Does Diversity Increase Trust in Science?: Addressing Vaccine Hesitancy Through Representation *

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Abstract

While the scientific community largely supports the safety and efficacy of the COVID-19 vaccines, willingness to receive them among the general public has lagged. One possible explanation for this disconnect is that the general public distrusts the objectivity of scientists, particularly given beliefs are typically split along ideological lines. In this paper, we present experimental findings that relate the effectiveness of scientific communication on the COVID-19 vaccine to the identity and diversity of scientists conveying the message. By randomly varying the demographic and political/religious orientation of scientists conveying a positive message about the safety and efficacy of the COVID-19 vaccine, we measure changes in the willingness of participants to receive a vaccine. Our results suggest that we can reduce vaccine hesitancy with relatively simple informational interventions. In particular, statements from scientists who differed from each other demographically (and, to a lesser extent on signals of political orientation) increased participants' willingness to receive the vaccine. We hypothesize that individuals interpret agreement among scientists with different backgrounds as reflecting a more informative signal of consensus within the scientific community.

Keywords: Scientific distrust, diversity, vaccine hesitancy

JEL Codes: I12, I14, J15

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1 Introduction

Vaccine hesitancy is a major public health challenge. Particularly at the current moment, as the COVID-19 vaccination campaign rolls out world-wide, understanding how to reduce vaccine hesitancy and increase vaccine uptake is a pressing issue. While the scientific community at large supports the safety and efficacy of the COVID-19 vaccines, willingness to take the vaccine among the general public has lagged. Polling in early 2021 showed that between 7-21% of individuals in Australia, Canada, Japan, Spain, the US, and the UK rated strong disagreement with the statement "If a vaccine for COVID-19 were available to me, I would get it", with another 30-44% displaying uncertainty about their intentions to get a vaccine (IPSOS, March 2021). While initial uptake suggests that some of these uncertain individuals have resolved in favor of the vaccine - with first-dose uptake around 50% in the USA and 56% in the UK as of May 2021 - it is still unclear whether or when we will reach sufficient coverage to permit a return to normalcy in most countries.

The disconnect between the scientific consensus and individual perceptions on scientific issues is not limited to the COVID-19 vaccine, of course. On issues such as childhood vaccines, climate change, or the safety of 5G cell phone towers, a significant minority of the population rejects scientific consensus (among others, see van der Linden et al. (2015)). This raises the puzzle of why individuals are unwilling to listen to the opinions of much better-informed experts on these topics. One possibility is that the general public distrusts the objectivity of scientists. Scientists are people, and their opinions – particularly those relevant to policy – are shaped not only by evidence, but also by prior beliefs, values, and incentives. Especially given that the public's attitudes towards COVID-19 mitigation measures are split along political and racial lines Cornelson et al. (2020); Allcott et al. (2020); Green et al. (2020), the predominance of liberals and white men in science (e.g. Nelson and Rogers, 2005; Gross and Simmons, 2007) may play a role in limiting public acceptance of scientific evidence on the safety of the vaccine. While the impact of diversity in health care provision has been studied in other contexts - in particular, in the racial "matching" of doctors to patients Alsan et al. (2019) - there is no evidence to date on the importance of political or demographic diversity in shaping the effectiveness of scientific communication.

In this paper, we present experimental findings that relate the effectiveness of scientific communication on the COVID-19 vaccine to the identity and diversity of scientists conveying the messaging. All else equal, more diversity among scientists should increase the public's faith in scientific findings, because it signals that people with different prior beliefs and/or value systems have reached the same conclusion. Diversity may also help increase trust among under-represented groups, because it increases the probability that they hear a message from someone who "looks like them". In this study, we attempt to directly test this proposition by varying the demographic or political/religious orien-

tation of scientists conveying positive messages about the safety and efficacy of the COVID-19 vaccine.

Our sample consists of 6500 Canadians who belong to one of Canada's five largest ethnic/linguistic groups.[1] Aside from this restriction, the sample was representative of the Canadian population. 500 members of our sample were randomly assigned to a passive control group, who simply answered a short survey about their demographics and vaccine intentions. The remaining 6000 participants answered the demographic portion of the survey first, and then saw two messages about the safety and efficacy of the COVID-19 vaccine from scientists who were profiled with a picture and biography. The identity of the scientists was randomly varied, either along race and gender lines in Experiment 1 (as signaled by the picture and name), or along political/religious orientation in Experiment 2 (as signaled by statements in the biography about the scientists' careers and volunteer activities).

