

# Factors affecting COVID-19 vaccination among Indigenous peoples in Canada: a behavioural analysis (September 10<sup>th</sup>, 2021)

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## Factors affecting COVID-19 vaccination among Indigenous peoples in Canada: a behavioural analysis

### Research Questions:

- 1) From a behavioural science perspective, what are the barriers and enablers to COVID-19 vaccination confidence and uptake voiced and experienced by Indigenous peoples in Canada?
- 2) What strategies can and have been used to address identified barriers to vaccine confidence and uptake among Indigenous peoples in Canada?

### Summary of barriers and enablers

- Indigenous communities have been disproportionately impacted by the COVID-19 pandemic.<sup>1</sup> Vaccines are an important means by which to mitigate the impact of the pandemic. However, studies documenting anticipated and experienced barriers and enablers to COVID-19 vaccination among Indigenous peoples are largely absent from the research literature.
- To address this gap, the Indigenous Primary Health Care and Policy Research (IPH CPR) Network conducted an environmental scan and qualitative key informant interviews to better understand the challenges to vaccine confidence among Indigenous communities and to provide recommendations for effective strategies to support vaccination efforts<sup>2</sup>.
- We used a behavioural science approach to categorize the barriers to vaccination identified in the IPH CPR report according to the Capability, Opportunity, and Motivation-Behaviour (COM-B) model and Theoretical Domains Framework (TDF). This allowed us to compare the barriers identified in the IPH CPR to those identified through the Living Behavioural Science Evidence Synthesis (LBSES) general population review<sup>3</sup>.
- The barriers identified in the IPH CPR report centre on how the impact of colonialism, medical experimentation, structural racism, and contemporary tensions between Indigenous nations and the Canadian government contribute to mistrust, skepticism, and fear of vaccines delivered and promoted by the Canadian government. The barriers to vaccine uptake among Indigenous communities in Canada identified in the IPH CPR report correspond to 7 out of 14 TDF domains:
  - Capability-related factors included the need for accurate, accessible, and culturally relevant information (*Knowledge*)

- Opportunity-related factors included access to vaccine clinics (on and off reserve) (*Environmental Context and Resources*), access to trustworthy information sources such as Elders and Knowledge Keepers (*Environmental Context and Resources*), mistrust and skepticism in government/public health responses to the pandemic (*Social Influence*), and trust in Indigenous physicians and other healthcare workers with established relationships in the community (*Social Influence*)
- Motivation-related factors included concerns over vaccine safety given history of medical experimentation (*Beliefs about Consequences*), concerns over being judged given past experiences with discrimination (*Beliefs about Consequences*), other challenges like food insecurity conflicting with accessing healthcare (*Goals*), valuing social cohesion and collectivism (*Goals*), negative past experiences (e.g., abuse, racism) with healthcare providers, the healthcare system, and government (*Reinforcement*), and the fear of experiencing discrimination/harm while accessing healthcare services (*Emotion*)

### **Summary of strategies and policy recommendations to support Indigenous peoples in Canada**

- The IPHCPR report emphasizes the need for community-driven and community-led communication and vaccination efforts that are culturally relevant, incorporate Indigenous knowledge and values, and emphasize community capacity and strengths.
- We categorized these strategies according to the Behaviour Change Wheel (BCW) intervention functions and found that 6 out of 9 intervention functions were relevant for describing the IPHCPR recommendations:
  - Support Indigenous-led communication, education, and community-driven vaccine clinics to foster cultural safety and highlight community strengths (BCW intervention functions: *Enablement, Modelling, Environmental restructuring, Training*)
  - Ensuring vaccine education and communication is accurate, up to date, accessible, culturally relevant, integrates indigenous knowledge and is delivered by Indigenous leaders (e.g., Elders, Knowledge Keepers) (BCW intervention functions: *Education, Enablement*)
  - Ensuring communication strategies acknowledge past and ongoing harms, validate concerns, resonate with community values and respectfully

represent Indigenous communities (BCW intervention functions: *Persuasion*)

- Involving Indigenous communities and leadership in vaccine rollout planning and implementation by fostering respectful and meaningful partnerships (BCW intervention functions: *Enablement, Environmental restructuring*)
- Based on the identified barriers and suggested strategies, we identified 6 out of 7 BCW policy interventions that help clarify the role of government and healthcare institutions in supporting vaccine uptake in Indigenous communities:
  - *service provision, guidelines, and environmental/social planning* are important for supporting community-driven initiatives and ensuring that vaccine clinics and educational efforts are accessible and culturally relevant
  - *regulation and fiscal measures* policy levers are needed to explicitly address racism in government and healthcare institutions and remedy structural inequities that contribute to barriers to vaccine uptake
  - *regulation and environmental/social planning* are helpful for supporting meaningful and sustainable partnerships between the Canadian government, healthcare institutions, and Indigenous governments
  - *communication/marketing* policies are necessary for making public acknowledgments of past harms and for ensuring Indigenous communities maintain ownership over messaging regarding their experiences

### **Implications**

- Vaccination communication, education, and vaccine rollouts must be community-led and community-driven.
- This can only be achieved if Indigenous communities and leadership are involved in the planning and implementation of vaccination efforts.
- Addressing mistrust and skepticism in Indigenous communities requires a commitment to redressing longstanding structural inequities and developing meaningful nation-to-nation partnerships.

