# REACTIONS TO GOVERNMENTAL PUBLIC HEALTH ORGANIZATIONS POST-COVID-19:

# A SOCIAL MEDIA ANALYSIS

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## Declaration of Originality

I hereby declare that this thesis is entirely my own original work. The work presented in this paper has been entirely prepared and written by me, with the support and guidance of my thesis supervisors, Dr. Agnes Grudniewicz and Dr. Tracey O'Sullivan, and the insights of a social media analysis expert, Dr. Olivier-Champagne Poirier.

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## Abstract

The purpose of this thesis was to examine the reactions to Canadian public health organizations' messaging through a social media analysis by answering the following two research questions: 1) How did different levels of government use social media communication to inform the public of COVID-19 information during the reopening phase? 2) What was the public response to the lifting of COVID-19 measures? COVID-19-related Tweets posted by Ottawa Public Health (OPH), Public Health Ontario (PHO), and Health Canada and the Public Health Agency of Canada (HC & PHAC) and their replies were collected using the Twitter API through Python. Sentiment analysis of the data was conducted using the VADER tool. This was followed by a thematic analysis of Twitter threads to identify patterns in the Tweets posted by each organization and their respective replies. Results of the VADER sentiment analysis indicate OPH Tweets were mostly positive, whereas HC & PHAC Tweets were slightly more positive than neutral. PHO Tweets were mostly neutral. Public social media replies to the selected public health organizations were also measured; replies to both OPH and HC & PHAC were more negative than positive, although replies to OPH were slightly more positive compared to replies to HC & PHAC. Thematic analysis revealed five themes regarding public health organizations' use of social media communications and eight themes relating to the public response to information posted by the selected public health organizations. The results from both sentiment and thematic analysis can help inform recommendations to enhance communication by Canadian governmental organizations, especially in public health systems, and offer recommendations for public health social media communication to inform future disaster response policies.


***Keywords:*** *public trust, public health, public response, COVID-19, disaster response, social media, policy compliance, risk communication, netnography*

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## Abbreviations

| | |
|---|---|
| CDC | Centers for Disease Control and Prevention |
| CMOH | Chief Medical Officers of Health |
| COVID-19 | Coronavirus Disease 2019 |
| FDA | U.S. Food and Drug Administration |
| HC | Health Canada |
| NPI | Non-Pharmaceutical Intervention |
| OPH | Ottawa Public Health |
| PHAC | Public Health Agency of Canada |
| PHO | Public Health Ontario |
| SARS-CoV-2 | Severe Acute Respiratory Syndrome Coronavirus 2 |
| VADER | Valence Aware Dictionary and sEntiment Reasoner |
| VAERS | Vaccine Adverse Event Reporting System |

# Reactions to Governmental Public Health Organizations Post-COVID-19: A Social Media Analysis

## Chapter 1: Introduction

Trust in government and healthcare systems is an integral part of disease control (Cairns, de Andrade, & MacDonald, 2013). This notion was particularly evident during the COVID-19 pandemic, which affected nearly all countries around the globe. It is thus far the most impactful and damaging pandemic that North America has experienced in the 21st century. During the COVID-19 pandemic, Canadian federal and provincial governments implemented various public health guidelines to reduce COVID-19 infections and death rates. These guidelines require population compliance to be effective, but trust comes first; the population must perceive the government as trustworthy and credible to comply with public health restrictions (Cairns et al., 2013).

However, public health measures have encountered resistance. Incidents of individuals defying public health guidelines in businesses and hospitals were reported across Canada. Furthermore, there were protests against public health measures, most notably the Freedom Convoy protests, the February 2022 Ottawa occupation, and the blockage of Canada-US borders, even after lifting of COVID-19 measures were announced (Aiello, 2022). These events underscore the importance of understanding 1) public reactions to public health measures and 2) public trust in the government; both of which have prominent roles in disaster risk reduction (DRR).

## 1.1 Purpose

In this thesis, I sought to develop a deeper understanding of public reactions to- and public trust and distrust in- Canadian governmental public health decisions to lift COVID-19 measures, expressed through social media comments. Based on the findings, I aimed to formulate recommendations for government actions to rebuild trust among the population during the pandemic recovery period. To fulfill these aims, I conducted an exploratory social media analysis of comments on Canadian governmental public health organizations' COVID-19-related social media posts focused on the following two research questions:

1. How did different levels of government use social media communication to inform the public of COVID-19 information during the reopening phase?
2. What was the public response to the lifting of COVID-19 measures?

In the next chapter, I present an overview of the literature and existing frameworks on public trust and crisis and risk communication. The impact of the COVID-19 pandemic and the value of social media data will also be discussed to offer a better understanding of the circumstances surrounding the area of interest of this research.

# Chapter 2: Literature Review

In this chapter, I present a comprehensive summary of literature and frameworks relevant to the scope of this research, with an emphasis on public trust in government and public health organizations. Topics covered in this chapter include public trust, distrust in public health advice, the COVID-19 pandemic, conspiracy theories and misinformation, strategies to rebuild public confidence, the value of social media data, and public health risk communication frameworks.

## 2.1 Public Trust

Public trust is a vital element for public health recommendations to be successful. Population compliance with public health guidelines to reduce transmission helps prevent the burden of excessive demands for care in clinics and hospitals. However, the population will not follow public health guidelines unless they trust the authorities implementing them. Thus, building the credibility of the government is a foundation for developing trust with the population (Cairns et al., 2013).

To study public trust, it is essential to first define it. Although there is no single definition of trust, there are common themes present across definitions (e.g., trust revolves around vulnerability). From a general perspective, trust represents the confidence that expectations attributed to an individual or organization will be met, whether it is expectations of competence or integrity (Davies, 1999). When examining trust in a governmental setting, trust is indicated by the proportion of a population that expresses confidence in their government (Organisation for Economic Co-operation and Development, 2022).

Trust is a multi-dimensional concept that has evolved across time, and involves various stakeholders (e.g., healthcare providers, policymakers, citizens) (Alami et al., 2021). For the

purpose of this study, trust is defined as a relationship between individuals or groups demonstrating trustworthy qualities (e.g., reliability, competence, accreditations) (Resnik, 2011; Roundtable on Public Interfaces of the Life Sciences et al., 2015). This relationship aims to facilitate current relations involving risk-taking about future interactions with the expectations that the entrusted individual or group will act as anticipated (Resnik, 2011; Roundtable on Public Interfaces of the Life Sciences et al., 2015). Public trust can be defined as the willingness of the public to be vulnerable to the actions and decisions of governing officials with the expectations they will act in the best interest of the public (Roberts et al., 2013; Roundtable on Public Interfaces of the Life Sciences et al., 2015).

In the vein of trust in health systems, Hall *et al.* (2001) presented a framework on trust in providers and medical institutions that included five main dimensions: fidelity (prioritizing a patient's greatest interests); competence (achieving the best possible solution and preventing errors); honesty (being truthful and avoiding deliberate lies); confidentiality (safeguarding and using appropriately private or sensitive information); and global (viewing trust holistically).

Similarly, the Citizen Trust in Government Organizations scale structured items on a five-point scale, from *strongly disagree* to *strongly agree*. This scale was created to obtain a more multi-dimensional and precise knowledge of public trust in government (Grimmelikhuijsen & Knies, 2015). The scale is comprised of nine items that reflect three dimensions of trust in government: integrity (e.g., the Government of Canada approaches citizens in a sincere way), perceived competence (e.g., the Government of Canada is expert), and benevolence (e.g., the Government of Canada acts in the interest of citizens) (Grimmelikhuijsen & Knies, 2015). The dimensions retrieved from both frameworks can be used to assess and interpret information related to public trust in government, more specifically to public health decisions. These

frameworks are taken into consideration to ensure rigour due to the qualitative nature of this study. As public trust in institutions has been investigated in the past, it is important to evaluate whether the results from this current study aligns with findings from previous research.

Further research on public trust is necessary as a lack of trust undermines public health safety (e.g., increased risk of infection and death rates) and healthcare delivery (e.g., increased hospitalization rates) (Gille, 2015). For instance, a 2006 study by Whetten *et al.* explored the relationship between trust in care providers and the government with health service usage and outcomes. After interviewing 611 HIV-positive individuals, they observed how distrust interfered with health service usage and health outcomes and concluded that distrust might be a barrier to optimal health outcomes (Whetten et al., 2006). A meta-interpretation study (2012) on public trust in the food safety regulatory system also determined that transparent and comprehensible public communication on scientific information would improve public trust in public health agencies (Papadopoulos et al., 2012). The interest of researchers on the idea of trust in health systems also emphasizes its value. Trust is a fundamental aspect for streamlined care and efficient public health crisis prevention and mitigation. Therefore, it is particularly important to conduct further research on public trust, especially after a public health crisis, to better understand scope for improvement.

### 2.2 Understanding Distrust in Public Health Advice

It is essential to attend to history to understand distrust in public health decisions during the COVID-19 pandemic. Research and technology used in that domain have rapidly evolved over time, as well as methodologies and understanding of the world. As such, public health decisions and pharmaceutical research had critical limitations. For instance, uncertainty in the quality and safety of vaccines may be partially due to previous policy mistakes. One such mistake

was the U.S. Food and Drug Administration's (FDA) failure to reject OxyContin's misleading label that contributed to the opioid crisis (Van Zee, 2009); this addictive drug was approved by Health Canada in 1996 (OxyContin Task Force, 2004, p. 52). OxyContin is an opioid analgesic promoted to relieve moderate to severe pain (OxyContin Task Force, 2004, p. 12). The warning label of OxyContin indicated this medication must be taken whole as altering how it is ingested (e.g., crushing the pill) will affect its controlled-release property (OxyContin Task Force, 2004, p. 12). The facility in altering OxyContin controlled-release property to a rapid-release into the bloodstream makes it easily addictive and abused; this led to increased addiction and participation in criminal activity to obtain this medication (OxyContin Task Force, 2004, p. 12). In Canada, the opioid crisis remains problematic; the harmful effects of opioids continue to be a pressuring issue in many jurisdictions (Government of Canada, 2019).

Similarly, past events, such as the thalidomide scandal, may have led to doubt in the development and administration of new medications and vaccines, as well as increased distrust in public health pharmaceutical recommendations. In the 1950s, thalidomide, a drug promoted as safe, was given to pregnant women to relieve nausea and other symptoms (Thalidomide Victims Association of Canada, n.d.). However, this medication turned out to be teratogenic, meaning it caused congenital malformations. This flagrant error was due to poor testing methods; testing was done in mice, but thalidomide is not teratogenic in rodents. The teratogenic effects went unnoticed as testing in closer laboratory models to humans, such as monkeys, was not required (Kazuki et al., 2016). Although testing methods and guidelines are much more rigorous than in previous decades, fear of similar mistakes to occur may still linger in the minds of many.

Considering public distrust in governmental public health recommendations that surfaced during prior pandemics, research was conducted to better understand vaccination intention and

pandemic behaviour among Canadians. A 2013 study examined the public health decision-making process in Canada during the 2009 H1N1 pandemic (Rosella et al., 2013). Rosella *et al.* (2013) interviewed 40 scientific advisors and public health officials throughout Canada and reviewed 76 pandemic policy documents about four pandemic policies: Usage of personal protective equipment, adjuvanted vaccine during pregnancy, sequencing and priority groups, and school closures. They found that 1) elucidating responsibilities within Canada's public health system would help preserve credibility and reduce the risk of repetition, 2) ideological perspectives of Canadian public health officials influenced their interpretation of scientific evidence for decision-making in pandemic policies, and 3) the implementation of policies that went against the evidence was explained by conflict-avoidance theory (Rosella et al., 2013).

Furthermore, a 2014 review examining literature on public trust during pandemics indicated trust in health institutions was associated with greater intentions of the public to comply with recommended public health behaviours, including vaccination intentions (Siegrist & Zingg, 2014). This review of the literature also revealed that concerns regarding the safety and effectiveness of the H1N1 vaccine were substantial justifications for individuals to decline vaccination (Siegrist & Zingg, 2014). This indicates both a lack of trust in pharmaceutical industry to manufacture effective and safe vaccines, and a lack of trust in governmental entities to effectively shield the public from adverse events (Siegrist & Zingg, 2014). Overall, the findings of the reviewed studies indicate that trust in authorities is related to adopting preventive behaviours during a pandemic (Siegrist & Zingg, 2014). This association was also present even when individuals believed that the health ministry did not respond adequately to the issue (Siegrist & Zingg, 2014). However, the reviewed studies suggest individuals are more likely to trust advice from health practitioners if the guidance of the governmental organization and

general practitioner differs (Siegrist & Zingg, 2014). This review also highlighted the importance of instituting trust in health authorities before a public health crisis (Siegrist & Zingg, 2014).

In relation to the H1N1 pandemic, a 2010 cross-sectional survey study examined the attitudes and concerns about receiving seasonal influenza and pandemic H1N1 vaccines among healthcare workers in British Columbia, Canada (Kaboli et al., 2010). Based on this self-administered online survey results, 69% of respondents indicated intent to obtain the H1N1 vaccine (Kaboli et al., 2010). Vaccination against seasonal influenza the previous year was the most prominent predictor of intentions to receive the H1N1 vaccine (Kaboli et al., 2010). Exclusively, the fear of making a loved one sick was correlated with the intent to receive the H1N1 vaccine (Kaboli et al., 2010). In comparison, the intention to reject vaccination against the H1N1 virus was linked with vaccine safety concerns and perceived low severity of the H1N1 virus (Kaboli et al., 2010). Based on the findings of this research, Kaboli *et al.* (2013) recommended vaccination campaigns highlight risk of illness from the H1N1 virus, especially among younger people, and underline the value of getting vaccinated to protect loved ones. The authors also recommend addressing uncertainties on the effectiveness and safety of the vaccine (Kaboli et al., 2010). These findings on the predictors of intention to receive a vaccine are consistently detected in research on vaccination intention (Nguyen et al., 2011).

A systematic review of 10 English survey studies on the acceptance of pandemic influenza vaccines among the general public found that personal risk perception, vaccination attitudes, and ethnicity were consistently reported themes predicting vaccination intentions (Nguyen et al., 2011). Personal risk perceptions include individuals' perceived risk of infection, perceived proximity or severity of the public health issue, perceived severity of personal consequences caused by the disease, and concerns about the adverse effects of the vaccine

(Nguyen et al., 2011). Vaccination attitudes refer to receipt of previous vaccines, belief in the effectiveness and necessity of the vaccine, and anti-vaccination attitudes (Nguyen et al., 2011). Four of the ten studies in the systematic review also reported ethnicity as associated with intent to receive a pandemic vaccine (Nguyen et al., 2011). This result emphasizes the importance of diverse messages that are meaningful and appropriate for all communities.

Driedger *et al.* (2015) explored H1N1 vaccine behaviour among Métis people in Manitoba; the authors determined Canada's history of colonialism profoundly impacted the perceptions of Métis people about the H1N1 pandemic and vaccine. Historic legacies such as colonialism must be considered by health systems when developing future disaster responses. The participants in their study reported concerns about vaccine safety and felt under-informed about the H1N1 pandemic and the vaccine. Moreover, media coverage of the pandemic, the influence of peer groups, and being named a priority group for the vaccine, had both positive and negative influences on vaccination behaviour (Driedger et al., 2015). To mitigate the most influential negative factors during future pandemics, Driedger *et al.* (2015) recommended "leveraging doctor-patient interactions as a site for sharing vaccine-related knowledge, and targeted, culturally-appropriate, and empowering public information strategies to supply reliable vaccine and pandemic information". This study underscores the importance of further research on communication strategies most effective at disseminating public health information and maintaining public trust during pandemics.

In the same vein, a 2014 study found that examining vaccination beliefs at the local level, rather than globally, may indicate a need for more tailored interventions to reduce vaccination skepticism, as choices regarding vaccination are viewed to be personal (Lawrence et al., 2014). Similarly, a 2016 study on pandemic influenza behaviours determined that future intervention

development should focus on psychosocial (e.g., levels of knowledge) and sociocultural determinants (e.g., work environment challenges) to effectively encourage population compliance (Flowers et al., 2016). More recently, a 2019 study conducted in Canada found that a person's knowledge of hazards and preparedness is rooted in the social environment context, which calls for a critical need for a multi-level perspective in risk communication and management of natural disasters due to the increasingly diversified Canadian population (Yong & Lemyre, 2019).

Thus, extensive research has explored compliance to public health measures and vaccine uptake and offered recommendations to improve trust in public health following pandemics. However, the effectiveness of these strategies to mitigate public distrust will highly depend on the context surrounding the crisis.

### 2.3 COVID-19 Pandemic

The coronavirus disease (COVID-19) is an infectious illness triggered by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (World Health Organization, 2021). In December 2019, the World Health Organization was first informed of cases of this novel coronavirus in Wuhan, China (World Health Organization, 2021). This virus spread rapidly across countries, leading to a worldwide pandemic, consequently killing millions (World Health Organization, 2021). In Canada, the first COVID-19 case was detected on January 25, 2020 (Rocca, 2022). The Canadian federal, provincial, and municipal governments hurried to implement a response plan to manage the increasing numbers of COVID-19 cases around the country.