Within each experiment, participants were randomized into one of four treatment types. The first (T1), the "no match, no diversity" treatment, showed the participant statements from two scientists who did not match their own group and but who did match each other. For example, an East Asian female participant might see statements from two white males, or a secular liberal participant might see statements from two religious conservatives. The second treatment (T2), the "no match, diversity" treatment, showed two scientists who did not match each other, but also did not (perfectly) match the participant. For example, a black male participant might see statements from a white female and a South Asian male; a secular conservative participant might see messages from a religious conservative and a secular liberal. Comparing the results from T2 to T1 tells us whether diversity builds confidence in scientific community separately from any effects of matching the participant. In the third treatment (T3), the "match and diversity" treatment, we ensure that one of the scientists matches the participant while the other does not. Comparing T3 to T2 tells us whether individuals are more willing to trust scientists who are similar to themselves. Finally, the fourth treatment (T4), "match, no diversity", showed the individual two scientists who both matched the individual. Comparing T4 to T3 tells us about the relative benefits of matching vs diversity alone. Following treatment, we asked participants about their vaccine intentions and their level of agreement with several statements related to the COVID-19 vaccine.

Our results suggest that we can improve COVID-19 vaccine intentions among hesitant individuals with a relatively simple informational intervention. While matching our respondents on demographics or values had relatively little effect, there did appear to be a positive effect from showing people statements from scientists who differed from each other demographically (and, on signals of political and religious orientation).

[1] The restriction on ethnicity and language was imposed in order to facilitate the assignment of treatment status, described below.

2 Results

2.1 Who are the vaccine-hesitant?

We begin with a discussion of the predictors of vaccine hesitancy within our sample. We use two sets of outcome variables for this analysis. The first is a summary variable capturing vaccine intentions on a 0-10 scale. The question used to elicit this measure was "On a scale from 1 to 10, how likely or unlikely would you be to get a COVID-19 vaccine within 6 months from the time it is available to you?", with 1 representing "Not at all likely" and 10 representing "Very likely". The second set of variables are indicators based on responses to the following question: "If a vaccine against COVID-19 became available to you, which of the following best describes what you would do?", with the possible responses "Get the vaccine right away", "Eventually get the vaccine, but wait a while first", "I would not take the vaccine", or "Not sure". We define vaccine hesitancy as answering either "wait a while" or "unsure". We focus on this group in some parts our analysis of treatment effects below, because these answers indicate that the individual has not completely decided about whether to get a vaccine and may have more scope to be influenced by treatment.

We first regress our summary intentions measure on all of the covariates in our sample. These include age and age squared; indicators for gender, race, level of education, immigrant status, first language, health care worker status, and having any reported religion (as opposed to no religion); a scale for the importance of religion in the respondent's daily life; indicators for each level of the political orientation scale; and indicators for whether the respondent gets the flu vaccine "sometimes" or "never/rarely" (as opposed to "always or nearly always"). The results of this regression are reported in the appendix. Of these variables, only two are statistically significant at the 10% level: the left-right scale indicators, and the flu vaccine behavior indicators. We explore the relationship between these variables and vaccine intentions in more detail in Table 1. The first column of the table shows the results from a regression of vaccine intentions on the orientation and flu vaccine variables, in a single regression. The results show that more right-wing respondents report lower levels of the vaccine intentions scale, although the relationship is only statistically significant for one of the indicators ("Right-wing"). Getting the flu vaccine sometimes is associated with a large and statistically significant decline in the intentions scale (1.3 points) compared to getting it always or nearly always, while respondents who rarely or never get the flu vaccine report a 2.2 point decline. In order to ascertain how much of the variation in vaccine intentions can be explained by political orientation vs flu vaccine behavior, the next two columns report the results from regressions of the intentions scale on the flu vaccine and political orientation variables separately. The results are consistent with column (1) in both cases, and show that flu vaccine behavior does the best job of predicting COVID-19 vaccine hesitancy (although the

difference in the R^2 from these regressions is not large.)

The next three columns of the table show the results from regressions of our other measures of vaccine intentions - indicators for intending to get the vaccine right away, being hesitant, or not planning to get it at all) - on the political and flu vaccine indicators. Roughly speaking, the results show that people who are left-wing and/or get the flu vaccine almost always are much more likely to report that they plan to get the COVID-19 vaccine right away. People who are in the center-right of the political scale or who report getting the flu vaccine "sometimes" are most likely to be hesitant, while people who are very right-wing or who never get the flu vaccine are more likely to report that they will not take a COVID-19 vaccine. In our results on treatment effects in the next section, we will use these relationships to identify individuals who are likely to be vaccine-hesitant within our treatment sample.

