

JOURNAL OF INFORMATION SYSTEMS APPLIED RESEARCH

Volume 17, No. 2
August 2024
ISSN: 1946-1836

In this issue:

- 4. Insights for the next viral outbreak: An information systems applied research based on lessons from COVID-19**
Ivan D'Souza, Robert Morris University
Sushma Mishra, Robert Morris University

- 18. Decisional Guidance to Promote Motivation in Supply Chain Decision Making**
Russell Haines, Appalachian State University
Darin Hodges, Appalachian State University

- 31. Examining Factors Influencing the Acceptance of Big Data Analytics in Healthcare**
Abdul Sajid Mohammed, University of the Cumberland
Mary Lind, University of Louisiana Shreveport

- 45. Tools for Success: Their Impact on Salaries in the Data Analytics Job Market**
Kathleen S. Hartzel, Duquesne University
Pinar Ozturk, Duquesne University

- 61. An Action Research Approach to Building an Enterprise-Specific Chatbot (ESCB)**
Zach Wood, University of North Carolina Wilmington
Geoff Stoker, University of North Carolina Wilmington

The **Journal of Information Systems Applied Research** (JISAR) is a double-blind peer reviewed academic journal published by ISCAP, Information Systems and Computing Academic Professionals. Publishing frequency is three issues a year. The first date of publication was December 1, 2008.

JISAR is published online (<https://jisar.org>) in connection with the ISCAP (Information Systems and Computing Academic Professionals) Conference, where submissions are also double-blind peer reviewed. Our sister publication, the Proceedings of the ISCAP Conference, features all papers, teaching cases and abstracts from the conference. (<https://iscap.us/proceedings>)

The journal acceptance review process involves a minimum of three double-blind peer reviews, where both the reviewer is not aware of the identities of the authors and the authors are not aware of the identities of the reviewers. The initial reviews happen before the conference. At that point papers are divided into award papers (top 15%) and other submitted works. The non-award winning papers are subjected to a second round of blind peer review to establish whether they will be accepted to the journal or not. Those papers that are deemed of sufficient quality are accepted for publication in JISAR. Currently the acceptance rate for the journal is approximately 35%.

Questions should be addressed to the editor at editor@jisar.org or the publisher at publisher@jisar.org. Special thanks to members of ISCAP who perform the editorial and review processes for JISAR.

2024 ISCAP Board of Directors

Jeff Cummings
Univ of NC Wilmington
President

Amy Connolly
James Madison University
Vice President

Eric Breimer
Siena College
Past President

Jennifer Breese
Penn State University
Director

David Gomillion
Texas A&M University
Director

Leigh Mutchler
James Madison University
Director/Secretary

RJ Podeschi
Millikin University
Director/Treasurer

David Woods
Miami University
Director

Jeffrey Babb
West Texas A&M University
Director/Curricular Items Chair

Tom Janicki
Univ of NC Wilmington
Director/Meeting Facilitator

Paul Witman
California Lutheran University
Director/2024 Conf Chair

Xihui "Paul" Zhang
University of North Alabama
Director/JISE Editor

Copyright © 2024 by Information Systems and Computing Academic Professionals (ISCAP). Permission to make digital or hard copies of all or part of this journal for personal or classroom use is granted without fee provided that the copies are not made or distributed for profit or commercial use. All copies must bear this notice and full citation. Permission from the Editor is required to post to servers, redistribute to lists, or utilize in a for-profit or commercial use. Permission requests should be sent to Scott Hunsinger, Editor, editor@jisar.org.

JOURNAL OF INFORMATION SYSTEMS APPLIED RESEARCH

Editors

Scott Hunsinger
Senior Editor
Appalachian State University

Thomas Janicki
Publisher
University of North Carolina Wilmington

2024 JISAR Editorial Board

Jennifer Breese
Penn State University

Dana Schwieger
Southeast Missouri State University

Wendy Ceccucci
Quinnipiac University

Anthony Serapiglia
St. Vincents College

Ulku Clark
Univ of North Carolina Wilmington

Michael Smith
Georgia Institute of Technology

Edgar Hassler
Appalachian State University

Jason Triche
University of Montana

Melinda Korzaan
Middle Tennessee State University

Karthikeyan Umapathy
University of North Florida

Lisa Kovalchick
PennWest University

Hayden Wimmer
Georgia Southern University

Li-Jen Lester
Sam Houston State University

Paul Witman
California Lutheran University

Jim Marquardson
Northern Michigan University

David Woods
Miami University Regionals

Muhammed Miah
Tennessee State University

Insights for the next viral outbreak: An information systems applied research based on lessons from COVID-19

Ivan D'Souza
isdst110@mail.rmu.edu

Sushma Mishra
mishra@rmu.edu

Department of Computer and Information Systems
Robert Morris University
Moon Township, PA 15108, USA

Abstract

The COVID-19 pandemic disrupted everything that people had taken for granted, specifically the freedom through which they could interact and engage with others. The COVID-19 vaccines provided the means to earn back the normalcy that people had lost. However not everyone was willing to receive the vaccine. Some wanted to take a chance on their health to wait and see. Others had other ways to defer the vaccine. One of the main reasons they credited for their hesitation was the communication process invoked by authorities at the onset of the pandemic and the uncertainty about the safety and effectiveness of the vaccines. The purpose of this information systems applied research paper is to conduct a phenomenological study and answer a research question that is geared toward understanding what vaccine hesitancy looks like in people with certain behavioral traits; some of these are established components of vaccine hesitancy and were known to underpin vaccine uptake during the 2009 H1N1 epidemic. Through the interview process and the ensuing thematic analysis, this paper hones into six themes with the intent to aid healthcare administrators and policy makers with a clearer understanding in planning effective campaigns against epidemics and pandemics in the future.

