



## **CanCOVID Issue Note**

### **Determinants of COVID-19 vaccination hesitancy and ways to improve vaccine acceptance and confidence**

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## Executive summary

### Determinants of COVID-19 vaccination hesitancy and ways to improve vaccine acceptance and confidence.

Vaccine development has been a key factor that can potentially end the COVID-19 pandemic (1). However, the success will depend on the proportion of people being vaccinated (2). After the initial few months of COVID-19 vaccination, what do we know about the determinants of vaccine hesitancy and how to improve vaccine acceptance and confidence?

### Summary of Included Resources

Our review identified eight reviews, eleven individual studies, nine instances of ongoing research in Canada, and a list of 34 experts on vaccine hesitancy. The comprehensiveness of this summary may be limited given the rapid nature of our approach to conduct the evidence search and preparation of a summary of the documents retrieved. Only one review by Galanis et al. (2020) formally assessed the quality of the evidence using the Joanna Briggs Institute critical appraisal tools, which was moderate to good.

### What do we know?

Vaccine hesitancy impacts the uptake COVID-19 vaccination and is determined by myriad factors related to vaccine characteristics (3–6), socio-demographic factors such as income level (4,7–9), age (4,6,7), sex (8–10), education (7), employment (6), ethnicity (6,7), beliefs (4,5,8), and perception and trust in COVID-19 vaccines (7,11,12). The infodemic of misinformation leads to distrust in science and affects individuals' intent to get vaccinated (5,7,13).

### What are the notable gaps?

- Most studies are cross-sectional, whereas the terrain of vaccine hesitancy is dynamic, and the trends need constant monitoring.
- There is a lack of implementation studies to develop and test interventions to increase vaccine confidence.
- Countering misinformation requires the development of communication strategies and research to understand better the pathways of social media influence on vaccine hesitancy.

### What is on the horizon? What are the studies that are underway to address the gaps?

Dr. MacDonald's study from the University of Alberta is studying the acceptability of COVID-19 vaccines, thus documenting the evolving trends in vaccine hesitancy and associated factors. Three upcoming research studies by Dr. Rosberger, Dr. Kronfli and Dr. Ben-Shoshan from McGill University focus on developing and testing video based-interventions to increase vaccination rates. Dr. Colmegna and Dr. Gold, also from McGill University, are researching the promotion of trust-based strategies, engaging community members and healthcare workers. Simultaneously, Dr. Bettinger and Dr. Wessinger (University of British Columbia) are using qualitative methods such as interviews and digital ethnography to better understand the influence of social media on decision-making related to vaccines. Whereas, Dr. Bacon (Concordia University) and Dr. Lavoie (Université du Québec à Montréal) are assessing public awareness, attitudes, concerns and behavioural responses to COVID-19 public health policies, including vaccination.

**Concluding statement:** Vaccine hesitancy remains a dynamic area that needs further multi-disciplinary exploration from clinical, behavioral, and social sciences perspectives. More research is underway in Canada to provide insights, counter vaccine hesitancy and increase confidence.

## CanCOVID Rapid Review

### What are the determinants associated with COVID-19 vaccination hesitancy/acceptance/confidence? Are there ways to increase vaccine acceptance/confidence?

#### Summary of included resources

The following summary presents a rapid review of the available evidence on determinants of COVID-19 vaccine hesitancy and measures to increase vaccine confidence/acceptance. It includes published resources retrieved via searches conducted in PubMed, Google Scholar, and the University of Toronto library COVID-19 resources, prioritizing higher-level evidence (i.e., systematic reviews, rapid reviews, and meta-analyses). We found eight reviews, eleven individual studies, nine instances of ongoing research in Canada, and a list of 34 experts on vaccine hesitancy. This review is organized into four sections: the first section details the determinants of vaccine hesitancy using a framework identified by the SAGE Working group of the World Health Organization (WHO); the second section presents the factors related to vaccine hesitancy identified in Canadian studies/data; the third section describes the vaccine hesitancy factors in Healthcare Workers; and, the fourth section shares reported measures to increase vaccine confidence. This review also outlines upcoming registered systematic reviews, government-issued or advised guidelines to build vaccine confidence, online portals tracking vaccine hesitancy, and ongoing research related to vaccine hesitancy and increasing its acceptance in Canada. The comprehensiveness of this review may be limited given the rapid timeline for this work; it is possible that we may have missed potentially relevant evidence. Links to the source documents are included in the tables below. The short summaries for each resource listed below provide an overview of the main results but there is no integration or interpretation of the results.

#### Definitions: Vaccine Hesitancy & Confidence

**Vaccine hesitancy:** *“is a behaviour, influenced by a number of factors including issues of confidence [do not trust vaccine or provider], complacency [do not perceive a need for a vaccine, do not value the vaccine], and convenience [access]”.*(14)

**Vaccine confidence:** *“is the belief that vaccination, and the providers, private sector, and political actors behind it, serve the best health interest of the public and its constituents”.* (15)

**Determinants of vaccine hesitancy –** The SAGE Working group of WHO on vaccine hesitancy suggests three Vaccine Hesitancy Determinant categories: vaccine/vaccination-specific influences, individual and group influences, and contextual influences (16).

#### Vaccine/vaccination – specific issues directly related to vaccine or vaccination

The expedited development and novelty of the COVID-19 vaccine are prevalent concerns that affect the level of confidence in these vaccines. The most common reasons directly related to vaccines and causing hesitancy or refusal are fear of safety or associated side effects (4–6), including long-term effects (3), and effectiveness (3–6) of the vaccines. The speed of vaccine development, use of new platforms for vaccine development, uncertainty regarding duration of immunity offered, and lack of long-term safety records remain challenges for vaccine confidence (3). Information on continuing vaccine efficacy against variants of concern is still emerging and may affect hesitancy (a future summary of the research currently in progress will be helpful).

The other factors associated with COVID-19 are the challenge of communicating vaccine complexities; since several COVID-19 vaccines are available, with different levels of effectiveness, risk profiles, modes of delivery, prioritization schemes, vaccine schedules, and safety requirements for storage and transportation (3).

