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Examining public health risk communication via social media by provincial and local health authorities in Ontario during the COVID-19 pandemic

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Abstract

Risk communication campaigns are essential during public health crises to inform the public about ways to mitigate, alleviate and manage potential risks. The purpose of this study was to describe risk communication on social media by Ontarian health authorities amid COVID-19, in addition to examining the strategies that guided their social media use. This was completed through (a) a narrative review of risk communication literature; (b) a qualitative content analysis of select health authority *Twitter* messaging following three major COVID-19 milestones; and (c) key informant interviews with those coordinating social media responses to COVID-19. Information giving and news updates were the prominent functions of *Twitter*, while communicating about health equity and misinformation was less prominent. Interviews revealed that staffing, financial resources, and leadership buy-in are key to facilitating risk communication, and there is mixed use of theory and evidence to inform strategies. Recommendations are discussed, including the need for evidence-based, proactive emergency communication plans, and an increased consideration of equity in risk communications.

Keywords

risk communication, social media, *Twitter*, public health, COVID-19, pandemic, provincial government, local government, Ontario, content analysis, key informant interviews

Summary for Lay Audience

Social media is a powerful tool that governments can use to communicate essential information to the public, especially during an emergency like a pandemic. However, it is also important that these governments approach the use of social media carefully, as misuse can lead to confusion and misinformation. Evidence has unfortunately shown that there are gaps in how governments use strategies to communicate over social media (Tursunbayeva, Franco, & Pagliari, 2017).

This study aimed to describe how *Twitter* was used during an emergency by provincial and local governments in Ontario using COVID-19 as a case study, while also aiming to understand what strategies were used by these governments to communicate on social media. This was done by reviewing tweets from a group of Ontarian health authorities following three major COVID-19 milestones. Following this, interviews were conducted with six individuals who were responsible for social media communication to gain an understanding of their successes, challenges, and strategies.

The analysis of *Twitter* communication revealed that primarily, this group of Ontarian governmental bodies focused on offering information and resources to the public, while providing updates about the spread of COVID-19 in the community. While important, there was less focus on the impact of COVID-19 on vulnerable populations (e.g., those experiencing homelessness, addiction, etc.), and providing clarity on misinformation. Interviews showed that individuals responsible for this communication at these governmental bodies may need access to increased staffing and funding, as well as more support from the leaders at their organization. Further, interviews confirmed that some governmental bodies used evidence to back up their social media communication, while others did not.

Based on these findings, it is suggested that governments work toward having strategies in advance of a crisis that uses evidence to be better prepared, while actively working with media outlets to identify and manage misinformation. More focus on how crises such as COVID-19 impact vulnerable populations should also remain a priority for these governments in their communication strategies.

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Preface – About the Author

Remaining consistent with the belief that identifying paradigmatic beliefs of a researcher is important to determine quality of qualitative research, I will aim to remain reflexive by identifying my own positionality throughout the completion of my thesis. This is done with the goal of enabling the reader to assess how my pre-conceived notions and assumptions may shape and influence my writing. My understanding of paradigmatic approaches is guided by Guba and Lincoln (1994), who present five paradigms: (a) positivist; (b) post-positivist; (c) constructivist; (d) critical theory; and (e) participatory. Through reflexive notes conducted throughout coursework and this thesis (see Appendix A), I situate myself as a critical constructivist.

I believe the paradigmatic beliefs of critical theory and constructivism can be aligned as they are ontologically commensurable. Having only recently been introduced to the depth of qualitative inquiry, I was immediately made aware through reflexivity of my inherent tendency toward issues of social justice and equity, as well as my belief that realities are constructed by individual experiences. As a student with a Bachelor's degree in Public Health, I have been trained in my education to remain acutely aware of social injustices and consider approaches to address these inequities. For example, I completed community engagement projects focused on engaging LGBTQ+ populations around HIV stigma, as well as working in non-profit organizations that facilitate job building skills and workshops for lower income individuals. I strongly believe that our communities are stronger when we put effort into uplifting those who are systematically disadvantaged.

These experiences and my background in public health have led me to investigate how health information can be made accessible and communicated appropriately to communities. I have an inherent belief that health information should be easily understood and communicated

properly to combat inequities that arise as a result of social determinants of health, particularly education and socioeconomic status. Further, my alignment with constructivism enables me to understand, through interviews, how health communication is executed from the relative reality of interview participants and their lived experiences. With this in mind, I do also believe that diversity in approaches is important to provide a complex and well-rounded understanding of the world around us.

I've always been interested in health equity and connecting with hard-to-reach populations. I've also had an interest in social media because I think that it is becoming one of the most important communication tools that public health has to reach populations. Firsthand experiences have revealed for me that remaining connected through technology remains a priority for most individuals, regardless of factors like socioeconomic status. I believe that social media has become such an important part of society and there is significant value in investing time and resources into thinking about how it is done properly. Further, I believe the work of local health units presents key opportunities to make meaningful change in communities. Through their connections to local agencies and their reach with individuals in the community, they play a significant role as a source of support and information. These experiences have motivated me to understand specifically how our local health authorities work in tandem with the Ontario provincial government to communicate in the midst of COVID-19, as I believe it has a significant impact on the ability of our communities to utilize information to protect themselves.

Throughout this thesis, I hope you are able recognize the importance of examining official communications amidst a public health crisis, the presence of my paradigmatic positioning, and the significance of this research, specifically for vulnerable populations.

Chapter 1 – Introduction, Research Questions and Gaps

1.1 Introduction

Risk communication campaigns are essential during public health crises to inform the public about ways to mitigate, alleviate and manage potential risks (Sutton, Renshaw, & Butts, 2020). Periods of crisis amplify the need for clear and decisive communication. If not managed properly, these crises can leave the public susceptible to further harm as they try to navigate mass amounts of conflicting information (Sezgin et al., 2020). Risk communication strategies have been most notably used during previous public health crises like that of the H1N1, SARS, Ebola and Zika virus epidemics (Wang, Hao, & Platt, 2021). The COVID-19 pandemic is clearly a public health crisis that necessitates a comprehensive risk communication strategy, and beyond this, one that would benefit from technology such as social media to aid in its effort of educating and protecting the public.

The onset of the COVID-19 pandemic began in December of 2019, where cases of pneumonia with an unknown origin began to spread across China (Zhao et al., 2020a). In a matter of months, the COVID-19 virus spread globally, becoming a deadly threat, especially to vulnerable populations such as older adults (Zhao et al., 2020a). COVID-19 required health authorities around the world to adapt and refine the methods in which they communicated the newest scientific findings and resulting public health information and policies. Historically, the execution of effective communication from health authorities has been lacking, as research during previous public health crises found that risk communication strategies clearly needed to be strengthened (Chew & Eysenbach, 2010; Department of Health and Human Services, 2020). As such, social media presents unique opportunities to improve public health risk communication strategies to provide information to individuals who are active and attentive to social media platforms.

Risk can be defined as "a situation or event in which something of human value (including humans themselves) has been put at stake and where the outcome is uncertain" (Hampel., 2006, p. 7), while risk communication focuses on "the exchange of real-time information, advice and opinions between experts and people facing threats to their health, economic or social well- being" (WHO, 2020a, para. 1). Risk communication is generally approached with two streams of thought – realist and social constructionist. Realist risk communication sees risk as objective and separate from context, while social constructionists see risk as interrelated with social context (Abrams & Greenhawt, 2020). Risk communicators have most commonly held the social constructionist approach (Abrams & Greenhawt, 2020), as an individual's perception and relationship with a risk play an influential role in how they mitigate their risk (Abrams & Greenhawt, 2020). This perception on relationship with risk is significant, as understanding how risk communicators view and understand risk itself influences how they develop systematic and coordinated risk communication campaigns. This thesis will approach risk communication from the social constructionist perspective, which will remain consistent with the researcher's paradigmatic positioning.

This thesis will focus on the use of social media as a communication tool to disseminate information to educate the public, using the COVID-19 pandemic as a case study. Social media can be considered "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user generated content" (Kaplan & Haenlein, 2010, p. 61). More specifically, social media slightly differentiates itself from the term *social networking.* Authors like Moorhead and colleagues (2013) identify that social media functions generally as a communication channel that delivers a message, while networking is more about two-way

communication. However, these terms are not considered mutually exclusive, as social media platforms can facilitate social networking. This study will focus on the role of social media as a communication channel, specifically from a governmental health authority during a period of crisis, rather than evaluating exchanges of information (i.e., networking) in these online environments.

The widespread and growing use of social media applications, such as *Facebook* and *Twitter*, have enabled health authorities to communicate directly to their communities via these channels, making them powerful methods of communication. A Canadian survey revealed that 83% of Canadians who are online reported having at least one social media account in 2020 (Gruzd & Mai, 2020), and over 70% of those online are using these sources to seek health information (Fox & Duggan, 2013). *Twitter* is seen as especially popular in the context of public health crises (Chan et al., 2020) and has been selected as the social media platform of interest given its ability to promote rapid dissemination and result in the spread of user-generated content (Chan et al., 2020).

Despite the increasing use of social media, from an equity perspective, it is important to keep in mind the reach of social media. There are specific groups of people who are not online or do not utilize these platforms, and thus do not have access to information from sources like *Twitter*. While the ability of social media to effectively disseminate information to the public will be mentioned throughout this thesis, it is important to remain aware that 17% of the Canadian population is not on any social media (Gruzd & Mai, 2020). For example, researchers in Canada have identified that individuals with low income (household incomes of $30,000 or less) were less likely to have internet access (ACORN, 2019). This is what is often identified as the *digital divide*, which refers to inequitable access to the internet that is not

evenly distributed amongst the general population, leaving gaps in who can access web-based information (van Deursen, 2020). This concept will be examined further in Section 1.3, which will focus on equitable considerations for social media. However, throughout this thesis, the awareness of these inequities must remain at the forefront and be stated at the outset when discussing social media's ability to disseminate health information to the public amidst a public health crisis.

Investing time and resources into using and understanding social media platforms is nevertheless worthwhile. Researchers have shown that the internet was the most popular source of health information used by the public during the H1N1 pandemic of 2009 (Jones, 2009). During this time, social media was shown to facilitate the monitoring and surveillance of disease levels and public concern (Signorini, Segre, & Polgreen, 2011). The ability of social media to act as a source of data for monitoring a public health crisis held true for the Ebola outbreaks of 2014 as well, as a strong relationship was identified between the events of the Ebola outbreak and increased *Twitter* activity related to such concerns (Househ, 2016).

Fung and colleagues (2016) also explored social media literature on the Ebola outbreak by completing a systematic review of twelve studies that met their criteria. These authors found that evidence suggests social media has the ability to enhance public health communications, but the utility of social media research to public health practitioners is needed. Utility in this context refers to the use of social media research in routine health communication practice of public health agencies. This lack of understanding in utility highlights the importance of connecting social media research to its practical applications in healthcare settings, as research does not easily translate into practice (Fung et al., 2016). If members of the public are looking to social media for information, it is important for

governmental bodies to ensure they approach their own social media communications strategically to spread reliable information. This is significant as governments act as an authority in the dissemination of accurate information in online spaces (Zeemering, 2020). However, the effective utilization of social media has not always been the case; evidence shows that governmental social media use is often atheoretical and does not adequately use strategies and frameworks to guide its use (Tursunbayeva, Franco, & Pagliari, 2017).

The availability of social media as a communication method has presented new communication opportunities, and unsurprisingly, governmental bodies have increasingly relied on social media as a method of communication (Chen et al., 2020). Social media is often used to communicate with the public to identify priorities, explain crises, and relay public decisions due to the ability of social media to create open information flows between health authorities and the public (Panagiotopoulos et al., 2016). In case studies of governmental engagement on social media, there is evidence to support the ability for information dissemination and health promotion to audiences en masse (Bellström et al., 2016; Roengtam et al., 2017).

Canadians more specifically look to governmental bodies to provide accurate and up-to- date information during times of uncertainty, such as the COVID-19 pandemic (Neustaeter, 2021). However, it has become difficult for Canadians to trust and understand the governmental messaging (Carter, 2020). Media outlets have reported that the general public in Canada, and particularly those in the province of Ontario, have been left with confusion about what steps to take in best protecting themselves against COVID-19, often due to the rapidly evolving evidence and research on the virus (Carter, 2020; Neustaeter, 2021). This level of confusion by the public necessitates consideration about the ways governments can better

create and execute comprehensive risk communication campaigns. This was reinforced when Canadian performance indicators were developed in 2019 to improve public health emergency preparedness (Khan et al., 2019). Communication was emphasized as a key aspect, as it was a domain with the second highest number of indicators (Kothari et al., 2021). Social media was identified as an important communication platform for public health messaging, monitoring misinformation, and responding to questions and concerns from the public (Kothari et al., 2021). Consequently, it is timely and important to examine how social media is used by governmental sources in Ontario, especially during a public health crisis, to understand how it is currently used in practice and to make recommendations for improved use in the future.

The following sections will discuss some of the additional context necessary to situate social media use and risk communication by understanding its use in the field of healthcare, as well as the implications for information dissemination in online spaces with regard to equity. This will then be used to explain the research gaps and questions that guide this study.

1.2 Social Media Use in Healthcare

The use of social media in the field of healthcare has created opportunities to improve healthcare delivery and communications. One example is that social media has allowed healthcare professionals and researchers to monitor and understand attitudes of the public who are users or active on social media (Dyson & Govin, 2017; Harris et al., 2016). Having access to this information can help to inform policy and programs that aim to address specific health issues. For example, Tibebu and colleagues (2018) utilized *Twitter* as a data source to understand information about the use of opioids and the perception of the opioid crisis in Canada, as well as

gauge recurring topics mentioned about opioids. This data were then used to inform public health practice of various local agencies with a vested interest in addressing the opioid crisis.

Similarly, King and colleagues (2013) examined 120,000 tweets to understand how the sentiment of tweets changed with the passage of the Health and Social Care Bill in the United Kingdom (U.K.), which structurally reorganized the healthcare system by abolishing primary care trusts and strategic health authorities (King et al., 2013). The researchers were able to compare *Twitter* data to conventional opinion polls taken over the same period and used this information to propose a metric that can measure influence on *Twitter*. Similar work to examine public perception and attitude on social media has been done by Harris and colleagues (Understanding local health department *Twitter* followership, 2014a), Harris and colleagues (*YouTube* responses to a Health Charity Video, 2016), and Dyson and Govin (Construction of borderline personality disorder on *Twitter*, 2017). These studies all reinforce that social media is a viable and powerful tool to understand complex health attitudes and opinions of population segments, which in turn can be used to better inform public health practice, policy and, ultimately, outcomes.

From a health policy lens, there is an important aspect of social media use that decision makers can examine to understand how social media can feed into the policy process. There is evidence that influential social media accounts play a significant role in agenda setting, meaning that any individual or organization with a vested interest in specific health policy outcomes should be monitoring social media as a site for policy discussion (Yun et al., 2016). However, researchers have suggested that organizational social media accounts often have more influence than individual accounts and are highly effective in disseminating information to shape policy discussion (Yun et al., 2016). This means that health information professionals who engage in

social media communication should design health campaigns that collaborate with media and organizational accounts to achieve campaign outcomes (Yun et al., 2016). Further, those working in health policy can look to social media as an opportunity to understand certain policy options.

Similar to the possible impacts of social media on health policy, it is equally important to think about health-related social media use through a governmental lens. Booth and colleagues (2017) provide an example of local research that aimed to understand how public health units in Ontario engaged with social media. They held a planning meeting with a group of 20 public health unit representatives (out of 36 in Ontario), alongside academics, students, and government representatives. This meeting was used to develop insights into social media use, communication, and public health in Ontario. In this meeting, they identified that public health units across Ontario use social media as a part of their regular communication operations. Further, social media is used by public health units as a communication avenue to convey health education messages, but with few exceptions, there was little public engagement on social media. Important recommendations were compiled about the use of social media in a public health context in Ontario, such as the increased and efficient use of social media from health authorities, the need for leadership buy-in and resource allocation, social media policies, performance measurement and evaluation, and regular practices related to engagement with program recipients (Booth et al., 2017). Steffens and colleagues (2019) provided some additional strategies gathered from their research on perspectives and experiences of risk communicators in Australian organizations focusing on promotion of vaccines through social media. Recommendations such as communicating with openness in an evidence-informed way, fostering community relationships, and pairing scientific evidence with stories that speak to audience's beliefs and values were all posed.

Another area that has benefitted from the use of social media is that of health promotion. Health promotion has significant implications for the world of health communication, as both fields often pull on the same underlying theories and goals – to influence health behaviours. Internet-based health promotion campaigns have been proven to have positive effects on health behaviours of interest (Korda & Itani, 2013). Before social media existed as a concept, researchers like Murray and colleagues (2004) examined what was then considered *interactive health communication applications* and its implications on health promotion and behaviour change. They found that online health promotion interventions improved user's knowledge, social supports, health behaviours, and clinical outcomes. It should be noted that lifestyle behaviour change remains incredibly challenging, and while it has been observed to remain effective in influencing health behaviours, there is a large emphasis in health communication and promotion research on using strategies or approaches to achieve this end goal of positive behaviour change. Interventions that have a basis in theory often have a greater impact (Korda & Itani, 2013), and the use of analytical frameworks for evaluation are indicated in research as keys to success (Neiger et al., 2013).

Ample guidance is available for health promoters who are looking to engage with specific populations in online spaces (Vraga & Jacobsen, 2020). A key aspect of social media health promotion is engagement, but it has been identified as an ongoing challenge within public health organizations to effectively use social media as a form of engagement with the public (Heldman, Schindelar, & Weaver, 2013). Embracing the social aspect of public health practice when approaching populations in online spaces is significant to create meaningful change, but also understanding what engagement really means on social media can help health promoters to maximize the potential of social media (Neiger et al., 2013 It is important for

public health professionals to collectively work together to learn how we can best leverage social media to improve public health outcomes. Doing so will inform the development of practical tools for public health professionals to utilize social media to better communicate with the public.

1.3 Equitable Considerations for Social Media

Remaining consistent with the paradigmatic approach of the researcher, it is important to discuss the equitable implications of social media risk communication during public health crises. Further, during times of crisis, it is often the most vulnerable populations who disproportionately experience negative outcomes (Vaughan & Tinker, 2009), so including equity in discussions around health communication is important to work towards bridging the gap and addressing inequities experienced by vulnerable populations.

While the impacts of public health crises more commonly affect vulnerable populations directly, there is a sociological and psychological aspect that is important to consider. Certain populations are often targeted in society and portrayed as being partially or even fully responsible for the crisis at hand. For example, specific populations have been blamed for previous pandemics or crises, such as gay men being chastised for the spread of HIV and Latino populations being deemed responsible for the H1N1 pandemic (McCauley, Minsky, & Viswanth, 2013). During the COVID-19 pandemic, Asian populations have been blamed (Markowitz et al., 2021). This concept of blame is significant, as research examining psychological processes has shown that populations who are targets of blame during moments of crisis perceive the risks associated with the crisis differently than their non-marginalized counterparts, often by not perceiving the risk as an immediate or outsized threat (McCauley,

Minsky, & Viswanth, 2013). Recognizing that certain populations perceive threats differently based on discriminatory and biased perspectives in society is important for risk communication, as it reinforces the need for risk communicators to tailor health information and education depending on the population (i.e., populations who are subjects of discrimination vs. those who hold discriminatory beliefs).

Another equitable consideration of health communication is that of health literacy. Health literacy "entails people's knowledge, motivation and competences to access, understand, appraise, and apply health information in order to make judgments and take decisions in everyday life concerning healthcare, disease prevention, and health promotion" (Sørensen et al., 2012, p 3). Health literacy is a social determinant of health in Canada, given its anchor in key health promotion documents, such as the Ottawa Charter for Health Promotion (Vamos et al., 2019). Individuals' health literacy skills are associated with factors like socioeconomic status, age, culture, language (Omachi et al., 2013) and as such, there is a need for risk communicators to attend to the ways in which information is communicated to specific populations. Researchers like Sentell, Vamos, and Okan (2020) have explored health literacy in various contexts, such as the individual, interpersonal, community, and policy level. They highlight that understanding, appreciating, and applying health literacy into all policies can help achieve health equity and promote better health and wellbeing across populations. For example, their research reinforced tailoring how information is presented to various populations to facilitate uptake of that information (Sentell, Vamos, & Okan, 2020). In the context of digital technology, health literacy focused on accessing and interpreting online health information is often referred to as *eHealth literacy*. This further complicates addressing health literacy, as researchers such as Monkman and colleagues (2017) suggest that health

literacy and eHealth literacy are dissimilar and, as such, eHealth literacy should be assessed differently. Regardless, it is imperative that public health takes health literacy into account when information is shared and that the most vulnerable are at the forefront of health communication, especially in the wake of a public health crisis.

Socioeconomic status (SES) is a significant social determinant of health that must be factored into health communication strategies. Given that those of low SES are more likely to live in high-density living quarters (Friesen & Pelz, 2020), and that COVID-19 is transmitted primarily through close contact (Government of Canada, 2020), it consequently leads to a higher risk of these individuals disproportionately contracting COVID-19 (Robinson et al., 2020). For example, St-Denis (2020) highlighted how low-income occupations in Canada that require completing activities which increase the risk of infection with COVID-19 is especially the case for women, immigrants, and members of visible minority groups.

Similar inequities persist in online spaces, as those of lower income are additionally more vulnerable to what is called the *digital divide,* the inequitable access to internet and a barrier to who can access web-based information (van Deursen, 2020). The *digital divide* was demonstrated in Canada by Haight, Quan-Haase, and Corbett (2014) who utilized the 2010 Canadian Internet Use Survey (CIUS) to exemplify that access to the internet reflects pre-existing inequalities related to social determinants of health like income, education, and age. In their work, they expanded to analyze internet access and how demographics affects social networking site adoption. Haight, Quan-Haase, and Corbett (2014) found that the *digital divide* persists in online spaces, but has recently expanded to social networking sites, like *Twitter* and *Facebook* (Haight, Quan-Haase, & Corbett, 2014). While this data was collected in 2010, recent data from the CIUS conducted in 2020 shows that gaps persist in access to

social networking adoption based on factors like education (Statistics Canada, 2021). Further, Robinson and colleagues (2020) argue that exposure and risks from COVID-19 are tied specifically to digital disadvantage (i.e., adequate access to digital tools, such as social media). This means that individuals who can more effectively *digitize* parts of their lives benefit from more protection against risks, such as COVID-19 (Robinson et al., 2020). As such, this digital divide is a significant factor that risk communicators should keep in the forefront of their risk communication strategies, as only certain populations benefit and are present on social media.

Those with disabilities are also a part of the health equity conversation for public health risk communication. Abrams (2020) noted that communication surrounding public health emergencies is often done at the expense of individuals with disabilities. For example, a headline published in the BBC read that "*91% of People Dying with Coronavirus have an Underlying Health Condition, ONS Figure Shows"* (BBC News, 2020). Media has had the tendency to correlate COVID-19 deaths with disability and pre-existing conditions – and Ontario is not an exception to this. The Toronto Star reported almost daily during the first waves of COVID-19 on outbreaks in assisted living residences, and seemingly did not account for the living conditions in these residences as a contributing factor to adverse health outcomes (McKeen, 2020). Abrams (2020) points out that there is an ableist discourse rooted in the way public health crises are communicated, as this messaging encourages those who do not have pre-existing conditions to feel relieved. These concepts are all important in encouraging communication professionals to remain critical of the equity that is often missing from public health risk communication.

As emphasized by Peters, Jandric, and McLaren (2020), a critical global health crisis occurs when a virus such as COVID-19 makes inroads to developing countries that do not

have the infrastructure or capacity to handle it. Issues with access to information was reinforced by van Duersen (2020), who completed a national survey in the Netherlands of over 1700 people. Through this survey, it was found that people who are already relatively more advantaged are more likely to access health information via social media, while those who are less advantaged are consequently less likely to benefit from this information.

1.4 Research Questions, Gaps and Rationale

This research examining public health risk communication by Ontarian health authorities on social media is composed of two phases. The overall objective was to understand how social media (i.e., *Twitter*) was utilized by governmental agencies in Ontario to deliver information to the public during the first wave of COVID-19 (January 2020 to May 2020) and its implications. Underlying this overall aim was to determine if the use of social media by governments in Ontario was guided by any consistent frameworks, strategies, or tools, given the emphasis by risk communication literature on ensuring social media use is grounded in theory (Tursunbayeva, Franco, & Pagliari, 2017).

The COVID-19 pandemic will be used as a case study to understand and describe how government agencies engage in risk communication during moments of crisis. Despite being a foreseeable global crisis early in 2020, countries like Canada still seemed to be caught unprepared, and the pandemic seemed to blindside governments and policymakers when it rapidly spread around the world in March 2020 (Collins et al., 2020; Smith & Upshur, 2020). Public health professionals who engage in risk communication had to rely on lessons learned from previous crises like SARS, H1N1 and Ebola – none of which impacted the world to the extent of COVID-19. Along with this, local governments played an instrumental role in

navigating these crises and providing information to the public during times of such uncertainty (Yang et al., 2021).

This study explores how social media, specifically *Twitter*, has been used by provincial and local health authorities in Ontario to communicate information to the public. It uses COVID- 19 as a case study to gather a snapshot of risk communication campaigns via social media utilized in a Canadian context. This study examined this by: (a) exploring literature on risk communication via social media; (b) describing *Twitter* use by health authorities in Ontario via content analysis, focusing on three distinct 1-week periods following significant COVID- 19 milestones; and (c) interviewing those who were responsible for risk communication at these health authorities. It concludes by identifying recommendations and approaches to engage with risk communication on social media.

While social media is generally considered an effective method of communication that can facilitate the dissemination of information (Chew & Eysenbach, 2010), *Twitter* has specifically been chosen as the medium of focus. This is due to its ability to disseminate this information to a wide audience in a highly efficient and timely manner (Zeemering, 2020), and have a transformative effect on how information and news diffuse throughout society (Sloan & Quan-Haase, 2017). It was also indicated to be one of the most used social media sites by public health agencies to communicate with communities in Ontario (Booth et al., 2017).

1.4.1 Part 1 – *Twitter* Content Analysis

By conducting a content analysis of *Twitter* messaging by Ontarian provincial and municipal health authorities, this study describes the ways in which social media has been

used at different points throughout the COVID-19 pandemic in Ontario. The specific research questions for this part of the study are as follows:

- In what ways has *Twitter* been utilized by provincial and local governments in Ontario for public health risk communication during the COVID-19 pandemic?
    - What are the primary functions of *Twitter* for provincial and local governments in Ontario during the COVID-19 pandemic?
    - Has there been consistency between provincial and local government messaging in Ontario on *Twitter* during the COVID-19 pandemic?

Conducting a content analysis on *Twitter* will help inform this body of literature by adding descriptive information on how social media has been used in practice to engage the public during one of the largest public health crises in history. While there are few existing studies to understand how local governments engage in social media risk communication (Bellström et al., 2016; Harris et al., 2014b; Roengtam et al., 2017; Wong et al., 2017), to my knowledge, no studies have described how social media has been used in local practice during a public health crisis, nor have any studies examined this phenomenon in a Canadian context.

This study will further inform whether communication has been consistent between provincial and municipal governing bodies in Ontario, as well as provide insight on the potential gaps in social media risk communication. Recognizing that this study is examining risk communication in the province of Ontario, it is important to note the existence of the Ontario Public Health Standards (OPHS) that mandate the requirements for public health communication by health authorities (OPHS, 2021). This study will identify if local health authorities appear to abide by these principles and policies in practice while communicating about risks associated with COVID-19, which has not yet been explored in risk communication research.

With these goals in mind, data were collected and analyzed from a sample of provincial and local health authority's *Twitter* accounts in the week following three key milestones of COVID-19 in 2020 (i.e., the declaration of COVID-19 as a public health

emergency by the World Health Organization on January 30, 2020, the announcement of the first death in Canada from COVID-19 on March 10, 2020, and the announcement of Ontario's first reopening on May 14, 2020). This was done to describe the main functions of the *Twitter* messaging by the provincial and local health authorities, the frequency of messaging, and the overall themes represented in the tweets.

1.4.2 Part 2 – Interviews with Governmental Public Health Risk Communicators

Through key informant interviews with risk communicators (*n*=6) at local health authorities, the goal of this research is to provide insight into strategies or frameworks that are guiding their social media communications. There are no studies examining the experiences of risk communicators utilizing theory or frameworks in practice, especially during a public health crisis such as the COVID-19 pandemic in Canada (Fung et al., 2016). Researchers have found that historically, with past pandemics like SARS and H1N1, information is continuously communicated in a way that generates public confusion, despite the implementation and availability of communication principles to avoid these issues (Driedger et al., 2018; Mian & Khan, 2020). Examining the approaches of those who engage in risk communication in practice in Ontario can address potential gaps in governmental risk communication strategies that may lead to public confusion, despite available tools.

For example, Public Health Ontario emphasizes that communication campaigns require planning, preparation, and practice (Public Health Ontario, 2019), and suggest certain frameworks and guiding principles such as those outlined by Diggins and Brecher (2002). Speaking directly with risk communicators in practice will serve to: (a) substantiate and explain findings from Part 1 of this research; (b) identify factors that influence the success of social media risk communication in practice in Ontario; and (c) provide an understanding of the extent

to which guidelines outlined in the literature and by Ontario's governing body are being followed. More specifically, this aspect of the study will aim to answer the following research questions:

- What strategies or frameworks are used in practice to guide how *Twitter* has been used for public health risk communication during COVID-19, according to social media risk communicators at Ontario's provincial and municipal governments?
    - According to these risk communicators, what are key barriers and facilitators to public health risk communication on social media in Ontario?

Given the opportunities available to governments through engagement with the public via social media as discussed in earlier in this Chapter, understanding how information has been delivered by governments during the COVID-19 pandemic and identifying what strategies, frameworks, or theories were used to guide this communication may provide additional evidence for best practices on risk communication. Thus, this research will fill the gap in literature characterized by a lack of information on structured and evidence-informed social media practice during a public health emergency in the Canadian health care system. Interviews with those engaging with risk communication at the health authorities will help to build on the content analysis by providing the rationale as to the ways in which *Twitter* has been used. Further, given the need for the development of communication strategies for public health response to further improve response frameworks (Depoux et al., 2020), this study provides insight into the successes and challenges that inform these strategies.

1.5 Conclusion

With the above in mind, the following Chapters of this thesis will outline the three methods that were taken to further understand how *Twitter* has been used by provincial and local health authorities in Ontario to engage in risk communication. First, Chapter 2 explores the literature on risk communication via social media and outlines underlying disciplines that inform

this work. Chapter 3 will then describe how *Twitter* was utilized throughout key milestones during COVID-19 in 2020. Chapter 4 will summarize six interviews completed with risk communicators at local health authorities. Lastly, Chapter 5 will compile these findings together in the form of recommendations for risk communication on social media by health authorities.

Chapter 2 – Narrative Literature Review

2.1 Introduction

This Chapter will set the basis for understanding risk communication as an interdisciplinary field, which will later inform the discussion and recommendations for this thesis. The Chapter begins with an overview of the methodology utilized to explore the literature on risk communication. Following this, I review several prominent themes that are discussed throughout risk communication research reviewed relevant for this project. These are: (a) public health risk communication theory and tools; (b) the spread of information: misinformation and *infodemics*; and (c) governmental approaches to social media risk communication. The remainder of this thesis draws on these findings and informs the *Twitter* content analysis and key informant interviews with public health risk communicators, as well as helps to guide the recommendations for how public health communicates risk via social media tools can be improved.

2.2 Search Methods and Parameters

A narrative review methodology was adopted to explore this literature. Narrative reviews aim to "describe a specific topic or theme from a theoretical and contextual point of view" (Rother, 2007, p. 1). In the context of this thesis, sources included were those that examined risk communication and social media engagement in various capacities, which are summarized within the main categories outlined in this section. The goal of this narrative review is not to systematically measure and rigorously include all literature on risk communication, but rather to provide an overview of risk communication literature most relevant to this thesis.

This search strategy and methodology was developed in consultation with a Western University librarian. Generally, this literature review aimed to identify information about social media use by Ontario governments during the COVID-19 pandemic, which remains consistent with a narrative review methodology that aims to provides readers with up-to-date knowledge about a specific topic (Rother, 2007). This includes both methodological and empirical research that identify where this field of research is currently situated, as well as forecast future areas for this research to expand. These papers were discovered primarily through the databases Scopus, CINAHL, MedLine and the Library Literature and Information Science Full Text (LISA). This review includes research up to April 2021 when the most recent search was conducted. Further, only literature in English was included in the search and there were no geographic restrictions.

The overall goal of the literature search was broken down into concepts that informed the actual search strategy. See Table 1 for a list of search terms related to the main concepts in the search strategy.

Table 1: Narrative Review Search Terms

Concept	**Search Terms**
Social media	"social media", "*Twitter**", "tweet", "*Facebook*", "*Instagram*", "*YouTube*", "post"
Government	"government", "policy", "law"
Canadian context	"Canad*", "Ontari*"
Risk communication	"COVID-19", "pandemic", "Coronavirus". "epidemic", "crisis", "risk"

The search terms used across the aforementioned databases yielded a total of 546 abstracts, which were reviewed to determine their relevance to the topic. This process brought the number of relevant articles down to 97, which included studies that utilized quantitative and qualitative methods for data collection, as well as a variety of systematic reviews, meta-analyses, narrative reviews, and relevant single studies. A *backwards search* was also conducted in the

reference section of these studies to identify any additional articles that appeared to be relevant. This assisted in discovering foundational pieces of literature in this area of research.

