"It felt like building a plane while in flight": the consideration of social inequalities in the design and planning of a contact-tracing intervention for COVID-19 in Montreal, Quebec

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Abstract

Objective In Canada and globally, the COVID-19 pandemic has increased social inequalities in health (SIH), furthering the vulnerability of certain groups and communities. Contact-tracing is a cornerstone intervention with COVID-19 prevention and control programs. The aim of this study was to describe whether and how SIH were considered during the design of the COVID-19 contact-tracing intervention in Montreal.

Methods This study is part of the multi-country research program HoSPiCOVID, looking at the resilience of public health systems during the COVID-19 pandemic. A descriptive qualitative study was carried out in Montreal, based on a "bricolage" conceptual framework describing the consideration for SIH in intervention and policy design. Qualitative data were collected using semi-structured interviews with 16 public health practitioners, recruited using both purposive and snowball sampling. Data were analyzed thematically, both inductively and deductively.

Results According to participants, SIH were not initially considered during the design of the contract-tracing intervention in Montreal. The participants were frustrated by the Minister of Health's initial resistance to integrating SIH into their public health response. However, adaptations were gradually made to better meet the needs of underserved populations.

Conclusion There is a need for a clear and common vision of SIH within the public health system. Decision-makers need to consider SIH prior to designing public health interventions in order for these not to further increase SIH in the future, especially in the face of a health crisis.

Résumé

Objectif Au Canada et dans le monde, la pandémie de COVID-19 a augmenté les inégalités sociales de santé (ISS), aggravant la vulnérabilité de certains groupes et communautés. Le suivi des contacts est une intervention fondamentale des programmes de prévention et de contrôle de la COVID-19. L'objectif de cette étude était de décrire si et comment les ISS ont été prises en compte lors de la conception de l'intervention de suivi des contacts pour la COVID-19 à Montréal.

Méthodes Cette étude fait partie du programme de recherche multi-pays HoSPiCOVID, portant sur la résilience des systèmes de santé publique pendant la pandémie de COVID-19. Une étude qualitative descriptive a été menée à Montréal, sur la

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base d'un cadre conceptuel « bricolage » décrivant la prise en compte des ISS dans la conception des interventions et des politiques. Des données qualitatives ont été recueillies au moyen d'entrevues semi-structurés avec 16 praticiens de la santé publique, recrutés par échantillonnage raisonné et en boule de neige. Les données ont été analysées de manière thématique, de façon inductive et déductive.

Résultats Selon les participants, les ISS n'ont pas été initialement prises en compte lors de la conception de l'intervention de suivi des contacts à Montréal. Les professionnels de santé publique ont déploré le manque de volonté du Ministère de la Santé d'intégrer les ISS dans la réponse de santé publique. Toutefois, des adaptations ont été progressivement apportées pour mieux répondre aux besoins des populations vulnérables.

Conclusion Il est nécessaire d'avoir une vision claire et commune des ISS au sein du système de santé. Les décideurs doivent prendre en compte activement les ISS pour que celles-ci soient mieux conceptualisées, et que les interventions de santé publique n'aggravent pas les ISS, surtout en période de crise sanitaire.

Keywords COVID-19 · Social inequalities in health · Public health · Contact-tracing intervention · Montreal, Quebec · Canada

Mots-clés COVID-19 · inégalités sociales de santé · santé publique · intervention de suivi des contacts · Montréal, Québec · Canada

Introduction

In Quebec, there were more than 850,000 cases of COVID-19 as of January 28, 2022 (Gouvernement du Québec, 2021). The first case was declared on February 27, 2020, and the provincial government declared all the non-essential services closed starting March 24, 2020. With more than 1,700,000 inhabitants, Montreal, the largest city in Quebec, rapidly became the most burdened city in the province. In Montreal, COVID-19 and the associated measures differentially impact underserved communities relative to the general population (Cambon et al., 2021). There is past and present evidence of inequalities in prevalence and mortality rates in pandemics: between high/low income countries, more/less affluent areas, higher/lower social classes, and urban/rural areas (Bambra et al., 2020). The severity of the COVID-19 pandemic, in terms of mortality rates, is amplified because of (pre-) existing social inequalities (Bambra et al., 2020).

