

# Journal of Public Health in the Deep South

---

Volume 3  
Number 2 *COVID-19 Response and Recovery in  
Mississippi and the All of Us Research Program*

---

Article 6

2023

## Formative Research to Inform COVID-19 Vaccine Education in Mississippi

Mmesoma I. Okafor  
*Mississippi State University, m.okafor@msstate.edu*

Follow this and additional works at: <https://scholarsjunction.msstate.edu/jphds>

---

### Recommended Citation

Okafor, Mmesoma I. (2023) "Formative Research to Inform COVID-19 Vaccine Education in Mississippi," *Journal of Public Health in the Deep South*: Vol. 3: No. 2, Article 6.  
Available at: <https://scholarsjunction.msstate.edu/jphds/vol3/iss2/6>

This Research Studies is brought to you for free and open access by Scholars Junction. It has been accepted for inclusion in *Journal of Public Health in the Deep South* by an authorized editor of Scholars Junction. For more information, please contact [scholcomm@msstate.libanswers.com](mailto:scholcomm@msstate.libanswers.com).

## **Formative Research to Inform COVID-19 Vaccine Education in Mississippi**

**Mmesoma I. Okafor**

*Mississippi State University*

**Holli H. Seitz**

*Mississippi State University*

**Laura H. Downey**

*Mississippi State University*

**David R. Buys**

*Mississippi State University*

### **Abstract**

*Background:* Coronavirus Disease 2019 (COVID-19) vaccine rates in Mississippi are below the national average. Vaccine hesitance is particularly high among rural adults in Mississippi.

*Purpose:* To investigate community members' beliefs about the COVID-19 vaccine and perceived barriers and enablers of vaccination to inform the development of vaccine education materials. *Methods:* We conducted in-depth interviews with twenty adult community members in the Appalachian region of Mississippi. Interview notes were analyzed using thematic analysis.

*Results:* Major themes identified were related to barriers and enablers of COVID-19 vaccination. Barriers included safety concerns such as a fear of side effects, fertility issues, death, and distrust of governing bodies. Enablers included a desire to protect individual and community health, along with a desire to return to social activities. Access to vaccinations were also found to be a non-issue within Mississippi communities. Dominant themes within each concept are reported.

*Conclusion:* Perceptions about the COVID-19 vaccines varied across Mississippi communities. However, the barriers and enablers identified provide significant insight into Mississippians' attitudes towards vaccination. Messaging focused on the positive aspects of COVID-19 vaccines may contribute to increasing vaccinations in the state. These insights will inform the development of vaccine education and promotion materials in Mississippi.

*Keywords:* formative research, thematic analysis, COVID-19, rural health, vaccines

### **Formative Research to Inform COVID-19 Vaccine Education in Mississippi**

Since Coronavirus Disease 2019 (COVID-19) was declared a global pandemic in March 2020 (World Health Organization, 2020), Mississippi has experienced 608,768 documented COVID-19 cases and 10,563 deaths due to COVID-19 (Mississippi State Department of Health, 2022; as of January 12, 2022). COVID-19 accounted for approximately 13% of Mississippi deaths in 2020 and 2021 (Mississippi State Department of Health, 2022). COVID-19 vaccines have shown promise for reducing hospitalizations associated with COVID-19 (Self et al., 2021), but vaccine uptake in Mississippi trails national vaccine rates (Rezal, 2022). Vaccine hesitancy, defined as a “delay in acceptance or refusal of vaccination despite availability of vaccination services” (McDonald, 2015, p. 4161), is particularly high among Mississippians (Centers for Disease Control and Prevention, 2022). To address vaccine hesitance and increase COVID-19 vaccinations, our interdisciplinary team was tasked with creating vaccine education materials for Mississippi adults in the Appalachian region (twenty-four counties in northeastern Mississippi). As part of this effort, we conducted formative research needed to understand current COVID-19 vaccine views in the region.

Noar (2006) highlights the importance of formative research for effective health mass media campaigns, concluding that “success is more likely when campaign designers conduct formative research with the target audience to clearly understand the behavior and the problem area” (p. 25). Noar notes that formative research can include analyses of existing data, surveys, focus groups, and interviews. Our team reviewed existing data, including national survey data (e.g., Hamel et al., 2020), which provided a general understanding of existing barriers to COVID-19 vaccination. Hamel et al. (2020) found that 59% of vaccine-hesitant respondents were worried about potential side effects, 55% lacked trust in the government, and 53% were worried about the newness of the vaccine. However, existing data were not detailed enough to allow us to examine barriers in the counties of focus or to provide an understanding of vaccine beliefs among the priority population. Therefore, we decided to supplement existing data by conducting interviews with key informants in the region.

