**Title:** The COVID-19 Vaccine Conundrum: An Assessment of Vaccine Hesitancy Amongst Patients at a Federally Qualified Health Center

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## Abstract

**Background:** With three COVID-19 vaccines currently authorized for emergency use in the US, vaccine hesitancy has the potential to sabotage COVID-19 vaccination efforts and be detrimental to establishing herd immunity. In order to realize the extent of vaccine hesitancy, an adequate understanding of the role that self-identified barriers and epidemiologic factors may play is timely and important.

**Objective(s):** The objectives of this study were to 1) determine if there is a correlation between vaccine hesitancy and epidemiologic factors, and 2) identify perceived patient-reported barriers associated with receiving a COVID-19 vaccine.

**Methods:** A written questionnaire was utilized to collect data from eligible patients over a 15-week period between October 2020 and February 2021. A combination of non-parametric tests and descriptive statistics were used to analyze this data.

**Results:** A majority of patients were either very strongly in support of (28.2%) or very strongly against (29.7%) receiving a COVID-19 vaccine. Notable findings included the comparison of patients with advanced degrees being more likely to get vaccinated (48.1%) to those without advanced degrees, who were more unlikely to get vaccinated (38.8%) ($p = 0.002$). There was also a significant difference between races regarding their interest in receiving a COVID-19 vaccine. Blacks were much more likely to answer very strongly against receiving the vaccine compared to Caucasians and Hispanics ($p < 0.001$). The most reported barrier to receiving a COVID-19 vaccine was concern for side effects.

**Conclusion:** This study provides a glimpse into possible correlations between vaccine hesitancy and epidemiologic factors as well as patient-reported barriers to receiving a COVID-19 vaccine. With widespread vaccination underway, it is imperative that we learn about and address concerns about receiving the COVID-19 vaccine to ensure herd immunity can adequately be achieved.

**Background**

COVID-19, the disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) virus, was first discovered in December 2019 following an outbreak in Wuhan, China. After spreading quickly across the world, the World Health Organization (WHO) on March 11th, 2020 declared the COVID-19 outbreak a global pandemic. Just two days later, a national emergency was declared in the US. As of May 3rd, 2021, there were a reported 32,191,342 total cases in the US and 573,780 deaths[1]. There are currently three COVID-19 vaccines that have been granted emergency authorization for immunization in the US. Pfizer-BioNTech and Moderna have both developed a two-dose mRNA vaccine series to be administered intramuscularly in those 16 and 18 years of age or older, respectively.[2] Johnson & Johnson's Janssen vaccine is a single dose alternative. This viral vector vaccine is administered intramuscularly and recommended for people aged 18 years and older.[3]

The World Health Organization (WHO) has listed vaccine hesitancy – the reluctance or refusal to vaccinate despite the availability of vaccines – as one of their top ten threats to global health.[4] A 2009 National Immunization Survey found the delay or refusal of vaccine administration to be a result of patient concern for vaccine safety and effectiveness as well as a lower perceived risk of contracting a vaccine-preventable disease.[5] The survey concluded that parents who delayed or refused the vaccination of their children had greater distrust in medical professionals and were less likely to believe that medical professionals in charge of vaccinations had their child's best interest at heart.[6]

From 1989-1999 the Center for Health System Change conducted a population-based survey to discover the racial/ethnic differences of distrust in the healthcare system. The study included other sociodemographic variables such as gender, age, insurance coverage, educational attainment, and household income. Mean levels of physician distrust were higher with Blacks compared to Hispanics and Caucasians (19.7, 18.9 and 17.4, respectively).[7] Findings also concluded that women had lower distrust scores than men (regardless of race) meaning that women were more likely to trust medical professionals. Additionally, this study noticed that higher levels of educational attainment were associated with lower distrust scores amongst Blacks and Hispanics but not amongst Caucasians. With regard to insurance status, there was a significant difference in distrust among Blacks between public and private insurance, between Caucasians who had any insurance versus those with none, and no difference among Hispanics.[7]

While vaccine hesitancy is a widely studied phenomenon, there is minimal data to evaluate the hesitancy the public may have to receiving one of the three novel COVID-19 vaccines. In order to assess COVID-19 vaccine hesitancy specifically, an adequate understanding of self-identified barriers and epidemiologic factors may be imperative to successful herd immunity.

**Objective(s)**

The objectives of this study were to 1) determine if there is a correlation between vaccine hesitancy and epidemiologic factors, and 2) identify perceived patient-reported barriers associated with receiving a COVID-19 vaccine.

## Methods

### Study Design

This descriptive cross-sectional study occurred over a period of 15 weeks between October 2020 and February 2021. This study was approved by the University of Missouri Kansas City Institutional Review Board (Protocol #: 2034362).