Individual and group influences: Influences arising from personal perception of the vaccine or influences of the social/peer environment

There is a consistent pattern related to socio-demographic differences and vaccination intentions: it has been demonstrated that individuals who are with lower-incomes (4,7–9), women (8–10), unemployed (6), have lower education (7), belong to an ethnic minority group (6,7), uninsured (4), or live in rural or large households (4), are less likely to have any intention of being vaccinated. People over 55 or 65 remain the most receptive, whereas being younger age is associated with less likelihood to accept the vaccine (4,6,7).

The intention to get vaccinated is higher if individuals believed in science (10), perceived the higher risk of infection (4,5,8), mortality (4), severity of disease (4,5,9), and was also correlated with influenza vaccine uptake (9,10). In comparison, the belief in lower risk of exposure (8), vaccines being unnecessary with a shorter duration of immunity, and inadequate information was associated with lower acceptance rates (4).

Contextual influences: Influences arising due to historic, socio-cultural, environmental, health system/institutional, economic or political factors

COVID-19 vaccine programs are rolling out in the context of an unprecedented infodemic with misinformation that often fills the knowledge void leading to distrust of science (5,7,13). Social media influences the information and communication environment, which enables the spread of misinformation (3); not relying upon social media for virus information has a positive effect (9). Researchers illustrated that exposure to misinformation could result in lower reported intent to vaccinate for COVID-19, even among people who have earlier reported intent to be vaccinated in the United Kingdom (UK) and the United States (US) (3,13).

The politicization of COVID-19 vaccine development and deployment, and the role of some governments, in downplaying the pandemic, and repressing news or rumours concerning COVID-19, have undermined the public trust and confidence (3). Thus, respondents with higher scepticism had lower perceived risk of infection and trust in government, and higher doubts and objections to vaccination (4). Many U.S. studies coincided with the U.S. presidential election and included politically-oriented questions, revealing partisan influences, with persistent vaccine attitude gaps between Democrats and Republicans (4,8,9).

### **Vaccine Hesitancy and associated factors in Canada**

This section covers the data and studies specific to Canada, though most of these findings are very similar to studies discussed above.

A cross-sectional study across U.S. and Canada reported that 20 percent of Canadians would not get vaccinated if the vaccine was available. The most significant correlation was between vaccine refusal and mistrust of the benefit of a COVID-19 vaccine. Female gender, whether completed full or partial college education as compared to did not complete, being unemployed, and minority status were all significant factors for vaccine refusal (17).

A Statistics Canada study, shared data from the Canadian Perspectives Survey Series (CPSS), which are representative of the Canadian population living in the ten provinces. 57.5 percent of the population indicated that they would very likely get a COVID-19 vaccine, whereas 19 percent reported they are somewhat likely to get vaccinated. Canadians who are older have higher levels of education are more likely to get a COVID-19 vaccine. However, Canadians concerned about vaccine safety, risks and side effects, were unlikely to get vaccinated (18).

Independent research by Angus Reid Institute reported that in December 2020, 48 percent of Canadians would get immunized immediately. This marked an 8 percentage-point increase from the previous month, whereas 31 percent would eventually get vaccinated but would wait, a 5-point decrease from the previous

month. People over 65 years of age were most likely to report eagerness to get immunized. People reporting they would wait to get vaccinated or not get a vaccine expressed concern for long-term side effects (19).

The Social Contours and COVID-19 survey in Saskatchewan, which captured data points over eight months, May to Dec 2020, reported an upward trend post-vaccine rollout in the province in its most recent report, where vaccine readiness stayed 80 percent throughout January 2021. Those who reported vaccine hesitancy (do not know if they would accept the vaccine), have less education, are female, newcomers (last 20 years) or Indigenous and report high or moderate risk to exposure in the past seven days (20).

The City of Calgary citizen perspective survey reported that 74 percent of Calgarians intended to get a COVID-19 vaccine when available to the public. Seniors (aged 65 or older) were more likely to intend to get a COVID-19 vaccine compared to younger Calgarians (21).

A rapid review of the literature to better understand the vaccine hesitancy resources developed for and offered to Primary Care teams across Canada reported that Primary Care physicians have little information to identify and address the sociocultural components of vaccine hesitancy. The gaps identified were resources not being specific to COVID-19 vaccines and not addressing the various sources or types of vaccine hesitancies (22).

### **Vaccine hesitancy In Healthcare Workers**

This section shares the available evidence related to vaccine hesitancy in healthcare workers' (HCW's). Addressing vaccine hesitancy in HCWs is critical as they can play an important role play in stimulating vaccine acceptance among hesitant patients (23)

A systematic review and meta-analysis of 11 studies (December 2020) on HCW's intention to accept COVID-19 vaccination reported that the acceptance for vaccination was 55.9 percent (24). Another survey of HCWs in France, French speaking Belgium and Quebec, Canada (October-November 2020) reported 'high' acceptance in 48.6 percent, moderate acceptance of 23 percent and hesitancy/reluctance in 28.4 percent (12). Similar results have been found for flu vaccines in health care workers.

The hesitancy among medical students in a U.S. university has been reported as 23 percent (11). In long-term care staff in a U.S. state, 45 percent of respondents indicated they would receive an approved COVID-19 vaccine as soon as available. Of those unwilling to take the vaccine when it is available, 44 percent would consider in the future. Similarly, a survey of HCWs, including clinical and non-clinical staff, researchers, and trainees (November-December 2020) in a medical university in U.S., showed that 80.4 percent of scientists and physicians agreed they would take the vaccine if offered, but 33.6 percent of registered nurses, 31.6 percent of allied health professionals (physical, occupational, and respiratory therapists, radiology technicians), and 32 percent of Master's level clinicians were unsure whether they would take the vaccine (25).

The willingness to get vaccinated was higher with the following associated factors; male gender (4,24–26), older age (4,24–27), being a physician, less work experience, comorbidities, acceptance of seasonal influenza vaccination (4,12,24), stronger vaccine confidence, positive attitude towards a COVID-19 vaccine, fear about COVID-19, individual perceived risk about COVID-19, and contact with suspected or confirmed COVID-19 patients (4,24,25). Hesitancy was mostly driven by vaccine safety concerns (12,26), perceived effectiveness (26), distrust in the ministry of health or public health experts to ensure vaccine safety (11,12), speed of vaccine development (26) and associated side-effects (12,27).

