BOOSTER VACCINE UPTAKE AND HESITANCY IN CANADA FROM FEBRUARY TO OCTOBER 2022

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INTRODUCTION AND BACKGROUND

There is now a mountain of evidence to suggest that the COVID-19 pandemic has impacted certain groups and communities in Canada more than others. Canadians who were in precarious economic situations prior to the outbreak are now facing even more dire circumstances. Indigenous Peoples, visible minorities and newcomers to Canada tend to be overrepresented among those in vulnerable social and economic conditions (Statistics Canada, 2022).

Visible minorities are at an increased risk of infection and mortality from COVID-19 (Subedi et al. 2020). One of the contributing factors to increased risk is working in sectors where there is a greater risk of exposure to COVID-19, such as the overrepresentation of Black and Filipino employees in the health care and social assistance industry (Turcotte and Savage, 2020). Immigrants are also disproportionately represented in sectors with greater exposure to COVID-19—front-line and essential service workers, including long-term care, where the majority of deaths have occurred (Statistics Canada, 2020).

An Ontario study found that rates of COVID-19 infection were three times higher in neighbourhoods with higher concentrations of visible minorities (Public Health Ontario, 2020). The same study found hospitalization rates to be four times higher and deaths were twice as high. Visible minority groups were also more likely to experience job loss or reduced work hours compared to Whites during the pandemic, especially Filipinos and West Asians (Statistics Canada, 2020).

Another contributing factor to the COVID-19 experiences of Indigenous Peoples, visible minorities and newcomers is vaccine hesitancy. Many Indigenous people have expressed substantial hesitancy and even opposition to vaccination for COVID-19 (Mosby and Swidrovich, 2021). The Canadian Community Health Survey (2020) revealed that all three of these groups were more reluctant to receive the COVID-19 vaccine (Statistics Canada 2021).

With support from Canadian Institutes of Health Research (CIHR), the Association for Canadian Studies (ACS) and University of Manitoba conducted a cross-national comparison of Canada, United States and Mexico to understand

and answer the following research question: To what extent has the COVID-19 pandemic exacerbated socioeconomic inequalities faced by Indigenous Peoples, racialized persons and immigrants? And as a follow up question: How has vaccine (and booster) hesitancy contributed to these social and economic disparities?

Five large-scale population-based surveys were conducted between October 2020 (Wave 1) and October 2022 (Wave 5) with over 40,000 respondents in Canada, United States and Mexico. The surveys were administered by Leger Marketing using a Computer-Assisted Web Interface (CAWI) approach. The focus of this study is on Wave 4 and 5 data for Canada.

Various themes were explored in each survey wave, which were contingent upon time-relevant issues surrounding the pandemic. Some of the major themes focused on financial impacts of the pandemic, fear of catching COVID-19, vaccine uptake and hesitancy, mental and physical health, and trust in institutions. This current study focuses on vaccine uptake and hesitancy in Canada—topics which were at the forefront of discussions around COVID-19 during 2022 and coincided with the final two survey waves. (See Table 1)

VACCINE UPTAKE—QUANTITATIVE ANALYSIS

Figure 1 below portrays the rate of vaccination among Canadians surveyed in February-March 2022 (Wave 4) and October 2022 (Wave 5). While the overall rate of vaccination (at least one dose) did not change much across the survey waves (increased from 88% to 90%), there was a slight uptick in the proportion of Canadians who received their third, fourth and fifth doses (boosters), up from 61% in Wave 3 to 67% in Wave 4 (42% with 3 doses, 24% with 4 doses and 1% with five doses). Much of this increase however can be accounted for by the wider availability of booster shots in October 2022 compared to the spring of 2022. (See Figure 1)

