

Impact on Canadians' Mental Health due to COVID19

Angel Chan¹, Helen Heacock²

1 Lead Author, B. Tech Student, School of Health Sciences, British Columbia Institute of Technology, 3700 Willingdon Ave, Burnaby, BC V5G 3H2

2 Supervisor, School of Health Sciences, British Columbia Institute of Technology, 3700 Willingdon Ave, Burnaby, BC V5G 3H2

Abstract

Background

SARS-CoV-2, also known as COVID19, spread across the globe in 2020 and 2021 impacting many people, their livelihood, and their mental health. Because of how the disease spread, certain controls were enacted such as community lockdowns, social distancing, working remotely, restricting one's social contacts, and mask wearing. This caused unintended consequences where some people are left with psychological distress. While the media and the general public appear to be more focused on the physical health aspect of the virus, mental health has not received the same attention. This study examined the mental health of Canadians during the COVID19 pandemic. Results can be used to create policies and programs addressing mental health issues that have arisen from this global health crisis.

Methods

An online self-administered survey hosted by SurveyMonkey was conducted. The survey was disseminated through Reddit's subreddits, as well as contacts of contacts. The survey was open for three weeks and contained questions on demographics and how a participant perceived their mental health.

Results

Responses were received from 218 persons and over 200 respondents answered each question. According to Wilcoxon Signed-Ranked tests, people experienced an increase in depressive thoughts ($p = 0.000$), anxiety ($p = 0.000$), unbearable stress ($p = 0.000$), and trouble going to sleep or staying asleep ($p = 0.000$) in early 2021 compared to 2019. 77.7% of the respondents indicated that COVID19 has very likely or likely impacted their mental health. According to chi-square tests, location of residence in Canada did not affect perceived quality mental health ($p = 0.1929$) or perceived impact of COVID19 ($p = 0.3986$). There was, however, an association between age and perceived quality of mental health ($p = 0.0043$) but not with the perceived impact of COVID19 ($p = 0.5977$).

Conclusion

In general, people are experiencing a diminished quality of mental health regardless of where they are located. Females and younger people were more affected than males, and older populations. Given these results, policymakers should allocate more resources to mental healthcare to help ensure that the next health crisis is not a mental health one.

Keywords: COVID19, mental health, depression, anxiety, unbearable stress, social distancing, lockdowns

Introduction

Since December 2019, SARS-CoV-2, also known as COVID19, has spread across the world becoming a global pandemic. COVID19, a novel coronavirus discovered in Wuhan, China

infected more than 146 million people and killed over 3.1 million in more than one year as of April 24, 2021 (Worldometer, 2021). Because it is an infectious respiratory disease, stringent control measures had to be put into place.

Countrywide lockdowns, travel bans, quarantine, isolation, social distancing, and other measures were enacted. While this disease only causes physical illness, the unintended consequences of these control measures left some people with psychological distress. Due to lockdowns, many people suffered financial hardships, increased stress and anxiety. Coupled with this, a delay in vaccination rollout and changing vaccination policy in Canada has resulted in Canadians falling behind in vaccination distribution, compared to other developed countries (Eitizaz, 2021). Because of quarantine, isolation, social distancing, as well as the slow pace and uncertainty of vaccination delivery and distribution many people are feeling lonely and frustrated. These are “well known risk factors for several mental disorders” (Giallonardo, et al., 2020).

The media and the general public appear to be more focused on the physical health aspect of this virus. However, more attention should also be paid to the mental health outcomes because after the pandemic is over, the sequelae could be a global mental health crisis. By studying how Canadians are currently feeling during the pandemic, programs and policies regarding mental health can be made to address this issue.

Literature Review

Mental Illness and Risk Factors

In Canada, it is estimated that one in five people are living with mental illness, with the

prevalence of this illness projected to increase (MHCC, 2013). World Health Organization (WHO, 2020) defines mental disorders as an umbrella term for many problems with different symptoms but generally consists of “some combination of abnormal thoughts, emotions, behaviour and relationships with others”. WHO (2012) states that many factors can affect a person’s mental health, which is categorized into three main categories: individual attributes, social circumstances, and environmental factors. In the context of the COVID19 pandemic, social circumstances and environmental factors will be discussed. Individual attributes will not be discussed due to the pandemic’s broad nature where it affects everyone regardless of one’s attributes. However, it should be noted that some individual attributes can make a person more susceptible or resilient to their social and environmental stressors, which means individually everyone will be affected by the pandemic differently. But, looking at the general population as a whole, social and environmental factors will be the focus. Due to control measures or even the virus itself, risk factors that are relevant listed by WHO (2012) include financial stability, employment status, social interactions and support, ability to access basic services and exposure to traumatic events. Because of the projected increase of mental illness (MHCC, 2013) before COVID19 happened, now compounded with the pandemic, a study on how Canadians are faring during the

pandemic is important to prepare for a potential mental health crisis.