#### **Purpose**

This research was designed to increase knowledge about existing barriers to vaccination and views regarding the COVID-19 vaccine among Mississippians. This research will also inform the development of vaccine education materials for Mississippi adults as part of a larger national effort to engage Cooperative Extension in vaccine education.

#### **Methods**

This research protocol was determined to be exempt by the Institutional Review Board at the authors’ institution. All participants were provided with information about the study and verbally provided informed consent.

### Participants

Participants included adults (eighteen years or older) from twenty-four Northeast Mississippi counties (those served by the Appalachian Regional Commission).<sup>1</sup> Fifty-seven potential participants were recommended, forty-two were contacted, and twenty consented and were assigned to this study. The 20 participants represented nine Mississippi counties. Mean participant age was 63.8 ( $SD = 9.1$ ). The majority of participants described themselves as women (85%), Black or African American (80%), and not of Hispanic, Latino/a, or Spanish origin (100%). Participants were well educated, with 50% holding a four-year or graduate/professional degree. Thirty percent were employed, 55% were retired, and 15% were disabled. The median annual household income range was \$20,000-\$29,999.

### Measures

The interview guide was adapted from the COVID-19 Vaccine Confidence Rapid Community Assessment Guide (Centers for Disease Control and Prevention, 2021) sample interview guide. See Table 1 for adapted questions.

**Table 1**

*Interview Questions*

Concept	Item(s)
Effect on Community	How has COVID-19 affected your community through the course of this pandemic?
Beliefs about COVID-19 vaccine	What do you think about the COVID-19 vaccine?
Perceived descriptive norms about the COVID-19 vaccine	What are some of things you have heard from your community about the COVID-19 vaccine? Do you think most people in your community have gotten the COVID-19 vaccine?
Enablers of COVID-19 vaccination	Thinking about the COVID-19 vaccine, what are the main reasons people in your community may have gotten the COVID-19 vaccine?
Barriers to COVID-19 vaccination	What are the main reasons people in your community may not have gotten the COVID-19 vaccine? What difficulties might people in your community face in getting a COVID-19 vaccine if they wanted one?
Strategies to improve vaccine confidence	What can [organization] do so more people can have confidence in the COVID-19 vaccine?

<sup>1</sup> Note this study was one of two being conducted simultaneously. Participants who were vaccine hesitant were recruited for a separate study, so participants in the present study had either received the COVID-19 vaccine ( $n = 18$ ) or had decided not to be vaccinated ( $n = 2$ ).

Strategies to improve vaccine access	What can [organization] do so more people can have access to the vaccine?
--------------------------------------	---

*Note.* This table lists questions used to elicit each concept in individual interviews with key informants. Perceived descriptive norms refer to beliefs about the probability that others are doing the behavior of interest (Fishbein & Azjen, 2010).

### Procedure

County Extension agents (agents) who work in the twenty-four target counties were asked to nominate a diverse range of adults, eighteen years or older, who could share their thoughts about the COVID-19 vaccine. Via email, agents provided names, phone numbers, and/or email addresses of potential participants who agreed to be contacted. Additional participants were recommended by initial interviewees. The first author contacted potential participants by phone and/or email and followed up once if there was no response to the first attempt. At initial contact, the first author shared the purpose of the study, collected demographic information, and set up a time to conduct the interview.

All interviews were conducted by the first author, who took detailed notes during each interview. Interviews began with an overview of the research and consent form. Participants were asked to give verbal consent if they were willing to proceed and be audio-recorded. Interviews lasted no more than thirty minutes, and participants were compensated with a \$20 gift card.

### Analysis

Interview notes were analyzed using Braun and Clarke's (2006) thematic analysis methodology. After all interview notes had been coded, the first author reviewed the codes to search for and extract emergent themes, subthemes, and examples. The first and second authors then worked together to review and name themes and create the results table.

## Results

Resulting themes and examples from the thematic analysis are summarized in Table 2 and described in detail in the following sections.

