Factors affecting COVID-19 vaccination in Black communities in Canada: a behavioural analysis (September 17th, 2021)

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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 Black communities in Canada and worldwide?
2) What strategies can and have been used to address identified barriers to vaccine confidence and uptake in Black communities in Canada?

Summary of barriers and enablers

- Early during the pandemic, Black Canadians reported a lower willingness to get vaccinated than other groups despite experiencing more COVID-19 related risks (e.g., overrepresented in patient-facing jobs) and consequences (e.g., infections, hospitalizations)[1,2].
- Studies conducted in Canada, the United States and United Kingdom have found that racialized survey respondents, including Black respondents, are more likely to express vaccine hesitancy[3]. However, few studies have explored the specific barriers to vaccination faced by Black communities.
- The National Collaborating Centre for the Determinants of Health (NCCDH) conducted qualitative research with key informants at the forefront of vaccination efforts in Black communities in Canada to explore barriers to vaccination uptake and make recommendations for a more equitable rollout[4].
- Researchers at the Ottawa Hospital Research Institute (OHRI) applied a behavioural science approach to map the barriers and enablers to vaccination identified in the NCCDH report to the Capability, Opportunity, and Motivation-Behaviour (COM-B) model and Theoretical Domains Framework. This allowed us to compare the barriers and enablers identified in the NCCDH report to those identified through the Living Behavioural Science Evidence Synthesis (LBSES) general population review v4[3].
- The NCCDH report identified anti-Black racism in health systems and in society more broadly, a history of medical abuse and unethical health research conducted on Black communities, the rapid development of vaccines, misinformation, and accessibility of vaccines as key barriers to vaccine uptake.

- The barriers to vaccine uptake identified in the NCCDH report correspond to 6 out of 14 TDF domains:
    - Capability-related factors included the misinformation/disinformation that stems from constantly evolving vaccine knowledge (*Knowledge*) as well as the importance of culturally relevant and affirming educational events (*Knowledge*).
    - Opportunity-related factors included anti-Black racism in the health system (*Environmental Context and Resources*), inadequate public health response/lack of prioritization of Black Communities during vaccine rollout (*Environmental Context and Resources*), vaccine accessibility (e.g., barriers to online registration) (*Environmental Context and Resources*), culturally relevant vaccine clinics (*Environmental Context and Resources*), mistrust in the government/public health response (*Social Influences*), and trust in Black community members involved in vaccine efforts (*Social Influences*).
    - Motivation-related factors included concerns over vaccine development and the treatment of Black people in vaccine trials (*Beliefs about Consequences*), past experiences with racism in health systems (*Reinforcement*), and feeling that concerns are heard and validated (*Emotions*).
- Many of the TDF domain barriers experienced by Black communities are uniquely rooted in anti-Black racism, requiring a tailored and community-informed approach to supporting vaccine confidence and uptake.

Summary of strategies and policy recommendations to support vaccination in Black communities in Canada

- The NCCDH report describes how Black leaders and Black-focused community and health organizations in Canada (e.g., Health Association of African Canadians, Black Health Alliance) mobilized to address unmet COVID-19 vaccination needs in the wake of public health efforts that did not prioritize Black communities during the COVID-19 vaccination rollout[4].
- Many of these community-driven initiatives were viewed as successful by organizers and by community participants. Based on the insights gained from these experiences and the feedback obtained from key informants, the NCCDH report outlines strategies for supporting an equitable vaccine rollout. We categorized these strategies according to the Behaviour Change Wheel (BCW)

intervention functions and found that 5 out of 9 intervention functions were relevant for describing the NCCDH recommendations:
    - Acknowledging and addressing past and present anti-Black racism in society and in the health system (intervention function: *Persuasion, Environmental restructuring*)
    - Ensuring education and vaccination efforts are led by Black experts, leaders, physicians, and community ambassadors (intervention functions: *Education, Environmental restructuring, Modelling*)
    - Providing communication and education that 1) directly addresses prevailing myths and vaccine concerns, 2) respectfully addresses and represents Black communities, and 3) emphasizes contributions made by Black leaders and community members to the development of vaccines (intervention functions: *Education, Persuasion, Modelling*)
    - Working with communities to support well-resourced self-organized accessible (e.g., flexible hours, minimal registration) and culturally relevant (e.g., providing culturally appropriate food, music, symbols) vaccine clinics (intervention functions: *Enablement*)
    - Fostering relationships with community ambassadors who are already trusted leaders in the community while ensuring that Black communities and Black-led community initiatives maintain decision-making power and autonomy (intervention functions: *Environmental restructuring, Enablement*)
- Policies addressing anti-Black racism are necessary across multiple sectors to support vaccination efforts in Black communities. Policy interventions may include:
    - *Communication/marketing* to publicize formal acknowledgments of past harms committed by public health and health systems prior to and during the pandemic and *legislative* actions to address anti-Black racism in health systems and society
    - Changes in *regulation* and development of *guidelines* to evaluate current policies and processes to ensure they do not further contribute to inequities in Black communities
    - *Guidelines* and *regulations* to remove barriers to accessing vaccines and healthcare more broadly
    - *Service provision* to support community-based and Black-focused organizations with resources they have identified as useful/necessary to continue their work