Social Needs of Humans

Humans have a fundamental need to belong, form and maintain strong relationships with others (Baumeister & Leary, 1995). Baumeister & Leary (1995) showed links between this social need, health and well-being. With COVID19, many social interactions were cut off due to lockdowns and social distancing. However, with the advent of online technology, people could still stay connected at a distance via virtual platforms. But a study by Sacco & Ismail (2014) concluded that online interaction did not satisfy the human social need as well as in-person interactions. Therefore, there is a unique opportunity to study whether or not this extended duration of social distancing is impacting people's mental health.

Traumatic Events, Isolation, and Staying at Home

The COVID19 pandemic is unlike most previous traumatic events because it is not localized where a person can escape from, but it is globalized where it becomes a threat that can be everywhere (Giallonardo, et al., 2020). Most research done on mental health due to epidemics is on the sequelae of the disease itself rather than on the control measures put into place like social distancing (Galea, M.Merchant, & Lurie, 2020). Even so, it is evident that traumatic events lead to increased mental disorders (Galea,

M.Merchant, & Lurie, 2020). A couple of comparable events are SARS in 2003 and MERS outbreaks. Increased stress, psychological distress, and PTSD in patients and healthcare workers occurred during SARS, its aftermath, and continued to persist for a long time (Galea, M.Merchant, & Lurie, 2020). Studies during the SARS outbreak found that people experienced negative feelings like fear, helplessness, and depression (Giallonardo, et al., 2020). From these past events, an increase in mental health illness should be anticipated during and after COVID19.

Jeong, et al (2016) conducted a study in 2015 during the MERS outbreak in South Korea, which examined people, who were isolated during the MERS epidemic, for anxiety and anger, both during the isolation and for a period after isolation. They observed that a proportion of people showed anxiety symptoms and had feelings of anger during isolation. These symptoms and feelings would persist at four to six months after due to their experience of "isolation, inadequate supplies, social networking activities, history of psychiatric illnesses, and financial loss" (Jeong, et al., 2016). They concluded that early intervention is needed by providing mental health support for possible prevention of mental health problems after release from isolation (Jeong, et al., 2016). As with COVID19, many people were put into isolation or quarantine while the rest of the country was told to stay at home. Knowing how

people are feeling can provide information as to whether intervention is needed for any mental health problems.

During the whole pandemic, the general public was told to stay at home. While it is a great control method against the virus, a study by Chow, et.al (2017) found that having more negative emotions are associated with spending more time at home. These negative emotions will cause an individual to further retreat and further socially isolate themselves (Chow, et al., 2017). With COVID19, a person who is experiencing negative emotions can quickly spiral into a depressive state, since they are advised to stay at home and have no social interaction with others away from home.

Looking at a different type of traumatic event, war may also be able to shed some light on the mental health of the general population. A research review conducted by Murthy & Lakshminarayana (2006) on multiple wars and conflicts of varying length in different countries concluded that one of the most significant consequences of these events was the impact on the mental health of the civilian population. Studies have found that women were more affected than men and the general population had an increase in incidence and prevalence of mental disorders (Murthy & Lakshminarayana, 2006). They also noted that “prevalence rates are associated with the degree of trauma, and the availability of physical and emotional support” (Murthy & Lakshminarayana, 2006). While

COVID19 is very different from war, there are many similarities. The general population has to face months or years of stress or fear of an unknown situation. So while the degree of trauma faced by the population may not be able to be controlled, making physical and emotional support more available may help lower rates of mental disorders.

Coping Mechanism

Different people have different ways of coping with stress and other challenges. HealthLinkBC (2019) lists many different types of coping responses. However, with COVID19, many of the coping responses are no longer available due to the lockdown. Some of the coping responses provided by HealthLinkBC that were not available or advised against doing include: going out with friends, going to church, exercising or getting outdoors to enjoy nature. With social distancing, mass gathering ban, parks and gyms closed, many people’s coping responses were no longer available during the height of the lockdown. With their coping responses gone some people may have difficulty relieving the increased stress coming from the pandemic itself. This became an added burden on people’s mental health.

But humans are resourceful. Even though most coping mechanisms were no longer available, people looked for other ways to deal with the situation. A lot of in-person activities became online including concerts, worship services,

classes and meetings, taking place on a platform like Zoom. Many celebrities changed to live streaming their concerts for free to help people get through the lockdown and some even organized concerts just for the lockdown (Gardner, 2020). Shopping, a pastime for many people has also been affected. According to Statistics Canada (2020) online shopping almost doubled from February (before lockdowns) to May 2020. With the internet, people could stay connected and still communicate while being physically distanced. But the biggest caveat as mentioned before is that online interactions do not equate to in-person interactions (Sacco & Ismail, 2014). So even though the internet can help people stay connected and cope differently, is it enough?