### Community Effects of COVID-19

Participants identified the following effects of COVID-19 on the community: effects on academic and religious institutions, community/social effects, economic effects, and effects on health. Effects on academic institutions primarily involved the inability of children to attend school due to school shutdowns and effects on student learning and participation. The effect on religious organizations was also related to shutdowns and a shift from in-person activities. The community/social impacts ranged from cancellation or adaptation of community activities to establishment of distancing measures, to social/political divide related to masking policies. Economic effects were reflected in employment and supply chain issues. Health effects were primarily related to sickness and death within the community.

### Beliefs About the COVID-19 Vaccine

Many participants made positive statements when asked about beliefs regarding the COVID-19 vaccines. However, they expressed varying levels of vaccine acceptance: high acceptance

(participants who anticipated the vaccines or supported vaccinations for all), indifference, skepticism, and complete disregard for the vaccine (from participants who had decided against vaccination [n=2]). Participants also expressed varying beliefs in vaccine efficacy. Some expressed doubts about its effectiveness in preventing COVID-19, and others expressed trust in the vaccines' ability to either prevent illness or death or decrease the severity of illness.

### **Descriptive Norms About the COVID-19 Vaccine**

Within the concept of descriptive norms, participants identified four main ideas. First, participants noted concerns about safety, especially related to fertility and mortality. Secondly, participants alluded to a distrust of governing bodies with references to the vaccines being some type of magnet or tracker. Third, participants expressed mixed perceptions about their community's desire to receive vaccines. Finally, participants mentioned factors associated with perceived susceptibility to infection — hence, desire to receive the vaccines — such as maintenance of health habits and previous infection with COVID-19.

### **Enablers of COVID-19 Vaccination**

Four primary enablers of getting the COVID-19 vaccine included a desire to preserve individual health, and/or the health of others; a desire to return to social activities such as those related to school, church, or family; needing to receive it because of employment conditions; and other external influences such as seeing others receive the vaccines.

### **Barriers to COVID-19 Vaccination**

Five main barriers to COVID-19 vaccination were identified, with concerns about vaccine safety being the primary barrier. These safety concerns related to insufficient research on the vaccines, speed of vaccine development, and fear of side effects or death. Distrust of medical and governmental bodies is another barrier stemming from a belief in ulterior motives such as depopulation, tracking, and the vaccines as a means of control. Some participants also expressed a desire for autonomy as a barrier, as they felt they were being forced to become vaccinated through the media, mandates (for health workers), etc. Additionally, some participants alluded to political beliefs influencing vaccination. Finally, low perceptions of disease vulnerability and severity served as barriers, as participants did not find it necessary to seek vaccination in these instances.

When asked specifically about difficulties people might face in receiving a COVID-19 vaccine, participants identified very few difficulties. Participants primarily interpreted this question in terms of physical accessibility to and availability of vaccines. They expressed that the availability and accessibility of the COVID-19 vaccines were high. Participants often followed up their statements with an example of existing provisions in their community to encourage or promote vaccinations such as mobile clinics, drive-through vaccination, financial incentives, and community or church transport service to vaccine sites.

### **Strategies to Improve COVID-19 Vaccine Confidence**

Participants encouraged the use of advertising mediums such as print and electronic media, public figures/channels, and existing social organizations, especially churches, to promote or educate about the vaccines. A large majority of participants also expressed that continuously highlighting positive aspects of the vaccines could increase vaccinations.

### Strategies to Improve Access to COVID-19 Vaccines

Most participants stated that the vaccines were readily accessible. However, participants mentioned that physical access could be improved by promoting and providing transportation, drive-through vaccinations and mobile clinics, and by bringing vaccinations to homes.

**Table 2**

*Concepts related to the attitudes and beliefs about COVID-19 and the COVID-19 vaccines*