Keywords: COVID-19, vaccine hesitancy, vaccines, pandemic, qualitative analysis, phenomenology

Recommended Citation: D'Souza, I., Mishra, S., (2024). Insights for the next viral outbreak: An information systems applied research based on lessons from COVID-19, *Journal of Information Systems Applied Research*, 17(2), pp.4-17. <https://doi.org/10.62273/NWCI5504>

Insights for the next viral outbreak: An information systems applied research based on lessons from COVID-19

Ivan D'Souza and Sushma Mishra

1. INTRODUCTION

The COVID-19 pandemic has been an unprecedented experience for all. Since at its onset there were no viable vaccines for COVID-19, nations all over the world enforced lockdowns and social restrictions to curb the spread of the virus (Hale et al., 2021). Despite these measures the COVID-19 pandemic disrupted the way people lived, worked, and interacted with each other (Ciotti et al., 2020; Shieh-zadegan et al., 2021). People felt disconnected and isolated from the physical world and therefore relied on their social networks on social media to stay connected. As a result, digital activity surged (De' et al., 2020). In the United States of America (US or USA), the uncertainty of the virality of the COVID-19 infections and the constant pivoting of the federal and state governments on what should be done to curb this viral spread without an effective vaccine at the time, led to a deluge of conflicting information on social media (Reno et al., 2021). The World Health Organization (WHO) termed this phenomenon the 'infodemic' (WHO February 2020 Situation Report-13, 2020). While the world was struggling to keep pace with both the pandemic and infodemic, major pharmaceutical companies were in a race to be the first to produce an effective vaccine against COVID-19 (Lockey, 2020). Lopalco and Tan (2016) posited that vaccination is one of the main pillars of public health's response to a pandemic. Xia et al. (2020) supported vaccination as a safer way to accomplish herd immunity than building immunity from infection. According to the Mayo Clinic, once herd immunity is attained, the spread of the disease from person to person would become unlikely (Mayo Clinic Staff, 2022). Therefore, when the COVID-19 vaccines were rolled out, it was proposed that herd immunity in the US could be achieved if 90% of the population was fully vaccinated (Kricorian et al., 2022).

But, despite the wide availability of COVID-19 vaccines since November 2021, vaccine hesitancy, represented by those that were either avoiding or delaying COVID-19 vaccinations

(Khubchandani et al., 2021; Dubé & MacDonald, 2022), continued to represent a significant impediment to attain herd immunity in the US (Neely et al., 2022). In 2023, three years since the onset of COVID-19, life in the US for people has returned to some degree of normalcy, and the numbers of infections and deaths have reduced. But people are continuing to fall sick and die from COVID-19 (Centers for Disease Control and Prevention, 2023). As per the CDC through August 2023, due to COVID-19, hospitalizations had increased by 19% and deaths had increased by 18%. This showed that the drive to herd immunity through vaccination (Mayo Clinic, 2022) had still not achieved its goal. Also, there has been no letdown in social media activity with a userbase on social media platforms of 4.9 billion globally (Wong & Bottorff, 2023). Which begs the question; in 2023, are people in the US getting sick from COVID-19, due to their vaccine hesitant nature fueled by their activity on social media?

Blaming the spread of COVID-19 on the hesitant nature of humanity would be presumptive. Vaccine hesitant individuals are found in the middle of a continuum ranging from total acceptors to total refusers, and vaccine hesitancy could change over time (Larson et al., 2014; MacDonald et al., 2015, p. 4162). Vaccine hesitancy is not a recent phenomenon. People have demonstrated this behavior in the past toward other vaccines, for example: the routine influenza vaccine and the measles, mumps, and rubella (MMR) vaccines (Dubé et al., 2013). In 2012, the Strategic Advisory Group of Experts (SAGE) on Immunization identified three key factors among others that influenced vaccine hesitancy: confidence (do not trust vaccine or provider), complacency (do not perceive a need for a vaccine, do not value the vaccine), and convenience (access to a vaccine, barriers in acquiring a vaccine) (Larson et al., 2014, p. 2151). Based on their research on the 2009 H1N1 epidemic, Mills et al. (2020) found three additional factors: sources of information, social networks, and past vaccination behavior. Therefore, finding out what people are thinking now and what they plan to do in the future

based on their pandemic experiences would be invaluable for the US public health administration and the government in accommodating for vaccine hesitancy among the people in their methodical preparation against a future epidemic or pandemic.

The present study aims to explore vaccine hesitancy among people in the USA, based on their lived experiences during the COVID-19 pandemic. To achieve this aim, this study intends to answer the following research question (RQ): How does vaccine hesitancy induced by confidence, complacency, convenience, sources of information, social norms, and past vaccination behavior during the COVID-19 pandemic manifest in people in the USA?

2. LITERATURE REVIEW

Vaccine hesitancy

The World Health Organization (WHO) had estimated that vaccinations prevented at least 10 million deaths annually between 2010-2015 (Fridman et al., 2021). But vaccine hesitancy defined by the WHO as the "delay in acceptance or refusal of safe vaccines despite availability of vaccine services" and influenced by three key factors: vaccination confidence, vaccination complacency, and vaccination convenience (MacDonald et al., 2015) had continued to be a barrier to the effectiveness of vaccination programs globally (Betsch et al., 2018). Therefore, in 2019, a year before the COVID-19 crisis, vaccine hesitancy was listed among the top 10 health threats in the world by the WHO (Wilson & Wiysonge, 2020).

Vaccination confidence

The SAGE Vaccine Hesitancy Group defined vaccination confidence as "the trust in the effectiveness and safety of vaccines and in the system that delivers them, including the reliability and competence of the health services and health professionals and having trust in the motivations of the policymakers who decide which vaccines are needed and when they are needed" (WHO, 2014). Aw et al. (2021) evaluated COVID-19 vaccine hesitancy in high-income countries including the USA and found that the vaccine hesitant believed that COVID-19 vaccines were unsafe or ineffective. In 2020, the communication about the efficacy and safety of COVID-19 vaccines in the USA had to be executed under a cloud of uncertainty; people presumed that the vaccine development had a political impetus ("Operation Warp Speed") in consideration of the upcoming Presidential

elections (Mills et al. 2020, p. 10). Troiano and Nardi (2021) analyzed the theme of vaccine hesitancy in the US during the COVID-19 pandemic and found that the vaccination hesitant had concerns that the vaccines were rushed, were too dangerous, and that the vaccines were useless because COVID-19 was harmless.

