**Abstract**

**Background**: The COVID-19 pandemic and subsequent lockdown measures have led to increasing mental health concerns in the general population.

**Objective**: We aimed to assess the short-term impact of the pandemic lockdown on mental health and emergency service use in the Kitchener-Waterloo region of Ontario.

**Methods**: We conducted an observational study using National Ambulatory Care Reporting System metadata from psychiatric assessments at three regional hospitals, mental health and substance related calls to Waterloo Regional Police, and calls to a central mental health crisis telephone line during pandemic lockdown, comparing these volumes with the same period in 2019.

**Results**: Between March 5 and September 5, 2020, there was a marked reduction in all categories of psychiatric emergency visits, when compared to the same period in 2019.

**Conclusions**:

Keywords: COVID-19, lockdown, pandemic, psychiatric emergency

**Introduction**

During the COVID-19 pandemic, the scope of community containment measures have been unprecedented in modern history and are colloquially referred to as “lockdowns” (Wilder-Smith 2020). Such measures are variably defined, but generally expand voluntary social distancing measures through business, school, and workplace closures, restrictions on movement and social gatherings, and imposition of legal penalties for violations. Lockdowns must often remain in place for a period of months to avoid a rebound in disease transmission among susceptible individuals when controls are lifted (Ferguson 2020). Quantitative evaluations of the effectiveness of such measures in attenuating pandemic peaks are rapidly emerging (Flaxman, 2020, Islam, 2020; Fong 2020; Petherick 2020).

Policy considerations, however, must balance these potential benefits against direct and indirect harms. In particular, lockdowns raise ethical questions when movement is restricted in liberal democratic societies (Fong 2020; Bensimon 2007; Kass 2001). Community lockdowns conflict with individual rights to movement and assembly, and may further isolate the marginalized, elderly, and those living alone. This may exacerbate loneliness and depression and contribute to mental health-related morbidity and mortality (Holt-Lunstad 2010; Brooks 2020). Mental health represents an urgent health concern, and suicide mortality represents the sixteenth most common cause of death in the Waterloo Region of Ontario, Canada (Deming 2019). The direct effects of lockdown can be expected to be exacerbated by the economic stresses of business closures, increasing unemployment, and recession (Reger, 2020). As a result, lockdowns make additional community support for anxiety, mental illness, suicidality, alcoholism, substance abuse, and domestic violence an ethical imperative (CDC 2004; Brooks 2020).

We might intuitively expect these consequences to be reflected in increased demand for and use of social and mental health services, but there has been limited formal research (Brooks 2020) and early reports have been conflicting. Counterintuitively, the pandemic has seen a generalized decrease in Emergency Department visits in the United States during pandemic peaks (Hartnett, 2020), and three international studies suggest substantially decreased mental health consultations (Pignon, 2020; Clerici, 2020; Capuzzi, 2020). On the other hand, European member states saw a 60% increase in emergency calls from women regarding intimate partner violence (Mahase, 2020). While Ontario and Durham region have seen an apparent 22% increase in domestic incidents and sexual assaults (Bradley, 2020), women’s shelters often remain quiet (Patel, 2020).

To better understand the short-term mental health and social impacts of public health mandated lockdowns, **primary objective** of this study was to determine the short-term effects of lockdown on emergency mental health service use including: mental health related emergency department (ED) visits, mental-health related calls to police services, and calls to a central crisis help line. We hypothesized that during lockdown, there would be a year-over-year increase in use of all selected mental health services.

**Methods**

**Study Design**

We used secondary analysis of population-level data to assess the volume of use of multiple mental health and social services during lockdown interventions in a single region in Ontario, Canada. The observation period was over a six-month period from the first confirmed case of COVID-19 on March 5, 2020 to September 5, 2020. The number of total visits were compared to the same period a year earlier in 2019.

**Population & Context**

Data were captured for the Waterloo-Wellington LHIN, which is a region in Southern Ontario consisting of Kitchener, Waterloo, and Cambridge, with a total census population of 523 894 (as of November 26, 2020, per Statistics Canada, available at <https://www12.statcan.gc.ca/census-recensement/2016/as-sa/fogs-spg/Facts-cma-eng.cfm?LANG=Eng&GK=CMA&GC=541&TOPIC=1>). The region is served by three hospitals: Grand River Hospital (GRH), St. Mary’s Hospital (SMH), and Cambridge Memorial Hospital (CMH). All residents of this region with a phone would have access to police services and crisis hotlines.

In the province of Ontario, a state of emergency was declared on March 17, 2020, which directed impacted the Waterloo-Wellington LHIN. The lockdown period included school and university closures, closure of non-essential businesses, and prohibition of non-essential public gatherings of over five people followed on April 5, 2020. Graduated re-opening began between May 4 and June 2, 2020, with recommendations on mask wearing, social distancing, and limits on large gatherings maintained.

**Measures of Mental Health Related ER Visits**.

Daily total emergency department visits were collected for GRH, SMH, and CMH between March 5 and September 5, 2020. Anonymous, retrospectively coded National Ambulatory Care Reporting System (NACRS) chart metadata for each of the three hospitals were obtained through Decision Support for selected mental health discharge diagnoses: substance related (excluding alcohol), alcohol intoxication, mood related (anxiety, PTSD, depression, bipolar), psychosis-related (psychosis, bizarre behaviour), situation related (situational disturbance, life crisis, concern for safety, domestic violence), self harm related, and completion of Form 1 indicating involuntary detention for psychiatric assessment. Patients from all sites were pooled and considered as a single population. The data were used to analyse the number of visits for each diagnosis over the study period.