Theme	Subthemes (if applicable)	Examples from interviews
<b>Themes Related to Community Effects of COVID-19</b>		
Impact on Academic Institutions		<ul style="list-style-type: none"> <li>• School system shutdown</li> </ul>
Impact on Religious Organizations		<ul style="list-style-type: none"> <li>• Church activities moved to conference call</li> </ul>
Community/Social Impacts		<ul style="list-style-type: none"> <li>• Lessened participation in community activities</li> <li>• Couldn't be around people</li> </ul>
Economic Impacts	Employment	<ul style="list-style-type: none"> <li>• People lost their jobs</li> </ul>
	Supply Chain	<ul style="list-style-type: none"> <li>• Food shortages</li> </ul>
Health Impacts		<ul style="list-style-type: none"> <li>• Death in community</li> </ul>
<b>Themes Related to Beliefs about the COVID-19 Vaccine</b>		
Positive regard for the vaccine		<ul style="list-style-type: none"> <li>• It has given us hope for the pandemic</li> </ul>
Vaccine Efficacy	Doubts about Vaccine Efficacy	<ul style="list-style-type: none"> <li>• Vaccinated people still getting sick</li> </ul>
	Trust in Vaccine Efficacy	<ul style="list-style-type: none"> <li>• Helps keep you from getting very sick</li> </ul>
Vaccine Acceptance	High Acceptance	<ul style="list-style-type: none"> <li>• It should be mandatory like childhood immunizations</li> </ul>
	Indifference	<ul style="list-style-type: none"> <li>• I don't feel any different about it than the flu shot</li> </ul>
	Skeptical	<ul style="list-style-type: none"> <li>• Skeptical about any shots but took it</li> </ul>
	Low acceptance	<ul style="list-style-type: none"> <li>• Don't want to take it</li> </ul>
<b>Themes Related to Descriptive Norms about the COVID-19 Vaccine</b>		
Perception of Community Interest in the COVID-19 vaccine	Negative Perception	<ul style="list-style-type: none"> <li>• People in community won't take it</li> </ul>
	Positive Perception	<ul style="list-style-type: none"> <li>• Everyone wanted to get the vaccine</li> </ul>
Safety Concerns		<ul style="list-style-type: none"> <li>• Hesitance among African Americans due to claim that it affects fertility</li> <li>• Vaccine just isn't safe (kids died, adverse effects)</li> </ul>

Distrust of Governing Bodies		<ul style="list-style-type: none"> <li>• Belief that it's a hoax</li> <li>• It's some kind of tracking magnet</li> </ul>
Perceived Susceptibility		<ul style="list-style-type: none"> <li>• Maintain health habits so don't need it</li> </ul>
Themes Related to Enablers to COVID-19 Vaccination		
Desire to Preserve Health	Preserve Own Health	<ul style="list-style-type: none"> <li>• Fear of getting sick from COVID-19</li> <li>• Fear of death from COVID-19</li> </ul>
	Preserve Health of Others	<ul style="list-style-type: none"> <li>• Desire to protect family, friends, loved ones</li> </ul>
Employment		<ul style="list-style-type: none"> <li>• Due to medical line of work</li> </ul>
Return to social organizations/activities		<ul style="list-style-type: none"> <li>• Desire to gather with others</li> <li>• Desire to return to normal</li> </ul>
External Influence		<ul style="list-style-type: none"> <li>• Saw others getting the vaccine without side effects</li> </ul>
Themes Related to Barriers to COVID-19 Vaccination		
Safety Concerns	"Newness" of the COVID-19 Vaccine	<ul style="list-style-type: none"> <li>• Not enough research/hasn't been studied long enough</li> </ul>
	Fear of short or long-term side effects	<ul style="list-style-type: none"> <li>• Sterility among young people</li> <li>• Fear of paralysis, shaking</li> </ul>
	Fear of injury or death	<ul style="list-style-type: none"> <li>• Worry that vaccines would harm them</li> <li>• Worry that the vaccines would kill them</li> </ul>
	Lack of sufficient information	<ul style="list-style-type: none"> <li>• Don't know what's in the vaccine</li> </ul>
Distrust	Distrust of Medical Community	<ul style="list-style-type: none"> <li>• Can't trust medical community</li> </ul>
	Distrust of Government	<ul style="list-style-type: none"> <li>• It's a depopulation effort</li> <li>• Vaccines are being used to control/track people</li> </ul>
Desire for Autonomy		<ul style="list-style-type: none"> <li>• Negative reaction to mandates for health workers</li> <li>• Negative reaction to media push for vaccination</li> </ul>
Risk Perception	Perceived vulnerability to COVID-19	<ul style="list-style-type: none"> <li>• Already take care of my health e.g., eat right and exercise so don't need it</li> <li>• Don't believe COVID-19 will affect them</li> </ul>
	Perceived severity of COVID-19	<ul style="list-style-type: none"> <li>• COVID-19 is not a virus, it's a cold or strep</li> </ul>
Themes Related to Strategies to Improve COVID-19 Vaccine Confidence		