Table 1: Predictors of vaccine intentions

VARIABLES	(1) Intentions (0-10)	(2) Intentions (0-10)	(3) Intentions (0-10)	(4) Get vaccine right away	(5) Hesitant (delay/unsure)	(6) Will not get vaccine
Left-wing	0.318		-0.290	-0.178**	0.183**	-0.00487
	(0.588)		(0.565)	(0.0899)	(0.0867)	(0.0221)
Somewhat left-wing	0.285		-0.277	-0.0711	0.0530	0.0181
	(0.593)		(0.566)	(0.0829)	(0.0780)	(0.0262)
Neither left/right-wing	-0.673		-1.463***	-0.275***	0.218***	0.0570**
	(0.573)		(0.547)	(0.0779)	(0.0739)	(0.0221)
Somewhat right-wing	-0.922		-1.556**	-0.313***	0.297***	0.0165
	(0.634)		(0.612)	(0.0919)	(0.0896)	(0.0299)
Right-wing	-2.743***		-3.305***	-0.532***	0.422***	0.110*
	(0.727)		(0.763)	(0.109)	(0.119)	(0.0585)
Very right-wing	-0.945		-2.058	-0.112	-0.159	0.271*
	(1.417)		(1.492)	(0.166)	(0.120)	(0.152)
Gets flu vaccine sometimes	-1.323***	-1.338***		-0.362***	0.334***	0.0272
	(0.261)	(0.272)		(0.0552)	(0.0560)	(0.0243)
Gets flu vaccine rarely/never	-2.188***	-2.268***		-0.370***	0.208***	0.162***
	(0.287)	(0.298)		(0.0474)	(0.0492)	(0.0322)
Observations	499	499	499	499	499	499
R-squared	0.199	0.129	0.082	0.202	0.130	0.104

This table shows the relationship between left/right political orientation, flu vaccine behavior, and measures of COVID-19 vaccine hesitancy within the experimental control group. The omitted groups are "very left-wing" for the political variable, and "Get flu vaccine always" for the flu vaccine variable. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

2.2 The effect of treatment by hesitancy status

We next examine the impact of being in any of our experimental groups, relative to the passive control group. Panel 1 of Table 3 shows treatment effects in the entire sample, estimated from a regression of the indicated outcomes on a treatment status indicator and control variables. The intervention had little effect on net. Treatment effects are very close to zero in all cases, and are never statistically significant.

We would not expect treatment to have any effect on individuals who already have strong opinions - one way or another - on whether to take the vaccine. We next examine whether there is a larger response among individuals who are more likely to be undecided, or hesitant, about the vaccine. We proxy for hesitancy using political orientation and flu vaccine behavior, as suggested by the results in Table 1. We classify an individual as "Predicted hesitant" if they either i) report getting the flu shot "sometimes", as opposed to "always" or "never", or ii) report that they are "somewhat right-wing" or "right-wing", as opposed to any other orientation, and as "Predicted decided" otherwise. Panel 2 of Table 3 shows the effect of treatment separately for these two groups. Among the predicted hesitant, treatment is associated with a non-significant 0.2 percentage point increase in the vaccine intentions scale. There is a large and significant probability, however, on the probability that an individual reports an intention to get a COVID-19 vaccine as soon as it is available: the treatment group is 7.5 percentage points more likely to declare this intention, relative to the control. The treatment group is 10.3 percentage points less likely to report wanting to delay the vaccine or being unsure, and slightly (but not significantly) more likely to report not wanting to get the vaccine at all. On the whole, the treatment appears to be effective at increasing vaccine intentions among people who are likely to be undecided.

For individuals who are predicted to have decided already on the vaccine, the treatment effects are uniformly insignificant for all variables. The point estimates suggest a *decline* in vaccine intentions, with about a 4 percentage point decline in the probability of intending to get the vaccine right away. While not shown in the table, additional regressions show that this effect is driven by people who are most likely to be hostile towards getting the vaccine: those who never or rarely get the flu vaccine or who report being "very right-wing". This is consistent with the backfire effect among people with anti-vaccine attitudes documented in Nyhan and Reifler (2010). Among people who are more likely to be decided in favor of getting the vaccine (people who always get a flu vaccine or who are left-wing), the treatment effect is very close to zero.