## Introduction

Since April 2021, we have been conducting a Living Behavioural Science Evidence Synthesis (LBSES) (updated monthly) of barriers and enablers to COVID-19 vaccine acceptance in the general public as described in studies around the world. Using a behavioural science approach, we interpret the barriers and possible strategies to addressing uptake<sup>3</sup>. Our most recent update (v4, July 2021) identified 143 studies on COVID-19 vaccine acceptance. Despite an exponential increase in research on COVID-19 vaccine acceptance there is a significant gap in research exploring and documenting the concerns of Indigenous communities in Canada. In fact, none of the studies included in the LBSES identified barriers to COVID-19 vaccination that are specific to Indigenous or Native American communities in North America.

Given the absence of Canadian data on Indigenous peoples' concerns over the COVID-19 vaccine, the Indigenous Primary Health Care and Policy Research (IPH CPR) Network conducted an environmental scan and 12 qualitative key informant interviews to better understand the challenges to vaccination Indigenous communities experience, as well as possible strategies and approaches for overcoming barriers to vaccine uptake<sup>2</sup>. Key informants worked in a variety of sectors (e.g., health, government) across four Canadian provinces and half identified as Indigenous. The present report aims to consider the IPH CPR findings in relation to international research literature by comparing the barriers and enablers identified in the IPH CPR to those reported in the LBSES v4<sup>3</sup>.

Consistent with our broader international LBSES report<sup>3</sup>, we used the Capability, Opportunity, and Motivation (COM-B) model<sup>4</sup> and Theoretical Domains Framework<sup>5,6</sup> components of the Behaviour Change Wheel (BCW) to identify and classify barriers and enablers to COVID-19 vaccination confidence and uptake (see Figure 1), and use the same approach to explore alignment and unique factors for Indigenous peoples in Canada. We also use the BCW<sup>4</sup> (see Figure 2) intervention and policy functions to link identified barriers and enablers to the strategies put forward by the IPH CPR report and link strategies to broader policies that may address the needs of Indigenous people in Canada.

Behaviour change approaches focus on the factors that drive and can promote change in a given behaviour; in this case, COVID-19 vaccination. While the focus is on behaviour, this does not imply that the onus of behaviour change is placed on the individual. Rather, most contemporary behavioural approaches (including those used in the present report) situate behaviour as being a function of both internal and external factors. Personal agency can be supported or thwarted by the social and structural settings in which people live and work, past and present. The BCW approach used herein situates vaccination within such a context, from

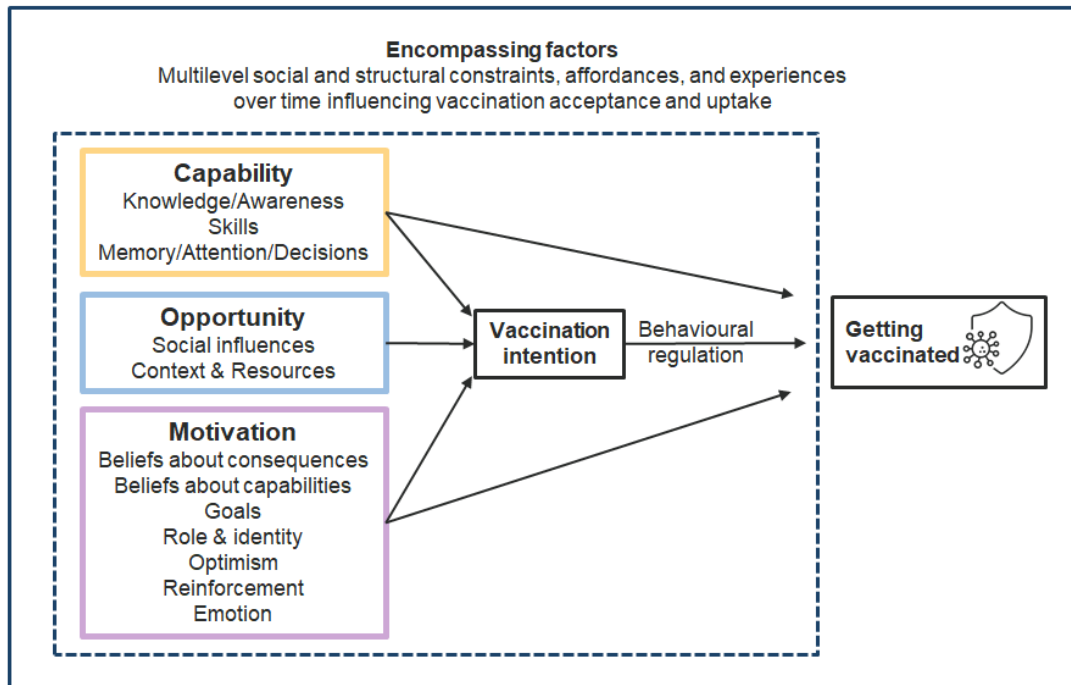
the barriers and enablers to the possible strategies to address them and the higher order policy levers that can be enacted to ensure the strategies can be successful.