Potential gaps in research were filled with the use of a grey literature search using tools such as Google Scholar and the Canadian Health Research Collection, to ensure breadth in the search method. Only 8 sources from grey literature were deemed to be relevant.

2.3 Public Health Risk Communication Theory and Tools

Risk communication as a field of research and practice is guided by a large variety of disciplines, meaning it is rooted in and guided by various theories, frameworks, and tools. This section will explore some of the most prominent theories and tools that guide this field of study. Those discussed are considered prominent and were chosen by researcher due to (a) their ability to describe the theoretical underpinnings of risk communication; (b) their uptake and usefulness in practice; and (c) the frequency of citation or reference in relevant literature.

2.3.1 Theories and Models

One of the leading theoretical papers, cited over 500 times in risk communication literature, is that published by Glik (2007). Gilk's review of underlying risk communication theory has been chosen to guide this section, as she provides a comprehensive review of the theory that guides the field of risk communication for public health emergencies. According to Tursunbayeva, Franco, and Pagliari (2017), the field of risk communication is underdeveloped and atheoretical. However, the paper by Glik (2007) highlights the importance of various theories to explain this interdisciplinary field. Theories will be organized by discipline, following Glik (2007), as indicated in Table 2. This is not meant to be an exhaustive list of all disciplines and theories related to risk communication, but to provide an overview of the fundamental beliefs and theoretical underpinnings that risk communication operates upon.

Table 2: Summary of Underlying Disciplines for Risk Communication

Discipline	Frame	Associated/example theories and concepts	Associated/example papers
Psychology	Social, cognitive, and economic implications on psychology; impacts an individual's ability to process information and influence behaviour change	• Mental noise theory • Negative dominance theory • Social learning theory • Stages of behaviour change model • Transtheoretical model • Social exchange theory • Social cognitive theory	• Baron et al. (2000) • Covello et al. (2001) • Peters, Covello, & McCallum (1997) • Bandura (1997) • Weinstein & Sandman (1992) • Schiavo (2013) • Paek et al. (2010) • Lin & Chang (2018)
Human development and learning	Focus on risk perception; how people organization information	• Mental models approach • Mental maps • Knowledge networks • Outrage theory	• Sandman (1987) • Keselman, Slaughter, & Pate (2005) • Damiano & Allen Catellier (2020)
Disaster and crisis studies	Understanding of crisis lifecycles; conceptualizes crises in phases	• Crisis management process • Crisis lifecycle	• Fink (1986) • Lettieri, Masella, & Radaelli (2009) • Coombs (2014)
Health promotion	Aims to have messages planned and targeted to create awareness and motivate behaviour change **Health promotion similarly draws on other disciplines noted in this table, especially on social psychology*	• Communication persuasion matrix • Health belief model • Protection motivation theory • Precaution adoption process	• McGuire (1978) • Windahl et al. (1992) • Strecher & Rosenstock (1997) • Rogers & Prentice-Dunn (1998) • Bellström et al. (2016) • Roengtam et al. (2017)

Communications	Informs on broad communication strategies that aim to reach large populations	• Theory of selective and limited influence • Magic bullet theory	• Scott-Kakures (2009) • DeFleur & DeFleur (2016) • Robledo (2012)
Economics, marketing, and literacy	Recognizes external factors like economic positioning; specific marketing tactics to influence behaviour	• Bounded rationality • Nudge theory • Audience segmentation	• Simon (1945) • Doak et al. (1996) • Thaler & Sunstein (2009) • Kosters & Van der Heijden (2015)
Media studies	Conceptualizes the functions of media outlets; how issues are framed in media	• Social representations theory • Social amplification theory	• Lippman (1922) • McCombs & Reynolds (2002) • Washer (2004)

Risk communication research largely operates upon social, cognitive, and economic psychology, as well as the ways in which they are applied to organizations and communities. The goal of risk communication is to understand and support people as they process information about risks, which are often associated with fear in stressful situation (Glik, 2007). The stress associated with risks consequently impedes an individual's ability to process information. For example, mental noise theory (Baron et al., 2000; Covello et al., 2001) holds that when people are stressed, they attend to internal mental noise and cannot attend to external information. This often means that individuals respond more frequently with emotions when faced with stressful situations. Risk communication considers such psychological theories to address the informational needs of people in times of crisis.

Psychology ties in closely with human development and learning, as it builds upon the gap in informational needs by understanding how information is organized and risks are perceived by humans. Ensuring that information and scientific concepts are explained in a way that is understandable to wide audiences is proposed by human development literature as a key to assisting the public in organizing their information, as inaccurate risk perception is often due to the inability of populations to interpret the information (Glik, 2007). The mental model approach (Morgan et al., 2002) is an example of a conceptualization from this discipline that aims to improve risk perception, as it outlines the importance of gathering information about a population's perception, and then using that information to tailor messaging in an understandable way. Similarly, knowledge networks hold that people learn through mental maps or knowledge networks, meaning that new information must resonate with pre-existing knowledge (Keselman, Slaughter, & Patel, 2005). Knowledge networks emphasize the importance of understanding that

perceptions of risks determine how people respond and behave, which is in turn dependent on media representations, framing, as well as how risks are communicated and by whom.

While much of psychology and human development research on risk emphasizes the way that risks are communicated to assist the public in properly organizing information, the disaster and crisis discipline is more focused on the characteristics of the threat itself, the associated specific disastrous events, as well as occurrences before, during and after them (Mileti et al., 1975; Mileti et al., 1992). Fink (1986) proposes that crisis management utilizes a comprehensive process, often referred to as the theory of crisis lifecycle. Crises often move through cycles and phases, which have been explained through various stage theories. An example of this is Coombs (2014) who characterizes crisis through a three-stage model: pre-crisis, crisis, and post-crisis, each including their own communication challenges and distinctive features. Other scholars propose a four-step process, with two pre-crisis phases or two post-crisis phases (Lettieri, Masella, & Radaelli, 2009). Crisis communication slightly differentiates itself from risk communication, as crisis communication focuses on things that have gone wrong, while risk communication focuses on things that might go wrong, as well as any event that may cause public concern and focus media attention (Telg, 2010). Despite the variations, these types of theories guiding crisis communication hold that a linear process can help risk communicators address needs, depending on the stage of the crisis (Yang et al., 2021).

While the goal of risk communication is to ensure that the public is actively taking steps to protect themselves and their communities, health promotion focuses more specifically on planned and targeting messaging to create awareness and motivate behaviour change (Glik, 2007). Health promotion is concerned with the way that messages are communicated, often focusing on how the framing and the formatting of the message could be perceived by a specific

audience, with an aim to ensure messages are communicated in a means that best reaches the intended population (Windahl et al., 1992). An example of a model that was created to guide health promotion is the health belief model (Champion & Skinner, 2008), which informs how messages are developed. This model holds that behaviour change is dependent on cognition, meaning that individuals take action to reduce their exposure to a risk if they believe they are susceptible to that risk (Strecher & Rosenstock, 1997).

Health behaviour change through health promotion also draws upon social psychology, such as the social learning theory (Bandura, 1997), to understand how people absorb information. This theory holds that people learn directly through social networks and their actions or examples (Bandura, 1997). This has implications for health behaviour change and communication, as it guides risk communicators on where and how to intervene with communication strategies. Health behaviour change and communication utilizes other forms of social psychological processes to shape understanding and action, often through stage theories, which characterize people as being at various stages of awareness and motivation in behaviour change. An example of a stage conceptualization in health promotion is the transtheoretical model (TTM; Prochaska & Velicer, 1997). TTM posits that people are at different stages of acceptance to behaviour change, and communication efforts should target each stage of the behaviour change process (Park et al., 2016). Social exchange theory takes this one step further, by stating that through these stages, there is a reciprocal relationship of information exchange between an individual and their environment. This in turn facilitates the need for modes of communication like social media (Lin & Chang, 2018).

Health promotion theory and its goals are often used in tandem with research and theory from economics, marketing, and literacy (Glik, 2007). Economic theories like bounded

rationality (Simon, 1945) argue that individuals are unable to cognitively have capacity to hold the necessary information to make economically optimal decisions. This notion became the central premise for Thaler and Sunstein's (2009) nudge theory, which provides a "more innovative and less coercive government intervention to shape people's behaviours" (Kosters & Van der Heijden, 2015, p. 276). Nudge theory believes that altering the *choice architecture* helps to direct or shape individuals' decisions about health, wealth, and happiness. Conversely, marketing strategies like audience segmentation promote the use of separate approaches and messages depending on the audience. Marketing is used to encourage those in public health risk communication to communicate information in a way that resonates with specific cultures and demographics, while literacy encourages risk communicators to create messaging that is easy-to-read (Doak et al., 1996).

The theories and strategies outlined thus far have provided a basis for the importance of creating messaging that motivates specific behaviour change to targeted audiences, but the medium used to disseminate these messages are of equal importance to the overall success of risk communication. This is where media studies come in, as risk communicators need to work with media partners for effective dissemination. With the increased reliance of the public on media to obtain information (Glik, 2007), whether it be through traditional means or social media, it means that risk communication must continue to foster relationships with media partners. Media theory is expansive, especially when it aims to understand misinformation and its spread (Glik, 2007). One historic rationale from a media perspective on misinformation is that of the *meaning construction* function of the press, where journalists report on what they think is occurring, rather than the facts of what is occurring (Lippman, 1922). As such, media studies view risk not as an objective hazard or danger that can be avoided, but one that is inevitable and

mediated through cultural and social processes (Glik, 2007). This perception informs agenda-setting by media, as they carefully identify what is newsworthy. This ultimately means media can shape public perception (McCombs & Reynolds, 2002). As such, framing communication through media is key, as it will determine how the public interprets and reacts. This is important, especially from a media perspective, as media is the primary means by which such collective risk perceptions are communicated to the public, even if the portrayal is not reflective of the actual risk. This suggests that media relations training and relationship building with media partners is a key aspect of public health risk communication.

2.3.2 Tools and Frameworks

Tools and frameworks are essential for public health professionals to engage in risk communication, as they ensure that theory and evidence are more readily used in practice. Tursunbayeva, Franco, and Pagliari (2017) conducted a systematic review of twenty-two studies that gathered the most practical frameworks and tools that guide social media for governments during health crises. Their work is one of the first systematic reviews on this topic, and this approach lends to the credibility of their summary. Table 3 provides a brief overview of these prominent tools, which draws on the review of Tursunbayeva, Franco, and Pagliari (2017). Additional local examples are included, as they are likely to be utilized for risk communication in Ontario.

Table 3: Summary of Relevant Risk Communication Tools and Frameworks

Tool or Framework	Purpose or Benefit to Risk Comms	Associated organization/author(s)
Rand Public Health Disaster Trust Scale	Measurement tool to identify communities where there is a low amount of trust; can indicate communities for targeted communications and inclusion in community partnership	Eisenman et al. (2012)
Crisis and Emergency Risk Communication (CERC) Toolkit	12 modules which outline elements of a crisis, as well as the message development and audience research required to create public health risk communication plans	Centers for Disease Control and Prevention (2014)
Primer on Health Risk Communication Principles and Practice	Not created with public health crises in mind; combines a variety of practical strategies that are beneficial for risk communications, such as assessing audience needs and building relationships with media	Lum & Tinker (1994)
Theoretical Domains Framework (TDF)	Focuses on implementation; preserves theory throughout the process of creating communication plans which targets specific health behaviour change	Atkins et al. (2017)
Risk Communication on Social Media (RCSM) Model	Aims to help risk communicators in identifying factors that facilitate message passing in social networks in their specific context	Vos et al. (2018)
Social media and Public Health Epidemic Response (SPHERE) Continuum	Characterizes the functions of social media across the epidemic-response continuum (i.e., one side of the continuum is labeled *social media as contagion*, which refers to misinformation that can contribute to harm in the same way the disease can)	Schillinger, Chittamuru, & Ramirez (2014)

Health Communication at a Glance	12-step process for communicators to develop health communication initiatives; based on project management approach; includes sample worksheets and fillable documents	Public Health Ontario (2019)

The Rand Public Health Disaster Trust Scale (Eisenman et al., 2012) is the first example identified by Tursunbayeva, Franco, and Pagliari (2017) to be one of the most prominent tools used for risk communication. This is a measurement tool that can assist risk communicators in identifying communities where there is a low amount of trust and can indicate to risk communicators that these are communities that need to be targeted for inclusion in community partnerships (Eisenman et al., 2012). Through the lens of public health risk communication, such a tool can be utilized in a brief and validated way to ensure that communication is tailored to the needs of communities. Its roots in psychology and assessment of the psychometric properties of trust ensure that the health authority will have a level of understanding of their audience that will consequently inform how they attempt to influence behaviour change. Further, literature such as that of Toppenberg-Pejcic and colleagues (2019) emphasizes the importance of not using a one-size-fits-all approach to risk communication, so using this tool can be a first step in identifying which populations need effort in relationship and trust building.

Another tool that is commonly utilized by agencies and governments is that of the Center for Disease Control and Prevention's (CDC) Crisis and Emergency Risk Communication (CERC) Toolkit (Centers for Disease Control and Prevention, 2014). This tool consists of 12 modules that outline the elements of a crisis, as well as the message development and audience research required to create public health risk communication plans. It is often considered one of the most comprehensive set of guidelines for risk communication (Tursunbayeva, Franco, & Pagliari, 2017). This tool remains useful for Canadian organizations engaging in risk communication, as Canada's public health system still does not have any similar resource, or at least any that is publicly available. Further, this tool effectively utilizes evidence from various disciplines, such as crisis and disaster, communications, and media studies. Through this, the

toolkit emphasizes the importance of both internal and external communications planning and management, as well as developing crisis communication plans, developing messaging and message maps, and creating media material like press releases.

The Primer on Health Risk Communication Principles and Practice (Lum & Tinker, 1994) is not a tool that was created with public health crises in mind. However, it was identified by Tursunbayeva, Franco, and Pagliari (2017) as useful given its ability to combine a variety of strategies that benefit risk communication efforts. For example, it emphasizes the importance of formulating messaging, understanding audience needs, managing their stress, building relationships with media, handling misinformation and organizations events, and scheduling meetings and forums to address questions or concerns by the public.

Guiding frameworks utilized by risk communicators includes options from the field of behaviour change, given the reliance of risk communication on this area of research. A prime example of a framework based on behavioural and implementation scientists includes the Theoretical Domains Framework (TDF; Atkins et al., 2017). This framework offers a guide to risk communicators on ways to incorporate TDF in practical ways, especially given its focus on implementation (Atkins et al., 2017). Atkins and colleagues (2017) explain how this framework helps to preserve theory through implementation of communication plans, while covering potential reasons that evidence is not taken up into practice in an efficient manner (Atkins et al., 2017). Further, this framework is a useful tool for risk communicators that are looking to utilize a theory-based approach that helps target specific behaviour change.

Focusing on risk communication via social media channels, Vos and colleagues (2018) developed a model specifically for Risk Communication on Social Media (RCSM). This model predicts that risk messages spread across social networks depending on the characteristics

of the messaging, the account sending the message, the network of followers on that account, and the salience of the message topic at the time it was sent. Vos and colleagues (2018) proved this model's consistency with previous areas of literature on message diffusion (Rogers, 2003; Spitzberg, 2014), which reinforces that this model is rooted in evidence. By using this model, Vos and colleagues (2018) contend risk communicators will be able to identify the factors that facilitate message passing, while keeping context of the needs of the community in mind. Further, it includes suggestions on key message content and posting at moments when people are paying attention.

It can be overwhelming for risk communicators to navigate the dissemination of health information amidst an *infodemic*. Briefly, an *infodemic* refers to an overabundance of information that may generate confusion by the public (Kulkarni et al., 2020), and includes deliberate attempts to disseminate inaccurate information to undermine public health responses or advance alternative agendas (WHO, 2020b). This is closely tied to the term misinformation, which is defined as "false or inaccurate information that is deliberately created and is intentionally or unintentionally propagated" (Wu et al., 2019, p. 80). This varies from disinformation, which is specifically referring to "the dissemination of deliberately false information" (Stahl, 2006, p. 86). Misinformation is particularly important to manage during a public health crisis, as it contributes to feelings of confusion and often leads to non-compliance with actual public health messaging to reduce the spread of infectious diseases (Badell-Grau et al., 2020). The SPHERE (Social media and Public Health Epidemic REponse) continuum developed by Schillinger, Chittamuru, and Ramirez (2020) is a framework that aims to help risk communicators utilizing social media during public health crises by characterizing the functions of social media across the epidemic-response

continuum. For example, one side of the continuum is labeled *social media as contagion*, which refers to misinformation that can contribute to harm in the same way the disease can, while the other side has *social media as treatment*, which increases the likelihood that interventions to reduce harm from the disease are accessed. Beyond this, there are several factors that influence the role of social media across the SPHERE continuum, such as attributes of health communication, characteristics of the pathogen or disease, and properties of the host (Schillinger, Chittamuru, & Ramirez, 2020). This tool is flexible to meet the communication needs depending on the public health crisis and encourages risk communicators to consider the role that social media plays in navigating *infodemics*.

More locally, Public Health Ontario has released helpful and synthesized tools that are based on evidence available in this body of literature. A prominent example is the *Health Communication at a Glance*, which proposes a 12-step process for risk communicators to develop health communication initiatives (Public Health Ontario, 2019). Based on a project management approach, the broader phases of this process document include: (a) scoping, which harnesses evidence to inform the health communication cycle; (b) development, which aims to translate the evidence from the previous phase into tangible messages and action plans; and (c) execution, which aims to bring the previous phases together in a practical plan (Public Health Ontario, 2019). This tool provides sample worksheets and fillable documents to assist risk communicators in carrying out health communication initiatives.

There is a wide variety of options available to risk communicators to strategically develop communication plans in the face of COVID-19. Despite this, there is a lack of a universal analytical framework to extract, quantify and compare content in public discourse

on different health issues, meaning that it can be difficult for risk communicators to select a tool or framework that works best for their context (Chen et al., 2021). The options are numerous, but this research emphasizes that one or a combination of these theories and tools should be utilized, as often, communication plans are not evidence-based (Sezgin et al., 2020).

While it can be overwhelming for risk communicators to navigate the breadth of available theories and frameworks, it is often just as overwhelming for the public to absorb the plethora of information presented to them during crises, as noted in many of the theories in this section. The following section will outline the informational needs of individuals and populations, as well as reviewing the spread of information in online spaces that occurs during public health crises.

2.4 The Spread of Information: Misinformation and *Infodemics*

With the concerns that often accompany public health emergencies, it is especially important to bridge any disconnect between scientific consensus and public understanding to combat online misinformation (Mian & Khan, 2020). The spread of information and information seeking is a prominent theme in risk communication literature, as it provides an understanding of the ways in which the public educate themselves on an issue of concern. A reality consistently mentioned thus far about the availability of information on social media is the potential for misinformation.

In the context of a pandemic, the rapid spread of information that accompanies an event like a public health crisis can result in an *infodemic*, where there is an overabundance of information that may generate confusion by the public (Kulkarni et al., 2020). While social

media has created opportunities for health education and promotion, especially during emergencies, the risk of misinformation must be carefully considered, and strategies are needed to deal with the spread of misinformation (Sharma et al., 2017). Understanding the spread of misinformation and having strategies to manage it is important, as misinformation is difficult to pin down and refute. Further, it includes an extremely complicated landscape of relationships, trust, and communication (Larson, 2020). This section will explore the literature that discusses how information is spread and managed during public health emergencies.

2.4.1 Information Seeking Behaviours

The first part of understanding how information is accessed via online spaces often begins with attempting to understand who exactly is accessing this information. As highlighted by Ali and colleagues (2020), information seeking is significantly determined by individual socioeconomic characteristics and their knowledge and beliefs about the pandemic. Research has been done to attempt to characterize these social media users during public health crises. There is mixed evidence concerning the association between COVID-19 knowledge and information sources accessed. However, COVID-19 beliefs have been significantly predicted by one's primary information source (Ali et al., 2020). Sociodemographic characteristics therefore are a key factor when understanding information seeking behaviours. Xu and colleagues (2020) further identified that the public expressed both negative and positive sentiments while engaging with information. Between the onset of COVID-19 in December 2019 and the confirmation of transmission in late January 2020, there was primarily confusion and anxiety after being exposed to information (Xu et al., 2020).

Availability of information is necessary to guide the public during the onset of a public health crisis, but this highlights the challenge of how and what information is beneficial.

In understanding the channels by which the public accesses information, information seeking literature has identified that there are practical challenges in accessing offline healthcare services, and therefore the internet has been seen as an important source of health information during a public health crisis (Zhao et al., 2020b). However, Carvajal-Miranda and colleagues (2020) identified that during COVID-19, there has been an absence of official government voices in the online spaces to generate topics of discussion that can help shape online discourse. This is a major gap when understanding how information spreads, especially considering the potential lack of accuracy and reliability of information being shared (Carvajal-Miranda et al., 2020).

Social media is a primary online space that affects this information dissemination, and consequently impacts the sentiments, feelings, and behaviours towards a specific risk. Research examining the early changes in *Twitter* activity about COVID-19 found that the political and economic consequences of the pandemic dominated discussion in online spaces, as opposed to public health risk and prevention (Medford et al., 2020). Stigma communication research on *Twitter* during the rise of COVID-19 similarly found that peril was mentioned most often, and tweets with conspiracy theories were more likely to blame specific populations (Li et al., 2020). This stigmatized discourse was shown to have negative implications on *Twitter* user's perception of the pandemic (Li et al., 2020). This reinforces the prevalence of negative sentiments that have been observed, and their relationship to misinformation, during the spread of COVID-19.

Not all research on *infodemics* focuses on the negative outcomes and consequences of health seeking behaviours from public health crises. Some evidence has suggested that the pandemic positively shifted internet seeking behaviours to have more reliance on scientists. With the onset of COVID-19, Falcone, and Sapienza (2020) found that there was a significant shift in internet seeking behaviours of their over 4000 participants to access the most reliable information possible (Falcone & Sapienza, 2020). Further, the utilization of well-designed infographics has shown to be easily accessible, engaging, reusable and modifiable to fit local needs (Chan et al., 2020). While there is an acknowledgement of the risks of non-peer-reviewed materials being disseminated via social media, Chan and colleagues (2020) have noted that social media must be utilized given its ability to be a speedier alternative to free open access educational material and traditional communication methods. To combat unreliable information on social media, a set of criteria for professional social media platforms and users to promote responsible use was presented by Chan and colleagues (2020) to continue to facilitate the benefits of social media at times of crisis. However, Trajkova and colleagues (2020) identified that it is important to remain critical of such infographics via social media, as multiple factors influence the success of a post, such as the source of the data, who created the graphic (individual vs. organization), the type of visualization, and the variables included within it. There is benefit to the public for having health information accessible to them via online spaces, but it is important to remain critical of how this is done, and how the information might be interpreted, depending on the population.

2.4.2 Managing Misinformation

Research on how to manage misinformation has looked specifically at who is able to amplify these pieces of information. Kawchuk and colleagues (2020) found that *Twitter* users with the greatest influence to spread misinformation were individuals, rather than institutions or organizations. With this in mind, it has been proposed that consistent social media monitoring, especially of influential individuals, is the best method of tracking and dispelling misinformation (Islam et al., 2020). Machine learning has been proposed as a solution to manage the spread of misinformation. A machine learning algorithm developed by Brynielsson and colleagues (2014) was demonstrated to automatically classify tweets based on the emotion portrayed in the tweet and showed that this form of social media analysis had about 60% accuracy. The algorithm that the researchers used was integrated into a European crisis alerting system and became a key part of Europe's crisis management (Brynielsson et al., 2014). This reveals that the use of regular internet analytics to monitor internet activity, especially of individual users with influence, may be effective in helping healthcare regulators and organizations protect the public from potentially misleading information.

More comprehensive tools have been proposed to manage misinformation on social media. For example, the World Health Organization (WHO) has used their *Information Network for Epidemics* platform to track false information in various language across the world and are collaborating with social media platforms like *Twitter*, *Facebook,* and *Weibo* to help filter misinformation (Smith et al., 2020). The introduction of an interactive platform and dashboard to provide real-time alerts of rumours and concerns about the spread of COVID-19 has also been proposed, which could enable public health communication professionals to respond in a proactive and timely manner to dispel misinformation (Depoux et al., 2020).

While this type of tool is less comprehensive than the WHO's tool, misinformation research suggests that social media intelligence should be harnessed, and online discussions should be geographically coded over time to create a real-time map of the spread of information (Depoux et al., 2020). These maps would be used for risk communicators to know exactly where and how to intervene with educational campaigns.

Given their work in this area, the WHO has made it clear that misinformation must be taken seriously. To this end, the WHO held a technical consultation on responding to *infodemics* related to COVID-19 to crowdsource and suggest actions for *infodemic* management (Tangcharoensathien et al., 2020). The analysis team consolidated the collected suggestions into 50 proposed actions for a framework for managing *infodemics* in health emergencies. With this research, they reinforced that one of the most important ways to combat misinformation is with swift, coordinated, regular, and systematic action and communication from health authorities (Tangcharoensathien et al., 2020). Overall, there is a push for governments and prominent figures in media to collaborate with experts from organizations like the WHO to deliver information in a manner that is sensible, reliable and does not incite panic, while also remaining aware of misinformation circulating in online spaces (Mian & Khan, 2020).

Researchers like Malik, Khan, and Quan-Haase (2021) examined the extent to which prominent health organizations, such as the WHO, have actually helped to manage and dispel misinformation. In their study, they collected and analyzed a series of *Instagram* posts by four leading health organizations (i.e., WHO, CDC, IFRC, NHS). Despite the emphasis by these prominent health organizations to manage misinformation, these researchers found that there is still much opportunity for these organizations to strengthen their own role in countering

misinformation. Additionally, the use of celebrity involvement, clarification posts, and the use of infographics were commonly used to convey risk communication messages on social media.

Strategies and advice have been made available to health communications professionals by researchers like Vraga and Jacobsen (2020) to manage information during public health emergencies. Vraga and Jacobsen (2020) identify three major challenges that those involved in health policy, advocacy, implementation, and enforcement must be aware of during the development of communication strategies: (a) information overload; (b) information uncertainty; and (c) misinformation. Information overload is characterized by the overwhelming quantity of information that circulates during emergencies. To handle this overload, organizations should keep messaging simple and clear, and they suggest that the most essential information should be communicated first to facilitate its uptake by media. Information uncertainty focuses more so on the limited evidence available to base initial policies and communication strategies on. To handle this challenge, the authors recommend describing the available evidence and identifying the source(s) informing any conclusions. It is also important to clarify to the audience about whether the evidence or advice might change. Lastly, the challenge of misinformation can be handled with two strategies according to the authors: disseminate accurate information and actively seek to minimize inaccurate information. They also suggest that social media analytics and research during these moments of crisis can help to further reveal health issues and populations that are not included in these online spaces, which will help develop online health education campaigns (Vraga & Jacobsen, 2020).

The proposed approaches to handle misinformation have extended beyond organizational strategies to communicate accurate information and have noted other potential

underlying causes that contribute to misinformation; namely, the ability of the public to identify reliable information. Swire-Thompson and Lazer (2020) propose that academia should be less concerned with the overall decrease in trust of media than they should be with the inability of the public to place trust in sources that are evidence-based. Swire-Thompson and Lazer (2020) present experimental evidence that demonstrate these approaches can be effective in minimizing misinformation when organizations assess health literacy levels and provide corrective information on specific topics via social media. Further, their work asks researchers to re-frame the problem of misinformation and proposes different solutions to tackle health literacy that will consequently have a positive influence of the sharing of accurate information.

Eckert and colleagues (2018) summarized a large part of the literature on managing misinformation. The researchers conducted a mixed-method systematic review of all literature between 2003 and 2016 on the best social media practices to protect reliable health information and dispel misinformation. After reviewing 79 studies that met their criteria, they had many primary findings with implications for public health risk communication campaigns via social media (Eckert et al., 2018). Through their systematic review, Eckert and colleagues (2018) emphasized that agencies need to contextualize the use of social media based on specific populations and crises. They also reinforced that the use of social media needs to be routinely incorporated into governmental agencies, as the current research finds that many have not adopted social media as a means for communication. The adoption of social media by government agencies into communications strategies has the potential to enable better two-way communication and dialogue with the general population during all phases of a crisis. For those that already utilize social media for public health risk communication, researchers

have found that public relations officers, governments, and the public have all successfully utilized social media to spread credible information, while simultaneously dispelling misinformation (Eckert et al., 2018). However, gaps exist in this body of literature, primarily on understanding the implications of using social media to reach vulnerable populations, and who exactly needs to be reached via other means (Eckert et al., 2018).

2.5 Governmental Approaches to Social Media Risk Communication

Governments and governmental agencies are often looked to in moments of crisis by the public to provide guidance for making decisions (Wukich & Mergel, 2016). As such, the risk communication literature contains discussions regarding the role that governmental organizations play in communicating to communities throughout crises. Further, as society has become increasingly technological, it has required governments to adapt to ensure they are modern in their approaches to support and communicate with the public (Zeemering, 2020). As such, governments are increasingly utilizing social media as one method to communicate with the public. This section will discuss the literature that explores the adoption and maintenance of social media risk communication by governments.

2.5.1 Organizational Functions of Social Media

One of the most influential studies that has set the foundation for exploring organizational use of social media was that of Lovejoy and Saxton (2012). They looked at the utilization of *Twitter* across 100 of the largest non-profit organizations in the U.S. At the time of publication, the authors emphasized that organizational-level research focusing on social media utilization was quite scarce. It was acknowledged that many non-profit organizations engaged stakeholders via social media and were doing it more effectively than they could via traditional

means, such as websites. Through looking at the social media engagement of these organizations, Lovejoy and Saxton (2012) developed one of the first ways to methodically classify the ways in which organizations use social media. The key functions were broken down into three broad categories: information, community, and action. The information-community-action classification is considered significant as it goes beyond the simpler information-dialogue dichotomy that was being discussed in literature at the time of publication. This thesis will utilize aspects of this classification for its own analysis, which will be discussed further in Chapter 3.

Gruzd and colleagues (2018) expanded on the work of Lovejoy and Saxton (2012) by comparing the use of *Instagram* and *Twitter* by the Halifax Harbour Bridges (HHB) corporation to engage the public in a 30-month, $207-million project to re-deck the suspended spans of the Macdonald Bridge. The authors utilized the 3-tier coding schema created by Lovejoy and Saxton (2012) but expanded it to include two new categories – *shared past event* and *presence maintenance*. Using this, they found that *Instagram* was more engaging in relation to the number of likes and replies relative to *Twitter*. However, *Twitter* appeared to address the social concerns of the public more effectively. Gruzd and colleagues (2018) is a prime example of the ability of Lovejoy and Saxton's (2012) classification system to assist in identifying social media functions. It also emphasizes that governmental bodies should consider the platform-specific implications of social media and to tailor messaging to the platform utilized.

2.5.2 Governmental Public Engagement on Social Media

Considering public engagement on social media is valuable for governments to understand the needs and wants of the public and can be used to inform policy and governance. Researchers like Mickoleit (2014) have found that when social media was approached methodically from an institutional lens, social media was able to promote government services effectively by engaging the public with government resources and resulting in an increase of

traffic on government websites. Through this, social media has created opportunities for governments to promote evidence-based findings on emerging topics to positively influence public policy (Hancu-Budui, Zorio-Grima, & Blanco-Vega, 2020). This research on governmental engagement with the public who has access to social media reinforces that it is mutually beneficial; more specifically, for the public in accessing evidence-based information and for governments in understanding public perspectives that may help inform policy processes.

While social media is known to be beneficial when effective, there are decisions governments need to make about the method of engagement. A consideration in governmental social media research are the challenges surrounding functional fragmentation, especially through the lens of a pandemic (Zeemering, 2020). Functional fragmentation focuses on issues concerning departments within cities using their own discretion when exploring scope and selection of social media platforms (Bennett & Manoharan, 2017; Feeney & Welch, 2016; Mergel, 2012). Further, it has been defined as the "fragmentation of authorities among policy areas, services, and departments and agencies within a single government, resulting in inefficiencies and ineffectiveness in delivering public services" (Yi & Cui, 2019, p 1052). Functional fragmentation has been characterized as problematic in times of crisis, as governments try to adopt a consistent response. Zeemering (2020) examined this by conducting a comparative case analysis of three cities using data from their *Twitter* accounts, as well as key informant interviews with social media managers in each city. Ultimately, their analysis revealed that functional fragmentation had consequences for coordination of social media about the pandemic, while it highlighted the importance of having managers in city agencies to contribute to the appropriate coordination of information provision to the public. The findings reinforced

those of Wukich and Mergel (2016), who found that the public turns to government as trusted sources during emergencies and share their information with the public.