U.S. Study on Mental Health During the COVID19 Pandemic

While Canada and the United States are different countries with many differences, the two countries also share some similar characteristics. Therefore, looking at how citizens of the USA are faring can help shed some light on how Canadians are doing. A study by Marroquína, Vineb, & Morgan (2020), which was conducted in the United States in February and March 2020 looked at whether or not social distancing and stay-at-home orders had implications on mental health. They found that social distancing was associated with increases in depression and general anxiety between the two months. The study also suggests that social supports that can

help people stay mentally fit is not sufficient at eliminating the impact of social distancing. The authors conclude that while social distancing is necessary for controlling the virus, there should also be more investment made towards mental health interventions (Marroquína, Vineb, & Morgan, 2020).

Mental Health of Specific Groups

Some groups of people have been studied regarding their mental health due to the pandemic. One of the most studied groups of people is healthcare workers. A review paper by Spoorthy, Pratapa, & Mahant (2020) found that healthcare workers “are encountering a considerable degree of stress, anxiety, depression, insomnia due to the COVID-19 pandemic”. A study identified factors that caused stress in healthcare workers, which include concerns for personal safety, concerns for family, concerns about patient mortality, lack of treatment, lack of personal protective equipment, and exhaustion (Cai, et al., 2020). The same study also identified their coping mechanism includes knowledge that their family are well, a positive work environment that ensures personal safety, the knowledge that there is a reduction of reported cases due to disease prevention measures, and positive self-attitude (Cai, et al., 2020).

Another study was done on post-secondary students of the United States. The study found that students were experiencing increased stress,

anxiety, and depressive thoughts (Son, Hegde, Smith, Wang, & Sasangohar, 2020). The students were concerned about their loved ones, had difficulty concentrating, disrupted sleep patterns, decreased social interactions, and greater concerns about their academic performance (Son, Hegde, Smith, Wang, & Sasangohar, 2020). Son et al. (2020) found that most students would self-manage with some students using negative coping methods. Of the students that self-managed around one-third would engage in positive coping methods like meditation and the majority would do relaxing hobbies like exercise (Son, Hegde, Smith, Wang, & Sasangohar, 2020). Students would also seek support from family and friends by communicating with them (Son, Hegde, Smith, Wang, & Sasangohar, 2020). However, 93% of the students did not use the school's counselling services during the pandemic even though tele-counselling was available (Son, Hegde, Smith, Wang, & Sasangohar, 2020). This is an important finding because this shows that even if services are made available people might not use them.

Adequacy of Canadian Mental Health Care Services

As access to health care is one of the social determinants of health, adequacy of mental health care services would also play a role in people's mental health. An article by Scharf & Oinonem (2020) discussed how the current healthcare system is very physician-centric.

Because of this, the public is limited from accessing adequate mental health care services as physicians are not trained to provide mental health services (Scharf & Oinonen, 2020). They concluded that psychologists and other registered mental health care providers should be part of the insurance program. Pre-COVID19, a report by the Mental Health Commission of Canada (2017) reports that 1.6 million Canadians in 2012 said: "their need for mental health care was only partially met or not met at all". This is concerning as this shows that in pre-pandemic times there were already insufficient mental healthcare services and with the pandemic things could potentially get worse.

Importance of this Study

A pandemic of the COVID19 scale has not happened in the twenty-first century. The most severe pandemic in recent history is the 1918 influenza pandemic (Spanish flu) according to the CDC (2019). Even though there is a lot that can be learned about from recent smaller pandemics or epidemics and the Spanish flu to help prepare or combat COVID19, this pandemic is very unique. The main difference between the social level of COVID19 and the Spanish flu is that the twenty-first century is very much a digital age. The technology of every aspect has seen so much improvement, whether it is medical or computer technology. Time is also a factor. The Spanish flu happened over one hundred years ago therefore, almost no one remembers or experienced it personally.

Due to these reasons, the current population will probably face a different set of problems and be affected differently compared to people who were alive during 1918. While there were other smaller pandemics like SARS and MERS, these two pandemics were just not on the scale that COVID19 is. So, the effect of those two pandemics on people would also be different.

As discussed in previous sections, multiple factors play a part in people's mental health. Knowing people's mental fitness and how the different factors affect mental health during the pandemic could help predict the sequelae of the COVID19 pandemic. This could translate to policy changes to improve on current practices, investments in needed health services towards people that need them, and even preparing for a better response method for any future pandemics.