### **Measures to increase vaccine confidence/acceptance**

Measures that act as facilitators to increase vaccine confidence are; doctors' recommendation and motivation, opinion of families and friends, past inoculation history of influenza and MMR (Measles, Mumps, Rubella) vaccines (4). Multi-pronged approaches need to be designed, tailored to socio-political contexts, specific social groups and even individuals with specific characteristics, to yield the best results (3).

Context-specific designs need to assess and identify communication preferences, language needs, and build on local terminologies (3,5). Engaging in transparent dialogue and community engagement (5), co-designing strategies with citizens, healthcare-workers and working with trusted influencers are all strategies likely to improve uptake (3).

## Literature

**Table 1: Reviews, single studies and brief summaries**

Type of Evidence	Author	Resource	Last updated	Summary
Rapid Systematic Review (4)	Lin, C. et al	<a href="#">Confidence and Receptivity for COVID-19 Vaccines: A Rapid Systematic Review</a>	30 December 2020	<ul style="list-style-type: none"> <li>• Authors reviewed academic databases like PubMed, Embase, and PsycINFO, news, and official reports.</li> <li>• The study found a declining vaccine acceptance (from &gt;70% in March to &lt;50% in October) with demographic, socioeconomic, and partisan divides.</li> <li>• Common associated factors for acceptance were perceived risk of COVID-19, concerns over vaccine safety and effectiveness, doctors' recommendations, and inoculation history were common factors.</li> <li>• The unique COVID-19 factors included political party orientation, doubts toward expedited development/approval process, and perceived political interference.</li> </ul>
Rapid Review (5)	Mills, M. et al	<a href="#">COVID-19 vaccine deployment: Behaviour, ethics, misinformation and policy strategies</a>	21 October 2020	<ul style="list-style-type: none"> <li>• Electronic search conducted in Scopus, PubMed and Web of Science, the study also included pre-print and other material from MedRxiv, PsyRxiv, bioRxiv, SocRiv and media reports and books on the topics.</li> <li>• Behavioural factors that underpin vaccine uptake are: (1) complacency, (2) trust and confidence in efficacy and safety, (3) convenience, (4) sources of information; and (5) socio-demographic variation.</li> </ul>

				<ul style="list-style-type: none"> <li>• The uncertainties of vaccine uptake are associated with immune responses following vaccination, effectiveness, risks for various risk groups, duration of immunity, repeated vaccination, transmission dynamics, microbiological and clinical characteristics of the virus and multiple vaccines.</li> <li>• COVID-19 vaccine deployment faces an infodemic with misinformation in three ways: (1) distrust of science and selective use of expert authority; (2) distrust in pharmaceutical companies and government; and (3) straightforward explanations.</li> </ul>
Systematic Review (28)	Sallam, M. (3)	<a href="#">COVID-19 vaccine hesitancy worldwide: a systematic review of vaccine acceptance rates*</a>	4 January 2021	<ul style="list-style-type: none"> <li>• Electronic search conducted in PubMed/Medline.</li> <li>• Survey studies on COVID-19 vaccine acceptance rates in 33 different countries.</li> <li>• Vaccine acceptance rates in US, it was 56.9% in April, and ranged from 67.0% to 75.0% in May, and reached 75.4% in June.</li> </ul>
Systematic review & meta-analysis (24)	Galanis, P.A et al.	<a href="#">Intention of health care workers to accept COVID-19 vaccination and related factors: a systematic review and meta-analysis*</a>	11 December 2020	<ul style="list-style-type: none"> <li>• Authors conducted searches in PubMed, Medline, Scopus, Web of Science, ProQuest, CINAHL, and medRxiv.</li> <li>• 55.9% HCWs showed an intent to accept COVID-19 vaccination.</li> <li>• Associated factors to increase HCW willingness towards COVID-19 vaccine were male gender, older age, physician profession, fewer work experience, comorbidity among HCWs, seasonal influenza vaccination, stronger vaccine confidence, positive attitude towards a COVID-19 vaccine, fear about COVID-19, individual perceived risk about COVID-19, and contact with suspected or confirmed COVID-19 patients.</li> </ul>



<p>Rapid Systematic review and meta-analysis (7)</p>	<p>Robinson, E et al</p>	<p><a href="#">International estimates of intended uptake and refusal of COVID-19 vaccines: A rapid systematic review and meta-analysis of large nationally representative samples*</a></p>	<p>3 December 2020</p>	<ul style="list-style-type: none"> <li>• Review includes examination of intentions to be vaccinated against COVID- 19 in large nationally representative samples from PubMed, Scopus, and pre-print servers.</li> <li>• COVID-19 vaccination intentions vary substantially across countries, the percentage of the population intending to be vaccinated has declined across countries as the pandemic has progressed.</li> <li>• Reduced likelihood of intending to be vaccinated was found in female, younger, of lower income or education level and belonging to an ethnic minority group.</li> </ul>
<p>Rapid Review (3)</p>	<p>Hrynich, T. et al</p>	<p><a href="#">Vaccine Hesitancy and building confidence in COVID-19 vaccination</a></p>	<p>November 2020</p>	<ul style="list-style-type: none"> <li>• The study determines three Individual and group influences: 1) personal perceptions; 2) contextual influences (historic, socio-cultural, environmental, health system/institutional, economic or political factors); and 3) issues related to vaccine and vaccination.</li> <li>• Challenges associated with COVID-19 vaccine confidence are expedited development and novelty of COVID-19 vaccines, information and communication environments and efforts, politicisation of COVID-19 vaccine development and deployment.</li> <li>• Increasing vaccine confidence would need good politics to build public trust, creative communication and honest dialogues, acting together with trusted influencer, citizen and healthcare workers and monitoring vaccine confidence.</li> </ul>
<p>Rapid Review (22)</p>	<p>Pinto, N.et al</p>	<p><a href="#">COVID-19 Vaccine Hesitancy Conversations: A rapid review of resources available to</a></p>	<p>03 Feb 2020</p>	<ul style="list-style-type: none"> <li>• Authors conducted a rapid review of the literature to available to primary care teams across Canada.</li> </ul>