Social determinants of health cause health inequalities. Some authors describe structural and intermediary determinants of health (Gautier et al., 2020; Solar & Irwin, 2010). The first encompass the political and socioeconomic context (e.g., labour, housing, education, and health and social protection policies in place in a country) and social position which is shaped by gender, age, socioeconomic (income, occupation, and education), minority status, and migration status. Intermediary determinants include living and working conditions, psychosocial factors (e.g., stress), and access to healthcare and other public services. Systemic discrimination, such as colonialism and racism, and social networks impact both levels of determinants (Gautier et al., 2020). In Canada, the impact of poverty on health is considerable with about one out of six Canadians living in a low-income household (Martin et al., 2018). Ethnic minorities and Indigenous people often experience racism, social exclusion, and barriers to healthcare (Hyman, 2009). Migrants without medical insurance face important unmet medical needs due to financial constraints (Ridde et al., 2020).

Social inequalities in health (SIH) can be defined as variations in health that are "systematic, socially produced (and therefore modifiable) and unfair" (Whitehead & Dahlgren, 2006). SIH have been studied extensively in public health, but much remains to be done, particularly about the most appropriate approach to reduce health inequalities. For instance, Geoffrey Rose (2001) made an argument in favour of a population-wide approach for public health interventions, in which interventions target the entire population and not only individuals who are deemed at high risk of particular health problems. This approach is based on the premise that controlling the determinants of a disease on the population as a whole would shift the distribution of risk in a way that the incidence of the disease within the overall population would be reduced (Rose, 2001). However, Frohlich and Potvin (2008) argued that the population-wide approach has the potential to increase SIH by reaching primarily the most privileged groups. They argued that an approach focused on social vulnerability would be complementary to the population-wide approach, and that Rose's approach on its own does not in fact address the mechanisms that lead to different distributions of risks within different groups. Instead, the vulnerable-populations approach that they suggest targets the fundamental causes that create vulnerability within certain population subgroups (e.g., those with low socioeconomic status). Therefore, they argue that the vulnerable-populations approach would decrease SIH between vulnerable and privileged groups (Frohlich & Potvin, 2008). Other authors suggest adopting the principle of proportionate universalism to reduce SIH, an approach that states that interventions should be universal but their scale and intensity

should be adapted to the most underserved groups (Francis-Oliviero et al., 2020). Finally, the design phase of a public health intervention is a crucial phase to consider SIH, as it is unlikely that SIH will decrease if the intervention was not intentionally designed to accomplish this (Potvin et al., 2008).

Contract-tracing is a cornerstone public health intervention for infectious diseases that are transmitted from person-to-person, such as SARS-CoV-2, with the goal to identify, assess, and manage people who have been exposed in order to prevent onward transmission. Contact-tracing involves informing people that they may have been exposed to a confirmed case, assisting them in getting tested and understanding their contacts and risk of exposure, and giving them information on self-isolation if necessary. Considering that COVID-19 outcomes have been aggravated by SIH within underserved populations (Cambon et al., 2021), public health interventions must work to prevent transmission, such as via contact-tracing, and maximize the opportunity to prevent onward transmission. The aim of the study was to explore whether and how SIH were considered during the design and planning of the contact-tracing intervention in Montreal during the first and second waves of the COVID-19 pandemic.

Methods

We conducted a descriptive qualitative study in Montreal, Quebec, in the fall of 2020. This study is part of the HoSPi-COVID project, a multi-country study which mainly focuses on the resilience of the health systems to the COVID-19 pandemic in Canada, France, Brazil, Mali, Japan, and China. The qualitative descriptive approach was chosen as it is considered to be an appropriate methodology to research a "straight description of a phenomenon" (Kim et al., 2017).

The COREQ checklist (consolidated criteria for reporting qualitative research) was used to ensure the methodology of the study is reported rigorously (Tong et al., 2007). We provide the COREQ checklist in the Appendix.