Vaccination complacency

For the SAGE Vaccine Hesitancy Group, vaccination complacency "exists where perceived risks of vaccine-preventable diseases are low, and vaccination is not deemed a necessary preventive action" (WHO, 2014). A study by Wolf et al. (2020) found that in March 2020 during the initial outbreak of COVID-19 in the USA, 25% of the participants were very worried about contracting the virus with around 13% not worried at all. For Fan et al. (2021), a perceived high risk of contracting COVID-19 was associated with individuals' health-related attitudes and increased their likelihood in participating in preventive behaviors such as wearing a mask, washing hands, and keeping social/spatial distance. Aw et al. (2021) revealed that the vaccine hesitant believed that since they had already fallen sick from COVID-19 they were already immune from the disease from future infections.

Vaccination convenience

According to the SAGE Vaccine Hesitancy Group, vaccination convenience "affects the decision to vaccinate and is the quality of the service (real and/or perceived) and the degree to which vaccination services are delivered at a time and place and in a way that is considered appealing, affordable, convenient, and comfortable" (WHO, 2014). Aw et al. (2021) revealed that the differences in vaccine hesitancy rates across countries or regions in the world were linked to disparities in access, cost, and awareness of vaccines. The researchers also observed that the vaccine hesitant demonstrated a lack of trust in vaccination administrators.

Sources of information

Mills et al. (2020) presented multiple studies from several countries during the H1N1 pandemic to show the influence of sources of information on vaccination uptake. In one study they found that parents in the UK who watched national television news and in general proactively engaged in information-seeking behavior were more likely to vaccinate their children. In another study in the US, the researchers found that individuals who received their information about H1N1 from a health-care

provider or public health department were more likely to perceive the vaccine as safe. Furthermore, the surge in social media use during the COVID-19 pandemic (De' et al., 2020), and the resulting proliferation of anti-vaccination misinformation throughout social media, gave vaccine hesitancy a new urgency (Wilson & Wiysonge, 2020) for health care administrators and policy makers.

Social norms

A study found that parents who chose not to vaccinate their children had a much higher percentage of individuals (70%) in their social networks with similar attitudes than those who did vaccinate their children (13%) (Meleo-Erwin et al., 2017). Dubé et al. (2013) argued that the omnipresence of anti-vaccination content on the World Wide Web and Web 2.0 has allowed users to create and share this content using social networks. The researchers found that social norms of people who favored vaccine uptake intentions resulted in a collective stronger vaccine uptake behavior and concluded that social norms are a potentially powerful driver of vaccine acceptance. Even in communities that were isolated from media influence, social norms were an influential factor of vaccine acceptance as Henderson et al. (2008) found in their study of an orthodox Jewish community, in which word of mouth among the people was a potent source of rumors about vaccination dangers. Husain et al. (2021) and Yahaghi et al. (2021) supported this conclusion through their own findings that those around you, whom you respect, are being vaccinated themselves or having their children vaccinated, was a factor related to vaccine acceptance.

Past vaccination behavior

A systematic review of H1N1 vaccination uptake found that one of the strongest predictors for vaccination is past vaccination behavior (Mills et al., 2020, p. 12). Those who had previously been vaccinated against seasonal influenza were the most likely to opt for a pandemic vaccination (Bish et al., 2011; Jung et al., 2013). Past vaccine refusal, perceived risk of infection, and presence of comorbidities were confirmed as significant predictors of COVID-19 vaccine hesitancy (Reno et al., 2021).

This literature review showed that confidence, complacency, convenience, sources of information, social norms, and past vaccination behavior induced vaccine hesitancy among people during the COVID-19 pandemic and other outbreaks. Considering that herd immunity and vaccine hesitancy as an obstacle to it could be

issues to reckon with for generations, finding out what people think today about the vaccines and what they plan to do about it in the future could be leveraged by future research and/or future targeted public health messaging campaigns or strategies in the USA during future outbreaks of COVID-19 or other epidemics and pandemics.

3. METHODOLOGY AND ANALYSIS

Methodological approach

People experience life and share their experiences differently, whether as an individual or part of a family, group, community, or sub-culture. Qualitative research provides researchers with a lens to focus on how people live and experience the world by using one of its many approaches (Creswell & Poth, 2018). Phenomenology, a research design of inquiry, is a qualitative approach in which a researcher describes the lived experiences of individuals about a phenomenon, as described by participants of the study (Creswell & Creswell, 2018, p. 13). Phenomenology does not just focus on the life of an individual but rather on a research problem which focuses on a phenomenon and the essence of the lived experiences of people about that phenomenon (Creswell & Poth, 2018, pp. 121-122). The present study focuses on vaccine hesitancy as the phenomenon and adapts the design of phenomenological research using interviews to help elicit the essence of this phenomenon in the lived experiences of participants (Creswell & Creswell, 2018, p. 13).

Participant sampling and recruitment

The sampling frame of this study includes US residents, who were 18 years of age or older, used social media, and either directly or indirectly had experienced vaccine hesitancy. 15 participants were sampled through a combination of purposive and snowball sampling techniques. An initial set of five participants were selected from one of the researchers' social circle of friends. From these initial participants, referrals were obtained for ten additional participants who satisfied the requirements of the sampling frame. The participants were contacted for the interview either through email, a phone call, a mobile text message, or a personal face-to-face invitation. Through all these outreaches the purpose of the research and the interview, confidentiality of the interview process, and the duration of the interview were conveyed. Twelve of the fifteen participants agreed to a 'Google Meet' video-conference interview, and the remaining agreed to a face-

to-face meeting. The particulars of the meeting were emailed to the participants.

The interview

The researchers set up a free account with a third-party transcribing tool, 'otter.ai', for audio recording and transcribing the interview. At the beginning of the interview the researchers introduced themselves, and provided an overview of the research they were conducting, the format of the interview and its expected duration of forty minutes. The researchers also clarified the use of the transcription tool, 'otter.ai', to record the audio and transcribe the conversation. They assured confidentiality of the process and the measures they would take to safely and securely archive the information collected from the interview. Only after the participants had expressed their consent to continue and agree to the transcription of the interview, the researchers started the interview and activated the transcription of the interview. The interview protocol included in the Appendix was a semi-structured questionnaire made up of four demographic questions and 12 questions adapted from previous research. Each of the 12 questions attempted to gain a participant's perspective about an RQ component. For example: "Under what situations would you consider a COVID-19 vaccine and other vaccines in the future and why?" is an interview question that probed the participant's perception and future consideration or avoidance of vaccines. Based on how the conversation and the sharing of information progressed during the interview, the researchers decided on which questions would be used, altered, or skipped. At the end of the interview, the researchers thanked the participant for his/her participation and contribution to the study.

