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Lessons from the Infodemic:
Overcoming communication challenges

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INTRODUCTION

By **Lisa Jane de Gara**

On January 1, 1970, the Coordinated Universal Time was launched—the backbone of our digital communications, and believed by many to be the birth of the Information Age. Over the last half-century, our reliance on digital networks and modes of communication has only increased; segueing from academic curiosity to luxury to inevitable and needed. In the last decade, we might find cause to argue that the Information Age has curdled into the Disinformation Age.

Electoral and political disinformation have been endemic in online spaces for at least the last several years, but the COVID-19 pandemic has been a generationally significant moment for disinformation. The combination of fear, disruption of social engagements, isolation, and political tumult have accelerated and embedded COVID-19 disinformation into public discourse.

The COVID-19 pandemic has been co-branded the "Infodemic." While vaccines have effectively inoculated much of the world against SARS-CoV-2, viral disinformation remains a more challenging and shifting target. For many, the pandemic presented an opportunity to calcify beliefs, deepen prejudice, and spread their message to a wider audience. With this in mind, vaccinating a public afflicted by disinformation presents a Sisyphean challenge. How can public health messaging expect to compete with slickly-produced videos, designed to hold attention? How can medical professionals present rational arguments against beliefs not based in rationality?

Fact-checking, question and answers, and active listening (protocols for assuaging anxieties early in the pandemic) effectively persuade many people—but not all. For so many, the messages of disinformation are more potent than the dryly-delivered data their health authorities dispensed from the podium. This is more than a shame, but a crisis to be resolved. Disinformation, especially vaccine-related disinformation, kills.

There are now thousands of grim epitaphs to the deaths from disinformation. On Reddit, a forum was founded September 21, 2020—"The Hermain Cain Award," named for the late pizza CEO and one-time presidential candidate who first claimed COVID-19 was a hoax, and subsequently died of the virus. Boasting more than 500,000 subscribers, the forum is a grim record of the consequences of disinformation. A typical entry features a half dozen Facebook posts, citing conspiracy theories about vaccines, mocking "liberals" for their willingness to "succumb" to vaccinations, flaunting health restrictions. Then the second act: a post from a relative, usually a son or daughter, explaining a recent hospital admission ("COVID-19 pneumonia") and asking for prayer. The final post is just as predictable: *We'll miss you, Daddy. Heaven got another angel today*.

While the consequences of disinformation are clear, the resolutions are markedly less so.

In this issue, we will cover the breadth and depth of disinformation in Canada's Infodemic. Rummens and Alkoby examine the tensions in information flows in a pandemic—when there was too much, not enough, or when information was soundly displaced by disinformation. Celestini discusses COVID-19 as a "super conspiracy," hierarchically linked

to depopulation, the United Nations, and fear of a one world government. Jedwab examines why some people are more easily swayed by disinformation—with nearly 40% of unvaccinated Canadians believing the vaccine is dangerous to their health. Asmi, Trevors, Argyropoulos, and Morin explore innovative methods of customizing public health communication to vulnerable ethno-cultural communities. Annable, Bonnell, Ge, and Palad examine outcomes from the Immunization Partnership Fund, including efforts to support evidence-based vaccination communication. In examining mythologies and enabling beliefs of the mainstream media and healthcare, Marshall explores how racist preconceptions can bias public health and prevent adequate support to Black communities. De Gara (that's me!) provides a few home truths about disinformation on the ground-level, pulled from lived experience in grassroots vaccination clinics. Finally, Holley and Shrestha examine vaccine and booster shot uptake across demographic groups and conclude that waning uptake may be related to the associated public discourse and conflicting messaging on the topic.

Ultimately, even as the COVID-19 pandemic is squarely in the rear-view mirror for most, the impacts of disinformation linger in communities and digital spaces. Our ability to manage it requires robust analysis—and we hope you will enjoy what this issue can offer.

INFORMATION IN THE TIME OF COVID-19

Joanna Anneke Rummens, PhD, is a transdisciplinary health systems researcher and Associate Professor in Nursing, Faculty of Community Services at Toronto Metropolitan University. Her work focuses on the interconnections among diverse identities, social inclusion/exclusion, health/wellbeing outcomes, and on knowledge transfer governance.

Asher Alkoby, S.J.D., is an Associate Professor at Ted Rogers School of Management and Chair of the Research Ethics Board at Toronto Metropolitan University. His interests include civil society engagement, corporate social responsibility, and access to justice.

"Can I get COVID-19 from the vaccine?" The question from an experienced registered practical nurse at the beginning of a second year of pandemic stunned.

As did the revelation by a registered nurse that her advanced practice colleagues removed their protective N95 masks when taking selfies in the staff room on COVID-19 wards during the earliest waves of the pandemic, when the donning of full personal protective equipment was both mandatory and life-saving safety protocol.

So too the minimal usage by a senior cohort of health professional trainees of complementary electronic subscriptions to a leading newspaper known for its robust investigative coverage regarding what was then a rapidly emerging, clearly serious, and completely unknown viral threat.

How to explain the gap in essential knowledge, its uptake and its application during uncertain pandemic times?

It is perhaps the greatest irony of our age that despite the ready availability of a plethora of information of all kinds shared via multiple mechanisms and modalities within our knowledge economy, having the right information at the right time in the right place and geared to the right purpose remains such a tremendous challenge.

Why is it that our immediate access to an abundance of disseminated and exchanged information does not necessarily translate into greater uptake of science-research-based or practice-informed evidence, lived experiences, and diverse knowledge systems, into actual decision-making to then also inform policy, programming, and practice?

How exactly do our newly emergent information and communication channels shape our thoughts, reflections, and perspectives and guide our behaviours and actions? To what effect and with which consequences? Are we engaging or increasingly disengaging in knowledge-seeking?

And why is it that the exponential rise in exposure to a wealth of knowledge, expertise, and considered opinion facilitated via the worldwide internet in conjunction with more traditional television, radio and print media does not necessarily bring with it the anticipated enhancements in the quality, nature and types of discussions and deliberations among us? Instead, our societal discourses are all too often left riddled with disruptions, distortions and disconnects.

Why exactly do these communication challenges exist? How might we perhaps best seek to overcome them?

The rapid technological shift from the more content-driven Web 1.0 upload-and-push-out of information via static organizational websites to the rapid, dynamic, interactive information sharing via Web 2.0, with its user-generated content and concomitant growth of social media, currently very effectively circumvents our existing gatekeeper checks and balances for veracity, evidence, accuracy and bias. Exposure to mere information without critical appraisal, fact-checking, evidence review, cross-comparison with other sources, followed by thoughtful reflection, disrupts this essential process and all too often translates into increased prevalence of things demonstrably untrue and yields unintentional misinformation.

Instead, the intertwined strengths and limitations of our newest communication channels now have us communicating more with ourselves or perfect strangers—within increasingly siloed virtual bubbles and algorithmically driven echo chambers, as opposed to deeply connecting and truly engaging with each other as social actors and fellow human beings. Even our existing societal divisions and chasms are now virtually articulated, experienced, reified, challenged, negotiated, resolved, and impacted. Such disruption in our social interaction and lives not only leave us increasingly isolated from each other, but it also distorts our social weave, lives and realities. It renders us that much more vulnerable to intentional dissemination by politically motivated or ideologically driven actors of information that is demonstrably not true or accurate, namely disinformation. With loss or compromise of social discourse we lose our informational veracity checks-and-balances against unintentional misinformation and intentional disinformation alike.

Context matters too. In a time when climate change is no longer dismissible as distant warning and has instead become lived reality, when long-existing social fissures become more visible and acute, and when our geo-political world order is quickly shifting, the additional threat presented by a viral worldwide pandemic discombobulates, disorients, and distresses. These new uncertainties impact our perspectives, attitudes, behaviours and beliefs, and bleed all too readily into our social narratives and interactions. Untruths often become that much more appealing when confronted with the stark reality of the unknown. There are also those who would much prefer a good and beautiful lie to an unhappy or ugly truth.

How else to explain the association between high usage of internet and social media and higher vaccination hesitancy despite ample available scientific evidence of both the efficacy and effectiveness of our vaccines for population health and against severe illness and death for individuals?

Trauma occurs when our sense of safety in the world is disrupted. In our need and search for certainty, for meaning, for solace, for comfort, for connection and belonging, we begin to believe what others believe. In the face of fear, we are sorely tempted to consider true that which simply makes us feel safe. It is this loss of safety in the world that leaves us vulnerable to the disruptions of misinformation, distortions of disinformation and to ultimate disconnects. With simultaneous non-information and sheer information overload, we retreat yet further and begin slowly but surely to fully disengage.

Response to the rapid emergence of COVID-19 as a global pandemic in early 2020 began with profound concern regarding an unknown and very real global threat. We transitioned into caution when more became known about its properties and when effective protective strategies could be devised and implemented. With the arrival and demonstrated effectiveness of new vaccines developed and manufactured at an unprecedented speed and of responsive treatments came increasing complacency. Throughout, consistent challenges in cooperation, coordination, and clear communication by our leaders have all too often left us bewildered, frustrated, and confused. Exactly three years into the pandemic, we now find ourselves in a current collective state of dissociated numbness even as the newest variants prove able to bypass our existing treatments.

Amidst these breaches of civic leadership and breakdowns in social accountability and ensuing lack of information, or non-information, responsibility for knowing, sharing, deciding and acting has now essentially been downloaded to the individual. As the past three years of the COVID-19 pandemic have shown us, regulating behaviour for the purpose of managing public health has become extremely challenging due to constitutional limits, enforcement challenges, and lack of trust in institutions. Many governments resorted to downloading collective responsibility for managing health risks to individuals, encouraging them to consider the impact their behaviours would have on others, even when it is not legally required. We are used to making decisions about risks that affect us.

In a pandemic we are expected to consider the risk to others and to the community. The ethic of care here diverges: those who only look to protect themselves, those who think about risks to themselves and their immediate loved ones, and those who also consider the risk of their behaviour on complete strangers in the community. Our responsibilities to each other as a community and as communities are now increasingly out of our actual conscience as well. We seem somehow to have lost sight of our social ties and responsibilities, our interconnectedness and interdependence, as each looks more deeply into our virtual world rather than to each other.