- *Environmental/social planning* to facilitate government and public health collaborations with community leaders and organizations that respect community/leaders' autonomy and decision making power

Implications

- Public health efforts must consider the ways in which our past and existing health system disadvantages Black communities and contributes to vaccine hesitancy
- Acknowledging and working to dismantle anti-Black racism within society and the health system is critical to addressing barriers to vaccination
- Addressing anti-Black racism and fostering trust with Black communities requires a commitment to developing meaningful and responsive relationships with community ambassadors and community leaders

Introduction

Given the increasingly vast research on COVID-19 vaccination confidence and uptake (>200 studies since Nov 2020), our work to date at the Ottawa Hospital Research Institute has sought to use a behavioural science lens to bring coherence across a broad and diverse international literature. Despite the surge in research on COVID-19 vaccination acceptance, only 29 out of 143 studies in our most recent living behavioural science evidence synthesis[3] (representing studies published prior to July 7th 2021), provided data on vaccine acceptance among racialized groups. Of these studies, only two represented Canadian data. As a result, the National Collaborating Centre for Determinants of Health (NCCDH) sought to redress this issue and conducted nine key informant interviews with leaders in Black communities across Canada to better understand the experiences of Black communities as it relates to COVID-19 vaccination. Key informants included researchers, scientists, medical health professionals, and representatives from various community organizations (e.g., The Black Health Alliance) who have been at the forefront of supporting vaccine uptake and health equity in Black Communities in Canada. The NCCDH report is essential reading to ensure Black communities in Canada are appropriately supported and recommendations acted upon.

The present report seeks to consider the findings from the NCCDH report on the experiences of Black communities[4] during the vaccine rollout in Canada. We aim to position the findings from the NCCDH report within the global literature by comparing the results from the NCCDH report to those reported in the living behavioural science evidence synthesis (LBSES v4)[3]. We also seek to consider how applying a behavioural science lens may help complement the recommendations put forward by the NCCDH report.

Behaviour change approaches focus on the factors that drive and promote change in a given behaviour; in this case, COVID-19 vaccination. Most contemporary behavioural approaches (including those used in the present report) understand behaviour as being a function of both internal and external factors. While the focus is on the behaviour of individuals, the onus for changing behaviour may, therefore, lie with various entities (e.g., individuals, groups, communities, leaders, institutions). For example, personal agency can be supported or thwarted by the social and structural settings in which people live and work, past and present.

The Behaviour Change Wheel (BCW) approach used herein helps to 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 support possible strategies. Consistent with our LBSES report[3], we used the Capability, Opportunity, and Motivation-Behaviour (COM-B) model[5] and Theoretical Domains Framework[6,7] components of the 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 similar and unique factors for Black communities in Canada. In addition, we sought to leverage the BCW intervention functions[5] (see Figure 2) to link identified barriers and enablers to the recommended strategies presented in the NCCDH report. We further explore links to policy functions that may further support the implementation of equitable vaccination approaches that address the needs identified by Black communities.

Figure 1. Potential drivers of vaccination acceptance and uptake based on the COM-B model and Theoretical Domains Framework