VACCINE INTENTIONS BY KEY SOCIODEMOGRAPHICS

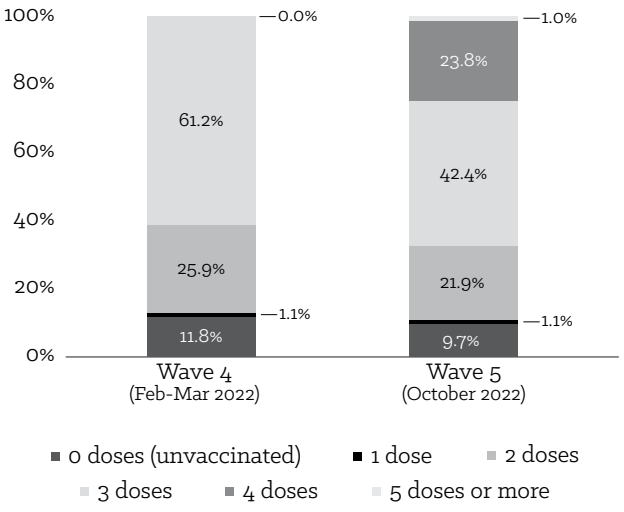
In the spring of 2022 (Wave 4), approximately half of Canadians (50.4%) who had received the initial two doses of a COVID-19 vaccine intended to get a third booster dose. However, intentions to get vaccinated for a third time were dependent on whether or not boosters were compulsory, at least for half of those who reported intentions to get vaccinated (See Table 2a).

Males were somewhat more likely to get a third booster vaccine (54% total 'Yes' responses) than females (47%), and a Pearson's Chi-Square test found these differences to be statistically significant ($X^2 = 8.58$, $p < .05$). There were also observ-

TABLE 1. DEMOGRAPHIC INFORMATION OF THE CANADIAN SAMPLE FOR WAVE 4 (FEBRUARY-MARCH 2022) AND WAVE 5 (OCTOBER 2022).

Demographics	Wave 4	Wave 5
Sample size	2939	3031
Sex		
Male	48.3%	48.5%
Female	51.7%	51.5%
Age		
Between 18 and 24	10.7%	10.1%
Between 25 and 34	16.6%	16.5%
Between 35 and 44	16.0%	16.5%
Between 45 and 54	18.3%	15.7%
Between 55 and 64	17.3%	17.5%
65 and older	21.1%	23.6%
Ethnicity		
White	74.1%	74.1%
Indigenous	5.0%	5.0%
Black	3.6%	3.6%
Asian	12.0%	12.1%
Other	5.4%	5.3%
Immigrant Status		
Non-immigrant	78.1%	77.8%
Immigrant	21.6%	21.9%
Province		
British Columbia	13.5%	13.9%
Alberta	11.2%	11.1%
Prairies	6.5%	6.4%
Ontario	38.4%	38.7%
Quebec	23.5%	23.1%
Maritimes	6.9%	6.7%

FIGURE 1. VACCINE UPTAKE ACROSS SURVEY WAVES 4 AND 5.



able differences across age groups (X^2 = 37.63, p <.001) and ethnic groups (X^2 = 23.56, p <.05). It appears that younger and older Canadians were the most likely to get a third vaccine compared to the middle-age groups in the spring of 2022. For instance, nearly two-thirds of Canadian youth aged 18 to 24 (65%) and Canadians aged 65 and over (63%) intended to get a third vaccine compared to less than half of Canadians in all other age groups (46% on average). Asian Canadians had the highest booster vaccine intentions (68% 'yes' responses) while Black Canadians were the most hesitant (39% 'yes' responses). Immigrants also had slightly higher intentions than non-immigrants to get vaccinated, but these differences were not statistically significant (See Table 2a).

There were also large differences in booster vaccine intentions across provinces or regions of Canada (X^2 = 76.47, p <.001), income (X^2 = 40.44, p <.001), educational attainment levels (X^2 = 39.12, p <.001), and across the political spectrum (X^2 = 58.90, p <.001). The two Canadian coasts had the highest rates of vaccine intentions (61% 'yes' responses in BC and 67% in the Maritimes), however BC respondents were much more definitive in their intentions to get1 vaccinated (46% reporting 'Yes' and 15% reporting 'Yes, but only if required') compared to East Coast respondents (19% reporting 'Yes' and '49% reporting

TABLE 2A. CANADIANS' INTENTIONS TO GET A THIRD VACCINE BOOSTER (WAVE 4 DATA).