In December 2020, the first mass COVID-19 vaccination programme was launched (World Health Organization, 2021). After months of strict health measures to minimize the spread of the COVID-19 virus, the vaccines represented a light at the end of the tunnel, with

vaccination seen as the only effective method to develop herd immunity (Han et al., 2021). As defined by the World Health Organization (2020a), herd immunity refers to a population developing protection against an infectious disease through preceding infection or vaccination. However, herd immunity should be achieved through vaccination to prevent needless new cases and deaths (World Health Organization, 2020a). Unfortunately, a vocal minority of the Canadian population remained unconvinced of the efficacy and safety of the vaccines and the necessity of public health measures to manage the pandemic. On August 11, 2021, the Federal Government of Canada announced a standardized proof of vaccination for international travel to further motivate Canadians to get vaccinated against the COVID-19 virus (Government of Canada, 2021). Although mostly successful, large protests against COVID-19 vaccine mandates ironically led to businesses remaining closed and residents staying at home for safety concerns (Lord, 2022), such as during the nearly four-week February 2022 Ottawa occupation. Halfway through the Ottawa occupation against public health measures, Ontario Premier Doug Ford announced the province would remove its proof of vaccination requirement on March 1st, 2022 (Jabakhanji, 2022). However, the timing of the announcement led to further divisiveness within the population, split between wanting a return to normalcy and ensuring safety.

Compliance with public health guidelines is a concern in any pandemic. For instance, public health measures and policies, such as mask mandates, maintaining social distancing, and practicing hand hygiene, necessitate compliance of the population to effectively prevent the spread of transmittable disease (Han et al., 2021). However, based on a recent study in the United States, it sparked debate throughout the COVID-19 pandemic due to pre-existing distrust in politicians and medical professionals (Priniski & Holyoak, 2022). Yet, it is not Canada's first pandemic; the country experienced the 1918 influenza pandemic (also known as the Spanish flu),

the HIV/AIDS pandemic, the 2003 Severe Acute Respiratory Syndrome (SARS) pandemic (HIV/AIDS and SARS have been characterized as epidemics or pandemics depending on the organization), and the 2009 H1N1 (or Swine Flu) pandemic (Bailey, 2022).

During the COVID-19 pandemic, hesitancy in following public health guidelines may have stemmed from discrepancies between the advice given by different governmental organizations over time, rather than misinformation and conspiracies. One example of these discrepancies is when Health Canada and the National Advisory Committee on Immunization published conflicting advice about the AstraZeneca vaccine in spring 2021 (Dunhan, 2021). This conflicting information may have caused citizens and healthcare experts to doubt the safety of available vaccines. The rapidly evolving evidence on the virus and public health guidance, such as mask wearing, also led to individuals questioning public health advice (Dyer, 2020). Shortly after the COVID-19 virus was recognized as a pandemic by WHO, the Government of Canada did not recommend asymptomatic individuals wear a mask (Dyer, 2020). This advice changed later on as the COVID-19 pandemic crisis continued, which only led to further confusion within the public. Hence, distrust in governmental COVID-19 measures may be due to the medical evidence that was both defeasible (the medical evidence is revisable considering new findings [e.g., mask use]) and emergent (the medical evidence is expected to alter with time [e.g., knowledge on the COVID-19 virus]) (Upshur, 2020).

However, government decisions to start learning to live with COVID-19, meaning lifting COVID-19 measures, also divided the population. This lack of unity indicates disagreement in governmental public health decisions. According to an Angus Reid survey (in 2022), 39% of participants felt the province of Ontario was removing restrictions too quickly, 35% felt they were removing them at the right time, and 26% felt they were removing them too slowly (Angus

Reid Institute, 2022). These findings highlight the critical need for provincial and federal governments to study the state of public trust in public health institutions coming out of the COVID-19 pandemic.

Following the H1N1 pandemic, a 2011 cross-sectional Italian telephone survey was conducted to better understand the role of trust and personal beliefs with compliance with recommendations (Prati, Pietrantoni, & Zani, 2011). The findings of this study indicated respondents with high trust in the media and health ministry reported compliance with the recommended public health behaviours, even when they perceived the media had exaggerated the risks of the virus and the health ministry did not handle the crisis adequately (Prati, Pietrantoni, & Zani, 2011). This study emphasizes the value in maintaining or building public trust for the success of public health responses and recovery measures (Organisation for Economic Co-operation and Development, 2020). The findings of this survey study also highlight the importance of developing public trust ahead of the next pandemic.

The extent of the COVID-19 pandemic crisis underscores the importance of advancing knowledge on the drivers of public trust (Organisation for Economic Co-operation and Development, n.d.). An international longitudinal survey that examined the behavioural and psychological impacts of the COVID-19 pandemic found trust in government was associated with perceived knowledge of the virus, clear communication, and a sense of organization and fairness of pandemic control measures (Han et al., 2021). During the COVID-19 pandemic, greater trust in government was positively correlated with compliance with prevention measures and prosocial behaviours (e.g., making personal sacrifices to protect groups at heightened risk or minimize the spread of COVID-19) (Han et al., 2021). However, due to the novelty of the virus, information distributed by the media and politicians was often contradictory, and insights on the

virus changed rapidly with ongoing research (e.g., the effectiveness of face masks in reducing transmission of COVID-19) (De Coninck et al., 2021). The stress generated by the worldwide pandemic and conflicting media information led to the popularization of various conspiracy theories (e.g., the pandemic is a hoax, 5G cellular network causes the virus) and rapid dissemination of misinformation regarding the COVID-19 virus and response measures.

### 2.4 Conspiracy Theories and Misinformation

A conspiracy theory can be defined as a belief that powerful secret organizations are responsible for critical events (Douglas, Sutton, & Cichoka, 2017). Heightened beliefs in conspiracy theories are used by some people to make sense of a stressful and unpredictable situation, such as a pandemic; they use these beliefs to cope with their anxiety (De Coninck et al., 2021). Conspiracy theory beliefs —and refusal to comply with public health decisions— can also be explained by psychological reactance, which is a phenomenon characterized by motivational arousal to regain freedom after experiencing a threat to or a loss of freedom that leads to a resistance to social influences (Steindl et al., 2015). This phenomenon was observed worldwide during the COVID-19 pandemic through the anti-mask, anti-lockdown, and anti-vaccine protests (Taylor & Asmundson, 2021).

However, conspiracy theorists endanger their health and the health of the community by refusing to follow COVID-19 guidelines (e.g., masking, social distancing, testing for COVID-19, staying home when symptomatic, vaccination), by increasing risk of transmission and causing further outbreaks. Healthcare workers were harassed, threatened, and hindered from entering or exiting healthcare facilities (e.g., hospitals) by people protesting pandemic measures. These events highlight the harmful consequences of beliefs in misinformation and conspiracy theories on public health and safety (De Coninck et al., 2021). Interestingly, protests about governmental

COVID-19 measures were still taking place after most mandates had been lifted or announcements to that effect, such as the April 2022 Rolling Thunder motorcycle convoy (Osman & Ritchie, 2022).

### 2.5 Rebuilding Public Trust

Taylor and Asmundson (2021) suggest that specific communication strategies can reduce psychological reactance against health guidelines, such as 1) adding postscripts highlighting freedom of choice, 2) anecdotal narratives emphasizing freedom of choice, 3) communicating the impact of individuals' decisions on others, 4) subliminally targeting the communication to another audience, 5) communicating the possibility of undergoing psychological reactance, or 6) even using reactance to reinforce the communication. More importantly, transparency, meaning clearly explaining steps and findings of publicly available research on health-related matters such as vaccines, can be one of the most effective strategies to help rebuild trust in the government (Hapuhennedige, 2020).

Several studies have focused on the psychological aspect of misinformation and conspiracy theories, such as who is most vulnerable to believing in them, what makes them so persuasive, and strategies to change these false beliefs. Čavojová *et al.* (2020) reported that individuals who have existing beliefs in conspiracy theories will likely believe newly encountered misinformation. Past research also indicates that explaining the existence of COVID-19 conspiracy theories to individuals predisposed to believe in them may lead to increased support for these theories and weaken their inclination to help reduce the spread of COVID-19 (Vitriol & Marsh, 2021). In a study by Orosz *et al.* (2016), participants were assigned to different conditions to investigate which method was the most effective at reducing beliefs in conspiracy theories: 1) providing rational arguments against conspiracy theories, 2) ridiculing conspiracy

theory believers, 3) raising empathy between the respondent and the object of the conspiracy theory, and 4) a control group. The findings suggest that rationalizing, ridiculing, and questioning the apparent intelligence and competence of the individual delivering the conspiracy theory belief-reduction information reduced conspiracy theory beliefs, whereas empathizing had no effect (Orosz et al., 2016).

However, rationalizing with scientific evidence did not eradicate conspiracy theories or misinformation concerning COVID-19 prevention measures. For instance, over 20% of eligible Canadians were unwilling to receive the COVID-19 vaccine in 2020, mainly due to a lack of confidence in vaccine safety, despite the vaccines being rigorously tested (Statistics Canada, 2021). Similarly, anti-vaccination attitudes were positively related to COVID-19 conspiracy theories beliefs (Čavojová et al., 2020). Moreover, false beliefs, mistrust in authorities, and repeated COVID-19 media consumption are associated with adverse mental health consequences as they amplify anxiety (Généreux et al., 2020; Holmes et al., 2020). This is important to consider as heightened media-fuelled distress may lead to decreased compliance in public health recommendations and increased behaviours negatively affecting healthcare systems (e.g., face mask hoarding) (Garfin, Silver, & Holman, 2020).

Individuals' use of social media as their primary sources of COVID-19 related information increased their probability of exposure to misinformation, leading to a greater risk of distrust in government (Organisation for Economic Co-operation and Development, 2020). According to Brennen *et al.* (2020), social media is attributed to 88% of pandemic-related misinformation. Younger age is also associated with less resistance to conspiracy beliefs (De Coninck et al., 2021). Understanding what makes conspiracy theories persuasive, especially in an era of rapid information dissemination, can inform policymakers about factors or strategies to encourage

citizens to base their judgment on scientific findings and critically assess social media information (van Prooijen & Douglas, 2018).

### 2.6 Social Media Data

Social media (e.g., Facebook, Instagram, Twitter) can provide valuable information on the perspectives of Canadians who remain resolute in their beliefs (Pagoto et al., 2019). Studies using social media data can provide insight into the mindset of a large and diverse sample of the Canadian population. In 2018, around 90% of 15 to 34 years old, 80% of 35 to 49 years old, and 60% of 50 to 64 years old Canadians used social media frequently (Schimmele et al., 2021). Previous research on the value of social media data also noted that policymakers were generally satisfied with online data as a source of policy evidence due to the wide variety of information instantaneously available and lower research costs than other means of data collection (Panagiotopoulos et al., 2017).

Additionally, social media data is naturally occurring, meaning that individuals express their opinions freely on these online platforms; this helps reduce certain biases compared to other methods like interviews or surveys (e.g., from response bias). Although the increased presence of bots (automated) and trolls (real users) on social media may bias data, they are valuable to include as part of the digital social environment. Thus, usage of online comments in previous research has led to its acknowledgement as a valuable approach to understanding public opinion without researcher intervention (Lynch et al., 2019).

Since the COVID-19 pandemic, a larger body of research has investigated social media data. For instance, a recent Canadian study examined COVID-19 vaccines related comments in articles from the CBC national news websites (Rotolo et al., 2022). Based on their data, Rotolo *et al.*

(2022) reported social media content as valuable for social sciences research and to devise recommendations for public health communications.

Another 2022 study explored Canadian governments' and public health officials' Twitter messages during the first wave of the COVID-19 pandemic and the public reaction to these messages (Kada et al., 2022). This study conducted a hashtag and trend analysis to determine the evolution of public discourse and trends in information communicated in Canadian federal and provincial/territorial governments and public health officials' Tweets, followed by an analysis of the public engagement rates and sentiment analysis on the public reaction to these Tweets (Kada et al., 2022). The sentiment analysis was conducted using an online machine-learning platform MonkeyLearn (Kada et al., 2022). Kada *et al.* (2022) identified eleven sentiments expressed by the public in reaction to Canadian authorities' Tweets: concern, distrust, downplay, frustration, humour or sarcasm, information requests and inquiries, information sharing and resources, personal experiences, personal opinion or suggestion, racism and stigma, and relief. The findings on public engagement indicated increased engagement toward federal officials' Twitter accounts compared to provincial/territorial accounts (Kada et al., 2022).

Moreover, the results from the hashtag trends analysis of the public discourse demonstrate a shift in the Canadian public discourse between the period preceding the first wave of the COVID-19 pandemic to the period of the first wave (Kada et al., 2022). Overall, the Canadian COVID-19-related public discourse was consistent throughout the first wave of the pandemic and was mainly related to COVID-19 mitigation strategies and goals (Kada et al., 2022). This study also recommended future research to explore these trends throughout the different phases of the COVID-19 pandemic to evaluate the public discourse over time (Kada et al., 2022).

Furthermore, comments and replies on social media posts provide interesting information on public perspectives, which could inform policy development and enhance public trust. For instance, citizens' reactions to governmental social media posts could indicate if public health policies based on past research recommendations on public trust had the desired effect. The analysis of social media data is also an informative tool to evaluate social media communication strategies most successful at disseminating scientifically validated health information (Pagoto et al., 2019).

### 2.7 Public Health Crisis and Risk Communications

Due to rapidly growing use of social media as a main source of news, the exploration of public health organizations' social media messages during the COVID-19 pandemic can inform on areas of improvements for future social media risk and emergency communications. Following previous emergency public health events, organizations and research institutes have investigated and developed frameworks for effective risk and crisis communication messages.

One of the developed frameworks is the IDEA model, which contains four main components: Internalization (I), Distribution (D), Explanation (E), and Action (A) (Sellnow et al., 2017). According to the IDEA model, internalization refers to clearly stating to the targeted recipients of the message how they, and those they care about, may be affected by the risk or crisis and to what extent (e.g., risk of death) (Sellnow et al., 2017). Distribution refers to communication sources to reach the target audience and the distribution of the messages (e.g., social media) (Bang, 2021). Explanation refers to explaining the risk or crisis, why it is happening, and the figure of authority's response based on credible sources (e.g., COVID-19 pandemic announcement by WHO) (Sellnow et al., 2017). Lastly, action refers to specific actionable directives that individuals should or should not take to protect themselves and others from the risk (e.g., social

distancing) (Sellnow et al., 2017). Based on this model, for risk or emergency communication to be effective all four components of the IDEA model must be met.

The Centers for Disease Control and Prevention (CDC) in the U.S developed the Crisis and Emergency Risk Communication (CERC) framework to help "health communicators, emergency responders, and leaders of organizations communicate effectively during emergencies" (Centers for Disease Control and Prevention, 2018a). The CERC framework is based on six principles: 1) Be First, 2) Be Right, 3) Be Credible, 4) Express Empathy, 5) Promote Action, and 6) Show Respect (CDC, 2018b). The first principle, Be First, refers to the rapidness of the release of time-sensitive information to the public (CDC, 2018b). The second principle, Be Right, represents the importance of sharing accurate information to maintain credibility, while the third principle, Be Credible, refers to the importance of remaining truthful and honest (CDC, 2018b). Based on the CERC manual, credibility and trust must be present for a communication to be deemed successful. The credibility of a message is based on the speed of release, that is how quickly established lifesaving information is shared, and the accuracy of the information, that is how precise (e.g., ensuring facts shared are correct) the information is (CDC, 2018c). Trust is dependent on openness, such as notifying the public about why information cannot be released at a given time, and empathy, that is acknowledging and demonstrating understanding on how others may perceive the event (CDC, 2018c).

The fourth principle of the CERC framework, Express Empathy, indicates the importance of acknowledging to the public awareness of the challenges and suffering people may be facing during the crisis (CDC, 2018b). The fifth principle, Promote Action, refers to assigning meaningful actions the public can do to improve their sense of control and reduce anxiety (CDC, 2018b). Lastly, Show Respect, relates to communicating respectfully as it stimulates rapport and

collaboration (CDC, 2018b). The CERC framework recommends integrating all six principles to ensure effective risk and emergency communications (CDC, 2018b).

Other research informed a framework aimed to better predict public reactions to response strategies and protect reputational assets during and post-crisis, such as the Situational Crisis Communication Theory (SCCT) (Coombs, 2007). The SCCT is an evidence-based framework developed to offer guidance on crisis response strategies to protect the reputation of an organization during a crisis (Coombs, 2007). The SCCT provides eight communication guidelines on crisis response strategies usage based on the situational aspect of the crisis, such as the attributions of crisis responsibility and the historic presence or absence of similar crises (Coombs, 2007). Leaders in organizations can refer to the SCCT guidelines to offer the most appropriate crisis communication based on situational factors surrounding the crisis.

### 2.8 Overview of Literature

My review of the literature indicates that public trust —and components leading to distrust in public health advice— have a strong evidence base. Numerous studies investigated different angles of the COVID-19 pandemic and its implications, such as vaccine intention and heightened proliferation of conspiracy theories and misinformation. Furthermore, the literature demonstrates the extent of various strategies to rebuild public confidence, before and after the COVID-19 pandemic, as well as prominent risk and crisis communication frameworks.

Nevertheless, few studies have investigated public trust in public health institutions in the Canadian setting or the public reaction to social media public health communications in Canada. Leveraging social media to understand public opinion during a public health crisis is a valuable tool that can inform areas of improvement to bolster trustworthiness and robustness of public health systems.

## 2.9 Research Questions

The impact of the COVID-19 pandemic and the gaps identified in the literature review indicate a need to develop deeper understanding of trust in Canadian public health organizations. For this reason, I evaluated social media communications during the lifting phase of the COVID-19 pandemic to provide insights on the usage of social media by governmental public health organizations and to explore the reaction of the public to these public health communications. In the present study, the following two research questions were addressed:

1. How did different levels of government use social media communication to inform the public of COVID-19 information during the reopening phase?
2. What was the public response to the lifting of COVID-19 measures?

In the next chapter, I present the methods I used to answer these two questions.

# Chapter 3: Methodology

In this section, I elaborate on the methodology and methods I used to answer the research questions, including the study design, inclusion criteria, ethical considerations, data collection procedure, data cleaning, and data analysis. A positionality statement and the strategies used to ensure quality of the data are discussed at the end of this chapter.

