, and it’ll rewrite our DNA so we can no longer be Christian. | Negative  |
| Headline: Margaret Keenan, 90, just received the world’s first post-trial COVID vaccine. Historic.  
Hit sentence: Small world. Congratulations! That’s awesome! Brave woman : ) | Positive  |
| Headline: I’m curious what it’s gonna be like as people start to get the Covid vaccine  
Hit sentence: They’re saying that you will indeed have to keep masking and following social distancing | Neutral   |
| Headline: How Are We Supposed to Deal with Vaccine Hesitancy in Patients?  
Hit sentence: how ready are you to get a COVID vaccine? “Maybe a 4 or 5.” Okay. Well what makes you not a 1? “Well I think COVID is really scary, but . . . ” | Neutral   |

**Facebook**

The analysis from Facebook included approximately 1.3 million comments collected from April 26, 2020, through April 26, 2021. Of the comments in our sample, 86 percent were neutral, 8 percent were negative, 5 percent were positive, and less than 1 percent were not rated. Top emojis for all comments from most to least used include love, joy, anger, fear, sadness, and surprise. Sentiment analysis of comments on public Facebook pages demonstrated high levels of politicization of the vaccine. Both supporters and opponents of former President Donald Trump, for example, expressed both positive and negative sentiments about the vaccine. For example, one individual commented positively on the vaccine saying, “Thanks so much Pfizer for working for President Trump and getting virus under control. So glad Trump was able to get you guys to get this vaccine.” Another posted this neutral-sentiment comment: “Pfizer has nothing to do with Trump or operation warp-speed. They took no federal funding. They distance themselves from this . . . This is not a Trump accomplishment. This is all Pfizer’s doing. This is all science.” Negative Facebook posts were about now well-known conspiracy theories (e.g., Bill Gates’s role in development of the vaccine, claims that the vaccine contains a microchip or will change one’s DNA). They also reflected distrust in the health care and public health systems and large pharmaceutical companies. For example, one post read, “Pfizer is one of the most corrupt and dirty corporations there is.” Examples of additional exemplary quotes from Facebook comments are in Table 4.4.
### Table 4.4. Social Media Sentiment Analysis: Exemplary Facebook Comments

<table>
<thead>
<tr>
<th>Match Sentence</th>
<th>Sentiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comment on NPR’s Facebook page: “So WE (American taxpayers) pay for this vaccine TWICE. FIRST to Pfizer (government money means taxpayer money) and then we have to pay a...SECOND time to health care”</td>
<td>Negative</td>
</tr>
<tr>
<td>Comment on K102’s Facebook page: “Isn’t that ironic info comes out 6 days after election!! Not putting any Covid vaccine in my body!!”</td>
<td>Negative</td>
</tr>
<tr>
<td>Comment on President Joe Biden’s Facebook page: “I love❤ and fully trust Dr Fauci. My family members got J&amp;J vaccine and they are between 18–35 so far no problem but we still monitor to be”</td>
<td>Positive</td>
</tr>
</tbody>
</table>

### Instagram

Approximately 2,300 Instagram comments collected from April 26, 2021, through May 2, 2021, met our inclusion criteria. Instagram posts were limited to the period after the vaccines had received emergency use authorizations from the FDA. Of the posts in our sample, 89 percent were neutral, 8 percent were positive, and 2 percent were negative. Top emojis for all posts from most to least used included love, joy, anger, fear, sadness, and surprise. Positive-sentiment posts focused on the role of health care providers and public health officials in encouraging individuals to get the vaccine and the role of one’s social circle in acceptance of the vaccine. Above all, posts were about users’ “why” for getting the vaccine. For example, one user wrote: “It’s so nice having game nights with your #vaccinated friends and being able to hangout with people and not feel like you’re trapped. . . . It’s nice to have a sense of ‘normal’ while playing❤.”

Negative posts highlighted themes identified in other social media platforms, including politicization of the vaccine, lack of trust in pharmaceutical companies, and concerns about side effects. There were few neutral posts, most of which weighed the risks and benefits of the vaccine. For example, one user posted,

I asked in my stories the other day what others’ opinions were on getting the COVID vaccine while pregnant and to be honest the answer was . . . being vaccinated FAR out ways [sic] the risks for myself and baby girl and so earlier this week i got my first dose of the Pfizer vaccine.