Conceptual framework

This study is built on a conceptual framework that was designed by the larger HoSPiCOVID research team (Gagnon-Dufresne et al., 2022) based on three theory-driven analytical tools: Policy design by Howett (Howlett, 2019), Planning of public health interventions by Pineault and Daveluy (Pineault & Daveluy, 1995), and REFLEX-ISS by Guichard and colleagues (Guichard et al., 2019). Combining these three analytical tools into one (a "bricolage" approach often used in health policy and health system research (Jones et al., 2021)) allowed for a holistic analysis of the consideration of SIH in the intervention design. The final framework includes four aspects: (i) perceptions of SIH, (ii) approaches to address SIH, (iii) intersectoral collaboration, and (iv) adaptive capacity (Tables 1 and 2). The interview guide was built using this conceptual framework. The framework was also used for deductive coding and helped us categorize our findings. For more details about the framework, please refer to Gagnon-Dufresne and colleagues (2022).

Study sites

The health system in the province of Quebec is governed by the provincial Ministry of Health and Social Services which is responsible for 22 administrative regions. Public health activities are part of a province-wide service delivery program distributed among each administrative region

Table 1 Frameworks on policy design and planning

References	Stages of policy and public health intervention design and planning explored in the literature			
	Problematization (*emergence*)	Policy/intervention design (*formulation*)		Policy/intervention implementation planning
Policy design (Howlett, 2019)	Synthesis of available evidence	Solution development and evidence-based decision-making	Consideration of diverging stakeholders' interests	Anticipation of the potential effects of the proposed solutions
Planning of public health interventions (Pineault & Daveluy, 1995)	Strategic planning	Tactical and operational planning	(Implicit)	Operational planning
REFLEX-ISS tool (Guichard et al., 2019)	Analysis of problems and needs	Objectives, justification, and conception of SIH	Involvement of partners and the population	(Not applicable)
Combined framework (authors' own work)	Understandings and perceptions of SIH	Approaches to address SIH	Intersectoral collaborations	Adaptation capacities: accessibility, acceptability, availability, and unintended impacts

Source: The combined framework is based on authors' own work, and Howlett, 2019; Pineault & Daveluy, 1995; Guichard et al., 2019

Table 2 Definitions of the four categories of the combined framework

Categories	Definitions
Understanding and perception of SIH	Designers' and planners' perspectives about SIH, (lack of) common vision of SIH shared with their teams, institutions, and partners, based on a mutual analysis (or lack thereof) of the context and supported by evidence
Approaches to address SIH	Respondents' discourse about a "milieu-based" approach to tackle SIH versus "at-risk" groups approach (i.e., to avoid stigmatization) and other similar approaches
Intersectoral collaboration	Respondents' mentions of involving key partners from other sectors outside of public health and ensuring their ongoing collaboration, thus delivering an intersectoral approach
Adaptation capacity (incorporating the subcategories below)	Respondents' discourse about flexible design and planning, monitoring, and adjusting as needed, e.g., accounting for implementation shortcomings and incorporating new evidence (related to SIH)
Unintended consequences	Intervention designers' and planners' ability to anticipate unintended and undesirable consequences, and to adjust accordingly
Acceptability	Perceived capacity for intervention recipients to benefit from the intervention and intervention's capacity to adjust to enhance acceptability
Availability	Perceived reception of the intervention, and intervention's capacity to adjust to enhance availability
Accessibility	Information on how to access the intervention, and adaptations of communication tools to be more accessible

The combined framework is based on authors' own work and Howlett, 2019; Pineault & Daveluy, 1995; Guichard et al., 2019

through a regional public health directorate. In Montreal, the regional public health directorate conducts contact-tracing as part of their mandate within communicable disease control. For COVID-19, the activities involved with contract-tracing depended upon the level of risk of the contact in question (low, medium, or high): (i) active surveillance of the contacts by telephone or email for a maximum period of 14 days, or (ii) self-monitoring of the contacts with public health supervision via a daily email (a questionnaire focused on evaluating symptoms).

Participant selection

Data collection took place among the regional public health directorate in Montreal, Quebec, and involved semi-structured interviews with public health professionals. We chose Montreal because the city was the epicentre of the pandemic during the first and second waves of COVID-19. Participants were purposively selected as follows: (i) they worked in the public health department for infectious disease prevention, which was the main department involved in the COVID-19 response when the pandemic started, and (ii) they were or had been involved in the contact-tracing intervention's design, implementation, or adaptation to different populations or settings. First, a short list of potential participants was created based on the professional network of the researchers. Potential participants were then contacted by email or phone by the researchers in charge of conducting the interviews. Snowball sampling was then used to identify other potential participants, as each participant was asked to provide names of colleagues who were involved in the design of the COVID-19 contact-tracing intervention.