Purpose of the Study

The purpose of this research was to assess perceived mental fitness of the Canadian population one year prior to the COVID19 pandemic (2019) and 10 months after the start of the pandemic (January 2021) to determine whether there is an increased perception of mental ill health due to the COVID19 pandemic.

Methods and Materials

Materials

For this research project, a computer was used to design a survey and perform statistical analysis.

The survey was hosted on SurveyMonkey in Canada (<http://www.surveymonkey.com>) and distributed on the social media platform Reddit. The results were statistically analyzed using NCSS (NCSS, 2021) and Microsoft Excel.

Standard Methods

The standard method used involved conducting an online self-administered survey hosted by SurveyMonkey, an online survey platform, using a license given by BCIT. Before the survey was opened to the public, a pilot study was conducted. The survey questions were edited to reflect the feedback from the pilot study. The study received BCIT Research Ethics Board approval and was open to the public from January 13th, 2021 to February 4th, 2021. The survey had two parts. The first part included questions on demographics. The second part had questions on how a participant perceived their mental health. The survey focused on how a person perceived their mental health and was not based on any clinical diagnoses. All the questions had closed-ended answers for ease of statistical analysis (Heacock, personal communication [lecture slides], 2020). The survey was open to all persons with access to a computer and posted on Reddit to gather responses. On Reddit, the survey was posted on multiple subreddits based on location, universities, and relevance to the research topic. The survey was posted in r/takemysurvey, r/SampleSize, r/simonfraser, r/richmondcb, r/burnaby, r/BCIT, r/CanadaCoronavirus, and

r/Langley. The survey was also sent to contacts to be forwarded to their contacts to complete. Excluded from participating were friends, family members and classmates of the authors. The survey took participants an average of 1 minute 40 seconds to complete and was designed to be simple and easily understandable by everyone. Once the survey was closed, the raw data was exported to Microsoft Excel. Then the data was transferred into NCSS for analysis.

Statistical Analysis and Results

Description of Data

Both sections of the survey collected multichotomous nominal and ordinal data. However, for analytic purposes, the ordinal data were converted to numerical data. For example, when asked about the frequency of occurrence the options included: All of the time, Most of the time, Some of the time, A little of the time, None of the time. A value was assigned to each of the options, where 1 stands for 'All of the time', 2 stands for 'Most of the time', 3 stands for 'Some of the time', 4 stands for 'A little of the time', and 5 stands for 'None of the time'.

Descriptive Statistics

A total of 218 responses were recorded. While some people skipped some questions, all questions had more than 200 responses. The majority of the participants were between the ages of 15-34, 67% (N=146). 1% (N=2) was under 15 years old, 20% (N=43) was between ages 35-54, 11% (N=25) was age 55 or above,

and 1% (N=2) preferred not to say. More females, 60% (N=130), responded to the survey than males, 37% (N=81). 2% (N=5) said they consider themselves as other and 1% (N=2) preferred not to say.

The majority of the participants reside in Canada, 92% (N=201). 6% (N=13) reside in the USA, 1% (N=3) preferred not to say and one participant said they live in a place not listed as a choice. If the participant responded that Canada as their place of residence, further breakdown of their location of residence was made. The majority 64% (N=128) said they were residing in British Columbia. 3% (N=6) were residing in Alberta, 1% (N=2) were residing in Manitoba, one participant residing in New Brunswick, 1% (N=2) were residing in Nova Scotia, 28% (N=57) were residing in Ontario, 1% (N=2) were residing in Quebec, 1% (N=2) were residing in Saskatchewan, and one participant preferred not to say.

17% (N=35) of the participants thought they had excellent mental health in 2019, 34% (N=72) thought they had very good mental health in 2019, 30% (N=64) thought they had average mental health in 2019, 14% (N=30) thought they had not very good mental health in 2019, 5% (N=10) thought they had poor mental health in 2019, and one participant preferred not to say. As compared to 8% (N=18) of the participants thought they had excellent mental health in 2021, 21% (N=44) thought they had very good

mental health in 2021, 30% (N=64) thought they had average mental health in 2021, 27% (N=57) thought they had not very good mental health in 2021, 14% (N=29) thought they had poor mental health in 2021, and one participant preferred not to say.

Q6 Also in 2019, how often would you experience the following in a given week?