Examples of additional exemplary quotes from Instagram posts are in Table 4.5.
Table 4.5. Social Media Sentiment Analysis: Exemplary Instagram Posts

<table>
<thead>
<tr>
<th>Match Sentence</th>
<th>Sentiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Fatigue, constipation, headaches, insanity . . . the list goes on and on. 0/10 do not recommend.”</td>
<td>Negative</td>
</tr>
<tr>
<td>“Fully vaccinated and filled with gratitude. When mRNA becomes the vaccine standard and we continue eradicating diseases, we’ll truly appreciate the significance of this scientific breakthrough.”</td>
<td>Positive</td>
</tr>
<tr>
<td>“Massive smile behind my mask getting my second shot 😊 Here’s to hugs and theatre and indoor restaurants after this dark and difficult year. Grateful to Nurse...”</td>
<td>Positive</td>
</tr>
<tr>
<td>“With 40 percent of COVID’s casualties being black and brown people, I decided to go ahead and get vaccinated. I dealt with Covid and it was... My prayer is that you live and not die. Much love ❤️!!”</td>
<td>Neutral</td>
</tr>
<tr>
<td>“Second jab done yesterday, no side effects, no second head appearing etc! Now I just need the international travel stuff to get sorted so I can visit my sister.”</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

Key Takeaways

As described in detail above, a total of 11.8 million mentions/comments met search criteria for the social media sentiment analysis across the platforms of Twitter, Reddit, Facebook, and Instagram. We identified several important themes that were present across our three sentiment categories (i.e., positive, negative, and neutral) and four social media platforms. Common themes included the politicization of the vaccine; the influence of trusted messengers on vaccine acceptance or refusal; the “why” for getting or not getting the vaccine; the role of health care workers in encouraging vaccine uptake; mistrust of health care systems, government, and pharmaceutical companies; and concerns about the side effects of the vaccine. We also identified peaks in social media posts that correlated with important global and national events related to the pandemic and the vaccine, suggesting that social media may help measure critical national (and international) sentiments (WHO, 2020). These trends could be used to identify time points when clear public health messaging is needed in order to counter any misinformation that is propagated through social media platforms.

We summarize our findings as to how to improve messaging to help boost vaccine acceptance using the WHO’s three C’s model of confidence, complacency, and convenience:

- **To boost confidence** in COVID-19 vaccines: Address mistrust of health systems, government, and pharmaceutical companies, particularly among populations that have historically had negative experiences with these entities.
- **To boost confidence** in COVID-19 vaccines and **combat complacency**: Address politicization of the vaccine and concerns over the efficacy, safety, and side effects of the vaccine through consistent, evidence-based public health messaging. Ongoing surveillance of social media platforms can help track misinformation that needs to be addressed through aggressive, science-based counter-messaging on those platforms.
- **To boost confidence** in COVID-19 vaccines, **combat complacency**, and **promote convenience**: Understand motivators (e.g., the “why” of those who have been vaccinated) and develop effective messaging from health care providers, public figures, and social circles.
Chapter 5. Expert Roundtable

Overview

We held an expert roundtable in May 2021 to discuss key findings from the broader study (environmental scan, focus groups, and social media analysis) and to identify promising strategies for boosting vaccine acceptance from the perspective of practitioners and misinformation experts. We summarized key findings from the environmental scan, focus groups, and social media analysis and presented them to a group of experts, whom we asked to provide recommendations on vaccine-acceptance-boosting messages, messengers, and messaging platforms—especially with respect to populations whose hesitancy is driven by religious and/or political ideology or misinformation. Further, we sought to understand what components a toolkit to boost COVID-19 vaccine acceptance would need to include in order to address the root causes of hesitancy among different populations.

Methods

We conducted recruitment for the expert roundtable via email in May 2021. We sent out eight invitations to key experts on COVID-19 vaccine and misinformation research from the RAND Corporation and the University of Michigan. A total of four individuals participated. The participants included a pediatric emergency physician, two social scientists, and a behavioral scientist. All the participants had expertise and/or firsthand experience addressing vaccine hesitancy in clinical settings. Given the quick-turn nature of the project and need for an evidence base to boost COVID-19 vaccine acceptance, we opted to proceed with this expert roundtable of four participants instead of recruiting more individuals. The participants did represent the types of expertise that we were seeking for this panel.

Questions addressed to the expert roundtable participants were informed by the project’s environmental scan, focus groups, and sentiment analysis, and included:

1. How can messages, messengers, and messaging platforms be effectively tailored for different populations?
   a. What other factors need to be considered?
2. What strategies can best combat hesitancy among . . .
   a. the political hesitant?
   b. the religious hesitant?
   c. those who believe in the anti-vaxxer movement?
   d. conspiracy theorists?
3. What should the ultimate toolkit to boost COVID-19 vaccination acceptance look like?
a. What components would it have?
b. What partnerships would be required to develop and deploy such a toolkit?

Similar to the focus group methodology, all our discussions were recorded, transcribed, de-identified, and analyzed using the rapid analysis technique described in Chapter 4.