2.5.3 Case Studies of Governmental Engagement on Social Media

Case studies have been undertaken to understand the ways the public express their opinion on social media and how social media impacts decision-making. For example, Harris and colleagues (2013) examined how local health departments in the U.S. use social media to educate and inform the public through a case study of diabetes. Their case study focused on any tweet related to diabetes coming out of these health authorities and compared them with the characteristics of those authorities. They found that jurisdictions with larger populations and availability of staff resources were the ones that more effectively tweeted about diabetes (Harris et al., 2013). Their findings on governmental social media revealed that local health departments were increasingly using social media to provide educational materials about health issues. Further, local health department success in this regard was dependent on organizational staffing and resources. There is some evidence to support that these factors are also related to the geographic size of the region the health authority operates over. Jurisdictions that had larger populations and geographic size were more likely to be early adopters and innovators of social media (Harris, Mueller, & Snider, 2013). Because of this, these health authorities also had more social media connections to facilitate the spread of information and highlights the benefits of understanding one's social media followership (Harris et al., 2014a). This research lends to the idea that having a deeper level of understanding about audience can help guide public health organizations in tailoring their content and dissemination strategies, and further, that smaller health authorities and regions may need additional support to facilitate the dissemination of information on social media.

More recently, Bellström and colleagues (2016) examined the government presence on *Facebook* within a municipality in Sweden to understand the kind of information exchange that happens between local government and the public. Their study found that this form of communication is primarily being used to promote events in the municipality, but also to ask questions to the municipality or other users. This study by Bellström and colleagues (2016) was one of the first to use a content analysis to categorize *Facebook* page owner posts, as well as use posts on a local government *Facebook* page. Roengtam and colleagues (2017) is another case study on the impact of social media use in selected local governments in Indonesia, Thailand, and the Philippines. While previous researchers reinforced the benefit of engagement with the public on social media, this case study found that social media was used only for information dissemination to the public, meaning that the public was not being consulted in decision-making processes. A later case study of these same governments expanded to look at both *Twitter* and *Facebook* and found that they made significant achievements in engagement levels by consulting with the public in daily city affairs (Nurmandi et al., 2018). This was built upon by Yang and Su (2020) who reinforced through their analysis of the China Health Code policy during COVID-19 that public voice on social media was significant in promoting policy evolution. Further, it was a key form of cooperative governance to assist in maintaining social stability in the face of a public health emergency (Yang & Su, 2020).

In the context of public health crises, and with each health authority having varied experiences communicating health information on social media, there is evidence to suggest that communication campaigns across regions can be disjointed. More specifically, researchers have shown that messaging strategies tend to vary widely across health authorities, potentially leading to gaps in communication (Wong et al., 2017). The variation in messaging means that more

research needs to be done to identify where gaps are occurring during emergency social media responses. One opinion is that governmental use of social media is largely atheoretical, as theory should be more readily used to help guide the proper and efficient use of health-related social media (Tursunbayeva, Franco, & Pagliari, 2017). Beyond this, Tursunbayeva, Franco, and Pagliari (2017) reinforced many other findings previously stated in this literature review, such as the effectiveness of social media by stakeholders to influence policy and decision-making, the need for civic engagement, and the opportunities for governmental health organizations to use social media to disseminate health information and policies.

2.6 Conclusion

This Chapter outlined prominent literature in risk communication research as identified through a narrative literature review. Researchers in risk communication literature characterize that risk communication is an interdisciplinary field that draws upon many disciplines as its theoretical basis. While there are challenges with incorporating numerous theories into practice, it remains important for the success of risk communication. Although there are tools available to assist those engaging in evidence-based risk communication, few are widely used.

Misinformation and the spread of information across social media is identified as a major component of risk communication and management. A variety of strategies are prosed to manage the spread of information to promote reliable information and, consequently, risk mitigation policies and behaviours. Strategies for risk communication on social media from an organizational and governmental perspective constitute a sizable portion of the risk communication literature. Evidence suggests that social media presents an opportunity for two-way information exchange between governments and the public to consequently improve their messaging and policies, but governments must also make improvement to act as informational authorities in online spaces, as the public looks to them for support and guidance.

Chapter 3 – *Twitter* Content Analysis

3.1 Introduction

Governments and governmental agencies are often looked to for guidance from the public during public health crises. To meet this need, governments have turned to online spaces like social media to communicate, recognizing the internet as a primary source of information. This Chapter examines how *Twitter*, a predominant social media platform, was utilized by health authorities in Ontario to communicate with the public about the COVID-19 pandemic.

Utilizing a qualitative content analysis methodology, publicly available tweets by provincial and local Ontarian health authorities on *Twitter* were collected and analyzed across three milestones during the first wave of the COVID-19 pandemic (i.e., the declaration of COVID-19 as a public health emergency by the World Health Organization on January 30, 2020, the announcement of the first death in Canada from COVID-19 on March 10, 2020, and the announcement of Ontario's first reopening on May 14, 2020). The following section will more specifically identify the methods taken for data collection and analysis, as well as the rationale for the data included in this Chapter. Once the methods are articulated, findings will be presented to describe how *Twitter* was used by health authorities in Ontario following these COVID-19 milestones. Finally, these findings will be discussed alongside risk communication literature.

3.2 Methodology

The research questions for this portion of the study are as follows:

- In what ways has *Twitter* been utilized by provincial and local governments in Ontario for public health risk communication during the COVID-19 pandemic?
    - What are the primary functions of *Twitter* for provincial and local governments in Ontario during the COVID-19 pandemic?
    - Has there been consistency between provincial and local government messaging in Ontario on *Twitter* during the COVID-19 pandemic?

To answer these research questions, a qualitative content analysis methodology was used. Content analyses utilize a variety of approaches to interpret meaning from the content of text data (Hsieh & Shannon, 2005). This methodology lends well to the objectives of this study given that it aims to describe the use of *Twitter* during COVID-19. More specifically, a *directed* content analysis methodology was used, which uses a previously established coding framework to explain a phenomenon of focus (Hsieh & Shannon, 2005). This approach enables this research to build upon existing research similarly examining how social media is utilized by governmental bodies during a public health crisis, but in a Canadian context.

Beyond this, the critical constructivist paradigm guiding this research is consistent with the assumptions of a content analysis given its foundation in the key tenets of naturalism (Hsieh & Shannon, 2005). The naturalistic paradigm recognizes that reality is multiple and subjective (Guba, 1979), which is ontologically aligned with critical theory and constructivism (Guba & Lincoln, 1994). Therefore, the utilization of a directed content analysis is suitable for this research as it acknowledges the importance of context, expands upon previous research, and is consistent with the paradigmatic approach. The following sections will identify the specific methods to collect and analyze data to answer the proposed research questions.

3.2.1 Sample and Data Collection

To answer the aforementioned research questions, this study examines a representative sample of health authorities from the provincial and local level in Ontario. As such, this study utilized a purposive sampling approach, which is defined as "a strategy in which particular settings, persons, or events are selected deliberately in order to provide important information that cannot be obtained from other choices" (Taherdoost, 2016, p. 23). Table 4 details the health

authorities included in the data collection and analysis of the study, as well as the amount of data each health authority provided.

Table 4: Health Authorities Included in *Twitter* Data Collection Sample

	Name of health authority	**Abbreviated name**	***Twitter* username**	**Number of tweets**
Provincial	Ontario – Ministry of Health	MOH	@ONThealth	49
	Government of Ontario	ONGOV	@ONgov	66
	Public Health Ontario	PHO	@PublicHealthON	58
Provincial Total				173
Local	Algoma Public Health	APH	@AlgomaHealth	34
	Middlesex-London Health Unit	MLHU	@MLHealthUnit	134
	Ottawa Public Health	OPH	@OttawaHealth	193
	Simcoe Muskoka District Health Unit	SMDHU	@SMDHealthUnit	96
	Thunder Bay District Health Unit	TBDHU	@TBDHealthUnit	103
	Toronto Public Health	TOPH	@TOPublic Health	264
	Windsor-Essex County Health Unit	WECHU	@TheWECHU	95
Local Total				919
TOTAL				**1,092**

At the local level, Toronto, Middlesex-London, Ottawa, and Windsor represent urban centres, while Algoma, Thunder Bay and Simcoe Muskoka represent more rural areas. This was done to be representative of messaging across the province. Further, at least one health unit was chosen from the peer groups as identified by Statistics Canada (Statistics Canada, 2015). Peer groups were created to group together jurisdictions with similar geographics. The utilization of peer groups means that the sample has jurisdictions with varying characteristics, which includes those that are mainly urban centre with moderate population density (peer group B – e.g., MLHU), sparsely populated urban-rural mix (peer group C – e.g., APH), mainly rural (peer group D – e.g., SMDHU), and largest population centres with high population density (peer groups G & H – e.g., TPH) (Public Health Ontario, 2018).

This part of the study did not require ethics approval from Western University's Non-Medical Research Ethics Board (NMREB), given that it used information that is publicly accessible, as per the Tri-Council Policy Statement (Article 2.2). The sample (i.e., Ontarian health authorities) did not have an expectation of privacy of the content they shared.

This study examined all tweets from the Ontarian health authorities identified in Table 4 throughout three 1-week periods following major milestones during the first wave of the COVID-19 pandemic, which include: (a) the declaration of COVID-19 as a public health emergency by the World Health Organization on January 30, 2020, with tweets examined from Jan 30 - Feb 6; (b) the announcement of the first death in Canada from COVID-19 on March 10, 2020, with tweets assessed from Mar 10 - Mar 17; and (c) the announcement of Ontario's first reopening on May 14, 2020, with tweets examined from May 14 - May 21. Examination of tweets was limited to the period of 1-week following each milestone to gather data about the immediate messaging and response on *Twitter*. Given the rapid evolution of the pandemic and the nature of social media posts, the 1-week period was determined to be an appropriate timeframe for sampling messaging. The three milestones were selected to gather an understanding of the progression of communications throughout the first wave of COVID-19 pandemic. They were selected to represent moments in Ontario that would have been of local public concern and conversation around COVID-19 in online spaces. Understanding the timing of a crisis and understanding this kind of information has been identified in risk communication literature as useful for future instances of crisis management (Yang et al., 2021). Table 5 displays the time frames that were selected for data collection, their associated milestone, alongside the total number of tweets collected in each time frame.

Table 5: COVID-19 Milestones that Guided *Twitter* Data Collection

Milestone	Time frame of data collected	Number of tweets
Milestone #1: 1 week after the WHO declared COVID-19 was a public health emergency of international concern	January 30th, 2020 – February 6th, 2020	192
Milestone #2: 1 week after the first death was announced from COVID-19 in Canada* **WHO declaration of COVID-19 as a pandemic on **March 11th** and state of emergency announcement in Ontario on **March 17th** also falls in this range*	March 10th, 2020 – March 17th, 2020	334
Milestone #3: 1 week after Ontario reopening was announced* **Actual opening on May 19th*	May 14th, 2020 – May 21st, 2020	566
TOTAL		**1,092**

The *Twitter* analytics tool Vicinitas (https://www.vicinitas.io/) was used to gather all historical user tweets from each health authority account. Vicinitas helps users to track and analyze all real-time and historical tweets of *Twitter* campaigns and brands (*Twitter* Analytics, n.d.). All data for each time frame was extracted from *Twitter* on October 2, 2020. This temporality is important to note due to the time sensitivity of social media, as historical posts can be deleted at any point in time. Microsoft Excel macros were developed and used on the raw *Twitter* data extracted using Vicinitas. Because the data extracted from Vicinitas collected all historical tweets by the health authority, the macros enabled the researcher to narrow down data to the specific time frame associated with the COVID-19 milestones indicated in Table 5.

Appendix B shows how *Twitter* data were organized via Microsoft Excel. Tweets analyzed in this study only included those sent out in English as this study did not have the capacity for translation and nuance may be lost in translation. A total of 28 tweets were excluded from the sample as they were tweeted in French (27 from Public Health Ontario, and 1 from Ottawa Public Health). Replies to tweets were also excluded from the data set as this study only examines messaging provided by the health authorities. While examining replies would make for an interesting study and would allow for a deeper understanding of engagement by public health authorities with the public, this was outside of the scope of the study. No other exclusion criteria were used for tweets during data collection, as the goal of this study was to get a sense of communication by health authorities in Ontario amid a public health crisis. While the COVID-19 pandemic was the focus of this case study, other public health issues persisted (e.g., opioid crisis), just within the context of a pandemic, so the subject matter of the tweets extended beyond COVID-19. After data collection, *Twitter* data were imported into NVivo (v.12) for analysis and coding. See Appendix C for a snapshot of NVivo (v.12) coding. The analysis of these data will be discussed further in the next section.

3.2.2 Data Analysis

The first step in conducting a directed qualitative content analysis is identifying key concepts or variables as the initial coding categories. Wong and colleagues' (2017) coding schema on social media communication during the Ebola pandemic was adopted to create the basis of coding categories, which included *information giving*, *news update*, *event promotion*, and *preparedness*. This was expanded by incorporating Lovejoy and Saxton's (2012) three key functions of how non-profit organizations use social media (*information*, *community*, and *action*).

As analysis was completed, some re-structuring and re-wording of categories was required based on the context of COVID-19 that did not necessarily align with the context of the Ebola outbreaks of 2016 that applied at the time of publication for Wong and colleagues (2017). For example, *Travel* was moved from the *News update* category to the *Information giving* category, as COVID-19 communications related to travel focused more on travelling safely and preventative measures, rather than the travel advisories during Ebola. The codes suggested by Lovejoy and Saxton (2012) and Wong and colleagues (2017) were reviewed to ensure they aligned with the realities of COVID-19. For example, the *myths* category was reframed as *misinformation* to remain consistent with the narrative of the *infodemic* during COVID-19.

The next step in a directed content analysis is to code all passages of text using the predetermined codes. Any text that cannot be categorized by the initial coding schema is then given a new code, which builds a degree of inductivity to the process (Hsieh & Shannon, 2005). This inductivity is important in the process to help enhance, revise, or update existing frameworks, models, and theories. These emergent codes expanded the schema adapted from Wong and colleagues (2017) and Lovejoy and Saxton (2012). As an example of how the coding schema evolved throughout analysis, *reactive measures* was added as a category for the communication of measures that were implemented in reaction to the spread of COVID-19. This was not accounted for the in the initial coding schema from Wong and colleagues (2017). This is once again consistent with directed content analyses, which states that subcategories may need to be identified during analysis to reflect more nuance in the coding schema (Hsieh & Shannon, 2005).

Categories were further divided into three overall content focuses – *COVID-19*, *COVID-19 implicated*, and *non-COVID-19* content. Overall content focuses are the analytical products

that will be used to answer the research questions and will be referred to in the Findings section as *functions*. This operates under the assumption that the *Twitter* categories with the largest content area of focus is also considered the primary function. The coding schema was further adapted to include messaging not directly related to COVID-19. Tweets were coded into the *COVID-19* category if they explicitly focused on direct impacts of COVID-19, those focusing on the ripple effects of the COVID-19 pandemic or used the pandemic to highlight other health issues were coded into the *COVID-19 implicated* category, and those focusing on content unrelated to COVID-19 were coded into the *non-COVID-19* category. See Table 6 for the resulting coding schema following the direct content analysis approach, which includes descriptions and examples of all sub-categories.

Table 6: Adapted Wong and colleagues (2017) and Lovejoy and Saxton (2012) Coding Schema

Category	Description	Sample Tweet	n	%
COVID-19 CONTENT			864	55.3
Information giving	General information on COVID-19		545	34.9
Resources	Directs people to learn more about COVID-19 through a Web site or infographic	Our website is up to date on COVID-19 information that may be helpful to you. https://t.co/hec2k4gZrk	224	14.3
Transmission	Describes how COVID-19 spreads	The transmission of #COVID19 can still happen, even if someone isn't showing signs of being sick. Help #stopthespread and #stayhomesavelives.	4	0.3
Prevention	Recommendations to prevent or reduce the risk of COVID-19 infection	Help prevent the spread of germs and protect yourself from #coronavirus or other viruses by practicing proper cough and sneeze etiquette. https://t.co/PvR7dYc87X	224	14.3
Dispelling misinformation, providing facts	Clarifying information or facts to dismiss COVID-19 misinformation	With so much information circulating on the internet beware of questionable offers around #COVID19, such as: · Miracle cures · Vaccinations · Faster testing. Consult trustworthy sources like @CPHO_Canada and @GovCanHealth	23	1.5
Reducing fear	Directly aimed at dismissing fear toward COVID-19	It is NOT time to panic. It is NOT time to shutter all businesses. But it is time to make carefully selected choices to reduce spread. Waiting is no longer an option.	25	1.6
Risks/symptoms	Risks or symptoms associated with COVID-19 infection	Protect yourself and your friends from the flu, colds, and the COVID-19 virus by staying home if you are sick. If you have a fever, cough, or shortness of breath AND have travelled outside of Canada in the last 14 days, call the WECHU.	19	1.2
Travel	Best practices for travelling during COVID-19	Do you have family or friends returning home from March break vacation? Make sure they know what it means to self-isolate. Learn more: https://t.co/QBnEqB71Uj	26	1.7
Preparedness	Measures in place to prevent spread of COVID-19		68	4.4

Category	Description	Sample Tweet	n	%
Educational institution	Primary, secondary, or higher education preparedness	Health and Safety Top Priority as Schools Remain Closed https://t.co/ziYOwpO63u	8	0.5
Local government	Local or community-level preparedness	#Coronavirus Preparedness: We are actively working with many partners, provincial and locally, as per our infectious diseases emergency response plan. Find out more. https://t.co/0i3lJ7q8da	30	1.9
Provincial government	Province-wide preparedness	All provincial emergency orders in Ontario including mandatory closures of public establishments, and prohibition of events and gatherings of over five people, have been extended to April 13.	28	1.8
Organizational	Organization-specific preparedness	Starting Monday, March 16 and until further notice, the London Public Library will be closed to the public to help slow the spread of COVID-19.	2	0.1
Reactive measures	Measures put in place in reaction to the prevalence and impact of COVID-19		27	1.7
Adapting events of services	Changes made to various services or events based on COVID-19	OSAP borrowers, the government is taking steps to ensure that you will not be required to make any #OSAP loan payments between March 30 & September 30, 2020 & no interest will accrue on your student loans during this time.	11	0.7
Economy	Economic measures in place to support people and economy during COVID-19	Ontario's response to #COVID19's economic impacts includes making $10 billion available to support people and businesses to improve cash flows.	4	0.3
Local government	Measures to lessen the impacts of COVID-19 by local government or municipalities	The @CityofToronto has partnered with @ritual_co to support Toronto restaurants and food services. Businesses that sign up for #RitualONE by June 1 will receive the service free for life without any commission or monthly subscription fees.	6	0.4
Provincial government	Measures to lessen the impacts of COVID-19 by the province	By Emergency Order, @ONgov has set all time-of-use price periods to 10.1¢/kWh. Eligible bills will be automatically adjusted. No customer action required. Stay tuned for more info.	6	0.4
News update	New information on the progress or actions taken against COVID-19		154	9.9

Category	Description	Sample Tweet	n	%
New cases	Alert given for a new confirmed or diagnosed COVID-19 case	Folks, we have a positive case of novel #coronavirus in #ldnont. The individual is a young woman who is a student at Western but has NOT been on campus since returning from China.	18	1.2
Current status	Description and any updates of current COVID-19 cases within an area	Read my latest statement on the #2019nCoV #coronavirus: https://t.co/Zbh01IsUDO	136	8.7
International support	Canadian COVID-19 aid and assistance internationally	N/A	0	0
Event promotion	Physical or virtual platform to deliver information on COVID-19 outbreaks with date, time, or location of event		54	3.5
Hotline	Phone lines set up to answer community COVID-19 questions	Have questions about the #2019nCoV #coronavirus? Call our hotline at 416-338-7600, Monday to Friday from 8:30 a.m. to 8 p.m. and weekends from 10 a.m. to 6 p.m.	1	0.1
Speech/forum	Televised speech or public forums to answer COVID-19 questions	2:30 p.m. today -- Chief Medical Officer of Health and Associate Chief Medical Officer of Health to Hold Media Briefing (livestream available)	31	2.0
Web chat	Online arena to answer COVID-19 questions (e.g.., *Twitter* or *Facebook*)	Go to the Windsor-Essex County Health Unit Facebook page to listen to the local COVID-19 public health updates at 9 a.m.	16	1.0
Radio	Public or health officials answer COVID-19 questions	Coming up at 4:35pm: @VeraEtches chats with @radioKristy on @CFRAOttawa about the latest COVID-19 developments in our community.	6	0.4
Other COVID-19 codes	Other information included in COVID-19 tweets		16	1.0
Research	Tweet mentions evidence from research	Study: 3 a month will fly with COVID: Up to three COVID-infected travelers might board an international flight… http://t.co/5YshOwfsTF	5	0.3

Category	Description	Sample Tweet	n	%
Phone number	Tweet includes a phone number	Questions about #coronavirus? Contact Health Connection 705-721-7520 (1-877-721-7520) Mon to Fri 8:30 to 4:30 or Telehealth 24/7 1-866-797-0000	7	0.4
Physical address	Tweet provides a physical address	A second COVID-19 Assessment Centre, operated by @LHSCCanada, @stjosephslondon, #MLHU and @CityofLdnOnt, will open on Thursday, March 19 at 11AM at Carling Heights Optimist Community Centre (CHOCC), located at 656 Elizabeth Street in London. #LdnOnt #Middlesex	2	0.1
E-mail address	Tweet provides an e-mail address	#TBay and region.. any closures email thunderbay@CBC.ca. This is important .. and please share widely. Big thanks to CBC Interactive team https://t.co/WQnIVdyali	2	0.1
COVID-19 IMPLICATED CONTENT			401	25.7
Community* *Inspired by Lovejoy & Saxton (2012)*	Foster relationships, create networks, and build communities during the pandemic		234	15.0
Giving recognition and thanks	Boosting community morale through recognition of individuals/groups	Thanks for practicing physical distancing @JairusCTV.	89	5.7
Acknowledgement of current/local events	Bringing people together for in-person or virtual events or challenges (*with COVID-19 implications)*	Don’t miss out on fireworks today! While we practice #PhysicalDistancing to prevent the spread of #COVID19, we found out that @getsnapd is having an augmented reality fireworks show at 8pm tonight.	8	0.5
Addressing loneliness, isolation, and mental health	Directly aimed at addressing impacts of isolation, quarantine and general mental health	Here are some good tips for managing your #mentalhealth during #COVID19. Thanks @ottawahealth - it's an important reminder that #MentalHealthIsHealth!	59	3.8
Sentiment of community	Promoting a sense of community and the idea that we are “all in this together”	Have a neighbour or family member that is self-isolating? Be their HERO and deliver groceries/essential items to their doorstep. We are in this together. https://t.co/hec2k4yAiS	54	3.4
Response solicitation or tagging/calling on others	Promote interactivity and dialogue	Please watch and share! ⁉️ Everyone needs to step up and fight #COVID19. #StayHomeStaySafe #PlankTheCurve #ldnont	24	1.5

Category	Description	Sample Tweet	n	%
Other public health issues	Other health issues that are implicated alongside COVID-19		112	7.2
Drug and alcohol use	Discussed the implications of the pandemic on drug or alcohol use	We are all in this together. Stigma and discrimination of people who use substances and those with a substance use disorder hurts their efforts to stay safe during COVID-19 pandemic.	18	1.2
Education access + parenting	Impacts of COVID-19 on education in Ontario and parent's facilitating learning for their children	TVO Kids offers educational programing for school-aged children throughout the day! See what is on and when here: https://t.co/QZp3b0ZYZe.	12	0.8
Environmental health	Impact of the pandemic on the environment and living conditions	As we all do our part to #flattenthecurve by staying home, having a safe and #healthyhome is even more important. Store your household chemicals away from children, and make sure to follow all the instructions on the labels.	2	0.1
Equity + vulnerable populations	Disproportionate impact of COVID-19 certain populations or issues	In the wake of #COVID19, we know that many people in our region cannot afford to adequately prepare for how the outbreak is affecting their family. That's why we've joined forces with local health authorities, front-line agencies and partners to launch: https://t.co/RYM85NDk84	15	1.0
Food security	Impact of COVID-19 on access to food and food security	To support the great work food banks across the province do to provide individuals, children and seniors with nutritious food Ontario is providing @FeedOntario additional funding	12	0.8
Intimate partner violence	Tweets related to intimate partner violence amid the pandemic	Message to the community: Remain vigilant about the potential for abuse towards women and children https://t.co/ozrTIRbWne	3	0.2
Maternal health	Tweets related to intimate partner violence amid the pandemic	For COVID-19 related information for pregnant and breastfeeding mothers, please visit https://t.co/GqKn6gjagi	1	0.1
Staying active	Tweets related to physical activity amid the pandemic	The Living True Sport: Helping Families Keep Active While Staying Home activity guide is now available to download.	38	2.4
Worker protection	Tweets related staying safe while at work amid the pandemic	Employees, does your employer require a sick note? We've got your back: https://t.co/rSqq7I0Sls	11	0.7

Category	Description	Sample Tweet	n	%
Miscellaneous			55	3.5
Career, professional	Tweets about job opportunities and professional development related to COVID-19	Job Posting: 1 Public Health Emergency Preparedness Coordinator - Environmental Health - Non-Union Full-Time, Contract https://t.co/OFJGAMen70	3	0.2
Crime and safety	Tweets related to COVID-19 compliance and enforcement	Bylaw Officers are now able to enforce the provincial orders on gatherings and non-compliment businesses. Bylaw will be taking an escalating approach with an initial goal of education, they may issue fines if non-compliance continues. You may report issues by calling 3-1-1.	4	0.3
Resource access	Tweets providing direction on accessing resources related to COVID-19	We've launched a new email and phone line for residents to report concerns about businesses or individuals not following #COVID19 orders.	34	2.2
Transportation	Traffic and local transportation information due to COVID-19 restrictions	Eastbound Gardiner exit to Lake Shore Blvd, parts of Lake Shore Blvd W and Bayview Ave. is closed this #VictoriaDay long weekend (until Mon 11 p.m.) for people to be outside, get exercise and practise #physicaldistancing.	9	0.6
Weather	Tweets regarding weather that mention COVID-19 restrictions or recommendations	This warm weather is perfect for getting some outdoor #physicalactivity! Adults should aim for 150 minutes of physical activity per week.	5	0.4
NON-COVID-19 CONTENT			297	19.0
Community* *Inspired by Lovejoy & Saxton (2012)*	Foster relationships, create networks, and build communities during the pandemic		80	0.5
Giving recognition and thanks	Boosting community morale through recognition of individuals/groups	Thank you @BANAWindsor for placing a kindness rock at our Windsor office. We appreciate the kind gesture…	28	1.8
Acknowledgement of current/local events	Bringing people together for in-person or virtual events or challenges (*not focused on COVID-19 information*)	Today is the start of the Bon Soo Winter Carnival – the greatest snow on earth. Opening ceremonies begin at 6 pm with fireworks at 7:15 pm at The Machine Shop.	18	1.2

Category	Description	Sample Tweet	n	%
Addressing mental health	Directly aimed at addressing impacts of isolation, quarantine and general mental health	That's amazing! We're committed to continuing the conversation on mental health all year long. #MentalHealthMatters #BellLetsTalk	27	1.7
Sentiment of community	Promoting a sense of community and the idea that we are "all in this together"	In cold weather, please check on neighbours, vulnerable and elderly people. #FrostbiteAdvisory	2	0.1
Response solicitation or tagging/calling on others	Promote interactivity and dialogue	Alright, before we get this week going, yesterday was #PalindromeDay – who's got a sweet palindrome to share?! Was it a rat I saw?!	5	0.4
Miscellaneous content			69	4.4
Career, professional	Job postings, professional development	Are you passionate about supporting patients and their caregivers across the health care system? Then explore an opportunity as the new Ontario Patient Ombudsman.	9	0.6
Crime and safety	Discussing crime in communities, prevention	Crime Stoppers is vital to community safety and everyone has a role to play. That's why we invested new funds into the 24/7 toll-free tip line (1-800-222-TIPS).	5	0.4
Emergency preparedness	Not related to COVID-19, general emergency preparedness	RT @Safety_Canada : Do you have the recommended additional items in your #EmergencyKit? Here are some: • Toiletries • Toilet Paper • Tools like a hammer	11	0.7
Governmental services	Various government services: child support, license plates, health cards, etc.	RT @ServiceOntario : New and improved licence plates – available at a ServiceOntario near you! Learn more: https://t.co/ZT3UX5gF5S	19	1.2
Transportation	Traffic, commuting	Know the facts and have fun! @Ontransport tips for snowmobile safety. https://t.co/flAWonKzk7	12	0.8
Weather	Discussing current weather, implications	The #FrostbiteAdvisory has been lifted! Windchill temps have warmed up to *checks notes*….-18C….it's…it's just the warmest of mornings.	13	0.8
Health-related content			148	9.5
Alzheimer's	Tweets about Alzheimer awareness	There are many myths about #AlzheimersDisease. Learn the realities of this disease during #AlzheimersAwarenessMonth.	1	0.1

Category	Description	Sample Tweet	n	%
Cancer	Tweets about cancer awareness and advocacy	RT @CancerCare_ON : Today is #WorldCancerDay. Learn how you can make daily changes to reduce your risk of cancer at #MyCancerIQ: https://t.co/LMPSrjwZl0 #OntarioHealth #cancercare	11	0.7
Concussions	Tweets about concussion education	Anyone snowboarding, skating, tobogganing this winter? Wear a helmet &; know the signs &; symptoms of concussions. Concussions can happen without a direct hit to the head and without losing consciousness.	1	0.1
Dental health	Tweets about dental health advice and resources	ICYMI: the Healthy Smiles Ontario program helps keep children smiling! Routine dental care is covered for families who qualify. Visit the WECHU for more information on the oral health services offered for children 17 and under.	2	0.1
Disabilities and accessibility	Tweets related to accessibility and disabilities	RT @ONAccessibility : Our government is funding the @RickHansenFdn Accessibility Certification program to help make organizations more aware of ways to remove identified barriers for people with visible and invisible disabilities.	2	0.1
Drug or alcohol use	Tweets related to drug or alcohol use	WECOSS Alert: High Rates of Drug-related ED Visits – May 12 − May 18, 2020 https://t.co/9NYUWOv80F	19	1.2
Environmental health	Tweets about environmental health and protection	The weather is getting warmer, watch out for ticks! The Health Unit will not be accepting ticks for identification or testing for the 2020 season. You can now maintain your physical distancing by using the FREE etick website at https://t.co/Cq18iGo5g6	17	1.1
Falls and accidents	Tweets about fall and accident prevention	RT @parachutecanada : Falls send more Canadian children to hospital with injuries than any other cause❗Check out The Canadian Child Safety Report Card	3	0.2
General public health advice	General advice that does not specifically mention COVID-19	Stop the spread of germs. Wash your hands…often! If soap and water are not available, use hand sanitizer.	19	1.2
Healthy eating	Includes food safety, eating disorders	Do you know the signs and symptoms of eating disorders? They can affect anyone, regardless of age, gender, or size. To understand and find help for eating disorders, visit: https://t.co/Ec9zuB4rn1	28	1.8

Category	Description	Sample Tweet	n	%
Influenza and infectious diseases	Tweets related to prevention and spread of influenza and other infectious diseases (except COVID-19)	The Health Unit’s latest Influenza Surveillance Report is now available: https://t.co/mC35QfWEQr #LdnOnt #Middlesex Overall Assessment: Influenza activity in the Middlesex-London region is moderate, with both influenza A and B cases reported.	9	0.6
Maternal health	Tweets about maternal health and associated resources	Find prenatal and after birth help and support: prenatal classes, medical care, community and breastfeeding services. Find a service near you.	4	0.3
Sexual health	Tweets about sexual health education	Go long. #UseCondoms #SuperBowlLIV	3	0.2
Smoking cessation	Tweets related to smoking cessation	Thinking of quitting smoking? There’s 1 week left to register for the Ultimate Break It Off Challenge!! Stay tobacco free for a chance to win $$$!	4	0.3
Staying active	Tweets promoting physical activity	Walking or wheeling to school or the bus stop is a healthy, green choice that’s good for you. Tag us in pics of your active travel choices on Winter Walk Day as you journey outside.	12	0.8
Vaccines	Tweets related to all vaccines (not including COVID-19)	Parents: It's your responsibility to keep personal immunization records up to date. You can even do it online. https://t.co/387OLRQeOn	11	0.7

Tweets were capable of being coded multiple times, as they often included messaging that straddled multiple categories. While 1,092 tweets were collected and analyzed, the analysis resulted in 1,562 instances of codes. For the Findings of this Chapter, the instances of codes (n=1,562) will be used as the denominator, rather than number of tweets (n=1,092). For example, the following tweet was coded as both *Prevention* and *Resources* under *Information giving*:

> *"Chief Medical Officer of Health for Ontario is recommending cancellation of all mass gatherings over 250 people. If your gathering is near that, here are some risk considerations and potential mitigation strategies. #COVID19 https://t.co/SR01IJwPKD"* [Middlesex-London Health Unit; March 13, 2020]

Tweets were also coded based on the information and content included in the tweet. The context of tweet related to the progression of COVID-19 was not accounted for to lessen the amount of interpretation needed from the researcher during analysis. For example, the following tweet was coded as *General public health advice* in the *non-COVID-19* category:

> *"5 easy steps to get rid of germs!*
> *1. Wet hands*
> *2. Soap & lather for 20 seconds*
> *3. Rinse*
> *4. Towel dry*
> *5. Turn off tap with towel*
> *Learn more about staying healthy: https://t.co/hec2k4yAiS #ThisIsPublicHealth"* [Algoma Public Health; March 14, 2020]

Although this tweet was posted on March 14, 2020, only a few days after the pandemic was declared, the tweet did not specifically reference any messaging related to COVID-19. As a result, this tweet was coded into the *non-COVID-19* category. The rationale for this was that only tweets explicitly mentioning COVID-19 either through its content or hashtags were coded into the *COVID-19* category to keep analysis as consistent as possible. This supports the

trustworthiness of findings, as acknowledging and embracing the subjectivity within analytical process is a suggested approach within a constructivist paradigm (Patton, 2002).

