RESEARCH PAPER

COVID-19 Vaccine's Speed to Market and Vaccine Hesitancy: A Cross-Sectional Survey Study

Rapidité de mise en marché du vaccin contre la COVID-19 et hésitation à se faire vacciner : une étude transversale

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Abstract
Background: This paper aims to assess the extent to which the COVID-19 vaccine's speed to market affected Canadian residents' decision to remain unvaccinated.
Method: A cross-sectional survey conducted in late 2021 asked participants whether they had received the vaccine and their reasons for abstaining.
Results: Of the 2,712 participants who completed the survey, 8.9% remained unvaccinated. Unvaccinated respondents who selected "They made the vaccine too fast" (59.8%), were significantly more likely to identify as white, believe that the COVID-19 pandemic was not serious and have an unvaccinated social circle.
Conclusion: Should the COVID-19 vaccine rapid regulatory process be expanded, more patients may refuse treatment than if traditional timelines are followed.

Résumé
Contexte : Le présent document vise à évaluer dans quelle mesure la rapidité de mise en marché du vaccin contre la COVID-19 a influé sur la décision des résidents canadiens de ne pas se faire vacciner.
Méthode : Un sondage transversal mené à la fin de 2021 demandait aux répondants s'ils avaient reçu le vaccin et les raisons de leur abstention, le cas échéant.
Résultats : Parmi les 2 712 participants qui ont répondu au sondage, 8,9 % n'étaient pas vaccinés. Les répondants non vaccinés qui ont indiqué comme raison de leur refus que « le vaccin avait été fabriqué trop rapidement » (59,8 %), étaient beaucoup plus susceptibles de s'identifier comme étant blancs, de croire que la pandémie de COVID-19 n'était pas grave et d'avoir un cercle social non vacciné.
Conclusion : Un plus grand nombre de patients pourraient refuser un traitement, si le processus de réglementation rapide du vaccin contre la COVID-19 était largement adopté plutôt que de suivre les échéanciers traditionnels.

Introduction
Vaccine hesitancy is a critical issue for the control and mitigation of infectious diseases and was a point of controversy during the COVID-19 pandemic. Vaccine hesitancy has been defined as "the reluctance or refusal to vaccinate despite the availability of vaccines"

(WHO 2019) and presents as both an attitude (e.g., concerns about the safety of vaccines) and a behaviour (e.g., refusing to receive a vaccine) (Dubé et al. 2016). The causes of vaccine hesitancy are complex and in high-income countries, vaccine hesitancy is particularly impacted by social media, the spread of misinformation and changing attitudes regarding science (Dubé et al. 2013; Kennedy 2020). The main concern regarding vaccines in these countries is safety (Kennedy 2020).

An issue that began to arise in the media during the COVID-19 pandemic is the belief that the vaccine development was rushed. A narrative review published in 2021 noted that of those who refused to receive the COVID-19 vaccine, some believed that the vaccine development was hurried and, therefore, dangerous (Troiano and Nardi 2021). A Canadian survey conducted in December 2020 found that timing affects willingness to take the vaccine: the longer it takes for a vaccine to become available, the more likely people are to take it immediately (Kennedy et al. 2021). Yet another study conducted in May 2021 noted that in vaccine-hesitant Canadians, the most common concern was that the fast production of the vaccine compromised its safety (Piltch-Loeb et al. 2021).

Survey studies (Kennedy et al. 2021; Piltch-Loeb et al. 2021; Troiano and Nardi 2021) on COVID-19 vaccine hesitancy that assessed the speed-to-market concern were conducted in the Canadian population either prior to vaccine approval or prior to the vaccine being widely available, and no such surveys to our knowledge have been conducted after the COVID-19 vaccine became widely available. By November 2021, COVID-19 vaccines had been available for all Canadian adults for several months, yet uptake had begun to plateau following the introduction of vaccine mandates. This timing is important because individuals still abstaining at this point during the pandemic (November to December 2021) were likely committed to their position with their reasoning being top of mind. The motivation for the current study was to survey the Canadian population from November to December, 2021, to assess (i) the extent to which the vaccine's speed to market was still a persisting motivation for some Canadians to remain unvaccinated and (ii) whether there were any unique socio-demographic characteristics as compared with other unvaccinated individuals and survey respondents.