Results

Tailoring Messages, Messengers, and Messaging Platforms for Different Populations

The expert roundtable participants commented on several motivators for vaccine acceptance. In one example, an individual stated that a family member who was “anti-vaccine” still obtained the vaccine after being told by a family member that without it, they could not visit their grandchildren. The discussants raised the concept of an “idiosyncratic turnkey” and inspirational messaging for each individual based on the root cause of their hesitancy. “I get to see my grandkids” may be a turnkey for some, and sharing that story may prompt others to get the vaccine.

People can be hesitant to get the vaccine for different reasons, and thus messaging should be tailored according to the reason for hesitancy. The expert roundtable discussion emphasized two main types of reasons for vaccine hesitancy that can inform messages, messengers, and messaging platforms: (1) characteristics of the vaccine and (2) hesitancy related to institutions and sources of influence. Regarding the first issue, many people are hesitant to get a vaccine because they have concerns about how it was developed and/or what effects it will have. Messaging to this group should seek to increase people’s confidence in the vaccine’s safety and effectiveness. Regarding the second issue, many people are hesitant to be vaccinated because people they trust are hesitant and/or because they do not trust people who are promoting the vaccine. For this group, messaging needs to seek first and foremost to build trust where it is currently lacking; efforts to provide information about the vaccine’s safety and effectiveness will not succeed if the person or institution delivering this message is not trusted. We discuss messaging strategies for these two groups in more detail below.

For all hesitant groups, discussants stressed the importance of repeat messaging. For example, health care providers should take every patient encounter as an opportunity to introduce the concept of vaccination, because a hesitant patient may be more or less prone to changing their mind depending on the time when and circumstances under which they are approached. Further, the discussants expressed that for some populations providing vaccination incentives may be effective.

Messaging Strategies to Address Hesitancy Related to Characteristics of the Vaccine

Messaging to address hesitancy related primarily to vaccine characteristics should aim to provide people with more information and to address their concerns directly. Health care professionals, public health officials, other government representatives, and other institutional
authorities can help address this form of hesitancy both by pushing information out broadly to the public and by engaging with individuals (e.g., in health care settings) to answer questions and address concerns.

Vaccine Development Process (Novelty and Speed)

The expert roundtable discussed the concepts of rapid vaccine development and concerns about very quick evaluation, testing, and distribution (including Operation Warp Speed), which can individually or collectively lead to vaccine hesitancy. In particular, participants discussed a failed opportunity to improve vaccine acceptance by highlighting the novel aspects and efficiencies of COVID-19 vaccine development in messages to the general public. As one expert panelist said:

. . . you know the whole notion of Operation Warp Speed was to expedite the vaccine delivery process by doing multiple things in parallel and, therefore, they can achieve sort of the same level of safety [and] efficacy in a shorter period of time, and it seems like part of that parallel effort would have included some sort of public messaging, some sort of PSA [public service announcement] planning to address . . . the vaccine hesitancy. They’ve had a lot of time to do that and I’m surprised that they haven’t done something even something fairly basic from a messaging standpoint yet.

Concern for Short- and Long-Term Adverse Effects

Panelists also noted that hesitancy can arise out of concerns for the short- and long-term adverse effects of the vaccine. They noted that health care workers, who interact with patients in different health care settings, can potentially be effective messengers to boost vaccine acceptance among those concerned about vaccine side effects and general adverse effects. Directing messaging at groups that professionally manage side effects may be helpful.

Messaging Strategies to Address Hesitancy Related to Institutions and Sources of Influence

As noted above, messaging to address concerns related to institutions and sources of influence needs to identify and emphasize opportunities to build trust. Such strategies can take many forms, including using a member of a trusted group to deliver the vaccine message, tailoring messages to address the needs of specific professions, contextualizing messaging in ways that connect with the intended audience, and addressing sources of mistrust (including past experience with discrimination or harm) honestly and directly. For these audiences, the most effective messengers are likely to be individuals or groups that are trusted by the target audience, and not necessarily those who may possess scientific expertise but who lack a direct connection.

Influence of Social Circle

Participants discussed the role of an individual’s social circle and their worldview and how topics such as vaccine hesitancy or conspiracy theories can become an integral part of one’s
identity and can foster a sense of community. Discussants noted that this creates challenges for messaging related to vaccines and for the effectiveness of vaccine education to boost vaccine acceptance. Addressing these challenges require messaging, events, and education that provide good reasons to break with one’s currently identified community, foster broader social belonging, and replace vaccine hesitancy with vaccine normalization and acceptance.