Reliability, validity, and ethical considerations

Credibility, transferability, dependability, and confirmability are four criteria through which trustworthiness of a qualitative study for accomplishing validity and reliability is assessed (Bell et al., 2022, p. 363-364). To attain credibility, the researchers reviewed the results of the study with three participants. To attain transferability the researchers included direct quotations from the interviews to highlight codes and themes. To attain dependability the researchers ensured that all data collected and generated was archived in a safe, secure, and accessible place. Finally, to attain confirmability the researchers appropriately documented all steps and conclusions to promote future audits of the study (Bell et al., 2022, p. 365).

Participation in the interview was voluntary. The researchers sent the transcription and recording to the participants who had requested a copy. The audio recordings were destroyed at the end of the study and all other data from the study would be retained for a maximum period of three years and destroyed afterward.

Data Analysis

The researchers used NVivo to organize and analyze the audio recordings and transcribed data collected by 'otter.ai' from each participant's interview. The researchers established classification sheets to organize the participants based on gender, marital status, level of education, and occupation. The researchers read and reread the text from the transcripts, and identified key words, combination of words, and sentences from each participant's transcript and from that process organized these into a set of thirteen unique categories of codes. Once organized into codes, the researchers repeated the review of the codes to form a unique set of six themes which formed the basis of the response to the research question and the findings of the overall study (Table 1).

4. RESULTS

15 participants, including five women and ten men with a lived experience of vaccine hesitancy, were chosen for the interview. There was one participant in the 18–29 age group, one in the 30–39 age group, five in the 40–49 age group, seven in the 50–59 age group, and two in the 60 years or older age group. Two were single and the remaining were married. One had high school education, two with some college, eight had undergraduate degrees, two with postgraduate degrees, and two had doctorates in the health care field. One participant was retired, another a home maker, three were business owners, while the rest were employed by others, with one in a part-time position. Among those employed, two were educators, two health care providers, one who worked in manufacturing, one in wealth management, one a software consultant, two in health care support, and one in religious ministry. The 15 transcripts recorded by 'otter.ai' yielded 555 significant sentences and phrases. The researchers arranged these sentences and phrases into clusters of 12 categories or codes aligned with the behavioral factors in the research question. A thematic analysis of these codes yielded six themes which are summarized in Table 1 and now discussed in more detail.

Theme 1: Natural immunity is more effective than vaccine induced immunity for the vaccine hesitant.

For most participants of the study, natural immunity was perceived as more effective than immunity induced by COVID-19 vaccines. As a participant quoted – “I’ve had COVID before. If I did get it my natural immunity would kick in and I wouldn’t be subject to it so hard if it was ever to happen again.” For another – “our immune system is designed so that when you do get a disease such as this, our bodies build up natural immunity to it. You know head colds are viruses. You don’t get the same head cold every year. You might get a head cold every year, but it’s not the one that you had last year or it’s a variant of the one that you had last year because our body has built up an immunity to that one.” Conversely there were participants who expressed their support for vaccines. For one – “I used to get so sick with the flu. Oh, I felt terrible for four or five days, but I went to work. I dragged myself. Then I got a flu vaccine. Guess what? I didn’t get the flu anymore.” And for another – “I’ve received a vaccine every time I go to my doctor. I get every vaccine that is offered. I trust my PCP.”

Theme 2: Freedom to choose to vaccinate or not is appreciated, but this was not the case in the past.

When the vaccines were rolled out in the US depending on their line of work people were mandated to vaccinate. A few took exception to this corporate strategy – “I think it’s just terrible, that you take away someone’s ability to provide for their family based on a decision that they make regarding their own health”, and “it should be your choice if you want to get it, but the mandate is the part that I had some concerns with.” Participants voiced their opinion that they would prefer to have the freedom to choose and enact their choice, as one quoted – “it should be up to ... the individual to choose whether they want certain shots or not” and another quoted – “all the freedom in the world ... to be able to choose whether you want to take the vaccine or not. I mean, that’s part of being an American.” Vaccination mandates were not enforced everywhere. According to one - “every place that I’ve gone the vaccine itself has been either optional or not required” and another “within our school it was strongly encouraged but it was not 100% mandated”. In 2023 vaccination mandates have either been relaxed or eliminated. One participant was grateful for her newfound freedom – “Right now I absolutely feel like I have complete freedom to get boosted or to continue along the path I am right now”.

Theme 3: Not all media is trustworthy, selectiveness of sources of COVID-19 information is prudent.

Since the onset of the COVID-19 pandemic in early 2020, people in the US were subject to an onslaught of information from the government, public health sites, and the news and social media. Due to the deluge of information, people who were not sure about being vaccinated found that the information was conflicting and inconsistently biased. For one participant – “I do find that most of the news is slanted, in my opinion ... political issues that the newspaper overwhelmingly pounds certain opinions, and I really don’t trust that.” For another – “there’s a lot of information that’s coming out recently that even executives who have made the COVID vaccine have come out and said, well vaccination really doesn’t restrict you from passing the disease on to somebody else.” Participants visited the CDC web site to see how things were progressing relative to the infections, fatalities, and vaccines but observed that information from certain qualified health care professionals, with alternative points of view, were blocked or suppressed. One shared – “Some of the medical professionals who are reliable were seen as unreliable by the media.” Based on their personal preferences, participants chose where they went to look for information about COVID-19. For one - “I like to look at the research. I like to get down into the sciences ... PubMed research, peer reviewed information”, and another “I look for sources of information like the CDC to help make that educated decision.”

Theme 4: Not everyone will believe in the same things. Diversity of thought should be respected.