Methods

Study population

This cross-sectional study was conducted among residents of Canada between November 16, 2021, and December 23, 2021. AskingCanadians, an online data collection company, executed the survey (AskingCanadians 2023). AskingCanadians has more than one million Canadians in their panel who come from ranging socio-economic strata and are motivated to take part in AskingCanadians' surveys in order to earn rewards, such as Hudson's Bay Rewards, Aeroplan Miles, Petro-Points or VIA Préférence points (AskingCanadians 2023). The University of Calgary research team was not involved in compensating the AskingCanadians survey participants.

Potential participants were selected to be nationally representative based on province of residence, biological sex, income level and visible minority status. Study participants were 18 years and older. The cohort sample size aimed for 2,500 survey responses as this sample would provide sufficiently precise estimates while fitting within the practical considerations of this study.

Questionnaire

The survey asked participants whether they had received a COVID-19 vaccine and the reasons why or why not. Questions also assessed various beliefs, values and attitudes toward COVID-19 and the COVID-19 vaccine, such as how participants viewed the threat of COVID-19 and whether their social circle was vaccinated. Basic socio-demographic questions were also asked. The questionnaire was based upon similar questionnaires used in other survey studies regarding COVID vaccinations (Clarke et al. 2021; Merkley and Loewen 2022; Owen et al. 2020). The questionnaire was tested by the research team and translated into the French language. AskingCanadians provided the translation, which was not back translated.

Participants were asked, "Which of the following factors helped you decide to not get the COVID-19 vaccine?" They were asked to select all statements that applied from a list (for the full list of options, see Appendix 1: Table A1, available online at www.longwoods.com/content/27153). Statements were divided into different categories: accessibility; social factors; beliefs, values and experiences; marketing factors and others. All response choices within each category were visible on the same page in random order without scrolling. Respondents were able to see these categorizations. Options within each category and the order of categories were also randomized. Participants were able to select category titles, which would select all options in that category. One option in the "beliefs, values and experiences" category was "They made the vaccine too fast" (for the full list of options, see Appendix 1: Table A2, available online at www.longwoods.com/content/27153).

Participants were also asked two open-ended questions to which they were able to type their responses:

- Did any other factors not stated help you decide not to get partially or fully vaccinated against COVID-19 vaccine? Please explain.
- Do you have alternative ideas you would like to share on how access to COVID vaccines should have been organized when supply was limited?

For data quality purposes, all respondents who completed the survey faster than 30% of the median survey length were automatically excluded from the sample. In addition, open-ended questions were assessed, and the cases where respondents provided a low-quality answer were removed. This was conducted by the AskingCanadians team.

Data analysis

Data were collected directly in an online platform and exported as a CSV file. Descriptive statistics were reported with data visualization created in the ggplot package using R. Respondents were divided into two main groups: vaccinated and unvaccinated. Unvaccinated respondents were further divided into those who answered "Yes" to "They made the vaccine too fast" and those who did not. Socio-demographic factors were also divided into two categories to allow for Chi-squared testing (e.g., age was divided into "Under 65" and "65 years and older"). The socio-demographic factors we chose to assess were based on research about the COVID-19 vaccine and social networks and included ethnicity, age, education, income, rurality and immigration status (Al-Jayyousi et al. 2021).

Chi-squared tests were performed in Stata (version 15, 2017) to distinguish statistically significant differences ($p < 0.05$). Three main Chi-squared tests were performed: one to compare socio-demographic factors; second to compare participants' views on the threat of COVID-19; and third to compare the vaccination status of participants' social circles. Vaccinated and unvaccinated respondents were compared with each other; unvaccinated respondents who answered "Yes" to "They made the vaccine too fast" were compared with respondents who did not. Another Chi-squared analysis was done to determine whether "They made the vaccine too fast" was associated with any other possible responses.

Open-ended responses were read to see whether respondents commented on COVID-19 vaccine's speed to market.

Ethics

Ethics approval was obtained from the Conjoint Health Research Ethics Board at the University of Calgary (Ethics ID: REB21-1535). All data transferred by AskingCanadians were deidentified, anonymized and tokenized before being sent to the University of Calgary team for analysis.