## 3.1 Study Design

For this qualitative study, we conducted a non-participatory netnography to explore social media discussions, using practices applied in ethnography via the internet (Lynch et al., 2019; Kozinets, 2015, p.3). Netnography is a practical method to explore individuals' beliefs based on their expressed viewpoints (Gupta, 2009). It enables researchers to study online social interactions and investigate comments and replies on older and newer posts, hence expanding the range and temporal evolution of perceptions throughout the phase of lifting pandemic restrictions (Addeo et al., 2020, p. 14; Lynch et al., 2019). Additionally, netnography involves the use of publicly available comments and replies, which has several advantages when it comes to minimizing certain biases (e.g., interviewer distortion and subversion) as the data collected occurs naturally; the respondents are not directly part of the study and express their opinion freely (Kozinets, 2015, p.19). This technique is particularly useful to gain knowledge on personal opinions and experiences of various individuals, especially when the topic of discussion is sensitive (Arenas Gaitán & Ramírez Correa, 2023). Although the impact of the COVID-19 pandemic was on a global scale, each country reacted differently, during the initial wave until the lifting phase of the pandemic. Thus, the exploration of the public reaction to the lifting of COVID-19 measures is important to be examined in a specific setting due to difference in

environmental factors, such as social, political, economic, cultural, and health systems differences among countries (Tang et al., 2022; Arenas Gaitán & Ramírez Correa, 2023).

### 3.2 Ethics

Ethics approval was not required by the University of Ottawa Research Ethics Board because the data collection included publicly available data and did not involve direct contact with social media users (non-participatory netnography). However, ethical considerations, such as retrievability of posts, social media users' expectations of privacy (e.g., believing that comments are not publicly available), and sensitivity of the topic, were taken into consideration (Stommel & de Rijk, 2021). For this reason, only replies to Tweets publicly accessible through Twitter were used. The data was also anonymized —social media users' identifiers (e.g., Twitter username) are not reported to maintain anonymity and privacy.

### 3.3 Data Collection

My population of interest was social media users who expressed their opinions on the lifting of COVID-19 restrictions, specifically by replying to Tweets from Canadian public health organizations. Due to the period of interest of this research, that is the COVID-19 reopening phase, only social media data posted between February 21$^{st}$, 2022, and April 27$^{th}$, 2022, were included. The corpus for this study was collected using the social media site Twitter, as it is among Canada's most widely used social media platforms. Social media users' replies on governmental COVID-19-related Tweets (e.g., updates on COVID-19 numbers, end of vaccine passport requirement, etc.) were collected using the Twitter Developer Platform with Academic Research access. The Twitter Developer Platform gives permission to academic researchers to access Twitter's full archive and all Twitter API v2 endpoints (Twitter, 2022).

Data collection included the following steps: Step 1: Finding the Twitter handles of the selected municipal, provincial, and federal governmental public health organizations (see **Table 1**), Step 2: Search of specific Tweets and replies using particular parameters (i.e., key terms, dates, language, Twitter handle) and Step 3: Repeat Step 2 for each public health organization's Twitter handle.

**Table 1**

*Public Health Organizations Social Media Platforms.*

| Public Health Organization | Government Level | Twitter Handle |
|---|---|---|
| Ottawa Public Health | Municipal | @OttawaHealth |
| Public Health Ontario | Provincial | @PublicHealthON |
| Health Canada and PHAC | Federal | @GovCanHealth |

In Step 1, the handles of the following governmental organizations were searched on Twitter: Ottawa Public Health [OPH], Public Health Ontario [PHO], and Health Canada [HC] and the Public Health Agency of Canada [PHAC]. At the municipal level, public health measures implemented at the national capital region, specifically in Ottawa, were the focus. Throughout the COVID-19 pandemic, the city of Ottawa was the centre of various protests toward the response measures, due to the inaccurate belief that provincial public health measures were under federal jurisdiction. Moreover, the downtown area of this city was occupied by the 'Freedom Convoy' for nearly a month in February 2022.

At the provincial level, Public Heath Ontario represents the provincial government where Ottawa is located. At the federal level, Health Canada and the Public Health Agency of Canada (HC & PHAC) are the federal governmental organizations responsible for national health policy

and public health. In my thesis research, we selected these public health organizations because they correspond to all three levels of governmental organizations responsible for public health, which allowed a health systems perspective. Due to Twitter algorithms, the selected governmental Tweets can appear on Twitter users' timelines, regardless of whether they are following these governmental pages (Dredge, 2014). Hence, replies included in this study may not be exclusively limited to governmental pages' followers, although it is more likely.

In Step 2, after obtaining Academic Research access to the Twitter API, we used the Visual Studio Code application to run codes to download the Twitter data into an Excel file. In the Visual Studio Code application, I wrote codes in the programming language Python to retrieve Tweets and replies using the following parameters: 1) Tweets and replies from or to @OttawaHealth/@PublicHealthON/@GovCanHealth; 2) containing any of the following key terms: "covid", "mask", "vaccine", "vax", "test*", "pass", "restrict*", "require", "lift", "mandate", "reopen", or "measure"; 3) published between February 21, 2022, and April 27, 2022; 4) written in English; and 5) excluding retweets. These dates aligned with the Government of Ontario's first effective date to start lifting public health measures and when the Ministry of Health for Ontario aimed to end all remaining measures (Ontario, 2022; Ministry of Health, 2022). To ensure validity, the code was revised by a computer programmer expert with over 20 years of experience in multiple programming languages, including four years of experience in Python. No changes were necessary.

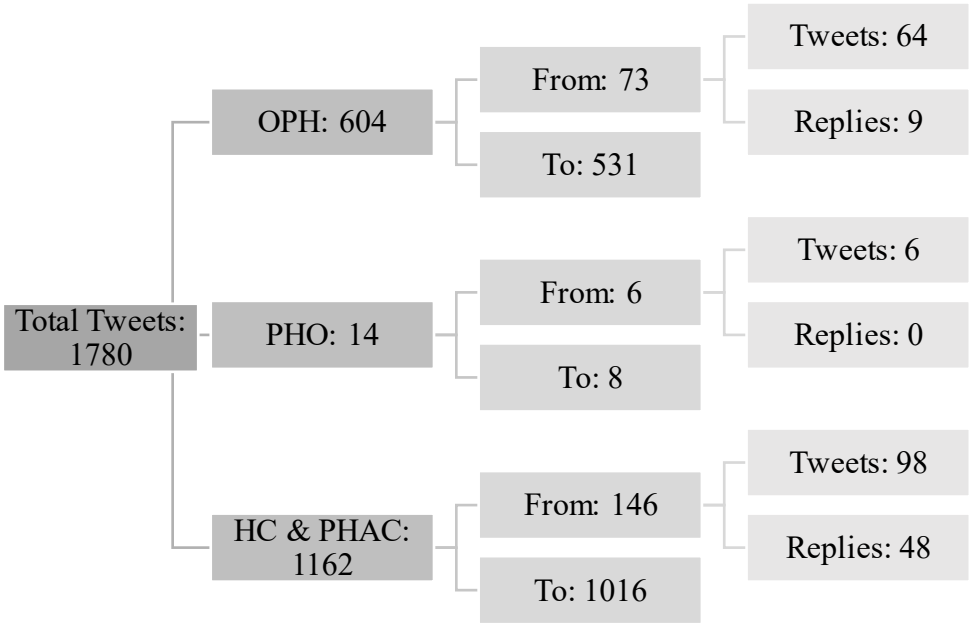
Lastly, in Step 3, I used the same code to collect data for each Twitter handle, thus creating three separate Excel files (one for each of the selected public health organizations).

### 3.4 Data Cleaning

In each Excel file, I excluded all original Tweets not retrieved with their corresponding replies and all replies that did not come with the original Tweet. This situation happened when the automated programmed selection of Tweets and replies contained one of the key words. I also removed duplicates of replies and kept the oldest (or original) version. In total, I gathered 64 Tweets and 9 replies posted by OPH and 531 replies to OPH, 6 Tweets posted by PHO and 8 replies to PHO, and 98 Tweets and 48 replies posted by HC & PHAC and 1016 replies to HC & PHAC (see **Figure 1**). The compiled data was formatted into an MS Word document and exported into the NVivo software for thematic analysis. NVivo is a qualitative data analysis software that facilitates the organization, analysis, and identification of themes in collected qualitative data (QSR International, 2021).

**Figure 1**

*Repartition of Tweets per Database by Public Health Organizations and Users.*




*Note.* In this figure, the abbreviations *OPH* refers to Ottawa Public Health, *PHO* refers to Public Health Ontario, and *HC & PHAC* refer to Health Canada & the Public Health Agency of Canada. *"From"* refers to Tweets and replies posted by a public health organization, while *"To"* refers to replies to public health organizations posted by the public.

### 3.5 Data Analysis

Sentiment analysis of all Tweets and replies provided an overall impression of the communication style and context between each public health governmental organization and the response of the public. Through Python, I used VADER (Valence Aware Dictionary and sEntiment Reasoner), a rule-based and lexicon sentiment analysis tool that was created specifically to analyze the overall sentiment of social media data, including Twitter Tweets (Hutto & Gilbert, 2014). The sentiment scores of all Tweets were indicated in the same Excel file used during data collection. I chose the VADER sentiment analysis because it is a validated tool that determines how positive, neutral, or negative a Tweet is and provides an overall sentiment score of each Tweet (Hutto & Gilbert, 2014).

Using NVivo, thematic analysis was conducted to identify the broad themes and patterns across all collected Twitter data. We chose this method as it allows researchers to distinguish, analyze, and report themes or patterns inductively (Braun & Clarke, 2006). Moreover, it is also a practical method to generate qualitative analyses fitted to advising policy development (Braun & Clarke, 2006), which is one of the objectives of my thesis.

The overarching analysis of the collected data was done based on Braun and Clarke (2006) thematic analysis process involving five major steps. 1) Familiarization with the data: I first read through the Tweets and replies. 2) Generating initial codes: I added first-level codes inductively in NVivo based on the discussion in each thread. These initial codes were discussed and reviewed with my thesis supervisors (investigator triangulation) before coding the rest of the data. 3) Searching for themes: I re-read the replies and codes and collated similar codes and concepts into potential themes (second-level codes). 4) Reviewing the themes: I reviewed all first-level and second-level codes to further refine the list of codes. Thereby, the codes were

contrasted to determine whether they truly represented two distinct codes; similar codes were combined into one if the distinction between them was unclear (Braun & Clarke, 2006). To do so more easily, all codes were exported from NVivo in a data structure table inspired by the one presented in Gioia *et al.* (2012), to help visualize the data structure and the progression from raw data to themes (presented in Chapter 4). 5) Defining and naming the themes: I re-read each code and potential theme to refine the title for each theme and formulate clear definitions. The final list of themes, divided into two categories (i.e., public health Tweets and public response), are presented in the results section.

Codes and themes were conceptualized inductively while reflecting on the dimensions found in the Hall *et al.* (2001) framework and the Citizen Trust in Government Organizations scale (Grimmelikhuijsen, & Knies, 2015) when interpreting the meaning of the results to determine whether they aligned with the literature.

### 3.6 Positionality and Reflexivity

Throughout my research, I reflected on my positionality by evaluating how my beliefs and biases could impact the analysis, including the definition of codes and the interpretation of the data. As a self-identified white woman in my early 20s living in Ottawa, studying in Health Systems, and working for a public health organization, it is essential for me to be transparent and state my positionality to remain as impartial as possible when conducting this research project. For this reason, it is important for me to disclose my two main assumptions related to the lifting of COVID-19 measures and public health organizations: (1) measures, such as vaccination and masks, were effective and essential to reduce the spread, and (2) the Freedom Convoy protest was an adverse event.

To challenge my assumptions and ensure as much objectivity in this project as possible, I decided to retrieve the data automatically rather than manually. For instance, instead of selecting specific posts and reviewing them one by one, I programmed a code to retrieve data automatically using broad, but specific key terms relating to COVID-19. This allowed for a more rigorous approach to the data collection process. To enhance rigour in the sentiment analysis, I used the VADER sentiment analysis tool to automatically rate the sentiment of each Tweet and reply. During thematic analysis, it was particularly important for me to revisit my assumptions and be aware of their influence on the qualitative coding. In the course of thematic analysis, one of my thesis supervisors independently coded 10% of one of the databases until saturation was reached. Then, we discussed and compared our codes before I coded the rest of the data. Codes were then assessed and combined into recurrent themes. At every step of the process, subcodes, codes, and themes were reviewed, discussed, and confirmed with my thesis supervisors and a social media analysis expert.

### 3.7 Quality of Data

To ensure data quality, I took several precautions based on Miles *et al.* (2020) five main issues to look for in qualitative research. Epistemologically speaking, the qualitative research methods sourcebook from Miles *et al.* (2020) was used to guide the data quality process as it aligns with the thematic analysis approach outlined by Braun and Clarke (2006), such as the importance of immersing oneself in the data and revisiting the data to identify patterns. Miles *et al.* (2020) offers an overview of common practices in qualitative analysis, as well as recommendations to bolster confidence in the findings of a qualitative research study.

First, to ensure confirmability in this qualitative study, I explicitly described all data collection and analysis procedures used to reach my conclusions (Miles et al., 2020).

Additionally, as previously stated, as a researcher, I aimed to keep a neutral stance throughout the project by peer reviewing my Python code with a computer programmer and my qualitative codes with my thesis supervisors and expert in social media analysis, assessing rival conclusions, and retaining the data for reanalysis by others (Miles et al., 2020). Second, to improve the reliability of this study, my thesis supervisors and a social media analysis expert peer reviewed the preliminary themes during the data analysis process; this also ensured greater consistency in the categorization of my data by reducing personal biases in identifying thematic patterns (O'Connor & Joffe, 2020).

Third, to assess credibility, I used data source triangulation; I collected multiple Tweets from different Twitter handles (municipal, provincial, and federal), which enhanced the representativeness of the sample. Moreover, I consulted multiple researchers (i.e., thesis supervisors and a social media analysis expert) to assist me in this project (investigator triangulation), which increased rigour in confirming the findings (Miles et al., 2020). Fourth, concerning transferability, I explicitly described the sample selection to allow comparisons with other future samples or studies, and described limits regarding the findings (Miles et al., 2020). Fifth, in relation to the application of this research, I explicitly acknowledged ethical concerns early in this thesis as it may increase awareness of social media users on the accessibility and usage of their social media data and evoke COVID-19 issues that have directly impacted individuals (Miles et al., 2020). Based on the findings, I offered action recommendations to help remediate distrust in governmental public health organizations and improve the usage of social media communication by these organizations (Miles et al., 2020).

In the following chapter, the sentiment analysis and thematic analysis findings are illustrated, explained, and defined. Example quotations are provided to demonstrate the development of the themes.

# Chapter 4: Results

Subsequent to elucidating this study's value within the existing literature and the methodology and methods used to conduct this research, it is now appropriate to describe the findings that transpired from the data. In this chapter, I first provide an overview of the Tweets and replies between the selected public health organizations. The sentiment analysis results between public health organizations are then presented and discussed, followed by the results of the thematic analysis.

## 4.1 Tweets and Replies Overview

Following data cleaning, a total of 1780 Tweets were analyzed (*see Figure 1 in Chapter 2*). The drastic difference between the number of Tweets retrieved from PHO compared to OPH and HC & PHAC was anticipated, considering PHO was the least active public health organization on Twitter among the three. As of January 21st, 2023, PHO had 6,048 Tweets compared to 39.5K Tweets for OPH and 29.4K Tweets for HC & PHAC. Although the total Tweet count for OPH is the highest among the three, it was expected that more Tweets would be collected for HC & PHAC. Considering that HC & PHAC is the public health organization at the federal level, their COVID-19-related messaging is pertinent for a greater portion of the population, compared to OPH at the municipal level. Additionally, federal public health mandates were longstanding, compared to those at provincial and municipal levels.