### Setting

Research was conducted at KC CARE Health Center, a Federally Qualified Health Center (FQHC) located in Kansas City, MO. Although KC CARE has four locations, the questionnaire was only offered at the main location in Midtown Kansas City. KC CARE is dedicated to vaccinating its community and works closely with federal, state and local health departments to help distribute the COVID-19 vaccine.[8]

### Approach

Patients were included in this study if they were at least 18 years of age with an ability to speak and read the English language. All KC CARE medical staff and personnel were excluded. A written questionnaire (**Appendix 1**) was utilized to collect data from eligible patients. Participation in this study was voluntary and anonymous.

Members of the patient services department were asked to offer questionnaires to all patients presenting to the health center between October 30th, 2020 and February 12th, 2021. The clinic staff received training regarding the handling of questionnaires and were informed of the inclusion and exclusion criteria. They were also provided a script with recommended talking points to aid in questionnaire distribution. To increase the likelihood of distribution and decrease the duplication of data, questionnaires were attached to patient intake forms, which are completed annually for KC CARE patients. Upon completion, questionnaires were placed in a secure key-locked drop box only to be accessed by the primary investigator.

### Questionnaire Tool

The questionnaire was created with a readability of 64.5% (Flesch-Kincaid Grade Level = 6.7) to ensure the content would be understood by the general population. It was also pilot tested by 10 patients during the month of October to ensure clarity and patient comprehension. No revisions to the questionnaire were necessary based on pilot data.

The questionnaire consisted of six multiple-choice questions to obtain demographic data relating to age, gender, race/ethnicity, education, household income, and health insurance. A single multiple-choice question was used to determine the nature of the patient's visit. There were two 'Yes/No' questions to determine if a patient had been previously exposed to or tested for SARS-CoV-2. Patients were asked to answer five questions concerning vaccine hesitancy, which were measured on a Likert Scale (1 – Highly Unlikely, 5 – Highly Likely). The final question (select all that apply) served to help identify perceived patient-reported barriers associated with receiving a COVID-19 vaccine.

### Statistical Analysis

A combination of descriptive statistics and non-parametric tests were used to analyze this data. Descriptive statistics were used to evaluate demographics in addition to the perceived barriers to

receiving a COVID-19 vaccine. A Chi-square test was performed to detect a difference between Blacks, Hispanics, and Caucasians regarding their likelihood of receiving a COVID-19 vaccine. To evaluate COVID-19 exposure versus vaccine intention and COVID-19 test result versus vaccine intention, a two-group comparison was completed via Chi-square. This test was also used in an effort to detect any differences between the likelihood of vaccine administration for those with reduced levels of education compared to those with higher academic achievements. Analyses were accomplished using SPSS v. 27 and an a-priori alpha of 0.05.

**Results**

A total of 224 questionnaires were collected. One participant did not meet the eligibility criteria (age <18 years) and was excluded from data analysis.

**Patient Demographics**

The plurality of patients identified as male (49.8%), between the ages of 25 to 39 (43.6%) and reported having an associate degree or higher (35.7%). Over 80% of the patients identified as either Black or Caucasian (40.4% and 41.7%, respectively), while only 13.9% identified as Hispanic. Many of the patients reported being uninsured (39.9%) and almost half had an annual household income of less than $25,000 (48.9%). A large number of patients presented to the health center for a provider visit (66.5%), and other reasons included pharmacy or lab visits (2.6% and 13.4%, respectively). A very small proportion of patients presented to the clinic for COVID-19 testing (2.1%); notably, more than half of patients said they had been tested for COVID-19 at least once since the start of the pandemic (52.6%). Of those tested, 11.4% reported a positive result. When asked about potential exposure to the virus, an overwhelming majority felt as if they had never been exposed at all (83%). A complete list of demographics can be found in **Table 1**.

More than a third of patients were likely (8.4%) or highly likely (28.2%) to receive a COVID-19 vaccine (**Figure 1A**). Similar results were found when asked if they would return for a second dose of the vaccine (**Figure 1B**). Approximately 70% of this patient population (n=138/197) reportedly have children and of those, 59.4% said that it was either highly unlikely (47.8%) or unlikely (11.6%) for them to forbid their children from receiving a COVID-19 vaccine (**Figure 1C**). Of the remaining 40.6% reported to have children, 15.2% said they were highly likely, 2.9% said they were likely, and 22.5% said they were neither unlikely nor likely to forbid the vaccination of their children. Additionally, patients were more likely to recommend the vaccine to their friends and family (**Figure 1D**). Roughly one-quarter of patients felt impartial to making this recommendation altogether (neutral: 23.8%). When asked about mask use, nearly 70% of patients said it was either highly unlikely (59.3%) or unlikely (8.5%) for them to stop wearing one post-vaccination (**Figure 1E**).