## Methods

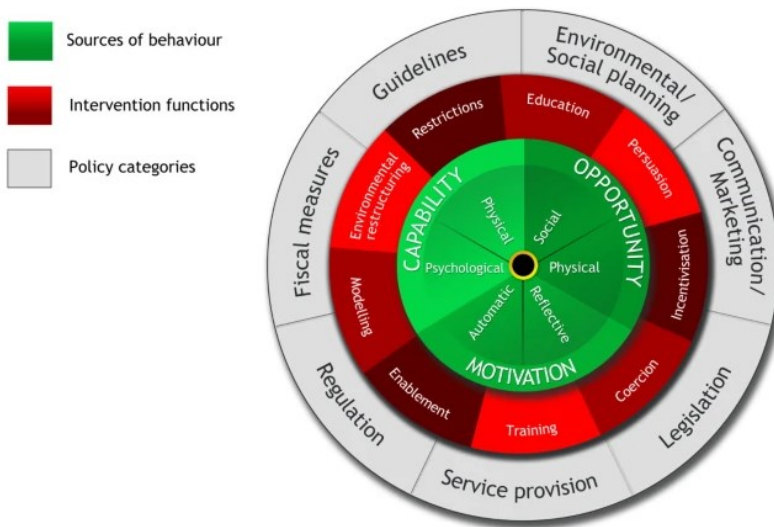
We used the results described in the IPHCPR report entitled: “‘It’s beyond hesitancy...it’s outright fear’ Understanding COVID-19 Vaccine Confidence and Uptake Among Indigenous Peoples in Canada”<sup>2</sup> as our source material. We categorized the barriers and enablers to receiving COVID-19 vaccines that were described in the IPHCPR report according to the COM-B model<sup>4</sup> and Theoretical Domains Framework (TDF)<sup>5,6</sup>. We then assessed how the barriers and enablers reported in the IPHCPR report compare to those reported across all studies identified in our LBSES v4<sup>3</sup>.

We also categorized the suggested strategies for supporting vaccination according to the Behaviour Change Wheel (BCW) intervention functions<sup>4</sup> and mapped the TDF based barriers and enablers to BCW interventions to generate insights into what policy functions might be appropriate for addressing the identified barriers. Definitions for BCW intervention and policy functions are provided in Appendix 1.

**Figure 1. Potential drivers of vaccination acceptance and uptake based on the COM-B model<sup>4</sup> and Theoretical Domains Framework<sup>5,6</sup>**



**Figure 2. The Behaviour Change Wheel<sup>4</sup>**



The Behaviour Change Wheel.

## Results

### Summary of findings from the IPHCPR report on vaccine confidence among Indigenous peoples in Canada

Montensanti and Goveas report on findings from 12 key informant interviews conducted in 2021 and an environmental scan capturing key documents (e.g., toolkits, communication campaigns, news articles, etc.) related to COVID-19 vaccination in Indigenous communities that were published between 2019-2021. Key informants were identified based on their ability to provide insights regarding the experienced barriers to vaccination for Indigenous people in Canada and potential strategies to overcome them. Key informants worked in healthcare, government, and research settings, in British Columbia, Alberta, Saskatchewan and Ontario. Half of respondents identified as First Nations and/or Métis and half as non-Indigenous.

The barriers and enablers identified by key informants included how the impact of colonialism, medical experimentation, structural racism, and contemporary tensions between Indigenous nations and the Canadian government contribute to mistrust, skepticism, and fear of vaccines delivered and promoted by the Canadian government. Key informants discussed past (e.g., Indian Hospitals) and recent (e.g., Joyce Eshaquan's death) egregious abuses suffered at the hands of healthcare institutions as critical examples that contribute to mistrust in the Canadian government, healthcare system, and fear of COVID-19 vaccines. Importantly, the IPHCPR report describes how Indigenous communities were not consulted regarding pandemic measures nor the decision to prioritize Indigenous communities during the vaccine rollout. Key informants noted that the prioritization of Indigenous communities was unexpected and counter to longstanding patterns of "broken promises and broken treaties" and government failures to appropriately address structural inequities experienced by Indigenous communities. This contributed to further skepticism, suspicion, and fear that the vaccine prioritization effort was yet another instance of medical experimentation.

To build confidence in the vaccines, key informants discussed the importance of community-driven, Indigenous-led vaccination efforts where Indigenous leaders and communities are driving decision-making processes and the development of culturally relevant education (i.e., integrating Indigenous knowledge, language, cultural symbols, and values) that is delivered by trusted community leaders (e.g., Elders, Knowledge Keepers) through accessible means (e.g., podcasts, social media). They also emphasized the need to build capacity within Indigenous communities so they are able to collect their own data and information to use in response to community needs, rather than waiting for government sectors to release this data. The barriers



and enablers identified in this report have been summarized and organized according to the COM-B model and TDF in Table 1.

#### Summary of findings from the LBSES v4

The LBSES v4 identified 143 studies representing data from countries around the world on factors affecting COVID-19 vaccine acceptance. Based on 104 studies from around the world that provided data on vaccine acceptance rates, 66% of respondents were willing to be vaccinated (median=63%, IQR=50-80%). Of the 143 studies that were identified, 115 provided evidence of the factors impacting vaccine acceptance. Nine of 14 domains from the TDF were identified as influencing willingness to get vaccinated. Capability-related factors included a desire for knowledge, particularly around disease-specific guidance. Opportunity-related factors included a mistrust in government and health agencies, the importance of social norms, and the influence of healthcare providers. Motivation-related factors included concerns over vaccine safety, efficacy, and necessity. Table 1 summarizes the barriers and enablers identified from this review and how they relate or not to the barriers underscored by Montensanti and Goveas' report.