Results

Between November 13, 2021 and December 23, 2021, a total of 4,445 potential participants accessed the survey and 2,712 (61%) participants completed the full questionnaire. Among the study participants, 8.9% ($n = 241$) were unvaccinated at the time of the study. Compared with vaccinated respondents, unvaccinated respondents were significantly more likely to identify as white (80.5% vs. 71.8%, $p = 0.004$), were younger than 65 years of age (78.4% vs. 70.8%, $p = 0.013$) and a Canadian citizen (95.0% vs. 91.3%, $p = 0.048$). They were also less likely to be college educated (49.8% vs. 61.8%, $p < 0.001$), have an annual income of more than $50,000 (18.7% vs. 30.4%, $p < 0.001$) and be living in an urban location (70.5% vs. 82.6%, $p < 0.001$) (Table 1).

TABLE 1. Socio-demographic factors of unvaccinated vs. vaccinated respondents

Characteristic	Unvaccinated (n = 241)	Vaccinated (n = 2,471)	p-values
Ethnicity			
White	80.5% (n = 194)	71.8% (n = 1,773)	p = 0.004
Non-white	19.5% (n = 47)	28.2% (n = 698)	
Age			
Under 65 years of age	78.4% (n = 189)	70.8% (n = 1,750)	p = 0.013
65 years and older	21.6% (n = 52)	29.2% (n = 721)	
Education†			
High school or less	48.6% (n = 117)	37.7% (n = 931)	p < 0.001
College-educated	49.8% (n = 120)	61.8% (n = 1,527)	
Income†			
Less than $50,000	68.1% (n = 164)	57.6% (n = 1,423)	p < 0.001
More than $50,000	18.7% (n = 45)	30.4% (n = 752)	
Rurality			
Rural	29.5% (n = 71)	17.4% (n = 430)	p < 0.001
Urban	70.5% (n = 170)	82.6% (n = 2,041)	
Immigrant status			
Canadian citizen	95.0% (n = 229)	91.2% (n = 2,253)	p = 0.048
Permanent resident/ non-citizen	5.0% (n = 12)	8.7% (n = 214)	

† Some participants chose "prefer not to say."

Characteristics of unvaccinated individuals who selected "They made the vaccine too fast"

Among unvaccinated individuals (n = 241), 59.8% (n = 144) selected "They made the vaccine too fast" as one of their reasons for being unvaccinated. There were no significant differences between those who answered "Yes" and those who did not, based on age, education, income, rurality and immigration status. However, significantly more unvaccinated individuals who identified as white selected "They made the vaccine too fast" as compared with other unvaccinated individuals (85.4% [n = 123/144] vs. 73.2% [n = 71/97], p = 0.019) (Table 2).

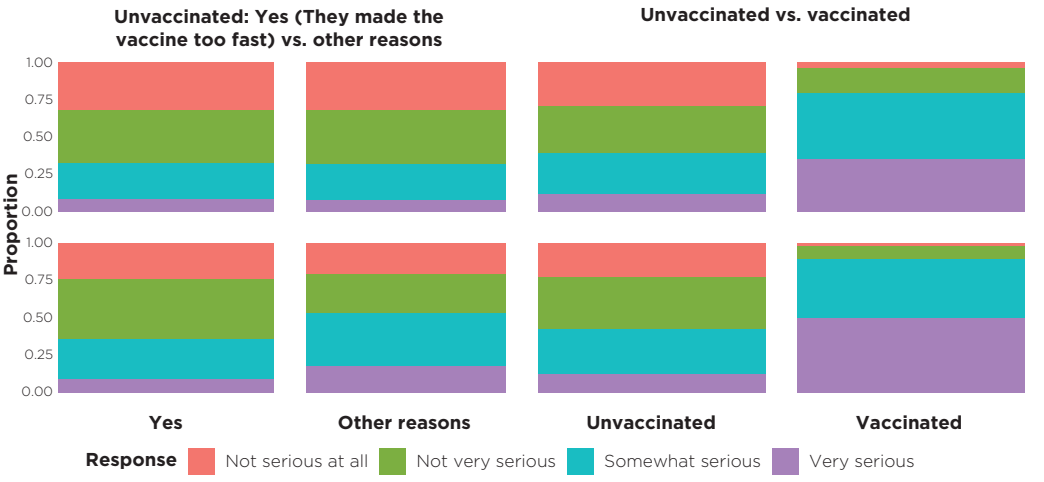
Respondents who were unvaccinated were significantly more likely to view the pandemic as a "Not very serious" or "Not serious at all" threat to themselves (p < 0.001) or to Canada (p < 0.001) as compared with their vaccinated peers (Figure 1; Table A3, available online at www.longwoods.com/content/27153). Those selecting "They made the vaccine too fast" as a reason for vaccine abstinence were also significantly more likely to report the view that the pandemic was a "Not very serious" or "Not serious at all" threat to themselves (p = 0.023) or to Canada (p = 0.006) as compared to all other unvaccinated respondents.