Data collection

An interview guide was created based on our conceptual framework (Table 2), which was piloted prior to data collection. The pilot interview was done by the authors in charge of data collection (RM and ASL) who were both students at the time of the study. The pilot interview consisted of conducting one interview with a participant to adjust questions and formulation. The participant involved in the pre-test was not included in our participant selection. The interview guide remained the same throughout the entire data collection process, but follow-up questions were sometimes asked for participants to elaborate on a specific aspect. Participant recruitment and semi-structured interviews were conducted at the same time between November 2020 and February 2021. Interviews were conducted online using Zoom by two researchers (RM and ASL). Interviews were conducted in French, the main language used in Montreal's public health system. Researchers were alone with the participant during the interview. The interviews were recorded and videotaped, as Zoom's feature for recording includes videotaping automatically, but we did not include the videos in our analysis. At the end of each interview, the interviewer wrote notes to highlight important elements discussed. Interviews lasted between 31 and 105 min. The audio files were transcribed by the researchers who conducted the interviews. Table 3 presents the main domains of the interview guide.

Analysis

The first author carried out data analysis using a thematic analysis approach. Data were organized and verbatim transcriptions were read several times. We used a hybrid

Table 3 Domains in the interview guide

Domains	Example of question
Design process of the contact-tracing intervention	*Could you explain how the design of the intervention was carried out?* *If you had the opportunity to design the intervention, what would you have done to consider the social inequalities in health?*
Vision, knowledge, and consideration of social inequalities in health	*In this particular position, what do social inequalities in health mean to you?* *Are there ever formal discussions of social inequalities in your workplace?*
Partnerships and consultation with other actors	*How were community organizations involved in the design of the intervention?*
Adaptations and re-design process of the intervention	*Can you explain other adaptations to the intervention and what drove the adaptation to consider social inequalities?*

inductive and deductive coding approach. First, codes and categories were developed inductively from the data, to closely reflect the words of participants. Second, we used a deductive approach to fit the categories into the four themes of our conceptual framework, while allowing for researchers to create new themes inductively. All throughout the analysis process, the codebook was discussed and reviewed with several members of the research team. The first author translated the parts of the verbatim used in the Results section, from French to English. Data analysis was assisted by NVivo release 1.5. Table 4 presents an overview of the framework dimensions and the corresponding analytical category that reflected our results.

Ethical issues/statement

The research project has been approved by the University of Montreal's Research Ethics Committee (CERSES-20–061-D). Written consent was provided by email prior to conducting the interviews. Individual interviews were conducted on Zoom, during which the interviewer was in an isolated room to ensure confidentiality. For data sharing among the team, data were stored on a password-protected server and de-identified. Data will be kept for 7 years according to the University of Montreal's Ethics Committee guidelines.

Reflexivity

All authors have a public health academic degree but have also studied or worked in different fields (e.g., nursing,

social science, political science, humanitarian work, epidemiology). We all work or have worked with underserved populations in various settings. Although we have different backgrounds and experiences, we share a common vision of SIH and recognize the importance of considering them in public health. We acknowledge that our perspective may be rooted in academia and may differ from those of participants who practice in the field in a time of crisis. We also acknowledge that our perspectives may have shaped the study design, data collection, and interpretation of results.

Results

We recruited 16 participants for data collection. All participants were public health professionals and were involved in the COVID-19 contact-tracing intervention, either in its design ($n=2$), implementation ($n=4$), or adaptation ($n=10$). Participants work in different public health departments, such as health promotion ($n=1$), urban environment ($n=2$), occupational health ($n=3$), and infectious disease prevention ($n=10$). Their work experience varied between less than a year ($n=6$), between 1 and 2 years ($n=3$), or more than 2 years ($n=7$). Participants had diverse training backgrounds, such as a medical degree ($n=4$), a nursing degree ($n=5$), a public health degree ($n=3$), or others ($n=4$) (e.g., anthropology). We conducted 16 semi-structured interviews. The categories of findings follow from the main four categories of the conceptual framework (see Table 4).