		<a href="#">Primary Care Teams across Canada</a>		<ul style="list-style-type: none"> <li>• Primary Care physicians have little information to assist in identifying and addressing the sociocultural components of vaccine hesitancy.</li> <li>• Three key gaps were found in the existing COVID-19 vaccine hesitancy resources: 1) resources tend to be information- or fact-based; 2) resources do not address the various sources or types of vaccine hesitancies clinicians are likely to encounter; and 3) resources are not specific to the COVID-19 vaccines.</li> </ul>
Narrative review (6)	Troiano, G. and Nardi, A.	<a href="#">Vaccine hesitancy in the era of COVID-19</a>	22 February 2021	<ul style="list-style-type: none"> <li>• Search for original peer-reviewed papers in the electronic database PubMed (MEDLINE)</li> <li>• 15 studies were included in the review. The percentage of COVID-19 vaccine acceptance was not so high (up to 86.1% students or 77.6% general population)</li> <li>• Several factors influenced the acceptance or refusal (ethnicity, working status, religiosity, politics, gender, age, education, income)</li> <li>• The most given reasons to refuse vaccine were being against vaccines in general, concerns about safety/thinking that a vaccine produced in a rush is too dangerous, considering the vaccine useless because of the harmless nature of COVID-19, general lack of trust, doubts about the efficiency of the vaccine, belief to be already immunized, doubt about the provenience of vaccine.</li> </ul>
Randomised Controlled Trial (13)	Loomba, S. et al	<a href="#">Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA</a>	05 February 2021	<ul style="list-style-type: none"> <li>• Authors conducted a randomized controlled trial in the UK and the USA.</li> <li>• The recent misinformation induced a decline in intent of 6.2 percentage points in the USA among vaccine acceptors.</li> </ul>

				<ul style="list-style-type: none"> <li>Misinformation impact varies across sociodemographic groups- females are less robust to misinformation, lower-income groups are less likely to lower their vaccination intent to protect themselves.</li> </ul>
Single study (17)	Taylor, S. et al	<a href="#">A Proactive Approach for Managing COVID-19: The Importance of Understanding the Motivational Roots of Vaccination Hesitancy for SARS-CoV2</a>	19 October 2020	<ul style="list-style-type: none"> <li>Authors conducted cross-sectional study with sample of 3,674 American and Canadian (May 2020).</li> <li>25 % American and 20% Canadian would not get vaccinated against SARS-CoV2 if a vaccine was available.</li> <li>The factors associated with vaccine rejection was most strongly correlated with mistrust of vaccine benefit, and also correlated with worry about unforeseen future effects, concerns about commercial profiteering from pharmaceutical companies, and preferences for natural immunity.</li> <li>The evidence for rigorous testing and safety of the vaccine were of greatest importance to promote uptake.</li> </ul>
Single study (8)	Khubchandani, J. et al	<a href="#">COVID-19 Vaccination Hesitancy in the United States: A Rapid National Assessment</a>	10 December 2020	<ul style="list-style-type: none"> <li>Community based sample of 1878 individuals in US. (June 2020).</li> <li>The survey found that 52% were very likely, 27% somewhat likely, 15% not likely and 7% definitely not (7%).</li> <li>In multiple regression analyses vaccine hesitancy was predicted significantly by sex, education, employment, income, having children at home, political affiliation, and the perceived threat of getting infected with COVID-19 in the next 1 year.</li> </ul>

Single study (12)	Verger, P. et al	<a href="#">Attitudes of healthcare workers towards COVID-19 vaccination: a survey in France and French-speaking parts of Belgium and Canada, 2020</a>	21 January 2021	<ul style="list-style-type: none"> <li>• Authors surveyed 2,678 healthcare workers (HCWs) in France, French speaking Belgium and Quebec, Canada.</li> <li>• 48.6% HCWs showed high acceptance, 23.0% moderate acceptance and 28.4% hesitancy/reluctance.</li> <li>• Hesitancy was mostly driven by vaccine safety concerns.</li> </ul>
Single study (9)	Ruiz, J. B., & Bell, R. A	<a href="#">Predictors of intention to vaccinate against COVID-19: Results of a nationwide survey</a>	4 January 2021	<ul style="list-style-type: none"> <li>• Authors did a nationwide online survey of 804 individuals in the U.S.</li> <li>• 14.8% of respondents being unlikely to get vaccinated and another 23.0% unsure.</li> <li>• The significant predictors of vaccination intent were general vaccine knowledge rejection of vaccine conspiracies, perceived severity of COVID-19, influenza vaccine uptake, having <math>\geq 5</math> pre-existing conditions, affluent household, identifying as a Democrat and not relying upon social media for virus information.</li> </ul>
Single study (29)	Kristyn Frank and Rubab Arim	<a href="#">Canadians' willingness to get a COVID-19 vaccine: Group differences and reasons for vaccine hesitancy</a>	25 August 2020	<ul style="list-style-type: none"> <li>• Over half of Canadians indicated that they are very likely (57.5%) to get a COVID-19 vaccine when it becomes available and an additional 19.0% reported that they are somewhat likely to get vaccinated.</li> <li>• Canadians who are older, have higher levels of education more likely to get a COVID-19 vaccine</li> <li>• Canadians who are unlikely to get vaccinated mostly concerned about vaccine safety, risks and side effects</li> </ul>
Single study (10)	Katie Atwell et al	<a href="#">Converting the maybes: Crucial for a successful</a>	20 January 2021	<ul style="list-style-type: none"> <li>• An online survey in May 2020 assessed Australian adults' willingness to receive a COVID-19 vaccine (yes, maybe, no).</li> </ul>

		<a href="#">COVID-19 vaccination strategy</a>		<ul style="list-style-type: none"> <li>• A multinomial logistical regression of responses (N = 1,313) was used to identify correlates of vaccine willingness between the three groups.</li> <li>• 65% were willing to vaccinate, with 27% being in the 'maybe' category.</li> <li>• Respondents were more likely to be in the 'maybe' than the 'yes' group when they perceived COVID-19 to be less severe, had less trust in science, were less willing to vaccinate for influenza, and were female.</li> <li>• They were more likely to be in the 'maybe' than 'no' group when they perceived COVID-19 as severe, and less likely to be a hoax, had more trust in science, and greater willingness to vaccinate for influenza.</li> <li>• A repeat of the survey in November 2020 with a subset of participants found fewer of them saying yes to the vaccine (56%) and more saying maybe (31%)</li> </ul>
Single study (26)	Rahul Shekhar et al	<a href="#">COVID-19 Vaccine Acceptance among Health Care Workers in the United States</a>	3 February 2021	<ul style="list-style-type: none"> <li>• cross sectional study to assess the attitude of HCWs (3479 responses) toward COVID-19 vaccination between 7 October and 9 November 2020.</li> <li>• 36% of respondents were willing to take the vaccine as soon as it became available while 56% were not sure or would wait to review more data.</li> <li>• Only 8% of HCWs do not plan to get vaccine.</li> <li>• Vaccine acceptance increased with increasing age, education, and income level.</li> <li>• A smaller percentage of female (31%), Black (19%), Lantinx (30%), and rural (26%) HCWs were willing to take the vaccine as soon as it</li> </ul>