## 4.2 Sentiment Analysis Results of the Social Media Communication Environment

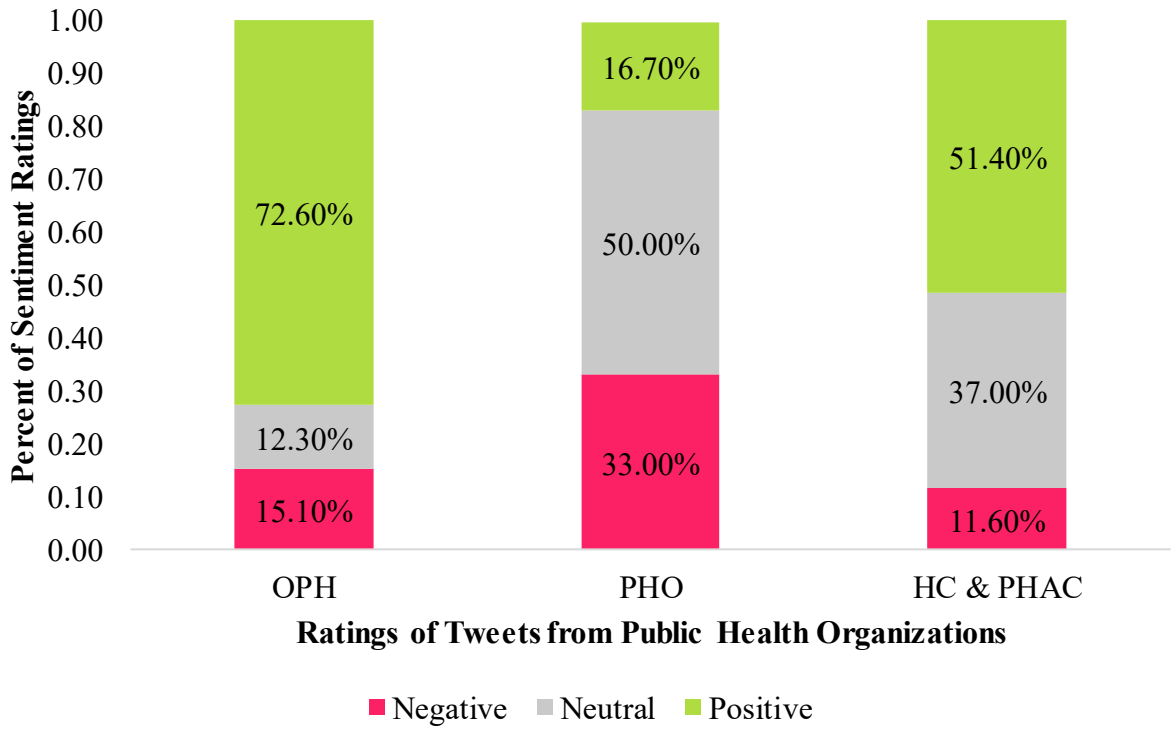
### *4.2.1 Sentiment Analysis Differences Between Each Public Health Organization*

VADER Sentiment Analysis was used to detect the polarity (i.e., if a Tweet conveys a positive, neutral, or negative opinion) and the intensity (e.g., slightly to very positive/negative opinion) of a Tweet (Hutto & Gilbert, 2014). According to the VADER Sentiment Analysis,

Tweets from OPH were most positive among the three selected organizations. Around 72.60% of collected Tweets and replies from OPH were positive, compared to 51.60% of Tweets and replies from HC & PHAC. Comparatively, 50% of Tweets from PHO were detected as neutral. VADER Sentiment Analysis' assessment of overall positivity, neutrality, and negativity across public health organization are presented in **Figure 2.**

**Figure 2**

*Percentage of Sentiment Type Between Each Public Health Organization Based on the VADER Sentiment Analysis Tool.*



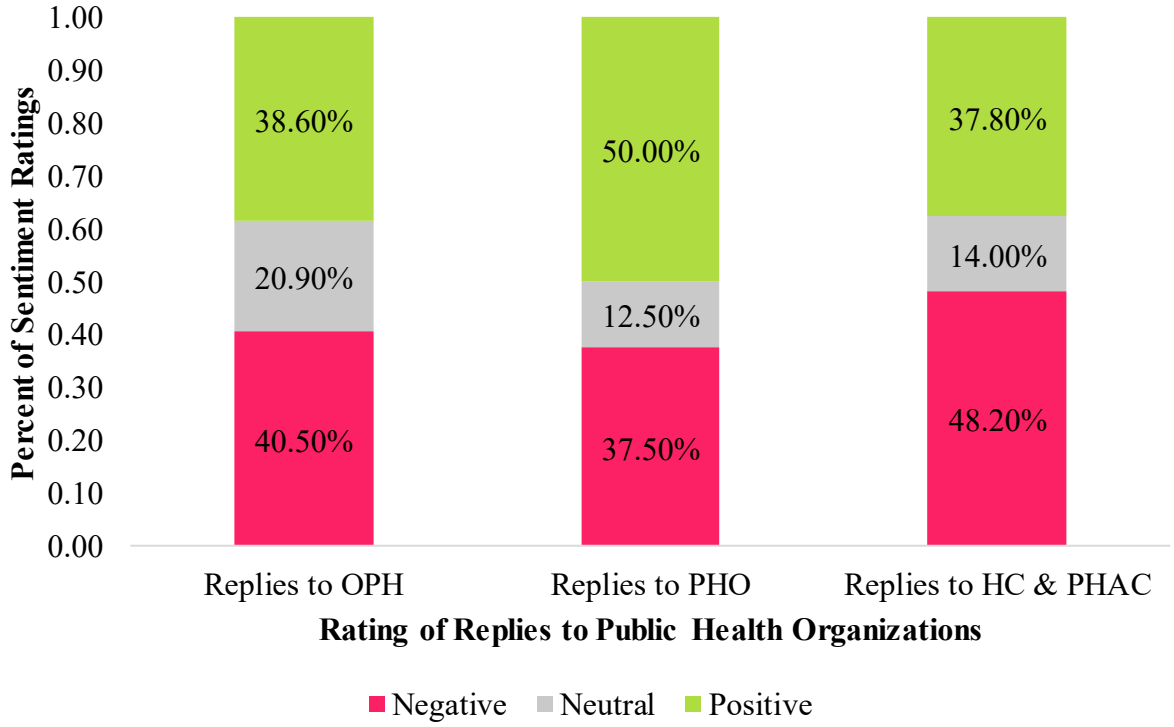

### *4.2.2 Sentiment Analysis Differences Between the Public Response for Each Public Health Organization*

According to the VADER Sentiment Analysis, replies to PHO Tweets were the most positive among the three selected organizations. Around 50% of replies to PHO Tweets were

positive compared to 37.50% that were negative. However, only eight replies were retrieved for this public health organization, which is an important consideration when interpreting this result. Comparatively, replies to OPH (40.50%) and HC & PHAC (48.20%) Tweets were more negative than positive. Slightly more replies to OPH were positive (38.60%) compared to replies to HC & PHAC (37.80%). In comparison to PHO and HC & PHAC, OPH had the greatest proportion of neutral replies (20.90%). The percentage of each sentiment category between the replies to each public health organization based on the VADER Sentiment Analysis tool is presented in **Figure 3.**

**Figure 3**

*Percentage of Sentiment Type Between the Public Response for Each Public Health Organization Based on The VADER Sentiment Analysis Tool.*



### 4.3 Public Health Organizations' Social Media Communications

Five interconnected themes were identified from thematic analysis of Tweets of the public health organizations. These themes were identified based on the joint analysis of all three databases. The code list leading to the development of these themes is presented in **Table 2**, while samples of supporting quotations for each theme are provided in **Table 3**.

**Table 2**

*Public Health Tweets: Code List Leading to the Identification of the Themes.*

| First-Level Codes | Second-Level Codes | Themes |
|---|---|---|
| Advice to prevent communicable disease | Disease prevention | Risk Communication |
| Covid-19 equity information | Informing on covid-19 updates & risks | |
| Covid-19 recovery information | | |
| Informing on covid-19 treatment | | |
| Informing on covid-19 guidelines | | |
| Travel requirements update | | |
| Informing on health risks from covid test | | |
| Informing on increased transmission during covid reopening | | |
| Informing on limiting covid transmission | | |
| Informing on studies | | |
| Risk communication about influence of language | Risk communication | |
| Risk communication information | | |
| Vaccine passport information | Vaccine information & promotion | |
| Vaccine safety | | |
| Vaccine side effects information | | |
| General vaccine information | | |
| Encouraging covid-19 vaccination | Encouraging protective measures against covid-19 | Encouraging Specific Behaviours |

| First-Level Codes | Second-Level Codes | Themes |
|---|---|---|
| Thanking community's support and compliance | Promoting kindness & compassion | |
| Encouraging taking precautions against covid | | |
| Encouraging mask wearing | | |
| Promoting kindness | | |
| Persuasive messages to respect others | | |
| Message to respect choice to mask up | | |
| Persuasive messaging to be compassionate | | |
| Access | Information about access | Accessibility |
| Informing on access | | |
| Informing on covid tracking app | Informing on covid tracking app | Logistical Information Sharing |
| ArriveCAN information | | |
| Sharing differences between jurisdictions | Sharing differences between jurisdictions | |
| Informing on provincial health care agreements | | |
| Acknowledging mental health impacts of pandemic | Acknowledging impact of pandemic response | Evoking Emotions from the Public |
| Help provided for covid isolation | | |
| Humour in public health communication | Humour in public health communication | |

**Table 3**

*Public Health Tweets: List of Themes and Supporting Quotations.*

| Theme | Definition | Quotation |
|---|---|---|
| **Risk Communication** | Messaging on how to reduce the public's risks to health and safety, including updates on the COVID-19 virus and guidelines. | *"As of April 1, 2022, the Government of Canada is easing border measures, allowing Canada to continue moving towards a sustainable approach to COVID-19."* |
| **Encouraging Specific Behaviours** | Messaging using behavioural insights to encourage a certain behaviour. | *"#Covid19 can make anyone sick. Getting your #booster can help protect you against severe illness and hospitalization."* |

| Theme | Definition | Quotation |
|---|---|---|
| **Accessibility** | Information about access to services or contact person to access these services. | *"The administration of vaccines falls within the purview of individual provincial/territorial health units. For more information on the availability of COVID-19 vaccines in your area, please contact your local health unit."* |
| **Logistical Information Sharing** | Information on COVID-19 applications to manage COVID-19 numbers and logistical differences between provinces/territories during the pandemic. | *"Travelling to Canada and unable to use #ArriveCAN?*<br>*You can ask someone to submit the mandatory info on your behalf by signing in online. Ask them to share the receipt with you by printing out a copy or by sending you a screenshot.*<br>*Learn more: [URL removed]"* |
| **Evoking Emotions from the Public** | Acknowledging the impact of the pandemic response on the public and usage of humour in communications. | *"For some people with #Covid19, safe isolation can be a challenge. The #GoC is providing an additional $4.8M to @CityWindsorON to support two safe isolation sites for agri-workers who have symptoms or may have been exposed to COVID-19. [URL removed]"* |

### *4.3.1 Risk Communication*

The majority of Tweets posted by the selected public health organizations relate to risk communication, that is, information shared to the public to reduce their risks to health and safety. Such risk communication messaging included information on how to reduce risks of contracting or spreading transmittable diseases (not exclusively the COVID-19 virus) and updates on COVID-19 cases, mandates and guidelines: "*Today, border measures are changing. Get the latest information here: [URL removed]"* and updates on COVID-19 cases and estimated cases in the population: *"We continue to track and analyze research and case reports from around the world on #Covid19 and animals. Visit: [URL removed].*" — HC & PHAC

Many risk communication Tweets referred to vaccination. Most vaccine-related Tweets provided general information (e.g., effectiveness, usefulness) on COVID-19 vaccines (including

booster doses), information on approved COVID-19 vaccines, eligibility to receive a certain COVID-19 vaccine, or simply promoting vaccination: "*It is National Immunization Awareness Week. NIAW highlights the collective action needed to promote the use of vaccines - it's important for more people, and their communities to be protected from vaccine-preventable diseases. #VaccinesWork #NIAW2022"* — OPH

Tweets communicating information on COVID-19 vaccine safety and side effects, as well as information on COVID-19 proof of vaccination, were mostly observed in HC & PHAC communications: "*Can vaccine side effects show up later? After a few days, the #CovidVaccine is no longer in the body and only the immune protection remains. Long-term side effects from vaccines are unlikely. [URL removed]"* — HC & PHAC

### *4.3.2 Encouraging Specific Behaviours*

Many public health Tweets aimed to encourage prosocial behaviours or protective behaviours against the COVID-19 virus using behavioural insights, or nudges, in their messaging. Most Tweets under this theme encouraged the public to get vaccinated, including parents to vaccinate their children. For example, public health Tweets referred to keeping one child safe through vaccination: "*We keep our kids safe every day. COVID-19 vaccines are safe for kids and serious side effects are extremely rare.*" — HC & PHAC

Several Tweets broadly urged the public to take various precautions against the COVID-19 virus for their safety or the safety of others: "*Did you know that ventilation helps prevent the spread of #Covid19? Combining ventilation with other public health measures, like wearing a mask, can reduce the risk to you and others.* 🌬️😷 *[URL removed]*" — HC & PHAC. These Tweets usually referred to the concept of prosocial behaviours, such as indicating that one is caring for those that are more vulnerable by wearing a mask:

*Also, it's important to remember that wearing one helps protect those at higher risk from COVID-19 complications (those who are immunocompromised, of older age, have other health issues or have less than 3 doses of vaccine).*

*Your mask protects them. Thanks for wearing it.* — OPH

Some Tweets also aimed to persuade the public to be "*kind*" and compassionate to others, including respecting individuals' decision to wear a mask after the lift of the mask mandate:

*Lastly, if you see someone wearing a mask...don't remind them that masks are no longer mandatory.*

*They probably know, &; have likely chosen to continue wearing one.*

*Thanks, Ottawa.*

*p.s. info about masks, vaccines &; risk reduction can be found here [URL removed]* — OPH

### *4.3.3 Accessibility*

Some Tweets were related to service accessibility, such as the location to obtain certain services (e.g., where to obtain a COVID-19 test or vaccine) or who to contact to receive more information on these services:

*Looking for a COVID-19 vaccination clinic near you? We have a list of After-school clinics for anyone aged 5 and up, their families and household members in the surrounding community.*

*Find a convenient location for you, here: [URL removed]* — OPH

Most Tweets regarding accessibility were related to COVID-19 vaccines and booster doses, COVID-19 antiviral treatments, and rapid tests.

### *4.3.5 Logistical Information Sharing*

A few Tweets were related to information on COVID-19 applications to manage COVID-19 numbers and logistical differences between provinces and territories' COVID-19 response. Such Tweets included information on COVID-19 tracking and travel applications, as well as comparisons with other jurisdictions.

Information on COVID-19 tracking apps, mostly regarding ArriveCAN, was only communicated by HC & PHAC:

> *Check out #ArriveCAN's new optional saved traveller feature. It saves your travel and proof of #COVID19 vaccination information for re-use on future trips.*
> *Download the latest version of the app if you haven't already! [URL removed]* — HC & PHAC

Very few Tweets mentioned other jurisdictions' COVID-19 response, but those that did were usually comparative in nature:

> *How are other jurisdictions handling the ongoing COVID-19 pandemic? Read about current public health measures and COVID-19 epidemiology in select jurisdictions in our environmental scan: [URL removed]* — PHO

### *4.3.6 Evoking Emotions from the Public*

A few Tweets acknowledged the challenges or the impact of the COVID-19 pandemic and the COVID-19 response, and used humour to appeal to the public.

For example, some Tweets referred to mental health, especially due to or exacerbated by the COVID-19 pandemic: "*If the last few weeks have done a number on your mental health, you*

*are not alone. Please know that resources and supports are always available here: [URL removed]"* — OPH

Other Tweets acknowledged the impact of the COVID-19 pandemic on Canadians' mental health by providing evidence: "*Read the #HPCDP Journal to learn how #COVID19 has impacted the #mentalhealth of Canadians. New data indicates that fewer adults reported high self-rated mental health in winter/spring 2021 compared to fall 2020. Learn more: [URL removed]"* — HC & PHAC

Communication style, specifically humour in public health communication, was also evident, but exclusively in OPH Tweets:

> *It's Tuesday which means it's a great day to get your booster dose of the COVID-19 vaccine! Wednesdays are good too. So are Mondays &; Fridays. And weekends. We're also open on Thursday if you're into that.*
> *Drop into any clinic, any day. No appt needed. [URL removed]* — OPH

### *4.3.7 Thematic Comparison Between Public Health Organizations*

All three organizations posted Tweets related to risk communication. PHO was the organization with the highest proportion of Tweets related to risk communication among the three. The analyzed PHO Tweets were exclusively associated with risk communication and logistical information sharing, although most Tweets were related to risk communication. Although few occurrences were observed, only PHO and HC & PHAC posted Tweets related to logical information sharing.

Within OPH dataset, most of its Tweets were also coded for risk communication, followed by Tweets encouraging specific behaviours. Although fewer, many of OPH Tweets

were also referenced to accessibility. Few of OPH Tweets were evoking the emotions of the public.

HC & PHAC Tweets were also prominently referencing risk communication. Several HC & PHAC Tweets encouraged specific behaviours. A couple of Tweets posted by HC & PHAC were referenced to both logistical information sharing and accessibility. Very few HC & PHAC Tweets alluded to evoking the emotions of the public.

### 4.4 Perceptions of Twitter Users

Each theme and pattern were examined based on Tweets from public health organizations and Twitter threads to gain deeper understanding of the public response to governmental COVID-19 reopening decisions. Eight non-mutually exclusive themes were identified. The code list used to develop these themes is presented in **Table 4**, while definitions and supporting quotations for each theme are shown in **Table 5**.