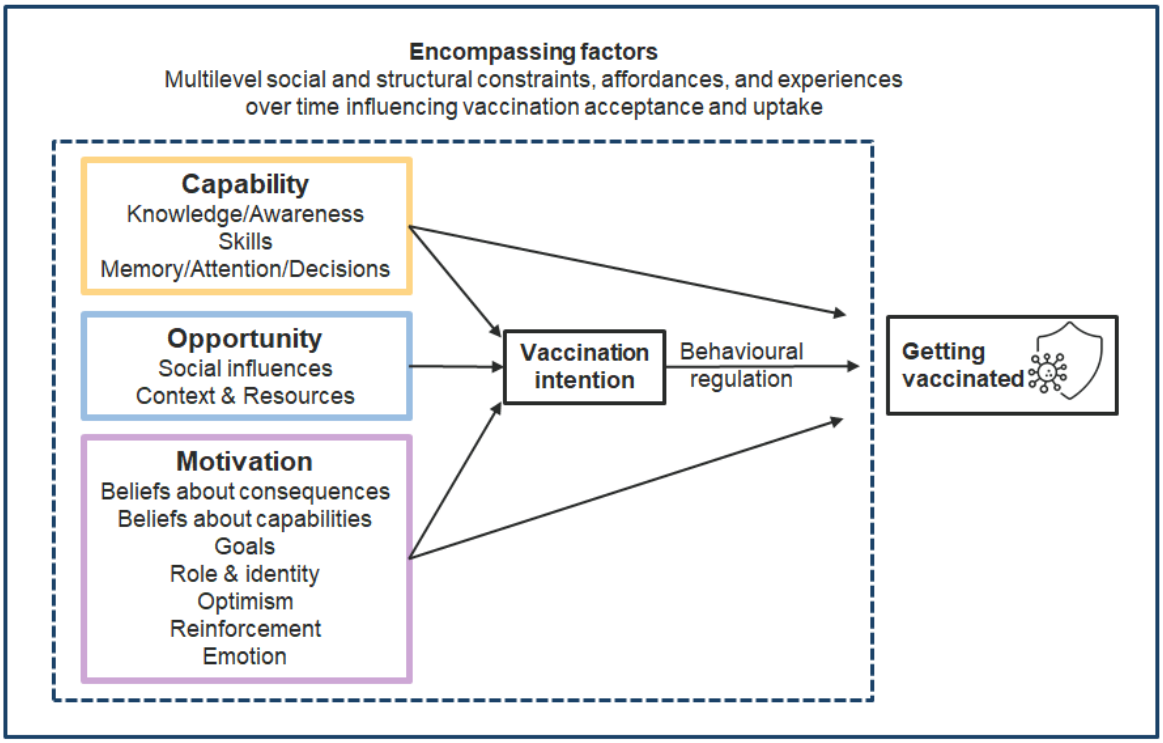
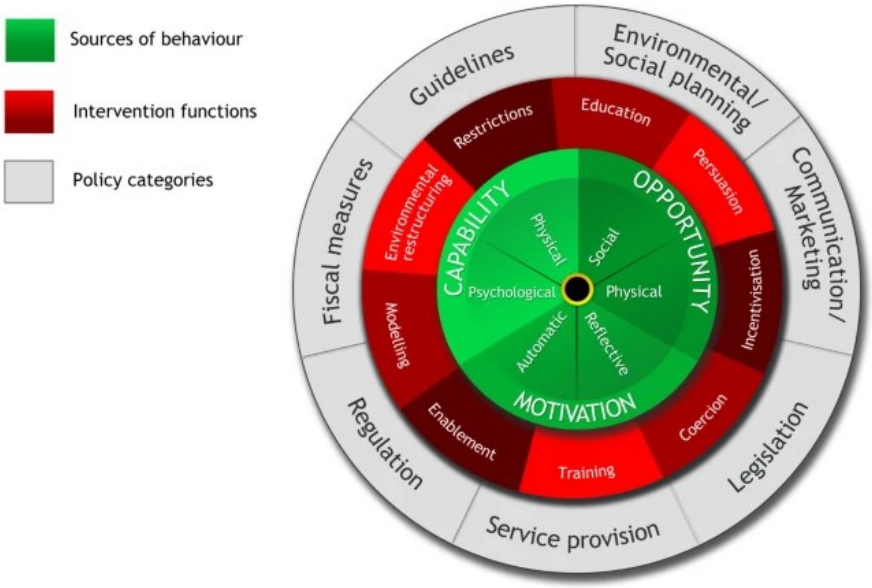


Figure 2. The Behaviour Change Wheel[5]



The Behaviour Change Wheel.

Methods

We used the NCCDH report entitled: "We were out ahead of public health: Leading COVID-19 vaccine equity for Black Communities across Canada" as our source material. We categorized the content described in the results section of the NCCDH report according to the COM-B model[5] and Theoretical Domains Framework (TDF)[6,7]. We then assessed how the barriers and enablers identified in the NCCDH report compare to those reported internationally across all studies and among racialized groups, including Black communities, in North America and the United Kingdom that were identified in our LBSES v4 report.