Perhaps it is the very profusion, overabundance, and excessive amount of available information itself that all too readily gives traction to misinformation and dis-information. Perhaps

too it frustrates and thus translates into retreat and the false comforts of non-information. We are easily lost and begin to rely on what is close at hand and familiar rather than putting effort into exploration, inquiry, and both truer and deeper engagement.

Yet it isn't simply a matter of availability of information. Accountability for accuracy remains critical and it is this that we appear to have lost sight of along the way. Trust in the informational source is key to uptake, and so we need to re-establish mechanisms—and also develop new ones—via which to verify credibility within the more rough-and-tumble world of Web 2.0. Quality matters too... and we appear to be awash in mere quantity. Overload.

How do we address this?

In times of emergency and inevitable information vacuum, trust in institutions is critical. It has traditionally been our professional journalists and investigative news reporters who have attended to the monitoring, information finding and fact-checking regarding significant happenings and events in our day-to-day world as they prepared for us the rough drafts of our histories. This needs to be acknowledged, supported, safeguarded, and now more than ever, deemed essential public service.

Equally pressing is the need for practical and effective mechanisms by which to assess the veracity of content shared via our internet and social media and, at minimum, to convey any irregularities or untruths. The need is great, and it has in fact increased within our information economy for trustworthy, skilled, timely, and knowledgeable appraisals of content for credibility and accuracy. In addition to knowledge mobilizers we now need knowledge content 'curators,' 'distillers,' 'synthesizers' and 'streamers.' Greater transparency is needed too of information flow, uptake, and actual use to inform our decision-making in policy, programming, and practice. All of this necessitates the creation of new systems and supportive structures to securely anchor these information-sieving and appraising initiatives.

We also need to recreate places and new spaces through which to truly engage again with each other in open dialogue, discussion, debate, deliberation, and decision-making. This matters because it is our shared knowledge, or lack thereof, and our collective values that shape our perceptions, attitudes and beliefs, informing our behaviours, practices and actions. And we can't really know nor assess in a vacuum, virtual or otherwise. It is interconnectedness and interdependence through true engagement with each other that most readily translates into greater confidence that what we think we know to be true... is in fact so.

COVID-19 CONSPIRACY THEORIES— A CHALLENGE TO DIVERSITY AND DEMOCRACY

Dr. Carmen Celestini is a Post-Doctoral Fellow at Queen's University School of Religion, where she researches extremism and conspiracy theories in Canada. She is also a Definite Term Lecturer at the University of Waterloo in the Arts First and Religious Studies Departments. Her areas of research include conspiracy theories, politics, right-wing extremism, and social media.

In 2021 Canada witnessed the occupation of the nation's capital and border crossings with the United States by so-called Freedom Convoys. The repercussions are still being felt in the nation because of an uprising against COVID-19 mandates, conspiracy theory ideas of a New World Order, disinformation about what was contained in the vaccines, and the disinformation campaigns regarding the health dangers the vaccines posed. The impact of conspiracy theories and disinformation throughout the pandemic has influenced not only the acceptance of the vaccines but also the death toll. A study conducted by Islam et al. in 2020 found that conspiracy theories and disinformation can lead to distrust and vaccine hesitancy. Their research analyzed 637 COVID-19 related posts from 52 different countries found on mainstream social media platforms including YouTube and Twitter.[1]

A further study conducted by the Oxford Coronavirus Explanations, Attitudes, and Narratives Survey (OCEANS) found a lack of confidence in vaccines can be exacerbated by lack of knowledge about how vaccines themselves work, a sense of distrust in institutions in society such as the government and the healthcare/pharmaceutical industries, and a concern or distrust with the newness of the vaccines or sense that the vaccines were created too quickly.[2]

Studies in Canada have shown that vaccine hesitancy and conspiracy theories are linked, in that the infodemic on social media platforms such as Facebook and Whatsapp has lowered the intentions of Canadians to get vaccinated. Those who believe in one or more conspiracy theories regarding COVID-19 or the vaccines have a lower intent to get vaccinated.[3] There were numerous COVID-19 based conspiracy theories that eventually morphed into a super conspiracy, with many linked hierarchically. The pandemic-based conspiracies found connections within the Great Reset, the Great Replacement, QAnon, United Nations-based, and technology-based conspiracies. A commonality with each of these conspiracies is a belief that the virus was a tool being utilized by an evil cabal to create a New World Order by tyrannical governments or world organizations such as the World Economic Forum. Technological advancements such as 5G technology or health measures such as lock downs, vaccines, and masks were understood to be mechanisms of control to ensure world domination over a complicit population. In response to these conspiracy theories the world watched as protests erupted of varying degrees, from weekly local protests to nationwide so called "freedom convoys" and border barricades, crippling Canada's economy and occupying the nation's capital.

Much like the COVID-19 conspiracy theories, the milieux of anti-COVID-19 protestors and dissidents was comprised of both long established organizations and groups created solely on anti-mandate and anti-vaccine foundations. While many of the individuals who joined these groups were frustrated with the impacts of the mandates there were also quite a few right-wing extremists who entered into the fray. Their role

as spokespeople and influencers within the anti-COVID-19 groups helped to spread their ideologies, conspiracies, disinformation, and create a perpetual sense of fear for the group members.

Well-known far-right-wing groups included the Oath Keepers, Soldiers of Odin, and the Yellow Vests Canada.[4] The pandemic itself accentuated the structural violence within Canadian society, including systemic racism and socio-economic disparities, leading to a strengthening of social polarization across the nation.[5] This social polarization created an opportunity for far-right or extremist groups to spread disinformation that positioned marginalized groups as the cause of the pandemic and resulting social upheaval and to endorse acts of violence against these marginalized communities. Further, these fears, conspiracies, and "othering" of marginalized communities created an opportunity for political leaders to attempt to secure elected positions of power through the promotion of anti-democratic agendas and platforms.[6]

Both far-right groups and populist political leaders promoted narratives of COVID-19 being human made and that those governing were lying when denying this idea, or that governments, pharmaceutical companies, healthcare agencies, and world organizations were profiting from COVID-19 and the resulting vaccines, and that the virus was being used to create a new political landscape or New World Order.[7] The platform for the spreading of political populism, far-right ideology, and COVID-19 linked conspiracy theories was social media, both mainstream and alternative. The result of these social media campaigns included social movements, religio-political movements, and acts of violence. Platforms such as BitChute, Youtube, and Odyssey were foundational in the creation of conspiracy theorists, political, and far-right vlogger influencers, while Facebook groups and Telegram channels created large scale communities with international memberships. Established alternative media such as Rebel News, Western Standard, True North, and The Post Millennial presented themselves as journalists and news outlets that not only helped to spread disinformation and conspiracy theories, they did so under the auspices of journalistic integrity while being the voice of those who were disenfranchised and distrustful of the institutions of society. Focused on a conspiratorial, truth-knowing, and anti-government narrative, these media sources became the voice of the self-proclaimed silenced, the persecuted, and the prosecuted, while delineating who was a patriot and who was the enemy of the nation.

Acceptance of conspiracy theories can take place when an individual feels that the world is in a perpetual state of disaster, when one negative thing happens after another with no resolution in sight. Even if the person is religious, they can turn to their deity in hopes of a solution to this sense of chaos, but if no resolution comes forward then they start looking for a human cause for this situation. With the pandemic this sense of disaster could be found in numerous ways. The fear of the virus itself, the economic fears arising from the lockdowns and lack of employment, and the social isolation, caused some to see the world through a lens of perpetual doom. Conspiracy theories can help to delineate and explain the "evil" that is the cause of these perpetual disasters, by providing an organization composed of individuals who are working secretly to achieve a malevolent end. In their understanding of the world nothing that occurs in the universe is random, in their view the world is governed by design.[8]

Conspiracy theories are a method for those who believe that the political realm is impenetrable or a secret institution not available to them to participate.[9] In an environment where there exists a distrust of societies' institutions, such as the government, the media, academia, and science, and a mix of millenarian religion (apocalyptic thought or an end times view of the world), occultism, and radical politics, this can lead to what scholar Michael Barkun has titled improvisational conspiracism. In this form of conspiratorial belief, adherents can create novel belief systems that allow them to create a holistic and complete vision of the world that can explain all the phenomena they are witnessing. Similar to a moral panic, the media that is ingested by the conspiracy believers focus on repetitive fear-based messaging that promotes the idea that the adherents need to take action, not only to defeat those who are deemed the enemy, but also to save civilization. The fear mongering from the media influences how the world is perceived, leading to an understanding that perpetual fear and threat are central to normal life, that things are completely out of control. The answers that conspiracy theories give for the cause and solution to these chaotic times, provide a sense of control for the believers.

Those who adhere to this fear-based understanding of the world understand that they have to take action to save civilization, and in doing so they perceive themselves as social heroes who are ready to face their enemy and stop their malevolent plans. These social heroes believe they have the truth at their disposal, a truth those who are "sleeping" are unaware of, and when they speak this truth, there are ramifications. These believers will be shunned, denigrated, and ostracized by friends and family for their beliefs. In fact, their worldviews will cause them to be segregated by larger society, pushing them further into their conspiracy communities, and more importantly helps them to develop an identity as a victim. They are being persecuted and, in some cases, prosecuted for their beliefs and for speaking out.

Far-right individuals consistently linked themselves to the anti-COVID-19 movements creating a conduit for their hate ideologies to seep in and recruit from the anti-COVID-19 movement. The crossover between far-right ideology and the anti-COVID-19, anti-vax protestors was propositioned through the distrust and weakened support for the institutions in society. An example of the crossover between

far-right ideology and the anti-COVID-19 movement is the White Lives Matter (WLM) day of protest in 2021. WLM had planned protests across North America, with a single location in Canada, Toronto, Ontario. The Toronto based WLM channel on the social media platform Telegram developed a plan to bring anti-COVID-19 protestors to their movement and their planned day of protest. The WLM administrators were posting numerous comments on the channel about keeping the chat focused on the upcoming protests and excluding racial commentary or extremism. The administrators made this proclamation to ensure that any media that were monitoring their Telegram channel would focus on the planned protest rather than any hate speech or racism, and also to create an appealing environment for anti-COVID-19 groups or individuals.