				<p>became available than the overall study population.</p> <ul style="list-style-type: none"> <li>• Direct medical care providers had higher vaccine acceptance (49%).</li> <li>• Safety (69%), effectiveness (69%), and speed of development/approval (74%) were noted as the most common concerns regarding COVID-19 vaccination</li> </ul>
Single study (11)	Victoria C. Lucia et al	<a href="#">COVID-19 vaccine hesitancy among medical students</a>	29 December 2020	<ul style="list-style-type: none"> <li>• 23% of medical students were unwilling to take a COVID-19 vaccine immediately upon FDA approval.</li> <li>• Students willing to immediately take the vaccine were more likely to trust public health experts, have fewer concerns about side effects and agree with vaccine mandates (P &lt; 0.05).</li> <li>• Concern for serious side effects was independently predictive of lower odds of intent to participate in a COVID-19 vaccine trial (AOR = 0.41, P = 0.01).</li> </ul>
Single study (27)	Kathleen T. Unroe et al	<a href="#">Willingness of Long-Term Care Staff to Receive a COVID-19 Vaccine: A Single State Survey</a>	28 December 2020	<ul style="list-style-type: none"> <li>• Study conducted in Indiana Department of Health surveyed nursing home and assisted living facility staff.</li> <li>• Weighted frequencies and logit regression estimated characteristics associated with vaccine willingness.</li> <li>• Overall, 45% of respondents indicated they would receive an approved COVID-19 vaccine as soon as available. Of those unwilling to take the vaccine when first available, 44% would consider in the future.</li> <li>• Concerns about side effects was the primary reason for vaccine hesitancy (70%)</li> <li>• Characteristics associated with increased willingness were age over 60, male, and white race (P &lt; .0001)</li> </ul>

<p>Single study (25)</p>	<p>M., Shaw., J. et al</p>	<p><a href="#">Assessment of U.S. health care personnel (HCP) attitudes towards COVID-19 vaccination in a large university health care system</a></p>	<p>25 January 2021</p>	<ul style="list-style-type: none"> <li>• Cross-sectional survey of HCP, including clinical and non-clinical staff, researchers, and trainees (November-December 2020)</li> <li>• Overall, 57.5 % of individuals expressed intent to receive COVID-19 vaccine. 80.4% were physicians and scientists representing the largest group.</li> <li>• 33.6% of registered nurses, 31.6% of allied health professionals, and 32% of master’s level clinicians were unsure they would take the vaccine (p&lt;.001).</li> <li>• Respondents who were older, males, White, or Asian were more likely to get vaccinated compared to other groups.</li> <li>• Vaccine safety, potential adverse events, efficacy and speed of vaccine development dominated concerns listed by participants.</li> </ul>
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\*pre-print publication

## Registered Protocols and future studies on vaccine hesitancy

**Table 2: References and brief summaries**

Description	Review questions
<p><a href="#">International assessment of the link between COVID-19 related attitudes, concerns and behaviours in relation to public health policies: optimising policy strategies to improve health, economic and quality of life outcomes (the iCARE Study)</a></p>	<p>The overall objective of the iCARE Study is to assess public awareness, attitudes, concerns and behavioural responses to COVID-19 public health policies, and their impacts, on people around the world and to link behavioural survey data with policy, mobility and case data to provide behavioural science, data-driven recommendations to governments on how to optimise current policy strategies to reduce the impact of the COVID-19 pandemic. (30)</p>
<p><a href="#">COVID 19 Vaccine hesitancy: A protocol for systematic review and meta-analysis</a></p>	<p>The main objective of the study is to determine the pooled hesitancy rate for COVID 19 vaccine uptake globally. Review examines determinants of race, religion, location, occupation, socioeconomic class, level of education, and gender influencing COVID 19 hesitancy globally. It also studies the social media influence, misinformation and lack of information influence.</p>

<a href="#">Systematic review and meta-analysis on COVID-19 vaccine hesitancy</a>	The study examines the proportion of population, who would be hesitant to take a COVID-19 vaccine hesitancy or refusal of COVID-19 vaccination through the published and grey literature using multiple databases.
<a href="#">Determinants of COVID-19 vaccine acceptance: a systematic review and meta-analysis</a>	The study generates prevalence rates of the acceptance of a COVID-19 vaccine, and how the acceptance is associated with sociodemographic, and other contextual factors.
<a href="#">Understanding reluctance to vaccinate against COVID-19 in the United States, a systematic review protocol</a>	The study examines what are the motivators and deterrents for vaccine uptake across the United States and determines the associated factors with COVID-19 vaccine acceptance, also identifying profile of people who are willing to accept vaccination.