Influence of Social Media Networks

The expert roundtable’s major discussion point around social media was focused on groups that espouse views of vaccine hesitancy and how they may represent an important part of one’s social network and social needs. Discussants emphasized the importance of vaccine messaging that does not alienate users of social media networks and specific subgroups. In particular, it is important to understand and acknowledge that, no matter their views, everybody wants healthy friends and family members and that safe medicine is important. One expert panelist commented that

\[
\ldots \text{at least in social media, there’s a lot of badgering of anti-vaxxers which data suggests would only increase their resistance to vaccination [and] not do anything to improve that . . . to improve vaccination rates. So we certainly argue that you need to talk to these people in an open, transparent, and empathetic way.}
\]

When discussing the social dynamics of vaccine hesitancy, the social support offered by groups such as Facebook communities was mentioned as a particular driving factor. Replicating a social support system may be a factor to combat hesitancy by replacing the social support individuals may seek on social media platforms with a sense of community through vaccination. Tailoring messages, messengers, and messaging platforms when using social media to analyze and map out concerns and to identify and promote alternative social support was suggested.

Influence of Politics

The panelists discuss politics predominantly in regard to specific populations. They emphasized that messaging should be adjusted to fit these populations and their political views and that messengers should include political leaders who align with the political views of the hesitant population. Emphasizing vaccination as a patriotic act was mentioned as a potential solution to boost vaccine acceptance among those hesitant based on political ideology.

Influence of an Individual’s Profession

The panel also discussed in broad terms the need to tailor messages, messengers, and messaging platforms to specific subgroups of the population. For example, vocational subgroups such as emergency medical responders saw multiple cases of vaccine side effects in their patient population. That COVID-19 often has a clinically less impressive presentation (with the term “happy hypoxia” being used for patients whose clinical status and vital signs are much worse than their apparent presentation) contributes to hesitancy. Messaging to this group using
evidence-based messages by trusted “champions” within their professional network may be effective.

Lack of Trust in Institutions

Participants discussed how past historical events have allowed the lines to be blurred between reality and conspiracy theories and the importance of confronting this head on in vaccine-acceptance-boosting messaging. One expert panelist said:

You know the other thing is that people... They really intermix like things that are actual bad things that maybe governments did with conspiracy theories that are totally made up and those things are really intermixed... For scientists and doctors, they think of those as like categorically different things... like they’ll talk about like oh it’s colonialism and Tuskegee and how the Central Intelligence Agency (CIA) created human immunodeficiency virus (HIV).... There’s just a bunch of stuff and some of its real and some of it is fake.

Lack of trust in institutions cannot typically be remedied quickly. A central theme surrounding the role of health care providers and public health officials as messengers in encouraging vaccination was the need to foster a long-term clinician-patient relationship. Discussants noted that success in convincing people to get vaccinated often relies on continued and repeated efforts and the establishment of trusting relationships:

But I do get success when I slow walk it over the course of the visit. So it is slow walking, is it coming at it from different options, is it treating choice and not a “have to.”

Key Takeaways

The expert roundtable highlighted and reinforced the importance of understanding motivators for vaccine acceptance, reasons for vaccine hesitancy, vaccine characteristics, and theories of hesitancy, including institutions and influencers. To boost COVID-19 vaccine acceptance in the United States, expert roundtable participants recommended the following, which we present according to the WHO’s three C’s model of confidence, complacency, and convenience:

- **Tailor messages, messengers, and messaging platforms for different populations.**
  - Repeat messaging (*confidence, complacency, and convenience*). Repeat exposure to opportunities to get the vaccine or be convinced may be key because someone who is hesitant may accept the vaccine based on timing and circumstances.

- **Combat vaccine hesitancy among different populations.**
  - Provide incentives (*convenience*). Using incentives (e.g., cash, prizes, lottery tickets) as a vaccine-acceptance-boosting strategy should receive closer consideration.
  - Launch a COVID-19 vaccine education campaign (*confidence and complacency*). Create a streamlined, consistent, truth-telling/myth-busting campaign on the part of the federal government to counter misinformation around the COVID-19 vaccine on a consistent and continuous basis.
- Normalize vaccination (confidence, complacency, and convenience). It is critical to normalize and/or depoliticize vaccination so that it is no longer an ideological issue.

- **Develop a toolkit to boost vaccine acceptance.**

  - Develop a vaccine-acceptance-boosting toolkit (confidence, complacency, and convenience). A toolkit of vaccine-boosting strategies should include options for different types of messages, messengers, and messaging platforms that public health and health care officials can mix and match to target different populations. Messages from this toolkit should be broadcasted/distributed in settings where people may be idle (e.g., on a plane, doctor’s office, emergency department waiting room, pharmacy).

