Identifying Anti-Vaccine Subgroups for Targeted Messaging

Steven R. Corman* & Bradley Adame

Center for Strategic Communication, Arizona State University, Tempe, Arizona

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*Corresponding author. Email: steve.corman@asu.edu Address: Hugh Downs School of Human Communication, P.O. Box 871205, Tempe, AZ 85287-1205. Phone: 480-965-3830.

Abstract

The United States SARS-CoV-2 vaccination effort is coming to a point where the challenge is to convince more reluctant groups to accept the vaccine. Yet there is little scientific knowledge about what specific attitudes motivate specific groups to resist the vaccine. In this study we surveyed 2569 participants about their vaccine-related intentions. Results show that Republican women, not Republican men, are over-represented in the group that never intends to be vaccinated. Such women have concerns about safety, side-effects, and effectiveness of the vaccine. Republican women are also anxious about DNA alteration. Discounting sex and party, resistant participants' greatest concerns include speed of production, trust of the vaccine, and trust of government. These results suggest specific, targeted messaging is needed to overcome these concerns.

Introduction

As the United States hits the so-called “vaccine wall” for SARS-CoV-2, it is critical that we search for motives that underlie resistance, which threatens our ability to achieve population immunity (1). Understanding motives can provide the basis for targeted, evidence-based messaging to address the concerns of reluctant groups. Conventional wisdom suggests that Republican men are the biggest holdouts against the vaccines. A poll (2) completed in March 2021 shows that 49% of them will refuse to get the vaccine. Republican women are hesitant too, but less so (34%). Independent men and women are in a similar range (36% and 31%, respectively).

Because repeated polling suggests that Republican men have high rates of resistance to vaccination, we predict:

H1: Republican men will be more likely than other groups to say they will refuse vaccination.

For effective messaging, it is important to uncover reasons resistant groups have for rejecting vaccination. We therefore ask a research question: What anti-vaccine attitudes do members of vaccine resistant groups hold?

Materials and Methods

Data were collected using the Mechanical Turk (mTurk) crowdsourcing service, between 9 and 25 April 2021. Participants were directed through the mTurk interface to a Qualtrics survey where they were consented and completed participation according to procedures approved as exempt with negligible risk, by the Arizona State University Institutional Review Board. Participants were compensated \$2.00 USD for their effort; workers with an approval rate of 80% or higher were eligible; research has supported the use of mTurk as a source for quality survey data (5, 6).

Participants responded to demographic and vaccination status questions, a set of ten Likert items measuring agreement with anti-vaccination statements (7, 8) (see SI Appendix), and other scales not reported here. Data will be available to readers through the [Open Science Framework](#).

To test our hypothesis that Republican men are the least likely to be vaccinated, we performed a hierarchical loglinear analysis on three nominal variables from our survey: biological sex (male, female; intersex excluded because of too few participants), political party registration (Republican, Democratic, Other), and vaccination status (vax-yes, vax-never). To address our research question, we computed an ANOVA on the vax-never respondents in the resistant groups, comparing their responses on the ten anti-vaccine reasons scales.

Results

Our $n = 2569$ survey participants' average age was 39.33 y (SD = 12.04) and were 51.2% female (0.1% reporting Intersex). Participants were mostly white 76.9%, with 9.3% Black, 7.8% Asian/Pacific Islander, 3.5% Latinx, 0.9% American Indian/Alaskan Native, 0.2% Semitic, and 1.4% reporting "other." The majority, 44.5%, were college educated; 53% of the sample reported receiving a COVID-19 vaccine, with 46% of those receiving two doses. Of those who have not been vaccinated, 63.6% reported being eligible, 15.9% reported not being eligible, and 20.5% were unaware of their eligibility. For unvaccinated participants, 20.6% ($n = 529$) reported having no intention of obtaining any COVID vaccine.

The generating class of the most parsimonious loglinear model not significantly different from the saturated model contained all two-way interactions between sex (male, female), party (Republican, Democratic, other), and vaccination status (vax-yes vs. vax-never); likelihood-ratio $\chi^2(2) = 3.04$ ($p < 0.215$). Standardized residuals, which show differences between actual and expected frequencies, are visualized in Figure 1.

We reject H1 because, contrary to expectations, Republican men are overrepresented in the vax-yes category and underrepresented in the vax-never category. Republican women are opposite: They are underrepresented in the vax-yes category and overrepresented in the vax-never category. The same is true for both men and women in the other party category, and they have more extreme deviations from expectations. Democratic men and women show only small deviations from expectations.