**Table 4**

*Public Response: Code List Leading to the Identification of the Themes.*

| First-Level Codes | Second-Level Codes | Third-Level Codes |
|---|---|---|
| Accountability for vaccine injury | Accountability | Blaming Authorities |
| Blaming Ontario government | Blame | |
| Blaming government | | |
| Blaming public health representative | | |
| Blaming public health | | |
| Persecuting government or public health organizations | | |
| Aggression | Anger | Expressing Dissatisfaction in Decision-Makers |
| Dramatic aggression | | |
| Anger | | |
| Aggressive stance | | |

| First-Level Codes | Second-Level Codes | Third-Level Codes |
|---|---|---|
| Anger toward lack of enforcement of measures or action | | |
| Anger toward lift of mandates | | |
| Call for authority to act in reinstating mandates | Call to action | |
| Plea to reinstate more measures | | |
| Plea for continuation of mask mandates | | |
| Requesting mask wearing | | |
| Call for PCR testing | | |
| Call for public health to promote tolerance | | |
| Call for quality equipment | | |
| Call to end mandates | | |
| Call to end travel requirements | | |
| Call for end to mask mandates | | |
| Call to end travel requirements | | |
| Call to improve healthcare system | | |
| Call vaccines for children | | |
| Call to end public health organizations from targeting vaccines in children | | |
| Plea to end mandates using impact on youth as a hook | | |
| Call to reinstate mandates using children as a hook | | |
| Concern of economic impact of covid | Consequences of mandates | |
| Emotional description of impacts of mandates | | |
| Mental health concerns | | |
| Encouraging respect of guidelines | Persuasive messages | |
| Encouraging others to stay home when sick | | |
| Persuasive messages | | |
| Persuasive message using moral argument ethos | | |

| First-Level Codes | Second-Level Codes | Third-Level Codes |
|---|---|---|
| Persuasive message using pathos | | |
| Persuasive messaging using logos | | |
| Expressing views on policy | Expression of views on policy | |
| Informal patterns of sharing information | | |
| Informal sharing of anecdotal information | | |
| Informal sharing of opinions | | |
| Connecting with the public | | |
| Noticing distrust in public health | | |
| Helplessness | Dissatisfaction in public health decisions | |
| Hopelessness | | |
| Impatience | | |
| Annoyance | | |
| Inefficiency of gov | | |
| Let down by public health | | |
| Disappointment | | |
| Disenchantment | | |
| Fear | Fear | Fear |
| Confusing other diseases with covid | Health literacy | Lack of Understanding of Scientific & Health-Related Information |
| Erroneous scientific publication or understanding | | |
| Minimizing risk from covid | | |
| Misinformation | | |
| Poor public health education | | |
| Scientific comprehension | | |
| Desire for a traditional vaccine | Vaccine confidence | |
| Engaging in the vaccine debate | | |
| Natural immunity and remedies | | |
| Necessity of vaccine | | |
| Negative side effects | | |
| VAERS | | |
| Vaccine variety issue | | |
| Lack of data | Inquiring on evidence | Skepticism & Disbelief in Evidence |
| Emotional plea indicating belief in missing information about risk | | |

| First-Level Codes | Second-Level Codes | Third-Level Codes |
|---|---|---|
| Requesting information and transparency | | |
| Questions on access | | |
| Disbelief | Disbelief | |
| Disbelief in effectiveness of gov tracking apps | | |
| Disbelief in effectiveness of mandates | | |
| Disbelief in effectiveness of masks | | |
| Disbelief in effectiveness of vaccine | | |
| Disregard for public health guidelines | | |
| Refusal to follow guidelines | | |
| Distrust due to previous public health mistakes | Mistrust | |
| Mistrust | | |
| Mistrust of public health | | |
| Sarcasm | | |
| Questioning authenticity of recommendations | Uncertainty & scepticism | |
| Questioning timing of decisions | | |
| Uncertainty | | |
| Risk-benefit analysis | | |
| Uncertainty about risk | | |
| Scepticism | | |
| Lack of autonomy | Maintaining locus of control | Necessity of Maintaining Locus of Control |
| Locus of control | | |
| Living with covid | Living with covid & comparison across countries | |
| Call for autonomy in learning to live with covid | | |
| Comparison with other countries | | |
| North American societal issue | | |
| Fed up with covid advertisement | | |
| Fed up with mandates | | |
| Disrespect | Disrespectful & derogatory language | |
| Labelling | | |
| Mocking | | |
| Name calling | | |
| Othering | | |

| First-Level Codes | Second-Level Codes | Third-Level Codes |
|---|---|---|
| Encroaching on peoples' rights | Perceived injustice | |
| Catastrophizing about future impacts of mandates or escalating encroachment on rights | | |
| Encroaching on peoples' rights | | |
| Perceived discrimination or ableism | | |
| Perceived loss of rights | | |
| Perceptions of inequity | | |
| Rights encroached on by mask mandate | | |
| Misinterpreting communication | Misinterpreted communication | Unclear Public Health Messaging |
| Lifting of measures indicates reduce risk from covid | | |
| Call for clear messaging | Need for clear messaging | |
| Call for broadcasted covid reminders | | |
| Hypocrisy of authority | Messaging discrepancy | |
| Perceived illogical recommendations | | |
| Exaggerated recommendations of public health | | |
| Perceived inconsistence in public health messaging | | |
| Belief cure for covid hidden by public health | Inaccurate reporting of public health information for personal gains | Presuming Political Corruption |
| Covid as economic excuse to swindle taxpayers | | |
| Government brainwashing or propaganda | Political corruption | |
| Perception of bias reporting by media or public health | | |
| Perception that lifts of measures is political | | |
| Political influence and corruption | | |
| Political polarization | | |
| Protests | | |

**Table 5**

*Public Response: List of Themes and Supporting Quotations.*

| Theme | Definition | Quotation |
|---|---|---|
| **Lack of Understanding of Scientific & Health-Related Information** | Public's lack of understanding and use of health-related information. | *"Well the vaccine won't keep your kids safe I'll do more harm to your kids and anything stop lying you piece of shit you don't give to fucks about us or the kids this Vaccine doesn't help it's not real vaccine because a real vaccine helps And not make you disabled or other things"* |
| **Skepticism & Disbelief in Evidence** | Indication of skepticism in COVID-19-related information or recommendation given by the public health organization and a demand for transparency. | *"Can't wait for all of the mask burning parties. This nonsense has gone on for far too long. Fun facts, masks don't work &; the jab doesn't work."* |
| **Expressing Dissatisfaction in Decision-Makers** | Various emotions and expression of views indicating a disenchantment toward a public health organizations' decision-making. | *"If you hadn't been so eager to follow Ford/Moore and dropping mask mandates at school, this weekend would have been a lot safer for everyone and we wouldn't have had to worry about this. #disappointed"* |
| **Presuming Political Corruption** | Belief that the figure of authority is dishonest about their reasoning behind COVID-19-related decisions and recommendations. | *"it becomes more obvious each day that this vaccine has been promoted for financial gains as opposed to peoples health. It's laughable that the first two doses don't work and have a long list of side effects that you have never posted about. Fake ass"* |
| **Necessity of Maintaining Locus of Control** | Indication of the importance of keeping one's autonomy or perceived autonomy, and the perceived injustice of being unable to do so. | *"We need non vaccinated freedoom and free to fly anywhere please no more mandates, we have antibodies from omicrone. Let us live if we get sick is under our responsibility, no more mandates pls thank you Mr gov, Back to 2019 before covid ."* |
| **Unclear Public Health Messaging** | Perceived unclear, inconsistent, or illogical communication and/or recommendations. | *"Rewrite it -- the wording is asinine. Try: "Despite being obliged by the provincial government to rescind our mask mandate, as infection accelerates, prudence compels us advise Ottawa residents to resume masking indoors with ~N95 respirators." Stop muddling."* |
| **Blaming Authorities** | Demands for public health organization or government | *"NO MORE VACCINES. Leave the children alone. You now know the damage from* |

| Theme | Definition | Quotation |
|---|---|---|
| | to be held responsible for the repercussions of their COVID-19 response. | *vaccines are worse then Covid. You will be held to account and there will be justice"* |
| **Fear** | Fear of the unknown, of lacking control, or of being lied to by a figure of authority. | *"Reading comments, looks like people you've given guidance for over two years are really scared of catching COVID. Once that fear is circulating it escalates causing others to panic as well. Living with CV means taking precautions but also providing facts on cure and survival."* |

### *4.4.1 Lack of Understanding of Scientific and Health-Related Information*

During the reopening phase of the COVID-19 pandemic, public health organizations offered recommendations on how to protect oneself against the virus, including encouraging the usage of non-pharmaceutical interventions (NPIs) (e.g., covering coughs and sneezes, frequent hand washing, physical distancing) and public vaccination. Many Twitter users' comments indicated a lack of understanding of scientific and health information. Misuse or miscomprehension of scientific data and publication type was also observed. This was mainly observed in replies that were against protective measures, in particular when vaccination was discussed.

Some users commented that natural immunity was more effective or safer than a vaccine: "*I encourage my kids to get covid er I mean the cold and flu *cough*".* Several users also commented a similar belief regarding "*traditional vaccine[s]*", meaning "*inactivated virus vaccine*", versus vaccines made using a technology deemed as non-traditional: "*Hope you are ready when the evidence proves that mRNA causes more harm than good. Why not approve #COVAXIN, a safe traditionally made whole virion inactivated vaccine.*" Similarly, certain users indicated miscomprehension based on the name of the mRNA vaccine, assuming it is gene therapy:

> *Not a chance in hell. Gene therapy that cause your body to produce the toxic spike protein causing inflammation, blood clots and apparently 2000 or so other side effects. The Kids are not being harmed by covid. Stay away from my kids.*

Misunderstanding of scientific data or sources of information was evident when commenters raised their concerns about the COVID-19 vaccines' side effects based on miscomprehension of information in a publicly available resource. For instance, a user referred to a retracted article to backup their claim on the uselessness of the COVID-19 vaccines in children:

> *If they die later you can always find something else to blame it on. "Risk of COVID-19 death decreases drastically as age decreases & longer-term effects of inoculations on lower age groups will increase their risk-benefit ratio, perhaps substantially." [URL removed]*

A few users also referred to VAERS (Vaccine Adverse Event Reporting System), a CDC and FDA co-sponsored early warning system that monitors the safety of USA-licensed vaccines (VAERS, n.d.), as a source of information for vaccines' adverse effects:

> *Stop targeting kids, who are at negligible risk of Covid. The vax is showing negative efficacy, more adverse side effects than any vaccine in history- just check out the hockey stick curve of vaers. Kids at greater risk of vax induced myocarditis than hospitalizations from covid.*

However, anyone can submit a report to VAERS, even though the adverse effect may not be related to the vaccine (VAERS, n.d.). A user commented that they viewed VAERS as unreliable because it publishes all reports: "*Ya like the one report on vaers that said that a kid put*

*a penny up his nose and it was actually reported as a vaccine side effect!!?? Come on people vaers is bs.*" The VAERS website states it is used to determine potential safety problems, but does not determine whether an adverse event is caused by a vaccine (VAERS, n.d.).

Similarly, several users claimed mRNA vaccines were unsafe by referring to the release of Pfizer's COVID-19 mRNA vaccine data document without necessarily understanding the reporting method for adverse events and the meaning of numbers indicated in the report: "*How about the 1200+ deaths in the first 3 months. Or the 1291 side effects on the 9 pages of Pfizer documents! You make me sick promoting this fake vaccine!"*

Several users seemed to have a limited understanding of the presence of other diseases and their transmissibility. For instance, Ottawa Public Health advised the public to take precautions against a “gastrointestinal illness” during the ongoing COVID-19 pandemic. Several Twitter users replied to that Tweet that it had to be COVID-19: "*Uhm…wild guess! Could it be COVID!? BA.2 variant…the one that targets stomach more than lungs…causing issues such as "digestive problems like nausea, diarrhoea, vomiting, abdominal pain, heartburn and bloating*." 🤦‍♀️🤦‍♀️". Similarly, users’ comments indicated a lack of understanding of the reduction of certain transmittable diseases due to non-pharmaceutical interventions:

> *Please show data of before the pandemic regarding flu's since the flu has disappeared so we can compare it to data driven by Covid. Masks don't work stop pretending they do. We have a serious mental health issue in this country that needs to be addressed. Concentrate on that.*

Users' belief or spread of misinformation also indicates a lack of understanding of scientific or health-related information, such as how vaccines work or how sexually transmitted

infections are transmitted. For example, some users commented that COVID-19 vaccines "*give +HIV tests*" or that *"[n]obody that is pregnant should get the vaccine. It is gene therapy and will also affect the dna of the baby*".

### *4.4.2 Skepticism and Disbelief in Evidence*

Many comments indicated uncertainty, skepticism, disbelief, and mistrust in the effectiveness of a measure, in risk communication advice from a figure of authority, or both. Many Twitter users' comments suggested uncertainty and skepticism in COVID-19-related information or recommendations given by the public health organization: "*So side effects and death are rare from the vaccines, can we talk about in comparison how rare death and side effects are to the same age group from just covid ?"*

Many individuals tweeted their disbelief in the effectiveness of NPIs, vaccination, and COVID-19 tracking apps (e.g., ArriveCan):

> *If she wants to recommend masks, she should first prove they work. We should never have mandated this completely useless measure. There was NEVER a case for it, masked regions didn't do better than optional regions and children were harmed*.

Disbelief in the effectiveness or necessity of COVID-19 vaccination was especially profound in response to recommendations to vaccinate children against COVID-19: "*Serious side effects from covid in children are even rarer, and the vaccines don't stop transmission. So there's no point in injecting your child with this experimental concoction with no long term safety data."*

Several Twitter users demanded "*transparency*" and the public health organization to provide evidence: "*Really? Do masks actually stop the spread of Covid? How do you know this?*

*What is the collection of studies/data that Ottawa Public Health uses to justify masking? Please make it publicly available. Ottawans deserve transparency*."

Various individuals mistrusted evidence-based public health recommendations provided by a figure of authority (e.g., government, public health organizations, a representative figure of authority) due to uncertainty about risk: "*Why vaccinate kids for a condition that they mildly get ill from and don't transmit much, especially when the vaccine is dangerous to them? PHAC Canada is not trustworthy*" or due to disappointing outcomes:

> *Getting vaccinated and vaccinated again and again? I think you people haven't got a clue! I trusted and got both shots and still got Covid. These vaccines, were they truly test proven? Is the health symptoms telling us the truth? Are the governing leaders truthful I think not!*

### *4.4.3 Expressing Dissatisfaction in Decision-Makers*

Public health organizations' decision-making process for public health recommendations or mandates, also sparked conversation among Twitter users, who expressed anger, discontent, disappointment, frustration, and annoyance. Interestingly, anger in public health decisions was expressed by both Twitter users against the lifting of measures and those supportive of the lifting of the remaining measures. Individuals expressed their discontent about the lifting of measures: "*There is no Covid response. It's been left up to the public to protect themselves from infection which will lead 4% of Canada to long Covid, a potentially life long disability.* 🥵 🖕", or toward the lack of enforcement of protective measures against COVID-19: "*Stop recommending that people do things. Start implementing restrictions. Masks in public places. Vaccine passport to restrict entry to non-essential places. You know that asking people politely doesn't work. We're 2*

*years in. Please stop with the performative Tweets.*" Many Twitter users also commented on their disappointment. As one user stated:

> *I used to be proud of you folks, and feel like I was living in a city that had the best possible people working to keep us safe. After the urgency of normal/living with Covid white flags, that is no longer the case. Just remember that you gave up on us before we gave up on you.*

Many individuals, especially in response to municipal Tweets, were also requesting or demanding the public health organization use its power and authority to reinstate mandates:

> *Because of y'all not bothering to keep mandatory masks I'll be reducing my risk by only leaving the house for curb side groceries. Thanks for zero support for those of us who want to avoid COVID as much as possible. Just use section 22 already. Indoors shouldn't be *this* risky.*

Several individuals also shared their frustration in the public health organization's lack of action:

> *I honestly don't understand the hesitancy here you are literally telling us it is really bad but not using the powers you have? Any rise in COVID spread in our city can be blamed in part on your unwillingness to actually do your job.*

On the other hand, several Twitter users also expressed annoyance with the remaining COVID-19 mandates or recommendations: "*Shove that vaccine all the way up.*" Many users requested or demanded authority figures take action to remove "*Covid mandates immediately*". This was particularly noted in response to federal Tweets: "*End the vaccine mandates!! Everyone should be allowed to travel freely within their own country in the least."*

### *4.4.4 Presuming Political Corruption*

Based on the timing or the type of public health decision or recommendations, several Twitter users indicated a belief that the figure of authority, whether public health or government, was dishonest about their reasoning behind COVID-19-related decisions and recommendations.

Several users commented on the belief that the public health organization and/or government were "*fear mongering*" and "*brainwashing*" the public or promoting their "*propaganda*" on the severity of the COVID-19 virus and the necessity to follow COVID-19 protective measures:

> *This propaganda is meant to scare you people, please wake up to this, please realize that you've been brainwashed this whole time. Covid is here to stay and it's not nearly as dangerous as the government makes you think. LIVE YOUR LIVES!!!*

Numerous individuals also commented their concern that COVID-19 vaccines have "*been promoted for financial gains as opposed to peoples health*" and that public health organization or government have been "*putting politics and corporate interests ahead of science and health*".

Several Twitter users voiced their concern about "*big pharma*", for example, that the government had financial interests in certain pharmaceuticals companies:

> *Why didn't you offer discounts on healthy alternatives like exercising, nutrition, vitamins and invest in the health care system as opposed to throwing tax dollars at a corrupt pharmaceutical company with a long history of deception. You killed so many.*

For instance, several users commented that the public health organization was "*corrupt*" for not approving the Covaxin vaccine in a shorter timespan:

> *What the literal F is wrong with you people approve Covaxin/Vaccigen! For the love of God it's been 9 months! It's a simple dead virus vaccine that all of us have gotten at birth. Stop your corruption already! #IchooseCOVAXIN #covaxin*.

Several Twitter users commented on the belief that public health decisions, such as travel restrictions to the U.S., were economically based:

> *Why is there no exemption for short trips, or at the very least allowing the test to be taken in Canada??? YOU CAN'T DETECT COVID ONE DAY LATER IF YOU WERE EXPOSED ON AN OVERNIGHT TRIP TO THE US!!! Is this only to limit cross border shopping to help the Canadian economy?*

The continuation or recommendation of using several layers of protection (e.g., get vaccinated and keep wearing a mask) against the COVID-19 virus also led users to indicate a similar belief that public health organizations or governments were using "*covid as an excuse to collect funds frOm THE TAX PAYERS*" or to generate a profit for the government: "*No change you still need a test, why test for people who got vaccinated in Canada ? You don't believe your own vaccination s. It's a money grab .*"

Several Twitter users, mostly at the municipal level, commented that the decision to start lifting COVID-19 mandates was "*too political*": "*This Tweet *enrages* me, as we wait for our (masked, vaccinated) kids to bring covid home from school. This Tweet reflects your choice to cave to political pressure rather than protect Ottawa's public health. Gross.*" A few users also referred to the Freedom Convoy as the reason for the lifting of COVID-19 mandates either directly by "*thank[ing] the freedom convoy for the choice*" or indirectly:

> *Ford has made Covid political and they have turned their backs on all of us. Especially our children. Please do not follow their political agenda to appease the 15% of anti-everything. We want to protect ourselves and others in Ottawa. #BeALeader*.