Despite the preponderance of studies identified in the latest LBSES review, only eight US based studies and one Canadian study out of 57 North American studies included data representing Indigenous, Native American, Native Alaskan and/or Native Hawaiian respondents. These studies reported that racialized survey respondents, including Indigenous/Native American survey respondents, were more likely to express vaccine hesitancy than White respondents. One study found that Native American/Pacific Islander respondents were more willing to get vaccinated than other racialized groups (Stern 2021). One Canadian study assessed hesitancy across various demographic factors and found that Indigenous respondents reported “greater than average” vaccine hesitancy<sup>7</sup>. None of the identified studies reported on any specific factors that influence vaccine willingness according to Native American or Indigenous status. Similarly, a recent study reported that Indigenous peoples in Saskatchewan were more than twice as likely to refuse vaccination than were other people living in Saskatchewan<sup>8</sup>. However, the reasons for vaccine hesitancy, refusal, and other experienced barriers to vaccine uptake among Indigenous peoples in Canada have yet to be formally reported in the literature.

Table 1. Barriers and enablers to vaccine acceptance in global population and among Indigenous Peoples in Canada

COM-B	TDF domains	Barriers/enablers in global population as identified in LBSES v4 (k = 143 studies)	Barriers/enablers among Indigenous peoples in Canada as identified in IPHCPR report
Capability	Knowledge	<b>Barriers</b> Gaps in knowledge about COVID-19 vaccines (k=19)	<b>Barriers</b> Inconsistent and unclear messaging around vaccine risks.
		No enablers identified	<b>Enabler</b> Accessible and culturally relevant information.
	Memory, attention, decision making	No barriers/enablers identified	No barriers/enablers identified
	Skills	No barriers/enablers identified	No barriers/enablers identified
	Behavioural regulation	No barriers/enablers identified	No barriers/enablers identified
Opportunity	Environmental context and resources	<b>Barriers</b> Access issues in terms of time, convenience, and cost (k=6)	<b>Barriers</b> Access issues in terms of geographical distance.  Access issues given differential rollout on and off reserve (i.e., off reserve Indigenous peoples were not prioritized).  Development and implementation of vaccine education and rollout without input and involvement of Indigenous communities.
		<b>Enablers</b> Having access to and trust in reputable information sources (k=12)	<b>Enabler</b> Having access to and trust in reputable (e.g., accurate, culturally relevant) information sources (e.g., Elders/ Knowledge Keepers).
	Social influences	<b>Barriers</b> Mistrust in government/public health response to COVID-19 (k=26)  Negative influence of close contacts and high-profile persons (k=8)	<b>Barriers</b> Mistrust and skepticism in government/public health response to COVID-19 (including prioritization) due to past and ongoing racism and discrimination.

		Direct advice from medical professionals about vaccination (k=8)	
		<b>Enablers</b> Advice from medical professionals encouraging vaccination (k=6)	<b>Enablers</b> Advice encouraging vaccination from <i>trusted</i> medical professionals (Indigenous and non-Indigenous) with established relationships in the community.  <b>Enablers</b> Valuing the well-being of family, community, Elders, Nations and land
Motivation	Social and professional role and identity	<b>Enablers</b> Certain political preferences/identities (k=5)  When getting vaccinated seen as a professional or collective/ prosocial responsibility (k=4)	No barriers/enablers identified
	Beliefs about capabilities	No barriers/enablers identified	No barriers/enablers identified
	Optimism	<b>Enablers</b> Optimism was associated with greater vaccine acceptance (k = 1)	No barriers/enablers identified
	Beliefs about consequences	<b>Barriers</b> Concerns about COVID-19 vaccine safety (k=41)  Concerns about COVID-19 vaccine development (k=7)  Concerns about COVID-19 vaccine efficacy (k=14)  Concerns about COVID-19 vaccine necessity (k=12)  Concerns about adverse reactions (specifically contraindications among specific patient groups) (k=3)	<b>Barriers</b> Concerns about COVID-19 vaccine safety rooted in histories of past abuses and medical experimentation.  Fear of being judged on the basis of race/class when accessing healthcare services.
<b>Enablers</b> Concerns about becoming infected with COVID-19 (k=23)		No enablers identified	

		Positive attitudes/perceived benefit of COVID-19 vaccines ( <i>k</i> =16)  Belief that COVID-19 vaccines will help protect family ( <i>k</i> =6)	
Intention		66% willing to be vaccinated ( <i>k</i> =104) 85.4% Indigenous respondents willing or unsure ( <i>k</i> =1) <sup>7</sup>	N/A
Goals		No barriers identified	<b>Barriers</b> Addressing other challenges (e.g., food insecurity, addictions, suicide, climate change) may conflict with accessing healthcare services, including vaccines.
		<b>Enabler</b> Matching vaccine preference	<b>Enabler</b> Looking forward to gathering and working collectively again.
Reinforcement		No barriers identified	<b>Barriers</b> Historical and contemporary violence, including a history of colonization, medical abuse, and experimentation contributes to fear and mistrust; and negative experiences with healthcare services and healthcare providers, including racism and discrimination.  History of broken trust, promises, and treaties contributes to mistrust and skepticism.
		<b>Enablers</b> Historical seasonal influenza vaccination ( <i>k</i> =21)  Members of families/close social network having being infected with COVID-19 ( <i>k</i> =3)	No enablers identified
Emotion		<b>Enablers</b> Fear about being infected with COVID-19 and its impact ( <i>k</i> =3)	<b>Barriers</b> Fear of experiencing discrimination and harm when accessing healthcare services given past experiences of oppression and medical experimentation.