The administrators for the Toronto group were making an appeal to anti-COVID-19 protestors in Toronto to join their protest on Sunday, April 11, 2021. Toronto based anti-COVID-19 protests were held in the city each Saturday during the mandates, and the WLM group were asking them to instead join in their Sunday protest. The Toronto Telegram channel was created on March 29, 2021, and on that day new members were asking if anyone was a part of the weekly, "end the COVID-19 oppression" protests in the city. The newly formed WLM group expressed sympathy for the anti-lock down protestors and hoped to create a bridge to that community based on shared perceived injustices and lack of government support for their causes. One WLM member posted, "the problem with that [lock downs] is the fact that it is creating a LOT of people with nothing left to lose. People have lost friends, family, and livelihoods. That is a dangerous state of affairs for any society. And it's being foolishly encouraged to continue by people who have nothing to lose." This astute post reflects the sense of fear, lack of control, and desperation of those who adhere to conspiracy theories, while also acknowledging how this is similar to their own racist positionality.

To create a cohesive and welcoming channel the WLM administrators asked members to post about "how we [whites] are victimized by non-whites." A secondary request from the WLM administrators focused on the signage at the planned protest, asking members to make protest signs that had images or references to white Canadians who had been murdered, especially children, so the members would not be "dismissed as white supremacists and other slurs." In the end the WLM's protest in Toronto that weekend was a failure, with only a small number of the Telegram channel's members showing up, and no anti-COVID-19 protestors in attendance. The legacy media wrote about the abysmal failure of the planned event, but failed to acknowledge the connections made between the two groups, or even the attempt to create a cohesive community.

While there was not a shared community at the protest, the WLM Toronto channel continued to build upon this initial recruitment plan. The members began posting more racist posts that reflected their worldview, but they also encouraged their members to recruit from within the anti-COVID-19 groups by attending "maskless" protests at grocery stores so they could create a bond through law breaking. This example of crossover between white nationalism and anti-COVID-19 movements reveals that the boundary between democratic political protests and that of far-right political populism is being blurred, which can create a challenge to democracy itself.[10] During the height of the pandemic and government response of mandates and lock downs, we witnessed a rise in anti-government protests, as well as conspiracy theories. Sociologist Ulrike M. Vieten compared social media messaging of far-right white political protests and found that there was a growing normalization of the far-right groups as they joined "anti-hygienic" or anti-lock down protests. Vieten found that white nationalists tied wider struggle over pandemic politics to arguments about who belongs.[11] A similar trope was being propagated by the anti-COVID-19 protestors as they delineated those who followed the COVID-19 mandates, those who wore masks, and those who were vaccinated, as complicit in the tyranny being enforced upon them, as well as the potential world domination understood as the foundation of their conspiracy theories.

Much like the WLM's attempted recruitment of the anti-COVID-19 protestors in Toronto, by far-right actors and groups, Levinsson et al. found that the association between COVID-19 conspiracy theories/beliefs and support of violent radicalization promoted by far-right groups, was evidenced by increased hate crimes and violence against individuals who identify as Asian, or arson attacks on 5G telecommunication infrastructure.[12] The ensuing violence and sympathy towards violent acts will not dissipate once the pandemic is over and could potentially lead to an increase in discrimination, hate crimes, and incidents of violence by both lone actors and organized groups. This discrimination and marginalization can also be furthered through political means.

Vieten argued that understanding the crossover between far-right white nationalist groups and anti-COVID-19 groups would be beneficial in understanding the political arena when the pandemic ended, expressing this new normal as "pandemic populism."[13] The Canadian federal election in 2021 revealed the initial impact of conspiracy theories and far-right ideologies on the political landscape of the nation. The People's Party of Canada, led by Maxime Bernier, had a platform based on limited immigration, anti-COVID-19 mandates, support of the convoys, and conspiracy theories. The platform promoted by candidates such as Mark Friesen in Saskatchewan, hinged upon the Great Reset, United Nations Agenda 21, and anti-immigration, all linked with COVID-19 hoax, anti-vaccine, and New World Order conspiracy theory narratives. While the People's Party of Canada did not fare well in the federal election, the anti-immigration,

pro-conspiracy platform was soon adopted in part by the Canadian Conservative Party under the leadership of Pierre Poilievre.

For us to understand the rise of populism in Canada we need to analyze the commonality of conspiracy theories in these two disparate groups. As COVID-19 variants continue to emerge and government response continues to be the promotion of vaccines and potential new mandates, some individuals' trust in their government and medical fields continues to deteriorate.[14] In response, populist political parties continue to promote a narrative of rising up against elitism, promoting conspiracy theories as a part of their political platforms, and most importantly positioning democratically elected politicians and parties as complicit in the conspiracy theories surrounding COVID-19. As scholars, policy makers, and public advocates and activists, we must work together to stem the flow of COVID-19 disinformation, conspiracy theories, and the spreading of far-right ideologies both by groups and populists, to ensure the protection of marginalized communities, racialized communities, and those affected by socio-economic disparities.

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CAN THE UNVACCINATED BE PERSUADED? WHY ARE SOME CANADIANS ESPECIALLY RECEPTIVE TO VACCINE DISINFORMATION?

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INTRODUCTION

To understand the conditions that have promoted the spread of disinformation in Canada (and for that matter elsewhere) about the COVID-19 pandemic, it is essential to examine the initial response to the contagion and the public's views on vaccination once it became available. It's important to recall that at the start of the pandemic many North Americans felt that the contagion was happening either somewhere else in the world or to someone else. In other words there was widespread denial about the severity of the threat. Hence, when news of a COVID-19 outbreak first appeared in Wuhan, China many North Americans appeared to believe that it was happening 'far away'. Soon after, as the contagion spread to Italy, some doubted that it wouldn't happen here. Even when case numbers soared in New York City, persons elsewhere on the continent remained confident that its effects would be limited. And when it finally spread to other major North America cities, some insisted that it targeted only the frail and elderly.

Even as the numbers of cases, hospitalization and deaths grew dramatically across the continent, the degree of 'denial' persisted with public opinion surveys in Canada and the United States pointing to significant minorities in each country feeling that the pandemic was being blown out of proportion and/or represented a relatively minor threat to most people's health.

This background is important towards understanding the spread of disinformation around COVID-19 vaccination because of its connection with people minimizing the threat arising from the pandemic. The varying perceptions around the gravity of the pandemic preceded the introduction of mass vaccination (following Health Canada's emergency authorization of the Pfizer-BioNTech vaccine on December 9, 2020, mass vaccination efforts began across the country on December 14, 2020).

That which follows will look at the relationship between the perceived threat of the pandemic, the perceived vaccine effectiveness, the degree of public trust in government/public health officials/pharmaceutical companies, scientists and the overall effect on one's adherence to vaccine disinformation. It is contended that the adherence to vaccine disinformation

cannot be understood in isolation of the aforementioned considerations. The findings arise from selected web based surveys conducted over the period September 2020 through October 2022 by the firm Leger for the Association for Canadian Studies and for the University of Manitoba.

EVOLVING VACCINE INFORMATION/ DISINFORMATION

A Leger-ACS survey conducted in September 2020 saw close to one in five Canadians say that they would not take the vaccine and another one in five saying that they didn't know. As observed below in September 2020 amongst those saying they would not take the vaccine, some one in five respectively believed that the development of the vaccine was rushed thus questioning its effectiveness and a similar percentage were worried about the vaccine's potentially dangerous side effects. As to the other examples of concerns the table below reveals that they secured far less uptake from Canadians at that point in time (see Table 1).

As the percentage of unvaccinated Canadians declined considerably over the two plus years since September 2020 the minority of Canadians (one in ten) that remained unvaccinated by October 2022 were considerably more inclined to endorse myths/inaccurate statements about vaccination. Again, however, some statements continued to acquire greater validation from the non-vaccinated and notably around the purported hasty development of the vaccine as well the notion that securing natural immunity was preferable to vaccination. The biggest gap in views between vaccinated and unvaccinated Canadians is in their respective perception as to whether the vaccine was rushed. As seen in the table below, even amongst vaccinated Canadians, some one in five believed that the vaccine was 'rushed' leaving doubts as to its effectiveness. Some one in six vaccinated Canadians believed that natural immunity was preferable to getting the COVID-19 vaccine (see Table 2).

EFFECTIVE DIVERGENCE OVER VACCINATION

It is difficult to determine the level of commitment of survey respondents to the selected examples of disinformation to which they're exposed. In the above tables we can gauge the extent to which survey respondents are prepared to affirm myths/inaccuracies about COVID-19 vaccination and which of them resonate more so than others. But for some survey respondents, such affirmations may merely reflect a willingness to endorse anything negative about vaccination. As an example, some three in four unvaccinated who believe that the COVID-19 vaccine can change or alter their DNA, also believe that it affects fertility and that natural immunity is better than vaccination. This illustrates the degree of intersecting negative views about vaccination.

Leaving aside the differences in degrees of validation over myths/inaccuracies relative to COVID-19 vaccination, a clear distinction between vaccinated and unvaccinated Canadians appears when they're asked whether vaccines are effective. Over 80% of vaccinated Canadians believe that the vaccine is effective against COVID-19 compared with some 20% of the unvaccinated population who feel that way.

In Canada and the United States, when unvaccinated and those with a single dose were asked why they did not complete their vaccine doses most contended that they did not see vaccines as safe while others maintained that they were ineffective. In both countries, just over one in ten said they don't take vaccines thus qualifying them as 'anti vaxxers' (although others may be reluctant to give that response seeing it as 'socially undesirable'). Still the data suggest that for the most part those who reject vaccination cannot be described as 'anti-vaxxers'. It is worth noting that Americans were somewhat more likely than Canadians to report that access to vaccines was an obstacle to vaccination (see Table 3 and Table 4).