  We synthesize these findings along with the key findings from the other analyses in Chapter 6.
Chapter 6. Recommendations

Summary

The recommendations we present in this chapter summarize the common themes that emerged across this mixed-methods project to evaluate the root causes of COVID-19 vaccine hesitancy and strategies to boost COVID-19 vaccine acceptance. While each previous chapter included key takeaways from each analysis, the following discussion provides the synthesized results of a triangulation analysis of the environmental scan, focus groups, social media platform sentiment analysis, and expert roundtable findings.

The recommendations are weighted by assessing the degree of supporting data in our analyses. As shown in Table 6.1, we assigned greater weight to recurring themes within and across the analyses. Using this data-driven weighting process, we categorized the recommendations into three tiers, depicted in Table 6.2. We used the weighting process to identify areas of concordance across the data sources and analyses in order to rank recommendations. The results of each of the analyses were weighted equally in ranking the recommendations. Two members of our team reviewed the results of all the analyses to determine how frequently a given approach or strategy was supported. Based on this review, each resultant recommendation was ranked from tier 1 to tier 3. Although there are some disparate findings across the project analyses, the more highly ranked recommendations are the ones that have support across multiple analyses. These recommendations can be informative for public health and health care officials, health care providers, policymakers, and researchers as they work to increase vaccination rates in the United States in order to achieve herd immunity and overcome the pandemic. Further, these recommendations can be used to develop a toolkit of strategies to use the most effective messages, messengers, and messaging platforms to boost COVID-19 vaccine acceptance among various hesitant populations in the United States. These recommendations are presented according to the WHO’s three Cs model of confidence, complacency, and convenience. Most of these recommendations are pertinent to public health officials, health care organizations, community-based organizations, and policymakers. Note that some of the presented strategies to boost vaccine acceptance may be more suited for certain hesitant populations, so health care and public health practitioners should assess the appropriateness and effectiveness of each strategy in the context of their own communities.
Table 6.1. Guide to Recommendation Tiers

| Tier 1 recommendations | are strongly supported by the analyses. These recommendations are supported by the environmental scan and social media sentiment analysis and are based on themes that were identified multiple times across the focus groups and expert roundtable. |
| Tier 2 recommendations | are moderately supported by the analyses. These recommendations are supported by the environmental scan and social media sentiment analysis and/or are based on themes that were identified multiple times in at least one focus group or the expert roundtable. |
| Tier 3 recommendations | may or may not be supported by the environmental scan and social media sentiment analysis but were discussed in at least one focus group or the expert roundtable and are deemed notable and/or innovative. |