Education/Advertisement	Print Media	<ul style="list-style-type: none"> <li>• Flyers, fact sheets, and posters branded with familiar affiliations</li> <li>• Newspaper notices</li> </ul>
	Electronic Media	<ul style="list-style-type: none"> <li>• Radio messages</li> <li>• Commercials</li> <li>• TV</li> </ul>
	Use Research/Surveys	<ul style="list-style-type: none"> <li>• Conduct and publish research surveys from vaccinated and unvaccinated people talking about positives &amp; negatives of the vaccine.</li> <li>• Hear information from regular people, not those with political motives</li> <li>• Research statistics in media ads</li> </ul>
	Use Public Figures/Channels	<ul style="list-style-type: none"> <li>• Factual info out through health department</li> <li>• Utilize celebrities and different faces to encourage vaccination</li> <li>• Place info in public places</li> </ul>
	Utilize Existing Social Organizations	<ul style="list-style-type: none"> <li>• Get info out through churches</li> <li>• Utilize agencies that already reach into communities</li> </ul>
Highlight Vaccine Positives		<ul style="list-style-type: none"> <li>• Put out positive information about the vaccines</li> <li>• Repetition that vaccines stop the spread</li> </ul>
Reward		<ul style="list-style-type: none"> <li>• Incentives to get the shot</li> <li>• Give promotional items with “I got vaccinated”</li> </ul>
<b>Themes Related to Strategies to Improve Access to COVID-19 Vaccines</b>		
Access is not an Issue		<ul style="list-style-type: none"> <li>• There’s nothing MSU/Extension can do. It’s available everywhere</li> </ul>
Improve Physical Accessibility		<ul style="list-style-type: none"> <li>• Free rides to vaccination</li> <li>• Door-to-door canvassing</li> <li>• Drive-through vaccinations</li> </ul>
Reward		<ul style="list-style-type: none"> <li>• Offer incentives</li> </ul>

### Discussion

These interview findings provide useful insight into beliefs about COVID-19 vaccines held by Mississippians in the Appalachian region. Some of the major barriers to vaccination identified (i.e., concerns about side effects, governmental distrust, and concerns about the newness of the vaccine) are consistent with barriers identified in national survey research (Hamel et al., 2020). These findings have remained consistent, as data for this study were collected roughly a year after that collected by Hamel et al. (2020). Our study also revealed that vaccine access was not a barrier in Mississippi communities, similar to findings reported for other Southern communities (Alcendor, 2021). Furthermore, our interviews revealed that an important strategy to improve

vaccine confidence was through existing social organizations, most importantly churches. This is also evident in a study by Nortey and Lipka (2021), showing that about 61% of religious service attendees trusted their religious leaders about information on the COVID-19 vaccines. This demonstrates that religious bodies can influence vaccination behavior and should be utilized as vehicles for increasing confidence. Findings also revealed that communication strategies focused on the positives of vaccination could improve vaccine confidence. This is consistent with research by Chou and Budenz (2020), who found that framing vaccines messages to appeal to altruism and the positive impacts of vaccination on the wider community could potentially enhance communication strategies. As such, developing vaccine education and promotion materials that echo positive messages about the vaccines and vaccination could effectively increase vaccinations.

### **Limitations and Recommendations**

#### **Limitations**

The results of this study should be interpreted with several limitations in mind. First, research participants were limited to Mississippians in twenty-four northeast Mississippi counties. This research should be replicated in other regions of Mississippi and other Southern states to assess if community beliefs about the COVID-19 vaccines vary across regions. Secondly, research participants were limited to those recommended by extension agents and participants. The participant pool consisted mostly of older adults, who were primarily women (85%) and African Americans (80%). The research team made efforts to recruit younger participants and men but were unable because our recruitment relied on recommendations by agents and because younger adults were less likely to be available for interviews (possibly due to work and family commitments) Therefore, participants are not representative of all communities in northeast Mississippi. Finally, in the initial screening, participants were selectively placed into different research studies based on vaccination status. Therefore, our results underrepresent views of those who are vaccine hesitant.

#### **Recommendations**

This research shows diverging perceptions among our population, even in a region that seems homogenous. The identified enablers and barriers provide some insight to inform the development of vaccine materials/messages but suggest that there must be various methods and messages used to reach Mississippi audiences, as one approach is unlikely to resonate with the whole. Reframing the vaccines in a gain lens and focusing on the positive aspects of vaccination may be effective in promoting vaccination among rural Mississippians. Those communicating with Mississippians about COVID-19 vaccines should also be aware of the possibility of underlying fear and mistrust as barriers to vaccination.

### **Acknowledgements**

This research was made possible by funding from the Cooperative Extension System, through an interagency agreement with the USDA National Institute of Food and Agriculture and the Centers for Disease Control and Prevention (CDC) to address health disparities among rural and other underserved communities.