We then coded the suggested strategies for supporting vaccination that were described in the NCCDH report according to the Behaviour Change Wheel (BCW) intervention functions[5] 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 and supporting suggested strategies. Definitions for BCW intervention and policy functions are provided in Appendix 1.

Results

Summary of findings from the NCCDH report on COVID-19 vaccine equity for Black communities across Canada

Based on qualitative interview data with nine key informants involved in various vaccination initiatives with Black communities in Canada, the NCCDH report details the challenges, successes, and recommended strategies for supporting vaccination in Black communities[4]. The NCCDH report outlines how Black communities were not prioritized during the vaccine rollout and so leaders in the community organized to support vaccination in the absence of public health efforts. These supports included educational events that acknowledged past harms committed by medical research and health systems, vaccine clinics that were culturally relevant (e.g., providing culturally appropriate food and music) and accessible (e.g., not requiring health card), and organizing vaccination efforts (e.g., clinics, town halls) with appropriate representation from Black communities and leadership. Importantly, key informants suggested that these community-driven efforts provided members of Black communities with a safe space within which to acknowledge how the legacy of unethical medical research impacts on vaccine perceptions and willingness to get vaccinated and engage in dialogue around vaccines that moved beyond exchanging information. Challenges identified by key informants included anti-Black racism in public health and health systems, the harmful impact of past unethical research and ongoing inequitable medical practices, concerns over the rushed development of vaccines,

misinformation, and accessibility barriers. The factors identified in this report were categorized according to the COM-B model and TDF and are presented in Table 1.

Summary of findings from the LBSES v4[3].

The LBSES review v4 identified 143 studies representing global data on vaccine acceptance. Based on 104 global studies 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) behavioural theoretical domains were identified as influencing willingness to get vaccinated. Capability-related factors included a desire for knowledge, particularly around comorbidity-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.

In total, 28 of 115 studies assessed differences in vaccine acceptance among Black, Latinx, Asian, and White-identified respondents in North America and the United Kingdom. These studies indicated that racialized respondents, including Black participants, reported more vaccine hesitancy than White respondents. Four of these 28 studies explored barriers and enablers to vaccine acceptance among racialized groups. Capability-related barriers that were more frequently cited by Black respondents than White respondents included not having enough information about the vaccines[8]. Opportunity-related factors that were more frequently cited by Black and other racialized respondents included distrust in pharmaceutical companies[9] and government institutions[10,11] and concerns over being used as an experiment[10]. Motivation-related factors that were cited by all respondents included concerns over vaccine safety[8,11] and efficacy[9,11] and concerns over a rushed approval process[9]. Barriers and enablers identified by studies assessing differences across race and ethnicity in North America and the United Kingdom are summarized in Table 1.

Table 1. Barriers and enablers to vaccine acceptance in global population, racialized survey respondents, and Black communities in Canada

COM-B	TDF domains	Barriers/enablers identified in LBSES v4 (*k* = # of studies)		Barriers/enablers in Black communities in Canada identified in NCCDH report
		Global population (k = 115)	*Black, Latinx, Asian, and White-identified respondents (k = 4)*	
Capability	Knowledge	Barriers Gaps in knowledge about COVID-19 vaccines (*k*=19)	Barriers Gaps in knowledge about COVID-19 vaccines (*k*=1)	Barriers Misinformation and disinformation about COVID-19 vaccines.
		No enablers identified	No enablers identified	Enablers Culturally relevant and affirming educational events.
	Memory, attention, decision making	No barriers/enablers identified	No barriers/enablers identified	No barriers/enablers identified
	Skills	No barriers/enablers identified	No barriers/enablers identified	No barriers/enablers identified
	Behavioural regulation	No barriers/enablers identified	No barriers/enablers identified	No barriers/enablers identified
Opportunity	Environmental context and resources	Barriers Access issues in terms of time, convenience, and cost (*k*=6)	No barriers/enablers identified	Barriers Access issues in terms of booking system, registration requirements, clinic hours, and wait times. Anti-Black racism in public health and health systems was named as the most significant barrier to vaccine uptake in Black communities in Canada.