The pandemic experience and the fallout from having to endure the social distancing, vaccination mandates, and differing opinions profoundly helped participants to respect the opinion of others. One quoted - “My son didn’t want to get ... vaccinated. It forced me to consider his perspective on it.” Participants also shared their interaction with family, friends, and acquaintances, and how these influenced their lived experiences about the pandemic. One said – “I have a brother-in-law who is a pharmacist, pushes for the vaccine, and we don’t. He called me and asked me if I would go for the vaccine. I said, no, for that was my choice. He let me be.” Another shared how a friend in the medical field provided him guidance in making a sound decision about his own health – “He’s very much an advocate for the vaccine. But he understood my reasonings as to not to get it. And he helped

#	Themes	Codes	RQ Factor	Times mentioned	Participants who mentioned it
1	Natural immunity or vaccine induced immunity	Health risks	Complacency	56	15
		Past vaccination	Past vaccination behavior	33	15
2	Freedom to choose to vaccinate or not	Freedom to choose	N/A	27	16
		Policy	N/A	32	14
3	Selectively trust media sources	Sources of information	Sources of information	153	15
4	Respect diversity of thought	Influence of people	Social norms	95	15
5	Past vaccination experience and full impact of COVID-19 vaccines	Access to vaccines	Convenience	19	12
		Efficacy of vaccines	Convenience	25	13
		Safety of vaccines	Confidence	49	15
		Speed to market	Confidence	22	13
6	High severity and fatality risk to vaccinate	Attitude	Vaccine hesitancy	26	13
		Will get the vaccine	Vaccine hesitancy	18	13

Table 1: Themes and Codes

me with extra precautions that I could take like, to wear a mask when I'm at work, and when I'm out in public places." A participant shared how she and her husband address their differences of opinion about vaccinating – "My husband and I agree to disagree about a lot of these things. He felt very strongly we should all be receiving these shots and I felt very strongly otherwise. So, we let our adult kids make their own decisions." A participant shared her opinion about the term "vaccine hesitant" – "I personally don't like the label vaccine hesitant. I feel like it diminishes my own intelligence and ability to do my own thinking to make decisions. I'm prochoice when it comes to vaccines. We're all about choice in every other aspect of life and death. So yeah, the term vaccine hesitancy, I think, isn't entirely accurate for me."

Theme 5: Past vaccination experience is key in determining future vaccination intention. Only time will tell the full impact of COVID-19 vaccines on the vaccinated.

Past poor and ineffective experience with vaccines affected the current stance of some of the participants of the study. One quoted – "I have received a few flu shots ... I had an adverse reaction to one ... so I don't get those anymore and that probably has affected my decision about the COVID vaccination." Participants

thought that the vaccines were rushed. For one - "I'm probably biased based on the sources that I have tended to pursue, but those have led me to believe that many of the trials were either rushed or some of the consequences were ignored or overlooked." Conversely for one - "The vaccine had already been made. So, I don't think it might have been rushed for the virus itself. Since the vaccine had been around long enough that it was perfectly safe to use and would not cause any adverse effects", and another expressed his confidence in vaccines in general - "No, I just like to say it's just my experience with how successful the flu shots have been." However, the future effects of the COVID-19 vaccines concerned a participant – "Just wonder in 10 or 20 years from now, if they ever find some type of tie back to heart attacks in young people, or maybe it's cancer or other issues ... I would say I worry about a little bit but at this point, you can't remove the vaccine. It's there, it has altered your DNA. And it is what it is." One recommended a study comparing the growth of children that have been vaccinated with those who have not been vaccinated. He believed that a lot can be learned from studies on the human anatomical effect of vaccines.

Theme 6: A higher fatality risk would be a factor to vaccinate for the vaccine hesitant. Those who rely on vaccines will continue to stay current on their shots when offered.

When participants were asked under which conditions they would consider being vaccinated or boosted at the end of their respective interviews, most of the participants thought that they would consider the vaccine only under life and death situations that affected someone at home or a close family member. One quoted – “if all of a sudden ... somebody near to me or in my house, you know, got cancer and they're undergoing chemo ... my thought process might change in that situation.” A participant was also looking at it from a severity or fatality perspective. According to this participant the rate of death due to COVID-19 in the US was under 2% and therefore was very low for him to consider the vaccine at this point. However, he would reconsider if the fatality rate would get higher than 20%. Other reasons that participants would consider a vaccine in the future were: a) getting vaccinated was the only viable option to build immunity against the disease, b) it was a must for their children to be vaccinated and they would also get it to support them, c) it was mandated at work, and d) if there was another lockdown and getting vaccinated was the way to get out of it. Some participants did not have any issues with the vaccination. They either were not against the vaccine or were for getting vaccinated whenever needed. One such participant quoted – “I am positive toward the vaccination ... I had all the confidence in the world that the COVID vaccine was nothing to be afraid of, that it was adequately tested, and that it should work and not harm me.”

5. DISCUSSION

Technology made the research process of inviting interview participation, conducting the interviews, and the analysis of the data collected from these interviews effective. Video conferencing through Google Meet made it possible for participants to be interviewed at their convenient time and place. Otter.ai automatically transcribed interviews and recorded the audio enabling researchers to stay focused on the interview instead of taking notes during the interview. Otter.ai was useful even for in-person interviews and those that required a phone call. NVivo, a qualitative analysis tool, helped the researchers in organizing the transcription and audio files from the interviews, classifying the content within these into twelve codes and six themes (Table 1). Based on these

six themes the researchers make the following six recommendations.

The unvaccinated were open to get the vaccine only if it was going to be a life and death situation close to home or the fatality rate was high. Some of the vaccinated were not sure if they would get the booster. They wanted to wait and see, since their experiences did not confirm the safety and effectiveness of the vaccine. Some of them had fallen sick from COVID-19 after they had been fully vaccinated and for others the side effects from the booster were severe. Conversely there were participants who wanted to follow the advice of their health care providers (HCP) and get the next dose whenever offered. Irrespective of their future considerations of whether to vaccinate or not, all participants wanted to continue to follow their self-prescribed precautions of good health and hygiene. They considered it their moral duty to protect and defend the wellbeing of their loved ones and the communities they lived and worked in. Public health administration and the government should account for this sentiment in their health crisis preparations to provide the needed resources to people who, despite being unanimous about not wanting to vaccinate, still have the innate desire to participate and contribute to the safety measures that are being put into place.