Wave 4 (Feb - March 2022)	Do you intend to get a third booster vaccine?			
	Yes	No	Yes, but only if required	I don't know
Total	25.9%	37.1%	24.5%	12.5%
Sex				
Male	27.9%	37.0%	25.9%	9.2%
Female	24.4%	37.5%	22.2%	15.9%
Age				
Between 18 and 24	32.0%	23.1%	32.7%	12.2%
Between 25 and 34	26.8%	41.1%	21.5%	10.5%
Between 35 and 44	28.6%	35.3%	24.8%	11.3%
Between 45 and 54	17.0%	43.7%	22.2%	17.0%
Between 55 and 64	17.0%	48.9%	22.3%	11.7%
65 and older	41.9%	25.6%	20.9%	11.6%
Ethnicity				
White	23.9%	40.0%	23.9%	12.1%
Indigenous	23.7%	34.2%	23.7%	18.4%
Black	20.5%	38.6%	18.2%	22.7%
Asian	37.4%	24.3%	30.8%	7.5%
Other	26.7%	41.7%	23.3%	8.3%
Immigrant Status				
Non-immigrant	31.0%	33.5%	25.4%	10.2%
Immigrant	24.4%	38.5%	24.2%	12.9%

'Yes, but only if required'). The picture was less clear in terms of income, however, lower and upper-income Canadians appeared to be more definitive in their booster intentions, with over 30 percent in each group responding 'Yes' unconditionally. Among educational groups, university graduates reported the highest intentions to get boosters (57% responding 'Yes' or 'Yes, but only if required') while those who situate themselves to the left of the political spectrum were also more likely to get a third booster compared to those Canadians on the political right (see Table 2b).

In October 2022 (Wave 5), less than one in four Canadians (23.3%) who had received the initial two doses of a COVID-19 vaccine intended to get a third booster dose. However, more than half of Canadians (52.5%) who had already received a third dose of the vaccine intended to get a fourth dose (second booster shot).

While the rates presented in Tables 3a and 3b below (Wave 5) are not directly comparable to those in Tables 2a and 2b above (Wave 4) due to different response options, we can look to the 'No' column in both tables to see the proportion of Canadians who have no intentions to get a booster shot. In Wave 4 (Feb.-Mar. 2022), 37 percent of Canadians (who had received 2 doses) indicated that they would not get a third booster shot, while in Wave 5 this increased to 56 percent (See Figure 3a).

Men were somewhat more likely to get booster vaccines (27% responding 'Yes' to getting a third shot and 54% for the fourth shot) compared to females (20% and 51%), but these differ-

TABLE 2B. CANADIANS' INTENTIONS TO GET A THIRD VACCINE BOOSTER (WAVE 4 DATA).

Wave 4 (Feb - March 2022)	Do you intend to get a third booster vaccine?			
	Yes	No	Yes, but only if required	I don't know
Total	25.9%	37.1%	24.5%	12.5%
Province				
British Columbia	45.9%	19.4%	15.3%	19.4%
Alberta	22.4%	50.9%	21.6%	5.2%
Prairies	20.0%	38.0%	14.0%	28.0%
Ontario	24.2%	34.3%	27.8%	13.7%
Quebec	23.3%	43.8%	23.3%	9.7%
Maritimes	18.6%	25.6%	48.8%	7.0%
Education				
High school or less	27.0%	29.0%	26.2%	17.7%
Postsecondary schooling	21.2%	45.0%	22.2%	11.6%
University bachelor degree or higher	31.2%	36.6%	26.2%	5.9%
Income				
$19,999 or less	31.3%	37.3%	18.1%	13.3%
Between $20,000 and $39,999	13.3%	40.8%	35.8%	10.0%
Between $40,000 and $59,999	25.5%	33.3%	27.5%	13.7%
Between $60,000 and $79,999	18.9%	38.9%	26.3%	15.8%
Between $80,000 and $99,999	34.9%	34.0%	18.9%	12.3%
$100,000 or more	31.8%	39.2%	22.2%	6.8%
Political Spectrum				
Right	31.5%	40.7%	20.4%	7.4%
Right of center	28.2%	37.3%	30.0%	4.5%
Center	28.7%	44.4%	19.1%	7.9%
Left of center	32.2%	31.0%	25.3%	11.5%
Left	40.8%	28.6%	14.3%	16.3%

TABLE 3A. CANADIANS' INTENTIONS TO GET THIRD AND FOURTH VACCINE BOOSTERS (WAVE 5 DATA).