				Inadequate/absence of consistent public health response for Black communities. Lack of prioritization despite disproportionate impact of COVID-19 on Black communities.
		Enablers Having access to and trust in reputable information sources (*k*=12)		Enablers Providing culturally relevant vaccination experience.
	Social influences	Barriers Mistrust in government/public health response to COVID-19 (*k*=26) Negative influence of close contacts and high-profile persons (*k*=8) Direct advice from medical professionals about vaccination (*k*=8)	Barriers Mistrust in government/public health response to COVID-19 (*k* = 4) Concerns about being used as an experiment among Black and Latinx respondents (*k* = 1) Mistrust in companies that developed vaccines among Black respondents (*k* = 1) Wanting others to receive vaccine first (*k* = 1)	Barriers Mistrust in government/public health response to COVID-19.
		Enablers Advice from medical professionals encouraging vaccination (*k*=6)	No enablers identified	Enablers Trusted members from the community present at vaccine related events.

Motivation	Social and professional role and identity	Enablers: Certain political preferences/identities (k=5) When getting vaccinated seen as a professional or collective/ prosocial responsibility (k=4)	No barriers/enablers identified	No barriers/enablers identified
	Beliefs about capabilities	No barriers/enablers identified	No barriers/enablers identified	No barriers/enablers identified
	Optimism	Enablers: Optimism was associated with greater vaccine acceptance (*k* = 1)	No barriers/enablers identified	No barriers/enablers identified
	Beliefs about consequences	Barriers: 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)	Barriers: Concerns about COVID-19 vaccine safety (*k* = 2). Concerns about COVID-19 vaccine efficacy (*k*=2) Concerns about COVID-19 vaccine development (*k*=1)	Barriers: Concerns about COVID-19 vaccine development. Concerns over the representation and treatment of Black people in clinical trials and medical research.

		Enablers: Concerns about becoming infected with COVID-19 (*k*=23) Positive attitudes/perceived benefit of COVID-19 vaccines (*k*=16) Belief that COVID-19 vaccines will help protect family (*k*=6)		
	Intention	66% willing to be vaccinated (*k*=104)	33.6% - 81.6% of Black respondents willing to be vaccinated (*k*=2)[8,9]	N/A
	Goals	Enabler: Matching vaccine preference	No barriers/enablers identified	No barriers/enablers identified
	Reinforcement	Enablers: Historical seasonal influenza vaccination (*k*=21) Members of families/close social network having being infected with COVID-19 (*k*=3)	Barriers: Past experiences with race-based discrimination (*k* = 1)	Barriers: Past experiences with race-based discrimination, particularly in health care.
	Emotion	Enablers: Fear about being infected with COVID-19 and its impact (k=3) Mental health challenges (stress, depression, anxiety)		Enablers: Feeling that concerns and mistrust are heard and validated.

		may contribute to protective behaviours, including greater COVID-19 vaccine acceptance (k=7)		

Convergences and complementarity in identified barriers

The TDF domains identified in the NCCDH report and LBSES review v4 indicate that some barriers and enablers are similar across Black communities in Canada, racialized groups in North America and the United Kingdom, and the general global population. For example, Capability-related factors like the need for more accurate and accessible information, Opportunity-related factors like access barriers, mistrust in vaccine development companies, health institutions and government, and Motivation-related factors like concerns over vaccine safety, efficacy and a rushed process were common barriers to getting vaccinated across all groups.

The NCCDH report provides further detail and nuance with which to understand these commonly reported barriers and enablers as they are experienced by Black communities in Canada. For example, our understanding of the mistrust experienced by Black communities is deepened by considering how mistrust and concerns about vaccine safety in Black communities are rooted in histories of oppression, systemic anti-Black racism in health systems and society, and the legacy of unethical medical research conducted in Black communities.

Comparing the NCCDH data to the broader literature also indicates that there are some barriers and enablers that have not been identified in the global literature. For example, the literature captured in the LBSES report suggests time, convenience, costs, and access to credible information are important factors. The NCCDH report indicates that in addition to time and convenience considerations, key resource related barriers included an absence of a consistent public health response as well as challenges in accessing booking systems that necessitate documentation and access to internet. Importantly, many of the resource related barriers identified in the NCCDH report could have been anticipated and addressed, yet remain in place.

The NCCDH report also indicates that histories of medical abuse and unethical treatment of Black communities by health research institutions, both locally and globally, has created a sense of cautiousness when Black communities are approached about accepting a new treatment or vaccine. The impact of past experiences with the medical and health research systems has not been identified as a barrier to getting vaccinated in the global literature. However, one US based study reported that a history of race-based discrimination in any context was associated with lower vaccine acceptance[12] suggesting that both past and ongoing experiences of anti-Black racism will continue to influence vaccine uptake.