Table 4 Framework dimensions and corresponding analytical categories

Framework dimensions	Deductive analytic categories
Understanding and perception of SIH	Perceptions of SIH: lack of common vision between public health professionals and the Ministry of Health and Social Services
Approaches to address SIH	Approaches to addressing SIH: attempts to consider SIH in a context of crisis during the first waves of the pandemic
Intersectoral collaboration	Intersectoral collaboration: building partnerships outside of the public health sector
Adaptation capacity (incorporating the two subcategories "accessibility" and "acceptability")	Adaptive capacity: increased efforts to improve accessibility and acceptability

Perceptions of SIH: lack of common vision between public health professionals and the government

The participants conveyed that SIH is a concept that is well understood within the Montreal regional public health directorate. Participants explained that they showed commitment to tackling SIH, whether in times of COVID-19 or not. However, during the pandemic, they often faced barriers to integrating responses to SIH within COVID-19 contact-tracing, due to limited time when designing the intervention and lack of financial resources.

> "So, the concepts of social inequalities, yes, I think there are people in public health who are very familiar with this subject, but we hadn't reached the point where all the teams had the time to integrate the concept of SIH, especially in infectious diseases, where budgets had been cut, so what we had was investigators to do the bare minimum" (Participant #4).
> "Yes, yes, yes, yes really there is one [formalized reflection about SIH]! Do we want to implement it? I think we want to, but there are so many fronts to fight, I think that's the lack of time, we can't actually, I wouldn't even know where to start…" (Participant #5).

Public health workers explained how SIH were important to them, and how they felt SIH were not a priority of the Quebec Ministry of Health and Social Services. Participants described how this lack of common vision of SIH resulted in disagreements at different stages of the design and implementation of the intervention, for instance, when developing data collection tools.

> "This is a debate that we have been having since March [2020], to add the questions of ethnic origin and ethnocultural belonging and migratory status. And it's probably now that we're finally going to add them, but the Ministry [of Health and Social Services] is still categorically refusing" (Participant #1).

For this participant, the lack of consideration for SIH and the refusal to collect ethnocultural data were likely related to the political agenda of the Ministry of Health and Social Services, which may have resulted in more challenges to consider and address SIH. Another participant made the case for a specific data collection on ethnic minorities, which would have been informative to better consider SIH within the local public health programs and interventions.

> "This [contact-tracing] questionnaire […] does not reflect any concern about social inequalities in health […]. And this is the wish of the Ministry! […]. If the concerns about social inequalities in health are not reflected in the political expectations [of the Ministry of Health and Social Services], they won't be reflected in the tools [the contact-tracing questionnaire] that are going to be imposed on us, they won't be reflected in the strategic orientations" (Participant #2).
> "Before we can talk about SIH, we have to measure them and so my concern and a large part of my work has been to advocate for this and to collect specific data on racialized populations. […] There are differentiated inequalities for these [racialized] populations compared to other disadvantaged populations" (Participant #7).

Approaches to addressing SIH: initial attempts to consider SIH in a context of crisis

Participants unanimously mentioned that there was no time to consider SIH during the design of contact-tracing. Participants described an atmosphere of urgency and panic that was overwhelming during the first wave of the pandemic, which resulted in contact-tracing being designed as quickly as possible, without consideration of SIH.

> "Montreal was going to be the Canadian city with the most cases during the first wave, obviously we weren't ready for that, it felt like building a plane during the flight. […] So it was too fast for us to be able to have any other consideration than just trying to catch this huge tsunami, and then being able to do the work that was asked of us, which was to call the cases within 24 h. […] Even at the federal and provincial level to support the activities there was nothing planned" (Participant #11).

However, as knowledge about the epidemiologic situation was improving, participants noticed that the contact-tracing intervention could not reach underserved groups and therefore their approach was adjusted. For example, as soon as it was recognized that people in certain workplaces were at higher risk of infection than the general population, a specific approach for employers was designed. The main purpose of this adjustment to the initial intervention was to help employers to identify contacts and to give them guidelines in the prevention of virus transmission within the workplace.