ANOVAs compared the standout groups from the loglinear analysis (vax-never Republican women, vax-never other women, and vax-never other men) on agreement with anti-vaccine reasons. Analysis showed four significant differences: safety ($F = 4.57$, $p < 0.011$), side effects ($F = 5.95$, $p < 0.003$), effectiveness ($F = 3.37$, $p < 0.036$), and DNA change ($F = 5.60$, $p < 0.004$). Means plots (Figure 2) show that safety is a prime concern of Republican women, and to a slightly lesser extent other women. Other men are almost a scale point lower on this concern. The pattern is the same for both side effects and effectiveness. For the DNA change concern, other women and other men were below the midpoint of the scale but Republican women were above the midpoint, again with about one scale point difference.

Among all vax-never participants (regardless of sex or party), the anti-vaccine reasons with mean ratings above the scale midpoint include side effects (mean = 5.95, SD = 1.38), production speed (mean = 5.90, SD = 1.36), vaccine distrust (mean = 5.60, SD = 1.45), government distrust (5.27, SD = 1.61) and safety (mean = 5.15, SD = 1.53).

Discussion

This study found that contrary to conventional wisdom Republican women—not men—are the most resistant to vaccination. A plausible explanation is that participation with anti-vax discourse on social media is largely female, with themes centering on moral outrage and institutional and media oppression (3). That both Republican and other women share similar concerns about the vaccinations may be the result of both the politicized nature of the US's COVID-19 response and the current information environment. Conservative media continue to urge audiences against vaccination and cultivate doubt about vaccine safety and effectiveness. This may make resistance an identity-affirming choice and devalue vaccination as a healthy and pro-social behavior.

Republican men are overrepresented in the vax-yes category, and this is at odds with recent polling. This may be because they are less likely to participate in anti-vax social media and thus

are less exposed to anti-vax messaging that distorts information and skews risk perception (4). Also, this was an academic survey rather than a public opinion poll, and the context may have reduced their incentive to “perform” political resistance.

Analyses of the antivaccine reasons reported by vax-never participants provides guidance for strategic messaging that can be targeted directly at the anti-vaccine attitudes. Vax-never participants, especially women, were most apprehensive about safety, side effects, and effectiveness of the vaccine. Republican women feared alteration of their DNA. Vax-never respondents in general had concerns about the speed of production and expressed lack of trust in the vaccine and government.

To combat these myths and enhance vaccination rates, messaging efforts should address these concerns directly with targeted message campaigns. Public health communicators should make efforts to reach general vax-never audiences via social media and inform them about the mildness of side-effects (compared to the disease) and explain why vaccine development was able to happen so quickly. Vax-never females should be specifically targeted with messages about safety and effectiveness, and Republican women should be targeted with messages debunking the DNA-change misinformation.

Our results point to a failure of science communication. While some forms of all proposed messages currently exist in the media landscape, there is no evidence of a concerted campaign. As a result, the messages are either not reaching or not resonating with vax-never audiences. As with all research, this study has limitations. First, data were collected via online crowdsourcing, where researchers could not control for extraneous influences. Previous research has supported the use of mTurk as a source for high quality data. Secondly, this study employed a cross-sectional design; conclusions must be interpreted with the appropriate level of caution for such designs. We believe that the importance and timeliness of this research warrant the use of these measures.

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Figure 1. Residuals of the loglinear model including all two-way interactions.

Figure 2. Means plots for three groups on significant ANOVAs. Error bars show 95% confidence intervals for the means.

Supplementary Information for

Identifying Anti-Vaccine Subgroups for Targeted Messaging

Steven R. Corman* & Bradley Adame

Corresponding author: Corman

Email: steve.corman@asu.edu

This PDF file includes:

Supplementary text
SI References

Other supplementary materials for this manuscript include the following:

None

Supplementary Information Text

Materials

Anti-vaccination Statements Likert-type Items.

To create the anti-vaccination statements items, we consulted recent academic and news sources that addressed why individuals might be resistant to the COVID-19 vaccine. We distilled the content into a series of 10 first-person statements to which a reader could agree or disagree on a 7-point scale. (1–4). Item ordering was randomized for each participant. The full list of items includes the following (along with variable names used in the manuscript): I believe the COVID-19 vaccine is unsafe (safety); I do not trust the COVID-19 vaccine (vaccine distrust); I do not trust the medical establishment (medical distrust); I do not trust the US government (government distrust); The COVID-19 vaccine was produced too quickly (production speed); I am concerned about potential side effects from the COVID-19 vaccine (side effects); I do not have the ability to get the COVID-19 vaccine (ability); I do not have the resources to get the COVID-19 vaccine (resources); I do not believe the COVID-19 vaccine will be effective (effectiveness); I am concerned that the COVID-19 vaccine will alter my DNA (DNA change).

SI References

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