		Mental health challenges (stress, depression, anxiety) may contribute to protective behaviours, including greater COVID-19 vaccine acceptance (k=7)	
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## Convergences and complementarity in identified barriers

Based on the IPHCPR report on barriers to vaccine uptake among Indigenous communities in Canada, 7 out of 14 TDF domains were identified as contributing to COVID-19 vaccine uptake: Capability (*Knowledge*), Opportunity (*Environmental Context and Resources, Social Influence*), and Motivation (*Beliefs about Consequences, Goals, Reinforcement, Emotion*) (see Table 1).

The factors identified in the IPHCPR report and the LBSES v4 review suggest some barriers experienced by Indigenous communities in Canada bare some similarity to those reported in the LBSES studies. For example, there is consensus around Capability-related factors like the importance of addressing knowledge gaps by providing clear and accurate information. Opportunity-related factors like mistrust in health institutions, needing access to trustworthy and reputable information sources, and valuing input from trusted healthcare providers were also identified in both reports. And, concerns over vaccine safety (Motivation-related factor) was a common barrier among Indigenous peoples in Canada and the general population world-wide.

However, the IPHCPR report clarifies that some of these barriers are nevertheless experienced *differently* given the specific socio-historical position of Indigenous peoples in Canada. For example, mistrust in government as a barrier to vaccine uptake has been documented globally. For Indigenous people in Canada, mistrust in the government is a direct result of longstanding tensions between the Canadian government and Indigenous nations that has been characterized by past and contemporary broken promises (e.g., broken treaties, lack of commitment responding to the Truth and Reconciliation Commission calls to action, failing to provide access to clean water to all Indigenous communities). Likewise, while the general public may be interested in general vaccine safety (e.g., short and long-term side effects), concerns over vaccine safety among Indigenous people are rooted in histories of violence, abuse, medical experimentation, and ongoing racism within the healthcare system and broader institutions.

The IPHCPR report also demonstrates how histories of violence and oppression produce multifaceted barriers to vaccination. For example, the report provides insights into how past experiences of racism and discrimination at the hands healthcare providers (*Reinforcement*), including transgressions against other Indigenous people, shape community perceptions and expectations of safety (*Beliefs about Consequences*), contribute to mistrust (*Social Influences*), and the fear of being mistreated within mainstream healthcare settings (*Emotion*).

Several barriers were discussed in the IPHCPR report that have not been previously identified in the international literature. For example, the government of Canada identified Indigenous peoples as a priority group for vaccination. Key informants noted that failing to involve Indigenous communities in the development and implementation of vaccine rollouts, including

the development of educational materials and the coordination of clinics, was a barrier to vaccination (*Environmental context and resources*) as this exclusion contributed to distrust and skepticism. Key informants also noted that the prioritization plan in some provinces only included Indigenous people who lived on reserves and did not provide guidelines for those living off reserves. This meant that many Indigenous people living in urban settings encountered challenges in accessing vaccines in a timely manner (*Environmental context and resources*). The report also indicates that Indigenous people may be faced with competing demands that may prevent them from getting vaccinated, like food insecurity, managing addictions, contending with suicides in their communities, and the consequences of climate change (*Goals*) while federal and provincial governments fail to follow through on adequately addressing these issues to minimize harm done to Indigenous communities (*Environmental context and resources*). Finally, the report identified collectivism, ancestral respect and social cohesion (*Goals / Social Influences*) as culturally relevant values that may help to promote vaccination.

#### Strategies and policies for supporting vaccine uptake among Indigenous peoples in Canada

The IPHCPR report discusses important strategies for supporting vaccination in Indigenous communities. The IPHCPR report emphasizes the need for community-driven and community-led communication and vaccination efforts that are culturally relevant, incorporate indigenous knowledge and values, and emphasize community capacity and strengths. We categorised these strategies according to the Behaviour Change Wheel (BCW) intervention functions and then mapped these strategies to the barriers and enablers identified in this report that were categorized according to the COM-B model and TDF (see Table 2). By doing so, we aimed to understand the potential linkages between identified barriers and enablers and suggested strategies to identify possible opportunities for drawing upon behaviour change research to complement the work of the IPHCPR.

Institutional resources and changes are necessary to support the suggested strategies for improving vaccine uptake. We, therefore, build on the work of the IPHCPR by identifying policy interventions that may be well suited to supporting community-driven initiatives (see Table 2). We have operationalized policy functions based on the recommendations provided by the IPHCPR report. Relevant BCW policy functions include *service provision, guidelines, and environmental/social planning* for supporting community-driven initiatives and ensuring that vaccine clinics and educational efforts are accessible, culturally relevant, and sensitive to the experiences of Indigenous communities. The *regulation* and *fiscal measures* policy levers are especially relevant for explicitly addressing racism in government and healthcare institutions and as it applies to vaccine planning. Changes in *regulation* and *environmental/social planning* are further required to encourage health institutions to work on community engagement and

remain responsive to community needs. Finally, the policy function *communication/marketing* is relevant to the call for public acknowledgments of past harms and for ensuring Indigenous communities maintain ownership over messaging about their experiences.