**Author Note**

Correspondence concerning this article should be addressed to Mmesoma Okafor ([mio23@msstate.edu](mailto:mio23@msstate.edu)), Mississippi State University Extension Service, 1 Research Blvd, Suite 200, Starkville, MS 39759. (601) 934 4459.

### References

- Alcendor D. J. (2021). Targeting COVID vaccine hesitancy in rural communities in Tennessee: Implications for extending the COVID-19 pandemic in the South. *Vaccines*, 9(11), 1279. <https://doi.org/10.3390/vaccines9111279>
- Bergin, D., Ladyzhets, B., Kincaid, J., Kravitz, D. Haselhorst, S., White, A., Capps, A., Keller, R., & Hassanein, N. (2021, December). Uncounted: Inaccurate death certificates across the country hide the true toll of COVID-19. *USA Today*. <https://www.usatoday.com/in-depth/news/nation/2021/12/22/covid-deaths-observed-inaccurate-death-certificates/8899157002/>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Centers for Disease Control and Prevention. (2021). *COVID-19 vaccine confidence rapid community assessment guide*. <https://www.cdc.gov/vaccines/covid-19/vaccinate-with-confidence/rca-guide/downloads/CDC-RCA-Guide-2021-508.pdf>
- Centers for Disease Control and Prevention. (2022). *Estimates of vaccine hesitancy for COVID-19*. <https://data.cdc.gov/stories/s/Vaccine-Hesitancy-for-COVID-19/cnd2-a6zw/>
- Chou, W.-Y. S., & Budenz, A. (2020). Considering emotion in COVID-19 vaccine communication: Addressing vaccine hesitancy and fostering vaccine confidence. *Health Communication*, 35(14), 1718–1722. <https://doi.org/10.1080/10410236.2020.1838096>
- Fishbein, M., & Ajzen, I. (2010). *Predicting and Changing Behavior: The Reasoned Action Approach*. Psychology Press.
- Hamel L., Kirzinger A., Muñana C., & Brodie, M. (2020, December 15). *KFF COVID-19 Vaccine Monitor: December 2020*. Kaiser Family Foundation. <https://www.kff.org/coronavirus-covid-19/report/kff-covid-19-vaccine-monitor-december-2020/>
- MacDonald, N. E. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine*, 33, 4161–4164. <https://doi.org/10.1016/j.vaccine.2015.04.036>
- Mississippi State Department of Health (2022, January). *Coronavirus Disease 2019 (COVID-19)*. [https://msdh.ms.gov/msdhsite/\\_static/14,0420.html](https://msdh.ms.gov/msdhsite/_static/14,0420.html)
- Noar, S. M. (2006). A 10-year retrospective of research in health mass media campaigns: Where do we go from here? *Journal of Health Communication*, 11, 21-42. <https://doi.org/10.1080/10810730500461059>
- Nortey, J., & Lipka, M. (2021, November 30). *Most Americans would trust their clergy's COVID-19 vaccine advice*. Pew Research Center's Religion & Public Life Project. Retrieved January 11, 2022, from <https://www.pewforum.org/2021/10/15/most-americans-who-go-to-religious-services-say-they-would-trust-their-clergys-advice-on-covid-19-vaccines/>
- Rezal, A. (2022, January). States with the worst COVID-19 vaccination rates. *U.S. News and World Report*. <https://www.usnews.com/news/best-states/articles/these-states-have-the-lowest-covid-19-vaccination-rates>
- Self, W. H., Tenforde, M. W., Rhoads, J. P., Gaglani, M., Ginde, A. A., Douin, D. J., Olson, S. M., Talbot, H. K., Casey, J. D., Mohr, N. M., Zepeski, A., McNeal, T., Ghamande, S., Gibbs, K. W., Files, D. C., Hager, D. N., Shehu, A., Prekker, M. E., Erickson, H. L., ... Arter, O. G. (2021). Comparative effectiveness of Moderna, Pfizer-BioNTech, and Janssen (Johnson & Johnson) vaccines in preventing COVID-19 hospitalizations among

adults without immunocompromising conditions — United States, March–August 2021. *Morbidity and Mortality Weekly Report*, 70, 1337-1343.

<http://dx.doi.org/10.15585/mmwr.mm7038e1>

World Health Organization. (2020, March). *WHO Director-General's opening remarks at the media briefing on COVID-19 – 11 March 2020*. <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>