> "We made a chart to support the employer to identify the close contacts, and if there is difficulty to do it, we do it with him on the phone. I'm not the one who does that, but when we developed it, we really developed it with the doctors, we presented it to the stakeholders, and then we tried to make it as simple as possible, despite the complexity of the thing" (Participant #14).

Participants explained that other structural vulnerabilities were considered by the regional public health directorate later in the implementation of the contact-tracing intervention. For example, it is well known that illegal migrants are more vulnerable to health risks due to the challenges they face during migration. Therefore, the public health authorities attempted to address specific issues faced by undocumented migrants and asylum seekers in terms of COVID-19 contact-tracing, such as the lack of trust in the governmental institutions.

"Often there is a [COVID-19] case, he will say 'well I can't tell you who my contact is, because the person is here illegally', and according to the law the person must declare, but the person didn't want to because he is afraid that this person can be deported or have legal problems. […] So […] we put a lot of energy into reassuring the relatives, the family, to say that we really are here to help. I think that when people who don't have the information think that when they have become contacts, it's like the police, but we try to say 'no, no, we don't want you to transmit the virus'" (Participant #15).

In addition, participants explained that the regional public health directorate also made adaptations to contact-tracing to reach ethnic minorities. The intervention is not necessarily accessible or acceptable to every community due to the structural barriers that they usually face (e.g., racism, xenophobia) which can lead to fear of stigma and mistrust in the public health institutions.

"Within the racialized communities […], when we try to look for contacts in this area, um, well, first, there is […] an incredible mistrust of the health system, of everything that is, um, institutional, you know. If I call someone to say, 'I'm calling the public health department', people freeze, you can really feel that there's a distrust of the system. And secondly, […] there's really a fear of stigmatization […] which makes them less likely to be reached" (Participant #1).

Therefore, according to participants, a particular unit of the regional public health directorate, which is responsible for adapting public health measures to different cultural communities, worked in collaboration with leaders of different communities in Montreal to make sure the contacts were able to quarantine themselves. For example, a partnership was built with religious leaders to help communities comply with public health measures while considering their religious practices.

"What we also do is intercultural mediation: we work with leaders of religious communities to anticipate with them the difficulties that the communities could have in the observance of religious practices […]. The idea is to anticipate with these communities, once again, these difficulties and to put in place mechanisms of intercultural mediation to look at whether there are points of convergence that could lead to a satisfactory solution for the communities [for them to respect public health measures]" (Participant #7).

Intersectoral collaboration: building partnerships outside of the public health sector

According to participants, several partnerships with organizations in sectors external to the public health sector were developed as the contact-tracing intervention was implemented. For instance, community organizations in Montreal worked in collaboration with the regional public health directorate to provide support to contacts who needed to isolate. Community organizations were not involved in the design of the contact-tracing intervention but were asked for support once it became evident that certain communities could not meet their basic daily needs during the lockdown.

"I think that in the first wave, we heard there were a lot of elderly people who died and were hospitalized and all that, so in the second wave, even before the second wave, there was already [a concern like] 'how do we help the elderly contacts?' Now there is a service from the Red Cross that allows to find an accommodation for the elderly so that they are not all alone at home, or there is someone who can prepare the meals. So today, there are services" (Participant #15).

Other partners were mandated by the Ministry of Health and Social Services to support the regional public health directorate with contact-tracing given increased number of contacts. These partners included private firms, such as call centres, without any knowledge in public health nor SIH. According to participants, building partnerships with those private firms resulted in wasted time in tracing contacts, which may have limited the success of the intervention.

"The public health objective is to reach the case within 48 h, the contact within 72 h. Before [the private firm joined the intervention] it was easy. We used to call, we would receive the fax there and then we would call right away, but now we don't, because of the system. You receive the fax and then you must enter that information in the information system, and then the person will only call the next day, so you already miss the 24 h. Currently not 100% of people are reached within 48 h, and when we don't reach them, well, it certainly causes risks" (Participant #15).