Table 2. COVID-19 vaccination strategies and policy interventions

COM-B (TDF domains)	Barriers/enablers in NCCDH report	BCW intervention functions	Strategies identified based on IPHCPR report	BCW policy functions	Possible policy interventions
Capability (Knowledge)	<b>Barriers</b> Inconsistent and unclear messaging around vaccine risks.	Education	Provide up-to-date, accurate, accessible (e.g., easy to understand, multimodal), culturally relevant (using/reflecting Indigenous language, symbols, values, teachings) education and communication that integrates Indigenous knowledge. Ensure transparency about what is known and what is not known.  Education and communication strategies will be most effective when they are community-driven.	Service provision	Provide clear, consistent, and accurate vaccine information.  Develop educational materials in collaboration with Indigenous communities.  Provide financial and material support to Indigenous-led organizations that have already developed and continue to develop informational materials.
	<b>Enabler</b> Accessible and culturally relevant information.				
Opportunity (Environmental context and resources)	<b>Barriers</b> Access issues in terms of geographical distance.	Enablement	Organize accessible clinics (e.g., mobile, community based clinics) and provide community members with multiple opportunities to get vaccinated.  Change policies to ensure all Indigenous people, on and off reserves, are prioritized during vaccine rollout. Engage and consult with Indigenous communities when planning changes to vaccine rollouts.	Service provision	Direct resources to developing community partnerships to enable accessible approaches (e.g., community-based/mobile clinics) based on stated community needs.
	<b>Barriers</b> Access issues given differential rollout on and off reserve (i.e., off reserve Indigenous peoples were not prioritized).			Guidelines	Develop and communicate clear guidelines for how, when, where Indigenous people on and off reserve are able to access vaccines. Ensure guidelines allow for timely access to booster doses.

					<p>Develop guidelines in collaboration with Indigenous communities, especially those living off reserves.</p> <p>Communicate the goals and objectives of the prioritization plan as well as efforts made to involve Indigenous communities to address concerns over past experiences with medical experimentation.</p>
	<p><b>Barriers</b>          Development and implementation of vaccine education and rollout without input and involvement of Indigenous communities.</p>	<p>Environmental restructuring</p>	<p>Facilitate the creation and maintenance of spaces where Indigenous people can voice concerns and engage in discussions regarding the COVID-19 vaccine.</p>	<p>Environmental / social planning</p>	<p>Organize town halls and community consultations to hear directly from Indigenous community members regarding their experiences and concerns. Ensure learnings are incorporated into vaccination rollout plans.</p>
			<p>Ensure Indigenous communities are involved in all decision-making pertaining to vaccine education, communication and uptake among Indigenous peoples.</p> <p>Build and foster ongoing, sustainable partnerships to ensure timely and effective public health interventions beyond the COVID-19 pandemic.</p>	<p>Regulation</p>	<p>Evaluate public health response and vaccination rollout. Make necessary adjustments to ensure inequities are addressed.</p> <p>Ensure vaccination strategies aimed at Indigenous communities are always developed in partnership with Indigenous communities, leadership and on-reserve government. Work with Indigenous leadership to lay groundwork for ongoing collaboration.</p>
			<p>Guidelines</p>	<p>Develop guidelines for respectful and meaningful engagement that works</p>	

					toward effective and sustainable partnerships.
Opportunity (Environmental context and resources)	<b>Enabler</b> Having access to and trust in reputable (e.g., accurate, culturally relevant) information sources (e.g., Elders/ Knowledge Keepers).	Enablement	Support the provision of accurate, accessible, and culturally relevant information and communication through Elders, Knowledge Keepers, and Band Councils.  Involve communities in co-developing and delivering accessible information to their communities.	Service provision	Develop educational materials in collaboration with Indigenous communities.  Provide financial and material support to Indigenous-led organizations to develop informational materials.  Provide financial and material support to Elders, Knowledge Keepers and Band Councils as needed to support the delivery and dissemination of vaccine information.
Opportunity (Social influences)	<b>Barriers:</b> Mistrust and skepticism in government/public health response to COVID-19 (including prioritization) due to past and ongoing racism and discrimination.	Enablement	Support Indigenous-led vaccine clinics as they have been the most successful because they have drawn upon community strengths to deliver culturally safe experience.  Support Indigenous-led data collection and use to ensure timely interventions.	Service provision	Provide community leaders/organizers with material and financial supports to run community-driven vaccine clinics. Provide supports based on the community's stated needs and on their terms.
				Environmental / social planning	Build and foster ongoing relationships with Indigenous leaders and communities to facilitate data sharing and ensure the timely delivery of effective public health interventions.
		Modelling	Encourage Elders and community leaders to share personal vaccination stories through social media (and other modalities).	Communication/ marketing	Promotion/ discussion/ communication of Indigenous leaders and Elders receiving vaccines (or views on vaccines) must be community-driven to ensure respectful representation of Indigenous people. Autonomy and

					decision-making power over messaging must be respected.
	<p><b>Enablers</b>          Valuing the well-being of family, community, Elders, Nations and land</p>	Modelling	Highlight and emphasize Indigenous community strengths in confronting the pandemic and delivering vaccines.	Communication/marketing	Counter harmful stereotypes and representations of Indigenous communities as “vulnerable” by highlighting and emphasizing strengths and successes as described by Indigenous communities. Ensure communities lead communication strategies about their own experience using language and modes of communication that speak to Indigenous ways of being and knowing.
	<p><b>Enablers</b>          Advice that encourages vaccination from <i>trusted</i> medical professionals (Indigenous and non-Indigenous) with established relationships in the community.</p>	Modelling	Involve indigenous physicians (and other trusted healthcare professionals) in vaccination efforts.	Service provision	<p>Provide Indigenous healthcare workers, allies, and communities with financial, material and human resources that are required for engaging trusted healthcare providers in vaccine efforts.</p> <p>Develop and support mentorship programs that allow healthcare providers who are already working with Indigenous communities to train, advise and guide healthcare providers new to the setting.</p> <p>Allow for the necessary time and resources for those new to working with Indigenous communities to develop trusting bonds.</p>
Motivation	<b>Barriers:</b>	Education	Provide up-to-date, accurate, accessible (e.g., easy to	Service provision	Provide clear, consistent, and accurate vaccine information.