TABLE 1: PERCENTAGE RESPONDING 'TRUE, FALSE OR DON'T KNOW' TO SELECTED STATEMENTS REFLECTING VACCINE DISINFORMATION.

Canada, September 2020	True	False	I don't know
Researchers rushed the development of the COVID-19 vaccine, so its effectiveness and safety cannot be trusted	22.8%	58.8%	18.4%
The side effects of the COVID-19 vaccine are dangerous	22.8%	58.8%	18.4%
If I've already had COVID-19, I don't need a vaccine	14.9%	71.2%	13.9%
The COVID-19 vaccine can affect fertility	10.7%	50.2%	39.1%
Getting the COVID-19 vaccine means I can stop wearing my mask and taking coronavirus precautions	9.6%	82.3%	8.0%
The COVID-19 vaccine enters your cells and changes your DNA	9.4%	70.3%	20.3%

Source: Leger for the Association for Canadian Studies, September 2020

TABLE 2: PERCENTAGE RESPONDING 'TRUE' AMONGST VACCINATED AND UNVACCINATED CANADIANS TO SELECTED STATEMENTS REFLECTING VACCINE DISINFORMATION.

True	Vaccinated	Not Vaccinated	Gap between vaccinated and unvaccinated
Researchers rushed the development of the COVID-19 vaccine, so its effectiveness and safety cannot be trusted	20.3	66.1	45.8
The natural immunity I get from being sick with COVID-19 is better than the immunity I get from COVID-19 vaccination.	17.5	58.8	41.3
If I've already had COVID-19, I don't need a vaccine	9.3	42.2	32.9
The COVID-19 vaccine can affect fertility	9.3	41.9	32.6
The COVID-19 vaccine can change or alter my DNA	6.6	32.5	25.9

Source: Leger for the Association for Canadian Studies and the University of Manitoba, October 3 to October 14 2022

TABLE 3: REASONS FOR NOT COMPLETING YOUR VACCINE DOSES IN CANADA AND THE UNITED STATES AMONGST THE UNVACCINATED AND THOSE WHO HAD A SINGLE DOSE.

	What is the main reason why you have not been vaccinated or have not completed your vaccine doses?	
	Canada	United States
I do not think the vaccines are safe and could potentially be harmful to my health	38.4%	33.9%
I do not believe the vaccines are effective against COVID-19	29.8%	21.1%
I do not take any vaccines	12.2%	11.6%
I have medical restrictions that do not allow me to take the vaccine	3.9%	8.7%
I have not had the opportunity/access to get any vaccine	3.5%	10.7%
It goes against my religious faith to take the vaccine	3.1	4.7%
Other	8.1%	9.3%
Total	**100.0%**	**100.0%**

Source: Leger for the Association for Canadian Studies and the University of Manitoba, October 3 to October 14 2022

TABLE 4: PERCENTAGE WHO THINK VACCINATION AGAINST COVID-19 HAS BEEN EFFECTIVE AMONGST VACCINATED AND UNVACCINATED CANADIANS.

Over the course of the pandemic, how effective do you think vaccination against COVID-19 has been….	Vaccinated	Not Vaccinated	Total
Total Effective	**83.6%**	**22.0%**	**78.0%**
Extremely effective	54.8%	10.1%	50.7%
Somewhat effective	28.8%	11.9%	27.3%
Not too effective	7.3%	13.7%	7.9%
Not effective at all	6.1%	54.5%	10.5%
I don't know	3.0%	9.7%	3.6%
Total	100.0%	100.0%	100.0%

Source: Leger for the Association for Canadian Studies and the University of Manitoba, October 3 to October 14, 2022

A closer look into the relationship between perceptions about vaccine effectiveness and the various myths/inaccuracies relative to the vaccine reveals a considerable degree of symmetry between perceived vaccine ineffectiveness and the endorsement of myths/inaccuracies about COVID-19 vaccines. As revealed below, those regarding the vaccine as 'not effective at all' are by far most likely to believe it modifies one's DNA and affects fertility (see Table 5).

THE UNVACCINATED AND PANDEMIC EXAGGERATION

As revealed above, many unvaccinated Canadians feel that the vaccine is not only ineffective but is also harmful. We'll now examine the degree to which they regard the pandemic as a threat to public health. It is worth noting that not all vaccinated Canadians believe that the response to COVID-19 has been balanced as surveys consistently demonstrate that just under one in five such Canadians believe that the response to the pandemic has been blown out of proportion. That said, the percentage differs markedly with the nearly one in two unvaccinated Canadians that believe the reaction to the pandemic is being blown out of proportion (see Table 6).

Delving further into how the perception of the threat of the pandemic affects views on myths/inaccuracies about COVID-19 vaccination, one observes in the table below that those who feel the reaction to the pandemic has been 'blown way out of proportion' are much more likely to endorse the inaccuracies than are those who regard the response to COVID-19 as either 'correct' or 'inadequate'. The findings add yet another important layer in establishing a pattern in the perception of persons endorsing myths/inaccuracies about COVID-19 vaccination (see Table 7).

TRUST IN PUBLIC INSTITUTIONS AMONGST THE UNVACCINATED

A critical element in examining the level of adherence to vaccine disinformation is the extent to which unvaccinated Canadians trust key institutions addressing the pandemic. As observed below there are sizable differences between vaccinated and unvaccinated Canadians in the degree of distrust of the federal government, public health officials, pharmaceutical companies and scientists (see Table 8).

Amongst unvaccinated Canadians, there is an important intersection between the degree of institutional mistrust and adherence to COVID-19 myths/inaccuracies. Those 80% of unvaccinated Canadians that say they do 'not at all' trust the federal government believe that the vaccine was rushed. There are similarly high intersections between institutional distrust amongst the unvaccinated and adherence to COVID-19 myths/inaccuracies.

As revealed below the unvaccinated population reporting the highest levels of institutional distrust are overwhelmingly of the opinion that the vaccine is 'not effective at all'. This finding contrasts sharply with those vaccinated Canadians reporting the highest levels of trust in selected institutions with some 80% regarding the vaccine as extremely effective (see Table 9).

TABLE 5: CROSS TABULATION OF VACCINATED AND UNVACCINATED CANADIANS WHO THINK THE VACCINATION AGAINST COVID-19 HAS BEEN EFFECTIVE AND THEIR RESPECTIVE RESPONSES TO SELECTED STATEMENTS REFLECTING VACCINE DISINFORMATION.

	Vaccination against COVID-19 - Over the course of the pandemic, how effective do you think the vaccine is?			
	Extremely effective	Somewhat effective	Not too effective	Not effective at all
The COVID-19 vaccine can affect fertility—Based on your knowledge about COVID-19 vaccines	5.3%	9.2%	20.9%	48.0%
If I've already had COVID-19, I don't need a vaccine	3.8%	9.2%	24.7%	51.4%
Researchers rushed the development of the COVID-19 vaccine, so its effectiveness and safety cannot be trusted	8.8%	24.4%	49.8%	78.4%
The COVID-19 vaccine can change or alter my DNA	3.6%	8.0%	13.0%	34.8%
The natural immunity I get from being sick with COVID-19 is better than the immunity I get from COVID-19 vaccination	8.9%	20.0%	40.2%	69.6%

Source: Leger for the Association for Canadian Studies and the University of Manitoba, October 3 to October 14, 2022

TABLE 6: PERCENTAGE OF VACCINATED AND UNVACCINATED CANADIANS WHO THINK THAT THE PUBLIC RESPONSE TO COVID-19 HAS BEEN BLOWN WAY OUT OF PROPORTION, CORRECT OR INSUFFICIENT.

COVID-19 pandemic—Do you believe the following issues are important and need to be addressed or are being blown out of proportion?	Vaccinated	Not Vaccinated
Being blown way out of proportion	18.2%	47.9%
Correct level of response to this important issue	59.8%	35.4%
Insufficient level of response to this important issue	22.0%	16.7%
Total	**100.0%**	**100.0%**

Source: Leger for the Association for Canadian Studies and the University of Manitoba, October 3 to October 14, 2022

TABLE 7: CROSS TAB: PERCENTAGE OF VACCINATED AND UNVACCINATED CANADIANS WHO THINK THAT THE PUBLIC RESPONSE TO COVID-19 HAS BEEN BLOWN WAY OUT OF PROPORTION, CORRECT OR INSUFFICIENT AND THEIR RESPECTIVE RESPONSES TO SELECTED STATEMENTS REFLECTING VACCINE DISINFORMATION.

True	Being blown way out of proportion	Correct level of response to this important issue	Insufficient level of response to this important issue
Researchers rushed the development of the COVID-19 vaccine, so its effectiveness and safety cannot be trusted	59.4%	14.6%	14.9%
The natural immunity I get from being sick with COVID-19 is better than the immunity I get from COVID-19 vaccination	55.5%	12.7%	8.7%
If I've already had COVID-19, I don't need a vaccine	38.0%	5.7%	3.4%
The COVID-19 vaccine can affect fertility	34.5%	6.0%	6.1%
The COVID-19 vaccine can change or alter my DNA	25.9%	3.8%	5.0%

Source: Leger for the Association for Canadian Studies and the University of Manitoba, October 3 to October 14, 2022

TABLE 8: PERCENTAGE OF VACCINATED AND UNVACCINATED CANADIANS THAT RESPECTIVELY DISTRUST THE FEDERAL GOVERNMENT , PHARMACEUTICAL COMPANIES, PUBLIC HEALTH OFFICIALS AND SCIENTISTS TO ADDRESS THE COVID-19 PANDEMIC.