Wave 5 (October 2022)	Do you intend to get a 3rd booster vaccine?			Do you intend to get a 4th booster vaccine?		
	Yes	No	I don't know	Yes	No	I don't know
Total	23.3%	55.6%	21.1%	52.5%	21.4%	26.1%
Sex						
Male	26.6%	52.5%	20.9%	54.2%	21.9%	23.9%
Female	20.2%	58.5%	21.3%	50.7%	21.0%	28.4%
Age						
Between 18 and 24	21.6%	50.5%	27.8%	45.6%	26.5%	27.9%
Between 25 and 34	23.6%	57.7%	18.7%	46.7%	29.7%	23.6%
Between 35 and 44	27.3%	61.0%	11.7%	50.4%	21.8%	27.7%
Between 45 and 54	17.6%	54.9%	27.5%	54.7%	20.1%	25.2%
Between 55 and 64	27.6%	49.4%	23.0%	56.2%	17.0%	26.8%
65 and older	15.4%	53.8%	30.8%	58.3%	15.8%	25.9%
Ethnicity						
White	23.8%	56.2%	20.0%	52.5%	21.0%	26.5%
Indigenous	19.0%	47.6%	33.3%	53.2%	21.3%	25.5%
Black	11.8%	66.7%	21.6%	38.7%	32.3%	29.0%
Asian	34.6%	50.6%	14.8%	55.1%	20.5%	24.4%
Other	17.0%	57.4%	25.5%	52.5%	19.7%	27.9%
Immigrant status						
Immigrant	27.8%	52.7%	19.5%	52.4%	19.3%	28.3%
Non-Immigrant	21.6%	56.7%	21.6%	52.4%	22.0%	25.6%

ences were not statistically significant. Older Canadians were generally more receptive to getting booster shots, especially those who already had three COVID-19 vaccines: 56% of Canadians age 65 and up were willing to get a fourth shot against COVID-19 while less than 46% of those 18 to 24 intended to get a fourth dose ($X^2 = 25.32$, $p < .01$).

Ethnicity was an important predictor of booster uptake for the third vaccine, but not the fourth. Asian Canadians were much more willing to get a third shot (35% 'Yes' and 15% 'I don't know') compared to Black Canadians (12% 'Yes' and 22% 'I don't know'). The Chi-Square test indicates significant differences between groups in terms of booster uptake ($X^2 = 15.70$, $p < .05$). While slight differences existed with regard to immigrant and Canadian-born' intentions to get a third dose they were not significant. There were however geographic differences present regarding intentions to get a fourth dose: 63% of British Columbians were willing to get a second booster dose compared to less than half of Quebecers and Ontario residents ($X^2 = 22.22$, $p < .05$) (See Figure 3b).

Education and income were also important predictors of vaccine uptake. Canadians with a university bachelor's degree or higher, for instance, were 9.5% more likely to get a fourth shot compared to those with a high school education or less ($X^2 = 16.14$, $p < .05$) and households that earned more than $80,000 per year were twice as likely to get a third shot compared to low-income households earning less than $20,000 ($X^2 = 28.55$, $p < .001$).

Where Canadians place themselves along the political spectrum also has a major impact on their likelihood of getting COVID-19 boosters, with left leaners being much more willing to get boosters than the right. Around two in five Canadians who positioned themselves left of center were willing to get a third dose and seven in 10 were willing to get a fourth dose. On the other hand, only about one in five Canadians to the right of the political spectrum considered getting a third dose and just over half were willing to get a fourth dose. Chi-square tests were significant across both analysis of political spectrum and vaccine hesitancy ($X^2 = 24.47$, $p < .01$ for 3rd dose and $X^2 = 28.38$, $p < .001$ for 4th dose).