Most of the participants indicated that they had already fallen ill from COVID-19 and recovered from it. Some who couldn't recall being sick from COVID-19 reported that they were probably asymptomatic. Those who did not want the COVID-19 vaccine considered their natural immunity to be sufficient to fend off the next infection. Those who had been vaccinated previously, had fallen ill, or had severe side-effects to the booster were not sure if they would get the booster, although there were a few who wanted to follow the advice of their HCP and get boosted whenever recommended. Overall, participants through their individual pandemic experiences expressed that they had the know-how of what they would need to do if there was another outbreak. This would be a great opportunity for public health administrators and the government to add both the positive and negative experiences of the public in their safety measures rather than only from those who are in health care, pharmaceuticals, and the government.

Participants expressed frustration toward the public health administration and specifically the CDC for discounting the impact of natural immunity against COVID-19. For these

participants profit and political gain were the motivating factors for mandating the vaccine on the masses. There were also participants who trusted the advice of their HCP, and based on their positive experiences with vaccines, believed that vaccines were necessary and safe in developing immunity against a viral infectious disease. Health and government authorities should take note of both the natural and vaccine induced immunity when devising steps to prepare for the next viral outbreak. Investing in consistent messaging which primarily deflates rumors and misinformation on all media, and improved mechanisms for the surveillance, monitoring, response, and treatment beyond vaccination, would be instrumental in earning the trust and building confidence of people about the counter measures which will be put into place.

For all participants social media had no direct influence on their vaccination stance, however they were unanimous in reporting that the government and media could have done a better job in communicating truthful, unbiased information to the public. Conversely their social media experience affirmed that they had to rely on their own formed conscience in establishing opinions about the information they consumed and not let that affect their own judgment for or against vaccination. Reiterating the impact of consistent messaging irrespective of the medium through which it is propagated will be key for public health administration and the government to ensure that people always have reliable information. Knowing that there will always be people on both sides of the vaccine hesitancy continuum, tailored messaging will be ideally suited for them to take required safety precautions. Local support representatives equipped with this messaging would effectively address localized situations impacting the area.

Participants had all grown to develop mutual respect for others, specifically for those who had different opinions. Some expressed sorrow in broken relationships, others felt compelled to stand their ground but were willing to adapt and protect the wellbeing of the other, especially those with low immunity. A unified stance for or against vaccination was strongly embraced within a nuclear family unit rather than in an extended family and a friend network. There was one instance where spouses were on opposite sides but still found a common medium for the sake of their children. They were open to a dialogue and not let their differences in opinions about vaccination come in the way of their marriage. Having ready access to family data

from census and medical health insurance records, health and government authorities could create impactful targeted messaging and support services for the successful outcome of health and safety measures.

Looking back to the years of the pandemic, all participants expressed gratitude toward having the freedom of choice to either get the vaccine or not. They were also grateful that they did not have to make any difficult decisions related to their employment as others had to do. For all of them the desire to freely choose the best health option will serve in the best interests of not only their own health but also of their near and dear ones, and the community in which they work and live. Past vaccination experiences for the participants of the study had been mixed and was rooted in how they felt after the shot was administered. For one participant it was disconcerting to consider the long-term impact of a DNA altering vaccine and its potential link to future serious health issues. This would be another great opportunity for health and government authorities to channel and leverage these experiences. Citizens should be encouraged to share their experiences, apprehensions, and successes with their HCP so that the resulting analytics and intelligence could be adopted into future measures. These could also infuse care and empathy into future health and safety programs.

6. LIMITATIONS AND FUTURE CONSIDERATIONS

This study interviewed 15 participants, and all but one participant was from the same geographic location that the researchers lived in. For a subsequent or a future study, a social media extract from Twitter or responses from 15 additional participants from a wider geographic area would provide for a better sampling of experiences of the phenomenon. There was only one participant in the 18-29 age group. A better mix of participants perhaps in the younger age groups would represent people with heavier social media participation and interaction. All but three interviews were conducted over a video conference and among these only two participants did not have their camera on for the interview. Video of the interviews was not recorded, however being on camera could have inhibited participants from being fully candid about their experiences. Not all participants had the same social media understanding. Perhaps a better overview on social media, its various forms, and how people use them would have been beneficial to elicit more feedback from the

participants on the topic of whether social media had any influence on their respective vaccination stances. Adding coders to help review the analysis and help generalize the themes of this study could have helped eliminate biases, a beneficial consideration for a future study. This study has shown the effective use of technology tools such as Google Meet, otter.ai, and NVivo in the study of health care behavior which could be conducive to students in an educational program to repeat this study. Finally, a mixed methods study involving a larger sample of participants explained sequentially through a quantitative survey followed by a qualitative interview would provide a clearer and richer picture of COVID-19 vaccine hesitancy.

7. CONCLUSION

Vaccine hesitancy will continue to be a phenomenon long after COVID-19. Governments and health organizations all over the world will need to continue to develop ways to unite all people, despite their diverse beliefs and actions, in the defense against future disease outbreaks. There will always be people who will decide against vaccination measures, and therefore collaborative ways to protect the immunity of those that cannot naturally defend against the infection will have to be designed with careful thought. The themes from this study could offer needed clarity for those future programs. One key aspect that became clear from this study was that people wanted to be free to choose. Therefore, in addition to the consistency and genuineness in their messaging, it would be significant for governments and health organizations to a) devise disease prevention programs which consider people's freedom to choose as a key component, b) provide free access to these programs, and c) promulgate disease prevention education to people in their respective constituencies.