3.3 Findings

3.3.1 Primary Functions

A total of 1,092 tweets were collected and analyzed across all health authorities and time frames, resulting in 1,562 coded instances. Of these 1,562 instances, 864 tweets focused primarily on the direct impacts of COVID-19 (55.3%; see Figure 1). Further, tweets focused more specifically on *Information giving* as its primary function, which was the dominant sub-category across all sub-categories (34.9%; *n*=545) as well as within the *COVID-19* category (63%; see Figure 2).

Figure 1: Breakdown of Tweets by Category by Sampled Ontarian Health Authorities during all COVID-19 Milestones

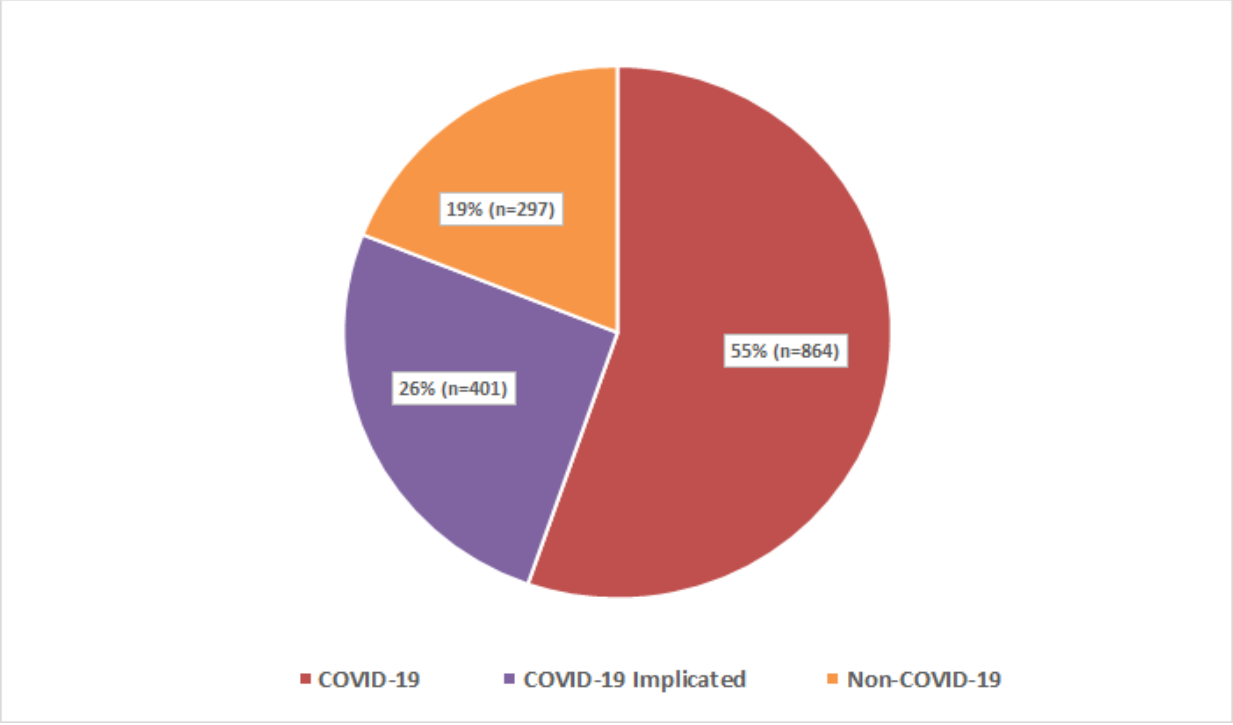
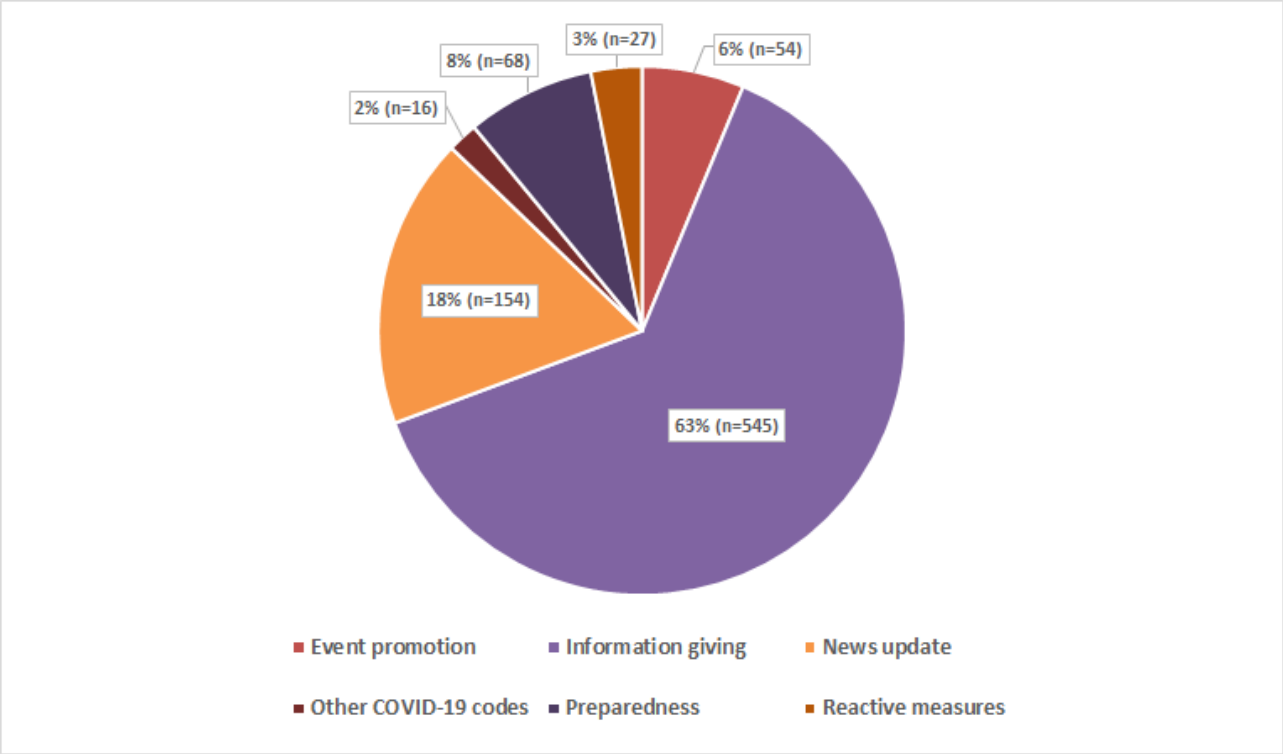


Figure 2: Breakdown of COVID-19 Content by Sub-Category



Information giving (see Table 6) included tweets that focused on correcting misinformation, educating about risks, symptoms, and transmission, as well as providing resources and steps to prevent the spread. The following are all examples of tweets coded as *Information giving*, and were more specifically coded into the *Dispelling misinformation*, *Resources*, and *Prevention* sub-categories, respectively.

> *"Be aware of scams and misinformation that is being shared. For credible, up-to-date information related to #coronavirus visit our website https://t.co/0i3lJ7q8da and follow @ONThealth @PHAC_GC @GovCanHealth"* [Simcoe Muskoka District Health Unit; January 31, 2020]

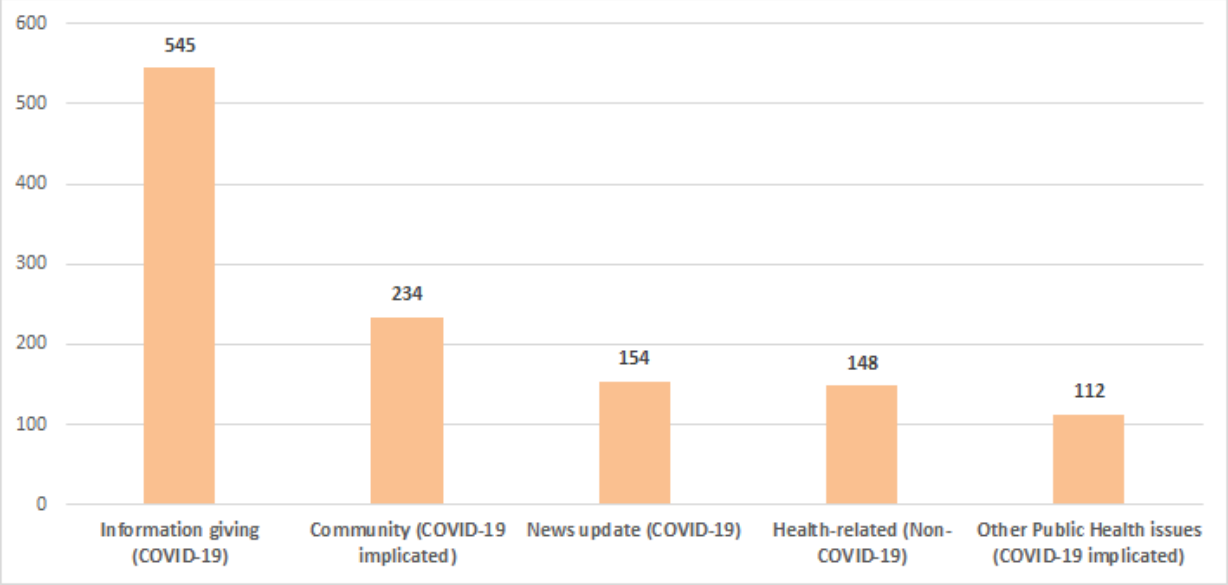
> *"Worried about the #coronavirus? Here's how you and your family can stay healthy. https://t.co/ZtW7Nsekts #COVID19"* [Government of Ontario; March 13, 2020]

> *"When wearing a face mask or covering, avoid touching and moving the mask around. Learn more about preventative tips to protect you from #COVID19ON: https://t.co/z1BrubgwK0"* [Ontario – Ministry of Health; May 21, 2020]

The content of these tweets appears to provide the public with access to information that gave insight on how they could protect themselves and their loved ones. Further, these types of tweets encouraged *Twitter* followers to do more research on credible websites by linking them directly in tweets. 41% (*n*=224) of tweets within the *Information giving* category focused on providing resources for their followers.

While COVID-19 and associated *Information giving* was the predominant function for *Twitter* by health authorities in Ontario, sub-categories show that the content spanned across all types, including both *COVID-19 implicated*, and *non-COVID-19* content. Figure 3 shows the most predominant functions of *Twitter* by the sampled Ontarian health authorities.

Figure 3: Top 5 Functions of *Twitter* by all Sampled Ontarian Health Authorities during all COVID-19 Milestones



The second most common function of *Twitter* during the first wave of COVID-19 from health authorities in Ontario was *Community* (15%; *n*=234) under the *COVID-19 implicated* category. *Community* as a sub-category focused on content that aimed to foster relationships and build a sense of community amidst the pandemic. This was done by recognizing members in their

community, addressing loneliness and isolation, and creating a sentiment of community through mantras like *we are all in this together*. The following are examples of *Community* tweets:

> *"This is the time when we all come together. When we all do our part to beat #COVID19. Everyone has a part to play. We're all in this together. #OttawaStrong"* [Ottawa Public Health; March 15, 2020]

> *"Thanks to our heroes for keeping Ontario's essential services and businesses open during the #COVID19 outbreak. Let's continue to #PhysicalDistance and protect others. #ThankYouThursday #COVID19ON"* [Ontario – Ministry of Health; May 14, 2020]

> *"If you're seeing this, reach out to a loved one. Call, send a text, or start a video chat. Check in on them. We will get through this together. #StrongerTogether #COVID19"* [Government of Ontario; May 21, 2020]

Health authorities in Ontario appeared to be aware of the impact the pandemic would have on individual mental health, as well as the community as a whole. The narrative was consistent across health authorities in Ontario in this category, and there was consistent messaging that communities could survive this public health crisis by relying on one another to follow enacted public health protocols.

The third most common function was *news updates* (9.9%; *n*=154), which included tweets that provided updates on cases and the spread of COVID-19 across regions in Ontario. These tweets often included Webinars and virtual presentations by Medical Officers of Health. Further, they focused on information about the current status of COVID-19 across the province and in their community:

> *"Ontario is closely monitoring the 2019 novel #coronavirus (#2019nCoV) & liaising with its federal, provincial/territorial partners. Overall risk to Ontarians remains low. Get the most up-to-date info on the status of cases in Ontario and learn more: https://t.co/alKmkTdOIc"* [Ontario – Ministry of Health; February 5, 2020]

> *"JUST IN: There are still ZERO cases of COVID-19 in Windsor-Essex. 96 people have been tested and 37 test results are still pending."* [Windsor-Essex County Health Unit; March 17, 2020]

> *"News release: Low-Risk Exposure at Walmart (Memorial Ave) in #TBay. Read the full release: https://t.co/NgBCX83eHc"* [Thunder Bay District Health Unit; May 14, 2020]

The next two most predominant functions include tweets about *non-COVID-19* related topics (9.5%; *n*=148), such as tick prevention and oral health, followed by tweets concerned with *COVID-19 implicated* public health issues (7.2%; *n*=112), such as intimate partner violence and substance abuse. The following are respective examples of these types of tweets:

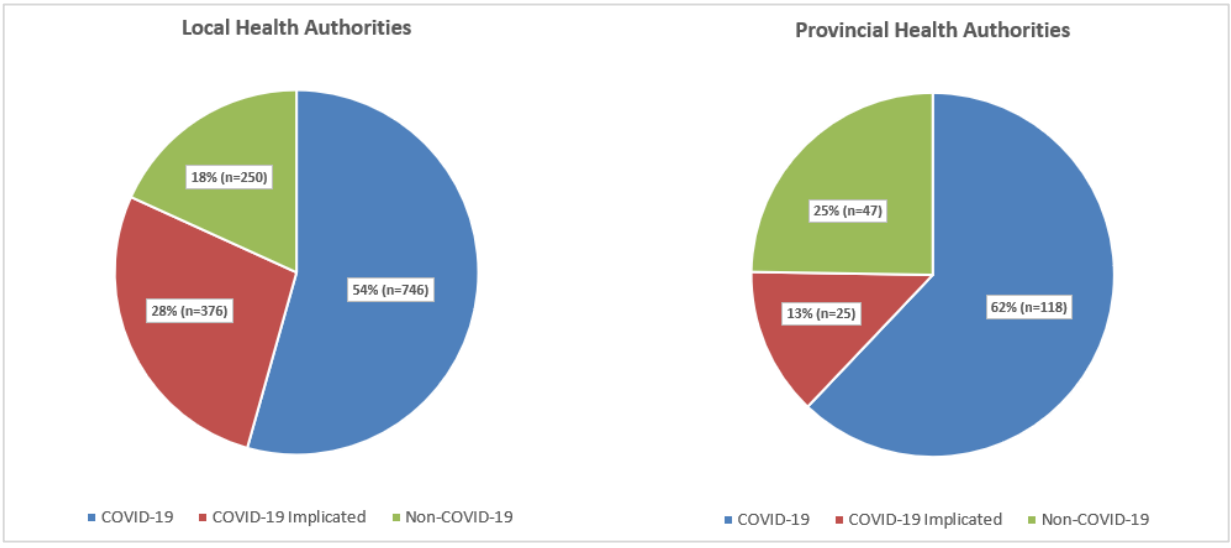
> *"Did you find a #tick? Submit a picture through the eTick app, and @eTickCA experts will identify your find! Download the app on Google Play or the App Store (https://t.co/Aan3u0R9Gs). #TickSeason"* [Middlesex-London Health Unit; May 17, 2020]

> *"Have you heard myths about alcohol and COVID-19? Find the facts here: https://t.co/6bROggkFAt"* [Ottawa Public Health; May 15, 2020]

3.3.2 Comparing Across Health Authorities

While the overall functions and utilization of *Twitter* throughout COVID-19 by health authorities in Ontario is clearly focused on COVID-19 and information provision, there are some variations in the ways the Ontario provincial government utilized its *Twitter* presence in comparison to local health authorities (see Figure 4).

Figure 4: Local vs. Provincial Health Authorities – Overall Breakdown by Category during all COVID-19 Milestones



When comparing broad categories, it appears that the three sampled provincial government accounts focused relatively more on *COVID-19* (62%; *n*=118) than the seven sampled local health authority accounts (54%; *n*=746). The biggest discrepancy between them is the variation in focus on *COVID-19 implicated* content for local health authorities, as local health authorities had 28% (*n*=376) of their *Twitter* presence discussing these issues compared to the provincial governmental accounts, where only 13% (*n*=25) of messaging was on these topics. The *Twitter* content from local health authorities from the *COVID-19 implicated* category was primarily focused on *Giving recognition and thanks* (*n*=85).

> *"Please follow the social distancing recommendations from @ottawahealth but if you must go out to get groceries or medication please remember to thank the cashiers, the staff that stock the shelves and clean the stores that are there for you in these difficult times."* [Ottawa Public Health; March 17, 2020]

> *"Students at @WesternU and @FanshaweCollege: you are not just leaders of tomorrow, you demonstrated true leadership today by staying home, as requested, this St. Patrick's Day. We've had no large-scale public gatherings, and no mass street parties in #LdnOnt."* [Middlesex-London Health Unit; March 17, 2020]

> *"Amazing profiles of all the #PublicHealthHeroes and their different roles that are working behind the scenes to manage this pandemic.* 👏👏 *https://t.co/LFaVl2L98D"* [Algoma Public Health; May 21, 2020]

Alternatively, the *COVID-19 implicated* content from the three sampled provincial government accounts were more concerned with public health issues like *worker protection* (*n*=5) in the context of COVID-19.

> *"Looking for #PPE for your employees? Visit the new Workplace PPE Supplier Directory https://t.co/q6brjj1YEx #COVID19"* [Ontario – Ministry of Health; May 14, 2020]

> *"Learn how to be safe on the job during the COVID-19 outbreak. Find 90+ workplace safety guidelines here: https://t.co/gKFu1RcvFo"* [Government of Ontario; May 15, 2020]

Figure 4 shows that the three sampled provincial health authorities tweeted relatively more frequently about *non-COVID-19* content (25%; *n*=47) than the seven local health authorities (18%; *n*=250). These tweets from the provincial accounts consisted mostly of *governmental services and resources* (*n*=23), which were aimed at informing the public about various services.

> *"New and improved licence plates – available at a ServiceOntario near you! Learn more: https://t.co/ZT3UX5gF5S"* [Government of Ontario; February 6, 2020]

> *"Are you #taxseason ready? Learn about the benefits you may be eligible for to help with living expenses such as child care or housing. https://t.co/4b5sH9BYJ3"* [Government of Ontario; March 13, 2020]

Local health authorities examined in this study, on the other hand, had their *non-COVID-19* content focused on other public health issues not explicitly discussed in the context of COVID-19. Prominent topics included *healthy eating* (*n*=26), *general public health advice* (*n*=19), and *environmental health* (*n*=17).

> "*TODAY at 12PM! #MLHU Public Health Dietitians Kim Loupos and Ginette Blake are discussing strategies and tips for managing meal times with your kids. Join us here: https://t.co/nsoRkg3mgI #NutritionMonth #MoreThanFood*" [Middlesex-London Health Unit; March 12, 2020]

> *"With March Break right around the corner, and many people hoping to get away from the cold, we've built a new website with info to help you stay healthy & safe while travelling: https://t.co/IWeNcyhQRz"* [Ottawa Public Health; March 11, 2020]

> "*Blacklegged ticks can transmit the bacteria that causes #LymeDisease. If you find a #tick, submit a photo to https://t.co/1NPNHtt49T for electronic identification. Follow these tips to protect yourself & learn more: https://t.co/mnDqpixCJU*" [Toronto Public Health; May 17, 2020]

Variation is also seen when the data are examined across the seven sampled local health authorities (Figure 5). The Middlesex-London Health Unit focused the most on *COVID-19* content relative to all their content shared on *Twitter* (73.4%; *n*=141), while Ottawa Public Health had the most equal representation of all content categories. Simcoe-Muskoka District Health Unit focused the most on content *non-COVID-19* content (36%; *n*=50) relative to other

local health authorities, while Toronto Public Health was the region who focused the most on *COVID-19 implicated* issues during the pandemic (44.6%; *n*=191). This also meant that they were the region who focused the least on *non-COVID-19* related content of the seven sampled local health authorities (8.6%; *n*=37).

Figure 5: Local Health Authorities – Breakdown by Category during all COVID-19 Milestones

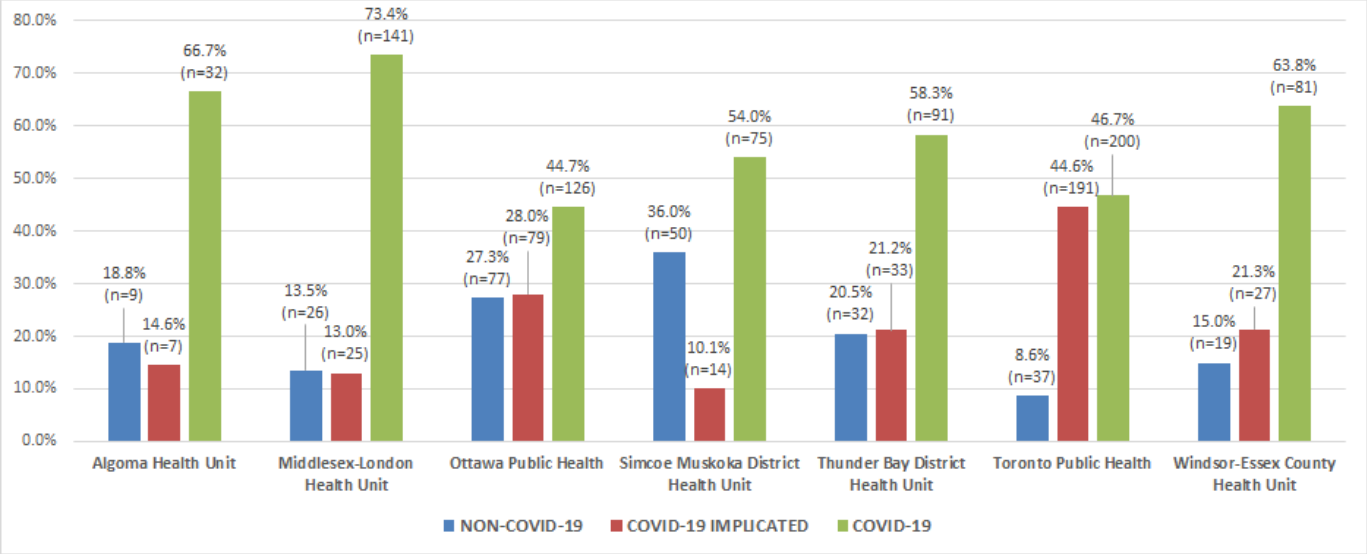
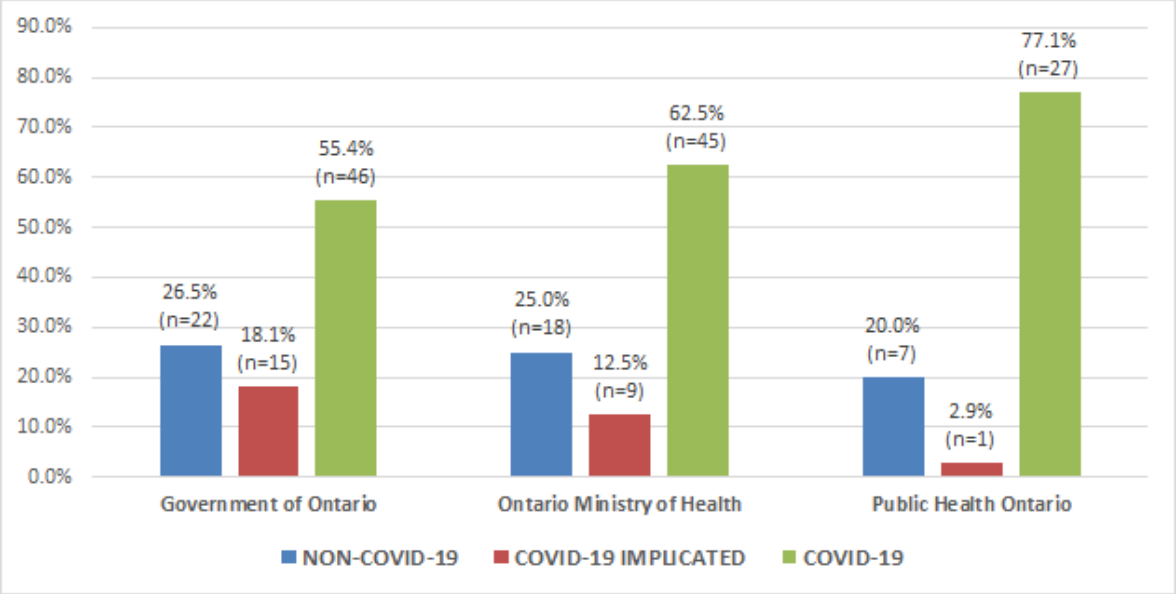


Figure 5 reflects that the seven sampled local health authorities had somewhat inconsistent *Twitter* focuses in the week following the three major milestones of COVID-19 studied here. Of course, consistency may not be reasonable to expect, as local agencies are likely to tailor their messaging to address the concerns of the public (Xu et al., 2020). One might suspect there to be similarities for local health authorities based on their geographic region, as identified in the methodology (e.g.., Peer group C – sparsely populated urban-rural mixes), but the variations persist between regions of the same peer group.

A similar variation occurs amongst the three provincial accounts examined, even though arguably they are dealing with the same geographical region (i.e., Ontario). Figure 6 identifies the primary content of the three provincial agencies.

Figure 6: Provincial Health Authorities – Breakdown by Category during all COVID-19 Milestones



The three provincial health authorities examined were quite consistent in their focus on *COVID-19* content. The main notable difference is that the Government of Ontario focused more on *COVID-19 implicated* content (18.1%; *n*=15) relative to the Ministry of Health (12.5%; *n*=9) and Public Health Ontario (2.9%; *n*=1). More specifically, the Government of Ontario focused more on *non-COVID-19* content, such as *crime and safety*:

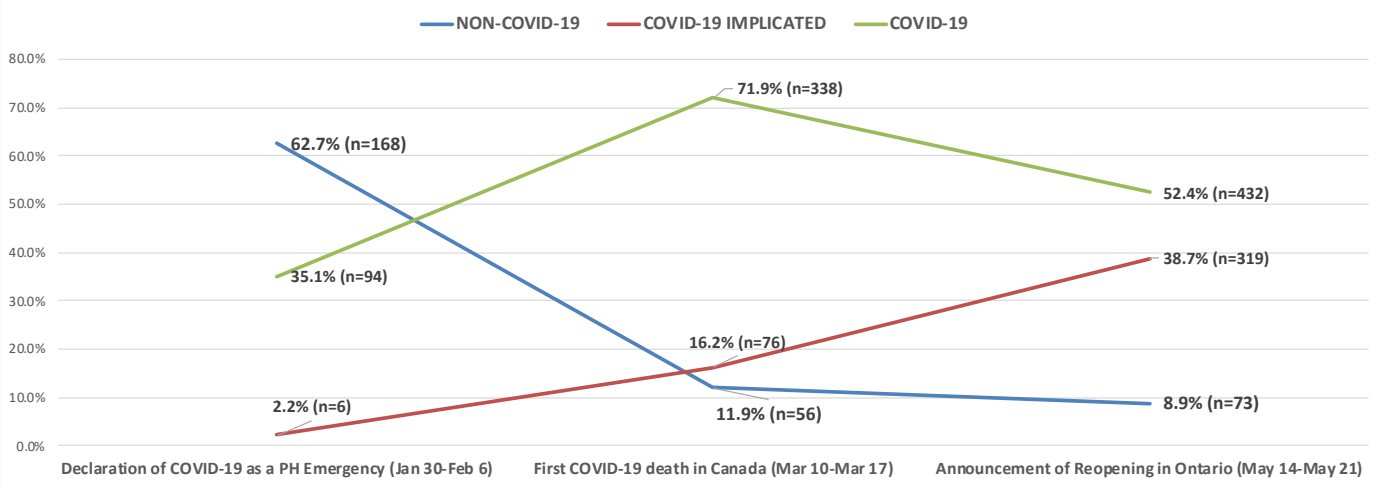
> *"#OPP's top priority is member and community safety amid concerns related to #COVID19. As we continue to respond to calls for service, consider the use of Online Reporting at https://t.co/lkZoGzFVZa to report minor incidents."* [Government of Ontario; March 16, 2020]

This type of variation is likely explained by the purpose or focus of each *Twitter* account from a provincial perspective. Just as local health authorities will be concerned with messaging relevant to its specific population, government accounts will also have nuance between them. Accounts such as the Ontario Ministry of Health or Public Health Ontario have a more specific organizational focus, particularly when compared to more general accounts, such as the Government of Ontario.

3.3.3 Comparing Across COVID-19 Milestones

Examining how *Twitter* was utilized across the three 1-week time frames associated with the three specific milestones during the first wave of COVID-19 provides a deeper understanding of the progression of content focus over time. Figure 7 shows this progression of the predominant content over the three identified milestones.

Figure 7: Breakdown of Categories of all Sampled Ontarian Health Authorities by COVID-19 Milestones

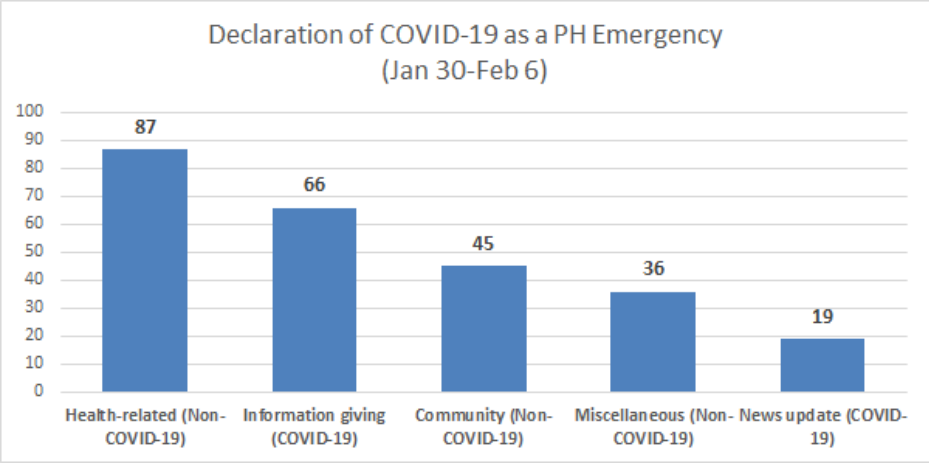


At the outset, in the week after COVID-19 was identified as a public health emergency (Jan 30 – Feb 6), Ontarian health authorities focused primarily on *non-COVID-19* content (62.7%; *n*=168). However, the total volume of content for this time frame was lower (*n*=268), relative to the amount of messaging by health authorities in Ontario during the other time frames (Mar 10 – Mar 17 [*n*=470], May 14 – May 21 [*n*=824]). This reflects that the Ontarian health authorities examined in this study communicated relatively more frequently around the beginning of the provincial lockdown in March and reopening in May. Figure 7 also shows the change in focus over time, as *non-COVID-19* content went from 62.7% (*n*=168) of its communication at the end of January and beginning of February, dropping down to only 11.9% (*n*=56) in March. When the province and local health authorities responded to the reopening

plans in May, content slightly levelled out, as it was the most balanced representation between all three categories following the identified milestones, while *non-COVID-19* content remained the least area of focus at 8.9% (*n*=73).

Examining the temporality of sub-categories following the identified milestones will provide a deeper understanding of more specific content that the sampled Ontarian health authorities focused on as COVID-19 progressed. In what follows, Figures 8 – 10 show the top 5 functions for all health authorities following each identified milestone.

Figure 8: Top 5 Functions of *Twitter* from all Sampled Ontarian Health Authorities following COVID-19 Milestone #1



The top function of *Twitter* by sampled Ontarian health authorities following the declaration of COVID-19 as a public health emergency (Figure 8) was about health-related information under the *non-COVID-19* category (*n*=87). This was a broad category focusing on health issues, such as cancer, sexual health, or physical activity. The most common types of tweets in this category for this time frame was about *healthy eating* (*n*=16) and *general public health advice* (*n*=16), followed by *drug and alcohol use* (*n*=12).