The NCCDH report also suggests how other barriers and enablers that have been identified in the broader global literature may have a differential impact on Black communities. For example, the global literature suggests that receiving encouragement from physicians may

support vaccination efforts. However, the role of physicians in supporting vaccination efforts in Black communities will depend on whether physicians are viewed as part of the community and whether they have developed a trusting relationship with community members. This suggests that trust between healthcare providers and the public may vary depending on their social positions and local contexts.

Finally, some barriers and enablers were identified only in the global literature. For example, political preferences, past experiences with influenza vaccination, influence of family members and close friends being infected, and mental health challenges were not specifically identified in the subset of studies assessing barriers and enablers among racialized groups included in the global literature synthesis or in the NCCDH report. While these factors may still be relevant to Black communities and other racialized groups, it may be that the manifestations and ramifications of anti-Black racism and systemic racism more broadly play a larger role in factors contributing to vaccination.

Strategies and policies for supporting vaccine uptake and equity among Black communities in Canada

The NCCDH report outlines key approaches for supporting vaccination efforts in Black communities. We categorized these approaches according to the Behaviour Change Wheel (BCW) intervention functions and then mapped them to the barriers and enablers identified in the NCCDH 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 NCCDH.

The strategies outlined in the NCCDH report speak to the importance of validating the experiences, concerns, and mistrust in health systems experienced by Black communities given the history of abuse and mistreatment in medical research and health settings. They speak to the importance of providing community-driven, accessible and culturally relevant education and care during vaccination rollouts. Finally, they emphasize the need to acknowledge and address anti-Black racism in public health and healthcare systems, including respecting Black-focused spaces and community decision-making power.

These approaches indicate an opportunity, desire and need to change systems at the policy level to better support community-driven initiatives. We, therefore, identified BCW policy functions that may be well situated to supporting the identified change strategies to address known barriers to vaccination acceptance and uptake in Black communities in Canada (see

Table 2). We have operationalized policy functions based on the recommendations provided by the NCCDH report. The BCW policy levers *service provision, guidelines, regulation,* and *environmental/social planning* are useful for supporting community-driven events that ensure vaccine clinics and educational efforts are accessible, culturally relevant, and autonomous. The policy functions *guidelines, regulation* and *legislation* are relevant for explicitly addressing anti-Black racism in healthcare institutions. *Regulation* changes 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 demonstrating accountability through observable and measurable action.

Table 2. COVID-19 vaccination strategies and policy interventions

COM-B (TDF domains)	Barriers/enablers in Black communities in Canada as identified in NCCDH report[4]	BCW Intervention functions	Strategies identified in NCCDH report	BCW Policy functions	Policy interventions
Capability (Knowledge)	Barriers Misinformation and disinformation about COVID-19 vaccines. Enablers Culturally relevant and affirming educational events.	Education	Provide accurate information on vaccine development, safety, efficacy, and side effects. Communication and education must consider different levels of comfort and knowledge with COVID-19 vaccine information. Communication and educational materials must represent communities respectfully and authentically.	Service provision	Provide financial and material support to organizations that are leading and organizing culturally relevant educational events. Develop educational materials and provide multimodal education in collaboration with Black-focused community organizations and community health centres.
Opportunity (Environmental context and resources)	Barriers Access issues in terms of booking system, registration requirements, clinic hours, and wait times.	Enablement	Improve vaccine accessibility through community-based and community-run pop-up clinics. Offer flexible vaccination clinic hours.	Service provision	Devote resources to improving access to vaccination by ensuring staff are appropriately compensated for after-hours clinics. Direct resources to developing community partnerships to enable accessible approaches (e.g., pop-up/mobile clinics).
			Provide access to vaccines without requiring online registration and documentation.	Regulation	Revise vaccine protocols to allow for flexible and responsive vaccination procedures (e.g., removing need for documentation).

			Prioritize care for older adults, people living with disabilities, pregnant people, and people with young children who are in line ups.	Guidelines	Provide vaccination clinics with guidelines on who and how to prioritize during open clinics. Communicate to communities what prioritization process they can expect.
Opportunity (Environmental context and resources)	Barriers Anti-Black racism in public health and health systems is most significant barrier to vaccine uptake in Black communities.	Environmental restructuring	Public health and health systems must develop a deep understanding of anti-Black racism in order to prioritize and support the needs of community-led vaccination activities while ensuring Black communities maintain decision making power.	Guidelines	Public health organizations and health systems must develop policies and guidelines that explicitly address anti-Black racism. Policies should outline plans and mechanisms for a) educating staff and leadership, b) community engagement and trust-building with Black communities, and c) for addressing policies within health systems that disadvantage Black communities.
	Barriers Inadequate/absence of consistent public health response for Black communities.	Enablement	Black communities have organized own community-driven responses to address COVID-19 vaccination needs.	Regulation	Evaluate public health response and vaccination rollout. Make necessary adjustments to ensure Black communities are prioritized and inequities are addressed. Ensure Black communities maintain decision making power.