### Canadian Data/studies (provincial/federal)

**Table 3:**

<b>Source</b>	<b>Description</b>
<p><a href="https://spheru.ca/covid-19/socialcontours/frequently-asked-questions.php">https://spheru.ca/covid-19/socialcontours/frequently-asked-questions.php</a></p> <p><a href="https://spheru.ca/covid-19/socialcontours/covid-19-results.php">https://spheru.ca/covid-19/socialcontours/covid-19-results.php</a></p>	<p>Social Contours and COVID-19: Using metrics and data to guide the reopening and reintegration process.</p> <p>Nazeem Muhajarine and team from SPHERU (Saskatchewan Population Health and Evaluation Research Unit) has been conducting a panel survey, repeated every month since May 2020, in Saskatchewan related to COVID-19. This survey has four objectives: 1) collect behavioural, perceptual, social, and place-based data (i.e. how we act, think, interact, and move); 2) assign a COVID-19 risk level to people and places, over time; 3) identify lower- and higher-risk places in our communities; and 4) communicate this information to public health officials and to the general public. Vaccine readiness, hesitancy and refusal and their associated factors, over time, have been studied in this survey.</p>
<p><a href="https://www.calgary.ca/cfod/csc/citizen-satisfaction.html">https://www.calgary.ca/cfod/csc/citizen-satisfaction.html</a></p>	<p>Overview of COVID-19 Public Opinion Research Results for Calgary and Alberta</p> <p>Key findings</p> <p>Three-quarters of Calgarians (74%) report they intend to get a COVID-19 vaccine when it's available to the general public.</p>



	<ul style="list-style-type: none"> <li>• While 84% of seniors say they'll get vaccinated, 70% of 18- to 34-year-olds and 74% of those 35 to 64 say they intend to do so.</li> <li>• Calgarians who live in the southwest and northwest are more likely than those in the northeast to plan to get vaccinated (81% SW and 78% NW vs. 64% NE; 70% of SE residents intend to get vaccinated but this is not statistically significant from the other quadrants).</li> </ul>
<a href="https://www.scienceupfirst.com/en/who">https://www.scienceupfirst.com/en/who</a>	Collective of concerned scientists, researchers, information experts, health care providers, science communicators, and organizations providing ways to help people in Canada work together against misinformation
<a href="https://www.covid19resources.ca/">https://www.covid19resources.ca/</a>	Team of multidisciplinary Canadians with expertise ranging from biomedical research to web-development and business analysis, virtually working together to execute on COVID-19 Resources Canada's vision and mission.
<a href="#">MORNING STAR LODGE COVID-19 FACT SHEET &amp; THE PROTECTING OUR HOME FIRES STRATEGY</a>	Morning Star Lodge is launching a "Protecting Our Home Fires" Strategy to provide valuable information to Indigenous communities and the scientific community. These contributions of disseminating knowledge around the COVID-19 Pandemic are critical to inform Indigenous communities about the risks of infection and preventative techniques. The strategy includes a series of short informational YouTube videos to inform the public, as well as a "COVID-19 Fact Sheet for Indigenous Communities" that has a clinical focus and a "Protecting Our Home Fires" Information Sheet that has a more community-based focus.

## Guidelines on building vaccine confidence

**Table 3: References and brief description**

<b>Guidelines</b>	<b>Description</b>
<a href="#">Building Confidence in COVID-19 Vaccines Among Your Patients Tips for the Healthcare Team</a>	Developed by CDC COVID-19 Response Vaccine Task Force January 2021. Shares guidance on vaccine safety monitoring, elements of vaccine confidence, strategies for building vaccine confidence, strategies for talking with patients about COVID-19 vaccine

<a href="#">Achieving Acceptance of COVID-19 Vaccine</a>	Framework and guideline for Equitable Access of COVID-19 vaccination by the Committee on Equitable Allocation of Vaccine for the Novel Coronavirus, The National Academies of Sciences, Engineering, and Medicine. Chapter-7 details on achieving Acceptance of COVID-19 Vaccine
<a href="#">Guidance on developing a national deployment and vaccination plan for COVID-19 vaccines</a>	The WHO Guidance on National Deployment and Vaccination Planning advise countries on how to develop evidence-based demand planning for vaccine introduction. Chapter-9 on vaccine uptake and demand share strategies to promote COVID-19 vaccination and manage expectations. Highlight how building trust and managing misinformation is key to achieving acceptance and uptake of COVID-19 vaccines.
<b>Canadian</b>	<b>Description</b>
<a href="#">Vaccine Hesitancy Resources for Physicians in Canada</a>	Summary of Vaccine Hesitancy Resources for Physicians in Canada. Prepared by Pinto, Fadaak, Leslie 2021, School of Public Policy, University of Calgary.

### Internet resources:

**Table 4: Internet resources and brief descriptions**

<b>Websites with infographics on vaccine hesitancy</b>	<b>Description</b>
<a href="https://ccp.jhu.edu/kap-COVID/vaccine-acceptance/">https://ccp.jhu.edu/kap-COVID/vaccine-acceptance/</a>	Explores the data on vaccine acceptance from 67 countries, including how acceptance has changed over time and who has the greatest potential to influence those who are vaccine hesitant.
<a href="https://www.visualcapitalist.com/visualizing-global-attitudes-towards-COVID-19-vaccines/">https://www.visualcapitalist.com/visualizing-global-attitudes-towards-COVID-19-vaccines/</a>	Using survey data from eight different countries, <a href="#">Global Web Index</a> the infographic illustrates how typical attitudes towards vaccines differ depending on a range of factors, such as age, income, lifestyle, and values.

## Research funded in Canada related to vaccine hesitancy:

**Table 5: Affiliation and description of research topics**

PI (first author)	University/Institute	Title & Objectives
Inés Colmegna	McGill University	Title: Preparing Adults for COVID-19 Vaccine – PROVIDE-A Objectives: 1) assessing current perceptions and beliefs about COVID vaccines; 2) informing and engaging community members and health care workers empowering them as trustworthy and responsible sources of information on COVID-19 vaccines; and 3) developing a decision aid tool tailored to and targeting specific at risk and under-vaccinated groups.
Zeev Rosberger	McGill University	Title: Enhancing COVID-19 Vaccination Intentions by Eliciting Prosocial Altruistic Motives: Evaluating the Efficacy of a Brief Video-Based Intervention. Objectives: Increasing vaccination rates in younger adults, using video-based interventions and before and after survey.
Ian Gold	McGill University	Title: Overcoming COVID-19 Vaccine Hesitancy. Objectives: The purpose of this project is to investigate Canadians' attitudes to a COVID vaccine and develop a trust-based strategy for increasing uptake of the vaccine once it is available.
Moshe Ben-Shoshan	McGill University	Title: COVERS: COVID Vaccine Evaluation of Resources and Solutions. Objectives: The study will determine the main barriers and solutions for COVID-19 vaccine administration, we will develop educational videos and a position paper that will summarize our recommendations.
Nadine Kronfli	McGill University	Title: The design, delivery, and evaluation of an educational intervention to increase COVID-19 vaccine uptake for incarcerated Canadian populations. Objectives: To increasing COVID-19 vaccine uptake among people incarcerated in prison, Using educational intervention and impact assessment.