> *"Need a snack for watching the big game? Add this Zesty Bean Dip and Chips recipe to your pre-game checklist. Boom!* 🏈 *#SuperBowl Full recipe here: https://t.co/KelpLUEkNY @DietitiansCAN"* [Middlesex-London Health Unit; February 1, 2020]

> "*Be a germ stopper: stay at home when you're sick. #ThisIsPublicHealth #Flu*" [Algoma Public Health; February 5, 2020]

> "*Prescription painkillers (opioids) are one way to manage certain types of pain but it's not your only option. Speak to your health care provider for a pain management plan that is right for you. https://t.co/4GTa7aHFMb"* [Ontario – Ministry of Health; February 5, 2020]

It should be noted that the second most common function was *information giving* about COVID-19 (*n*=66), which focused on providing *resources* (*n*=31) and *dispelling misinformation* (*n*=16).

> "*What can I do to protect myself? What are the symptoms? How are people being treated? Is there a vaccine? Get the facts. Read the Novel Coronavirus FAQs @GovCanHealth: https://t.co/jfiVfppE22*" [Middlesex-London Health Unit; February 5, 2020]

> "*Beware of misinformation about #2019nCoV #coronavirus on social media! The best defence against #misinformation is #factchecking and knowing your credible sources. #OutsmartEpidemics starting here: ➡ https://t.co/5Z5UAZI2rm ➡ Call 1-833-784-4397 ➡@GovCanHealth ➡@WHO https://t.co/JfXrqyzn2j"* [Ottawa Public Health; January 31, 2020]

These findings appear to suggest that although COVID-19 may not have been the primary focus following the WHO's declaration of a public health emergency, the COVID-19 virus remained on their radar as a potential area of concern and communicated accordingly.

Figure 9: Top 5 Functions of *Twitter* from all Sampled Ontarian Health Authorities following COVID-19 Milestone #2

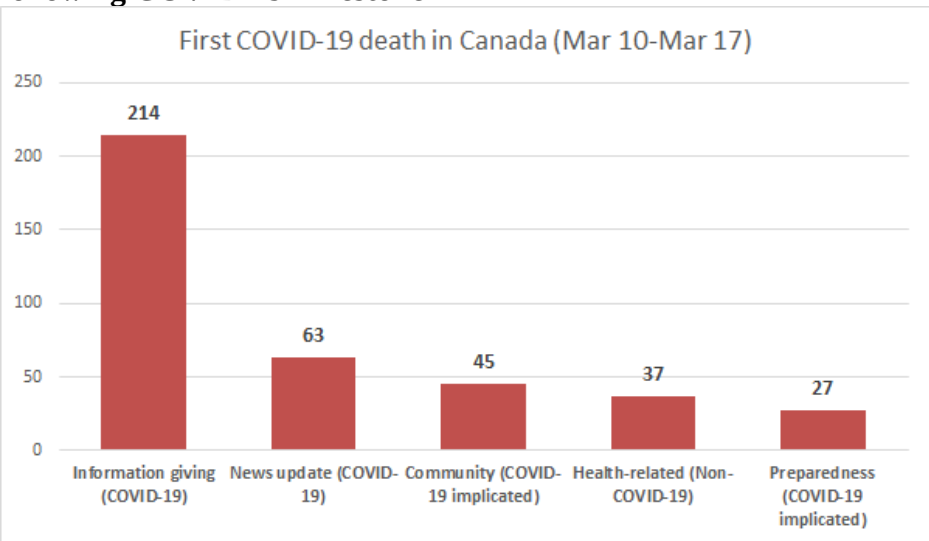
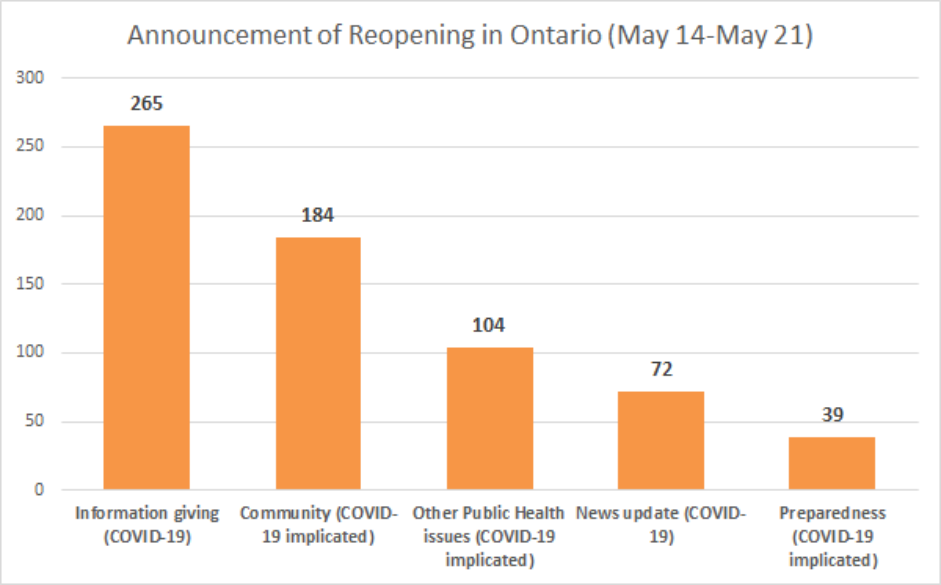


Figure 10: Top 5 Functions of *Twitter* from all Sampled Ontarian Health Authorities following COVID-19 Milestone #3



Remaining consistent with previous results, the top two categories following the first COVID-19 death and declaration of COVID-19 as a pandemic in March (Figure 9) was *information giving* about COVID-19 (*n*=214), followed by *news updates* about COVID-19 (*n*=63). While the top function of the sampled health authorities during the reopening of Ontario (Figure 10) was still *information giving* (*n*=265), a shift appeared to happen where the focus on *Twitter* seem to shift more to *community* (*n*=184) and *other public health issues* (*n*=104) related to COVID-19.

> "*As we work towards gradually reopening our city, a reminder that the best & most caring way to continue helping your community is to celebrate special occasions with household members only. Connect virtually or by phone with friends & loved ones. https://t.co/k6jemB71Gu*" [Toronto Public Health; May 21, 2020]

Health authorities spent more time communicating about the impact and ripple effect of COVID-19 into Ontarians lives and potential health issues, rather than focusing on updating the public about the spread of the virus. The most common COVID-19 implicated public health issue

discussed during May 2020 was *staying active* (*n*=38), followed by *drug and alcohol use* (*n*=18).

> "*Thankfully summer has decided to make an appearance! It is important to enjoy this beautiful weather while keeping physical distancing precautions in place. Continue to get out, get active and stay safe! https://t.co/i0evXye2bV*" [Ottawa Public Health; May 20, 2020]

> "*Stay Connected! People recovering from addiction face relapse issues during COVID-19. Self-isolation can be a trigger. Look online for information on what 12 step groups have virtual meetings & how people connect using social media & other online tools #VirtualRecovery #GetHelp https://t.co/yCMgIli8mp"* [Windsor-Essex County Health Unit; May 19, 2020]

3.4 Discussion

This study provided a snapshot of the *Twitter* use by a sample of three provincial and seven local Ontarian health authorities in the week that followed three major milestones during the first wave of the COVID-19 pandemic. The results from this study are consistent with Wong and colleagues' (2017) exploration of local health departments utilization of *Twitter* throughout the 2014 West Africa Ebola outbreak. Wong and colleagues (2017) identified that 78.6% of all local health departments using *Twitter* to tweet about Ebola were focused on information giving, 22.5% were on preparedness, 20.8% were on news updates, with smaller percentages making up the rest of the 2014 Ebola *Twitter* response from local health departments. This finding corresponds with this study, where 34.9% of all tweets following key milestone of COVID-19 were about information giving, which was followed by 15% of tweets about community and then 9.9% about news updates.

An important difference between this study and that of Wong and colleagues (2017) is that the latter only analyzed tweets related to Ebola, while this review collected all tweets by health authorities. This helps to explain the notable variation in percentages, particularly as it pertains to information giving. Regardless, the findings here are consistent with Wong and

colleagues (2017) in the predominance of *information giving.* Further, while apparent that there was discussion of COVID-19 on *Twitter* following the declaration of a public health emergency by the WHO in January, it was not until March 2020, when significant milestones took place (first death in Canada on March 10, 2020; declaration as a pandemic by WHO on March 11, 2020; state of emergency in Ontario on March 17, 2020), that the frequency of messaging appeared to increase around COVID-19. This reinforces the finding by Wong and colleagues (2017) whereby *Twitter* activity was aligned with major public and news events that took place throughout the 2014 Ebola outbreaks.

The similarity of findings between this study and that of Wong and colleagues (2017) pertaining both to content and timing is significant for understanding risk communication in practice. This is because it begins to characterize a pattern in social media risk communications whereby health authorities tend to communicate to the public primarily about information giving and news updates regarding a risk. This pattern provides an opportunity for risk communication researchers to examine whether these trends are beneficial to risk communication and education amid a public health crisis. An awareness of the consistency in timing of communications related to major news events between studies will better inform strategies for health authorities in communicating about a major crisis. Further, this relationship and consistency implies that monitoring major news events and creating positive relationships with news outlets may prove beneficial for social media risk communications. It lastly reinforces that collaboration with news outlets may result in more proactive communications as they will better address topics of interest by the public, given the media's ability to shape public perception (Glik, 2007).

What emerged from this examination of *Twitter* messaging was the diverging of messages between provincial and local health authorities. The provincial health accounts in

Ontario focused on the services and changes to guidelines that Ontarians were expected to abide by. Local health authorities focused on fostering a sense of community and relationship-building with the public, addressing other public health issues relative to the province, while also assisting in reinforcing messaging about provincial decisions to the public. The contrast between the *Twitter* messaging of the province of Ontario and local health authorities could reflect the fact that local health authorities have closer ties to their specific community and, therefore, spent more time discussing other areas of importance to their community. This is also likely a reflection of the Ontario Public Health Standards (OPHS, 2021) which outlines the minimum expectations for public health programs and services by public health units in Ontario. The OPHS requires that local health authorities utilize communication strategies that reflect local needs (OPHS, 2021). This area of focus from local health authorities is consistent with the sentiment by researchers in risk communication literature that social media is explicitly suitable for fostering a sense of community given their familiarity and responsiveness to users (Walwema, 2021).

The variations between the province and local health authorities were consistent across all levels of analysis in this study. The data demonstrates that the provincial government communicates more frequently about broader guidance, direction, and governmental services, while local health authorities communicate more frequently about health-related concerns, while attempting to promote connections within their communities. This finding is significant as it shows that the risk communication strategies vary depending on the goal of that specific organization's messaging, which is consistent with risk communication researchers that identify that the scope and purpose of social media varies across organizations and cities (Zeemering, 2020). This is once again likely consistent with the OPHS, which set the requirements for local

health authorities to engage in this risk communication (OPHS, 2021). This consistency in variation between the province and local health authorities demonstrates that the different communication goals between these governmental organizations is present within their social media presence and messaging.

The inclusion of tweets unrelated to COVID-19 reveals that as COVID-19 spread across the province in March, communication from health authorities regarding other public health issues were not prevalent. Further, any discussion of other public health issues, such as drug and alcohol abuse or intimate partner violence, was addressed on *Twitter* through the context of COVID-19. This is significant as these public health issues did not disappear when COVID-19 became the focus of public health, but instead were impacted by it. This suggests that health authorities did focus some of their messaging on the exacerbation of ongoing public health concerns, but relative to the communication explicitly dealing with COVID-19, these issues were not a content area of focus. These findings are also novel in the risk communication literature, as few studies have described the prevalence of other ongoing public health concerns on social media amid a public health emergency. This is important because ongoing public health concerns are negatively impacted during COVID-19 (Abrams, 2020). More specifically, in the context of risk communication, future strategies may need to better account for populations that are likely to have pre-existing public health concerns exacerbated. For example, those who struggle with opioid use are more likely to have ongoing health challenges exacerbated by COVID-19, such as increases in medication diversion (Marsden et al., 2020). It could be argued that in the week following COVID-19 milestones, this is not necessarily a priority for health authorities. However, these existing concerns should still be incorporated into communications strategies in the long-term, especially in a protracted crisis such as COVID-19.

More thought may need to be given to the focus and intent of social media during a public health crisis. As mentioned, this review of a sample of Ontarian health authority *Twitter* accounts is consistent with previous literature and suggests that social media is used for information giving and updates throughout the crisis (Wong et al., 2017). However, this information provision must be carefully approached. Research by Yang and colleagues (2021) found that social media content containing information sources may have a negative impact on citizen engagement and the misinterpretation and consequential spread of misinformation. This reinforces the sentiments expressed by Swire-Thompson and Lazer (2020) in Chapter 2 whereby assessments of eHealth literacy should be considered and will inform whether information actually helps or hinders health outcomes. It is unknown, based on analysis of tweets alone, if notions of health literacy were accounted for in the risk communication strategies of those health authorities examined. However, messaging did not address the digital divide that persists in online spaces. For example, messaging may have included resources or information on ways to better interpret or understand what could be considered scientific topics about COVID-19, especially when referring the public to conduct their own research online. Consideration of eHealth literacy is imperative for contemporary risk communication strategies as it is a key factor that determines whether access to information helps or hinders health outcomes and perceived trustworthiness of organizations (Swire-Thompson & Lazer, 2020).

Curbing rumours was also identified by Yang and colleagues (2021) as a recommended area of priority for social media presence from health authorities. However, this study found that tackling misinformation only accounted for 3% of the total COVID-19 content. This suggests that health authorities are not yet aligned with the recommendation by risk communication researchers which suggests that the handling of misinformation remain a priority for health

authorities (Eckert et al., 2018). This was reinforced by research such as that of Malik, Khan, and Quan-Haase (2021), who found that governmental institutions need to strengthen their role in countering misinformation. Rather than simply providing access to a website or resources for the public, health authorities may need to invest more time to actively understanding and dismantling misconceptions on social media. It may also be argued that this reflects timing (i.e., content communicated during the first wave), where dispelling misinformation was potentially not as much of a focus as later stages of the pandemic (e.g., promotion of vaccination). Regardless, there is merit for future research to analyze the actual content of messaging on social media to examine whether information is effectively communicated in an understandable way.

As highlighted at the outset of this paper, social media is not the only way that health authorities convey public health messaging, especially to marginalized populations who may not be present in such online spaces. With the increased emphasis on *community* in this *Twitter* data, there should also be increased discussion on how the pandemic disproportionately affects marginalized populations. However, few tweets (1% of all tweets as noted in Table 6) articulated the disproportionate impact of COVID-19 on specific populations like those of low socioeconomic status, the negative effects of which have been supported for these populations by preliminary studies of COVID-19 (Friesen & Pelz, 2020). Health authorities utilized a reoccurring mantra on *Twitter – we're all in this together*. One would argue that this speaks to the lack of insight to those who were disproportionately impacted by the pandemic, as we were in fact not all in this together in the same way. For example, research has found that there are disproportionate risks and consequences of COVID-19 for those living in neighbourhoods with higher proportions of essential workers in Toronto, Canada, many of which are occupations with

lower wages (Rao et al., 2021). This lack of awareness in messaging should be addressed in all risk communication strategies.

These findings related to inequity have implications not only for practice, but also for policy. This speaks to the need to ensure that the OPHS which guides the activities of health authorities is inclusive of equity, all the way up to the provincial level. This study did not specifically examine or analyze the OPHS; however, at minimum, there should be a consideration for how health authorities should include equity regularly in their communication strategies. For future research, it may be useful to investigate the extent to which OPHS incorporates equity in this context.

The last inequitable gap noted throughout this *Twitter* content analysis concerns Indigenous communities. In fact, no *Twitter* data collected in this study specifically referenced the challenges or barriers for any cultural groups, including Indigenous peoples. Researchers have suggested that Indigenous communities and organizations play a crucial role in helping to facilitate culturally adapted and reliable risk communication and information to help these communities mitigate and manage risks (Kuhn et al., 2020). There have been calls across Canada for health authorities to specifically disclose COVID-19 statistics to Indigenous nations so they can better prepare and respond (Power et al., 2020), reinforcing that there is a lack of consideration for how information is shared with these groups. This gap is especially apparent when considering that certain local health authorities have a notable proportion of their population as members of cultural groups. For example, 13.8% of Algoma Public Health's population is Indigenous, relative to the 2.8% provincial average (Statistics Canada, 2017). Similarly, Windsor-Essex County is recognized as one of the most culturally diverse communities in Canada, with 27% of their population being foreign born (City of Windsor,

2021). The gap identified in this *Twitter* content analysis suggests that health authorities should actively collaborate with and communicate specifically to cultural communities, such as Indigenous communities, to provide culturally adapted risk communication.

3.5 Conclusion

This Chapter identified the content areas of focus by three provincial and seven local health authorities on *Twitter* in a 1-week period following three specific milestones of COVID-19. This content analysis was able to describe the primary functions of *Twitter* through the most predominant content areas of focus during these time frames. Through this, the study provided an understanding of some of the nuances between local and provincial health authority communications in Ontario.

Information giving and news updates were prominent as the overall primary focus across milestones, which is consistent with previous literature (Wong et al., 2017). Provincial governments communicated about broader policies and guidance to protect against COVID-19, while local governments had a larger focus on community-building amidst the crisis, which is consistent with requirements of the OPHS. The messaging provided by health authorities gradually became more focused on COVID-19 content, eventually more frequently communicating about public health issues impacted by COVID-19. Lastly, little emphasis was placed on the disproportionate impact of COVID-19 on vulnerable populations by health authorities in this sample on *Twitter*. This may have reflected insensitivity to the disproportionate impact on these populations and suggests that improving culturally adapted risk communication may be an area for improvement. The results from Chapter 3 will benefit from contextual evidence provided by risk communicators who were involved in the development of these messages, discussed in the following Chapter.

Chapter 4 – Interviews with Governmental Public Health Risk Communicators

4.1 Introduction

Reviewing *what* health authorities communicate to the public through social media channels like *Twitter* allows for consideration of the content and function of social media messaging. It does not provide any insight into *why* health authorities are communicating or what framework may be informing public health messaging. Consultation with those who were responsible for risk communication on social media during COVID-19 has the potential to provide a deeper understanding of the practical opportunities and challenges for public health messaging in times of crisis. Further, these risk communicators were able to address questions around the theories that were utilized to guide their approach, the strategies adopted, and outcomes expected. This line of inquiry will go beyond descriptive analysis to help identify the framework(s) informing risk communication, a task researchers suggests is beneficial (Tursunbayeva, Franco, & Pagliari, 2017).

For this part of the study, semi-structured interviews were conducted with individuals (n=6) that were involved with or responsible for the public health communication from health authorities sampled in Chapter 3. Chapter 4 begins with an overview of the methodology behind the interviews conducted with risk communicators. Once the methodology and methods are articulated, the primary themes and findings from the completed interviews will be identified. Following this, the implications of these findings will be discussed to examine what they say about the current state and potential future of risk communication in Ontario.

4.2 Methodology

The research questions for this study are as follows:

- What strategies or frameworks are used in practice to guide how *Twitter* has been used for public health risk communication during COVID-19, according to social media risk communicators at Ontario's provincial and municipal governments?
    - According to these risk communicators, what are key barriers and facilitators to public health risk communication on social media in Ontario?

As such, the objective of this portion of the study was to understand what informed social media use by public health organizations as a tool for risk communication during a public health emergency, further providing insight into results from the *Twitter* content analysis in Chapter 3. This objective required the utilization of a qualitative methodological approach. Qualitative methodologies "refer in the broadest sense to research that produces descriptive data" (Taylor et al., 2015, p. 7). Given that the goal was to understand the experiences of public health risk communicators in public health organizations, key informant interviews were used. More specifically, semi-structured interviews were conducted on Zoom using an interview guide (Appendix D) with open-ended and descriptive questions to explore participants' experiences engaging in risk communication on social media during COVID-19 (Taylor et al., 2015).

Qualitative key informant interviews were the most viable approach to answer the research questions as they acknowledge experiences in a way that enables the researcher to appreciate experiences that are constructed by participants (Taylor et al., 2015), consistent with the paradigmatic approach informing this research. Further, constructivism means that the researcher can acknowledge world views, subjective meanings, and perspectives within social contexts (Guba & Lincoln, 1994), which fits well with the goals of key informant interviews to include subtleties of context throughout the interview process (Chazdon & Lott, 2010). The following section will articulate the methods utilized to collect and analyze this interview data.

4.2.1 Participants and Recruitment

The group of participants for this part of the study were limited to individuals who were employed by one of the three provincial, or seven local health authorities included in the Chapter 3 sample. As such, this portion of the study similarly relied on a purposive sampling approach. In addition, participants must have had control over or responsibility to coordinate the social media messaging from their health authority. Because the goal of this study is to understand the theories or strategies behind risk communication on social media by these health authorities, those eligible for interviews must have had some degree of control or involvement with the organization's social media presence. All participants were required speak English and had to be over the age of 18. No further exclusion criteria were made regarding age, race, gender, ethnicity, or time spent in the position, as these were deemed to not be relevant to the research questions.

Potential participants were initially recruited via email. Because the sample for this study included a very specific group of individuals, a broad recruitment strategy was not necessary. Instead, emails were gathered from government and organization websites that were publicly available. In cases where an email address was not accessible through the website, an email was sent to the health authority asking for the details of anyone who would be responsible for coordinating social media (see Appendix E). Potential participants were contacted with the necessary information of the study, as well as a letter of information outlining the purpose of the study (see Appendix F). If those contacted had an interest in participating in the study, they were then directed to email the researcher back to discuss participation further and schedule an interview. Interview questions (Appendix D) were also provided to potential participants in the days leading up to the

interview to ensure that they were comfortable with the content of the interview and helped assess if they were the right individual to answer the questions. Those who were interested in participating in interviews were asked to provide written consent after reading the letter of information to confirm that they understand the risks, benefits, and general information of the study. The researcher asked participants to return a signed copy of consent which was stored as an encrypted file on the researcher's laptop, following Western University's guidelines. These steps were submitted and approved by the Western University's Non-Medical Research Ethics Board (NMREB) on October 22nd, 2020 (Project ID – 116582; see Appendix G).

Using the initial recruitment strategy, the uptake from participants via email was minimal. Despite upwards of five email attempts and follow-ups with potential participants and completion of general inquiry forms on governmental websites, only three risk communicators agreed to participate. The challenges with recruitment were somewhat expected given that these risk communicators were still amid coordinating their communications response to COVID-19. These challenges called for the need to amend the recruitment method. This amendment was approved by the NMREB on April 19th, 2021 (see Appendix H) and expanded recruitment to telephone calls. The rationale was that telephone calls may be easier to identify and explain the purpose of the research study to potential participants (see Appendix I for call script). Once this strategy was implemented, the study gained more traction and resulted in increased uptake of participants, given that three additional risk communicators agreed to participate.

The above recruitment resulted in six key informant interviews, all completed throughout the first half of 2021 (January – May). Participants' roles within their organization included those responsible for the strategic insight over messaging to those responsible for authoring

content on the health authority's online spaces. Table 7 identifies the educational backgrounds of those who participated in the key informant interviews.

Table 7: Key Informant Educational Backgrounds

Educational backgrounds of participants
• Communication Management • Health Sciences/Health Promotion • Kinesiology • Media Information & Technology Studies • Professional and Intercultural Communications • Public Relations

Represented health authorities in the key informant interviews will not be reported to protect the confidentiality and anonymity of participants. However, it should be noted that the recruitment process resulted in participants exclusively from local health authorities, meaning that there is no provincial representation in the interview sample.

4.2.2 Data Collection

As identified, data collection was completed for this portion of the study via key informant interviews. Interviews were conducted at a time that was mutually agreeable to researcher and participant. Interviews were also required to be completed over Zoom to limit in-person contact as interviews were conducted during the COVID-19 pandemic. This study followed the methodology utilized by Driedger and colleagues (2018) who examined communication from risk communicators during the H1N1 influenza pandemic. The nature of interviews was exploratory as the content covered in the interview was dependent on the areas of significance most important to the participant. The interview questions focused on asking risk communicators to share their role at the health authority, their experience during the pandemic,

the theories or strategies in place that guide their communication via social media, as well as the challenges and successes they experienced (see Appendix D)**.** Follow-up questions were asked to clarify meanings throughout to ensure that the experiences constructed, and information provided by the participant was fully understood.

Prior to beginning the interview, the researcher verbally reiterated information outlined in the letter of information, which included the goals and purpose of the study, the length of the interview, as well as their right not to answer any questions and withdraw from the study. Field notes were taken during the interviews and included what is seen (e.g.., body language), as well as anything notable that occurs in the physical environment, such as any disturbances. The interviews were audio-recorded, transcribed verbatim and imported into NVivo (v.12) for analysis. Participants were numbered anonymously (e.g., Participant 1, Participant 2, etc.) during this process and any identifying information, such as the health authority they are employed by, was removed to ensure confidentiality. All quotes were anonymized to protect confidentiality of participants. Lastly, a feedback letter was sent to all participants after completion of the interview to direct participants on how to contact the researchers for follow up about the study, their right to withdraw and whether they wanted to be contacted when findings of the study were ready to be disseminated (see Appendix J).

4.2.3 Data Analysis

The data collected from interviews were iteratively and inductively analyzed to discover overall themes that reflected the reality constructed by participants. This thematic analysis applied to the data is defined as "a method for identifying, analyzing, and reporting patterns (themes) within data" (Braun & Clarke, 2006, p. 79). The goal with this approach is to answer

the research questions in identifying the most common experiences, strategies or successes and challenges faced by risk communicators at Ontarian health authorities.

Data analysis began immediately after the interviews through creation of a post-interview memo. These were written to note any initial thoughts and impressions from the interview. The next step was to transcribe the interviews. Transcripts are the descriptive data that is thematically analyzed in this study. Braun and Clarke (2006) have outlined a series of steps to conduct thematic analysis, which was utilized in this study.

The first step of this process is for the researcher to actively familiarize themselves with the data. Familiarization was completed as the transcripts were created and they were reviewed repeatedly over a series of weeks after the interviews were completed. The next step was to generate initial codes to identify features and elements of the data that stand out to the analyst (Braun & Clarke, 2006). After coding was completed, themes were identified among the codes. This step refocuses the analysis to broader themes and requires that the codes be sorted into potential themes (Braun & Clarke, 2006). The themes were then reviewed, which often requires removing, combining, or further breaking down themes identified in the previous step (Braun & Clarke, 2006). A process of defining and naming themes is taken to identify the essence of what each theme is about and helps to determine what aspect of the data each theme captures (Braun & Clarke, 2006). Finally, when a list of fully worked-out themes is created, the final phase includes writing up the report (Braun & Clarke, 2006). A reflexive journal was also kept throughout the process to ensure that personal biases and their potential implications on analysis were acknowledged (see Appendix A), as noted in the Preface of this thesis. This is also a recommendation in literature for improving the trustworthiness of findings within a constructivist paradigm (Morrow, 2005; Patton, 2002).

4.3 Findings

Data from the interviews were coded and, after analysis was completed, four major themes were identified – (a) *availability and growth of resources*; (b) *varied theoretical approaches*; (c) *relationships, collaboration, and partnerships*; and (d) *managing change and adaptation*. In what follows, findings are summarized and organized alongside these themes.

4.3.1 Availability and Growth of Resources

Participants in this study reported that communication teams rely on several resources to engage in comprehensive risk communication strategies that reach populations within their region or from across the province. Resources in this case reference the actual growth of the audience on social media platforms at health authorities in Ontario, as well as the associated internal staffing and financial investments to complete this work.

According to participants, social media followership increased exponentially following the onset of COVID-19, which meant that social media was a valuable method of dissemination for information during a time of such uncertainty. For example, Participant 6 mentioned the rapid growth of engagement with their content in online spaces.

> *"…before COVID, March 2020, we only had 5000 followers on Facebook, and now we're at I think almost 17,000. So, just even the handling the mass comments we were getting, we used to get maybe 5 to 10 comments a week, where now we're getting between 100 to 150 comments per post."* – Participant 6

This growth meant that health authorities had a wider audience to communicate their messaging to, as more members of the public turned to them as sources of information amidst the public health emergency. Beyond just an increase in followers, the actual engagement increased. The increased engagement meant that more people interacted with the information that health authorities communicated on social media.

While the expanding platforms for Ontarian health authorities was generally identified by participants as a positive for information dissemination, they also discussed the new level of strain this put on their team. As risk communicators discussed their experience of trying to effectively undertake risk communication campaigns for COVID-19, they noted that the complement of staff at their health authority became quickly overwhelmed.

> "*At the outset, it was extremely overwhelming and so using the sort of capacity at the time, it was just myself and we have a graphics person as well who gives assistance where needed, but essentially it was, it's just myself that does communications, and especially in those first few weeks, it was incredibly overwhelming with the demand that was placed on us*." – Participant 3

Various health authorities appeared to handle the staffing requirements of communications differently. For example, Participant 4 mentioned that the health authority invested in their communication staffing levels early on.

> *"…we built capacity within our organization by forming an ad hoc comms team, that kind of dealt with all communications not just digital but obviously a big part of it was digital and so I have two or three others now that work alongside myself and maintaining the website as well as all of our channels and reviewing the content or comments and creating content and so that's made life really easy, not easy, but much more manageable in my role."* – Participant 4

It appears that organizational size of the health authority may play a role in the ability to engage in risk communication. Some participants noted specific experiences in their networks of risk communicators regarding resourcing relative to size of the health authority.

> *"I find it a little bit discouraging to see the resourcing of smaller health units for communications, like sometimes it's like "I have 1 person, I'm 1 of 3 people, but we don't just do public health, we do all of emergency services or emergency management."* – Participant 3

Risk communicators at smaller health units potentially have a more centralized approach to communications, but this may be out of necessity based purely on the resources available to them. This aligns with previous evidence in risk communication literature that characterizes that

social media is simply an add-on to existing roles at many local health authorities in Ontario (Booth et al., 2017).

Beyond the staff complement that was reported by participants to be beneficial to engage in proactive and effective risk communication, participants also mentioned the financial resources required to ensure they have a comprehensive approach, especially when considering those who might not be accessing information in online spaces.

> *"…we do a little bit of advertising depending on the population, either for growth or specific posts that are more relevant to that population, … and especially on Instagram it has been harder for growth and engagement, so we did have to monetize to get the type of sharing and engagement for the reach we were looking for."* – Participant 1

To reach certain populations that may not be in online spaces, or at least accessing information from there, risk communicators mentioned that they employed or used strategies that extend beyond social media. It was mentioned that this approach was mostly taken to reach older adults and those of lower income who may not have access to social media.

> *"…we started some new [social media] channels as well, like the older adult channel is brand new, so we had to invest, and we grew that from 0 followers to 35,000 within 6 months"* – Participant 1

While these strategies to identify and communicate to hard-to-reach populations were mentioned by some health authorities, others did not identify specific strategies to do this. This variation was consistent with the broader theories and strategies that are used by health authorities in Ontario, as identified by risk communicators.

4.3.2 Varied Theoretical Approaches

As outlined in the risk communication literature, theory is an important aspect of any risk communication approach, as it ensures that the approach is rooted in evidence to effectively promote positive behaviour change (Vraga & Jacobsen, 2020). Interviews with risk

communicators at Ontarian health authorities revealed that the number and type of theories or strategies that guide their use is mixed. Overall, three participants outlined a specific theory, strategy, or framework they use to guide their health communication, while the other three did not identify an overall theory or strategy, but rather, guiding principles to help guide how social media is utilized at their organization, such as an organizational Terms of Use.

Participant 2 outlined how they utilize specific theories from behaviour change and health promotion literature.

> *"…I did a deep dive into the world of behavioral science ... So, I read two really key influential books in that field. One of them is called Thinking Fast and Slow by Daniel Kahneman … and another one called Nudge by Richard Thaler and Cass Sunstein. And Nudge Theory is another behavioral insight approach … And so, our approach was grounded in the knowledge that we gained from these two books, knowing that they're kind of like the big in behavioral science … So, we're also looking at more theories like some health promotion theories such as the diffusion of innovations theory, we're looking at, like protection and motivation theory, and maybe theory of planned behavior."* – Participant 2

The way participants characterized their theoretical approach was often as a process of learning as they went. As explained by Participant 2, their organization was identifying and attempting to implement theories as they read about them in literature. Similarly, Participant 1 mentioned that their organization draws on a series of theories and tools that guide their risk communication approach, and not necessarily one theory from a certain discipline in the literature.

> *"…the health belief model is one that we rely on a lot, which is more about risk communication, like feeling at risk and feeling the situation is serious … We also have the theoretical domains framework… and that theory has helped us just in terms of like, being more specific with certain elements of our posts … The other very broad toolkit that we use is just the CDC emergency communication toolkit, which just talks about things like being prompt, being empathetic, being reassuring but not over reassuring and just like those broad strokes sort of things."* – Participant 1

Participant 5 also identified a series of theories or strategies their health authority used to guide its approach to risk communication.