TABLE 2. Socio-demographic characteristics of unvaccinated respondents who selected "They made the vaccine too fast" vs. other reasons

Characteristic	"They made the vaccine too fast." Yes (*n* = 144)	Other reasons (*n* = 97)	*p*-values
Ethnicity			
White	85.4% (*n* = 123)	73.2% (*n* = 71)	*p* = 0.019
Non-white	14.6% (*n* = 21)	26.8% (*n* = 26)	
Age			
Under 65 years of age	77.8% (*n* = 112)	79.4% (*n* = 77)	*p* = 0.767
65 years and older	22.2% (*n* = 32)	20.6% (*n* = 20)	
Education†			
High school or less	47.2% (*n* = 68)	50.5% (*n* = 49)	*p* = 0.491
College-educated	52.1% (*n* = 75)	46.4% (*n* = 45)	
Income†			
Less than $50,000	68.1% (*n* = 98)	68.0% (*n* = 66)	*p* = 0.612
More than $50,000	17.4% (*n* = 25)	20.6% (*n* = 20)	
Rurality			
Rural	31.9% (*n* = 46)	25.8% (*n*= 25)	p *p* = 0.303
Urban	68.1% (*n* = 98)	74.2% (*n* = 72)	
Immigrant status			
Canadian citizen	97.2% (*n* = 140)	91.8% (*n* = 89)	*p* = 0.056
Permanent resident/ non-citizen	2.8% (*n* = 4)	8.2% (*n* = 8)	

† Some participants chose "prefer not to say.

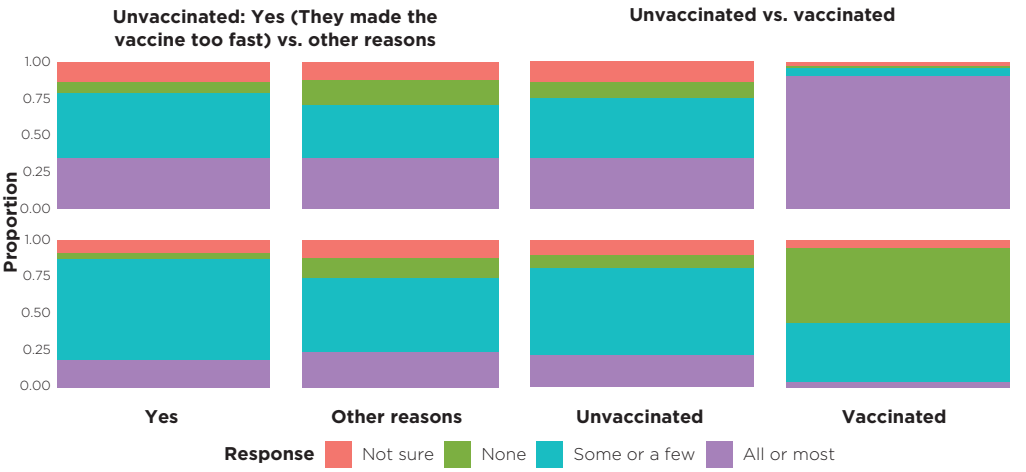
FIGURE 1. Respondents' views on the seriousness of the COVID-19 pandemic for themselves or for Canada



There was a considerable difference in the views between vaccinated and unvaccinated respondents on the seriousness of the COVID-19 pandemic for Canada (row 1) and for themselves (row 2). Far more unvaccinated respondents viewed the pandemic as either "Not serious at all" or "Not very serious" as compared to their vaccinated peers (right column). Among the unvaccinated, those who selected "They made the vaccine too fast," were also more likely to view the pandemic as either "Not serious at all" or "Not very serious" than those not selecting this factor as a reason for their choice to remain unvaccinated. The underlying data for Figure 1 is reported in Table A3.

Respondents' vaccination status was reflected in their social circles (Figure 2; Table A4, available online at www.longwoods.com/content/27153). The unvaccinated were significantly more likely to report that "All or most" or "Some or a few" in their social circles were also unvaccinated as compared to vaccinated respondents ($p < 0.001$). As compared to all other unvaccinated respondents, those indicating vaccine speed as a motivation for vaccine abstinence were significantly more likely to report that "All or most" or "Some or a few" in their social circles were also unvaccinated ($p = 0.007$).