2.3 Effects of matching and diversity

Finally, we examine the impact of varying the identity of the scientists giving the pro-vaccine messages. For this part of the analysis, we focus on the subset of individuals who are predicted to be vaccine hesitant, and who therefore have some scope to be influenced by our messages. We start by looking at

Table 3: Effects of any treatment

VARIABLES	(1) Intentions (0-10)	(2) Get vaccine right away	(3) Hesitant (delay/unsure)	(4) Will not get vaccine
		Panel 1		
Whole sample	-0.033	0.004	-0.024	0.020*
	(0.116)	(0.020)	(0.021)	(0.012)
Observations	6,498	6,498	6,498	6,498
R-squared	0.251	0.231	0.129	0.150
		Panel 2		
Predicted hesitant	0.277	0.076**	-0.104***	0.027
	(0.180)	(0.034)	(0.036)	(0.017)
Observations	2,702	2,702	2,702	2,702
R-squared	0.190	0.138	0.092	0.163
Predicted decided	-0.215	-0.039	0.028	0.011
	(0.148)	(0.025)	(0.025)	(0.160)
Observations	3,796	3,796	3,796	3,796
R-squared	0.295	0.288	0.145	0.158

This table shows the effect of any treatment on vaccine intentions. Panel 1 shows treatment effects for the entire sample, while Panel 2 shows the results separately for respondents who are predicted to be hesitant about the vaccine, and respondents who are predicted to be decided (positively or negatively) about the vaccine. Respondents are predicted hesitant if they either i) report that they get the flu vaccine "sometimes", as opposed to "always" or "never", or ii) report that they are "somewhat right-wing" or "right-wing", as opposed to any other response. The regressions include controls for: age and age squared, sex, race, first language, educational status, immigrant status, political orientation, degree of religiosity, and region. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

whether the treatment effects documented in Table 3 vary in the "demographic" or "values" treatments, and then examine differences based on treatment arm. For brevity, we focus on the dependent variable "Get vaccine now", which is an indicator for whether the respondent plans to get a vaccine as soon as it is available. The results in the first row of Table 5 show that there is very little difference in the effect of treatment by experiment. The demographic experiment arm increased intentions to get the vaccine right away by 7 percentage points, while the values treatment increased intentions by 7.7 percentage points. This difference is not statistically significant.

In the next panel of Table 5, we examine whether there was any impact of "matching" the participant in terms of demographic or values characteristics. The coefficients in this table show the results of treatment from either of the arms with a matched scientists, and the results of treatment from either of the arms with no matched scientist. These results are estimated within the same regression. Again, there is very little difference across treatment arms. The matched treatments have an effect of 6.7-8.0 percentage points, while the unmatched treatments have an effect of 7.2-7.4 percentage points. The matched treatment effect is not statistically different from the unmatched treatment effect in either of the experiments, or in the two combined.

In the third panel of Table 5, we examine whether there was any impact of introducing demographic or values diversity across the scientists delivering the message. In this case, there is suggestive evidence that the diversity treatments outperformed the non-diverse treatments, particularly in the demographic treatment. The effect of seeing a demographically diverse set of scientists was 8.7 percentage points and significant at the 5% level, while the effect of seeing scientists who were demographically the same was 5.7 percentage points and non-significant. The difference between the two treatments, while quantitatively meaningful, is just shy of statistically significant. The diverse treatment also outperformed the non-diverse treatment in the values experiment, although the difference is quite small.

Finally, the fourth panel of the table examines the treatment effects within each of the four treatment arms individually. For the demographic treatment, the results confirm that both of the diversity treatments outperform both of the non-diversity treatments. The results within the values experiment are more difficult to interpret, with the treatment effect concentrated in both the "no match, no diversity" arm and the "match, diversity" arm. One result that is consistent across both cases is that the treatment with both a match and diversity seems to have the strongest effect; this difference is marginally statistically significant ($p<0.1$) in the combined experiment, but not in either of the individual experiments.

2.4 Attitudinal outcomes

In Table 7, we examine the impact of treatment on measures of individual attitudes towards the COVID-19 vaccine and/or medical professionals. In the first column, the outcome variable is an individual's average level of agreement with the following three statements: 1) "I am confident that