> *"I've done a lot of … time and study around crisis communication, but also, as it relates to historical trauma and community resilience, particularly with Indigenous communities. … So, the one [we use] is critical intercultural communication around, power as it relates to communication, the actual practice of strategic communication … and I'm not a huge Grunig fan, … but I think the fundamental of, you know, his theories around two ways symmetrical communication, does play a role. … So, thinking critically, rather than being reactive, to try and move our team to think about proactively and intentionally preparing our communication response that sets us up for success for our reopening and sort of our post crisis state."* – Participant 5

These findings show that Ontarian health authorities who draw on specific theories or strategies to guide risk communication might not necessarily rely on one underlying theory, but a series of strategies and tools used in tandem. Further, Participant 5 demonstrates that some health authorities reflect on the relative strengths and weaknesses of different theoretical approaches. Because of this, risk communicators appear to utilize various areas of literature, such as behavioural science, health promotion, and public relations, depending on their personal critical thoughts of those underlying theories.

Other participants who did not identify a specific theory outlined general organizational principles or provincial tools that their communication team used when developing their messaging. Participant 3, for example, discussed the use of their social media policy and the provincial communications tool developed by Public Health Ontario:

> *"I think the foundation would be our social media policy at the health unit … we can kind of tie that back to … what are the main purposes of our channels … so inform, raise awareness, get people to interact, getting people into our services. So, I think our social media policy would be the framework … I would also point to the social media toolkit for Ontario public health units, that was a locally driven collaborative project that was created in 2013. So quite a while ago, but I think that had some really good and still*

> *relevant and applicable things, to help organizations guide their social media program."* – Participant 3

Similarly, Participant 6 explained the approach that their organization used to guide its risk communication on social media.

> *"We do have a digital media strategy; a Terms of Use for staff, how they interact on social media. And we do have a policy, I'm not too sure what to call it actually, but I guess, yeah it's a policy about how we interact on social media."* – Participant 6

These quotes show that there are long standing organizational policies at local health authorities that play a key role in shaping their content and engagement on social media platforms.

While the theoretical approaches varied at the time of interviews, it should also be noted that almost all participants noted that they did not necessarily have a theory or strategy in place as COVID-19 accelerated as an issue in Ontario in March 2020.

> *"I will admit at the beginning there was no digital media strategy. It was survival mode at the beginning and just you know, let's create a post, this has to get out immediately and then almost reacting versus being proactive."* – Participant 6

It is somewhat unsurprising that risk communicators, like almost all areas of public health, were unprepared for COVID-19, as researchers have noted public health's inability learn lessons from previous public health emergencies and adequately prepare for future crises (Smith & Upshur, 2020). Some participants, upon reflection, noted how incorporating evidence into an already existing strategy became difficult as their messaging was often more reactive than proactive.

> *"I would look at it after the fact and say, like, does this fit within the concepts that we're trying to do? … So, then I would provide comments, and then we would tweak it and edit beyond that. But … it's super helpful to be at the table right from the beginning, rather than commenting on something that's happened after the fact."* – Participant 4

In the context of the strategies and theories to guide risk communication in Ontario, this quote shows that according to participants, any theory or strategy in place to guide risk communication

in Ontario was not developed or implemented into their communications until the later months of the pandemic. Further, it meant that to utilize theory properly, a more proactive approach needs to be taken.

The underlying strategies to guide communication also appeared to reflect the backgrounds or education of those employed at the health authorities. For example, Participant 5 outlined where they wanted to lead their team based on their personal background.

> *"I think that it's more of a grounding for me in terms of the approach and where I want to lead the team. And there … are a number of different theories that I think help inform. One … I've done a lot of sort of time and study around is crisis communication."* – Participant 5

The personal approach to strategy was reinforced by other participants, as well, as they noted that the theories that may drive their approach may need to come from leaders at the organization.

> *"…not everyone likes theory or has the mind for theory, so sometimes the role of the manager or revisor should be to ensure that like we're checking the boxes within the theory and doing what it's intended to do."* – Participant 1

These quotes imply that for the participants in this study, when utilizing theory to guide risk communication, it likely comes from leaders at their organization who rely on their own area of expertise to inform their work. This also reinforces that risk communication is an interdisciplinary field that draws on several areas of literature to execute risk communication. This continuously resonated throughout interviews with risk communicators at health authorities, as their own educational backgrounds came from a wide variety of disciplines, as previously identified in Table 7. Beyond this, participants noted that they needed to expand their own knowledge base to attempt to engage in risk communication properly.

> *"…behavioral science … which I don't have like a background in. So, I tried to just be like … not an expert by any means, but someone who just kind of understands a little bit about behavioral science, and so that I could apply that to our approach"* – Participant 2

When it was not possible to educate themselves on certain areas of risk communication, other participants noted that they relied on others to help build their knowledge base.

4.3.3 Relationships, Collaboration, and Partnerships

One of the most prominent themes that was prevalent among all participants in this study was the collaboration required for risk communication on social media, both within and outside their organization.

The internal relationships that appeared to be extremely valuable for the success of risk communication at Ontarian health authorities were those within the organization that were considered content experts. These included colleagues who have knowledge about specific areas, such as mental health or infectious disease, that could inform the content of communications. Participants identified that they needed to collaborate with those who are content experts within their organization.

> *"Whenever there's content that we put out we'll either develop it or we'll speak with a content expert to ensure that it's accurate before we publish it."* – Participant 4

While significant for the perceived success of their work, participants also noted that the ability to collaborate with these internal content experts became more limited as the pandemic intensified. The insider knowledge became spread thin across the organization, which had an impact on the ability of communications teams to develop the content of some messaging.

> *"Everyone in this organization has been redeployed to something else making accessing that internal content more difficult, this year it seems like everything's just kind of all over the place and so we take sort of an ad hoc approach."* – Participant 3

Communication teams from this sample of Ontarian health authorities also seemed to note the importance of relationships with leaders at their organizations. However, not every health authority expressed that the leadership at their organization was visible enough in public health to assist in fostering trust with the public.

> *"… [our leadership] has been like hesitant to be public about a lot of things, and that's really made our job super difficult, because there's always this demand like what is the public saying and what is the public health scene saying, is it sort of this indecisiveness, or lack of response is very notable, very noticeable in our community, and we definitely felt the flack and we've heard the hate come from our community."* – Participant 4

Participants that did express that they had a positive relationship with leaders at their organization noted how this carried through to their ability to be able to engage in their risk communication strategies.

> *"… [our leadership] championing and being receptive is a huge factor for success, like I found that across the province, the people whose [leadership] were like "Yeah, I'm okay with communicating on social media myself" or investing into our health unit's social media were much more successful. So, um, it does rely on the strength of your leadership team and the openness of your leadership team or else there is no trust either with the public."* – Participant 1

Those who expressed that they did not have a solid presence in online spaces by leadership noticed the benefit of having buy-in of leaders in other regions. Further, they expressed that it would be beneficial for them to have that same type of presence in their own region.

> *"Yeah, and I would say our executive, unfortunately … the majority of them are not on social media. Yes, so, you know, I always look to [MOH] at [Region], right? I love that he's on social media … he's on there. … Ours isn't. He's not on Facebook, he's not on Twitter. So, even trying to get them to understand and the way it works, they don't get it, unfortunately."* – Participant 6

This finding suggests that having leaders within an organization that value social media communications and are present themselves in online spaces is instrumental for fostering a culture of online communications within that organization.

Relationships outside of participant's organizations also appeared to be significant. These spanned from relationships with other health authorities, to those within their community. A relationship noted by participants to be of significance were those with other local health authorities. Participants explained that there was typically a sense of comradery between risk communicators across local health authorities, and often noted building on one other's communications to develop their own messaging.

> *"… we've connected a lot with all of the communication managers in other regions, because we have more working groups, like pre COVID, that were all like around there, I think. … And I know that they've shared messages … and all the [local Region] medical officers of health did a video thing that got merged into one that was promoted. So there, there is a lot of sharing resources across health units."* – Participant 3

It appeared that the sentiment among participants was *why reinvent the wheel?* Relationships with other local health authorities appeared to be a source of moral support, while also serving a practical function in assisting the development of actual messaging by health authorities. Beyond this, some participants mentioned that they aimed to engage with one another in online spaces to boost the morale of public health on social media.

> *"We cheer each other on comments, we actually have like [Direct Messages] on Twitter, we have a DM with all the health units. It's just an ongoing DM thread, like, 'Hey, feel free to retweet this everyone' or 'Here's a tweet that we put out today' or, 'Oh I saw so and so's tweet … Great work everyone' or, you know, so there's this sort of encouragement along the way too, which has been really cool."* – Participant 4

Participants from local health authorities also discussed the role of the relationship with the provincial government of Ontario. Many expressed that the creation of provincial working groups for communication professionals was implemented to help health authorities collaborate with one another and understand what to expect as evidence became available.

> *"…early on the province established a stakeholder community, or a committee, as well so all the comms people from the different health units met, two, three times a week at the beginning. Now I think just once a week, but we were meeting two, three times a week for the first six months or eight months to sort of find out what is the problem, what's coming*

> *down the pipe from the province, and to field sort of the concerns and questions from health units across the province as well so that really helped because then we ensured that we're all sort of on the same page with the province."* – Participant 3

While it was identified that the province intended to provide information in advance to local health authorities, participants noted that this became less feasible as the pandemic progressed in Ontario.

> *"…the province is sort of tied, like they don't ever want to 'let the cat out of the bag' with a lot of their announcements and that. So, you did the best you could … we always had tried to pry, to find out like what's coming down the pipe, and the Ministry is very tight lipped about things."* – Participant 4

The general sentiment among these participants from local health authorities was that there was intent from the province to maintain positive working relationships with their local counterparts, but ultimately, these health units tried do their best to understand the information or policy changes that were happening with limited notice. This appeared to put local health authorities in difficult situations when having to communicate with their community.

> *"I think that there's a lot of goodwill at those tables. But ultimately, what we're talking about are separate entities with their own governance structures, their own objectives, their own philanthropic arms … So, I think there's a lot of goodwill and a willingness to work together. I think, though, that there are competing priorities sometimes. And, yeah, I think there's a general desire to keep people informed, and we did our best to do that."* – Participant 5

Other external relationships identified by participants that were significant for the work of risk communication were those with municipalities and media partners in their community. These relationships with other organizations in their communities influenced the approach of local health authorities, as they had to develop communication messaging within the specific context of their community.

The first distinction made among participants was the actual layout of the governmental structure in their region. More specifically, some participants noted that they have a 1:1

relationship with the municipality in their region, while other local health units must collaborate with many municipalities that fall under their geographic region.

> *"…when things were shut down from a city perspective, because we are so closely tied with our municipality, that was a huge asset for us because people from the city were redeployed to public health in the short term for services that were closed … and my heart goes out to some other health units that have cross municipalities, where that's not as easy to do, whereas like being one city with the municipality, like the city manager is always like 'one city, one team, one city, one team' and the pandemic reinforced that."* – Participant 1

Participant 1 notes how beneficial it was that there was a level of collaboration and coordination between their municipality and their health authority. This likely means that it is less onerous on the health authority to manage that sole relationship, which cannot be said for all participants.

> *"… We don't get everybody in our community, and we have a number of municipalities under us… I think it depends on like, our pre-existing relationships with them. So, with some of them, we have really great ones. Some of them, we're just still building, and they might, they may or may not have represented their community on our board. So, we just don't have close ties … it is definitely a lot. And sometimes, a lot of it gets centered around the bigger city, unfortunately."* – Participant 2

Participant 2 noted that they must manage relationships with multiple municipalities, and the relationships cannot all be treated the same. This distinction is significant because the quality of the relationship with the municipalities influenced the tone of content and had political implications on the work of risk communication.

> *"…there is a dance between political leadership and the public health unit. I think in the future. One thing that would help is, in these types of emergencies, a clear delineation between the municipality and the public health unit. And I know there are different experiences across the country in terms of how PHUs are organized in relationships, unions, municipalities, but in my experience, a clear delineation or more space would be really helpful for breadth and for clarity of message and ownership."* – Participant 5

Similarly, the quality of the relationship with local media partners played a significant role in the work of risk communicators at local health units. The way that their organization is characterized

in local news outlets has a significant influence on the ability of these health units to shape their messaging, whether it be positive or negative.

> *"Having media availability on a regular basis where the MOH would answer the dirty details of the questions … really helped us to establish trust and the media relations that go behind the scenes, like we have great relationships with our media partners now and they are a huge presence on social media as well, so it's not like they are separate activities, we interact with them on social media just as much as we interact with them behind the scenes and … they have a huge impact on behaviour and public opinion."* – Participant 1

> *"…the content thus far … has evolved into a very corporate type speak, particularly in [Region] where the media … just scrutinizes every kind of move both for the public health response and the municipal government response, that it's become very corporate. So, I find that the voice is really impersonal, there's more detachment, a little more [Public Service Announcement], a little less meeting our community. And that's definitely a challenge because of how we've been scrutinized by the media."* – Participant 5

An additional external relationship that was noted by participants as important in their communications was their relationship with their community. Having a positive relationship with the public on social media was significant for establishing a sense of trust, which consequently played an influence on the uptake of their messaging.

> *"There are times when certain decisions sometimes are just not popular and people sometimes just need to vent and sometimes yeah, like people are going to vent, sometimes they won't fully understand, but I think because we've established a trusting relationship, they tend to bounce back pretty quickly."* – Participant 6

Further, participants struggled at times to handle negative responses from certain policy decisions or restrictions on social media, as the public at times took their anger out on their local health authorities. This became a balancing act for participants as they wanted to address concerns of the community and maintain trust but did not want to engage with members of their community that did not seem interested in having an open conversation.

> *"I think the difficulty with some of the negative comments is when you're going to get into an argument really, like they're going to criticize the world, they're going to criticize what they perceive our role to be. They're going to criticize our role in some of the restrictions or some of the legislation. I think, you know, the best way to deal with that …*

> *is you got to just let it go and let it wash, you're not going to engage it, it's just going to make it worse. We all know this. Don't feed the trolls. But it's hard. I think it's hard sometimes to maintain that perspective."* – Participant 3

Other participants did note that in specific instances, they would engage with those who air grievances on their social media channels, as it has a potential for learnings from the broader community.

> *"There are sort of repercussions in determining what can stay and what can go, so we tread that line very carefully. And so you know racism and swearing and things like that we just outright delete because it doesn't edify or build anyone up, but in instances where someone seems misinformed, and its factually incorrect, we'll take the time to respond, because we're like 'okay this person's reasonable and maybe they'll be open to it', and we also have the idea that maybe even if this person isn't open to it, the other audience that's reading these comments may also be receiving this. Lots of people just read comments but don't engage. And so, we write for them as well and so there is this sense that like we'll try to correct the misinformation. We might do a back and forth like once or twice and then if it just continues and it's not going anywhere and it becomes a drain on our resources then we just, we ignore it."* – Participant 4

This finding shows that participants seem to have an awareness of what boundaries they draw in engaging in conversations with their community. Further, an important distinction was made between those who actually engage with content and those who observe it. This distinction reflects that even when risk communicators have difficult conversations on social media with the public, they are aware of the impact this has on those who simply read their content, and feel they have a simultaneous responsibility to factual correction and maintaining openness and honesty with their community.

4.3.4 Managing Change and Adaptation

In discussing the barriers to risk communication for local health authorities, participants expressed that a consistent one throughout their time coordinating the social media response during COVID-19: the constant change and adaptation required for the work. More specifically,

this manifested itself through the constant changing of evidence, the shift in workload and the personal toll of this work, as well as the moving target of reaching specific populations.

As briefly mentioned, participants identified that it was difficult to keep up with changing policies and scientific evidence as it became available. More specifically, they noted that it played a role in maintaining a level of trust with the public.

> *"…just the sheer speed at which the pandemic and all the evidence is emerging, and how do we compete with like people's rapid consumption over social media and like everybody's different tendencies to view and take in news? I feel like our it's our big question."* – Participant 3

> *"… [the change] causes confusion and it erodes trust as well. And that's a huge thing and of course it gets thrown in our face all the time … it's sort of … reflective of the nature of science itself. Science is constantly being invested in constantly building upon past knowledge and improving and, you know, new decision or new impacts, new conclusions are coming out all the time. And that's reflective of what science is. And so, it's important to sustain that, to keep that transparency."* – Participant 4

Participants noted that the uncertainty and novelty of COVID-19 within public health likely played an important role in what was communicated during the onset of the pandemic. As explained by Participant 6, there appeared to be hesitation when COVID-19 first started to spread across the province.

> *"…it feels like public health in Ontario as a whole was so cautious of saying the wrong thing that we still we weren't giving the information that they wanted and needed because they were hearing it in the media. So … that would be one of my first recommendations is that we need to stop worrying about saying the wrong thing."* – Participant 6

The rapidly evolving evidence required that health authorities adapt their strategies in communicating about protective measures that were in place. For example, the implementation of the mask mandate implemented later in 2020 appeared to cause confusion when they were not recommended at an earlier point in the pandemic (Dyer, 2020). Some participants noted that the

first strategy they employed throughout this period of evolving evidence was the actual phrasing of their messaging.

> *"We learned to like to soften our language, we would say things like, 'At this time, Health Canada recommends that…', you know, or 'new evidence has emerged' … and we kind of keep it like timely, we frame it in a way that's like this is subject to change. But right now, here's what we recommend here's what the science says right now, and by the nature of science is that can change, and we're open to that. But for now, here's what we're saying. So, I think just being careful about how we structure our communications that way, how we frame it."* – Participant 4

According to these participants, this approach helped ensure that any public health recommendations were relative to a time-period; an important consideration in the context of COVID-19 where evidence become rapidly available.

The next approach taken on by local health authorities to manage this change, and further, the general impact of the pandemic, was to have a more personal approach in their messaging.

> *"We would tell people, this is new. And this is all new to us and every week new research is coming out, and we will stay on top of it, so things were going to be changing and seem to settle most people. And, again, for most of them it's just being able to get a response out of you, but that seemed to be the best approach was, there's research … So, we really went with that, you know again its changing. We're going to find out more information that may be on pause, next week, right. So, I was expecting a lot of negativity from that. And we got none and I was floored. So, we like to think it's maybe the approach we took in terms of trying to connect with people."* – Participant 6

> *"Sometimes it's not always justifying the change, but about getting through it together and empathize, but also get people to get on board."* – Participant 1

Participants that identified that they utilized a *humanized* or more personal approach to risk communications noted that the public seemed more responsive to this. The challenge identified by health units was that it is difficult for the public to recognize that a human being is creating the messaging from a general health unit account. Introducing this more humanized approach

when there was confusion and angst among community members appeared to assist in fostering a better relationship with users on social media.

Change and adaptation also manifested itself for participants through the level of work required of them as COVID-19 became a more widespread issue. Like almost all facets of public health during COVID-19, communications had to adapt to a new level of uncertainty and pace of work, unlike anything experienced before. For participants, they expressed the personal toll this role took on risk communicators throughout the pandemic.

> *"How much you can take on your team? Like, I think it's more personal, I think the workload and the different roles on our team and who needs to do what and sharing the load has been really hard on [us], we're a small team. And our we're a fairly specialized team. So, like, I'm specialized in this, and my boss is specialized in that and to throw me into the mix of media relations is a challenge. And, you know, that's something I've personally struggled with. And also, it's the demands of the job. Like that's a 24/7 job and I'm not available 24/7, I have two young children. Like I can't be answering media calls at six in the morning on a Saturday."* – Participant 3

Considering the personal toll that COVID-19 appeared to have on risk communicators, they needed to adapt their coping mechanisms to continue with this work. Participants explained that to avoid burn-out throughout the pandemic, there were personal boundaries that needed to be drawn at times.

> *"You know, I think it's just around taking care of yourself in a protracted crisis, which is just like general self-care advice haha. And, you know, as my [partner] reminds me, like your email will be there, you can turn it off at 10pm. It'll be there in the morning. Like, it's okay. Which was a huge adjustment for me but was necessary."* – Participant 5

This change in pace of work also required a shift in the actual content that health authorities focused. Some participants expressed that they felt COVID-19 was an opportunity to discuss issues, like mental health.

> *"…substance abuse is a good example. Mental health is a good example. You know the natural tie in with COVID is, even just misinformation in general as the topic, that's always been a public health concern is the perpetuation of poor information, and we've seen this sort of 'Infodemic' … so this does present an opportunity for us to speak to*

> *those topics that are definitely within the world of public health, and often gets ignored but the pandemic has allowed for us to highlight that now."* – Participant 4

It appeared that there was some conflict for participants here, as they also noted that the dominant focus was on COVID-19, especially during its onset. These participants recognized the need to discuss other public health issues.

> *"I'm going to say honestly that COVID is dominating. So, … we do talk about some other things for sure, particularly around the social determinants of health. And our board has been really active around advocacy around access to secure housing, around sick days. I think, however,… that they do have at least a thread to COVID. So, we're able to talk about other issues and there have been a few opportunities I think, but it's impossible to not have this focus on COVID."* – Participant 5

These participants identified that COVID-19 has drawn attention to public health from the public, and believe that once the pandemic is more manageable, there could be opportunity to use this increased attention for other issues.

> *"[COVID-19] really gave us the opportunity to have an audience to be able to talk about other messages … but I think that after COVID-19 is where it will be interesting, we will have an engaged population which will be nice."* – Participant 1

In the process of adapting messaging, participants emphasized the need for risk communicators to tailor their messaging to specific audiences. More specifically, there was an understanding that the goal of risk communication strategies in online spaces is to reach a *moveable middle*.

> *"…we're recognizing that the demographic or the component of society that we're going to impact and affect their behavior is what we call that 'movable middle' and they're the ones who either, they're just sort of apathetic, or they're reasonable level-headed people who are not opposed to or who would embrace sound evidence-based science, but they just need to be exposed to it."* – Participant 4

This means that these participants recognized that there are users on social media that can be truly influenced with the provision of evidence-based information, and this really is the focus of risk communication on social media. Beyond this, there was some recognition by participants

that there are those who already support and understand the evidence and recommendations of public health. On the other hand, there are those who cannot be persuaded with reliable information, may align themselves with misinformation, and are combative about public health recommendations.

> *"…we learned fairly quickly not to waste resources, and energy. So that's one aspect, like it's just you're not going to convince these people who are on the fringes."* – Participant 3

Participants identified the ongoing challenges here with the increasing politicization of scientific evidence. For them, they noted that it was difficult to try and communicate public health information in a non-political way.

> *"…this is public health advice. There is always a middle. So, I understand it's not so clearly delineated. But I think a reminder, and an adjustment around, you know, public health advice really does need to rest with the MOH and the PHU. And I think … because this is medical advice, it's about professional expertise. I think, you know, some more clear delineation and boundary is really required in order to be effective and responsible. And I know that that's the tension for many given that it's become so political."* – Participant 5

The tailoring of messaging to audiences goes beyond the messaging, but also to the way in which social media accounts are used to deliver messaging. In risk communication literature, this can be considered *functional fragmentation*, which is concerned with the coordination of public services under one government structure as defined in Chapter 2. The use of this segmented approach remained true for some participants, as they identified that their health authority used this strategy to reach specific audiences.

> *"I think if we didn't have segmented accounts, it would be too much information going out to everyone, so it gives us the opportunity to get more into behaviour change with specific populations so like for youth to young adults and to focus our messaging to older adults, for example, so we can actually see people change their behaviour or agree with a behaviour like through some of the contests we were running."* – Participant 1

Participants went further to note the types of audiences that are present on certain platforms, as the same information delivered on *Twitter* and *Facebook* might not be absorbed the same way.

> *"…on the different platforms, it's important to recognize that Facebook is the sort of common denominator of social media, like everyone's on Facebook, which means your grandma, and your mom is on Facebook … and I get the sense that the people on that platform have a mentality of 'I don't like change, it's a big enough thing for me to be on Facebook, I'm not about to move on to other fancy platforms like Tik Tok or Twitter. And so, the platform appears to be reflective of their sort of narrow mindedness … And then Instagram is slightly less like that, and then Twitter is based in my mind on, I'm being witty … and you have to be able to banter, you have to be able to kind of appreciate humor … so that … the most of Twitter is just like a little bit smarter than everyone else, so they get it better."* – Participant 4

This indicates that risk communicators at health authorities have an awareness of the audiences on their various social media platforms, or at least that consideration was given to the different audiences that might be on each platform. Further, it suggests that they have learned to adapt their messaging in order to explain concepts and information in a way that makes the most sense for the audience on that platform.

The last notion of tailoring and adapting messaging that was a common theme among participants was the acknowledgement of those who are not present in online spaces. Participants appeared to recognize that certain populations of people do not access their information from social media and needed to account for this in their risk communication strategies.

> *"…we've done some print advertising through some targeted letters, like we have a community that's Francophone and very much loves their newspaper, so we run ads in that specific paper."* – Participant 1

> *"For example, with Indigenous populations, I think moving into our next phase of our campaign, it will be really more targeted, targeted and specific. Definitely we are going to target whether it's through, like an SMS campaign, or particularly targeted, I would say, I mean, we're going to slice it a few different ways, demographically."* – Participant 5

This often meant that these risk communicators expanded beyond social media to reach these populations. The concepts of health equity and the digital divide seemed to resonate with participants, as they recognized the need to build in alternatives to social media communications to properly communicate with all members of their community.

4.4 Discussion

The experiences of participants in this study suggest that adequate resources were an area of concern that affected the ability of Ontarian health authorities to proactively engage in risk communication strategies. As identified by Booth and colleagues (2017) during a series of planning meetings with public health stakeholders in Ontario, resource allocation was an area of concern for social media in public health. Beyond this, few researchers in risk communication have emphasized the role that access to proper resources, such as a staffing complement or financial resources, play in properly engaging in risk communication strategies. Participants in this study further identified that such financial resources may influence their ability to expand their social media presence and successfully reach specific audiences through targeted communications. Also, unlike traditional communications, social media can involve a certain level of discourse with the public in these online spaces. Participants mentioned the importance of engaging with their community on social media, so resourcing must look different for social media relative to traditional communications. Overall, this study identified that adequate and skilled staff and financial resourcing may act as a barrier to risk communication on social media.

Resourcing is likely tied in closely with leadership concerns identified by participants, given that leadership at some health authorities in Ontario may not see the value in investing in a present and proactive communication strategy on social media. This was once again identified by Booth and colleagues (2017) in their research, as leadership buy-in to social media communications was an area of concern. This buy-in from leadership also extended to the ability of health authorities to connect with those in their community. Further, it was identified that it can be difficult for the public to develop trust and a personal connection with a generic health authority account on social media. Regions who have a large social media presence from leaders in their community, such as Medical Officers of Health (MOHs), often appeared to have a

positive impact on the ability of the health authority in that region to communicate on social media, as it helped foster that level of trust with the community. The same was said for regions who did not have that investment in social media by leaders at their organization; they struggled to develop rapport from a general health authority account. As identified by Eckert and colleagues (2018), governmental agencies and those closely associated with them need to incorporate social media into daily operations, especially in advance of a crisis. These findings show that this was not necessarily the case for health authorities in Ontario, and there is still area for improvement on their social media integration.

Relationship building for communication teams both within and outside of the organization is a significant theme that came up during participant interviews. Relationships are key for the success of risk communication, given that the use of strategic partnerships and collaboration strengthen the amplification of reliable information (Tangcharoensathien et al., 2020). More specifically, the relationships built with other health authorities was particularly significant and encouraging, as forming strong bonds with organizations that share similar values and goals enhances the quality of risk communication and is suggested to improve public health outcomes (Heldman, Schindelar, & Weaver, 2013; Steffens et al., 2019). The relationships also likely reflect the breadth of strengths that each brings to the collective risk communication table.

This study revealed that the interdisciplinary nature of risk communication has proven to be both beneficial and a challenge for risk communicators at Ontarian health authorities. While a small sample, the participants in this study alone came from a wide variety of educational backgrounds, which could reflect the larger workforce in Ontario engaging in risk communication during COVID-19. It appears that each member of communication teams at health authorities can rely on their training and education to inform their work. However, those

engaging in risk communication cannot be well versed in all areas of risk communication, given how diverse the field is by nature. Before COVID-19, these risk communicators typically collaborated with other content experts at their health unit, but this became limited as COVID-19 progressed. The practical challenges associated with executing evidence-based risk communication strategies when they draw on a vast area of literature are not often discussed in the risk communication literature. More research may be warranted to understand the educational backgrounds that make up the communication teams and how this informs their strategies.

The interdisciplinary nature of risk communication also has implications for the theoretical underpinnings of the health authority's approaches. When examining the strategies identified by participants in this study and their educational backgrounds, they appeared to align with the approach that their organization used. Health authorities that used theories to guide their approach employed a combination of theories or strategies from different disciplines. This likely reflects that the use of various theories in practice at health authorities in Ontario may be consistent with the amount of interdisciplinary literature available about risk communication. Beyond the disciplines themselves, this study also found a general inconsistency with the use of theory. As discussed above, only three of six participants identified specific theories, frameworks, or strategies to guide their communications. This is significant given the emphasis often placed on the adoption of a theoretical approach by risk communication researchers for social media (Mian & Khan, 2020). However, this finding is not surprising given that it is consistent with research that has found that organizational social media approaches are often atheoretical (Tursunbayeva, Franco, & Pagliari, 2017).

While the approaches identified by participants in this study did reference theory, others noted that more general principles guided their use. This finding revealed the importance of tone

in social media risk communications. Chapter 3 of this study specifically examined functions of *Twitter,* but interviews highlighted that the tone of the message is of equal importance. For example, one participant highlighted how they historically communicated in a more corporate tone to respond to the media scrutiny they experienced, while another highlighted how they often were tongue-in-cheek and used humour to build rapport with their followers. The influence of Ontario's public health governance structure on social media policy and use may partially explain those who felt locked into a corporate tone, as this was highlighted as a barrier for risk communicators by Booth and colleagues (2017). Regardless, Steffens and colleagues (2019) recommends that to assist in uptake of health information, risk communicators need to consider pairing evidence-based information with personal stories that speak to audience beliefs and values. A closer examination of the tone of messaging on social media may reveal additional findings and a potentially fuller picture of how social media channels like *Twitter* were used by health authorities in Ontario.

Tailoring messaging to a specific audience is an important strategy identified for risk communication to manage information overload during a public health emergency (Vraga & Jacobsen, 2020). More specifically, the use of functional fragmentation has been proposed in risk communication literature as a possible strategy to communicate based on the specific needs of a community. This strategy was identified by some participants in this study. For example, a participant identified that a separate *Twitter* account was created to communicate COVID-19 information specific to the needs of older adults. However, functional fragmentation has mixed evidence, as it has been shown to pose theoretical concerns when governments attempt to have a whole-of-government approach (Zeemering, 2020). This whole-of-government conceptualization describes "efforts … to coordinate policy responses to complex problems through strategic

coordination across agencies" (Zeemering, 2020, p. 4). As such, public health emergencies such as COVID-19 result in complicated communication challenges that require consistent and coordinated communication. While there are benefits to tailored messaging, thought must be given by health authorities when engaging in functional fragmentation, as it is important that a whole-of-government approach remain at the forefront of risk communication strategies.

The findings from this study also revealed that participants went through a significant period of learning throughout the pandemic. Many noted that their experience from the first waves of COVID-19 will likely have learnings for future phases of COVID-19, such as vaccine hesitancy communication plans. This could expand on the risk communication literature concerned with phases of crisis progression, as they are often characterized as linear lifecycles. For example, Chapter 2 noted the three-stage model by Coombs (2014) pre-crisis (detection, prevention, and preparation), crisis (recognition and containment), and post-crisis. The protracted crisis that is COVID-19 shows that the crisis lifecycle is perhaps less linear. In the context of risk communication, the phases of crisis management feed into one another and inform the associated risk communication strategies. However, it is noted in risk communication literature that the informational needs of the public change over time. For example, during SARS, the public's concern at its onset was about data on outbreaks and the government's response, which transitioned over to attribution of responsibility and the development of vaccines (Yang et al., 2021). Findings from these interviews suggest that COVID-19 is following this same trend in the transitions of informational needs.

The last change in trend that came through as significant for participants was their requirement to compete with other's messaging, such as that of media outlets. These relationships with the media acted as either a facilitator or barrier to health authorities' risk

communication strategies. For participants, they often had to coordinate or contend with the narrative in media outlets about COVID-19. Househ (2016) suggests that healthcare organizations should attempt to utilize media outlets and develop communication campaigns in cooperation with leading news outlets in their community, which will likely influence social media activity. Discussions with risk communicators in Ontario build on this by noting that there is an important relationship to be managed there and is likely more complicated that simply coordinating with how media outlets report, given that they are not bound to cooperate with health authorities. Therefore, this suggests that specific strategies may need to be explored to build positive relationships with media partners.

4.5 Conclusion

Interviews with public health risk communicators revealed key facilitators and barriers to risk communication at Ontarian health authorities. These notably included proper staff and financial resourcing for communication teams, especially at what might be considered smaller health authorities, buy-in from organizational leadership to the value of social media, and relationships with organizations, such as other health authorities or media partners. Further, discussions with risk communicators revealed that inconsistency in the use of evidence-based or theoretical approaches persists, as was previously identified in Chapter 2 (Tursunbayeva, Franco, & Pagliari, 2017). The following Chapter will synthesize these findings alongside those from Chapters 2 and 3 to suggest recommendations for social media risk communication during a public health crisis.