Table 6.2. Recommendations for Boosting COVID-19 Vaccine Acceptance

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<tr>
<th>Tier</th>
<th>Goal</th>
<th>Recommendations</th>
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<tbody>
<tr>
<td>Tier 1</td>
<td>Boost confidence in COVID-19 vaccines and combat complacency</td>
<td>1. Increase awareness, knowledge, and dissemination of vaccination information</td>
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<td></td>
<td>• Improve penetration of accurate vaccine information among hesitant populations</td>
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<td>• Develop culturally sensitive educational materials in various languages and literacy levels</td>
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<td>• Explain both the purpose and value of vaccination while alleviating concerns about effectiveness and safety</td>
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<td>2. Communicate effectively through the use of personal narratives and stories about the “why” for vaccination</td>
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<td>• Communicate the need for vaccination through short, personal narratives to appeal to people’s emotions</td>
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<td>• Communicate the “why” of people who got vaccinated in messaging to boost vaccine acceptance</td>
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<td></td>
<td>Boost vaccine confidence in COVID-19 vaccines, combat complacency, and promote convenience</td>
<td>1. Employ multiple vaccination strategies directed at more than one level of engagement</td>
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<td>• Improve convenient access to vaccination for those ready to get a vaccine</td>
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<td>• Directly target unvaccinated or under-vaccinated populations</td>
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<td>• Engage influential leaders to promote vaccination</td>
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<td>• Personalize messaging to hesitant populations based on value-assessment and use of trusted voices within the community</td>
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<td>2. Target populations and segment initiatives for vaccination</td>
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<td>• Identify and implement strategies for addressing vaccination needs of marginalized and vulnerable populations (e.g., BIPOC, children, older adults, immigrants, refugees, and LGBTQ+ individuals)</td>
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<td>• Target populations who share similar beliefs, attributes, and health-seeking behaviors in order to shape interventions that can be most effective in each segment</td>
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<td>• Focus on the vaccine-hesitant, as opposed to those with “extreme” anti-vaccine views, as the latter may not be persuadable</td>
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<td>3. Identify components of the ultimate toolkit to boost COVID-19 vaccine acceptance</td>
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<td>• Develop vaccine-promoting templates with tailored messages, messengers, and messaging platforms deemed most effective for given populations</td>
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<td>• Use nuanced messages based on an understanding of the root causes of a community’s vaccine hesitancy and continue monitoring perceptions (e.g., through social media) to modify messaging</td>
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<td>• Include inspirational-based messaging (“why I got the vaccine”) as opposed to fear- or shame-based messaging</td>
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<td>Tier</td>
<td>Goal</td>
<td>Recommendations</td>
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|      | 4. Tailor messages, messengers, and messaging platforms | - Use familiar or trusted health care settings to promote vaccination (as opposed to settings with which the community has a history of distrust)  
- Promote health care provider education, use of clinical decision support, or collaboration with public-private stakeholders to successfully address provider/practice-related barriers |
| Tier 2 | Promote convenience | 1. Expand vaccination access through various settings and services  
- Arrange vaccination services through community groups, including home services, employers, neighborhood community centers, elder care centers, and religious groups  
- Expand access to vaccination sites by employing community settings with extended operating hours and flexible scheduling (e.g., pharmacies, workplace clinics, churches) |
| Boost confidence in COVID-19 vaccines and combat complacency | 1. Combat conspiracy theories, misinformation, and disinformation through different media  
- Improve the overall social media presence of health agencies and governments and foster partnerships with social media platforms to accelerate promotion of evidence-based public health strategies  
- Monitor online media messaging and conversations to identify and evaluate early signals of crisis and inform the real needs of those who are truly hesitant  
- Use social media to track trends and map out unique concerns of different groups or populations and “micro-target” emerging issues around vaccinations |
| Boost vaccine confidence in COVID-19 vaccines, combat complacency, and promote convenience | 1. Develop and implement vaccination programs through partnerships  
- Health systems and community-based organizations should partner with existing federal, state, and local vaccination programs  
- Acknowledge through government platforms that the federal response and messaging has been haphazard and the dependence on states has produced mixed results  
- Partner with industry/business leaders to develop and deploy COVID-19-vaccine-acceptance-boosting tools  
- Partner with faith leaders, use public service announcements, and create state-level partnerships while acknowledging that in some states the implementation may not be great  
- Partner with industry/business leaders (banks, grocery stores, gas stations, airlines) so that messages can become woven into everyday life with “captive” audiences |
| | 2. Develop and implement national public health campaigns and initiatives with a unified evidence-based message to counter inconsistent messaging  
- Include provider and patient education  
- Use practice-based immunization “champions” to improve adult vaccine uptake  
- Highlight personal risks of the disease as well as community benefit when communicating to populations that are less susceptible to COVID-19  
- Convene experts representing different sets of stakeholders with a view to brainstorming and discussing creatively how to better support national communication campaign efforts, how to respond and build resilience in crises situations, and how to better engage with grassroots and civil society organizations that can support advocacy for vaccination |
| | 3. Identify strategies to combat hesitancy among the politically vaccine-hesitant  
- Use health care providers as messengers for this group  
- Unify health care and public health messaging to prevent confusion and frustration |
<table>
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<th>Tier</th>
<th>Goal</th>
<th>Recommendations</th>
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| 3    | Boost confidence in COVID-19 vaccines and combat complacency | 1. Implement vaccination policies to increase vaccination rates and decrease disease incidence  
- Consider legislation mandating vaccination in various settings (e.g., places of employment)  
- Make access to valued settings (e.g., health care facilities, large workplaces, K–12 schools, and collegiate institutions) conditional on vaccination status as a motivator for getting vaccinated |
|      |      | 2. Prioritize research, evaluation, and other targeted vaccination interventions  
- Research context-specific factors to inform tailored approaches to immunization  
- Implement processes to evaluate the drivers of hesitancy and measure the effectiveness of interventions over time |
|      |      | 3. Foster a sense of belonging, togetherness, and/or community associated with vaccination  
- Create a sense of belonging and community through vaccination events (rather than just through messaging)  
- Consider financial incentives like the lottery, prizes, rewards, and other gifts, certificates, and coupons for some communities |
|      |      | 4. Identify strategies to combat hesitancy among members of the anti-vaxxer movement  
- Understand the idea of “remove and replace”—i.e., replacing a hesitant patient's reliance on a movement that gives them a sense of community with a different focus—recognizing that, within the anti-vaxxer movement, being anti-vaccine is not typically a stand-alone point of view but is part of a broader worldview and misunderstanding of science  
- Give members of the anti-vaxxer movement something to “replace” their current worldview |
|      |      | 5. Identify strategies to combat hesitancy among other conspiracy theorists  
- Recognize that conspiracy theorists and purveyors of mis- and disinformation are often conflated with the politically and/or religiously vaccine-hesitant and the anti-vaxxer movement in sharing a general distrust of experts and/or the establishment and/or science |
|      |      | 6. Normalize vaccination  
- Normalize the vaccine through messages, messengers, and platforms emphasizing that getting the vaccine is not a political or religious statement |
## Appendix A. Environmental Scan Search Strategy