8. REFERENCES

- Aw, J., Seng, J. J. B., Seah, S. S. Y., & Low, L. (2021). COVID-19 vaccine hesitancy—a scoping review of literature in high-income countries. *Vaccines* 2021, Vol. 9, Page 900, 9(8), 900. <https://doi.org/10.3390/VACCINES9080900>
- Bell, E., Bryman, A., & Harley, B. (2022). *Business research methods* (5th ed.). Oxford University Press.
- Betsch, C., Schmid, P., Heinemeier, D., Korn, L., Holtmann, C., & Böhm, R. (2018). Beyond confidence: Development of a measure assessing the 5C psychological antecedents of vaccination. *PLOS ONE*, 13(12), e0208601. <https://doi.org/10.1371/JOURNAL.PONE.0208601>
- Bish, A., Yardley, L., Nicoll, A., & Michie, S. (2011). Factors associated with uptake of vaccination against pandemic influenza: A systematic review. *Vaccine*, 29, 6472–6484. <https://doi.org/10.1016/j.vaccine.2011.06.107>
- Centers for Disease Control and Prevention. (2023, March 15). CDC COVID Data Tracker: Vaccinations in the US. Atlanta, GA: U.S. Department of Health & Human Services. https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-people-booster-percent-pop5
- Creswell, J. W., & Creswell, J. D. (2018). *Research design* (5th ed.). SAGE Publications.
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry & research design: Choosing among five approaches* (Fourth). Sage publications.
- De', R., Pandey, N., & Pal, A. (2020). Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice. *International Journal of Information Management*, 55, 102171. <https://doi.org/10.1016/J.IJINFOMGT.2020.102171>
- Dubé, E., Laberge, C., Guay, M., Bramadat, P., Roy, R., & Bettinger, J. (2013). Vaccine hesitancy. *Human Vaccines & Immunotherapeutics*, 9(8), 1763–1773. <https://doi.org/10.4161/HV.24657>
- Fan, C. W., Chen, I. H., Ko, N. Y., Yen, C. F., Lin, C. Y., Griffiths, M. D., & Pakpour, A. H. (2021). Extended theory of planned behavior in explaining the intention to COVID-19 vaccination uptake among mainland Chinese university students: An online survey study. 17(10), 3413–3420. <https://doi.org/10.1080/21645515.2021.1933687>

- Fridman, A., Gershon, R., & Gneezy, A. (2021). COVID-19 and vaccine hesitancy: A longitudinal study. *PLOS ONE*, 16(4), e0250123. <https://doi.org/10.1371/JOURNAL.PONE.0250123>
- Hale, T., Angrist, N., Goldszmidt, R., Kira, B., Petherick, A., Phillips, T., Webster, S., Cameron-Blake, E., Hallas, L., Majumdar, S., & Tatlow, H. (2021). A global panel database of pandemic policies (Oxford COVID-19 government response tracker). *Nature Human Behaviour* 2021 5:4, 5(4), 529–538. <https://doi.org/10.1038/s41562-021-01079-8>
- Henderson, L., Millett, C., & Thorogood, N. (2008). Perceptions of childhood immunization in a minority community: Qualitative study. *Journal of the Royal Society of Medicine*, 101(5), 244–251. https://doi.org/10.1258/JRSM.2008.070363/ASSET/IMAGES/LARGE/10.1258_JRSM.2008.070363-FIG1.JPEG
- Husain, F., Shahnawaz, M. G., Khan, N. H., Parveen, H., & Savani, K. (2021). Intention to get COVID-19 vaccines: Exploring the role of attitudes, subjective norms, perceived behavioral control, belief in COVID-19 misinformation, and vaccine confidence in Northern India. *Human Vaccines and Immunotherapeutics*, 17(11), 3941–3953. <https://doi.org/https://doi.org/10.1080/21645515.2021.1967039>
- Khubchandani, J., Sharma, S., Price, J. H., Wiblehauser, M. J., Sharma, M., & Webb, F. J. (2021). COVID-19 vaccination hesitancy in the United States: A rapid national assessment. *Journal of Community Health*, 46(2), 270–277. <https://doi.org/10.1007/S10900-020-00958-X/TABLES/2>
- Kricorian, K., Civen, R., & Equils, O. (2022). COVID-19 vaccine hesitancy: Misinformation and perceptions of vaccine safety. *Human Vaccines & Immunotherapeutics*, 18(1), 1950504. <https://doi.org/10.1080/21645515.2021.1950504>
- Larson, H. J., Jarrett, C., Eckersberger, E., Smith, D. M. D., & Paterson, P. (2014a). Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: A systematic review of published literature, 2007–2012. *Vaccine*, 32(19), 2150–2159. <https://doi.org/10.1016/j.vaccine.2014.01.081>
- Larson, H. J., Jarrett, C., Eckersberger, E., Smith, D. M. D., & Paterson, P. (2014b). Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: A systematic review of published literature, 2007–2012. *Vaccine*, 32, 2150–2159. <https://doi.org/10.1016/j.vaccine.2014.01.081>
- Lockey, E. (2020). COVID-19: The race for a vaccine. *Journal of the Renin-Angiotensin-Aldosterone System: JRAAS*, 21(2). <https://doi.org/10.1177/1470320320926902>
- Lopalco, P. L., & Tan, L. (2016). Pandemic vaccines: Are we prepared for the next pandemic? *Future Virol*, 11(4), 253–258. <https://doi.org/10.2217/fvl-2016-0020>
- MacDonald, N. E., Eskola, J., Liang, X., Chaudhuri, M., Dube, E., Gellin, B., Goldstein, S., Larson, H., Manzo, M. L., Reingold, A., Tshering, K., Zhou, Y., Duclos, P., Guirguis, S., Hickler, B., & Schuster, M. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine*, 33(34), 4161–4164. <https://doi.org/10.1016/J.VACCINE.2015.04.036>
- Mayo Clinic Staff. (2022, April 20). Herd immunity and COVID-19: What you need to know - Mayo Clinic. Mayo Clinic. <https://www.mayoclinic.org/diseases-conditions/coronavirus/in-depth/herd-immunity-and-coronavirus/art-20486808>
- Meleo-Erwin, Z., Basch, C., MacLean, S. A., Scheibner, C., & Cadorett, V. (2017). “To each his own”: Discussions of vaccine decision-making in top parenting blogs. *Human Vaccines & Immunotherapeutics*, 13(8), 1895–1901. <https://doi.org/10.1080/21645515.2017.1321182>
- Mills, M., Rahal, C., Brazel, D., Yan, J., & Gieysztor, S. (2020). COVID-19 vaccine deployment: Behavior, ethics,