### *4.4.5 Necessity of Maintaining Locus of Control*

Considering the unpredictable nature of the COVID-19 pandemic and its wide-ranging effect on the population, it was not surprising many Twitter users voiced their need to maintain their autonomy and their perceived injustice of being unable to do so. Numerous individuals commented that the COVID-19 mandates were "*discriminatory*", "*unethical*", "i*nhumane*" or "*criminal*" and that public health recommendations (even after the lift of that particular measure), was "*immoral*" and "*hateful*".

Many users' comments expressed wanting to "*move on with their lives*" as well as asking for the government or public health organization to *"[l]et people think for themselves/make their own decisions*":

> *Numbers were high when everything was shut down and masks. Normal needs to happen, We did what we were told for 2 years and frankly I want my life back. I am not wearing a mask and yeah I am vaccinated wore masks and still got covid. Scared? Then stay home! Thats a choice .*

During disaster situations, it is common for individuals to seek a sense of control in unpredictable situations. Various users' comments were related to wanting to have a choice or a say in the way they learned to live with COVID: "*Enough mandates, Live as you see fit, do what's right for yourself.*" Individuals' comments also expressed wanting to be responsible for their own actions: "*It's time for people to mitigate their own risk, stop living in fear, time to*

*normalize COVID*.", but not to necessarily be accountable for others: "*don't make ME wear a mask to protect you.*"

Whether the content of a public health organization Tweet was about continuing mandates or simply recommending measures no longer mandated, many comments were polarized and disrespectful (e.g., labelling, mocking, name-calling, othering) either towards one group to the other (e.g., pro- vs. anti-vax) or toward the public health organization or government when that decision was perceived to go against their rights.

Many users' comments targeted people following public health guidelines, othering them by using terms such as "*sheep*", "*hypochondriacs*", "*neurotics*", "*COVID radicalized*" and "*cultist*". This concept of othering the opposition was also observed in users' addressing those not following public health guidelines: "*Are all of you stupid maskless idiots paying attention to this? Put you mask back on your stupid face!*"

Derogatory terms, such as "*crazy*", "*disgusting*", "*sick*", "*incompetent*", "*piece of shit*", or "*communist puppets*", were also used by many users, most often those against COVID-19-related recommendations, to address a government, public health organization, or individual representative (e.g., minister of health, prime minister): "*Criminals! Kids are not at risk from Covid... they are at risk from the vaccines... stay away from children you ghouls.*"

### *4.4.6 Unclear Public Health Messaging*

Another important aspect noted in the data was the public's interpretation of public health messaging, in particular about its clarity. Twitter users often perceived public health messaging as unclear, confusing, inconsistent, or illogical based on previous communications or outcomes.

For instance, numerous Twitter users indicated discrepancies in public health social media communication:

> *There is so much hypocrisy and confusion in government. Get on the same page and deliver one clear message. I work in a store. I'm still wearing a mask to help protect the public and my family. A lot of customers not wearing them. You can't wear it for 20 minutes? Perplexed!*

Several users' comments referred to a public health organization's messaging as "*mixed*", "*confusing*", "*ubiquitous*", "*not clear*", or "*asinine*". Some users were asking public health organizations to "*improve [their] messaging*" and communicate "*more clearly*":

> *Your messaging is not clear. Regular people do not know what to do, they are turning to Facebook to ask - do I stay home? Do I send my kids to school? Do I have to mask? What does up to date on vaccinations mean? 2 shots? 3 shots - please publish CLEAR messaging.*

Several individuals' comments referred to perceived inconsistencies in public health messaging based on the COVID-19 information given and their recommendation:

> *Lol too late. You guys didn't lift a finger in Ford's face neither our MOH. Now after telling people it's over, you want them to go back to wearing masks ? Forget it ! Even if some people don't mind it this mixed messaging is going to fall on deaf ears.*

Many Twitter users also expressed perceiving public health recommendations as illogical based on prior information given:

> *This makes no sense, so you replace the PCR with a less accurate antigen test which will result in more false positives? How is that (apart from the cost) going to help travelers?*

*If you are positive on either test you won't be able to fly home until you quarantine for 10 days!*

Comments also indicated misinterpretations of public health organizations' Tweets. For example, an HC/PHAC Tweet advising the public on "*health risks from accidental exposure to some ingredients in #Covid19 rapid antigen tests*" was misinterpreted by several users: "*Oh OK What I am reading is: DO NOT test yourself for Covid. It is dangerous.*"

In this particular case, the public health warning on COVID-19 rapid antigen tests can be compared to warnings on rubbing alcohol; although it can be used for its purpose (e.g., disinfecting wounds), it should not be used for other purposes (e.g., mouthwash) as it could be dangerous for one's health (e.g., poisoning). Similarly, the packaged fluid in COVID-19 rapid antigen tests can be safely used to test for COVID-19 (e.g., mixing fluid with mucus sampled with a swab), but it could be dangerous if ingested (Government of Canada, 2022).

#### *4.4.7. Blaming Authorities*

Another theme from the data was the concept of blaming others. This theme is not unexpected in the context of the COVID-19 pandemic, considering that blame is common during pandemics (Hardy et al., 2021). Many Twitter users used the platform to demand a public health organization or government be held responsible for the repercussions of their COVID-19 response, at both ends of the pro-mandate/anti-mandate spectrum.

Several Twitter users' comments criticized public health decisions and COVID-19 mandates for making them unwell due to the perceived "*myopic focus*" of public health organizations on COVID-19: "*Yes, public health policy has pretty much ruined my life, struggling to get it back. And Covid wasn't that bad for me. I will likely never trust your advice*

*again.*" Many users were also specifically blaming a representative, such as from a public health organization: "*Get some balls. Etches is no role models*" or government: "*You are an embarrassment to my Country thanks to Turdeau."* for public health decisions.

Interestingly, comments blaming the Government of Ontario for the lifting of measures were present on all three selected municipal, provincial, and federal Twitter platforms. To illustrate, a user stated:

> *Highly recommended masks will not bring the #'s down. OPH and Ford have failed us in the worst way &; put us in danger. Own it. If you really want to protect OTT then fight for us. Mandate masks in ALL indoor settings. #CovidIsNotOver #MooreWave #OPHfailed #VoteFordOut.*

Several users commented that they wanted to "*sue the government*" or demanded that the public health organization "*be held fully accountable in due time for the irresponsible damage [they] have caused*", "*to be criminally liable and punished accordingly*", and to "*be jailed for what [they] did*". These comments were largely in response to vaccine-related Tweets.

### *4.4.8 Fear of Illness versus Government Control*

The concept of fear was a recurring theme present in most Tweets. Unpredictability and uncertainty, caused by the COVID-19 pandemic and the reopening phase, were generally accompanied by fear. Those fearing the COVID-19 virus mostly indicated compliance with public health measures and worry about the lifting of measures. Users' fear was demonstrated in numerous forms, the most predominant one being the fear of becoming sick or injured: "*I've taken 5 doses of covid shot but I'm seriously craving a 6th. I'm double-masked everywhere I go but still scared out of my mind. Having trouble sleeping."*

The fear of unfamiliarity, such as with new technology (e.g., mRNA vaccine), was also present among users' comments: "*How many kids have died from this. Why isn't the media reporting on vaccine injury. They NEVER have. It's impossible that there has been 0 injury and 0 death.*"

Several comments also referred to the fear of losing control (e.g., fear of government power on individuals' lives): "*The consequences of removing our rights to bodily autonomy will eventually lead to our kids being forced to donate organs to random ppl*", as well as the fear of being deceived by a figure of authority (e.g., fear that public health messaging on the severity of COVID-19 is incorrect):

> *Everybody I know who has been vaxxed did so out of fear. Not over fear of Covid, but fear of:*
>
> *-Loss of travel*
>
> *-Loss of access to the economy*
>
> *-Loss of visitation rights towards family members*
>
> *-Loss of job*
>
> *-Loss of friends*
>
> *So tell me, who is the bigger threat, Covid or the govt?*"

As indicated in the reply above, those indicating fear over the COVID-19 vaccine or the impact of public health measures, but not the COVID-19 virus itself, tended to demonstrate less willingness to receive COVID-19 vaccination and to comply with public health measures. Skepticism and distrust in the government were also present in these cases.

### *4.4.9 Thematic Comparison Between Replies to Public Health Organizations*

Although the concept of fear was widely present among the replies, it was the only theme that was not present in the response to all three selected public health organizations; none of the replies to PHO Tweets were marked as indicating fear. Fear seemed more prominent in the replies to HC & PHAC Tweets compared to responses to OPH Tweets; however, the analyzed database for HC & PHAC was also more extensive, which likely accounts for that observation.

The majority of replies to OPH Tweets referenced to dissatisfaction with decision-makers. Numerous responses to OPH Tweet were related to maintaining locus of control, lack of understanding of scientific and health-related information, and skepticism and disbelief in evidence, respectively. Several replies referred to blaming authorities, presuming political corruption, and perceiving public health messaging as unclear; the prominence of these themes in OPHs dataset was similar.

Most replies to PHO referenced dissatisfaction in decision-makers. In order of prominence, several replies referred to maintaining locus of control, skepticism and disbelief in evidence, and blaming authorities, respectively. Very few replies to PHO Tweets referred to presuming political corruption, the perception of unclear public health messaging, or the lack of understanding of scientific and health-related information.

In comparison, the most salient theme in the replies to HC & PHAC Tweets referenced a lack of understanding of scientific and health-related information. A similarly prominent theme in replies to HC & PHAC Tweets were related to skepticism and disbelief in evidence. Many replies indicated dissatisfaction in decision-makers; the prominence of this theme between HC & PHAC and OPH was relatively similar, although more replies to HC & PHAC were coded to that theme. Various replies to HC & PHAC Tweets also denoted the necessity of maintaining locus of

control; this theme was not as prominent compared to lack of understanding of scientific and health-related information and skepticism and disbelief in evidence. Several of the replies referenced political corruption. Compared to the other themes, few replies to HC & PHAC Tweets alluded to the perception of unclear public health messaging and blaming authorities; the salience of these two themes within the replies was similar.

### 4.5 Summary of Results

A sentiment analysis was conducted to get a sense of the contextual differences between each public health organization. This revealed that OPH Tweets were the most positive among the three selected organizations, but that the public response was the most positive to PHO.

Following the sentiment analysis, we conducted a joint thematic analysis of the public health organizations' Twitter threads, and developed five themes from the data. Eight additional themes based on the public response were developed. To answer the research questions, governments use social media communication to provide risk communication advice, encourage specific behaviours, inform on the accessibility of services, share logistical information, and evoke emotions from the public. Moreover, risk communication was the most commonly shared information among the three selected public health organizations; however, the frequency of the type of intelligence provided varied among these three organizations.

Comparatively, thematic analysis of the public response during the COVID-19 reopening phase demonstrated lack of understanding of scientific and health-related information, skepticism and disbelief in evidence, dissatisfaction in decision-makers, presumption of political corruption, the necessity of maintaining locus of control, the perception of unclear public health messaging, blaming authorities, and fear. Interestingly, fear was not noted in the response to PHO Tweets. The most prominent theme in the public response to both OPH and PHO was dissatisfaction with

decision-makers. In comparison, a lack of understanding of scientific and health-related information was the most perceptible theme in the public response to HC & PHAC.

# Chapter 5: Discussion

Trust in health authorities is integral to the success of public health emergency responses. In this thesis, I aimed to better understand public reactions and the state of public trust in governmental public health organizations coming out of the COVID-19 pandemic, to better prepare against future crises. With this in mind, I addressed the following research questions:

1. How did different levels of government use social media communication to inform the public of COVID-19 information during the reopening phase?
2. What was the public response to the lifting of COVID-19 measures?

In this chapter, I delve further into the interpretation, meaning, and implications of both sentiment and thematic analyses findings. I then describe the limitations of this study and areas for future research.

## 5.1 Social Media Environment of Public Health Organizations

Social media is now an essential part of public health communication strategies. Previous research exploring social media usage across public health agencies in Ontario, Canada, found that social media is used as a communication tool to expand the reach of messages, engage in real-time dialogue with the public and debunk myths, and monitor the scope of public health risks (Khan et al., 2019). Additionally, public trust has been identified as an essential element for effective social media communication within public health agencies and for individuals to act upon public health agencies' messages during an emerging public health risk (Khan et al., 2019). With the growing use of social media across Canada, public health organizations must be active on social media to effectively inform the public and build their credibility ahead of a public health crisis. The real-time bi-directional interactive feature of social media platforms also facilitates the assessment of public health actions (Khan et al., 2019). Such assessment includes

leveraging social media to evaluate trust in public health organizations before, during, and after a public health incident.

In this thesis, the social media activity varied considerably across selected public health organizations, a finding which aligns with a previous study on the subject (Khan et al., 2019). Of the three public health organizations we compared, OPH was the most active on Twitter, followed by HC & PHAC, although more response data was retrieved for HC & PHAC compared to OPH. As previously mentioned, this is unsurprising since HC & PHAC messages are relevant to a greater proportion of the population compared to OPH messages; federal public health mandates were also in place the longest. This observation aligns with another study on the subject which found that public engagement was highest toward federal officials' Twitter accounts, compared to provincial accounts (Kada et al., 2022). Even though the usage of social media is widespread in Canada, PHO was considerably less active than the other two selected public health organizations, which limited the opportunity to adequately assess public perceptions for that organization. However, future research is needed to better understand public perceptions on the social media activity of public health organizations.

Results from our VADER Sentiment Analysis indicated Tweets from OPH were the most positive, followed by HC & PHAC Tweets, while PHO Tweets were mostly neutral. Consistent with the sentiment analysis results, our thematic analysis found the OPH Tweets tended to be more humoristic than HC & PHAC. Replies to OPH were also slightly more positive than replies to HC & PHAC Tweets, which implies that a humoristic or positive approach can be a more effective communication strategy (Xiao & Yu, 2022). However, the sentiment analysis results show that replies to PHO were the most positive among the three selected organizations.

A study on government communications found that formal communications influenced behaviour more effectively than informal communications (Linos et al., 2023). This observation, referred to as the formality effect, suggest that formality acts as a heuristic for importance and credibility (Linos et al., 2023). Additionally, previous research examining the effect of humour in crisis response messages suggest that humour diminishes the reputation and the perceived sincerity of an organization (Xiao, Cauberghe, & Hudders, 2018). This could suggest that informal communications (e.g., humoristic messages) during the COVID-19 pandemic crisis may have negatively influenced the trustworthiness of OPH messages. Further research examining the effectiveness of formal, neutral messages and humoristic, informal messages during the COVID-19 pandemic is needed to better understand the influence of formality in public health communications on public trust.

Although PHO was the only organization where the public response did not illustrate fear, the thematic analysis showed the most prominent theme in the public response to this organization was dissatisfaction with decision-makers, a salient sub-theme being anger. A previous study evaluating the effect of fear and anger on trust in the government during the COVID-19 pandemic found that fear generally leads to increased trust in government, while anger leads to decreased trust in government (Erhardt, et al., 2021). The link between anger and distrust in government was related to the attribution of blame for the adverse repercussions of the government, especially in ideologically right-wing respondents (Erhardt, et al., 2021).

In the context of this current study, blaming authorities and dissatisfaction in public health decisions were often prominent themes within the same reply. Twitter users conveying fear of the virus tended to express anger toward the lifting of COVID-19 measures. In contrast, those perceiving fewer risks to the COVID-19 virus had a propensity to express anger toward the

remaining measures. Considering previous research on the association of anger and distrust in government, the prominence of these themes among the replies may signal distrust. These findings further support the importance of monitoring social media discussions, such as by assessing sentiment and public opinions, to identify unknown issues and inform public health action in real-time (Khan et al., 2019).

Furthermore, none of the analyzed Tweets from PHO were related to encouragement toward specific behaviours, which was the second most prominent theme in communications from OPH and HC & PHAC. Based on the sentiment analysis findings, this suggests that nudging the public to engage in a particular behaviour may be perceived negatively due to its persuasive nature. This observation can be connected to the necessity of maintaining locus of control because the public may view nudging as intrusive to freedom of choice (Hagman et al., 2015). A previous study examining public opinion on the use of nudges in policies revealed that although the level of acceptance of nudge-policies was largely high among Swedish and American respondents, most also viewed the nudge-policies as intrusive to freedom of choice (Hagman et al., 2015). Similarly, a case-by-case analysis evaluating the ethics of health-promoting nudges noted that one of the critiques against these nudges are the potential of violating individuals' autonomous choices (Engelen, 2019).

It is important to note that the Tweet and reply count for PHO was low; the sentiment analysis results for this public health organization may be skewed due to the limited data. Even though less data was retrieved for that organization, analyzing PHO Tweets and replies was valuable as it not only helped contextualize the online presence of public health organizations at different levels of government, but it also helped direct future areas of research and raise awareness on the trustworthiness of validated automated social media tools over time.

### 5.2 Effectiveness of Public Health Messaging

The majority of public health organizations' Tweets were related to risk communication messaging and encouraging specific behaviours among the public. Based on the IDEA model, a risk and crisis communication framework composed of four components, the thematic analysis results indicate that the public health messages lacked important elements of effective crisis communication. The public health Tweets in this thesis incorporated elements of the IDEA model, such as internalization (I) and action (A), but lacked in distribution (D) and explanation (E) (Sellnow et al., 2017; Bang, 2021).

For instance, public health risk communications incorporated the concept of internalization (i.e., describing how the public may be affected by the risk or crisis) by clearly stating the potential outcomes of the COVID-19 virus and those most at risks of severe illness from COVID-19 (e.g., older adults, immunocompromised, chronic condition). Additionally, the selected public health organizations communicated specific actions (i.e., stating actionable directives to protect oneself and others from the risk) that the public could take to protect themselves and their loved ones from severe illness (e.g., encouraging specific behaviours). Such actionable directives included recommending hand washing, mask wearing, and vaccination to reduce individuals' risks and the risk of others against COVID-19.