Chapter 5 – Recommendations and Conclusion

5.1 Introduction

This thesis provided an overview of how *Twitter* was used as a form of social media to engage in risk communication by health authorities in Ontario. Chapter 2 shared the results of a narrative literature review and identified relevant literature for risk communication in the context of social media by organizations, and more specifically, governments. With this background, Chapter 3 then described the primary functions of *Twitter* as a prominent form of social media by governments through a qualitative content analysis, which focused on a sample of ten Ontarian health authorities (three provincial, seven local). The sample of tweets was taken from three 1-week periods that follow three major milestones of COVID-19. Chapter 4 then provided context to these findings by gathering insight into the strategies and key factors that influenced the success of risk communication during COVID-19 through qualitative key informant interviews with public health risk communicators at these same Ontarian health authorities.

This Chapter will bring together findings from the previous three Chapters to consider what, when integrated, they indicate for public health risk communication by health authorities. This Chapter synthesizes the analyses completed thus far and makes recommendations for public health professionals and health authorities engaging in risk communication strategies, especially in the context of social media during a public health emergency, such as COVID-19.

5.2 Recommendations

The following recommendations are a result of the findings and discussions from Chapters 2, 3 and 4. Recommendations were determined based on what was consistent with risk communication literature, but also to the needs of public health risk communication on social

media by health authorities. As such, the findings from the thesis result in six major recommendations – (a) *proactive emergency communications plans*; (b) *incorporation of evidence-based strategies*; (c) *expanded resourcing*; (d) *buy-in from leadership*; (e) *relationship-building with media*; and (f) *including equity in risk communications*. Each is discussed below.

5.2.1 Proactive Emergency Communications Plans

This research revealed the significance of timeliness in risk communication related to major events, as well as the preparation required by public health in responding to these events. For example, it is clear from the data that the focus of public health risk communications shifted to COVID-19 content quite drastically in March 2020, relative to the declaration of a public health emergency in January. Beyond this, more communication was provided by health authorities following the reopening of the province in May 2020 relative to the onset of the pandemic in March 2020. Risk communicators in this study also expressed that they did not feel there was an appropriate level of preparation in their communications strategy.

While it is not possible to always predict specific public health emergencies accurately, it is nevertheless possible to predict that it is only a matter of time before emergencies occur. That is, while it might not have been possible to predict the *COVID-19* pandemic, public health has long been able to predict the potential for *a* pandemic. As emphasized by Smith and Upshur (2020), a common sentiment from the 2013-2016 Ebola outbreak in West Africa was that Ebola served as a *wake-up call*, but nearly five years later, the world was seemingly blindsided by COVID-19. Public health officials are aware of some potential risks that may arise in the future alongside the possibility of a hereto unknown risk. As such, health authorities must recognize the lessons learned from COVID-19 to prevent history from repeating itself.

Thus, public health risk communicators should actively ensure they have emergency preparedness communication plans in preparation for future public health crises. This should include incorporating strategies for how to identify and include evidence as well as communications-specific strategies, so that once a public health risk becomes apparent, health authorities have the tools ready and in place to educate and inform the public. Some approaches may be difficult to prepare for, as needs will be crisis dependent. However, there are some steps that can be taken in advance. For example, if a risk communicator had proactively selected the Risk Communication on Social Media (RCSM) Model to guide their risk communication strategy, they could swiftly request retweeting of key public health messaging by the public, which is proven in evidence to assist in effective information dissemination (Vos et al., 2018). Taking steps for lessons in preparation are extremely valuable for health authorities going forward, as it is suggested that the prominence of other public health issues such as the climate crisis will accelerate the frequency of future public health crises, whether they be infectious diseases or natural disasters (Morens & Fauci, 2020).

5.2.2 Incorporation of Evidence-Based Strategies

While proactive emergency preparedness plans will help ensure health authorities are equipped for any public health emergency, this study also revealed the extent to which potential risk communication strategies are informed by evidence and theory. The content analysis conducted in this thesis showed that health authorities with clear and identified strategies had more robust, varied, and frequent communications immediately following COVID-19 milestones. However, there are a wide variety of approaches to risk communication utilized by health authorities in Ontario. Some risk communicators referenced specific theories from a variety of disciplines that guide their work, while others noted using more practical tools, like

Public Health Ontario's *Health Communication at a Glance* toolkit, or organizational policies as their point of reference. Organizational policies and guiding principles are not necessarily evidence-based, so these findings reinforce that Ontarian health authorities engaging in risk communication may need to increasingly use theory and evidence. A proposed solution could be to build theory and evidence into organizational policies themselves (e.g., a Terms of Use).

It should be noted that this recommendation is focused on incorporating more evidence about risk communication, and not necessarily the risk. As mentioned, as future public health emergencies arise, it is imperative that health authorities have the theoretical background and evidence to inform their social media approach to readily handle any crisis. However, as identified in the risk communication literature, it is challenging to translate theory into practice (Tursunbayeva, Franco, & Pagliari, 2017).

This recommendation is not that specific *theories* necessarily need to be named and picked to guide the risk communication strategies of health authorities. Instead, the utilization of evidence-based *tools* that are readily available to be used in practice, such as the CDC's Crisis and Emergency Risk Communication (Centers for Disease Control and Prevention, 2014), can assist risk communicators to incorporate more risk communication evidence into their approach. For example, this tool suggests steps to understanding your audience by assessing the demographic and social traits of your potential audience *before* an emergency, which will later inform messaging strategies (Centers for Disease Control and Prevention, 2014). This practical step as suggested by the CDC will better incorporate evidence in a risk communication strategy. Further, doing so may assist in enabling health authority's risk communication strategies to communicate more effectively on social media amidst a crisis.

5.2.3 Expanded Resourcing

This study revealed that resourcing for communication teams to respond adequately to the spread of the pandemic appeared limited, as it was identified that many risk communicators at health units did not have the time or resources during the onset of COVID-19 to build a communications strategy until many months into the pandemic. While financial and staffing resource constraints were likely consistent with much of the public health sector during the onset of COVID-19, this reveals that both provincial and local health authorities may need to specifically expand their communications teams. Doing so may better assist in facilitating public health education on social media, as it is an upstream way to help ensure the public has the information to protect themselves. Alternatively, health authorities should plan for ways to buttress or supplement communication teams in the event that there is a resource-heavy crisis that requires attention.

COVID-19 may have revealed that underfunding in public health communications is a problem broader than in the context of public health crises. Participants in this study pointed out that communications teams at some health authorities were smaller prior to COVID-19 and has always impacted their ability engage in proactive and public health specific-communications, which reinforces previous findings in literature (Harris et al., 2014a). This finding would be consistent with what has been found in previous research examining social media use in public health in Ontario (Booth et al., 2017). More specifically, it may be worth specifically developing communications teams to include diverse groups of individuals with varying backgrounds (e.g., health promoters, librarians, public relations professionals, graphic designers, etc.). Given the interdisciplinary nature of risk communication, building this diversity into communication teams at health authorities will better equip them to develop robust communication strategies. It may be worthwhile to identify relevant expertise within an institution or organization, enabling the quick

identification of experts that can be added to or can consult with communications teams. As emergencies may vary, diverse expertise is advantageous. Public health authorities in Ontario should consider investing more resources to diversify and expand the abilities of the public health system to communicate efficiently and effectively before, during and after a crisis.

5.2.4 Buy-in from Leadership

The lack of resourcing for public health communications could be an extension of the lack of value seen in engaging in communications from an organizational perspective in government, both at the provincial and local levels. The first aspect of this comes from participants who noted that having publicly vocal and visible leadership on social media was a key facilitator for success of their social media risk communications. Health authorities who noted their leaders were active on social media expressed the benefit it had for facilitating trust with the public. For example, Dr. Chris Mackie from the Middlesex-London Health Unit (MLHU) frequently provides messaging on *Twitter,* and it was noted both multiple participants how beneficial this presence was for risk communication. Previous research has emphasized that using such communications champions may be an effective tool for risk communication (Malik, Khan, & Quan-Haase, 2021). Leaders at health authorities, such as MOHs, should strongly consider having a presence on social media, as it bolsters the ability of their organization to connect with the community and as such, may result in better uptake of information.

Another form of communication buy-in from public health organizational leadership that is valuable is the willingness to engage in social media communications at the outset of a crisis. Participants noted that there was hesitation from their health authorities to communicate about the information openly and willingly they had available to them as COVID-19 became more prominent, as there appeared to be hesitation to communicate about a novel public health crisis.

According to participants, this hesitation had consequences for risk communication in Ontario, as it left Ontarians without access to the information that they needed to protect themselves.

These findings suggest that leadership within health authorities need to recognize the value in social media communication to foster its success and to understand how delays in messaging, for example due to hesitation or uncertainty about the messaging, may impede the public's exposure to and reliance on evidence-based information. It is possible that hesitation may let the public come to their own conclusions or may allow space for misinformation to spread. Even if public health authorities elect to not provide official messaging to the public, it is important that they remain vigilant in assessing the type and quality of information that is circulating in the community that may be informing the public. Thus, leaders at public health authorities should push for their organization at minimum to monitor information in online spaces and to implement strategies to communicate with the public in sufficient detail and frequency to dispel misinformation, as suggested by multiple researchers (Badell-Grau et al., 2020; Depoux et al., 2020; Swire-Thompson & Lazar, 2020).

5.2.5 Relationship-Building with Media

A key relationship noted by participants that influenced their risk communication approaches was their relationship with media partners. Throughout interviews, participants articulated how public health messaging worked in concert with media outlets to develop the narrative on social media about COVID-19. More specifically, for health authorities that noted that the media characterized the work of public health in a negative way, it became an uphill battle to engage in productive risk communications on social media.

Productive and transparent relationships with media partners is paramount for risk communication, as media outlets are major channels for information and consequently impact narratives on social media channels. This means that health authorities should consider media partners as key players in risk communications strategies. This was identified by participants in this study who explained that they communicated frequently with their media partners, and this was beneficial for their ability to shape the narrative in the information disseminated in their community. Of course, as with any community partner from a governmental perspective, this level of collaboration and partnership will take time to develop.

A primary strategy for building strong relationships with media partners is to firstly recognize the different needs and functions of media. While the needs of government and media are different, there is common ground their goal to serve the public. Approaching media partners with this understanding can better facilitate the relationship, as it may enable the health authority to provide information that can equally benefit news outlets in achieving their goals (Reynolds & Seeger, 2020). It is suggested that health authorities should discuss common goals with media partners to establish the *rules of engagement* for a mutually beneficial relationship. Further, health authorities should aim to have in place an open and direct channel to communicate directly to media partners in order to foster a relationship of trust (Reynolds, 2010). This can be accomplished through sharing the governmental key contact information with media partners, creating a key media contact list with news directors and editors, and actively including these contacts in communication plans (Centers for Disease Control and Prevention, 2014). Lastly, ensuring those employed as risk communicators have access to media relations training or the employment of media relations specialists on communications teams may be of particular use. If a lack of interest persists from media partners in a reciprocal relationship, it is suggested that

health authorities should at minimum routinely monitor news outlets to identify their messaging or potential information gaps (Prue et al., 2003).

5.2.6 Including Equity in Risk Communications

In terms of health equity in risk communication, interviews with participants brought more context to the results of the *Twitter* content analysis in Chapter 3. The content analysis revealed that there was little to no focus on health equity and the disproportionate impact of COVID-19 on certain populations in the actual messaging and content communicated by health authorities. However, interviews revealed that risk communicators at health units expanded beyond social media to incorporate health equity into their communication strategies.

A brief review of the Ontario Public Health Standards (OPHS) explored during the *Twitter* content analysis indicated that there is not necessarily a specific emphasis for public health units in Ontario to consider equity in communications. While this warrants further exploration, a recommendation could be to include adding requirements to the OPHS to ensure equity in the communication strategies of health authorities in Ontario.

This thesis indicates that collaboration with cultural groups often not included for in risk communication strategies must also be considered. It was found that there was an absence of culturally adapted risk communication on social media to connect populations disproportionately impacted by COVID-19. Health authorities should build this participation and collaboration with cultural leaders into their risk communication plans by holding regular meetings to develop culturally adapted messaging. Equity must continue to be an area of emphasis in risk communication, especially as the COVID-19 pandemic continues to evolve, and its impact persists for vulnerable populations.

One may argue that if marginalized populations or those without adequate access to social media are less likely to be present in online spaces and less likely to benefit from it (van Duersen, 2020), social media communications may not necessarily need to be adapted or the focus to ensure equity in risk communication. To this point, it is strongly suggested that health authorities look to other communication strategies to reach such marginalized populations, as those who are most vulnerable may not be present on social media. Further, it would be advantageous to facilitate access through policy (e.g., subsidies) to social media and as such, health information in online spaces for disadvantaged populations, which has been suggested by previous researchers (Robinson et al., 2020).

While increasing access to health information especially for disadvantaged populations in online spaces should be considered, these findings also suggest that strategies should expand to assess for eHealth literacy of those on social media. While this study clearly identified that information provision was the primary function of *Twitter*, researchers have questioned whether this level of information provision is helpful or harmful to the public if not interpreted properly (Swire-Thompson & Lazar, 2020; Yang et al., 2021). Health authorities should strongly consider assessing the eHealth literacy of their populations present on social media through tools such as the eHealth Literacy Scale (eHEALS) to determine the specific frequency and type of information needed for those present on social media (Norman & Skinner, 2006).

5.3 Knowledge Translation Plan

Ensuring that research is readily translated into practice is a key aspect of any research, but especially in the context of risk communication. Much of this thesis focused on the importance of health authorities using theory and incorporating evidence-based approaches in their communication strategies, while acknowledging there are limitations to this underutilization

of research. Knowledge translation (KT) can be seen as a proposed solution for the utilization of research in practice. KT has been shown to result in more effective programs, policies, and health services, as well as improved health outcomes (Dobbins et al., 2009). This section will outline the KT strategies utilized for this thesis to help ensure that findings and recommendations are translated back to health authorities in Ontario, with the goal of incorporating more evidence into practice.

Briefly, KT is an interactive process of knowledge exchange between health researchers and research users (Mitton et al., 2007). Similarly, the Canadian Institutes of Health Research (CIHR) defines it as "the exchange, synthesis, and ethically sound application of knowledge—within a complex set of interactions among researchers and users—to accelerate the capture of the benefits of research for Canadians through improved health, more effective services and products, and a strengthened health care system" (CIHR, 2016, para. 4). Incorporating KT plans into research, especially those that explore organizational and governmental work, will help facilitate the uptake of research into practice.

The central goal of the KT plan for this thesis is to ensure that results and recommendations are disseminated to health authorities in Ontario to consequently improve their social media risk communication strategies. This will follow the work of Kothari and colleagues (2021) who similarly examined the public health social media communications during COVID-19, but in a federal and provincial context in Canada. The basis of their KT plan is utilized for this study given its similarity in research focus and the expertise of these researchers in fundamental KT concepts.

To achieve this goal, a brief overview of this study through a one-page summary and infographic will be created and distributed to local and provincial health authorities in Ontario

(see Appendix K for an example). Public health contacts, such as participants in this study, will be engaged to assist with dissemination to colleagues in their field. We will also distribute this one-pager to known scholars who are similarly engaging in research to understand risk communication on social media during COVID-19 in Canada. This thesis will then be submitted for publication in an appropriate academic journal, such as one dealing with public health and risk communication (e.g., Journal of Risk Research). Once these findings are published, abstracts and will be submitted to public health research conferences to raise the overall awareness of these findings and recommendations in the risk communication literature. Together, these actions will be taken to ensure that the findings and recommendations reach health authorities to continuously improve the quality of their work in better communicating with the public.

5.4 Limitations

As with any research, it is important to articulate the potential limitations of the proposed methodologies or findings. The following section outlines a series of potential limitations that should be considered with the approaches utilized in this study.

Chapter 3 of this study utilized a more static view of *Twitter* presence by health authorities in Ontario, focusing in specifically on the responses immediately following three major milestones during the first wave of the pandemic in 2020. Given that COVID-19 is a protracted crisis and that sentiments or focus on *Twitter* may have changed beyond these 1-week periods, this study does not provide a comprehensive account of information on how social media platforms were used throughout the first wave. Time is a major influential factor that is associated with actual progression of messaging throughout the pandemic (Chen et al., 2020), so it would be worth expanding data collection. Additionally, this study only examined the use of one social media site, *Twitter*. While it has been identified as one of the most used social media

websites, there is uncertainty about its consistency with other social media sites, and overall limitations remain for this platform (e.g., the 280-character limit). Expanding data collection to other social media platforms, such as *Facebook* and *Instagram*, would address this limitation so that the findings presented in this study could be compared to see if they persist on these other social media platforms.

The utilization of a qualitative content analysis revealed primary functions of *Twitter* by health authorities following major milestones of COVID-19 in Ontario by methodologically assigning a function to a tweet. However, this approach also presents limitations. *Twitter* data can be difficult to qualitatively analyze as it is not dense or saturated in a qualitative sense in the same way as interview transcripts (Marti, Serrano-Estrada, & Nolasco-Cirugeda, 2019). This has been emphasized by researchers such as Branthwaite and Patterson (2011) who contend that qualitative inquiry using social media is inferior to conducting interviews and focus groups, as researchers may miss subtle or unspoken narratives that are present in real-time. Given that qualitative data analysis methods have primarily been used for studies incorporating interviews, there were some challenges with applying this approach to the less robust *Twitter* dataset. For example, it was acknowledged in Chapter 3 that only tweets that explicitly mentioned COVID-19 through content or hashtags were coded into the *COVID-19* category. The lack of robustness in the social media data required the researcher to make decisions about how to account for the context around data. The last notable limitation of using social media data is that it is not possible to know if any tweets were missed, as tweets may have been deleted by the users sometime between the time they were posted and the point of data collection.

Finally, this study relied on human coding of both social media and interview data solely by the author, which is both labour-intensive and subject to bias. This means that the same data

could be analyzed by other research team members and produce slightly different findings. However, as noted in the preface to this thesis, the author's views align with a constructionist paradigm, meaning that interpretation is an inherent part of research. Acknowledging this bias and accounting for it through reflexive exercises addresses this limitation to some degree.

With these limitations in mind, there are opportunities for future research to examine these issues a little closer to continue to expand the knowledge base of risk communication literature and consequently improve the quality of risk communication on social media by health authorities specifically in Ontario, and more broadly, in Canada.

5.5 Future Research

There are a number of ways that this study can be expanded upon in future research. For example, only a specific snapshot of *Twitter* by a sample of Ontarian health authorities in the week following major milestones of COVID-19 was utilized. To provide a more holistic understanding, future studies would benefit from examining continuous social media data from health authorities throughout the pandemic, rather than looking at specific time frames. Expanding the data retrospectively and mapping the data alongside a series of milestones throughout the progression of COVID-19 will provide a richer understanding of how social media was utilized to engage in risk communication. Consideration should also be given to the social media accounts that are examined for risk communication. The social media presence of organizational and political leaders (e.g., Medical Officers of Health) associated with health authorities may assist in better understanding how their presence on social media facilitates risk communication messaging and trust with the public.

This thesis revealed that the use of theory and strategy is likely informed by personal education and expertise of leaders at organizations. Interviews could also be expanded to include

leaders at these organizations to understand their own implications on strategies for communication, but also to assess their beliefs on the use of social media for risk communication. Understanding the beliefs of leaders may assist in helping facilitate buy-in and dispel any potential misconceptions about the role of social media.

This research could be expanded through an examination of *engagement*, assessed via replies to social media posts by health authorities from the public. As noted by researchers in risk communication literature, understanding the two-way discussions between health authorities and the public is a significant way to fully examine risk communication on social media. This level of analysis provides unique opportunities for dialogue between authorities and citizens (Yang et al., 2021). Researchers have found that citizens who engage in non-compliant behaviour is often the result of misunderstanding information (Doogan et al., 2020). As such, it would be extremely beneficial to examine the responses to risk communication messaging to gauge interpretation of the level of understanding from the public. If a major goal of risk communication is to provide information that reduces ambiguity (Moorhead et al., 2013), this field of research needs to assess understanding and engagement by the public. Participants in this study also noted that engagement varies across social media platforms, such as *Facebook* and *Instagram*. Interviews in this thesis revealed that social media platforms may be used to inform the public in slightly different ways, so inclusion of these other platforms will provide more nuance in understanding the similarities and differences between them.

The concept of expanding beyond *Twitter* also has implications for future research related to health equity in risk communication. In order more fully understand the equitable implications of risk communication during COVID-19, future research may need to expand to all forms of communication beyond social media. This research suggested that equitable risk communication

strategies account for concepts like the digital divide, which characterize the audiences who are and are not present in digital spaces. This means that to develop proper recommendations for health authorities in keeping health equity at the forefront of risk communication, research must expand beyond social media to look at the full picture of communications activities. The policy implications of inequitable gaps may also need to be investigated. For example, the extent to which policies like the OPHS specifically include equity in their requirements of health authorities may need to be explored further. Unfortunately, the persistence of COVID-19 and its implications leaves opportunity to continue to investigate this impact (Zeemering, 2020).

As discussed in Chapter 2, there are few studies that have understood the use of social media during the recovery and preparation phases of a crisis (Eckert et al., 2018). Future research could examine the presence of health authorities in Ontario as the province enters recovery from COVID-19 at some point in the future. Further, it is important to explore changes in media engagement during different phases of a crisis as evidence suggests that there is inconsistency in the trust the public has at various points throughout a crisis (Vai et al., 2020). Future studies could explore social media presence by health authorities during the second or third waves in Ontario, or during the rollout of vaccinations, to understand more about the progression of social media use throughout the pandemic.

5.6 Conclusion

Risk communication campaigns play a significant role in helping the public navigate through moments of uncertainty (Xu et al., 2020). These campaigns help educate the public, while simultaneously building community resilience (Smith, Ng, & Li, 2020). The aim of this thesis research was to describe how *Twitter* was utilized in the context of Ontarian health authorities, while examining the underlying theories and experiences that guided these risk

communication campaigns on social media as identified by individuals responsible for the communication from these organizations. To this end, the *Twitter* accounts of three provincial and seven local health authorities were examined for three 1-week periods following significant COVID-19 milestones: (a) the declaration of COVID-19 as a public health emergency by the World Health Organization on January 30, 2020; (b) the announcement of the first death in Canada from COVID-19 on March 10, 2020; and (c) the announcement of Ontario's first reopening on May 14, 2020.

One of the key findings of this research was that *Twitter* was used prominently as a source for information giving about COVID-19. The type of information that was communicated differed between the provincial and local health authorities, which is likely consistent with the OPHS (OPHS, 2021). The government of Ontario focused on broader policy decisions and services, while local health authorities generally had more emphasis on community building and other public health issues impacted by COVID-19. This content analysis also revealed that there are significant equity considerations that should be considered for risk communication strategies, namely in remaining aware of the disproportionate impact of COVID-19 on vulnerable populations in messaging, assessing for eHealth literacy of their populations, and the need for more culturally adapted risk communications.

Key informant interviews with risk communicators from the same sample of the *Twitter* content analysis revealed that there are practical barriers and facilitators that risk communicators face when they engage in risk communication on social media. Risk communicators identified that having the proper staffing complement and financial resources would help ensure that health authorities were equipped for effective risk communication strategies. In addition to resources, relationships were identified as important. This includes relationships with colleagues and

leadership within the organization, but also other health authorities, and media and community partners. Each were identified to influence the ability of Ontarian health authorities to communicate amid a public health crisis. Lastly, participants identified different approaches to the incorporation of theory in risk communication strategies. When utilized, theories from multiple disciplines are referenced in tandem and are likely a result of the educational background of the communications leadership team. Local tools and guiding principles are used more frequently than specific theories, as they are more readily used in practice.

Social media will continue to present significant opportunities for health authorities to engage in risk communication to navigate current and future public health crises. However, there also continues to be areas for improvement in the ways that risk communication can be engaged to maximize its benefit. Findings from this thesis identified the ways *Twitter* has been utilized by Ontarian health authorities in the week following three major milestones of COVID-19 and highlight its emphasis on information and resource provision. Further, this thesis revealed that there are key facilitators to the success of risk communication, and gaps remain in utilizing theory by risk communicators. Future research that examines long-term data across a variety of communications channels and engagement from the public will be necessary to better understand how social media may influence behaviour change.

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Appendices

Appendix A - Reflexive Notes

September 10:

- Upon doing the initial readings for my qualitative methods course and having gone to the first class, I am very confused by many things.
- Having taken a qualitative class before during my undergrad degree, I thought this would be easy since I've covered methodologies, analysis, interpretation, etc.
- The readings around ontology, epistemology and axiology are particularly challenging to wrap my brain around (by Guba & Lincoln, 1994)
    - This feels almost like more of a philosophy exercise than a research methods exercise
- The readings definitely emphasized the researcher role much more than my previous qualitative course did, given that we mostly covered how to conduct interviews or focus groups in practice
    - Our background was more on shadow dialogues and the need to record verbatim what participants are saying (as not to misinterpret)
    - From what I understand, this reading is much more about approaching qualitative research as a co-construction (joint research product between interviewer and interviewee)
- With some of the information about paradigms, I struggle to understand how viewing research as a co-construction doesn't inherently align itself with a paradigm (constructivism)?
    - Is it possible to be a post-positivist qualitative researcher?
    - This is related to the question I'm going to be asking in the OWL forum: Finlay (2006) highlights that qualitative researchers are broadly seen as interpretivist, but vary widely when it comes to the realist-relativist continuum. If relativism emphasizes the diversity of interpretation, how can a qualitative researcher be seen as both interpretivist, but also realist?

September 18:

- I thought that it would be a helpful exercise given the class information on paradigms to consider my reflexive notes done in 2016 for another project to see where I've been/where I've come from:

November 8th (day of interview): Field notes were written on lined paper by myself during the interview as mental triggers for later analysis. I also took some notes about the direct environment in which the interview was held to see if those affected any interview data (mostly those potentially relevant to the research question). There wasn't much time to transcribe direct quotation, but the note taking was really helpful to ensure I was listening carefully and decoding information. It's worth noting that because it was impossible to write direct quotation, some bias was at play when I only wrote down things that I felt were "worth mentioning".

November 10th: It appears that first-year transitions (notably as a struggle) and diversity are obvious themes emerging; perhaps this is because first-year was a really hard time for myself? Also noticing a couple of instances in the transcript where I felt the interviewee wanted something else to be said... Did I want something more to be said? Did I want more data for analysis?

November 14th: The themes of balancing autonomy with parental relationships and perceptions on future-oriented engagement have emerged. My bias around parent-child relationships from immigrants may be coming through. Perhaps I feel that children usually tend to want to be more progressive while their parents are more conservative, especially when coming from another conservative country. Am I imposing this onto the data? I know a lot of my friends that live at home (like the interview participant) struggle with living with their parents – am I assuming the same thing in this situation because of this?

November 17th: As I think more about the idea of diversity on campus throughout the interview data, I feel that I am becoming more appreciative of the lack of support there is for non-Caucasian cultures. During the interview, I probably felt as though the idea of diversity is an academic construct, not a social one. From I recall, I felt that this was just another issue that I would write about in an essay. Now, I think that I can feel the real implications resonate from the transcript and interview notes. This new-found appreciation can help represent the true feelings of the interviewee.

- It's interesting to see how I interpreted reflexive notes as someone who was just beginning to understand the field of qualitative research
- Based on my notes, I clearly do not identify a paradigm or set of beliefs that guide my work, which now I am trying to think much more critically about
- My reflexive notes do not seem to go very deep, and revolve largely around pieces of relatability
    - It appears that my past experiences were always explanations as to why I interpreted results the way that I did (i.e.. A hard first year = projecting that onto interview data)
- Reflecting on the previous notes, and the course work so far, I feel that in general I am stuck between two different paradigms: critical theory and constructivism. I believe that realities are multiple, and perception is definitely reality (something my Mom taught me growing up - from the book "The Four Agreements"), but also I think that power plays a huge role given my background in public health…
- Is it possible to align with two paradigms?

September 28:

- Looking back again on my notes, I am seeing a lack of acknowledgement of the power at play when interviewing someone, especially someone who is a person of colour
    - I think it definitely negatively affected my ability to understand their issues related to diversity
    - You would think that I would be more aware of it given my interest in power structures?
- I recently watching a documentary on white privilege (*Hello Privilege. It's Me, Chelsea* on Netflix), and I think I am beginning to understand how my whiteness has benefitted me in my life. I always found it interesting how white people became defensive when privilege was brought up, and how they found it unfair that people of colour were given "special treatment" (which definitely happened in this documentary)
    - Reminds me of a saying that I resonate with, which goes something like this: equality begins to feel like discrimination when you've become accustomed to privilege
- Again, I think this could come back to being a male when it comes to issues for females. As a white male, how can I understand/empathize with women of colour, should/can I interview them?

October 3:

- While trying to conduct a critical appraisal, and having read the article (Renwick et al., 2019), I think I am seeing that it is possible to try and combine two paradigms
    - Clearly in the case of this paper, it appears to create some issues
- How can someone present a mixed paradigm in a way that is still high-quality research?
- Would be an interesting topic for a paper given that I don't think I can come to this conclusion without more research into it
- When thinking about how this could be used with marginalized populations and using them as more active participants in research, can we include their paradigm in the research process?

October 8:

- The reading on strategic research planning (Finlay & Ballinger, 2006) was interesting given its emphasis on predictable and controllable research
    - It appears to me that this view is almost counter-intuitive, as I view qualitative research as more exploratory than anything else
    - How can you predict or even create a research plan when you can't anticipate what participants will say?
    - It almost seems like research planning is a way for researchers to bring their assumptions about what the research process will look like to the forefront
        - Could it be used as a reflexive tool?

October 17:

- Readings on interviewing and sampling (especially about hard to reach populations) have me thinking again about power relations
- I think I am understanding that it's our job as researchers not to necessarily empathize with the experiences that others have, because that's not always possible, but to give voice to their experiences – a key for marginalized populations
- This is not necessarily the case for all researchers, but I believe that this is my motivation for wanting to conduct research

October 22:

- Class re: power relations in interviews made me reflect on my past experiences when interviewing
    - Being a male, white
- Needing to listen…
    - In my first interviews, I tried to re-route participants to answer questions
- Research into my dilemma around mixed paradigms have me stumbled upon the world of pragmatism as a paradigm within mixed methods
    - Does this mean that there is a paradigm in and of itself where other paradigms are mixed, when we feel that we don't align with one?

October 29:

- My confusion with paradigms and my values regarding equity/health system reform are clearly important takeaways – is there a way that these could be combined?
- Dr. Rudman will have useful insight on these ideas, and maybe there is a way that they could be combined
- Overall, I think that there's more merit in exploring using qualitative approaches HSPR as it speaks to both my beliefs and my motivation for being a researcher in the first place

November 5:

- Preparing for a student symposium on methodology (virtual ethnography) is making me reflect on the role of virtual fields beyond just the methodology of ethnography

November 12:

- Class today about participatory action research (PAR) really resonated with a lot of my questions and concerns about power relations and giving voice to marginalized populations
    - I struggled with the concept of what a 'social action' means
    - In my mind the goal was always to obtain policy/system change
- Questions about having a community not wanting their information to translate into policy is also difficult (if that's inherently my goal as a researcher)
    - I need to think critically about how I might be able to conduct a PAR while also (ironically) sacrificing "power" over the research process

November 19:

- Having completed the student symposium on virtual ethnography was particularly interesting for me as I'm considering the use of online data for my thesis
- The ethical considerations that I outlined during our presentation really resonated with me and is making me reflect a lot on how to approach online research ethically
    - How can you obtain consent when you don't even know who you're interacting with?

November 25:

- I had a class today re: knowledge translation and has evolved my understanding about the role between qualitative approaches and health policy
- It reaffirmed for me that I have an inherent belief in including marginalized populations (linked to my background in public health)
- My professor questioned whether it was even possible to use quantitative approaches in health systems research, which I thought was interesting given that I believe quantitative approaches are prominent in this area of literature

December 3:

- My final qualitative class has reaffirmed for me that I think it's possible to have a mixed paradigm, or at least be somewhere in the middle
- As per Dr. Rudman's suggestion, it's possible to tie critical theory and constructivism given their ontological alignment (vs trying to mix post-positivism and interpretivism)
    - I think this is where I situate myself (for now)!