Table 5: Treatment effects by experiment and treatment arm

	Dependent variable: get vaccine now		
	Demographic	Values	Combined
Any treatment	0.073**	0.078**	0.076**
	(0.036)	(0.035)	(0.034)
Match	0.071*	0.080**	0.079**
	(0.038)	(0.038)	(0.035)
No match	0.075*	0.076**	0.074**
	(0.038)	(0.038)	(0.035)
Diversity	0.086**	0.081**	0.083**
	(0.038)	(0.038)	(0.035)
No diversity	0.059	0.075**	0.070**
	(0.038)	(0.038)	(0.035)
No match, no diversity	0.065	0.104**	0.086**
	(0.042)	(0.043)	(0.038)
Match, no diversity	0.053	0.047	0.054
	(0.042)	(0.043)	(0.038)
No match, diversity	0.083**	0.051	0.063
	(0.042)	(0.041)	(0.038)
Match, diversity	0.088**	0.114***	0.103***
	(0.042)	(0.043)	(0.038)
Observations	1,464	1,431	2,702

This table shows the results of treatment for individuals who are predicted to be vaccine hesitant, separately by experiment and treatment arm. The first column shows the effect of treatment in the "demographic" experiment, where the race and/or gender of the scientists giving a message is randomized; the second shows the effect of treatment in the "values" experiment, where the political/religious orientation of the scientists giving a message is randomized; and column 3 shows the combination of the two. The regressions include controls for: age and age squared, sex, race, first language, educational status, immigrant status, political orientation, and degree of religiosity. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

vaccines are appropriately tested and regulated in Canada", 2) "The benefits of a COVID-19 vaccine would outweigh its risks", and 3) "A COVID-19 vaccine will end the pandemic". These variables are scaled from 1 to 5, with 1 representing "Strongly disagree' and 5 representing "Strongly agree". The table shows that there was a small, non-significant increase in the average rating of positive statements associated with treatment. The increase was largest and marginally significant in the "match + diversity" treatment, although the difference between this treatment and the others is non-significant.

The second outcome variable in the table, shown in column (2), is the average level of agreement with three negative statements about the COVID-19 vaccine: 1) "I am concerned about the short-term side effects of a COVID-19 vaccine", 2) "I am concerned about the longer-term side effects of a COVID-19 vaccine", and 3) "I don't trust the COVID-19 vaccine because of how quickly it is being developed." The variable showed a small, non-significant decline in the treatment group overall. This decline was much larger and statistically significant in the "match + diversity" treatment, and the difference between this treatment and the others is significant at the 5% level.

The third outcome variable, shown in column (3) is the average rating of trust in three groups of medical professionals: medical scientists, doctors, and public health officials. We focus on these three groups because the biographies of the scientists we showed could place our experts in any of these three groups. The ratings are given on a scale of 1 to 5, with 1 representing the lowest level of trust and 5 representing the highest. There is no treatment effect on these variables in any of the treatment groups, with all coefficients insignificant and very close to zero.

While not shown in the table, the results from this analysis are very similar if we consider the demographic treatment or the values treatment separately. The overall treatment effects are similar in both cases, and the "match + diversity" treatment outperforms all others for both the positive and negative statement variables in 3/4 cases (this is not true in the demographic treatment for the positive statements, where all treatments have similar effects.) The statements that show the biggest treatment effects overall are "I am confident that vaccines are appropriately tested and regulated in Canada" (increases by 0.128, significant at the 10% level), and "I don't trust the COVID-19 vaccine because of how quickly it is being developed" (declines by 0.185, significant at the 5% level); both of these variables show the largest changes within the "match + diversity" treatment. Because these are the statements most directly targeted by our treatment, the change in these variables gives us some confidence that the treatment is working as intended.

3 Discussion

Our results suggest that we can improve COVID-19 vaccine intentions among hesitant individuals with a relatively simple informational intervention emphasizing the rigor of the vaccine safety testing process. The effect of "personalizing" this intervention by matching the respondent on either demo-

Table 7: Effect of treatment on attitudinal outcomes

	Positive statements	Negative statements	Trust in medical professionals
Treatment	0.103	-0.107	0.001
	(0.063)	(0.072)	(0.051)
No match, no diversity	0.094	-0.089	0.009
	(0.070)	(0.080)	(0.057)
Match, no diversity	0.097	-0.073	-0.012
	(0.069)	(0.080)	(0.056)
No match, diversity	0.084	-0.071	0.004
	(0.070)	(0.081)	(0.056)
Match, diversity	0.136*	-0.194**	0.006
	(0.069)	(0.080)	(0.057)
Difference, match + diversity vs other treatment	0.045	-0.116**	0.006
	(0.039)	(0.046)	(0.032)
Observations	2,703	2,702	2,703

This table shows the effect of treatment on three summary variables of individual attitudes towards vaccines and/or medical professionals. The outcome variable in the first column is the average rating out of 5 for three positive statements about the COVID-19 vaccine, while the outcome variable in the second column is the average rating for three negative statements (see text for full description of the underlying variables.) The outcome variable in the third column is the average rating out of 5 for levels of trust in medical scientists, doctors, and public health officials.