However, the public health communications lacked in distribution (i.e., information sharing and reach of messages). There was a clear difference in social media presence among OPH, PHO, and HC & PHAC, with PHO having the least social media activity. PHO lower social media activity usage also led to less public interaction compared to OPH and HC & PHAC. Inconsistent distribution of information across these three levels of government was also observed. This was especially brought forward in the replies discussing provincial and municipal public health

decisions. For example, replies to OPH often referred to or blamed the provincial government (i.e., Government of Ontario) for starting to lift the COVID-19 measures as it seemed to have led OPH to follow shortly after. The inconsistency in terms of the presence or absence of mandates depending on the jurisdiction also led to uncertainty. For instance, federal mandates, such as mask wearing in federal public transport, were still in place while provincial and municipal mandates were lifted. At the federal level, this led to more upset and questioning on the rationales for the remaining mandates.

Based on the IDEA model, the explanation of risk and public health measures in public health communications were also lacking. Due to the novelty of the COVID-19 virus, the information on the virus and public health measures changed over time. However, the evolving science led to inconsistencies and confusion among the public. For example, users continued to doubt the effectiveness of masks even after new studies on the topic emerged. Furthermore, the explanation for these measures was not adequately presented. To illustrate, users' scepticism and distrust of the COVID-19 vaccines were often voiced in responses to Tweets about booster shots or needing additional booster shots. Some Twitter users seemed to believe that the primary purpose of COVID-19 vaccines was to prevent contracting the virus and the necessity of boosters indicated vaccines were flawed. In reality, the COVID-19 vaccines reduced risk of severe outcomes from the virus, as well as possibly reducing risk of becoming infected (Government of Canada, 2023). With new variants and immunity fading over time, new vaccines and boosters were necessary to tackle the renewed risk of severe illness from the virus. This subtlety was important to articulate clearly for the public to properly understand the value of COVID-19 vaccination. Based on public discussion, the vaccination communication could be perceived as unsuccessful. This highlights the importance of clear, concise, and consistent communication of information by public health

organizations. These findings also indicate that improving communication strategies is essential to enhancing public trust in the Canadian government and public health system.

### 5.3 Dynamic Context of Trust

Throughout the period of the lifting of COVID-19 measures, there was a clear shift from calls to lift mandates— to calls to re-implement mandates in response to OPH Tweets. The overwhelming majority of those stating their disenchantment with OPH and their fading trust in them altered drastically from February/March to April, indicating a dynamic context in which public trust fluctuated. Although a similar shift was noticed in the comments to HC & PHAC Tweets, it was not as apparent. Most comments stating their disenchantment towards HC & PHAC were still about the remaining federal measures. Meanwhile, replies to PHO hoping for mandates to be reinstated and replies against or skeptical towards the mandates were present in February and March.

The public Tweets against the COVID-19 measures reflected a belief that the government or public health organization is '*brainwashing'*, sharing *'propaganda'*, or *'fear mongering'* about the severity of the COVID-19 virus and the necessity of following guidelines or recommendations. Additionally, there was a strong sense of the public being "*fed up*" with COVID-19 and wanting to move on or return to normal. On the other hand, the public Tweets calling for the reinstatement of COVID-19 measures stemmed from the perception that lifting of mandates indicated that "*COVID is over*" and thus, people would no longer follow recommendations without mandates. Public Tweets against the lifting of COVID-19 measures often demanded the authority to use its powers (e.g., section 22 for OPH) to restore the mandates or indicated feeling let down by public health organizations. In both cases, users indicated skepticism of public health decisions, such as believing decisions were politically, rather than scientifically, based.

Consistent with the literature on trust in health authorities, it is unsurprising that those against the COVID-19 public health measures indicated skepticism of public health organizations. Based on previous literature on trust in authorities, trust in government or health authorities is correlated with compliance to preventive measures (Siegrist & Zingg, 2014; Han et al., 2021). However, skepticism of health authorities from the pro-mandate users is worrying because it suggests a growing sense of distrust in public health organizations from both ends of the pro-mandate/anti-mandate spectrum.

Indicators of distrust in selected public health organizations were closely related to dimensions of trust present in existing frameworks and measures of public trust in a governmental organization: honesty, benevolence, and competence (Grimmelikhuijsen, & Knies, 2015). For instance, Twitter users' mistrust in the selected public health organization was often due to perceived dishonesty (e.g., the public health organization is not sharing the evidence transparently), lack of benevolence (e.g., the public health organization is prioritizing political interests over citizens' health and safety), and incompetence (e.g., the public health organization is making illogical recommendations). These results align with previous research on public trust (Hall et al., 2001; Grimmelikhuijsen, & Knies, 2015).

Based on our findings, the public response to the lifting of COVID-19 measures indicates a need to demonstrate transparency by providing evidence and sharing data to increase the credibility of the public health organization and feeling of autonomy within individuals. Moreover, public health communications may emphasize sense of autonomy by presenting information in a way that individuals will perceive they are making their own risk-benefit analysis. To illustrate, such autonomy-supportive messages can encourage vaccination by stating

"*The evidence show that the vaccine is 90% effective at preventing severe illness from COVID-19.*" instead of prescriptive messages such as "*Get your COVID-19 vaccine to be safe.*"

Thus, we recommend future policies be transparent by declaring when further research is necessary before confirming whether a particular technology or technique is or is not effective in protecting against a novel disease. This will help improve public trust in Canadian governmental public health organizations and better prepare against future disasters, especially when the scientific knowledge on the matter is evolving.

### 5.4 Establishing Credibility Ahead of Public Health Crises

Twitter should be used carefully and strategically, being mindful that messages on social media can be co-constructed by both the posting organization and the public, and through their responses, message can become distorted (Steils & Obaidalahe, 2020). For instance, a topic, such as encouraging vaccination, was presented by a public health organization, but a member of the public could change the message by tweeting about dangers of the vaccine. This can create a snowball effect, where a simple Tweet is posted by an organization, but as more individuals connect with the Tweet and each other, more opinions and information are shared, such as replies with misinformation. As a post gains momentum, more information is transferred, such as the belief that the vaccine's side effects are more likely and severe than the COVID-19 virus (i.e., message distortion), leading to skepticism and distrust in the public health organization.

Due to the multi-directional nature of social media discussions, public health organizations must be conscious of the eventual co-construction and distortion of their messages. This indicates a need for public health organizations to establish credibility on social media ahead of a public health crisis to minimize belief in misinformation and disinformation the public may encounter. However, in the current context of the COVID-19 pandemic, we recommend public

health organizations assess common beliefs or shared misinformation and address these directly in a reasonable timeframe (using data to back up their claims) to minimize the spread of false information and maintain credibility during a public health crisis.

### 5.5 Political Literacy

The line between public health organizations and other forms of authority seemed porous to the public during the pandemic, which negatively impacted trust in public health organizations. The porosity between public health organizations and other governments seemed to have been both due to these organizations blending in the context of the COVID-19 pandemic (i.e., both governmental non-public health and public health organizations were sharing information on the COVID-19 pandemic and the guidelines) and a lack of political literacy among the general population. The public did not seem to clearly understand the role and difference between individual representatives of an organization (e.g., Dr. Vera Etches at OPH, Dr. Kieran Moore at PHO, Dr. Theresa Tam at PHAC versus Mayor Jim Watson, Premier Doug Ford, Prime Minister Justin Trudeau), public health organizations (e.g., OPH, PHO, HC & PHAC), and other governments (e.g., Government of Ontario, Liberal Party of Canada, Government of Canada). There is harm in leaving the roles and mandates across different governmental organizations ambiguous, as a dislike or distrust in a certain political affiliation or decision can lead to an instinctive distrust in a public health advice. In the Canadian context, Chief Medical Officers of Health (CMOH) are public servants, but they are expected to "assert independent authority as non-partisan scientific experts" to maintain their credibility (Cassola et al., 2022). This is particularly important for CMOH to demonstrate during a public health emergency, such as the COVID-19 pandemic.

In the future, political and public health authorities must maintain a distance to avoid confusion in their role and objectives. There is also a need to improve political literacy among Canadians to ensure that the answers to questions such as *"Who makes public health related decision?"*, *"Who applies them?"* and *"When does different organizations intersect?"* are clear to the general public. Increasing political literacy of the public can have beneficial implications in terms of maintaining public health organizations' credibility and enhancing the public confidence in them during future public health crises.

### 5.6 Health and Scientific Literacy

In the same vein, the results from this study indicate a need to improve scientific and health comprehension among the general population. The public often disregarded or mistrusted risk communication advice from a public health organization. For example, numerous users were displeased with a public health organization's recommendation to get vaccinated, due to the belief that natural immunity was more effective. This suggests a need for education on vaccines, herd immunity, natural immunity, and the difference between them. There is also a need to educate the population on the advantages and disadvantages of obtaining immunity through vaccines and natural infection to better understand the value of vaccines (CDC, 2022).

Twitter users expressed skepticism or disbelief in public health organizations' recommendations due to the perceived lack of data or transparency. Such requests for information included providing percentages (e.g., percent of risk of developing myocarditis from a vaccine) to better understand the risk-benefit of following COVID-19 protective measures. The lack of information led some individuals to do their own research to find evidence. For instance, a Twitter user referred to a scientific article from a credible source (e.g., NIH, PubMed) to back up their claim. However, upon checking, this article was withdrawn following peer review due to

evident bias. These results indicate a need from an increasing tendency of individuals to do their own research to have access to the data guiding public health decisions. The results also indicate a need to educate the general population on the meaning of the data, the importance of peer review, the presence of predatory journals, and the difference between a published versus a preprint article to reduce risks of misunderstandings and belief in misinformation.

### 5.7 Limitations

There are important limitations in this research that must be considered when interpreting the results. Firstly, the findings are limited to conversations in the selected Twitter threads, which may not accurately reflect the overall Canadian public discourse (Kada et al., 2022). Only Tweets and replies containing specific key terms were selected, meaning that relevant Tweets and replies discussing the lifting of COVID-19 measures could have been missed. Additionally, only Twitter posts and replies in English were considered in this study, which may also constrain the representativeness of the findings considering the diversity of the Canadian population (Kada et al., 2022). The data was not disaggregated, which limits specific considerations on the users and region, such as demographic information (Kada et al., 2022).

Furthermore, methodological research, specifically on automated sentiment analysis tools, is required to confirm the sentiment analysis observations in this study. As a qualitative study, this research aimed not to confirm hypotheses and produce generalizable results but to gain a deeper understanding and offer recommendations. However, because only 14 Tweets and replies were retrieved for PHO, the sentiment analysis results may be inflated due to the limited amount of data collected. Nonetheless, including this organization in this study was important to offer greater contextual information on the online presence between municipal, provincial, and federal public health organizations.

Additionally, automated sentiment analysis tools are efficient, but confirming their accuracy is crucial when mining for public opinion to make recommendations or implement new strategies. Because VADER Sentiment Analysis is a lexicon and rule-based sentiment analysis tool, sarcasm is often challenging to identify, which may skew the results. Furthermore, new internet vocabulary and slang emerge through time, and the addition of these new terms in the VADER lexicon would surely improve its accuracy (Meduru et al., 2017). Although the exact percentage of positivity, neutrality, and negativity for each public health organization may be debatable based on the sentiment analysis method used, the overall results from the VADER Sentiment Analysis tool, when it comes to the comparison between public health governments, are consistent with my impressions. That is, Tweets from OPH were the most positive, followed by HC & PHAC Tweets, while PHO Tweets were the most neutral. OPH Tweets tended to be more humoristic than HC & PHAC, while PHO Tweets were consistently neutral. Due to the larger number of replies, it is difficult to gauge the consistency of the sentiment analysis of the replies and my overall impressions. To confirm the sentiment analysis results of this research, convergent validity with VADER could be established by using another text analytic tool. However, quantitative research should also be undertaken to further evaluate the validity of VADER Sentiment Analysis tool.

Notwithstanding these limitations, the value and impact of this study remains instrumental. The novelty, methodological approach, and findings of this research led to the elaboration of practical policy and risk communication recommendations relevant to COVID-19 pandemic recovery and preparing for future public health crises.

### 5.8 Areas for Future Research

When a public health risk or crisis is successfully prevented, the public likely does not interact with the public health organization. However, when public health strategies are unsuccessful, the public is highly aware of the organization. Due to the extensive impact of the COVID-19 pandemic, Canadians' perception of public health organizations is likely moulded by their experience of that organization during this crisis. Thus, continued research on the impact of COVID-19 is needed as this crisis will influence the public future interaction with public health organizations.

Future studies could evaluate the opinions of individuals on the social media activity of public health organizations to better understand its influence on public perception during a public health crisis. Future research should also explore Canadians' political and health/scientific literacy through semi-structured interviews or focus groups to assess specific gaps of understanding and guide areas of improvements in education. Semi-structured interviews or focus groups would allow researchers to ask specific questions on the topic, and would also allow probing of interesting remarks that may arise during the conversation. Furthermore, future studies should investigate the effectiveness of autonomy-supportive messaging compared to prescriptive messaging. Future research should also assess public perception of an individual representative versus no definite representative of an organization to better understand how it influences perceived trustworthiness and credibility of that organization.

# Chapter 6: Conclusion

This thesis aimed to explore public trust in governmental public health organizations through social media communications during the COVID-19 pandemic reopening phase. By examining social media responses to the lifting of COVID-19 measures and the social media communication strategies used by different levels of government, I sought to gain a better understanding of the current state of public trust in Canadian public health organizations.

In alignment with the nature of this thesis, two research questions were articulated to narrow the focus of this research. As presented in the sections above, the research questions are provided below:

1. How did different levels of government use social media communication to inform the public of COVID-19 information during the reopening phase?
2. What was the public response to the lifting of COVID-19 measures?

Social media is a mainstream communication method. The use of social media platforms by public health organizations is also becoming widespread, although it necessitates close monitoring. Canadian public health organizations at different levels of government mainly used social media for risk communication. The public health organizations included in this thesis also used social media to share logistical information, inform on the accessibility of services, encourage specific behaviours, and evoke the public's emotions.

The reactions of the public during the lifting phase of the COVID-19 pandemic were mixed. However, negative sentiments, such as anger and frustration, were salient. The public expressed dissatisfaction with decision-makers, skepticism and disbelief in evidence, confusion regarding public health messages, and fear, which were all related to low confidence in the public

health organizations. Furthermore, the public response revealed the necessity of individuals to maintain their sense of autonomy during a crisis. The public also blamed authorities for the repercussions of public health decisions during the lifting of COVID-19 measures. Moreover, the public often did not understand scientific and health information, which posed a challenge during the pandemic. The public also did not distinguish between politics and public health.

To promote public trust, public health organizations must communicate clear, succinct, and consistent information, remain transparent about scientific uncertainty, demonstrate transparency by providing evidence and sharing data to increase the credibility and the sense of autonomy within individuals, and assess and address common misinformation. It is also pivotal for public health organizations and the government to improve science and health literacy among the public. Furthermore, there is a need to enhance political literacy, specifically to decrease the porosity between politics and public health in future disaster responses, to minimize distrust in public health advice due to dislike of a political affiliation.

The knowledge acquired from this project directly contributes to social sciences literature on trust, specifically on public trust in disaster settings. With respect to the thematic analysis results, future public health policies must be tailored based on the current state of trust in Canadian governments, especially in public health systems, to successfully incorporate public health advice within the public in the short- and long-term. Lastly, the suggestions made in accordance with the sentiment analysis results can be used to guide future public health social media communications and to caution on the confidence in using automated analysis tools in disaster response policies.