January 8 (date of first interview):

- Resourcing stands out as an interesting finding after this interview
    - Especially the comments about other health units
- Theoretical underpinning of this health unit was impressive – I wonder if theory it utilized more often than I think it is
    - Literature tells me that it isn't used, but I wonder if these updated conversations will contradict this
    - Important to remain aware of these biases I had coming into the interview

January 10

- Upon transcribing the first interview, I realize that my questions may be too leading to a conclusion or thought I have in my head

- Going forward, I want to try and leave my questions more open-ended to really understand the experiences of the participants

January 12 (date of second interview)

- The second interview reaffirmed once again that theory is used more than I thought it would be (my 'hypothesis')
- This health unit has an entire position devoted to incorporating research into their communications which is encouraging
- The contrast between a rural and more urban area is more clear
    - Relationships with municipalities are starting to become prominent

January 13 (date of third interview)

- The personal experiences of this interview resonated with me
- This interview reinforced the human experience of working in a pandemic; not something as prominent in the other interviews
    - Made me feel empathy for this type of work
- Going back to my paradigms, I am starting to appreciate how these experiences are constructing the reality for participants
- Noting potential lack of diversity in participants – need to continue to pay attention to the role of power

January 20

- After doing some transcription and initial analysis, I am feeling encouraged by the results
- Interviewers gave insightful thoughts into risk communication and the practical opportunities and challenges
- I still think I need to work on my follow-up questions and not going down rabbit holes

February 9 (first committee meeting)

- Lots of questions came up today about the approach for the *Twitter* content analysis
- There is some conflicts about whether or not there should be a quantitative vs qualitative approach
    - While results can be presented in a more quantitative method, at the core, this research is qualitative; there is a good opportunity within this research to look at temporal relationships
- Attention should be paid to the equity of this research; who is missed in this research?
    - Goes back to my critical paradigm; it can be easy to lose this when diving into numbers, but equity is really important to consider in online spaces

February 13

- Playing lots of back and forth with other potential participants
- Difficulty in recruitment may become an issue, as I expected for those actively coordinating the pandemic response

April 19

- Amendments sent to ethics to reach out to potential participants via phone
- Has me thinking about the ethical implications of research

May 4 (date of fourth interview)

- This interview has me thinking that theory may be a mixed bag among participants
- The reality that's been constructed is once again consistent; conversations about personal opinions about governmental structures and separating personal opinions from the work required came through

May 7 (date of fifth interview)

- Interesting observation interviewing someone in a 'higher up' position and their influence on the messaging from PHUs
- The positions of participants may have influenced the results, given that some focused more on creating content while other worked on broader, overall strategy

May 10 (date of sixth interview)

- The influence of organizational structure came through in the interview
    - Interesting observations about how the structure of the PHU and who is involved in communications may influence their strategy (i.e., this PHU has health promoters doing this work, which is different than other PHUs)
- Similarly, comments about other PHUs and the influence of organizational leadership is consistent once again

May 31 (second committee meeting)

- After thesis committee meeting, there are some real errors with the foundation of the *Twitter* content analysis
- Need to pay attention to my ontology when I'm writing up results
    - While there is a statement of an interpretivist approach, in some areas, I've written in a more post-positivist lens, especially with the citation in the methodology.
    - This has me thinking that I may have more work to do in figuring out my paradigmatic positioning

June 15

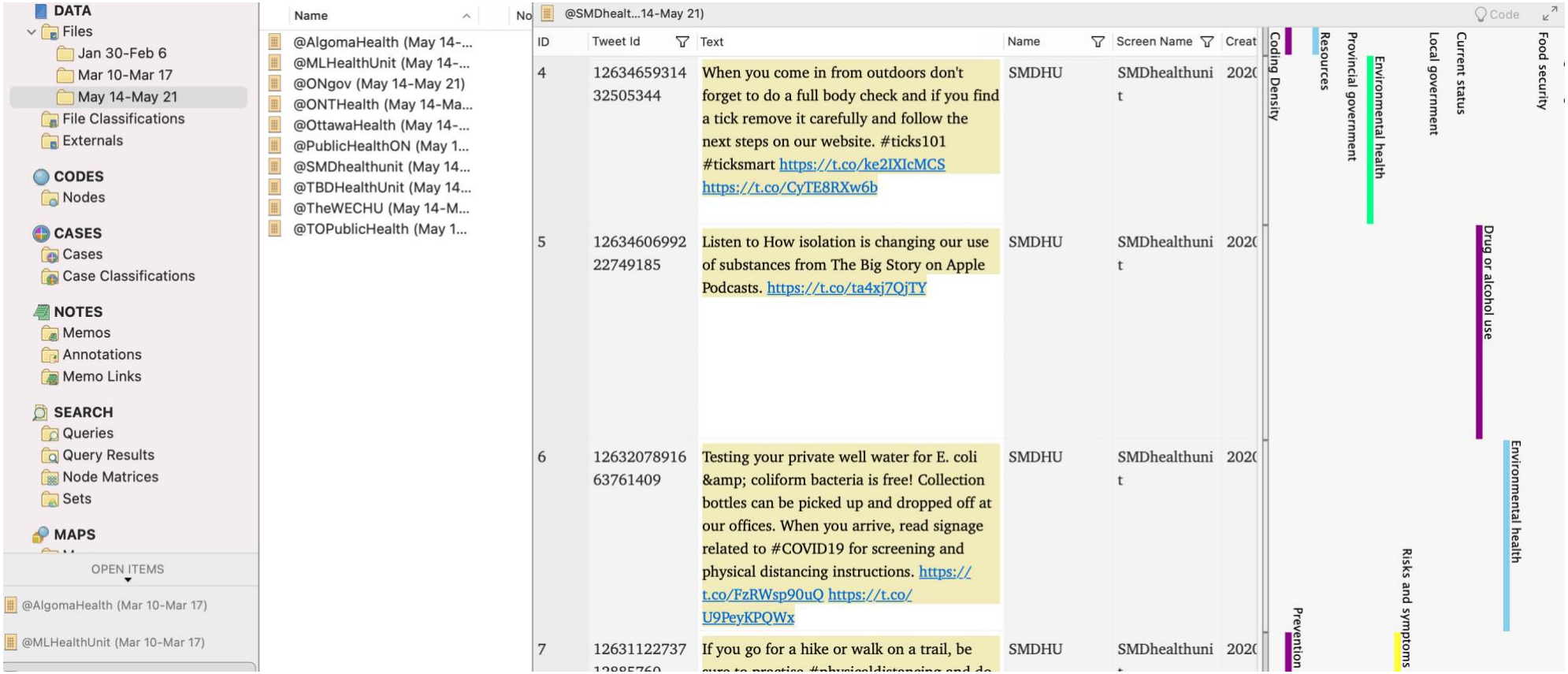
- Reflecting more on my paradigm and re-reading my work, I think my positioning between constructionism and critical theory remains
    - I think that in reading literature, I ended up reading more quantitative/post-positivist literature to inform my approach
    - Upon further reflection and exploring more content analysis literature that is more qualitative/interpretive, I agree more with that approach

Appendix B - Snapshot of Organization of *Twitter* Codes via Excel

	A: @AlgomaHealth (Jan 30-Feb 6)	B: @AlgomaHealth (Mar 10-Mar 17)	C: @AlgomaHealth (May 14-May 21)	Algoma Health	D: @MLHealthUnit (Jan 30-Feb 6)	E: @MLHealthUnit (Mar 10-Mar 17)	F: @MLHealthUnit (May 14-May 21)	MLHU	G: @OttawaHealth (Jan 30-Feb 6)	H: @OttawaHealth (Mar 10-Mar 17)	I: @OttawaHealth (May 14-May 21)	Ottawa P	J: @SMDhealthunit (Jan 30-Feb 6)	K: @SMDhealthunit (Mar 10-Mar 17)	L: @SMDhealthunit (May 14-May 21)	SMDHU	M: @TBDHealthUnit (Jan 30-Feb 6)	N: @TBDHealthUnit (Mar 10-Mar 17)	O: @TBDHealthUnit (May 14-May 21)	TBDHU	P: @U F
1 : Hotline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2 : Radio	0	0	0	0	1	2	0	3	0	0	1	1	0	0	0	0	0	0	0	0	
3 : Speech, forum	0	0	0	0	0	1	9	10	1	5	4	10	0	0	0	0	1	3	2	6	
4 : Web chat	0	0	0	0	0	0	7	7	0	0	0	0	0	0	0	0	0	3	1	4	
Event promotion	0	0	0	0	1	3	16	20	1	5	5	11	0	0	0	0	1	6	3	10	
5 : Dispelling misinformation or providing facts	0	0	0	0	1	0	0	1	5	3	1	9	6	0	0	6	3	1	0	4	
6 : Prevention	0	0	14	14	5	20	7	32	0	9	17	26	4	8	9	21	0	13	9	22	
7 : Reducing fear	0	0	0	0	1	4	0	5	2	2	1	5	0	0	1	1	1	2	1	4	
8 : Resources	0	6	3	9	5	29	5	39	8	9	12	29	6	10	7	23	3	15	12	30	
9 : Risks and symptoms	0	0	0	0	0	1	1	2	0	0	5	5	1	0	3	4	0	3	1	4	
10 : Transmission	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11 : Travel	0	3	1	4	0	8	0	8	0	3	0	3	1	1	1	3	0	0	1	1	
Information giving	0	9	19	28	12	62	13	87	15	26	36	77	18	19	21	58	7	34	24	65	
12 : Current status	0	0	0	0	9	9	0	18	2	7	5	14	0	3	1	4	1	5	3	9	
13 : International support	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14 : New cases	0	0	2	2	3	3	0	6	0	7	0	7	0	0	0	0	0	1	2	3	
News update	0	0	2	2	12	12	0	24	2	14	5	21	0	3	1	4	1	6	5	12	
15 : Email address	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	
16 : Phone number	0	0	0	0	0	2	0	2	1	0	0	1	1	1	0	2	0	0	0	0	
17 : Physical address	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	
18 : Research	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	
Other COVID codes	0	0	0	0	0	3	0	3	1	0	2	3	1	2	1	4	0	1	0	1	
19 : Educational institution	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1	
20 : Local government	0	0	0	0	0	3	0	3	0	4	5	9	1	0	1	2	0	0	1	1	
21 : Organizational	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
22 : Provincial government	0	1	0	1	0	1	1	2	0	0	2	2	0	0	4	4	0	1	0	1	
Preparedness	0	2	0	2	0	6	1	7	0	4	7	11	1	0	5	6	0	2	1	3	
23 : Adapting events or services	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0	
24 : Economy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
25 : Local government	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	
26 : Provincial government	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	
Reactive measures	0	0	0	0	0	0	0	0	0	3	0	3	0	1	2	3	0	0	0	0	
COVID CONTENT	0	11	21	32	25	86	30	141	19	52	55	126	20	25	30	75	9	49	33	91	
1 : Acknowledgement of current, local events	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	
2 : Addressing loneliness, isolation and mental he	0	0	0	0	0	0	1	1	1	3	8	12	0	1	0	1	1	1	3	5	
3 : Giving recognition and thanks	0	0	1	1	0	7	3	10	1	4	19	24	2	0	1	3	0	2	4	6	
4 : Response solicitation or tagging and calling o	0	0	0	0	0	1	1	2	0	2	6	8	0	0	0	0	0	6	2	8	
5 : Sentiment of community	0	0	4	4	0	8	1	9	0	4	8	12	0	0	1	1	0	1	2	3	
Community	0	0	5	5	0	16	6	22	2	13	42	57	2	1	2	5	1	10	11	22	
6 : Career, professional	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7 : Crime and safety	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8 : Resource access	0	0	0	0	0	1	1	2	0	5	5	10	0	5	0	5	0	3	1	4	
9 : Transportation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10 : Weather	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	1	1	
Miscellaneous	0	0	0	0	0	1	1	2	0	5	7	12	0	5	0	5	0	3	2	5	

	S : @TOPublicHealth (Jan 30-Feb 6)	T : @TOPublicHealth (Mar 10-Mar 17)	U : @TOPublicHealth (May 14-May 2	TOPH	LOCAL HEALTH UNITS	V : @ONgov (Jan 30-Feb 6)	W : @ONgov (Mar 10-Mar 17)	X : @ONgov (May 14-May 21)	ON gov	Y : @ONTHealth (Jan 30-Feb 6)	Z : @ONTHealth (Mar 10-Mar 17)	AA : @ONTHealth (May 14-May 21)	ONT hea	AB : @PublicHealthON (Jan 30-Feb 6)	AC : @PublicHealthON (Mar 10-Mar 17)	AD : @PublicHealthON (May 14-May 2	PHO	PROVINICIAL GOV'T	Jan 30-Feb 6 Totals	Mar 10-Mar 31 Totals	May 14-May 21 Totals	TOTA
1 : Hotline	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2 : Radio	0	0	2	2	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	6
3 : Speech, forum	0	0	5	5	31	0	0	0	0	0	0	0	0	0	0	0	0	0	2	9	20	31
4 : Web chat	0	0	2	2	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	11	16
Event promotion	1	0	9	10	54	0	0	0	0	0	0	0	0	0	0	0	0	0	4	16	34	54
5 : Dispelling misinformation or providing facts	1	0	1	2	23	0	0	0	0	0	0	0	0	0	0	0	0	0	16	4	3	23
6 : Prevention	1	5	68	74	201	0	2	3	5	1	0	14	15	0	0	3	3	23	11	66	147	224
7 : Reducing fear	2	3	0	5	20	0	1	0	1	0	4	0	4	0	0	0	0	5	6	16	3	25
8 : Resources	5	7	33	45	190	1	7	1	9	3	8	10	21	0	2	2	4	34	31	104	89	224
9 : Risks and symptoms	0	1	1	2	19	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	13	19
10 : Transmission	0	0	1	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4
11 : Travel	0	2	3	5	25	0	1	0	1	0	0	0	0	0	0	0	0	1	1	19	6	26
Information giving	9	18	107	134	482	1	11	4	16	4	12	24	40	0	2	5	7	63	66	214	265	545
12 : Current status	4	7	22	33	111	0	3	1	4	0	1	1	2	0	0	19	19	25	16	52	68	136
13 : International support	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14 : New cases	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	3	11	4	18
News update	4	7	22	33	129	0	3	1	4	0	1	1	2	0	0	19	19	25	19	63	72	154
15 : Email address	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
16 : Phone number	1	1	0	2	7	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	0	7
17 : Physical address	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
18 : Research	0	0	1	1	4	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	5	5
Other COVID codes	1	1	1	3	15	0	0	1	1	0	0	0	0	0	0	0	0	1	3	7	6	16
19 : Educational institution	0	0	0	0	5	0	2	0	2	0	1	0	1	0	0	0	0	3	0	7	1	8
20 : Local government	1	0	10	11	30	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7	21	30
21 : Organizational	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
22 : Provincial government	0	0	2	2	15	0	4	7	11	0	1	0	1	0	0	1	1	13	0	11	17	28
Preparedness	1	0	12	13	52	0	6	7	13	0	2	0	2	0	0	1	1	16	2	27	39	68
23 : Adapting events or services	0	0	2	2	5	0	3	2	5	0	0	1	1	0	0	0	0	6	0	6	5	11
24 : Economy	0	0	1	1	1	0	1	2	3	0	0	0	0	0	0	0	0	3	0	1	3	4
25 : Local government	0	0	4	4	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6
26 : Provincial government	0	0	0	0	2	0	2	2	4	0	0	0	0	0	0	0	0	4	0	4	2	6
Reactive measures	0	0	7	7	14	0	6	6	12	0	0	1	1	0	0	0	0	13	0	11	16	27
COVID CONTENT	16	26	158	200	746	1	26	19	46	4	15	26	45	0	2	25	27	118	94	338	432	864
1 : Acknowledgement of current, local events	0	0	7	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	8
2 : Addressing loneliness, isolation and mental he	0	0	35	35	57	0	0	2	2	0	0	0	0	0	0	0	0	2	2	5	52	59
3 : Giving recognition and thanks	0	0	41	41	85	0	0	1	1	0	0	3	3	0	0	0	0	4	3	13	73	89
4 : Response solicitation or tagging and calling o	0	1	4	5	23	0	0	0	0	0	1	0	1	0	0	0	0	1	0	11	13	24
5 : Sentiment of community	0	2	12	14	45	0	1	2	3	0	0	5	5	0	0	1	1	9	0	16	38	54
Community	0	3	99	102	218	0	1	5	6	0	1	8	9	0	0	1	1	16	5	45	184	234
6 : Career, professional	0	0	1	1	2	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	2	3
7 : Crime and safety	0	0	1	1	1	0	3	0	3	0	0	0	0	0	0	0	0	3	0	3	1	4
8 : Resource access	0	2	7	9	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	14	34
9 : Transportation	0	0	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9
10 : Weather	0	0	2	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5
Miscellaneous	0	2	20	22	51	0	3	1	4	0	0	0	0	0	0	0	0	4	1	23	31	55

Appendix C - NVivo (v12) coding of *Twitter* content



Appendix D - Interview Questions

1. To start off, could you tell me your position?
2. What does your role entail?
    a. Has social media always been a part of your portfolio?
3. What has your experience been like coordinating social media communications during the COVID-19 pandemic?
    a. What have you seen as the primary function of social media during the pandemic?
4. Do you use any theory, strategy or framework to guide how you have coordinated the response?
    a. If no: Is there one now?
5. How did you feel this strategy (or lack thereof) impacted your social media response?
    a. Throughout this process, have you actively collaborated with other health authorities or health researchers when developing your messaging?
6. What have been some defining moments for you?
7. What would you say have been your biggest successes?
    a. Did you ever see COVID as an opportunity to discuss other public health issues?
8. What would you say have been your biggest challenges?
    a. How did you approach informing the public during a pandemic with rapidly evolving evidence?
    b. How do you respond if you get a negative response or how do you navigate when people reply and ask questions to your posts?
9. Knowing what you know now, would you have done anything differently at the beginning?
10. What advice would you have for another professional trying to coordinate social media communications during a public health emergency?
11. Is there anything you'd like to add that we haven't discussed?

Appendix E - Email Recruitment for Interviews

Subject Line: Invitation to participate in research

Hello,

We have received your email address from the **[insert health organization]** website. We would like to invite you to participate in a study that we, Jacob Shelley and Marc Resendes, are conducting on social media responses to the COVID-19 pandemic by health authorities. Briefly, the study will involve asking you about your experience coordinating the social media response on behalf of [**insert health organization**]. This will be done through a Zoom interview, which will be around 40 – 60 minutes.

Attached to this email is a letter of information which outlines more details about the study. For any further questions or to set up a time for a potential interview, please contact Marc Resendes at the contact information below.

Thank you,

Jacob Shelley
Western University

Marc Resendes
Western University

Appendix F - Letter of Information for Interviews

Letter of Information and Consent

Project Title:
Examining public health risk communication via social media by provincial and local health authorities in Ontario during the COVID-19 pandemic

Document Title:
Letter of Information and Consent

Principal Investigator + Contact:
Dr. Jacob Shelley
Western University

Additional Research Staff + Contact (optional):
Marc Resendes
Western University

1. Invitation to Participate

You are being invited to participate in this research study about social media use by Ontarian health authorities during the COVID-19 pandemic. You are being invited because you hold a position in a governmental body in Ontario that is helping coordinate the social media pandemic response.

2. Why is this study being done?

This study is being done to firstly describe how social media, specifically *Twitter*, has been used by provincial and municipal health authorities to communicate policies and best practices to the public. This will be done through a content analysis of the Ontario governmental *Twitter* accounts and a representative sample of local health unit *Twitter* accounts.

This study also aims to understand the rationale as to the ways in which *Twitter* has been utilized by interviewing the risk communicators at the various health authorities, such as yourself. This will help gather insight into the frameworks or theories, if applicable, that are guiding the use of *Twitter* by these health authorities. The findings from this study will identify the challenges and successes of public health risk communication during a pandemic by Ontarian health authorities, as well as inform this body of literature on the guiding frameworks or strategies that have been used in practice to facilitate or hinder pandemic risk communication by government.

3. How long will you be in this study?

The anticipated length of the study will be approximately 1 year. This will only require 1 interview of you that will last about 40 – 60 minutes.

4. What are the study procedures?

As a participant in this study, you will be partaking in a key informant interview. These interviews will be semi-structured in order to leave room to expand on issues of importance to interview participants. These will be completed through Zoom to limit in-person contact amidst the COVID-19 pandemic.

Interview questions will be shared with you in advance should you express an interest in participating. They will focus on asking you to share your role at the health authority, your experience during the pandemic, your directives, or strategies in place for communication via social media, and the challenges and successes you've experienced while managing pandemic communications.

The nature of interviews will be exploratory as the content covered in the interview will be dependent on the areas of significance most important to you. I will ask follow-up questions to clarify meanings throughout to ensure that your experiences are fully understood.

Prior to the beginning of the interview, I will verbally reiterate information outlined in this letter of information which includes the goals and purpose of the study, the length of the interview as well as your right not to answer any questions and withdraw from the study. Field notes will be taken during the interviews and will include what is seen (i.e.. body language) as well as anything notable that occurs in the physical environment, such as any disturbances.

Interviews will be audio recorded through the use of a personal iPhone that will be secured. These audio files will be prompted transcribed verbatim to be analyzed. Once this is completed, the audio file will be destroyed. Transcripts will be stored electronically in an encrypted folder. Audio recording is a mandatory portion of this study, so you will not be eligible to participate if you are not comfortable with this.

After the interview, you will be sent a debriefing email which will direct you on how to contact us for follow up about the study, your right to withdraw and whether or not you want to be contacted when findings of the study are ready to be disseminated.

5. What are the risks and harms of participating in this study?

There are no known or anticipated risks associated with participating in this study. The only inconvenience that may be imposed upon participants is the time commitment required. Considering that the COVID-19 pandemic is still ongoing, it may be inconvenient for participants to allocate portions of their day to participate in this research.

To mitigate the potential inconvenience that may be imposed upon participants, the following steps will be taken: 1) Interviews will be kept brief in order to ensure that they are conducted in an efficient way to respect participants' time; 2) The researchers will be extremely flexible as to the dates and times that will be available for interviews to be scheduled to not limit participants to certain hours of the day.

6. What are the benefits of participating in this study?

You may not directly benefit from participating in this study, but information gathered may provide benefits to society as a whole which include important findings that will fill a gap in literature characterized by a lack of information on structured and evidence-informed social media practice during a public health emergency in the Canadian health care system. As a result, this study will hope to improve social media communications by health authorities to ensure that through updated frameworks and strategies, official sources of information are reliable, consistent, and coordinated at a time when they are needed most.

7. Can participants choose to leave the study?

You may decide to withdraw from this study at any point up until publication of the study, which includes the withdrawal of all data. If you wish to have your information

removed, please let the researcher know and your information will be destroyed from our records. After this time, we will not be able to withdraw your information.

8. How will participants' information be kept confidential?

To protect your privacy, all participants will be given pseudonyms during this process. Any other identifying information, such as the health authority you are employed by, will be removed from interview transcripts to ensure confidentiality. Additionally, given that participants are public servants representing health authorities, any quotations will not be directly attributed to any individual or jurisdiction and any identifying information will be removed to protect confidentiality. Only represented health authorities and anonymous quotes will be included in dissemination. This means that if the results of the study are published, your name will not be used. However, while we do our best to protect your information, there is no guarantee that we will be able to do so. The inclusion of organizations included in the study during dissemination of the results may allow someone to link the data and identify you.

Participant names and pseudonyms, contact information, health authority represented, and tracking information (such as if they completed written consent, if the interview has been scheduled, etc.) will all be kept on a master list. This will be done in order to properly track study progress according to the research objectives. This will be kept by the researcher in a secure place, separate from your study file. This master list will be an encrypted file that is only accessed by the researchers. This will be kept in an encrypted file on Marc Resendes' laptop and destroyed at the completion of the study, as per Western's guidelines (retained for a minimum of 7 years). To remain consistent with this, study records will be securely transferred to Dr. Jacob Shelley for long-term storage at the completion of Marc's degree.

Representatives of Western University's Non-Medical Research Ethics Board may require access to your study-related records to monitor the conduct of the research.

9. Are participants compensated to be in this study?

You will not be compensated for your participation in this research.

10. What are the rights of participants?

Your participation in this study is voluntary. You may decide not to be in this study. Even if you consent to participate, you have the right to not answer individual questions or to withdraw from the study at any point prior to publication, which includes the option to withdraw your data. If you choose not to participate or to leave the study, it will have no effect on your employment status. You do not waive any legal right by consenting to this study.

11. Whom do participants contact for questions?

If you have questions about this research study please contact: Jacob Shelley. If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Human Research Ethics. This office oversees the ethical conduct of research studies and is not part of the study team. Everything that you discuss will be kept confidential.

This letter is yours to keep for future reference.

Project Title:
Examining public health risk communication via social media by provincial and local health authorities in Ontario during the COVID-19 pandemic

Document Title:
Letter of Information and Consent

Principal Investigator + Contact:
Dr. Jacob Shelley
Western University

Additional Research Staff + Contact (optional):
Marc Resendes
Western University

Written Consent Form

Print Name of Person	Signature	Date *(DD-MMM-YYYY)*

This study has been explained to me and any questions I had have been answered. I know that I may leave the study at any time. I agree to take part in this study.

Print Name of Person Obtaining Consent	Signature	Date *(DD-MMM-YYYY)*

My signature means that I have explained the study to the participant named above. I have answered all questions.

Appendix G - Approval of NMREB Initial Application for Interviews

Western Research

Date: 22 October 2020

To: Dr. Jacob Shelley

Project ID: 116582

Study Title: Examining public health risk communication via social media by provincial and local health authorities in Ontario during the COVID-19 pandemic

Short Title: Governmental Use of Social Media during COVID-19

Application Type: NMREB Initial Application

Review Type: Delegated

Full Board Reporting Date: 06/Nov/2020

Date Approval Issued: 22/Oct/2020 14:14

REB Approval Expiry Date: 22/Oct/2021

Dear Dr. Jacob Shelley

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the WREM application form for the above mentioned study, as of the date noted above. NMREB approval for this study remains valid until the expiry date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

This research study is to be conducted by the investigator noted above. All other required institutional approvals must also be obtained prior to the conduct of the study.

Documents Approved:

Document Name	Document Type	Document Date	Document Version
DebriefingForm_V1_2020Sept7	Debriefing document	07/Sep/2020	1
InterviewGuide_V1_2020Sept7	Interview Guide	07/Sep/2020	1
RecruitmentEmail_V2_2020Oct16	Recruitment Materials	16/Oct/2020	2
LOI:C_V3_2020Oct21	Written Consent/Assent	21/Oct/2020	3

No deviations from, or changes to the protocol should be initiated without prior written approval from the NMREB, except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario. Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Katelyn Harris, Research Ethics Officer on behalf of Dr. Randal Graham, NMREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).

Appendix H - Approval of NMREB Amendment for Interviews

Western Research

Date: 19 April 2021

To: Dr. Jacob Shelley

Project ID: 116582

Study Title: Examining public health risk communication via social media by provincial and local health authorities in Ontario during the COVID-19 pandemic

Application Type: NMREB Amendment Form

Review Type: Delegated

Full Board Reporting Date: 07/May/2021

Date Approval Issued: 19/Apr/2021 16:18

REB Approval Expiry Date: 22/Oct/2021

Dear Dr. Jacob Shelley,

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the WREM application form for the amendment, as of the date noted above.

Documents Approved:

Document Name	Document Type	Document Date	Document Version
TelephoneScript_V1_2021March30	Recruitment Materials	30/Mar/2021	1

REB members involved in the research project do not participate in the review, discussion or decision.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario. Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Ms. Katelyn Harris , Research Ethics Officer on behalf of Dr. Randal Graham, NMREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).

Appendix I - Recruitment Call Script for Interviews

General phone number

Hi there, my name is Marc Resendes and I'm a Master's student from Western University. I've received this phone number from the **[insert health organization]** website. I was hoping to connect with some who works with Communications at your organization, as I am conducting on social media responses to the COVID-19 pandemic by health authorities. Briefly, the study would involve asking about the experiences coordinating the social media response on behalf of [**insert health organization**]. This will be done through a Zoom interview, which will be around 40 – 60 minutes.

Is there someone you might be able to connect me with to chat a little bit about this?

Specific staff phone number

Hi there, my name is Marc Resendes and I'm a Master's student from Western University. I've received your phone number from the **[insert health organization]** website. You may have received some emails from me about this, but I am reaching out in the hopes that we could chat a little bit about your work in Communications, as I am conducting a study on social media responses to the COVID-19 pandemic by health authorities. Briefly, the study will involve asking you to participate in a Zoom interview of about 40 – 60 minutes about your experience coordinating the social media response on behalf of [**insert health organization**]. The study is coming to a close, and just wanted to reach out one last time to see if you wanted to talk a little bit about the information I've collected and analyzed from your social media accounts.

Do you or a member of your communications team have some time to chat a little bit about this?

Appendix J - Feedback Letter for Interview Participants

Hello,

Thank you for your participation in this study! The purpose of this study was to explore how social media has been used by health authorities in Ontario and gather the experiences of communications coordinators.

If you are interested in being notified when the findings of the study are available, you may respond to this email indicating your interest.

Lastly, this is a reminder that you have the right to withdraw from the study, which includes the withdrawal of your data, at any point prior to publication of the study.

Thank you again for your participation.

Kind regards,

Jacob Shelley
Western University

Marc Resendes
Western University

Appendix K - One Page Study Summary (KT Plan)

RISK COMMUNICATION ON SOCIAL MEDIA

A CASE STUDY OF ONTARIAN HEALTH AUTHORITIES DURING COVID-19

CONTEXT

Risk communication campaigns play a significant role in helping the public navigate through moments of uncertainty, as they help educate the public while building community resilience. The aim of this research was to describe how Twitter was utilized by Ontarian health authorities during COVID-19 and examine the underlying strategies that guide their risk communication campaigns on social media. This was completed through 1) a content analysis of Twitter communications by a sample of Ontarian health authorities and 2) interviews with those involved with communications at these same health authorities.

KEY FINDINGS

STUDY 1 - TWITTER ANALYSIS

1. The primary function of *Twitter* during COVID-19 was 'information giving' followed by 'news updates'
2. Other health-related issues impacted by COVID-19 were not discussed on *Twitter* until later in the pandemic
3. Local health authorities focus more on community-building and resilience than the provincial government

STUDY 2 - INTERVIEWS

1. Staffing and financial resources were suggested to facilitate the success of risk communication on social media
2. Leaders do not always recognize the value of social media communications
3. There is mixed approaches between health authorities in their use of theoretical and evidence-based approaches to risk communication on social media

RECOMMENDATIONS FOR HEALTH AUTHORITIES IN ONTARIO

Proactive emergency communications plans

Communicators should have emergency preparedness communications plans and tools that are evidence-based in advance of a public health crisis to readily inform the public.

Incorporation of evidence-based strategies

Given the mixed evidence on use of evidence-based strategies in the first place, Ontarian health authorities should more frequently consult theory and evidence to guide their work.

Expanded resourcing

Provincial and local health authorities in Ontario may need to expand and diversify communication teams and funding in order to execute proactive public health risk communication.

Buy-in from leadership

Organizational leaders should consider having a presence on social media. Leaders who see value in social media communications appear to facilitate effective risk communication and trust with the public.

Relationship building with media

Health authorities should routinely identify message or information gaps and opportunities in news outlets and as such, should have open and direct communication channels with them.

Including equity in risk communication

Health equity should be incorporated more frequently in public health risk communications to acknowledge the disproportionate impact of emergencies on vulnerable populations.

For the full study, go here: https://mystudy.com.

Curriculum Vitae

MARC RESENDES

EDUCATION

September 2019 – December 2021 (Expected)
Western University | London, ON
Master of Health Information Science

September 2014 – May 2019
University of Waterloo | Waterloo, ON
Honours Bachelor of Public Health (Co-op)
Sociology Minor

RESEARCH EXPERIENCE

May 2020 – December 2021
Master's Thesis | Western University, London, ON
Supervisor: Dr. Jacob Shelley, PhD, JD

- Examining public health risk communication via social media by provincial and local health authorities in Ontario during the COVID-19 pandemic

September 2018 – April 2019
Capstone Research Project | University of Waterloo, Waterloo, ON
Supervisor: Dr. Elena Neiterman, PhD

- Explored the relationship between sexual minority experiences of "second adolescence" and mental health through qualitative interviews

September 2017 – December 2017
Undergraduate Research Project | University of Waterloo, Waterloo, ON
Supervisor: Dr. Mark Dolson, PhD

- Collected and analyzed interview data to examine experiences of student stressors on university campuses

PROFESSIONAL EXPERIENCE

June 2021 – Present
Program Evaluator | Vaccine Informatics & Planning Team, Middlesex-London Health Unit, London, ON

- Facilitating the assessment, planning, implementation, monitoring, and evaluation of programs and interventions

March 2021 – June 2021
Informatics Support | Vaccine Informatics & Planning Team, Middlesex-London Health Unit, London, ON

- Manage and develop processes for efficient data collection and data utilization, ensuring best practices for service delivery and proper handling of private health information

November 2020 – March 2021
COVID-19 Contact Tracer | Case and Contact Management, Middlesex-London Health Unit, London, ON

- Collaborate with Case Investigators to identify close contacts of COVID-19 cases, notify them of exposure, assess their clinical status, and provide public health education

January 2020 – January 2021
Teaching Assistant | Faculty of Media and Information Studies, Western University, London, ON

- Provide teaching support to undergraduate courses: MIT 1050: Navigating the Media Landscape and MIT 2025: Research Methods in the Digital Age

May 2017 – August 2017 | January 2018 – August 2018
Assistant Coordinator, Volunteer Resources | Regional Municipality of Peel, Mississauga, ON

- Provided support to divisional Public Health and Long-Term Care programs through volunteer management cycles

September 2016 – December 2016
Workplace Campaign Coordinator | United Way Kitchener-Waterloo & Area, Waterloo, ON

- Developed and delivered presentations in workplaces to educate and spread awareness about the importance of public health, equity, and prevention in communities

AWARDS AND HONOURS

September 2020 – August 2021
Ontario Graduate Scholarship ($15,000) | Western University

September 2014 – December 2018
Term Dean's Honours List | University of Waterloo

September 2014
President's Entrance Scholarship ($2000) | University of Waterloo