graphic or political values seemed to be relatively muted, however. This result is somewhat surprising in light of results from Alsan et al. (2019), although we note that treatment provided was for conventional preventative screenings. In this respect, our results build on this work to demonstrate the effects in the context of novel and potentially controversial therapies. While matching our respondents on demographics or values had relatively little effect, there did appear to be a positive effect from showing people statements from scientists who differed from each other demographically (and, to a lesser extent, on signals of political orientation). We hypothesize that individuals interpret agreement among scientists from different backgrounds as reflecting a more informative signal of consensus within the scientific community. Finally, we show suggestive evidence that the strongest effects of our intervention came from a treatment that combined matching with diversity.

Of course, our analysis is limited in several ways. First, we can only measure vaccine intentions, rather than actual vaccine uptake. To the extent that hesitant individuals report intentions, but do not actually act upon them, we can think of our estimates as an upper-bound on the effect of these targeted interventions. Nevertheless, evidence from numerous other contexts suggests that intention is a good predictor of vaccination (Patel et al., 2012; Lehmann et al., 2014). Second, our intervention captures the effect of scientist identity in a context where there is no actual interaction between the scientist and the respondent. While this mimics the environment in which much scientific communication takes place (e.g. statements by scientists or public health officials in the media), our results may not apply to settings in which there is dialogue between an expert and a vaccine hesitant individual (e.g. in a discussion between a family doctor and her patient.) The effect of matching could be either larger or smaller in this case.

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Appendix: Supporting Materials

3.1 Survey Text

ABOUT THIS RESEARCH

You are being asked to participate in a research study. Scientists do research to answer questions and learn new information. Some research might help change or improve the way we do things in the future. This consent information will tell you more about the study to help you decide whether you want to participate. Please read this information before agreeing to be in the study.

TAKING PART IN THIS STUDY IS VOLUNTARY

You may choose not to take part in the study or may choose to leave the study at any time. Deciding not to participate, or deciding to leave the study later, will not result in any penalty and will not affect your relationship with the University of Notre Dame.
As an alternative to participating in the study, you may choose not to take part.

Why is this study being done?

The purpose of this study is to understand more about Canadians' degree of hesitancy regarding the COVID-19 vaccine currently in development.
You were selected as a possible participant because you have previously agreed to be contacted as a potential participant in surveys by Critical Mass.
The study is being conducted by Kirsten Cornelson at the University of Notre Dame and Boriana Miloucheva at the University of Toronto.

How many people will take part?

If you agree to participate, you will be one of **12,750** participants taking part in this study.

What will happen during the study?

If you agree to be in the study, you will be asked to do the following things:

- You will be asked to complete a short survey. The survey will take about 10 minutes of your time.
- The survey will ask for some basic demographic information and about your religious and political orientation.
- You will then see some statements regarding the COVID vaccine, and will be asked about your viewpoints regarding the vaccine.
- You will be paid $XX upon completion of the survey.

What are the risks of taking part in the study?

While participating in the study, the potential risks include:

- Discomfort answering some of the questions in the survey. If you do feel uncomfortable at any time, you may discontinue the survey or skip any question.
- Loss of confidentiality in the data. To avoid this risk, responses to this survey are collected anonymously; no information that could identify you will be requested during the data collection phase. A limited number of research team members will have access to the data during data collection.

What are the potential benefits of taking part in the study?

We don't expect you to receive any benefit from taking part in this study but we hope to learn things that will help scientists in the future.

How will my information be protected?

Efforts will be made to keep your survey responses confidential. We cannot guarantee absolute confidentiality, but we have guarded against this risk by not asking for any information that could identify you. The data collected in this study will be stored in a secure location and will be accessible only to a limited number of researchers.

Organizations that may inspect and/or copy your research records for quality assurance and data analysis include groups such as the study investigator and his/her research associates, the University of Notre Dame Institutional Review Board or its designees, and (as allowed by law) state or federal agencies, especially the Office for Human Research Protections (OHRP), who may need to access the research records.

Will my information be used for research in the future?

Information collected in this study may be used for future research studies or shared with other researchers for future research. Since identifying information will not be stored with the data, we will not ask for your additional consent.

Will I be paid for participation?

You will be paid $XX for the survey upon completion.

Who should I call with questions or problems?

For questions about the study, contact the lead researcher, Kirsten Cornelson, at 574-631-3461.