**Perceived Barriers**

To assess potential barriers to receiving a COVID-19 vaccine, patients were asked to choose from a selection of postulated concerns. Patients were predominantly concerned about the potential side effects after vaccine administration (43%) (**Figure 2**). Even though immediate side effects were the most reported concern, others expressed concern about the long-term implications of a COVID-19 vaccine (4.0%). Close to 40% were concerned about the novelty of the vaccines (38.6%), and 38.1% felt as if they did not know enough about how the vaccines

work. Other patients simply felt that the vaccines would not work at all (18.4%) and 15.2% thought the vaccines would give them COVID-19. Cost was a concern for 19.7% of patients, while 1.8% were worried about transportation to/from vaccination location. Fourteen (7.7%) of the patients who responded 'other' manually listed not having any concerns at all.

Differences were found between education and likelihood of getting a COVID-19 vaccine. Patients with an associate degree or higher were significantly more likely to get vaccinated compared to those with less than an associate degree (p = 0.002) (**Figure 3**). There was also a significant difference between races regarding their interest in receiving a COVID-19 vaccine. Blacks reported that they were highly unlikely to receive a COVID-19 vaccine compared to Caucasians who were highly likely to receive the vaccine (p <0.001) (**Figure 4).** Hispanics were neutral in their desire of getting a vaccine and did not feel strongly one way or the other.

Many of the patients in this study population reported they had been tested for COVID-19 despite, to the best of their knowledge, never having been exposed to the virus. Those reportedly tested for COVID-19 were significantly more likely to get a COVID-19 vaccination regardless of their perceived exposure to the virus (p = 0.018) (**Supplemental Figure 1**). Fifty percent (n=6) of those who tested positive said that they were highly likely to receive a COVID-19 vaccine; however, a quarter of patients (n=3) were highly unlikely to get vaccinated despite their positive result.

**Discussion**

Patients in this study indicated their largest concern with receiving a COVID-19 vaccine was the associated side effects. Additionally, patients mentioned feeling uninformed about the vaccine in relation to its mechanism of action. These concerns are common and are not just limited to novel vaccine therapies.[5] In other studies lower education has been associated with vaccine hesitancy and the refusal to get vaccinated, which supports our finding that patients with an associate degree or higher were more likely to get vaccinated (p = 0.002).[9,10] This data suggests educating the public about vaccines is crucial to ensure public acceptance and widespread administration. While providing education is imperative for providers, the focus should not be on intimidating patients to receive the COVID-19 vaccine, but on dedicating time to listen to the thoughts, fears, and opinions of their patients so that they can be thoughtfully addressed at an appropriate level for the patient.[11] This allows patients to have adequate knowledge of the benefits and risks associated with COVID-19 vaccination, so patients can make their own informed decision. Taking the time to listen to hesitant patients has been supported by other studies which found that immediately addressing patient questions with an overwhelming amount of information has the potential to actually heighten medical mistrust and therefore, increase vaccine hesitancy.[11,12] Medical mistrust tends to affect a disproportionate amount of Blacks compared to other races, which is in line with this study's finding that Blacks reported they were more unlikely to get vaccinated compared to both Caucasians and Hispanics (p <0.001).[13]

While cost was not the most commonly reported concern, it was still mentioned as a barrier to receiving a COVID-19 vaccine. Currently in the US, vaccine doses are purchased with taxpayer dollars and available to everyone at no cost regardless of their immigration or health insurance status.[14] As we start on the path to herd immunity via widespread immunization, the WHO encourages the continued use of masks, and patients in this study indicated they were highly likely to continue wearing their masks even after vaccination (59.3%). This is encouraging

information; showing that the public does take COVID-19 seriously and wants to avoid either contracting or spreading the virus, even if they opt out of receiving a vaccine.

**Limitations**

Due to the anonymity of the study, it is possible that patients may have filled out more than one questionnaire. Appointment spacing, however, reduced the likelihood of this occurring as patients were usually seen once every 3 to 6 months. Additionally, questionnaires were attached to patient intake forms which are only completed once per calendar year. As is common with Likert-type questions, it is possible that patients were biased in selecting all highly unlikely since it was the first available value under these questions. Although questions were written in a way to reduce selection bias, evidence of this was seen during data analysis. Furthermore, KC CARE has a large population of Spanish speaking patients. Since materials were only available in English, our sample size was limited. While the investigators took steps to ensure the staff was properly trained and aware of the inclusion criteria, it is possible questionnaires were filled out by patients who cannot read or write English proficiently.

**Conclusion**

Vaccine hesitancy is still a threat to achieving herd immunity against COVID-19 and medical mistrust, especially in the Black population, is still prevalent despite the advancements in science and technology. This study showed that there was a correlation between vaccine hesitancy and epidemiologic factors. While this is not a problem to be tackled overnight, educating vulnerable or mistrusting populations and being empathic to their viewpoints are possible means of addressing vaccine hesitancy.

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