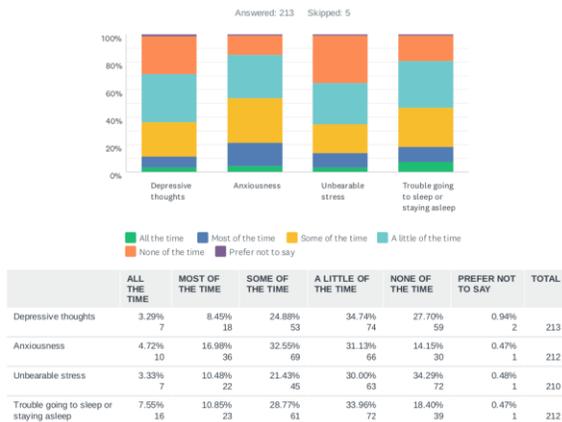


Figure 1 – Experiences in 2019

Figure 1 shows that in 2019 anxiety and trouble going to sleep or staying asleep was more of a problem for people than depressive thoughts and unbearable stress.

Q8 How often would you experience the following this week?

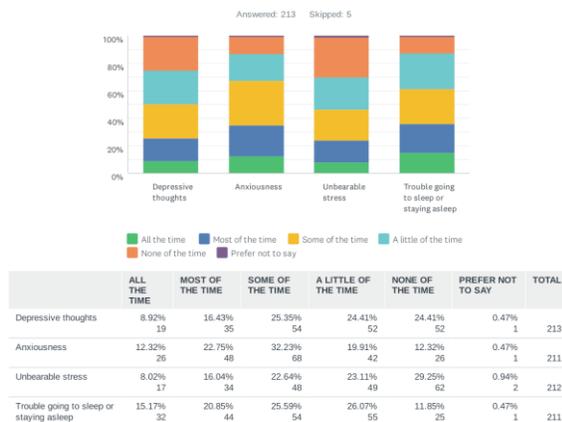


Figure 2 – Experiences in 2021

Figure 2 shows that anxiety and trouble going to sleep or staying asleep was more of an issue to people compared to having depressive thoughts or unbearable stress.

Furthermore, 45% (N=95) of the participants thought that COVID19 has very likely affected their mental health, 33% (N=69) thought that COVID19 has likely affected their mental health, 10% (N=21) thought that COVID19 has neither likely nor unlikely affected their mental health, 9% (N=18) thought that COVID19 has unlikely affected their mental health, 4% (N=8) thought that COVID19 has very unlikely affected their mental health.

Inferential Statistics

Two inferential statistical tests were used, the chi-square test and the Wilcoxon Signed-Ranked test. Table 1 provides a summary of the results.

All ‘prefer not to answer’ responses and skips were removed before analyzing because they were treated as non-responses that did not want to participate in answering the question. When comparing data sets that had gender, responses to ‘other’ were removed because there were only 5 out of 218 responses to that category therefore no significant conclusion could be made. When comparing data sets that had location, the comparison was between respondents residing in British Columbia to the respondents residing in the rest of Canada. This was due to a low number of respondents from other provinces and

territories other than Ontario. When comparing data sets that had age, the two ‘under 15’ responses were removed and the categories age 35-54 and age 55+ were grouped together

forming the category age 35+. This was done to have more evenly distributed responses and a greater number of responses in the age category 35+, which increased the power of the test.

Table 1: Summary of Inferential Statistics

Ho and Ha	Test Used	Results	Interpretation
Ho1 (Ho \geq 0): There is no difference, or better perceived quality of mental health in early 2021 compared to 2019. Ha1 (Ha < 0): There is poorer perceived quality of mental health early 2021 compared to 2019.	Wilcoxon Signed-Ranked	P = 0.000	Reject Ho and conclude that there is statistically significant reduction of quality of perceived mental health in early 2021 compared to 2019.
Ho2 (Ho \leq 0): People are experiencing no difference, or less depressive thoughts in early 2021 compared to 2019. Ha2 (Ha > 0): People are experiencing more depressive thoughts in early 2021 compared to 2019.	Wilcoxon Signed-Ranked	P = 0.000	Reject Ho and conclude that there is statistically significant increase of people experiencing depressive thoughts in early 2021 compared to 2019.
Ho3 (Ho \leq 0): People are experiencing no difference, or less anxiousness in early 2021 compared to 2019. Ha3 (Ha > 0): People are experiencing more anxiousness in early 2021 compared to 2019.	Wilcoxon Signed-Ranked	P = 0.000	Reject Ho and conclude that there is statistically significant increase of people experiencing anxiousness in early 2021 compared to 2019.
Ho4 (Ho \leq 0): People are experiencing no difference, or less unbearable stress in early 2021 compared to 2019. Ha4 (Ha > 0): People are experiencing more unbearable stress in early 2021 compared to 2019.	Wilcoxon Signed-Ranked	P = 0.000	Reject Ho and conclude that there is statistically significant increase of people experiencing unbearable stress in early 2021 compared to 2019.
Ho5 (Ho \leq 0): People are experiencing no difference, or less trouble going to sleep or staying asleep in early 2021 compared to 2019. Ha5 (Ha > 0): People are experiencing more trouble going to sleep or staying asleep in early 2021 compared to 2019.	Wilcoxon Signed-Ranked	P = 0.000	Reject Ho and conclude that people are experiencing more trouble going to sleep or staying asleep in early 2021 compared to 2019.
Ho6: There is no association between gender and perceived impact of COVID19 on a person’s mental health. Ha6: There is an association between gender and perceived impact of COVID19 on a person’s mental health.	Chi Square Test	P = 0.0225	Reject Ho and conclude that there is a statistically significant association between gender and perceived impact of COVID19 on a person’s mental health. Females perceive more impact from COVID19 on their mental health.
Ho7: There is no association between gender and perceived quality of mental health in early 2021. Ha6: There is an association between gender and perceived quality of mental health in early 2021.	Chi Square Test	P = 0.0205	Reject Ho and conclude that there is a statistically significant association between gender and perceived quality of mental health in early 2021. Males report better perceived quality of mental health in early 2021 compared to females.
Ho8: There is no association between location of residence in Canada and perceived quality of mental health in early 2021.	Chi Square Test	P = 0.1929	Accept Ho and conclude that there is no statistically significant association between location of residence in