FIGURE 2. Vaccinations among respondents' social networks



Whether respondents were vaccinated or unvaccinated themselves was somewhat reflective of their social circles. Far fewer unvaccinated respondents knew that "All or most" in their social circles had been vaccinated (right column). However, among the vaccinated, those who selected "They made the vaccine too fast," were also more likely to have reported that either "All or most" or "Some or a few" in their social circles were vaccinated. The underlying data for Figure 2 is reported in Table A4.

Other reasons for remaining unvaccinated

The median number of factors selected was seven. Nearly all participants who identified vaccine speed to market as a reason for remaining unvaccinated also selected other factors (only two selected vaccine speed to market as their only reason). "They made the vaccine too fast" was the third-most common reason for declining the vaccine (Table 3). Other reasons were "I am opposed to the government forcing us to get vaccinated" (63.1% of unvaccinated participants, $n = 152$), "I do not want to be a guinea pig" (60.6%, $n = 146$), "I don't trust the government" (55.6%, $n = 138$) and "The risk of side effects outweighs the risk of having COVID-19" (52.3%, $n = 126$). Answering "They made the vaccines too fast" was significantly associated with all four of these other reasons ($p < 0.001$).

Qualitative responses

Participants were also asked if there were any other factors that helped them decide not to get vaccinated. Of people who said the vaccine was made too quickly, one respondent wrote that the vaccine was "Too new." Of all unvaccinated participants, a few highlighted issues

TABLE 3. Other reasons for remaining unvaccinated selected by those who selected "They made the vaccine too fast"

Top five reasons for not receiving the vaccine (*n* = 241)	
Reasons for not receiving the vaccine	**Total**
I am opposed to the government forcing us to get vaccinated.	63.0% (*n* = 152)
I do not want to be a guinea pig.	60.6% (*n* = 146)
They made the vaccine too fast.	59.8% (*n* = 144)
I do not trust the government.	57.3% (*n* = 138)
The risk of side effects outweighs the risk of having COVID-19.	52.3% (*n* = 126)

Associations between "They made the vaccine too fast" and other top reasons for remaining unvaccinated			
They made the vaccine too fast	**Yes (*n* = 144)**	**No (*n* = 97)**	***p*-value**
I am opposed to the government forcing us to get vaccinated			
Yes	82.6% (*n* = 119)	34.0% (*n* = 33)	<0.001
No	17.4% (*n* = 25)	66.0% (*n* = 64)	
I do not want to be a guinea pig			
Yes	86.1% (*n* = 124)	22.7% (*n* = 22)	<0.001
No	13.9% (*n* = 20)	77.3% (*n* = 75)	
I do not trust the government			
Yes	79.2% (*n* = 114)	24.7% (*n* = 24)	<0.001
No	20.8% (*n* = 30)	75.3% (*n* = 73)	
The risk of side effects outweighs the risk of having COVID-19			
Yes	65.3% (*n* = 94)	33.0% (*n* = 32)	<0.001
No	34.8% (*n* = 50)	67.0% (*n* = 65)	

with the vaccine's speed to market. Different respondents wrote that it was "not developed and tested properly," there was "lack of full [disclosure] of the pros and cons of the vaccines" and "they do not tell the full truth about [vaccines]." One participant specifically mentioned that they "can't trust Health Canada."

Participants were also asked, "Do you have alternative ideas you would like to share on how access to COVID-19 vaccines should have been organized when supply was limited?" Of those who were unvaccinated and said the vaccine was made too quickly, three highlighted the vaccine's speed to market. Comments included: "[don't] roll out any vaccine until test and trials are public like vaccines in the past," "why the big pressure when the trial period does not end till 2023" and that the vaccine should not have been available "without research, proper development, testing and approval."

Of vaccinated respondents, none mentioned speed to market directly, though several comments implied discomfort with the level of clinical testing. One participant mentioned "waiting to see the side effects" before getting the vaccine. Another wrote, "Not [many] options, either way we are guinea pigs."