% distrust when it comes to addressing COVID-19 pandemic	Vaccinated	Not Vaccinated	Gap between vaccinated and unvaccinated
Pharmaceutical Companies	34.4	75.4	41.0
Federal Government	35.4	73.3	37.9
Public Health Officials	19.7	65.8	46.1
Scientists	12.7	55.3	42.6

Source: Leger for the Association for Canadian Studies and the University of Manitoba, October 3 to October 14, 2022

TABLE 9: PERCENTAGE OF UNVACCINATED CANADIANS WHO BELIEVE THE VACCINE IS INEFFECTIVE AND THAT SAY THEY DO NOT AT ALL TRUST SELECTED INSTITUTIONS (FEDERAL GOVERNMENT , PHARMACEUTICAL COMPANIES, PUBLIC HEALTH OFFICIALS AND SCIENTISTS) TO ADDRESS THE COVID-19 PANDEMIC COMPARED WITH THE PERCENTAGE OF VACCINATED CANADIANS WHO BELIEVE THE VACCINE IS EXTREMELY EFFECTIVE AND THAT SAY THEY DO TRUST 'A LOT' OF SELECTED INSTITUTIONS.

Unvaccinated...that do 'not at all' trust the following:	Percent who believe that the vaccine is not effective at all	Vaccinated and trust the following 'a lot'	Percent who believe that the vaccine is extremely effective
Pharmaceutical Companies	78.3%	Pharmaceutical Companies	86.5%
Federal Government	78.6%	Federal Government	83.7%
Public Health Officials	87.2%	Public Health Officials	82.4%
Scientists	83%	Scientists	74.9%

Source: Leger for the Association for Canadian Studies and the University of Manitoba, October 3 to October 14, 2022.

CONCLUSION

Policy makers tasked with coordinating efforts at mass public vaccination have expressed legitimate concerns over the propagation of disinformation about the COVID-19 vaccine. But public information campaigns aimed at attacking myths/inaccuracies head on risk not succeeding in achieving their desired aim amongst the remaining numbers of unvaccinated Canadians. That's in part because it is essential to address the underlying causes for vaccine refusal to combat disinformation.

An American study by Lin et al. concludes that "In pursuing interventions to reach the unvaccinated community, it is vital not to marginalize their concerns due to the resentment that can result. A compromise must be found that incentivizes vaccination without antagonizing or isolating unvaccinated individuals."

Others view the prospects for persuading the unvaccinated with considerably less optimism. A September 2021 survey of unvaccinated Americans for CNBC reveals that 83% say they do not plan to get vaccinated. The CNBC/Change Research poll notes that amongst the unvaccinated 87% said their decision wouldn't change even if their employer mandated them to do so. The November 2022 Leger-ACS-University of Manitoba survey reveals that amongst the remaining ten percent of unvaccinated Canadians more than 90% say they have no intention of getting vaccinated.

In December 2022, Dr Anthony Fauci observed that in the United States, "...we have been stuck at 68% of the population being fully vaccinated with the primary series. And we realized months ago, literally several months ago, that we were not going to get much past that no matter what we said." Fauci hoped that "...when people see how that approach leads to more hospitalizations and deaths of people, and it hits home to people, that they [will then] understand."

As regards vaccine disinformation, our survey research confirms that adherence to it is closely associated with elevated rates of institutional distrust and/or the minimizing of the threat of the contagion to personal and public health. Ideally policy makers would want to alter the perception of unvaccinated Canadians about the seriousness of the pandemic as well as identify persons or institutions that they trust to carry that message. That, however, may be a daunting task as the survey data suggest that the views of those who remain unvaccinated appear to be fairly locked-in (see Table 6).

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KNOW IT OR NOT: EXAMINING GAMIFIED INTERVENTIONS IN A REAL-WORLD PUBLIC HEALTH EDUCATION CAMPAIGN, AND CO-CREATING CUSTOMIZED TOOLS FOR EQUITY-DESERVING COMMUNITIES

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INTRODUCTION

The emergence of the COVID-19 virus during the age of rapid social connectivity produced an unprecedented symbiosis between a physically detrimental disease and socially harmful misinformation. Three years later, the world continues to contend with the intrinsic virality and constant evolution of these intertwined maladies that threaten the health and future of our communities.

An overabundance of information sharing during a pandemic is expected since public health issues are emotionally charged and value laden (Trevors & Ladhani, 2022), especially as we witness the harrowing consequences of an outbreak amidst persisting social inequities. Being bombarded with constantly changing and often conflicting news about an infectious disease, whilst trying to cope with the upending of "normal" life is anxiety-provoking (Abadi et al., 2021; Neill et al., 2021). This anxiety drives greater information-seeking in an effort to reduce the aversive feeling of uncertainty (Jungmann & Witthoft, 2020). However, when intense emotions are coupled with the speed, multiple mechanisms and lack of individual accountability with which information has been transmitted during the COVID-19 pandemic, we must reconsider our approach to health promotion and public education.

COUNTERING MISINFORMATION WITH GAMIFIED DIGITAL TOOLS

Technology has undeniably been the conduit for the alarming rise in misinformation globally, but it can also be a powerful tool to address it due to the same reasons: unparalleled reach, attention captivity and behavioural influence. Gamification is a form of technology that represents a new approach to education because it can offer personalized and positive interactions between individuals and information. By dynamically adapting to individuals' behaviors and responses as they play,

a gamified educational tool can enrich engagement and inform decision-making overall (Baram-Tsabari & Schejter, 2019).

Digital Public Square investigated the causal effects of gamified refutations regarding COVID-19 vaccine misconceptions on key outcomes within a large randomized control trial (RCT). Refutations have a substantial body of evidence supporting their use to correct misconceptions, yet reduced efficacy has been observed for some topics that generate negative emotional responses (Sharot & Sunstein, 2020; Trevors & Ladhani, 2022). A nationally representative sample of 4071 Canadian adults were recruited for a RCT between December 8th to 30th, 2022. They were randomly assigned to one of three conditions: gamified intervention (the *Know it or Not* game), active control blog (a non-gamified information page containing the same information as the game), or a no-information control condition. We contrasted these three conditions on their end-of-study vaccine knowledge/misinformation retention, vaccine confidence, and intent to receive a vaccine in the next six months. Participants' responses to knowledge questions were given a score of 1 if they answered correctly, 0 if they said they were "unsure", and -1 if answered incorrectly. Contrasts were performed for the full sample and among individuals who have not yet received a COVID-19 booster (i.e., two doses or fewer; N = 1503 or 37% of the full sample), for whom we hypothesized the intervention would have the most impact. Means for each condition and subsample are reported in Table 1.

TABLE 1: DESCRIPTIVE STATISTICS FOR OUTCOME VARIABLES ACROSS EXPERIMENTAL CONDITIONS

	Game		Blog		Control	
	Full	Unboosted	Full	Unboosted	Full	Unboosted
Knowledge[a]	**65%**	**50%**	58%	40%	24%	-2%
Confidence	**72%**	**53%**	70%	48%	65%	45%
Intent to receive	75%	**54%**	73%	49%	66%	43%

Note: Bolded values denote the unique statistically highest mean, $p < .05$.
[a]Range of possible values -100% to 100% to reflect presence of misconceptions vs. accurate knowledge, respectively.

Compared to the blog, and based on preliminary analysis, the identical content presented in the gamified context resulted in more vaccine knowledge (25% improvement among unboosted), confidence in vaccines (10% improvement among unboosted), and intent to get vaccinated in the next 6 months (8% improvement among unboosted).

UNDERSTANDING THE NEEDS AND PRIORITIES OF DIVERSE COMMUNITIES

We have seen a high level of engagement with the *Know it or Not* tool overall, with over 140,000 gameplays equating to over 1.3 million questions answered since November 2021. As a privacy first platform, the gamified tool does not collect personally identifiable data but users can opt-in to share demographic information. Based on those that choose to self-identify, the tool has lower engagement with certain communities disproportionately affected by COVID-19, particularly Black and Indigenous peoples. Thus, reaching these communities remains a key challenge and priority.

Given the complexity of vaccine hesitancy and the diversity within equity-deserving groups, we undertook in-depth qualitative engagement with members of Indigenous and Black communities across the age, gender, sexuality and socio-economic spectrum, to understand their pandemic experiences. We conducted three focus groups with Black community members in July and December 2022 (n = 27), and undertook in-depth interviews with 5 Indigenous health care professionals and community leaders in November 2022. The findings of this research are informing the development of customized versions of our gamified platform that are intended to meet the health information needs of Black and Indigenous communities, respectively.

Unsurprisingly, participants across both groups indicated the greatest driver of their community's vaccine hesitancy stemmed from systemic racism and distrust in the government. They emphasized that a critical first step in conversations about COVID-19 vaccine hesitancy is acknowledging that their skepticism of healthcare systems and public health initiatives is rooted in their historical and ongoing mistreatment in health-care environments.

FINDINGS FROM OUR ENGAGEMENT WITH INDIGENOUS COMMUNITY LEADERS

Indigenous identifying interviewees shared that the COVID-19 vaccine also presented challenges to their cultural identity, something they have had to strongly advocate for since colonization. For example, COVID-19 promotion is reminiscent of forced assimilation for some and the requirements for a status card to access healthcare means that Indigenous identities are questioned or need qualification by the government. Respecting the environment is also shared as critical in the Indigenous culture and western medicine is sometimes viewed as an interference with natural processes. Communications about the vaccine as a tool for returning to "normalcy" are perceived by some as a desire to return to practices that were harmful to our planet and their communities. Thus, core Indigenous beliefs can often be at odds with paternalistic messaging from authorities about their directives and inventions, such as the vaccine, being appropriate and necessary.

FINDINGS FROM OUR ENGAGEMENT WITH BLACK COMMUNITY MEMBERS

Black community members expressed the need for more visibility and acknowledgement of Black peoples' efforts in the pandemic response, including Black scientists' involvement in developing the vaccine. Appropriately recognizing and celebrating the role of Black people in healthcare helps build confidence and promotes a more inclusive healthcare system. Another key concern was the need for transparency regarding how personal information and data will be used.

WHAT DOES EFFECTIVE HEALTH COMMUNICATION LOOK LIKE TO INDIGENOUS COMMUNITIES?

Our consultations with Indigenous health practitioners emphasized that effective health communication in the Indigenous community requires information sharing by trusted cultural sources, data transparency, understanding the gravity of making a choice and fostering open dialogue.

Connecting health information sources to the Indigenous culture is critical and can be fairly straightforward to implement (for example, an Indigenous health practitioner explaining how vaccines are made from natural ingredients). Jointly, health promotion efforts need to consider past trauma and acknowledge the drivers of mistrust in order to gradually earn trust. This includes clarifying the purpose of data collection, data ownership and the rights of individuals to access or inquire about that information.