Ha8: There is an association between location of residence in Canada and perceived quality of mental health in early 2021.			Canada and the perceived quality of mental health in early 2021.
Ho9: There is no association between location of residence in Canada and perceived impact of COVID19 on a person's mental health. Ha9: There is an association between location of residence in Canada and perceived impact of COVID19 on a person's mental health.	Chi Square Test	P = 0.3986	Accept Ho and conclude that there is no statistically significant association between location of residence in Canada and the perceived impact of COVID19 on a person's mental health.
Ho10: There is no association between age and perceived quality of mental health in early 2021. Ha10: There is an association between age and perceived quality of mental health in early 2021.	Chi Square Test	P = 0.0043	Reject Ho and conclude that there is a statistically significant association between age and perceived quality of mental health in early 2021. People who are 35 and older report having better perceived quality of mental health in early 2021 compared to people in the age group of 15-34 years old.
Ho11: There is no association between age and perceived impact of COVID19 on a person's mental health. Ha11: There is an association between age and perceived impact of COVID19 on a person's mental health.	Chi Square Test	P = 0.5977	Accept Ho and conclude that there is no statistically significant association between age and perceived impact of COVID19 on a person's mental health.

Discussion

Results from the survey and the resulting inferential statistics indicated that people were experiencing worse mental health in early 2021 compared to 2019. In general, people have increased depressive thoughts, anxiety, unbearable stress, and trouble going to sleep or staying asleep in early 2021 compared to 2019. 77.7% of the surveyed people indicated that COVID19 had very likely, or likely, affected their mental health. This finding is in line with the study done during the MERS outbreak in South Korea in 2015 (Jeong, et al., 2016) and the research review on how wars and conflicts impact mental health by Murthy & Lakshminarayana (2006). In those studies,

traumatic events like war and disease outbreaks also led to worsening of mental health.

Results also indicated that females perceived more impact from COVID19 on their mental health and worse mental health quality compared to males. The research reviewed by Murthy & Lakshminarayana (2006) also found that females were more affected than men mentally in different types of traumatic events. Findlay, Arim, & Kohen (2020) also found that women and younger adults were more likely to report worse mental health. Similarly, Bu, Steptoe, & Fancourt (2020) found that women and young people were more at risk for loneliness during the pandemic, which increases the risk of mental illness.

Similar to the findings by Findlay, Arim, & Kohen, this study also found that the age group 15-34 years of age perceived their mental health was worse in early 2021 compared to people who were 35 years and older. However, there was no association between age and, the perceived impact of COVID19 on a person's mental health. This indicates that people, in general, all perceive an impact from COVID19 on their mental health, but people ages 15-34 years of age are especially experiencing worse mental health. As the survey was conducted before the third wave, COVID19 was predominantly affecting the older population. However, with the third wave, COVID19 preferentially affected the younger population (Kirkey, 2021), which may lead to further worsening of their mental health.

Interestingly, the results show there was no association between the location of residence in Canada and quality of mental health or perceived impact of COVID19. Indicating that all Canadians are feeling similar effects of COVID19 regardless of where they reside. However, due to the relatively low number of respondents in provinces and territories other than British Columbia and Ontario, this result may be somewhat unstable, and one must consider the possibility of a beta error. Therefore, more respondents from varying provinces and territories are needed to have a better understanding of whether there is an association between the location of residence in

Canada and quality of mental health or perceived impact of COVID19.