(Beliefs about consequences)	Concerns about COVID-19 vaccine safety rooted in histories of past abuses and medical experimentation.		<p>understand, multimodal), culturally relevant (using/reflecting Indigenous language, symbols, values, teachings) education and communication that integrates Indigenous knowledge. Ensure transparency about what is known and what is not known.</p> <p>Education and communication strategies will be most effective when they are community-driven.</p>		<p>Develop educational materials in collaboration with Indigenous communities.</p> <p>Provide financial and material support to Indigenous-led organizations that have already developed and continue to develop informational materials.</p>
		Modelling	Elders and community leaders sharing personal vaccination stories through social media have had a powerful impact.	Communication/marketing	Promotion/ discussion/ communication of Indigenous leaders and Elders receiving vaccines (or views on vaccines) must be community-driven to ensure respectful representation of Indigenous people. Autonomy and decision-making power over messaging must be respected.
	<b>Barriers</b> Fear of being judged on the basis of race/class when accessing healthcare services.	Persuasion	<p>Communication strategies must acknowledge and validate the impact of past harms.</p> <p>Support community-driven education and communication that is respectful of Indigenous representation.</p>	Communication/marketing	Public health and health systems must communicate an acknowledgement of past and ongoing harms and publicly commit to addressing racism in healthcare. Public statements should be coupled with publicized policies, guidelines, and plans for evaluating progress and maintaining accountability.

					Evaluate messaging in public health and government communications to ensure harmful stereotypes are not perpetuated.
				Regulation	Increase community engagement to gain a better understanding of community needs and experiences with racism in the healthcare system.  Audit, evaluate and revise existing healthcare protocols that may disadvantage Indigenous communities.  Create systems for ensuring accountability in healthcare providers who behave inappropriately.
		Education	Provide healthcare providers engaging with Indigenous communities the appropriate background and context with which to understand vaccine fears and concerns.	Service provision	Develop educational materials for healthcare providers in collaboration with Indigenous communities.
Motivation (Goals)	<b>Barriers</b> Addressing other challenges (e.g., food insecurity, addictions, suicide, climate change) may conflict with accessing healthcare services, including vaccines.	Enablement	Provide support for other health needs that may arise as part of trauma-informed approaches.	Environmental/ social planning	Work with community organizations and outreach services to connect community members with various resources at the same time as they seek to get vaccinated.
				Fiscal measures	Revise federal budget to redirect funds toward addressing structural inequities experienced by Indigenous communities (e.g., lack of clean water, food insecurity, housing).

	<b>Enabler</b> Looking forward to gathering and working collectively again.	Persuasion	Communication and messaging is more effective when it resonates with the values of Indigenous communities. Messaging that speaks to “protecting Elders” and “protecting your communities” may increase vaccine confidence.	Communication/ marketing	Communication strategies must be community-driven to ensure culturally relevant content and respectful representation of Indigenous people. Autonomy and decision-making power over messaging must be respected.
Motivation (Reinforcement)	<b>Barriers</b> Historical and contemporary violence, including a history of colonization, medical abuse, and experimentation contributes to fear and mistrust; and negative experiences with healthcare services and healthcare providers, including racism and discrimination.	Training	Provide vaccination staff who are new to working with Indigenous communities with training on socio-historical context of Indigenous peoples in Canada and how histories of colonization and ongoing racism and discrimination impact current experiences in healthcare.  Provide vaccination staff with trauma-informed training to ensure all are treated with respect and dignity. As part of trauma-informed approaches, allow sufficient time to consider options and arrive at autonomous, informed decision and direct community.	Service provision	Provide financial, material, and training supports to encourage participation in training.
				Regulation	Increase community engagement to gain a better understanding of community needs and experiences with racism in the healthcare system.  Audit, evaluate and revise existing healthcare protocols that may disadvantage Indigenous communities.  Create systems for ensuring accountability in healthcare providers who behave inappropriately.

	<p><b>Barriers</b>          History of broken trust, promises, and treaties contributes to mistrust and skepticism.</p>	Environmental restructuring	Build and facilitate allyship between healthcare, government, and Indigenous representatives to develop impactful and sustainable partnerships.	Environmental/ social planning	<p>Ensure representation of Indigenous community leadership across sectors (e.g., the Public Health Agency of Canada, provincial and local government and healthcare institutions) through hiring practices, contracts, collaborations, and community consultations.</p> <p>Engage community leaders in vaccine rollout planning.</p>
				Guidelines	Develop guidelines for respectful and meaningful engagement that works toward effective and sustainable partnerships.
Motivation (Emotion)	<p><b>Barriers</b>          Fear of experiencing discrimination and harm when accessing healthcare services given past experiences of oppression and medical experimentation.</p>	Persuasion	<p>Government and public health officials must acknowledge historical and contemporary racism and discrimination in the healthcare system.</p> <p>Communication strategies must acknowledge and validate the impact of past harms.</p>	Communication / marketing	<p>Public health and health systems must communicate an acknowledgement of past and ongoing harms and publicly commit to addressing racism in healthcare. Public statements should be coupled with publicized policies, guidelines, and plans for evaluating progress and maintaining accountability.</p> <p>Evaluate messaging in public health and government communications to ensure harmful stereotypes are not perpetuated.</p>
				Regulation	Acknowledgments must be coupled with concrete actions.