Furthermore, a one-size-fits-all model for addressing vaccine hesitancy within the Indigenous community is inadequate, and the level of social pressure that individuals may face when deciding about vaccination is often underestimated and minimized. Therefore, reflecting diverse viewpoints and acknowledging the emotional underpinnings of these decisions is crucial. Moreover, storytelling was asserted as the most culturally relevant approach to the traditional Indigenous knowledge system, and holds the potential to create a culturally safe environment by using communications material that shows genuine curiosity about traditional healing and allows open knowledge exchange.

WHAT DOES EFFECTIVE HEALTH COMMUNICATION LOOK LIKE TO BLACK COMMUNITIES?

Our community engagement found three key recommendations for effective health promotion in Black communities: an acknowledgement of systemic racism, Black representation in communications materials, and promoting the broader protection of the Black community through vaccination.

Black community members indicated that highlighting systemic racism in healthcare settings as a key driver of distrust in the COVID-19 vaccine is required to create a space where they feel comfortable to express concerns and seek advice about health. Respondents also asserted the importance of representation in generating meaningful connection. Including images of Black clients, doctors, and other healthcare professionals in communication materials acknowledges the valuable contributions of Black people in the vaccine development process, and may therefore aid in easing distrust. Additionally, framing vaccination as a way of protecting the broader Black community is helpful, though care is required to ensure that vaccine hesitancy is not framed as a form of community harm or betrayal. Creating a compassionate conversation about taking care of others whilst respecting bodily autonomy is key.

DIGITAL HEALTH TOOLS BUILT BY THE COMMUNITY, FOR THE COMMUNITY

Putting these learnings into practice promotes the development of online education platforms that are co-created with the communities they are meant to serve. These in-depth research findings have informed the product design (the look and feel), content (information), and distribution (how it's

being shared) of custom tools for each respective community. The inclusive product development process involved our Indigenous and Black-led project partners evaluating the content and design of our *Know it or Not* tool and seeking feedback from their respective community networks to propose modifications, while still maintaining the benefits of a gamified approach.

The customized tool for Indigenous communities adopts a storytelling approach to discuss health issues and concerns, using visual representation of the culture through the depiction of Indigenous people and elements of nature. Information in the tool will be narrated from the point of view of different members of the Indigenous community so that diverse views are represented and explored, focusing on Indigenous medicine and acknowledging the pressure involved in choosing to be vaccinated. The Indigenous health professionals engaged during our research process and our Indigenous collaboration partners will share the tool with their networks, serving as trusted distribution channels in the community.

The customized tool for Black communities presents topics in an exploratory modular format so that users can choose what they want to learn. The content centres Black experiences, specifically by acknowledging reasons why Black communities may distrust vaccines, and includes open-text questions where users can simply express how they feel. Trust in the tool will be built by distributing through Black-led organizations/networks, who stand to mutually benefit from the data insights collected when using them to inform their own health promotion activities.

Thus, the experience of validating a gamified approach to address health misinformation, coupled with Black and Indigenous community-led collaborations on the development and dissemination of customized tools, paves the way for greater and more equitable impact on improving vaccine confidence among equity-deserving communities. Our customized products serve the double purpose of both health promotion and data insights tools. For Indigenous and Black audiences, they deliver important, culturally sensitive information about the COVID-19 vaccines. For organizations or people that choose to disseminate the tools through their communications channels, they collect aggregate data insights about the health concerns of their audiences, which can then inform health promotion strategies at different scales, without compromising privacy. While the empirical insights from these custom tools will be available in March 2023, the findings from this work can inform public health interventions seeking to reach equity-deserving communities in Canada for many years to come.

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LESSONS LEARNED FROM IMMUNIZATION PARTNERSHIP FUND (IPF) PROJECTS: ADDRESSING MIS- AND DISINFORMATION (MIDI) AT THE COMMUNITY-LEVEL

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INTRODUCTION

High national vaccine confidence and uptake rates are essential to protect the health of Canadians. Through the Immunization Partnership Fund (IPF), the Government of Canada is helping close the gap among populations with lower vaccine uptake by enabling informed vaccination choices. The IPF has a unique ability to create change in marginalized, underserved and at-risk communities through community-led and evidence-based interventions designed to support informed vaccination choices.

The core objectives that IPF projects address include building the capacity of healthcare providers; community-based education, promotion, and outreach; and, building capacity for evidence-based vaccination communication. In order to achieve widespread coverage, the IPF leveraged the expertise, knowledge and reach of both traditional and non-traditional public health partners working in and representing communities across Canada. Since 2020, the IPF has deployed over $50M in funding to over 100 initiatives, with $14M earmarked to fight COVID-19 vaccine-related mis- and dis-information (MIDI) (Government of Canada, 2022). This article will spotlight the achievements of IPF recipients in preventing and dispelling MIDI in their program populations by exploring the following key themes: addressing the 'infodemic' surrounding COVID-19 and vaccines, diversity, vaccine-specific MIDI, and evidence-based communication.

ADDRESSING THE INFODEMIC

The COVID-19 pandemic has contributed to an increase in unreliable information spreading rapidly through social media and eroding vaccine confidence (Gunasekeran et al., 2022). Social media platforms have played a major role in the spread of false information during the pandemic, contributing to a

rise in vaccine hesitancy, and negatively influencing willingness to get vaccinated (ECDC, 2020). Conversely, the same features that make social media vulnerable to MIDI can be leveraged for positive public health messaging.

Online platforms are a low-cost means of delivering interventions to a large audience and may be particularly useful during a pandemic when in-person activities are restricted. In 2021-2022, IPF projects created nearly 8,000 social media products that garnered over 72 million impressions. This included social media posts on popular platforms such as Twitter, Facebook, and Instagram, as well as social networking and messaging apps like WhatsApp and WeChat. For example, Sickle Cell Awareness Group of Ontario (SCAGO) (2022) created a WhatsApp forum to support Black community members affected by sickle cell disease, resulting in more than 3,000 COVID-19 related chats. The project also ran four Ask-A-Doc sessions on WhatsApp where community members could direct their questions and concerns to health professionals. As a result, SCAGO has successfully engaged the SCD and Black community to equip them with knowledge to make informed decisions on COVID-19 vaccines.

IPF projects also recognized the importance of building the capacity of trusted healthcare providers (HCPs) as well-positioned figures to address vaccine MIDI. Culturally safe communication was particularly important for engaging with diverse communities. For example, University Health Network (UHN) (2022) built the capacity of personal support workers (PSWs) to educate their peers and patients about vaccination. Centering on lived experiences of racialized populations, the UHN IPF project integrated scientific knowledge with community experiences to support teaching, learning, and development among PSWs.

DIVERSITY

IPF projects emphasize diversity through the delivery of low barrier, inclusive and trauma-informed vaccine services and programming. Projects funded through the program have demonstrated that "meeting people where they're at" involves providing an accessible program design that addresses health inequities, and creates a safe space to ask questions without judgement. IPF projects make meaningful connections by using community ambassadors and peer-to-peer models to convey information, build trust with community members, and overcome barriers to accessing health services. By connecting individuals to community ambassadors that share a similar social positioning, IPF projects engage and build trusting relationships with diverse audiences, where people feel represented and safe in their healthcare settings. Diversity is also evident in IPF program design and delivery, which has included the use of incentives, mobile clinics, and pop-up events.

Many IPF projects demonstrated how vaccine confidence increases when individuals have access to equity-focused and culturally safe information. By tailoring interventions to specific communities throughout their program model, projects promote the long-term sustainability of their initiatives. Language is an essential tool for overcoming barriers in accessing information to make informed health decisions (Health Canada, 2001). For example, the Scarborough Centre for Healthy Communities (SCHC) (2022) has leveraged the many languages spoken by their team of community ambassadors to connect with community members who are most vulnerable and experiencing health inequities. SCHC has successfully reached isolated communities through the diverse cultural representation of their staff, have reduced language barriers, and have created job opportunities for newcomers to Canada.

VACCINE MIDI

MIDI is a significant driver of vaccine hesitancy in Canada (Rotolo et al., 2022). Vaccine MIDI may also be community-specific and therefore needs to be addressed using tailored education, promotion, and outreach approaches. IPF projects have demonstrated that building health and science literacy in communities is an important prerequisite to establishing population-level vaccine literacy. For example, Science North (2023) partnered with Indigenous communities to deliver the Virus of Misinformation exhibit and workshops in First Nations communities across Northern Ontario. Travelling to remote communities has created equitable access by providing a culturally safe option for accessing COVID-19 related information.

IPF evidence supports that many equity-deserving populations are underserved by mainstream vaccine confidence and uptake efforts in Canada. Projects funded by the IPF indicate that diverse community partnerships enhance the ability of recipients to efficiently distribute project materials to a wide audience. In 2021-2022, IPF recipients identified that more than 500 project partnerships had formed with over 775 unique Canadian organizations. IPF projects ran activities alongside established community programs designed to meet other important community needs, such as food and housing insecurity.

These wrap-around and intersectoral approaches considered the multiple priorities that compete with vaccine decision-making. For example, the Dr. Peter AIDS Foundation (2021) supported a series of small size, unique community projects through a low-barrier micro-contribution funding structure. Examples of initiatives funded through the Dr. Peter Centre include mobile and community-based vaccine clinics, peer led outreach strategies, and innovative communications strategies for addressing vaccine hesitancy.

EVIDENCE-BASED COMMUNICATION

IPF projects used evidence-informed decision-making (EIDM) to develop public communication strategies. EIDM is the process of distilling and disseminating the best available evidence from research, practice, and experience, and using that evidence to inform and improve public health policy and practice (PHAC, 2014). IPF projects were successful in both advancing and developing new vaccine confidence evidence for diverse communities across Canada. For example, ScienceUpFirst (2022), an initiative of the Canadian Association of Science Centres, has developed a first-in class platform for debunking misinformation. Fueled by a large network of scientists, researchers, science communicators, and community partners, ScienceUpFirst creates engaging, evidence-informed content that provides the tools Canadians need to separate sense from nonsense, resulting in better health outcomes. Through partnerships with Indigenous, South Asian, and Black communities, ScienceUpFirst addresses community-specific MIDI by creating linguistically diverse and culturally relevant materials.