As this survey was opened to everyone with few exclusions, the results are meant to give a well-rounded presentation of how people are mentally impacted by COVID19. As such, internal and external validity may have been compromised by the low number of responses from various provinces and territories other than British Columbia and Ontario and by not obtaining responses from those who do not access Reddit. The response rates for various ages and genders are relatively well-rounded and sufficient to draw valid conclusions.

Limitations

Given the response rate and demographics, the biggest limitation was the insufficient response from various provinces and territories other than British Columbia and Ontario. Posting on more subreddits or other media platforms targeting different locations would be able to help. Having a longer survey window for more recruitment opportunities would gather more responses. Since this research was conducted during the COVID19 pandemic, an online self-administered survey was the only feasible option, but having different modes of disseminating the survey would also help gather responses from different groups of people. Having a larger and more varied sample size would increase internal and, external validity.

Another limitation was that participants had to have access to a computer to use Reddit and to access the survey. There were also a few answers from contacts of contacts. Therefore, limitations in terms of external generalizability were that the results can only be generalized to people who use computers and, for the most part, only to those who use the platform Reddit.

Knowledge Translation

The results from this study can help policymakers understand the need for more resources and investment to be directed to mental health. As Scharf & Oinonem (2020) discussed in their article on how the current healthcare system is very physician-centric, this study further supports the need for specialized mental health programs to help people cope with the COVID19 pandemic and its sequela.

Understanding how people are impacted mentally during COVID19 can also help prepare for future pandemics or traumatic events. Just as people had been mentally impacted by MERS (Jeong, et al., 2016) and other traumatic events (Murthy & Lakshminarayana, 2006), COVID19 was not an exception. Therefore, policymakers should not only invest resources on resolving the situation surrounding COVID19 but also build a long-lasting mental health framework that can be used to help future traumatic events.

Future Research

Future research recommendations:

- Similar study but with a wider location target, capturing more people from different places of residence.
- Similar study but comparing following years, 2022 and beyond, to previous years, 2019 or 2021. To compare further mental health trends of the population.
- Similar study but also asking people's perception or opinion on the adequacy of the current healthcare system regarding mental health.

Conclusion

The SARS-CoV-2, also known as COVID19, caused a worldwide pandemic affecting many people, their livelihoods, and their mental health. According to the results from this study, people, in general, were experiencing worse mental health regardless of where they were located. Younger people and females were more affected than the older population and males. Given these results, policymakers should allocate more resources to mental healthcare to help ensure that the next health crisis is not a mental health one.

Acknowledgements

The lead author would like to thank Helen Heacock for her continued support and guidance throughout this research. The lead author would also like to thank everyone who took time in participating in the survey.

Competing Interest

The authors declare that they have no competing interests.

References

- Aston, J., Vipond, O., Virgin, K., & Youssef, O. (2020, July 24). *CanadaRetail e-commerce and COVID-19: How online shopping opened doors while many were closing*. Retrieved from Statistics Canada: <https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00064-eng.htm>
- Baumeister, R. F., & Leary, M. R. (1995). The Need to Belong: Desire for Interpersonal Attachments as a Fundamental Human Motivation. *Psychological Bulletin*, 497-529.
- Bu, F., Steptoe, A., & Fancourt, D. (2020). Loneliness during a strict lockdown: Trajectories and predictors during the COVID-19 pandemic in 38,217 United Kingdom adults. *Social Science & Medicine*.
- Cai, H., Tu, B., Ma, J., Chen, L., Jiang, Y., & Zhuang, Q. (2020). Psychological Impact and Coping Strategies of Frontline Medical Staff in Hunan Between January and March 2020 During the Outbreak of Coronavirus Disease 2019 (COVID-19) in Hubei, China. *Medical Science Monitor*.
- CDC. (2019, March 20). *1918 Pandemic (H1N1 virus)*. Retrieved from Centers for Disease Control and Prevention: <https://www.cdc.gov/flu/pandemic-resources/1918-pandemic-h1n1.html>
- Chan, A., Heacock, H. (2021). Impact on Canadian's Mental Health due to COVID19. *BCIT Environmental Health Journal*
- Chow, P. I., Fua, K., Huang, Y., Bonelli, W., Xiong, H., Barnes, L. E., & Teachman, B. A. (2017). Using Mobile Sensing to Test Clinical Models of Depression, Social Anxiety, State Affect, and Social Isolation Among College Students. *Journal of Medical Internet Research*, 1-12.
- Eitizaz, S. (Host). (2021, March 26). Canada's vaccine rollout vs. the world's, and whether vaccinating Canadians by summer is a long shot [Audio podcast episode]. In *This Matters*. Toronto Star. <https://www.thestar.com/podcasts/thismatters/2021/03/26/canadas-vaccine-rollout-vs-the-world-and-if-summer-vaccination-is-a-long-shot.html?rf>
- Findlay, L. C., Arim, R., & Kohen, D. (2020, June 24). *Understanding the perceived mental health of Canadians during the COVID-19 pandemic*. Retrieved from Statistics Canada: <https://www150.statcan.gc.ca/n1/pub/82-003-x/2020004/article/00003-eng.htm>
- Galea, S., M.Merchant, R., & Lurie, N. (2020). The Mental Health Consequences of COVID-19 and Physical Distancing: The Need for Prevention and Early Intervention. *JAMA Internal Medicine*, 817-818.
- Gardner, A. (2020, April 15). *Coronavirus: Every Artist Offering Free Online Concerts While You're Stuck at Home*. Retrieved from Glamour: <https://www.glamour.com/story/coronavirus-all-the-artists-offering-free-online-concerts-while-youre-stuck-at-home>
- Giallonardo, V., Sampogna, G., Del Vecchio, V., Luciano, M., Albert, U., Carmassi, C., . . . Tortorella, A. (2020). The impact of quarantine and physical distancing following covid-19 on mental health: Study protocol of a multicentric italian population trial. *Frontiers in Psychiatry*.
- HealthLinkBC. (2019, Dec 16). *Common Coping Responses for Stress*. Retrieved