Kimmelman, Jonathan	McGill University	<p>Title: Expert and Lay Perceptions of Translation of COVID19 Treatment and Vaccine Development.</p> <p>Objectives: To compare how well researchers' estimates of when COVID-19 treatments will be available align to the perceptions of the Canadian and US populations. The results of this study will help develop more effective communications regarding COVID-19 treatments to the Canadian and US public to ensure they have the best and most accurate information.</p>
MacDonald, Shannon E et al	University of Alberta	<p>Title: Vaccination in a pandemic: The impact on routine vaccinations and future COVID-19 vaccine acceptance.</p> <p>Objectives: 1) Assessing how provincial and territorial health systems are delivering routine vaccinations during the pandemic, and then measuring whether less/more people are getting vaccinated with routine vaccines during the pandemic 2) Examining public acceptability of new COVID-19 vaccines and the determinants of acceptability.</p>
Bettinger, Julie A; Weissinger, Sandra	University of British Columbia	<p>Title: Unpacking Vaccine Hesitancy among Perinatal Healthcare Providers: Influences on Beliefs and Practices.</p> <p>Objectives: This study uses qualitative (interviews, digital ethnography) to better understand the influence of information on social media on parents' decision-making about vaccination in Canada.</p>
Halperin, Scott A et al	Dalhousie University (Nova Scotia)	<p>Title: Canadian Immunization Research Network: COVID-19 Vaccine Readiness.</p> <p>Objectives: The research will address four areas; COVID-19 vaccine clinical trials, population prioritization and modeling, vaccine hesitancy and uptake, and coordination and information sharing.</p>
Bacon SL, Lavoie KL, Boyle J, et al.	Concordia University and Université du Québec à Montréal	<p>Title: International assessment of the link between COVID-19 related attitudes, concerns and behaviours in relation to public health policies: optimising policy strategies to improve health, economic and quality of life outcomes (the iCARE Study)</p> <p>Objectives: The overall objective of the iCARE Study is to assess public awareness, attitudes, concerns and behavioural responses to COVID-19 public health policies, and their impacts, on people around the world and to link behavioural survey data with policy, mobility and case data to provide behavioural science, data-driven recommendations to governments on how</p>

		to optimise current policy strategies to reduce the impact of the COVID-19 pandemic.
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**Table 1: List of experts on Vaccine hesitancy**

<b>Expert name (title; affiliation)</b>	<b>Resource</b>	<b>Expertise</b>	<b>Research involvement</b>	<b>Contact information</b>
Cheryl Lin (PhD, Policy and Organizational Management Program, Duke University)	<a href="#">Confidence and Receptivity for COVID-19 Vaccines: A Rapid Systematic Review</a>	Political Science	Teaching seminars on service marketing & consumer behavior.	Duke University Policy & Organizational Management Program 2204 Erwin Rd., Box 90402 Durham, NC USA 27708-0402  Email: <a href="mailto:C.Lin@duke.edu">C.Lin@duke.edu</a>
Pikuei Tu (PhD, Policy and Organizational Management Program, Duke University)	<a href="#">Confidence and Receptivity for COVID-19 Vaccines: A Rapid Systematic Review</a>	Political Science	Teaching seminars on public sector issues.	Duke University Policy & Organizational Management Program 2204 Erwin Rd. Box 90402 Durham, NC USA 27708-0402 Email: <a href="mailto:pikuei.tu@duke.edu">pikuei.tu@duke.edu</a>
Eve Dubé Department of Anthropology Faculty of Social Sciences, Université Laval		Medical Anthropologist	Socio-cultural field surrounding infectious diseases prevention. Special interest in vaccine hesitancy.	Department of Anthropology Faculty of Social Sciences, Université Laval 2400, avenue d'Estimauville 3e étage Québec, Québec Canada G1E 7G9 Email: <a href="mailto:Eve.Dube@inspq.qc.ca">Eve.Dube@inspq.qc.ca</a>
Leslie M. Beitsch (MD, JD, Department of Behavioral Sciences and Social Medicine, Florida State University College of Medicine)	<a href="#">Confidence and Receptivity for COVID-19 Vaccines: A Rapid Systematic Review</a>	health policy and public health	Bioterrorism, Health Care, Health Care Financing, Influenza, Medicaid and Uninsured, Population Health, Public Health Law, Social Determinants, Tobacco Dependency	Department of Behavioral Sciences and Social Medicine, Florida State University College of Medicine, 1115 W. Call St, Tallahassee, FL 32306, USA Phone: (850) 645-1830 Email: <a href="mailto:les.beitsch@med.fsu.edu">les.beitsch@med.fsu.edu</a>

Melinda Mills (FBA, MBE, University of Oxford, Leverhulme Centre for Demographic Science)	<a href="#">COVID-19 vaccine deployment: Behaviour, ethics, misinformation and policy strategies</a>	Sociology	demography, family sociology, quantitative methods, health and well-being, genetics, social inequality	Phone: +44 01865 281740 Email: <a href="mailto:melinda.mills@sociology.ox.ac.uk">melinda.mills@sociology.ox.ac.uk</a>
Malik Sallam (MD, PhD, Department of Pathology, Microbiology and Forensic Medicine, School of Medicine, the University of Jordan, Amman, Jordan)	<a href="#">COVID-19 vaccine hesitancy worldwide: a systematic review of vaccine acceptance rates*</a>	Laboratory Medicine/Clinical Virology		Email: <a href="mailto:malik.sallam@ju.edu.jo">malik.sallam@ju.edu.jo</a>
Eric Robinson (Department of Psychology, Eleanor Rathbone Building, University of Liverpool)	<a href="#">International estimates of intended uptake and refusal of COVID-19 vaccines: A rapid systematic review and meta-analysis of large nationally representative samples*</a>		Obesity, eating, drinking, psychology, nutrition	Department of Psychology, Eleanor Rathbone Building, University of Liverpool Liverpool, L69 7ZA, UK Email: <a href="mailto:eric.robinson@liv.ac.uk">eric.robinson@liv.ac.uk</a>
Michael Daly (Department of Psychology, Maynooth University, Co. Kildare, Ireland)	<a href="#">International estimates of intended uptake and refusal of COVID-19</a>	Psychology/Behavioral Science	health psychology, personality, mental health, obesity	John Hume Building, Maynooth University, Maynooth, Ireland TEL: +353(0)14747742 Email: <a href="mailto:michaeldaly1@gmail.com">michaeldaly1@gmail.com</a>
Tabitha Hrynick (Institute of Development Studies, UK)	<a href="#">Vaccine Hesitancy and building confidence in</a>	Research Officer	Development Studies, Health, Gender, Accountability, Technology	Email: <a href="mailto:t.hrynick@ids.ac.uk">t.hrynick@ids.ac.uk</a>