IPF projects have been creative in their methods for "pre-bunking" vaccine-related MIDI through equipping communities with the tools to spot and prevent MIDI from spreading. "Pre-bunking" involves providing individuals with evidence-informed information that builds their resistance and reduces their susceptibility to believing MIDI (Dubé et al., 2022). Digital innovation has allowed for the delivery of health promotion materials through accessible, flexible, and engaging ways. For example, Digital Public Square (DPS) (2022) developed a gamified platform that delivers COVID-19 education, where players differentiate COVID-19 vaccine facts from MIDI with interactive swiping. Their platform refutes MIDI by delivering evidence-based information that adapts to an individual's level of confidence in the COVID-19 vaccine. DPS assess dashboards displaying ~5,000 daily links informing the development of more than 30 disinformation narratives into platform questions that correct vaccine misconceptions for users. The tool has successfully circumvented harmful misinformation narratives, as well as equipped pro-vaccine individuals with information they can champion and disseminate.

CONCLUSION: LESSONS LEARNED AND BEST PRACTICES

Initiatives supported by the IPF have been successful in addressing MIDI by going beyond the traditional role of health promotion to address vaccine barriers for diverse communities across Canada. Best practices and lessons learned from the IPF to increase vaccine equity include:

- **TRUSTED & TAILORED APPROACHES:** IPF projects built and leveraged trusting relationships within underserved communities. Tailored approaches met people "where they're at" and diverse program materials were community-driven.

- **SUPPORTING INNOVATION:** IPF projects had the flexibility for innovation and created diverse programming to address community-specific MDI. IPF performance measurement data confirms that community-responsive social media products have been an effective method of sharing evidence-informed COVID-19 information quickly and broadly. IPF projects also counteracted vaccine-related MIDI by equipping communities with the tools to spot and prevent MIDI from spreading through "pre-bunking" and other evidence-based communication methods.

The IPF's pandemic-related call for proposals was oversubscribed, demonstrating heightened interest in non-traditional partners delivering programming in the vaccination space. As supported by IPF evidence, these partners are key to dispelling vaccine-related MIDI in Canada given their trusted relationships with diverse communities.

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THE DEFINITION OF A MYTH—BLACK FOLKS AND COVID-19

As a proud Caribbean Canadian woman, **Lydia-Joi Marshall** strives to use her voice to represent her lineage and community in a positive light on every platform. Lydia-Joi earned a Msc. In Human Genetics from the prestigious Howard University. As President of the board of directors of Black Health Alliance, a not-for-profit organization, she diligently worked to galvanize leaders to promote health awareness and patient advocacy from within the community. Their mission is to reduce the racial disparities in health outcomes and promote health and well-being for people from the diverse Black communities in Canada with emphasis on the broad determinants of health, including racism. This message can be seen through her public advocacy including her Tedx talk on the impacts of being Black in Canada. Ms. Marshall also works with Health Commons Solutions lab, which focuses on equitable solutions to addressing population wellness, including supporting marginalized communities during the current pandemic.

Mythology can be defined as tools that are used to preserve cultural beliefs, entertain or to warn. They may be rooted in lived experience or be a creative expression of various forms of knowledge. During the COVID-19 pandemic we saw the revitalization of myth-telling on a Herculean level, both because of its inherent global impact and our ability to virtually share in real time our opinions and experiences about what was happening. What emerged were diverse narratives around how we access, define and communally relate to medical interventions. Unfortunately, during the pandemic many healthcare values, especially those in Black communities, were framed as being uninformed which led to a polarization between emerging medicine and traditional values. Instead of dismissing this knowledge as mythology, going forward we can strive to learn to utilize our diverse tools in medicine to rebuild a system that is sustainable for all.

MYTH 1 - UNIVERSAL HEALTH CARE MEANS EQUITABLE CARE

Canada often prides itself on having an equitable system because of universal health care, simply because it is offered to everyone. The mythical aspects of this became abundantly clear when almost immediately disparities in who became infected with COVID-19 and who had access to care began to emerge. This was further illustrated when our cries of "we are all in this together" were not reflected by the dissonance seen in some posting TikToks about becoming expert bakers while quarantining at home, while others were still working front line with inadequate personal protective gear.

Leaders from groups that are marginalized by race, such as diverse Black communities, were requesting routine collection of statistics of these disparities. Both to secure additional resources to support those being disproportionately impacted, but also as a public record of gaps that were already known across the board in chronic and acute care needs. Health Authorities were reticent to use resources to collect this data, as in their experience our "post-racial" system would not benefit from this information. When it was finally examined, what was seen was a disturbing trend of disproportionate impact. In cities like Toronto 21% of COVID-19 cases were in Black people, who only made up 9% of the total population.[1] Worse yet, in regions of lower socio-economic means, Black people were 3.5 times more like to die from COVID-19 than their ethnically diverse counterparts.[2]

The reason for these trends are multifactorial and are rooted in the social determinants of health. This includes a sense of belonging to the broader community, relationships with governing bodies and systemic anti-Black racism which has

manifested in generational differences in access to public services, and private opportunities.

For example, it became evident that public transportation was a source of increased risk of COVID-19 transmission. While areas serving a diverse majority often tend to have more frequent services, resulting in less crowded commutes, many geographies serving dense communities of Black folks have less consistent route service and divergent surge planning. This results in higher opportunities for contact and spread. This was true even when economic status was normalized. Simply providing the opportunity to access healthcare to all citizens, does not remove the barriers to fully participating in this care, especially for groups that have been purposefully not integrated into the system. This can in fact further contribute to the widening of gaps of who is infected and how they recover to acute infections such as COVID-19.

MYTH 2 – GOOD HEALTH IS A UNIFORM UNIVERSAL CONCEPT

As a society we have long had a curiosity as to how our body functions and how to maximize this, some of these explorations have been recorded in medical books, others orally passed down, depending on the society and how they record knowledge. This can range from foods and herbs that are known to soothe minor ailments, to drugs or surgeries to address larger needs. For example, many families have tried and tested teas that are administered to relieve gastrointestinal problems, infectious disease or hormonal rebalancing. These address a need both by the familiar practice of it, and through active ingredients that may work well in balancing our biological symbiosis.

During the onset of the pandemic, commendably leaders were focused on mobilizing resources to secure the health of the global majority, an Imhotep-size task in a medically shifting landscape. This often meant choosing one narrative of health, and forming practices around achieving this. What did this feel like for those whose viewpoints had not been considered in the universal emergency plan? For many it felt like an erasure of their voice in the public conversation on health. A reinforcement that their cultures were not valued and that they would be forced to comply with a system that had historically marginalized them.

In response to the alarming statistics showing rates of COVID-19 in Black communities, we began to see mainstream headlines around hesitancy and strategic plans on how to "bust mythology" in these people. Equity and inclusion courses were put on sabbatical, as we routinely addressed unique Black communities as a monolith, and studied and reported on them as an entity to be swayed.

The debate was no longer about science and safety but became a competition of which voice was the acceptable normal, while the usual outliers were silenced.

Working on the front lines, what became evident was that most people did care deeply about their health and safety. Why the conversation had become divided was because we had not agreed on what these terms meant. The result was an increase of mistrust, not in modern medicine, but in the people enforcing power in how to use it.

MYTH 3 – WE ALL WANT TO "GET BACK TO NORMAL"

Black communities have often felt excluded from the broader discussions on healthcare. This comes in the form of systemic mistreatment which has been seen overtly in prejudices encountered when entering institutional settings. This is not only in reference to the now well catalogued clinical trials in Black populations, but rather to daily assumptions made about the capability to understand and engage in wellness practices, and the microaggressions that ensue based on this. This communal sentiment of being ostracized, was further exacerbated during the pandemic when public health care often focused on targeting Black people. The evidence showed that interventions to support demographics that were being impacted more severely were needed, but the way in which these strategies were presented often reinforced feelings of being further stigmatized. Many other groups had questions about COVID-19 care and vaccinations, where were their campaigns or tailored messaging? Instead, the media headlines presented many diverse Black communities as a monolith who were all making the same healthcare decisions.

Additionally, foundations of health from across the African Diaspora are rarely included in mainstream holistic health care conversation, even when discussing naturopathic or complementary services. For example, if you inform your primary care physician that you are also following an Ayurvedic practice of health care, it is generally understood, but if one said they followed an Ital lifestyle, subsequent line of questioning is often extensive.

This experience often makes members of marginalized communities reticent to share their practices and viewpoints, as they feel like they are being judged in a way that may impact the nature of their care. While legally part of this universal healthcare system, many Black Canadians have long been a part of a parallel system, because there is a feeling that full engagement is not in their best interest Participation in public health campaigns, research and even routine care has long looked very different, but prior to the pandemic few were paying attention.

This has an impact on the health outcomes of many, and it causes barriers to accessing care in both tangible and

psychosocial ways. If this was normal, there would be no desire to return to it.

LESSONS FOR THE FUTURE

What then is the goal for rebuilding in the era after the onset of COVID-19? We have learned of our incredible resilience, adaptability and compassion in circumstances that were new to a whole generation of people. The ingenuity that emerged and the progress of medical technology have been an amazing personification of the phrase survival of the fittest.

This progress must continue.

While we addressed the emerging health crisis, we learned how collecting disaggregated data helps give us a better picture of who we are serving and more importantly who are not. Often the solution to addressing any inequalities that are seen is to provide further education to the marginalized group, with the assumption that if we are all given the same information, we will value and interpret it in the same way. This has never been true of any philosophy, theory or practice. Instead, let us not dismiss our varied epistemologies of health as mythology and misinformation, but use them as a starting point to understand one another and what intersections we can find to achieve a healthy society. Reciprocal education on wellness is needed.