- from HealthLinkBC:
<https://www.healthlinkbc.ca/health-topics/ta5463>
- Jeong, H., Yim, H. W., Song, Y.-J., Ki, M., Min, J.-A., Cho, J., & Chae, J.-H. (2016). Mental health status of people isolated due to Middle East Respiratory Syndrome. *Epidemiology and health*, 1-7.
- Kirkey, S. (2021, April 30). *COVID's third wave is younger and sicker. Here's everything we know about why*. Retrieved from National Post:
<https://nationalpost.com/news/canada/covid-third-wave-is-younger-and-sicker-heres-everything-we-know-about-why>
- Marroquína, B., Vineb, V., & Morgan, R. (2020). Mental health during the COVID-19 pandemic: Effects of stay-at-home policies, social distancing behavior, and social resources. *Psychiatry Research*, 293.
- MHCC. (2013). *Making the Case for Investing in Mental Health in Canada*. Retrieved from Mental Health Commission of Canada:
https://www.mentalhealthcommission.ca/sites/default/files/2016-06/Investing_in_Mental_Health_FINAL_Version_ENG.pdf
- MHCC. (2017, March). *Strengthening the Case for Investing in Canada's Mental Health System: Economic Considerations*. Retrieved from Mental Health Commission of Canada:
https://www.mentalhealthcommission.ca/sites/default/files/2017-03/case_for_investment_eng.pdf
- Murthy, R. S., & Lakshminarayana, R. (2006). Mental health consequences of war: a brief review of research findings. *World Psychiatry*, 25-30.
- NCSS 2021 Statistical Software (2021). NCSS, LLC. Kaysville, Utah, USA, [ncss.com/software/ncss](https://www.ncss.com/software/ncss).
- Sacco, D. F., & Ismail, M. M. (2014). Social belongingness satisfaction as a function of interaction medium: Face-to-face interactions facilitate greater social belonging and interaction enjoyment compared to instant messaging. *Computers in Human Behavior*, 359-364.
- Scharf, D., & Oinonen, K. (2020). Ontario's response to COVID-19 shows that mental health providers must be integrated into provincial public health insurance systems. *Canadian Journal of Public Health*, 473-376.
- Son, C., Hegde, S., Smith, A., Wang, X., & Sasangohar, F. (2020). Effects of COVID-19 on College Students' Mental Health in the United States: Interview Survey Study. *Journal of Medical Internet Research*.
- Spoorthy, M. S., Pratapa, S. K., & Mahant, S. (2020). Mental health problems faced by healthcare workers due to the COVID-19 pandemic—A review. *Asian Journal of Psychiatry*.
- WHO. (2012). *Risks to Mental Health: An Overview of Vulnerabilities and Risk Factors*. Retrieved from World Health Organization:
https://www.who.int/mental_health/mhgap/risks_to_mental_health_EN_27_08_12.pdf
- WHO. (2020). *Mental Health*. Retrieved from World Health Organization:
https://www.who.int/mental_health/management/en/
- Worldometer. (2021, April 24). *COVID-19 Coronavirus Pandemic*. Retrieved from Worldometer:
<https://www.worldometers.info/coronavirus/>