TABLE 3B. CANADIANS' INTENTIONS TO GET THIRD AND FOURTH VACCINE BOOSTERS (WAVE 5 DATA).

Wave 5 (October 2022)	Do you intend to get a 3rd booster vaccine?			Do you intend to get a 4th booster vaccine?		
	Yes	No	I don't know	Yes	No	I don't know
Total	23.3%	55.6%	21.1%	52.5%	21.4%	26.1%
Province						
British Columbia	30.8%	50.0%	19.2%	63.3%	16.1%	20.6%
Alberta	25.3%	53.8%	20.9%	51.2%	17.6%	31.2%
Prairies	14.6%	58.3%	27.1%	62.0%	19.0%	19.0%
Ontario	24.8%	54.0%	21.2%	49.1%	23.2%	27.7%
Quebec	16.3%	64.4%	19.3%	47.7%	25.8%	26.5%
Maritimes	25.9%	51.7%	22.4%	53.6%	17.9%	28.6%
Education						
High school or less	16.6%	60.9%	22.5%	48.0%	23.5%	28.5%
Postsecondary schooling	26.9%	53.1%	20.0%	52.0%	21.4%	26.6%
University bachelor degree or higher	23.9%	55.6%	20.6%	57.5%	20.1%	22.4%
Income						
$19,999 or less	17.5%	52.6%	29.8%	37.2%	26.7%	36.0%
Between $20,000 and $39,999	30.9%	43.2%	25.9%	52.2%	17.9%	29.9%
Between $40,000 and $59,999	22.0%	54.0%	24.0%	51.7%	21.0%	27.3%
Between $60,000 and $79,999	13.2%	69.2%	17.6%	67.8%	17.2%	14.9%
Between $80,000 and $99,999	36.4%	47.5%	16.2%	46.5%	20.8%	32.6%
$100,000 or more	22.2%	64.2%	13.6%	53.2%	25.8%	21.1%
Right	21.2%	75.0%	3.8%	40.7%	32.2%	27.1%
Right of center	22.8%	59.8%	17.4%	55.1%	27.8%	17.0%
Center	29.6%	48.6%	21.8%	58.5%	20.3%	21.2%
Left of center	41.5%	44.6%	13.8%	66.1%	14.9%	19.0%
Left	38.2%	35.3%	26.5%	71.2%	9.3%	19.5%

VACCINE HESITANCY—QUALITATIVE ANALYSIS

Following up on the question about the intention to get a third booster vaccine in wave 5 (October 2022), we asked respondents who did not intend to get the booster to give us an open-ended response to their reasoning behind it. Four main themes (or reasons) emerged from those responses which are summarized as follows:

- Questioning the efficacy of the vaccine
- Unwillingness to risk the side-effects anymore
- Lack of trust in government and pharmaceutical companies
- Claiming enough immunity after two vaccines (and/or catching COVID-19)

These themes are also reflected in a word-cloud (Figure 2) generated from a query for the 50 most frequent words (relevant filters applied) in the responses. Moreover, Table 4 shows some of the detailed excerpts that highlight the emerging themes from the responses.

SUMMARY AND CONCLUSION

Vaccine uptake varies considerably across demographic groups in Canada. As of spring 2022 (Wave 4), males, elders (and youth), Asian Canadians, immigrants, BC and Maritimes residents were all more likely to get third vaccines (boosters). University graduates and households earning $100,000 or more were also more likely to get booster shots along with those to the left of the political spectrum. Similar patterns were observed in the fall of 2022 (Wave 5) in regard to getting

third and fourth vaccines, however it should be noted that there was significant drop-off in booster uptake (i.e., increased booster hesitancy) among those who had just two vaccines. In the final survey wave, less than one in four Canadians definitively stated that they would get a third booster (another one in five were unsure); however, the majority of Canadians who already had three COVID-19 vaccines intended to get a fourth (53% stated 'Yes' and 26% stated 'I don't know').