	Lack of prioritization despite disproportionate impact of COVID-19 on Black communities.			Service provision	Public health/government health agencies to provide community clinics with supports that communities have identified as useful/necessary for running community-led vaccination clinics (e.g., financial support, human resources, training, space, etc.) while respecting community autonomy.
Opportunity (Environmental context and resources)	Enablers Providing culturally relevant vaccination experience.	Enablement	Provide culturally appropriate food, music, interpreters, materials in various languages, and other cultural symbols as part of vaccine clinics.	Service provision	Provide community clinics with material and financial supports to continue running culturally relevant vaccination clinics.
				Environmental/ social planning	Work with community leaders to consider how existing vaccination clinics can better reflect the communities they serve.

Opportunity (Social influences)	Barriers Mistrust in government/public health response to COVID-19.	Persuasion	Public health and health system leaders must acknowledge historical and contemporary anti-Black racism in the health system.	Communication/ marketing	Public health and health systems must communicate an acknowledgement of past harms and publicly commit to addressing anti-Black racism in healthcare. Public statements should be coupled with publicized policies, guidelines, and plans for evaluating progress and maintaining accountability. For example, public health and health systems can develop a strategic plan for working with Black communities to identify and address health inequity in healthcare with measurable outcomes and objectives (an Ontario-based example of this type of work can be found here). Evaluate messaging in public health and government communications to ensure harmful stereotypes are not perpetuated.
				Legislation	Acknowledgments must be coupled with concrete legislative actions. Strategic plans for addressing anti-Black racism must be developed in consultation with Black communities on their terms.

		Enablement	Respect exclusive Black community spaces where vaccine education and rollout is currently being done.	Service provision	Provide community leaders/organizers with material and financial supports to continue running Black-led and Black-focused vaccine clinics. Provide supports based on the community's stated needs and on their terms.
		Modelling	Highlight the contributions of Black scientists and participants in the clinical trials.	Communication/ marketing	Counter media representations of Black communities as "vaccine hesitant" and mistrustful by acknowledging the breadth of perspectives. Celebrate Black scientists and Black community contributions to vaccine development and rollout.
	Enablers Trusted members from the community present at vaccine related events.	Environmental restructuring	Amplify multi-sectoral Black community leadership by ensuring representation in the health system and supporting Black leadership in the community. Champion the importance of community ambassadors as they are already trusted by communities and can engender trust for COVID-19 vaccines. Build-on existing trusted relationships with permanent clinics.	Environmental/ social planning	Ensure representation of Black community leadership within the Public Health Agency of Canada, provincial healthcare system, and local healthcare institutions through hiring practices, contracts, collaborations, and community consultations. Engage community leaders and ambassadors in vaccine rollout planning.
		Modelling	Involve members of the Black community as vaccinators to create a familiar, welcoming and trusting	Service provision	Provide Black-focused community organizations and initiatives with financial and material resources

			environment for members of the Black community.		that are required for engaging and compensating community members as vaccinators. Provide requested training to Black community members interested in delivering vaccinations.
Motivation (beliefs about consequences)	Barriers: Concerns about COVID-19 vaccine development.	Education	Acknowledge and directly address myths and misinformation.	Service provision	Provide financial and material support to organizations that are leading and organizing culturally relevant educational events. Develop educational materials and provide multimodal education in collaboration with Black focused community organizations and community health centres.
	Barriers: Concerns over the representation and treatment of Black people in clinical trials and medical research.	Modelling	Highlight the role of Black scientists in the development of COVID-19 vaccines and Black communities' participation in clinical trials.	Communication/ marketing	Increase the visibility of Black scientists and Black communities in the development of vaccines, vaccine trials and vaccine rollout in government communications and media campaigns.
Motivation (Reinforcement)	Barriers: Past experiences with racism, particularly in health care.	Environmental restructuring	Public health and health system leaders must acknowledge past harms to better address current health inequities that disadvantage Black communities.	Regulation	Implement and respond to existing demands and concerns from Black communities. Work to improve the social determinants of health for Black communities. Increase community engagement efforts 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 Black communities. Create systems for ensuring accountability in healthcare providers who behave inappropriately.
Motivation (Emotion)	Enablers: Feeling that concerns and mistrust are heard and validated.	Persuasion	Public health and health system leaders must acknowledge historical and contemporary anti-Black racism in the health system.	Communication/ marketing	Public health and health systems must communicate an acknowledgement of past harms and publicly commit to addressing anti-Black racism in health and other social determinants of health. Public statements should be coupled with publicized policies, guidelines, clear implementation plans and plans for evaluating progress and maintaining accountability.
				Legislation	Acknowledgments must be coupled with concrete legislative actions that transform power relations within health systems and in society.