Adaptive capacity: increased efforts on improving accessibility and acceptability

Rapidly after the beginning of COVID-19 contact-tracing, according to participants, it became clear that some social determinants of health (e.g., poor housing conditions and precarious work) and some sociodemographic characteristics (e.g., poverty and migration status) had the potential to greatly limit the acceptability of the intervention.

> "Depending on their living conditions, their working conditions, which are linked to social inequalities in health, we noticed that there were several communities who did not want to have any connection with public health because of their migration status, their relationship with the government, which was often represented by the police. […] It was really on these aspects that we saw the difference between the different communities, and the social inequalities in health" (Participant #9).

According to participants, to increase accessibility of the intervention, some adaptations were needed after its initial implementation. For example, when the first wave started, isolation guidelines were only available in French and English. This limitation was addressed with translations made available in 16 languages.

> "I can tell you honestly that this planning, even if it was good for ensuring a daily follow-up of contacts, it was done without thinking about social inequalities. The language, we tried very hard to simplify it, so it was available in French and English, in a simple language but […] we didn't include other languages right away. It was quite long before our isolation instructions were translated into 16 other languages" (Participant #4).

Participants described other adaptations that have been made to address the special needs of certain underserved populations, such as homeless people. For instance, a collaboration with community organizations to find the most appropriate ways to reach homeless people who did not own a cellphone. At the time of the study, the contact-tracing intervention was still being modified.

> "The adaptations really came at the end of the first wave and even then, we would have liked to be able to adapt the questionnaire to this effect, but we were not able to adapt it. But we have a bank of interpreters who can come quickly to support us in languages; we have set up a department that deals with homelessness; we are still working with the health workers to try to see

how we can support these people who work in several places and have a precarious status here in Montreal, so that's something we are working on" (Participant #11).

Discussion

To the best of our knowledge, our study is the first to examine whether and how SIH were considered in COVID-19 contact-tracing in Montreal. Our study is part of a larger research project called HoSPiCOVID, a multi-country project seeking to compare the COVID-19 public health response in six countries. The main purpose of this project is to share lessons learned from the first waves of the pandemic to public health policy makers. By providing evidence about the consideration for SIH in the contact-tracing intervention in Montreal, this article sheds light on the lessons learned from planning a key public health intervention for COVID-19 in Montreal.

SIH were not initially considered in COVID-19 contact-tracing in Montreal. Despite the willingness and skills of the public health practitioners to address SIH, there were major barriers to design an equitable intervention, such as lack of support from the provincial government for collecting specific data on ethnic minority groups and individuals. Moreover, the intervention was initially designed in a context of urgency, and participants felt they lacked resources (e.g., time, budget) to integrate SIH into the design of the intervention, or to collaborate with community partners from outside the health sector from the onset. However, certain adaptations were gradually implemented to improve the accessibility and reach of the intervention. Those adaptations were intended to better meet the needs of underserved populations.

Collecting ethnic data is essential to provide an informed understanding of the health status of ethnic and racialized groups, which may result in more equitable interventions. For instance, the city of Toronto built a publicly available database on the number of COVID-19 cases, cross-referenced with the neighbourhoods, the proportion of immigrants, and visible minority status (City of Toronto, 2021). These aggregate data at the community level showed that the Toronto neighbourhoods with the highest number of COVID-19 cases had the highest visible minority population and had higher percentage of visible minorities (Formuli & Rahman, 2020). Such data can be used to design and implement equitable public health interventions, by allocating the larger amount of resources to communities that need them the most (Ahmed et al., 2021).

In Quebec, the public health budget was cut by 33% in 2015. In 2019, Quebec spent only 2.2% of all health expenditures on public health, the lowest amount of all provinces and territories in Canada (Strumpf, 2020). The lack of resources, particularly during a crisis, does not provide public health authorities with sufficient support to address efficiently a major health challenge such as a pandemic (Maani & Galea, 2020). In the United States, the public health budget cuts that were made in February 2020 weakened its ability to respond to the COVID-19 outbreak (Devi, 2020). A sufficient budget must be allocated to public health authorities to ensure their impact, and to strengthen the four essential functions of public health (i.e., epidemiological surveillance, disease prevention, health promotion, and health protection) (Denis et al., 2020).