	<a href="#">COVID-19 vaccination</a>			
Myles Leslie (MD, PhD, Assistant Professor, School of Public Policy, Community Health Sciences, University of Calgary)	<a href="#">Vaccine Hesitancy and building confidence in COVID-19 vaccination</a>	patient engagement and health services researcher	Quality Improvement, Ethnography	Email: <a href="mailto:myles.leslie@ucalgary.ca">myles.leslie@ucalgary.ca</a>
Gianmarco Troiano (MD, UOSD Vaccinations, ASST Melegnano e della Martesana, Italy)	<a href="#">Vaccine hesitancy in the era of COVID-19</a>			UOSD Vaccinations, ASST Melegnano e della Martesana, Via Pandina1 20070 Vizzolo Predabissi (MI) Italy. Mobile: (+39) 347-9512771 Email: <a href="mailto:gianmarco-89@hotmail.it">gianmarco-89@hotmail.it</a> <a href="mailto:gianmarco.troiano@asst-melegnano-martesana.it">gianmarco.troiano@asst-melegnano-martesana.it</a>
Alexandre de Figueiredo (The Vaccine Confidence Project, Department of Infectious Disease Epidemiology, London School of Hygiene and Tropical Medicine, London, UK)	<a href="#">Measuring the impact of COVID-19 vaccine</a>		applied statistics, probabilistic modelling, vaccine hesitancy, public health	Email: <a href="mailto:a.figueiredo@imperial.ac.uk">a.figueiredo@imperial.ac.uk</a>
Jeffrey V. Lazarus, Barcelona Institute for Global Health (ISGlobal), Hospital Clínic, University of Barcelona, Barcelona, Spain	<a href="#">A global survey of potential acceptance of a COVID-19 vaccine</a>			E-mail: <a href="mailto:jeffrey.lazarus@isglobal.org">jeffrey.lazarus@isglobal.org</a>
Douglas L. Kriner, PhD, Department of Government, Cornell University	<a href="#">Factors Associated with US Adults' Likelihood of Accepting COVID-19 Vaccination</a>			Douglas L. Kriner, PhD, Department of Government, Cornell University, 209 White Hall, Ithaca, NY 14850 Email: <a href="mailto:kriner@cornell.edu">kriner@cornell.edu</a>
Steven Taylor, University of British Columbia	<a href="#">A Proactive Approach for Managing COVID-</a>	Psychology	Steven Taylor is a Professor and Clinical Psychologist in the	Department of Psychiatry, The University of British Columbia, Vancouver, BC, Canada

Vancouver, Canada	<a href="#">19: The Importance of Understanding the Motivational Roots of Vaccination Hesitancy for SARS-CoV2</a>		Department of Psychiatry at the University of British Columbia, Vancouver, Canada. Dr. Taylor's work focuses on anxiety disorders and also on the psychology of pandemics.	Address: Detwiller Pavilion 1818 2255 Wesbrook Mall Vancouver, V6T2A1 Tell: 604-822-7331 Email: <a href="mailto:steven.taylor@ubc.ca">steven.taylor@ubc.ca</a> <a href="https://www.drsteventaylor.com/">https://www.drsteventaylor.com/</a>
Kimberly A. Fisher, MD, MSc, UMMHC University	<a href="#">Attitudes Toward a Potential SARS-CoV-2 Vaccine</a>			, UMMHC University Campus, 55 Lake Avenue North, Worcester, MA 01655; e-mail, <a href="mailto:Kimberly.Fisher@umassmemorial.org">Kimberly.Fisher@umassmemorial.org</a> .
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<p>Julia W. Wu, Department of Epidemiology, Harvard TH Chan School of Public Health, Boston, MA, USA</p>	<p><a href="#">COVID-19 vaccine acceptance among pregnant women and mothers of young children:</a></p>			<p>Email: <a href="mailto:wwu@hsph.harvard.edu">wwu@hsph.harvard.edu</a></p>

	<a href="#">results of a survey in 16 countries</a>			
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Jana Shaw Division of Infectious Diseases, Department of Pediatrics, SUNY Upstate Medical University, Syracuse, New York, USA	<a href="#">Assessment of U.S. health care personnel (HCP) attitudes towards COVID-19 vaccination in a large university health care system</a>			Correspondence: J. Shaw, Department of Pediatrics, Division of Infectious Diseases, State University of New York Upstate Medical University, Golisano Children's Hospital, 750 East Adams Street, Syracuse, NY 13210 Email: <a href="mailto:shawja@upstate.edu">shawja@upstate.edu</a>

Other Canadian scientists working on vaccine hesitancy (as suggested by CanCOVID community member):

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2. Joe Schwarcz (McGill Office of Science and Society)
3. Colette Brin (ULaval)
4. Kathryn Hill (MediaSmarts)
5. Jonathan Jarry (McGill Office of Science and Society)
6. Jonathan Stea (UCalgary)
7. Heidi Tworek (UBC)
8. Gordon Pennycook (URegina)
9. Allyson Gallant (Dalhousie)

10. Elissa Abrams (UManitoba)
11. Ian Mosby (RyersonU)
12. Jaris Swidrovich (USaskatchewan)
13. Helen Monkman (UVictoria)
14. Janet McElhaney (Laurentian U)
15. Arnaud Gagneur (USherbrooke)
16. Kathryn Morrison (McGill U)
17. Colleen Flood (UOttawa)
18. Holly Witteman (ULaval)
19. Nicole Basta (McGill)
20. Gordon Asmundson (URegina)
21. Noni MacDonald (Dalhousie U)
22. Samantha Meyer (UWaterloo)

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