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# Appendix A

*Python Code for Collection, Download, and VADER Sentiment Analysis of Twitter Data.*

```
# File: twitter_api.py
# Creator: Lucie Péléja
# Version: Final
# Programming Language: Python
# Creation date: 2022-08-05
# Last modification: 2022-10-30
# Copyright: 2022 Telfer School of Management, University of Ottawa
# Reference: Hutto, C.J. & Gilbert, E.E. (2014). VADER: A Parsimonious Rule-based Model for
Sentiment Analysis of Social Media Text. Eighth International Conference on Weblogs and
Social Media (ICWSM-14). Ann Arbor, MI, June 2014.
# Description: this program extracts Twitter data based on specific criteria. The sentiment
expressed in each tweet is automatically analyzed using the VADER Sentiment Analysis (Hutto &
Gilbert, 2014). The data is exported into a .csv file.

from cProfile import label
import keyword
from telnetlib import STATUS
import tweepy
import configparser
import time
import pandas as pd
from vaderSentiment.vaderSentiment import SentimentIntensityAnalyzer

bearer_token =
                    Protected information


# read configs
config = configparser.ConfigParser()
config.read('config.ini')

api_key = config['twitter']['api_key']
api_key_secret = config['twitter']['api_key_secret']

access_token = config['twitter']['access_token']
access_token_secret = config['twitter']['access_token_secret']

# authentication
auth = tweepy.OAuthHandler(api_key, api_key_secret)
auth.set_access_token(access_token, access_token_secret)

api = tweepy.API(auth)

# user tweets
# user = 'veritasium'

# tweepy
client = tweepy.Client(bearer_token, wait_on_rate_limit=True)

# Search tweets
```

```
covid_tweets = []
for response in tweepy.Paginator(client.search_all_tweets,
                                 query = '(covid OR mask OR vaccine OR vax OR test OR pass OR
restrict OR require OR lift OR mandate OR reopen OR measure) (from:PublicHealthON OR
to:PublicHealthON) -is:retweet lang:en',
                                 user_fields = ['username', 'public_metrics', 'description',
'location'],
                                 tweet_fields = ['author_id', 'created_at',
'conversation_id','public_metrics', 'text'],
                                 expansions = 'author_id',
                                 start_time = '2022-02-21T17:54:00.000Z',
                                 end_time = '2022-04-28T03:59:00.000Z',
                                ):
    time.sleep(1)
    covid_tweets.append(response)

# Create DataFrame
result = []
user_dict = {}

# Loop through each response object
for response in covid_tweets:
    # Take all of the users, and put them into a dictionary of dictionaries with the info we
want to keep; allows to see all tweets instead of only one
    for user in response.includes['users']:
        user_dict[user.id] = {'username': user.username,
                              'tweets': user.public_metrics['tweet_count'],
                              'description': user.description,
                              'location': user.location
                             }

    for tweet in response.data:
    # Put all of the information we want to keep in a single dictionary for each tweet
        result.append({'User': tweet.author_id,
                       'Tweet': tweet.text,
                       'Number_Replies': tweet.public_metrics['reply_count'],
                       'Date': tweet.created_at,
                       'Convo_ID': tweet.conversation_id
                       })

# Retrieve score for polarity via row function
def vs(row):
    vs = SentimentIntensityAnalyzer()
    score = vs.polarity_scores(row)
    return score

# Separate the score for 4 rows (negative, neutral, positive, compound) function
def sentiment_analysis():
    df = pd.read_csv('Twitter PublicHealthON.csv')
    vs_results = [vs(row) for row in df['Tweet']]
```

```
    vs_df = pd.DataFrame(vs_results)
    # Compound score label
    vs_df['Sentiment'] = ['Positive' if x >= 0.05 else 'Negative' if x <= -0.05 else
'Neutral' for x in vs_df['compound']]
    return vs_df

# Create Excel file with data
df = pd.DataFrame(result)
df.to_csv('Twitter PublicHealthON.csv', encoding = 'utf-8')
# Call function to combine twitter data with sentiment analysis
dfJoined = df.join(sentiment_analysis())
# Create Excel file with combined data
dfJoined.to_csv('Twitter PublicHealthON.csv', encoding = 'utf-8')
```

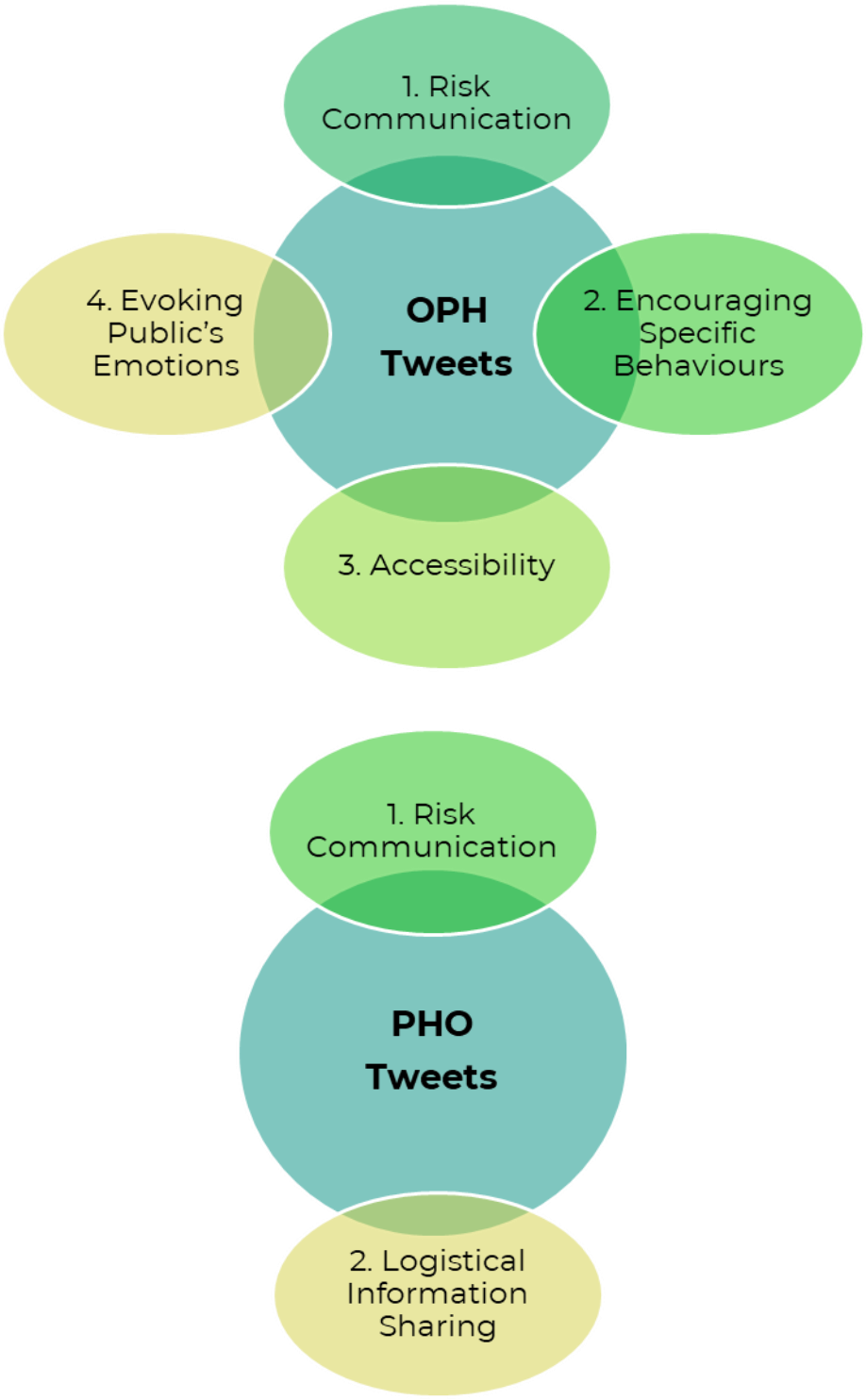
# Appendix B

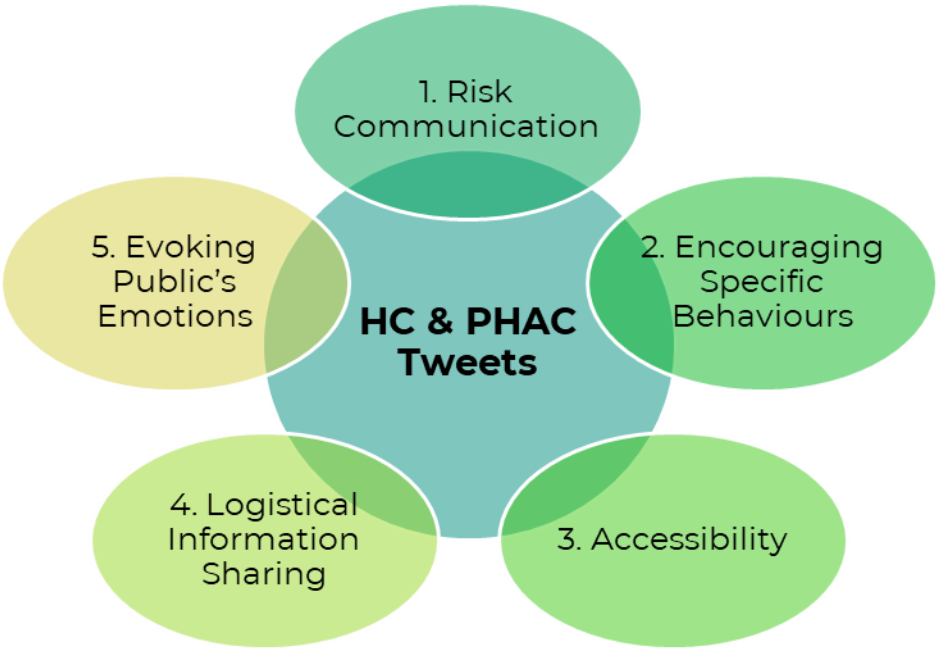
*Public Health Ontario Excel Database Sample.*

| | Tweet | neg | neu | pos | compound | Sentiment |
|---|---|---|---|---|---|---|
| 2 | PHO's Omicron Risk Assessment has been updated as mor | 0.067 | 0.863 | 0.07 | 0.0258 | Neutral |
| 3 | @PublicHealthON @uhwuhna This PHO risk assessment dc | 0.172 | 0.711 | 0.117 | -0.4325 | Negative |
| 4 | How are other jurisdictions handling the ongoing COVID-1 | 0 | 1 | 0 | 0 | Neutral |
| 5 | @PublicHealthON To which "ongoing COVID-19 pandemic | 0 | 1 | 0 | 0 | Neutral |
| 6 | The Ontario COVID-19 Data Tool provides the latest epide | 0 | 1 | 0 | 0 | Neutral |
| 7 | @PublicHealthON Hello, I also sent an email but the respo | 0.05 | 0.95 | 0 | -0.4497 | Negative |
| 8 | @PublicHealthON Unfortunately I, and many others, have | 0.103 | 0.769 | 0.127 | 0.2732 | Positive |
| 9 | @PublicHealthON Can you please post the data on the rec | 0 | 0.7 | 0.3 | 0.743 | Positive |
| 10 | Data and surveillance of key public health indicators conti | 0 | 0.863 | 0.137 | 0.5574 | Positive |
| 11 | @PublicHealthON Can we have key indicators that aren't l | 0.133 | 0.673 | 0.194 | 0.4927 | Positive |
| 12 | Our latest evidence brief looks at common themes to guid | 0.124 | 0.876 | 0 | -0.6573 | Negative |
| 13 | @PublicHealthON Please explain: if someone COVID posit | 0 | 0.877 | 0.123 | 0.7096 | Positive |
| 14 | Our new epi summary looks back at neighbourhood mater | 0.094 | 0.906 | 0 | -0.4215 | Negative |
| 15 | @PublicHealthON Here's an idea. Why not look at vaccina | 0.221 | 0.779 | 0 | -0.7783 | Negative |

## Appendix C

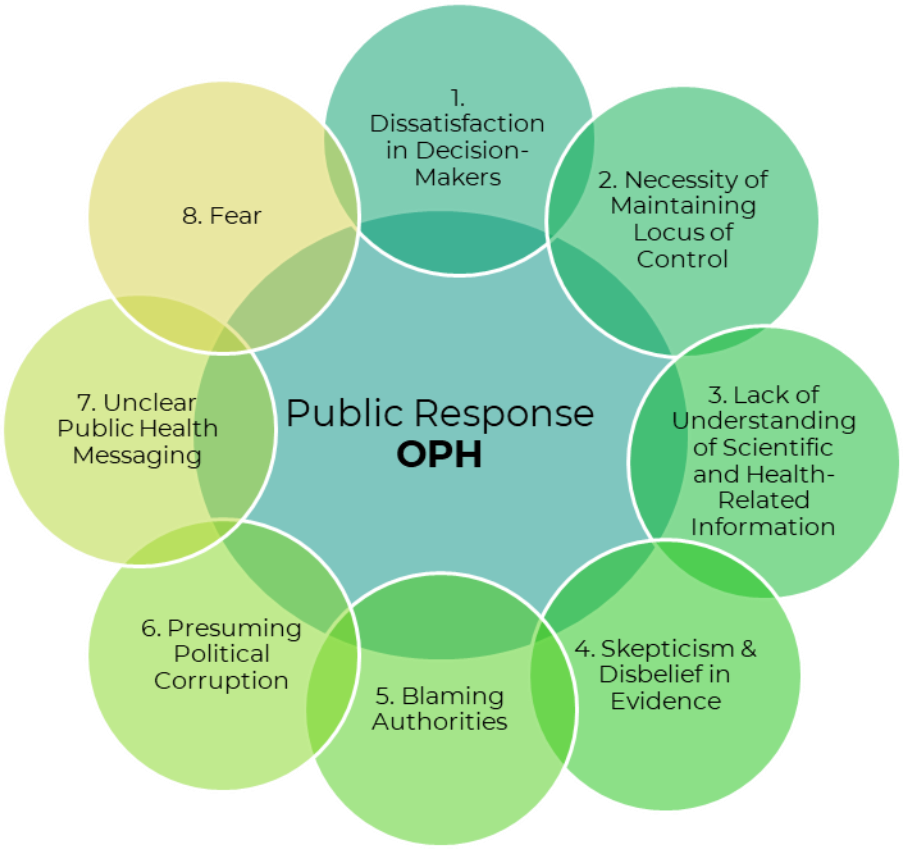
*Prominence of Themes for Each Public Health Organization.*

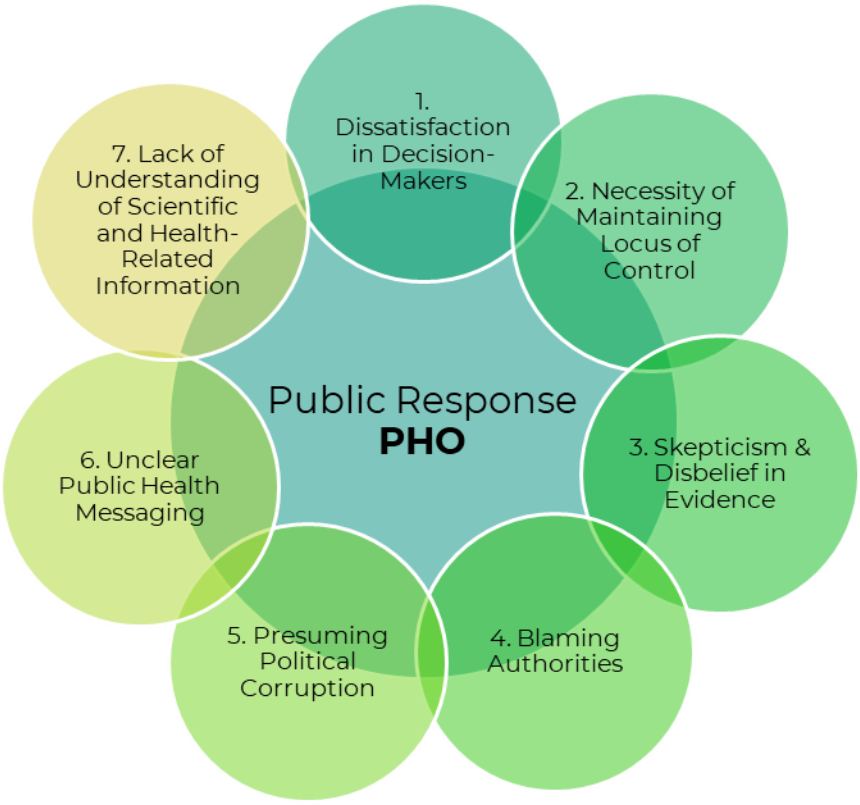


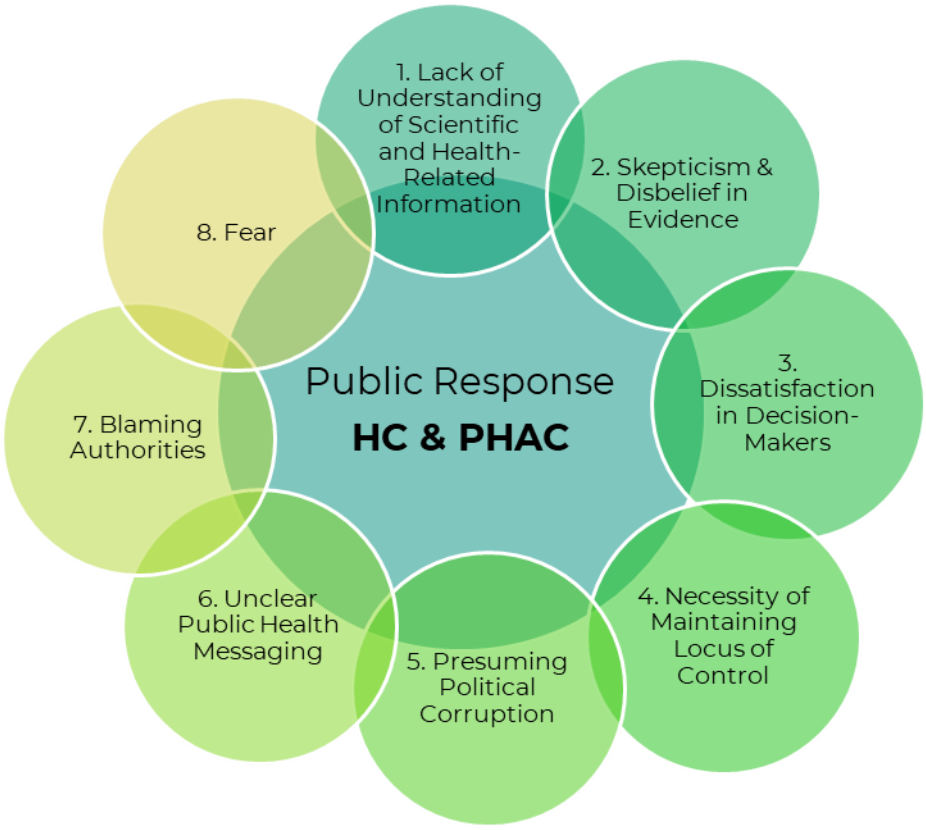

1. Risk Communication
2. Encouraging Specific Behaviours
3. Accessibility
4. Logistical Information Sharing
5. Evoking Public's Emotions
HC & PHAC Tweets

## Appendix D

*Prominence of Themes for the Public Response to Each Public Health Organization.*




1. Dissatisfaction in Decision-Makers
2. Necessity of Maintaining Locus of Control
3. Skepticism & Disbelief in Evidence
4. Blaming Authorities
5. Presuming Political Corruption
6. Unclear Public Health Messaging
7. Lack of Understanding of Scientific and Health-Related Information
Public Response
PHO


1. Lack of Understanding of Scientific and Health-Related Information
2. Skepticism & Disbelief in Evidence
3. Dissatisfaction in Decision-Makers
4. Necessity of Maintaining Locus of Control
5. Presuming Political Corruption
6. Unclear Public Health Messaging
7. Blaming Authorities
8. Fear
Public Response
HC & PHAC