The lack of resources in Montreal also had implications for partner collaboration during the implementation of COVID-19 measures. As our results suggest, intersectoral collaborations were only built after the implementation of the contact-tracing intervention; partners outside of the health sector were not involved in the design of the contact-tracing intervention. Importantly, partners, such as civil society organizations, can have an important impact by helping the underserved follow the self-isolation guidelines (Gautier, 2021). For example, in Montreal, community organizations played an important role in supporting underserved migrants, providing COVID-19 information and access to food banks and psychosocial support (Gautier, 2021). It is crucial to consider inclusion and participation of marginalized populations within the public health response, through partnerships with civil society, as they can raise awareness on SIH and foster community engagement in the public health response (Rajan et al., 2020).

Strengths and limitations

The main limitation of the study is that it took place within only one regional public health directorate in Montreal, which can limit the transferability of the results within other regions of Quebec or Canada. Further, due to the health situation in Montreal at the time of the study, it was not possible to triangulate data collection methods (e.g., with focus group), which could have helped increase the credibility of the results. Finally, participants were mostly involved in implementation of the intervention and not the design phase, therefore respondents spoke mostly about implementation issues. However, the numerous debriefings with the global HoSPiCOVID research team, as well as the co-construction and sharing of the codebook, increased the credibility of the results.

Conclusion

This study shows that despite the COVID-19 pandemic exacerbating social inequalities in health, SIH were not initially considered in the design and planning of the contact-tracing intervention in Montreal. Adaptations were made gradually after the implementation of the intervention to increase its acceptability and accessibility for the groups whose vulnerability had increased. Contact-tracing interventions, as well as other prevention and control interventions, need to actively include SIH from the early stage of the intervention design. Based on our findings, we recommend that Quebec's Ministry of Health and Social Services take action to develop a clear and common vision of SIH within the health system. We also recommend collecting data on sociodemographic characteristics (including race, ethnicity, place of birth, and immigration status) systematically. This would enable more systematic documentation on social inequalities in health. Finally, we recommend that the public health sector further develop and maintain meaningful partnerships with actors outside of the health sector, such as community organizations, who play a vital role in enhancing the inclusion of marginalized populations within the public health response.

Contributions to knowledge

What does this study add to existing knowledge?

- This is the first study to examine whether and how social inequalities in health were considered during the design of the COVID-19 contact-tracing intervention in Montreal, Quebec.
- This study sheds light on the lessons learned from planning a key intervention of the public health response to the first wave of COVID-19.

What are the key implications for public health interventions, practice, or policy?

- The findings of our study make the case for a better integration of equity and a greater consideration of social inequalities in health when designing and planning pandemic response interventions in Quebec and elsewhere.

COREQ checklist (Tong et al., 2007)

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	Page 5
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	Title page
Occupation	3	What was their occupation at the time of the study?	Page 5
Gender	4	Was the researcher male or female?	N/A
Experience and training	5	What experience or training did the researcher have?	Page 6
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	Page 5
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	N/A
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	Page 6
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Page 4
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	Page 5
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	Page 5
Sample size	12	How many participants were in the study?	Page 6
Non-participation	13	How many people refused to participate or dropped out? Reasons?	N/A
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	Page 6
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	Page 6
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	Pages 6 and 7
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Page 5
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	N/A
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	Page 6
Field notes	20	Were field notes made during and/or after the inter view or focus group?	Page 6
Duration	21	What was the duration of the inter views or focus group?	Page 6
Data saturation	22	Was data saturation discussed?	N/A
Transcripts returned	23	Were transcripts returned to participants for comment and/or	N/A

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Author contributions The study was conceived by VR and KZ. The instruments were developed by RM and ASL. Data were collected by RM and ASL, with data analysis and interpretation by CB. CB wrote the first draft of the manuscript. All authors read and gave feedback on the manuscript and approved its final version.

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Data availability The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Code availability Coding available from the corresponding author on reasonable request.

Declarations

Ethics approval The research project has been approved by the University of Montreal's Research Ethics Committee (CERSES-20–061-D).

Consent to participate All participants provided written informed consent. All methods were carried out in accordance with relevant national/international/institutional guidelines.

Consent for publication Not applicable.

Conflict of interest The authors declare no competing interests.

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