For questions about your rights as a research participant, to discuss problems, complaints, or concerns about a research study, please contact Notre Dame Research Compliance at 574-631-1461 or at compliance@nd.edu.

Participant's consent

In consideration of all of the above, I give my consent to participate in this research study. By proceeding, I confirm that I am 18 years old, and agree to take part in this study.

QUESTIONS: DEMOGRAPHIC / PROFILING INFORMATION

1. To begin, what year were you born?

   [DROPDOWN WITH YEARS]

2. What gender do you identify with?

   ☐ Male

   ☐ Female

   ☐ Prefer to self-identify: [RECORD VERBATIM]

3. What is your ethnicity?

   ☐ White/ Caucasian

   ☐ Black

   ☐ East Asian

   ☐ South Asian

   ☐ Indigenous/ First Peoples

   ☐ Something else? Please specify: [RECORD VERBATIM][ANCHOR]

4. What province/territory do you currently live in?

   ☐ Newfoundland (NL)

   ☐ Prince Edward Island (PEI)

   ☐ New Brunswick (NB)

   ☐ Nova Scotia (NS)

   ☐ Quebec (QC)

   ☐ Ontario (ON)

   ☐ Manitoba (MB)

   ☐ Saskatchewan (SK)

   ☐ Alberta (AB)

   ☐ British Columbia (BC)

   ☐ Yukon, NWT, or Nunavut

5. What is your first language?

   ☐ English

   ☐ French

   ☐ Something else? Please specify: [RECORD VERBATIM]

6. What is the highest level of education you have completed?

   ☐ Less than high school

   ☐ High school

   ☐ Some college or university

   ☐ Completed college

   ☐ Completed university

   ☐ Graduate degree

7. Where were you born?

   ☐ In Canada

   ☐ Outside of Canada

8. On the following scale, how would you rate your political views?

   ☐ Extremely left-wing

   ☐ Left-wing

   ☐ Somewhat left-wing

   ☐ Neither left- nor right-wing

   ☐ Somewhat right-wing

   ☐ Right-wing

   ☐ Extremely right-wing

9. What religion are you?

   ☐ Christian

   ☐ Jewish

   ☐ Muslim

   ☐ Hindu

   ☐ Buddhist

   ☐ A different religion? Please specify: [RECORD VERBATIM]

   ☐ I do not consider myself a member of any religion

10. On a scale from 1 to 10, with 1 not describing you at all and 10 describing you perfectly, how well does the following statement describe you?

    Religion is an important part of my daily life

    ☐ 10 – Describes me perfectly

    ☐ 9

    ☐ 8

    ☐ 7

    ☐ 6

    ☐ 5

    ☐ 4

    ☐ 3

    ☐ 2

    ☐ 1 – Does not describe me at all

11. Do you currently work as a healthcare provider or in an occupation that regularly interacts with patients in the health care system? *When we say healthcare providers, we are referring to doctors, nurses, pharmacists, health technicians, etc.*

    ☐ Yes

    ☐ No

12. Do you usually get a seasonal flu vaccine?

    ☐ Yes, every year

    ☐ Sometimes

    ☐ Never or rarely

STATEMENTS AND FOLLOW-UP QUESTIONS

We are now going to show you some statements about the COVID-19 vaccine from scientists Please read the statements carefully.

[TREATMENT OCCURS HERE. THERE ARE 8 TREATMENT ARMS – **750 INDIVIDUALS** ARE GOING TO SEE EACH TREAMENT. 1 PARTICIPANTS WILL SEE 2 STATEMENTS ON THE SAME PAGE AND ANSWER THE FOLLOW-UP QUESTIONS.]

[THERE WILL ALSO BE 1 CONTROL GROUP OF 500 INDIVIDUALS WHO DON'T SEE ANY STATEMENTS AT ALL. WILL SKIP STRAIGHT TO Q15]

Identity	Treatment	Individual 1	Individual 2
Demographic (race/gender)	E1, T1	Matches particip.	Does not match particip.
	E1, T2	Does not match particip.	Does not match particip., matches ind. 1
	E1, T3	Matches particip.	Matches particip.
	E1, T4	Does not match particip.	Does not match particip., does not match ind. 1
Political/religious orientation	E2, T1	Matches particip.	Does not match particip.
	E2, T2	Does not match particip.	Does not match particip., matches ind. 1
	E2, T3	Matches particip.	Matches particip.
	E2, T4	Does not match particip.	Does not match particip., does not match ind. 1