Discussion

The findings from the present report illuminate how barriers to getting the COVID-19 vaccine that have been identified in the global literature are similar to, yet differ from, those experienced by Black communities in Canada. The NCCDH report provides invaluable insights into the barriers to vaccine uptake experienced by Black communities and, perhaps more importantly, highlights how Black communities mobilized to meet vaccine-related needs independently from public health vaccine rollouts. Indeed, many of the strategies outlined in the NCCDH report have already been implemented by Black-led community driven initiatives, emphasizing the importance of acknowledging the agency, creativity and resiliency of Black communities and respecting Black communities' autonomy and decision-making capabilities. Still, anti-Black racism and intersecting structural and resource related barriers (e.g., inaccessible vaccine clinics) remain and necessitate government and public health action.

Behavioural science approaches like the COM-B model, Theoretical Domains Framework and Behaviour Change Wheel help to synthesize evidence by enabling the use of a common lexicon with which to summarize and consider how barriers and enablers are linked to possible strategies to promote COVID-19 vaccination. By categorizing the wealth of evidence on barriers and enablers to COVID-19 vaccination according to TDF domains, we are also able to draw upon decades of research to consider the theoretical linkages between identified barriers in the NCCDH report and the suggested strategies. Furthermore, by mapping barriers and strategies according to the BCW, we were able to identify policy functions that allow us to consider how vaccine uptake can be better supported by government, public health, and healthcare institutions.

The recommendations in the NCCDH report converge with those put forth by Black health researchers and organizations that have called for addressing systemic racism and inequities in vaccination rollouts and healthcare in Canada. These authors advocate for acknowledging and addressing past and present anti-Black racism within healthcare and government institutions, working with communities to co-develop and run education and vaccination initiatives, improving access to vaccines, and ensuring healthcare providers are well equipped to understand and address systemic racism in their practice and deliver culturally relevant and accurate vaccine information[1,13,14].

The NCCDH report provides further details on how recommendations such as building trust and addressing systemic racism may be operationalized. We build on this thoughtful work by demonstrating how individual level behaviours are theoretically linked to multi-level

interventions and necessitate policy changes and government action to adequately and equitably support vaccination uptake.

Future directions

Future work would be well served to further delineate policy recommendations by identifying "who needs to do what differently" across community organizations, health institutions, and different levels of government. A behavioural science approach may be useful for identifying and describing desired changes according to actors, actions, context, time, and targets and developing intervention logic models for planned changes[15,16].

Importantly, behavioural science approaches and associated strategies are most effective when they are responsive to the specific contexts where they will be implemented. Behavioural science approaches to developing targeted interventions are, thus, improved upon when coupled with findings from in-depth engagement with community ambassadors who can speak to the nuances of community needs. These in-depth approaches provide the necessary context for developing thoughtful and effective interventions. In-depth analyses of the barriers to getting the COVID-19 vaccine faced by Black communities and other racialized groups is currently missing from the global and Canadian evidence base. Out of 143 studies identified in the LBSES report, only two reported on qualitative data[3]. More in-depth, community-driven research is needed to appropriately understand and consider the diversity and heterogeneity within and between Black communities in Canada as well as how other intersecting factors (e.g., gender, age, income, location, identity) may impact vaccination. Understanding the specific experiences of local communities and how intersecting factors impact vaccine uptake will aid in developing specific and actionable interventions and policy changes that address the needs of communities in Canada.

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Appendix 1

Behaviour Change Wheel Intervention and Policy Function Definitions[5]

Intervention	**Definition**
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[1]
Policies	
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

[1]Capability beyond education and training; opportunity beyond environmental restructuring

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