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Appendix B. Social Media Analysis Search Terms

COVID-19

AND (COVID* OR coronavirus OR “Coronavirus Disease 2019” OR SARS2 OR SARS-CoV-2 OR “SARS CoV 2” OR “SARS Coronavirus 2” OR OR “sarscov2” OR “2019 nCoV” OR “2019-nCoV” OR “2019 Novel Coronavirus” OR “covid19” OR “covid_19” OR “covid-19” OR “covid19vaccine” OR “virus” OR “airborne virus” OR “airborne disease” OR “airborne”) AND (“pandemic” OR “crisis” OR “emergency” OR “infection” OR “health” OR “covid free”)

AND (“death*” OR “die*” OR “life” OR “lives” OR “million” OR “thousands” OR “infirm Americans” OR “patient*” OR “vulnerable” OR “population” OR “young” OR “old*” OR “student” OR “essential” OR “essential personnel” OR “doctor” OR “nurs*” OR “teach*” OR “healthcare worker” OR “healthcare” OR “incarcerated” OR “prison” OR “jail” OR “police” OR “fire” OR “EMS” OR “RN”)

COVID-19 Vaccine

AND (“Coronavirus vaccine” OR “Covid vaccine” OR “Moderna” OR “Pfizer” OR “Pfizer vaccine” OR “Johnson and Johnson” OR “J&J” OR “pharma*” OR “BioNTech” OR “manufacturers” OR “first dose” OR “second dose” OR “dose*” OR “flu shot” OR “mRNA vaccines” OR “effective vaccin*” OR “vaccineswork” OR “vaccin*” OR “immuniz*” OR “immunis*” OR “inoculat*” OR “shot” OR “dose*” OR “side effect*” OR “long term effect*” OR “effect”)

OR (“approved” OR “authorize*” OR “restrict*” OR “closed” OR “quarantine” OR “scien*” OR “research*”)

COVID-19 Vaccine Development and Availability

AND (“wearamask” OR “maskup” OR “mask*” OR “double mask” OR “supplies” OR “PPE” OR “shortage*” OR “available” OR “missing” OR “shipment” OR “ship*” OR “aid” OR “free” OR “cost*” OR “debt” OR “insurance” OR “relief” OR “unemploy*”)

COVID-19 Vaccine Hesitancy and Uptake

AND (“force” OR “mandatory” OR “scared” OR “scary” OR “necessary” OR “vital” OR “crucial” OR “safe*” OR “celebrate” OR “deny*”)
COVID-19 Political Context

AND ("country" OR "world" OR "government" OR "society" OR "trump" OR "maga" OR "thedefender" OR "fauci" OR "FDA" OR "HHS" OR "biden" OR "harris" OR "biden-harris" OR "healthy senator" OR "senat*" OR "Congress" OR "billgates" OR "public" OR "elect*" OR "vote" OR "politic*" OR "work" OR "privilege" OR "rallies" PR "thisisoursshot" OR "matter but none" OR "curfew for black" OR "curfew" OR "real non-twitter life" OR "demvoice1" OR "debate" OR "protest*")

AND ("treatment" OR "hydroxychloroquine" OR "immune*" OR "plan" OR "bill" OR "surg*" OR "under control" OR "it’s going away" OR "time to open up" OR "open" OR "operationwarpspeed")

OR ("hoax" OR "hacker" OR "Russian" OR "Russia" OR "lying" OR "lies" OR "false" OR "fake news" OR "misleading" OR "doubt" AND "breaking" OR "abc15" OR "news" OR "headline" OR "story" OR "news story" OR "media" OR "media-manufactured" OR "tru*"
Appendix C. Semistructured Focus Group Interview Guide

Identifying Strategies to Boost COVID-19 Vaccine Acceptance in the United States

Introduction

Good Morning/Afternoon. We are part of a research team from the Acute Care Research Unit at the University of Michigan. My name is (Researcher name here) and I am part of the research team. I’m so pleased to be here today for our focus group. Thank you very much for your time.

Consent

The University of Michigan Institutional Review Board has determined that this study (INSERT HUM NUMBER HERE) is (INSERT IRB STATUS HERE) by IRB oversight. Participation in this focus group is completely voluntary. Even if you decide to participate now, you may change your mind and stop at any time. You may choose not to answer questions for any reasons.