Discussion

This paper identified that the perceived rapid speed to market of the COVID-19 vaccine was a driver of vaccine hesitancy. Nearly 60% of unvaccinated participants highlighted speed to market as a reason for remaining unvaccinated even late into 2021 after most Canadians had safely received more than one vaccination, with only 0.056% of vaccinated Canadians (about 54,000 individuals) reporting an adverse event post-immunization (Government of Canada 2023a). Among the social characteristics associated with being unvaccinated (i.e., identifying as Canadian citizens, white, under 65 years of age, having an annual income of less than $50,000, rural-dwelling, having below university education and having unvaccinated peers), those identifying as a white Canadian with more unvaccinated peers were even more likely to indicate vaccine development speed when compared with all other unvaccinated individuals. The concern surrounding the vaccine's speed to market was also significantly associated with reservations surrounding vaccine mandates, government mistrust, ongoing testing outside the context of clinical trials and risk of side effects.

Our study found that the unvaccinated population most concerned with the vaccine's speed to market tended to identify as white and associate significantly more often with other unvaccinated persons, compared with vaccinated respondents and other unvaccinated respondents. This underscores the importance of this issue from an infectious diseases' perspective given that COVID-19 can cause serious cases, hospitalizations and death more often among unvaccinated individuals. To further put into perspective the scope and magnitude of this issue, as of February 2023, 9.5% of Canadians over 18 years of age had not received even one dose of the COVID-19 vaccine, a very similar proportion to our survey sample (8.9%); if nearly 60% of them avoided vaccination, in part, because of concerns about speed to market as in our survey, this would equate to nearly 3.6 million Canadians (Government of Canada 2023b). This is an important caution as policy makers weigh the trade-offs of accelerating clinical trials or regulatory approval processes.

Survey participants elaborating on their responses mentioned three aspects of the vaccine's speed to market that they perceived hurried: the speed of manufacturer development, clinical trials and regulatory approval. Regarding manufacturer development, survey participants noted that the vaccines lacked "proper development." The scientific communication from both manufacturers and the federal government comparing drug development timelines to other vaccines and drugs may have alleviated some of this concern. For example, one study found that pre-approval development timelines for the three most commonly used COVID-19 vaccines were within the range of other novel vaccine development timelines at around 10 years, a period longer than 98 other drug products in common use in the general population (Beall et al. 2022). However, while such evidence may have alleviated some concerns, it is important to acknowledge that increased scientific communication does not necessarily translate into increased uptake. In some instances, providing more information either has no impact with little public engagement or even increases vaccine hesitancy by adding confusion (Dubé et al. 2016; Merkley and Loewen 2022).

Regarding clinical trials, survey participants also mentioned a lack of "proper […] [clinical] testing" or being "a guinea pig." This may reflect a level of genuine public trust in the traditional, full, clinical testing process. The landmark manufacturer-sponsored clinical trials for the approved COVID-19 vaccines available at the time had scheduled completion dates in very late 2022 and well into 2023 (ClinicalTrials.gov 2023a, 2023c, 2023d, 2023e), including several authorized by Health Canada under the interim orders (ClinicalTrials.gov 2023b; Health Canada 2023). It is possible that acceptability may improve in this population when the full clinical trials end with favourable demonstrations of safety and efficacy. Therefore, manufacturers, public health authorities and regulators should consider carefully communicating news surrounding the finalization of these trials – informed by prior successes and failures of promoting COVID-19 vaccine clinical trial results to the public and popular media. That said, the same risks noted above remain regarding providing the right amount of information without introducing unnecessary confusion.

Regarding the regulatory approval process, survey participants additionally stated concerns about the lack of a "proper […] approval." The COVID-19 situation was unique and received significantly more press and media coverage than is typical for drug approvals. Throughout the COVID-19 pandemic, Canada's minister of health introduced several interim orders that allowed for flexible and rapid regulatory review of medical devices and drugs related to COVID-19, including one to expedite the approval process of COVID-19 vaccines by allowing Health Canada to accept submissions that were already in clinical trials, and allowed manufacturers to present submissions as a rolling submission (i.e., data are submitted as are collected during the phases of the clinical trials) (Government of Canada 2022b; Public Health Ontario 2022). In February 2022, the Clinical Trials for Medical Devices and Drugs Relating to COVID-19 Regulation (Governement of Canada 2022a) was introduced, which allowed for flexible authorization of clinical trials, reduced requirements for trials involving already marketed drugs and was flexible in how clinical trials may be run (Government of Canada 2022b; Public Health Ontario 2022).