13. Please rate your level of agreement with the following statements.

    I would get a COVID-19 vaccine to protect my family

    A COVID-19 vaccine will end the pandemic

    I'm concerned about the short-term side effects of a COVID-19 vaccine

    I'm concerned about the longer-term side effects of a COVID-19 vaccine

    I don't trust the COVID-19 vaccine because of how fast it is being developed

    The benefits of a COVID-19 vaccine would outweigh its risks

    If my family doctor recommends that I get the vaccine, I would be more likely to do so

    I am confident that vaccines are appropriately tested and regulated in Canada

    I am worried about getting COVID-19 and the effects of the disease on my health

    If my family doctor tells me that he or she had gotten the vaccine, I would be more likely to do so

    ☐ Strongly agree

    ☐ Somewhat agree

    ☐ Neither agree nor disagree

    ☐ Somewhat disagree

    ☐ Strongly disagree

14. Which of the following statements do you agree with more?

    ☐ People can generally be trusted

    ☐ You can't be too careful when dealing with people

15. Please rate how much you trust the following groups.

    Elected officials

    Public health workers

    Doctors

    Nurses

    Pharmacists

Naturopaths/alternative medicine providers

Medical scientists

People I know

Members of your community

Journalists

☐ Completely trustworthy

☐ Somewhat trustworthy

☐ Neither trustworthy nor untrustworthy

☐ Somewhat not trustworthy

☐ Not at all trustworthy

16. If a vaccine against COVID-19 became available to you, which of the following **best describes** what you would do?

☐ Get the vaccine as soon as possible

☐ Eventually get the vaccine, but wait a while first

☐ I would not take the vaccine

☐ Not sure

17. And, on a scale from 1 to 10, how likely or unlikely would you be to get a COVID-19 vaccine within 6 months from the time it is available to you?

☐ 10 – Very likely

☐ 9

☐ 8

☐ 7

☐ 6

☐ 5

☐ 4

☐ 3

☐ 2

☐ 1 – Not at all likely

18. Have you had or are you planning to get a flu vaccine this year?

☐ I have already had my flu shot

☐ I have not had my flu shot yet, but I am planning to get one

☐ I am unlikely to get the flu shot this year

3.2 Treatment Vignettes

What do Canadian scientists say about the COVID-19 vaccine?

Tamira Jelani is a professor of clinical pharmacology at the University of British Columbia. She holds degrees in pharmacy and medicine from McGill University, and advises the BC Center for Disease Control on matters related to the COVID vaccine.

“ When we develop a vaccine, we start by giving it to a small number of people to see if it has any side effects. In these early trials, the most promising COVID vaccines had very minor side effects, similar to a flu vaccine. We have now given the vaccines to tens of thousands of people worldwide in order to confirm that the vaccine is safe and effective. We are proceeding with an abundance of caution: if even one person gets sick for any reason, we stop the trial until we can be sure that their illness is unrelated to the vaccine. ”

What do Canadian scientists say about the COVID-19 vaccine?

Liu Hong is an immunologist working at St. Michael's Hospital in Toronto. He received his M.D. from the University of Toronto, and a Ph.D in molecular biology from Harvard University. He is a member of Health Canada's National Advisory Committee on Immunization, which helps to review the safety and effectiveness of vaccines.

“ No one is rushing the science when it comes to a vaccine. We were able to develop vaccine candidates quickly because a huge number of scientists cooperated with each other, and governments devoted unprecedented funding to the problem. The safety testing protocols have remained exactly the same as always. ”

What do Canadian scientists say about the COVID-19 vaccine?

Sandra Fox is an immunologist working at St. Michael's Hospital in Toronto. She received her M.D. from the University of Toronto, and a Ph.D in molecular biology from Harvard University. She is a member of Health Canada's National Advisory Committee on Immunization, which helps to review the safety and effectiveness of vaccines. Dr. Fox is a founding member of Scientists for the Ethical Treatment of Animals and volunteers at her church in her spare time.

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Shen Xue is a professor of clinical pharmacology at the University of British Columbia. She holds degrees in pharmacy and medicine from McGill University, and advises the BC Center for Disease Control on matters related to the COVID vaccine. She was an Assistant Deputy Minister of Health under the Steven Harper government.

“ When we develop a vaccine, we start by giving it to a small number of people to see if it has any side effects. In these early trials, the most promising COVID vaccines had very minor side effects, similar to a flu vaccine. We have now given the vaccines to tens of thousands of people worldwide in order to confirm that the vaccine is safe and effective. We are proceeding with an abundance of caution: if even one person gets sick for any reason, we stop the trial until we can be sure that their illness is unrelated to the vaccine. ”