We will be making an audio recording in order to create a word-for-word copy of today’s discussion for analysis. Notes will also be taken during the focus group. You will not be quoted or referenced by name in the notes or transcriptions and we will make every effort to assure that you cannot be identified through the details that you share. The audio recordings will be destroyed after transcription.

The results of this study could be published in a final report or journal article but would not include any information that would let others know who you are. We believe the risks to you participating are minimal and that there may be benefits to your community and others across the United States. Do you have any questions?

TURN ON THE RECORDER!
General Questions:

1) Are you up to date with your adult immunizations?

2) If you have children, were/are they routinely immunized?

3) If eligible, have you received the COVID-19 vaccine?
   i. If yes, why did you get the vaccine?
   ii. If no, why haven’t you gotten the vaccine yet?

4) Are most people in your family/social circles willing to get the COVID-19 vaccine? Has their willingness (or lack of willingness) influenced your decision to get vaccinated? If yes, how so?

Specific Questions Based on Root Cause:

1) Misinformation
   a) There are movements in the United States and other countries against populations getting vaccinated, often for reasons unsupported by science (e.g., the anti-vaxxer movement)
      i. What do you know about such movements?
      ii. What adverse events do you attribute to vaccines (e.g., autism in children, allergic reactions, blood clots, etc.)
      iii. If you have elected not to get vaccinated in the past, what factors play(ed) a role in that?
      iv. If you have elected not to be vaccinated, has that played a role in your decision regarding getting the COVID-19 vaccine?
      v. If you elect not to be vaccinated, would anything/anyone help you change your mind?

   b) Other theories
      i. What stories/theories have you heard about the vaccine (e.g., microchip inserted in vaccine)?)
      ii. Where/how did you hear about these?
      iii. Do you believe them? Why or why not?
      iv. How did/does hearing about these impact your decision to get the COVID vaccine?
      v. If you believe in any stories/theories related to the COVID-19 vaccine who/what would help change your mind?
2) Politics

   a) Should whether one chooses to get the COVID-19 vaccine or not be a political issue?

   b) Do you consider getting the COVID-19 vaccine a political issue? Why or why not?

   c) Do you think the political discourse around the vaccine has deterred people from getting the vaccine? If yes, how so?

   d) If known political figures of the party you are affiliated with get the vaccine, will that help convince you to take the vaccine? Why or why not?

3) COVID-19 Vaccine Characteristic/Development Concerns

   a) Do you have concerns about vaccine safety? If so, what are your concerns?
   Prompt: What can help address those concerns?

   b) Do you have concerns about vaccine effectiveness? If so, what are your concerns?
   Prompt: What can help address those concerns?

   c) Do you have concerns about the speed of vaccine development? If so, what are your concerns?
   Prompt: What can help address those concerns?

   d) Do you have concerns about the new technology used to develop the COVID vaccine? If so, what are your concerns?
   Prompt: What can help address those concerns?

4) Education

   a) Where do you/your social circle get your information about COVID-19?
   Prompt: Do you trust this source? If not, who do you consider a trusted source?

   b) Do you believe you have enough information about the COVID-19 vaccine safety and efficacy? If so, how did you get that information?

   c) If you don’t think you have enough information, what information do you think you need?
   Prompt: Who is best positioned to give you that information?
**Wrap-Up Questions:**

1) What should hospitals, public health and government do to get more people to take the COVID-19 vaccine?

2) What is the best source/platform (e.g., television, radio, internet, social media, print media) to convince more people to get the vaccine?
## Abbreviations

<table>
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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>BIPOC</td>
<td>Black, Indigenous, and people of color</td>
</tr>
<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
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<tr>
<td>COVID-19</td>
<td>coronavirus disease 2019</td>
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<tr>
<td>FDA</td>
<td>U.S. Food and Drug Administration</td>
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<tr>
<td>EMS</td>
<td>Emergency Medical Services</td>
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<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
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<tr>
<td>LGBTQ+</td>
<td>lesbian, gay, bisexual, transgender, and queer, or questioning</td>
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<td>NMA</td>
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<td>NPI</td>
<td>nonpharmaceutical intervention</td>
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<td>WHO</td>
<td>World Health Organization</td>
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References


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CDC—See Centers for Disease Control and Prevention.


FDA—See U.S. Food and Drug Administration.

FEMA—See Federal Emergency Management Agency.


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WHO—See World Health Organization.


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https://www.who.int/immunization/sage/meetings/2014/october/1_Report_WORKING_GROUP_vaccine_hesitancy_final.pdf