- misinformation and policy strategies. In The Royal Society. <https://royalsociety.org/-/media/policy/projects/set-c/set-c-vaccine-deployment.pdf>
- Neely, S. R., Eldredge, C., Ersing, R., & Remington, C. (2022). Vaccine hesitancy and exposure to misinformation: A survey analysis. *Journal of General Internal Medicine*, 37(1), 179–187. <https://doi.org/10.1007/S11606-021-07171-Z/TABLES/6>
- Reno, C., Maietti, E., Di Valerio, Z., Montalti, M., Fantini, M. P., & Gori, D. (2021). Vaccine hesitancy towards COVID-19 vaccination: Investigating the role of information sources through a mediation analysis. *Infectious Disease Reports*, 13(3), 712–723. <https://doi.org/10.3390/idr13030066>
- Shiehzadegan, S., Alaghemand, N., Fox, M., & Venketaraman, V. (2021). Analysis of the delta variant B.1.617.2 COVID-19. *Clinics and Practice*, 11(4), 778–784. <https://doi.org/10.3390/CLINPRACT11040093>
- Troiano, G., & Nardi, A. (2021). Vaccine hesitancy in the era of COVID-19. *Public Health*, 194, 245–251. <https://doi.org/10.1016/J.PUHE.2021.02.025>
- WHO February 2020 Situation Report-13. (2020, February 2). Novel Coronavirus (2019-NCov). https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200202-sitrep-13-ncov-v3.pdf?sfvrsn=195f4010_6
- Wilson, S. L., & Wiysonge, C. (2020). Social media and vaccine hesitancy. *BMJ Global Health*, 5(10), e004206. <https://doi.org/10.1136/bmjgh-2020-004206>
- Wolf, M. S., Serper, M., Opsasnick, L., O’Conor, R. M., Curtis, L., Benavente, J. Y., Wismer, G., Batio, S., Eifler, M., Zheng, P., Russell, A., Arvanitis, M., Ladner, D., Kwasny, M., Persell, S. D., Rowe, T., Linder, J. A., & Bailey, S. C. (2020). Awareness, attitudes, and actions related to COVID-19 among adults with chronic conditions at the onset of the U.S. outbreak. *American College of Physicians*, 173(2), 100–109. <https://doi.org/10.7326/M20-1239>
- Wong, B., & Bottorff, C. (2023, May 18). Top social media statistics and trends of 2023. *Forbes Advisor*, 1–1. <https://www.forbes.com/advisor/business/social-media-statistics/>
- World Health Organization. (2014). Report of the SAGE working group on vaccine hesitancy. https://www.who.int/immunization/sage/meetings/2014/october/1_Report_WORKING_GROUP_vaccine_hesitancy_final.pdf
- Xia, Y., Zhong, L., Tan, J., Zhang, Z., Lyu, J., Chen, Y., Zhao, A., Huang, L., Long, Z., Liu, N. N., Wang, H., & Li, S. (2020). How to understand “Herd Immunity” in COVID-19 pandemic. *Frontiers in Cell and Developmental Biology*, 8, 991. <https://doi.org/10.3389/FCCELL.2020.547314/BIBTEX>
- Yahaghi, R., Ahmadizade, S., Fotuhi, R., Taherkhani, E., Ranjbaran, M., Buchali, Z., Jafari, R., Zamani, N., Shahbazkhania, A., Simiari, H., Rahmani, J., Yazdi, N., Alijani, H., Poorzolfaghar, L., Rajabi, F., Lin, C. Y., Broström, A., Griffiths, M. D., & Pakpour, A. H. (2021). Fear of COVID-19 and perceived COVID-19 infectability supplement theory of planned behavior to explain Iranians’ intention to get COVID-19 vaccinated. *Vaccines* 2021, Vol. 9, Page 684, 9(7), 684. <https://doi.org/10.3390/VACCINES9070684>

Editor’s Note:

This paper was selected for inclusion in the journal as 2023 ISCAP Conference Distinguished Information Systems Applied Research Paper. The acceptance rate is typically 7% for this category of paper based on blind reviews from six or more peers including three or more former best papers authors who did not submit a paper in 2023.

Appendices and Annexures

Interview Protocol

The Script

At the start of the interview, the study participant would be welcomed using the following **script**:

Welcome and thank you for meeting with me today. I am a PhD student at Robert Morris University in the Information Systems and Communications program conducting a study that is exploring perceptions about COVID-19 vaccines. This interview will focus on your personal experiences with vaccines during the COVID-19 pandemic. This interview will last forty minutes and will consist of twelve questions following a few demographic related questions. I would like your permission to transcribe our conversation so I can accurately document the information you convey. If at any time during the interview you wish to discontinue the use of the transcriber or the interview itself, please feel free to let me know. All your transcribed responses will be kept confidential, archived in a safe place, and destroyed after the completion of this assignment. You will receive an email copy of the transcription after the meeting ends. Thank you. Do you have any questions or concerns before we begin? Then with your permission we will begin the interview.

The Interview

Demographics

1. What is your marital status?
2. What is your highest level of education?
3. What is your age group?
4. What is your occupation?

The Questionnaire

Note: Each question below shows the factor from the RQ it maps to in parentheses.

1. How worried are you about contracting COVID-19? (Vaccination complacency) (Mills et al., 2020)
2. Are you any less worried about contracting COVID-19, knowing that the COVID-19 vaccines are available? Explain. (Vaccination confidence) (Fan et al., 2021)
3. How do you stay in the know about COVID-19 and how do you consume this information? (Sources of information) (Reno et al., 2021)
4. Some people feel that the COVID-19 vaccines were created in a rush, are too dangerous for human consumption, and are ineffective against COVID-19. What do you think? Why? (Vaccination confidence) (Troiano & Nardi, 2021)
5. What has been your experience about vaccines and vaccinations, including COVID-19 vaccines? (Past vaccination behavior) (Mills et al., 2020)
6. What has been your experience in communities that you belong to including those on social media involving topics around the COVID-19 pandemic and COVID-19 vaccines? (Social norms)
7. How has your experience in communities on social media affected your trust of vaccines and in particular COVID-19 vaccines? (Social norms) (Fan et al., 2021)
8. What do the people close to you think about the COVID-19 pandemic and the COVID-19 vaccines? (Social norms) (Yahaghi et al., 2021)
9. What types of barriers or access to COVID-19 vaccines have you experienced and how have you overcome them? (Vaccination convenience) (Aw et al., 2021)

10. Describe your sense of freedom in choosing whether to get the COVID-19 vaccination or not? (Vaccination convenience) (Fan et al., 2021)
11. Under what situations would you consider a COVID-19 vaccine and other vaccines in the future and why? (Vaccine Hesitancy) (Yahaghi et al., 2021)
12. Would you have anything more to add relative to your pandemic experience?