We have found pride in promoting our diversity as a society and creating safe spaces for individual expression, but diversity does not only exist in the food we eat or the spectrum of melanin expression but is also found in our individual core of belief systems around health maintenance. It is possible to enhance a healthcare system that strives to make space for varied conversations on healing, while maximizing the amazing clinical strides we are making as a collective to maintain this.

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IT'S WORTH A SHOT: FIGHTING VACCINE DISINFORMATION IN EDMONTON'S MARGINALIZED COMMUNITIES

Lisa Jane de Gara is a Manager at Action for Healthy Communities, a federally-funded not-for-profit supporting immigrants and refugees in Alberta. In 2021 and 2022, as part of the Edmonton COVID-19 Rapid Response Collaborative, she led vaccination events, supporting approximately 1,000 vulnerable people getting their COVID-19 immunizations in Edmonton.

"You think it's a good idea to get it? The jab?" It was a hot day in late August 2021. Our team had taken over a church parking lot on Edmonton's Alberta Avenue. We had two things on offer: free hot dogs and COVID-19 vaccines. The vaccines were being delivered out of a modified sprinter van, no appointment necessary: frictionless, street-level access. You didn't need to get a vaccine to have a hot dog, but the proximity was by design. The gentleman who approached me had eaten two hot dogs already.

"The vaccine—my cousin said it's gonna kill me. It's not gonna kill me, is it?"

"Yes, I do think you should get the vaccine," I told him. "No, it isn't going to kill you." He thought about it, then walked over to the van and rolled up his sleeve. First dose. I saw him grab at least three more hot dogs before he left.

Mr. Hot Dog attended one of many clinics we hosted throughout Edmonton: in parking lots, in schools, shopping malls, community leagues, and cultural organizations. Our vaccination projects, funded once from May to December 2021 and again in May and June 2022, had an acute focus on immigrants and refugees, as well as urban Indigenous peoples—groups that were statistically less likely to be vaccinated.[1,2]

Throughout our work, disinformation cast a long shadow. Disinformation represents a terrible challenge for public institutions: it is difficult to track and harder to prevent. Community members told us, softly or through interpreters, that COVID-19 could be prevented by garlic, infrared lights, hot showers, or prayer. They heard on good authority, from friends or church or WhatsApp, that the vaccine was much more dangerous than COVID-19 itself. Still, we were able to encourage people to be vaccinated—wherever, however, and whenever we could.

Over the last several years of grassroots vaccine promotion, my team and I have had the chance to develop several key lessons:

LESSON 1: DISINFORMATION IS NOT A LACK OF INFORMATION

Many publicly-supported disinformation strategies presume unscientific or harmful beliefs are a result of *insufficient* information—that if only enough people knew the efficacy rate (high) or the complication rate (very low), they would make the reasonable decision to be vaccinated.

In this "lack of information" model, the solution to disinformation emphasizes repeating functional information, fact checking, and other concrete truths.[3] An example of this strategy would be a billboard saying: "Actually, vaccines *are* safe and effective." While well-intentioned, this is a naïve approach to disinformation. It neglects the emotions that enable disinformation to take root in the first place.

LESSON 2: DIFFERENT COMMUNITIES RECEIVE DIFFERENT DISINFORMATION

Many immigrant and refugee communities do not engage with English-language media, meaning they are influenced by different disinformation than their English-speaking peers. While Canadian public health refuted American disinformation (hydroxychloroquine and later ivermectin), international disinformation was seldom addressed.

Consider conspiracy—after all, vaccine-focused disinformation is a leading factor in vaccine hesitancy. A report published in *Nature* in 2022 noted that 57% of survey respondents had been exposed to "conspiratorial misinformation such as COVID-19 vaccines are harmful and dangerous."[4] Some of these conspiracies have entered the popular consciousness—COVID-19 vaccines' alleged connection to 5G, microchips, Bill Gates.[5]

Beyond these "typical" examples, some disinformation targets specific groups. For example, there was a persistent rumour that COVID-19 vaccines were made of pig's blood or pig's stem cells, rendering it haram for Muslims to consume,[6,7]; from Orthodox Christians, we heard that the vaccine was the Biblical Mark of the Beast, a marker of allegiance with the Devil at the end of the world.[8]

Unfortunately, these international disinformation streams were seldom addressed domestically. Not once did I hear a Canadian official identify the 2013 coerced sterilization of Ethiopian migrants in Israel with Depo-Provera as a prospective source of doubt in vaccination.[9] (I heard this from clients two or three times a week, particularly as Israel led the world in vaccine uptake, and concurrent anti-Semitic narratives about vaccination were widely propagated.) Never once did I hear about Russia's use of vaccine disinformation as a weapon of war since at least the Invasion of Crimea in 2014;[10] clients often spoke about their fears of vaccination in talking points lifted wholesale from this propaganda.

State-sponsored disinformation about vaccines is a contemporary reality, and many of these intentionally target the developing world.[11] Canadian authorities cannot fight against only English-language or Western disinformation.

LESSON 3: RECORDED SIDE EFFECTS AREN'T WHAT CLIENTS FEAR

As the pandemic wore on, it became evident that "vaccine side effects" had a different meaning for public health and the general public. When a public health official describes side effects associated with vaccinations, these are typically mild and expected (low fever, sore arms) and unusual but documented (heart inflammation, AstraZeneca's blood clots).

By contrast, clients disclosed to us that their concerns about vaccines were much more conceptual—that they feared side effects which would appear years or even decades later. A common conspiracy which spread widely through Facebook said that the COVID-19 vaccine had been reviewed with comparably poor scrutiny to Thalidomide.[12] (After refusing a vaccine, one client told me with deep sadness that it was too late for me: "Your babies will be born with gills.")

If clients fear fetal abnormalities, they do not feel reassured when government mentions the risk of minor aches. It is incumbent on public health to understand, respond to, and specifically refute what their clients fear—especially when it has no basis in fact.

LESSON 4: CHANGE IS HARD TO JUSTIFY

To communities with limited scientific literacy, changes in policy are often understood as previous *lies*. This is based on the incorrect belief that the government or public agency always knew all the information—that reversals, shifts, or changes are intended to deceive, not based on changing information.

For example, a policy shift from two-shot series to a three-shot (and now four-shot) booster was read by many communities as evidence of medical impropriety—i.e., that the two-shot series was a "trick," an inevitable prelude to more and more and more vaccines. Encouraging the suspicious general public to "trust the science" is a herculean effort; explaining that science is not a fixed list of rules is harder still. This challenge was perhaps best demonstrated by the low uptake rates for children under 12, once available.

One mother told me, "Miss Lisa, if children needed the vaccine, you would have had it ready for us from the start. You would have made sure." Imagine being the person who needs to explain age-differentiated clinical trials and testing standards, in a crowded community hall, in the client's third or fourth language!

LESSON 5: GRASSROOTS VACCINE WORKERS WILL BE THE TARGETS OF HARASSMENT

Our team encountered significant vitriol from anti-vaxxers. Posters were defaced; online posts were swarmed with anti-vaccine commenters threatening everything from murder to civil war. (My favourite non-sequitur: I emailed an invitation to a vaccine clinic; one client wrote back *YOU CAN F—ING DRINK IT!*)

In darker moments, the comments felt more menacing. Some comments evoked the Nuremberg Code of WW2,[13] claiming COVID-19 vaccines were comparable to Nazi experimentation—and that those who promoted vaccines would be tried and hanged like Nazi officers.

A man telephoned our clinic, called the receptionist a homophobic slur, and threatened we would "answer for our crimes against humanity." In his threat, he borrowed language from the Children's Health Defense Fund,[14] a notorious anti-vaccine website. Perhaps inspired by the same, a protester came to our office and yelled that we were "conducting illegal medical experiments on children." I had to threaten to call 911 before she would leave.

Despite this, the team's spirit was irrepressible. We regrouped; we sent promoters out in pairs; we looked for exits; we learned who was reluctant and who was volatile.

I reminded my team to ignore the comments. I reminded them that their work was valuable, lifesaving, and precious.

LEARNING 6: FREE FOOD WON'T CURE ALL OF DISINFORMATION'S IMPACTS, BUT IT'S CERTAINLY WORTH A SHOT

In June 2022, we hosted an event at a school favoured by newcomers, including many refugees. We covered our reception area in Middle Eastern chocolates, candies and chips, handpicked by our team member, himself a Syrian refugee. One family in attendance all received first doses: mother, father, and three children.

I asked them, "Why did you choose to get the vaccine today? Why not ever before?"

The mother paused and popped a chocolate in her mouth. She said to me: "You are here, you are nice. The nurse speaks my language. And you give food."

Despite all the work our team did to dispel myths, translate materials, and provide explanations, one technique got more shots into arms than anything else: a free meal, a quick chat, and a smile. How can you be scared when you break bread?

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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

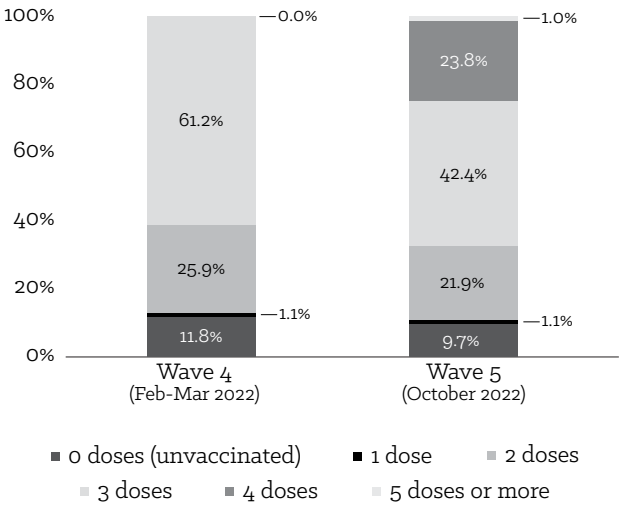
In the spring of 2022 (Wave 4), approximately half of Canadians (50.4%) who had received the initial two doses of a COVID-19 vaccine intended to get a third booster dose. However, intentions to get vaccinated for a third time were dependent on whether or not boosters were compulsory, at least for half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

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