					Strategic plans for addressing racism in the healthcare system must be developed in consultation with Indigenous communities on their terms.
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## Discussion

Behavioural science approaches like the Behaviour Change Wheel are important tools for synthesizing information because they facilitate the use of a common language with which to identify and summarize barriers, enablers, and possible strategies to promote COVID-19 vaccination. By categorizing research evidence according to the COM-B model, TDF, and BCW, we are able to draw upon decades of research to consider what strategies may be more appropriate for addressing specific barriers. In this report we aimed to complement the laudable work conducted by the IPHCPR by delineating the potential links between identified barriers and enablers, suggested strategies, and associated policy interventions.

However, given the paucity of Canadian data on the experienced barriers to COVID-19 vaccination among people Indigenous peoples, it is imperative that more research is conducted *with* Indigenous communities to better understand how the unique experiences of Indigenous people on and off reserve impact vaccine uptake. Importantly, Indigenous-led research that works with Indigenous ways of knowing must be funded and prioritized so government and health institutions can better understand the experiences of Indigenous communities in Canada as it relates to COVID-19 vaccination. Future research may also consider how behavioural science approaches do and do not reflect Indigenous ways of knowing to explore possibilities for complementarity.

Finally, given the past and present context of violence, oppression and structural inequities, promoting vaccination uptake must be done in tandem with efforts to improve access to basic human rights (e.g., drinkable water) and address longstanding nation to nation tensions. As vaccination efforts continue, it will be ever more important to invest in respectful, meaningful relationships and partnerships with Indigenous communities that build upon community strengths and capacities to address longstanding inequities.

## References

1. Mosby I, Swidrovich J. Medical experimentation and the roots of COVID-19 vaccine hesitancy among Indigenous Peoples in Canada. *CMAJ*. 2021;193(11):E381-E383. doi:10.1503/cmaj.210112
2. Goveas D, Montesanti S, Crowshoe, L. "It's beyond hesitancy...it's outright fear": Understanding COVID-19 Vaccine Confidence and Uptake among Indigenous Peoples in Canada. Calgary: University of Calgary, Sept. 30th, 2021.
3. Crawshaw J, Konnyu K, Castillo G, van Allen Z, Grimshaw JM, Pesseau J. Factors affecting COVID-19 vaccination acceptance and uptake among the general public: a living behavioural science evidence synthesis (v4, July 31st, 2021). Ottawa: Ottawa Hospital Research Institute, Jul 31, 2021.
4. Michie S, van Stralen MM, West R. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*. 2011;6(1):42. doi:10.1186/1748-5908-6-42
5. Michie S. Making psychological theory useful for implementing evidence based practice: a consensus approach. *Quality and Safety in Health Care*. 2005;14(1):26-33. doi:10.1136/qshc.2004.011155
6. Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation Science*. 2012;7(1). doi:10.1186/1748-5908-7-37
7. Tang X, Gelband H, Nagelkerke N, et al. *Quantifying COVID-19 Vaccination Hesitancy during Early Vaccination Rollout in Canada.*; 2021:2021.04.29.21256333. Accessed August 30, 2021. <https://www.medrxiv.org/content/10.1101/2021.04.29.21256333v1>
8. Muhajarine N, Adeyinka DA, McCutcheon J, Green K, Fahlman M, Kallio N. *COVID-19 Vaccine Hesitancy and Refusal and Associated Factors in an Adult Population in Saskatchewan, Canada: Evidence from Predictive Modelling.*; 2021:2021.06.28.21259675. Accessed August 18, 2021. <https://www.medrxiv.org/content/10.1101/2021.06.28.21259675v1>

## Appendix 1

### Behaviour Change Wheel Intervention and Policy Function Definitions

<b>Intervention</b>	<b>Definition</b>
Education	Increasing knowledge or understanding
Persuasion	Using communication to induce positive or negative feelings or stimulate action
Incentivisation	Creating expectation of reward
Coercion	Creating expectation of punishment or cost
Training	Imparting skills
Restriction	Using rules to reduce the opportunity to engage in the target behaviour (or to increase the target behaviour by reducing the opportunity to engage in competing behaviours)
Environmental restructuring	Changing the physical or social context
Modelling	Providing an example for people to aspire to or imitate
Enablement	Increasing means/reducing barriers to increase capability or opportunity <sup>1</sup>
<b>Policies</b>	
Communication/marketing	Using print, electronic, telephonic or broadcast media
Guidelines	Creating documents that recommend or mandate practice. This includes all changes to service provision
Fiscal	Using the tax system to reduce or increase the financial cost
Regulation	Establishing rules or principles of behaviour or practice
Legislation	Making or changing laws
Environmental/social planning	Designing and/or controlling the physical or social environment
Service provision	Delivering a service

<sup>1</sup>Capability beyond education and training; opportunity beyond environmental restructuring

### **Citation**

Castillo, G., Montesanti, S., Goveas, D., Crawshaw, J., Smith, M., Trehan, N., Gauvin, F-P, Grimshaw, J.M., & Pesseau, J. Factors affecting COVID-19 vaccination among Indigenous peoples in Canada: a behavioural analysis. Ottawa: Ottawa Hospital Research Institute, Sep 10th, 2021.