The COVID-19 pathway came in addition to two other priority pathways that already existed in Canada: the first pathway ensures that submissions for new and supplemental drugs are reviewed by Health Canada within a shorter time frame, and the second pathway gives conditional approval based on limited evidence to a new drug, with the condition that the company continues clinical trials and submits the results of these to Health Canada (Lexchin 2015). There is comparatively little public knowledge and media coverage of these pathways or the drugs approved by them. Canadians may, therefore, be less bothered by the use of the currently existing priority pathways or may not have had the same hesitations as they did with the COVID-19 vaccine.

The continuing use or expansion of the COVID-19 vaccine regulatory approval pathway – an atypical process as compared to all other existing and established regulatory procedures – may be counterproductive to improving and maintaining public trust in any products approved to treat COVID-19. To address increasing concerns about product approval speeds,

it may be advantageous to instead phase out the COVID-19 approval pathway going forward in favour of using the established priority pathways. However, even priority pathways should be used only when absolutely necessary, given that past research has demonstrated that drugs approved via Health Canada's priority regulatory pathways have a greater chance of being withdrawn from the market due to safety concerns (Lexchin 2012). A counterargument, however, is that faster regulatory approval may have led to more people being vaccinated more quickly, potentially leading to fewer deaths and long-term consequences from COVID-19 infection (Balch 2021; BBC News 2021). Regulators need to balance the concerns of those who want the vaccine as soon as possible with those who have concerns about speed to market while still maintaining public trust and confidence in the regulatory process. While survey participants citing the speed-to-market concern had additional reasons for their abstinence, phasing out the COVID-19 pathway may be the most concrete action in response to this study that regulators may consider, going forward, to restore confidence in the regulatory process.

There were several limitations to this study. The first is that "They made the vaccine too fast" was offered as an option for participants to choose from, rather than participants spontaneously noting that as a reason. However, participants were able to write other reasons and opinions in the survey, and several wrote the speed of vaccine development as one reason, which added a rich source of data for our study as discussed earlier. In addition, "They made the vaccine too fast" was only one option chosen among many for most respondents. Only two respondents selected speed to market as their only reason for remaining unvaccinated. Therefore, we cannot conclude that speed to market was the only reason, or even the main reason, for remaining unvaccinated but rather one reason among many. We also cannot know whether the concern about speed to market was the real underlying reason for vaccine hesitancy or whether it was, for at least some individuals, merely a socially acceptable justification for refusing the COVID-19 vaccines. As there are important policy implications to the reasons behind remaining unvaccinated, further research should be conducted to determine the relative strengths of the factors contributing to the ongoing vaccine hesitancy. Furthermore, "They made the vaccine too fast" may have been interpreted by respondents differently; some may have meant the manufacturers developed and tested the vaccine too quickly, whereas others may have meant the government approved the vaccine too quickly. These different views would have different policy implications, which we have attempted to outline earlier. Another limitation is that our survey was conducted after vaccine mandates had been applied – an extraordinary measure. Some respondents noted that mandates were the main driver behind their decision to get vaccinated, but our survey did not systematically ask such individuals whether speed to market was the reason for their reluctance. However, some vaccinated individuals did express concern with the level of clinical testing prior to market approval in the survey's open-ended question fields. Therefore, there is some risk that our estimate of the proportion of those who declined vaccination due to speed-to-market concerns does not capture the additional proportion of vaccinated individuals who would have

otherwise abstained from vaccination under more typical conditions (i.e., without the imposition of vaccine mandates). Finally, only 144 out of 2,712 people in our study indicated that speed to market contributed to their reasons for refusing to be vaccinated. Basing public policy on such a small sample carries risk, so additional evidence and study is likely necessary and may illuminate other reasons for hesitancy aside from speed to market that may be more important to take into consideration.

Conclusion

The results of this survey demonstrate that almost a year after the first COVID-19 vaccines were approved, many Canadian residents believed that the development and approval process was rushed and that belief contributed, at least partially, to why they remained unvaccinated. Vaccine hesitancy is a serious problem for vaccine uptake and it appears that for some people, hesitancy may be increased when there are concerns that the approval was "too fast." This will be important for policy makers and regulators to keep in mind when deciding whether to expand the COVID-19 vaccine's rapid regulatory process or instead to phase it out and return to using a regular review process, reserving the general priority pathways for use only when necessary.

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