FIGURE 2. WORD CLOUD OF RESPONSES TO "WHY DO YOU NOT INTEND TO GET THE 3RD VACCINE DOSE?"



It seems that by the fall of 2022, Canadians had made up their mind about vaccination: those who had not yet received their third dose probably weren't going to do so while those who had received their third dose were more likely than not to get a fourth dose.

The key findings of this study alert us to some challenges in the future regarding COVID-19 booster vaccines and vaccines in general. Vaccine uptake has waned over time in Canada, dropping from around 6 in 10 double-vaccinated Canadians who at least considered getting a third dose (booster shot) in the spring of 2022 to around 4 in 10 Canadians in the fall of 2022. More research is needed to understand why exactly this is, but some possible explanations may be tied to the public discourse and the mixed messaging that Canadians are exposed to in the media. Initially messaging (and regulations surrounding vaccine passports) indicated that two doses would be sufficient and many Canadians may have held onto that information for the long haul. "Younger, healthy people don't need another COVID-19 booster, according to vaccine experts" is also a common headline in the media recently, based on studies such as Dr. Paul Offit's "Bivalent COVID-19 Vaccines — A Cautionary Tale," in the New England Journal of Medicine (January 2023). The US Centers for Disease

TABLE 4. QUOTES FROM RESPONDENTS REGARDING VACCINE BOOSTER HESITANCY

Theme	Excerpt
Questioning the efficacy of the vaccine	"The first two vaccine shots didn't work and I've seen no evidence that a third is necessary or effective. I'm also worried about the safety of the vaccine…why risk my health on a third dose of an unproven, unsafe and ineffective vaccine to prevent getting a cold?" "Don't think it has much effect on the variants, and the variants are less dangerous so don't mind getting it"
Unwillingness to risk the side-effects	"The first 2 didn't prevent me from getting COVID-19. Risk of side effects is too high. I have an immune system, this is not a deadly virus." "I've experienced very bad symptoms with the first two doses. With my health declining so rapidly in the last two years I just cannot justify the risk for the potential benefit, if any at all."
Lack of trust in government and pharmaceutical companies	"Don't trust the government or pharmaceutical companies giving it." "Because I still had COVID-19 and the vaccine gave me more serious side effects than COVID-19 and it's not normal to get vaccinated at every turn, I do not trust the authorities that govern us or the powers of money that prevent us from living freely"
Claiming enough immunity after two vaccines (and/or catching COVID-19)	"I'm tired of the repeated "booster" requirements. I feel we are now at the stage where natural immunity is high and I still take preventive steps when dealing with the public." "I think two is enough. Considering I have not contracted the virus since it's beginning in 2020 I am confident in my immune system. I would take a 3rd dose maybe 4-6 years from now. I'll wait for science to do more research on the long-term effects of the vaccine and the virus."

Control and Prevention (CDC) has also issued public statements throughout the pandemic suggesting that booster shots are not immediately necessary among the fully vaccinated (two doses) or that Americans under the age of 50 can wait to get fourth doses (see Rutherford & Castronuovo, Bloomberg News, April 20, 2022). With this seemingly contradictory information, not to mention the many sources of disinformation that pervade social media platforms, it is no wonder that Canadians are in no rush to continue getting COVID-19 boosters.

REFERENCES

Offit, Paul. "Bivalent COVID-19 Vaccines - A Cautionary Tale", *The New England Journal of Medicine*, 2023, https://www.nejm.org/doi/full/10.1056/NEJMp2215780

Bowman, Emma, "Despite New COVID Variants, CDC Says You Don't Need Any Boosters Right Now," NPR, 2021, https://www.npr.org/sections/coronavirus-live-updates/2021/07/08/1014438902/despite-new-covid-variants-cdc-says-you-dont-need-any-booster-doses-right-now

Rutherford, Fiona and Castronuovo, Celine, "Most People Under 40 Don't Need 4th Shot Yet, CDC Panel Suggests", Bloomberrg, 2022, https://www.bloomberg.com/news/articles/2022-04-20/most-people-under-50-don-t-need-4th-shot-yet-cdc-panel-suggests?leadSource=uverify%20wall