**Mental Health Related Police Service Use.**

Waterloo Regional Police provided population-level data for the observations period and comparative period on police dispatches. They also provided Neighbourhood Policing semi-monthly reports and weekly COVID-19 Call Reports. All three sources of data were used to create the following categories: assault, domestic dispute, drug overdose, intoxication, and suicide attempts. The data were used to create XXX variables.

**Crisis-Line Use.**

Call volumes were obtained from Here 24/7, a call centre which serves as the single access point for mental health, addictions, and crisis in the Waterloo-Wellington region. Crisis-line call volumes for Waterloo-Wellington are tracked cumulatively. Data on call location presenting issues, and outgoing referral sources (i.e. emergency dispatch) were not available. The data were used to create XX variables.

**Covid Cases.**

Publicly available Waterloo Public Health data was used to track progression of the epidemic (as of January 19, 2021, per Region of Waterloo Public Health, available at [https://www.regionofwaterloo.ca/en/health-and-wellness/positive-cases-in-waterloo-region.aspx#](https://www.regionofwaterloo.ca/en/health-and-wellness/positive-cases-in-waterloo-region.aspx)).

**Data Analysis.**

Descriptive analyses of included variables were performed. Univariate analysis in order to detect statistically significant differences between periods?

Trends in number of visits over time are presented visually using line graphs....

Poisson regression? was used. Poisson or quasi-poisson regressions were used, depending on whether the model showed over-dispersion, meaning the Residual Deviance was greater than the degrees of freedom. Poisson models were chosen because of the time-series nature of the data and because the y-values were counts. Poisson distributions can handle observations that are not independent and count data, which can only be positive integers. Z-values are reported for poisson regressions and t-values are reported for quasi-poisson regressions. Statistical significance was established at p <0.05. We used R (version 4.02) to calculate all tabulations and statistics.

Institutional ethics approval was obtained from the Tri-cities Research Ethics Board (THREB), as well as approval from the Here 24/7 Ethics Committee and Waterloo Regional Police.

**Results**

A total of 69,877 ED visits occurred during the study period in 2020, and these included 8,674 visits related to mental health and substance use. There were 89,800 ED visits during the same period in 2019, and these included 11,045 visits related to mental health and substance abuse. Figure 1 shows the trend in Emergency Department total volumes in the weeks between March 5 and September 5, 2020, along with the number of COVID-19 cases. There was a decrease in Emergency Department volumes that mirrored the increase in COVID-19 cases and hospitalizations during the first wave of the epidemic. Poisson regression showed that ED visits were significantly different during the March 17 to May 4 lockdown period compared to the same period in 2019 (t=-30.29, p=6.33x10-51). Using a 7-day moving average, ED visits decreased by 49% from March 9 to April 4, 2020.

Figure 2 shows the trend in mental health diagnoses in the Emergency Department over the same period and mirrors the overall trend for ED visits. The volume of each of the mental health diagnoses were reduced during the lockdown period compared to the year before, however, only substance related, mood related, situational crisis, and self-harm related admissions were significantly reduced. Psychosis related admissions were not significantly reduced and alcohol related admissions were reduced at a level that approached significance (see chart).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **type** | **z.value** | **p-val(z)** | **t.value** | **p-val(t)** |
| Substance related | NA | NA | -3.0921751 | 0.00932457 |
| Alcohol related | NA | NA | -2.0624115 | 0.06150809 |
| Mood related | NA | NA | -8.8448687 | 1.33E-06 |
| Psychosis related | NA | NA | 1.12540121 | 0.28242464 |
| Situational crisis | -6.6184884 | 3.63E-11 | NA | NA |
| Self harm related | -2.3105893 | 0.02085555 | NA | NA |

The number of involuntary admissions (application of Form 1) were also significantly lower during lockdown compared to a year earlier (z=-10.59, p=3.28x10-26).

Figure 3 shows the trend in police responses over the same period, and the trend in calls to the crisis line. Suicide attempts were significantly decreased during the period of lockdown compared to a year before. Alcohol, assault, and domestic disputes were not significantly different during the period of lockdown compared to a year before (see chart).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **type** | **z.value** | **p-val(z)** | **t.value** | **p-val(t)** |
| Suicide | -6.0005932 | 1.97E-09 | NA | NA |
| Alcohol | NA | NA | -1.5651921 | 0.14351467 |
| Assault | NA | NA | -1.3216826 | 0.21091738 |
| Domestic Disputes | NA | NA | 1.22696306 | 0.24336501 |

Crisis calls were decreased during the initial period of lockdown compared to the same period in 2019 (t=-4.36, p=9.21x10-4). Weekly crisis calls increased by 43% from May 31 – June 6 to the July 12 – July 18 in 2020.

Chart

Description automatically generated

**Figure 1**. New COVID-19 cases, hospitalizations, and overall Emergency Department volumes over time in Kitchener-Waterloo. The shaded areas indicates the period of increasing restrictions (light red), lockdown (dark red), and diminishing restrictions (green).

Chart

Description automatically generated with low confidence

**Figure 2**. Year-over-year mental health diagnoses, by month, between 2017-2020 for A) involuntary, B) substance related, C) alcohol related, D) mood related, E) psychosis related, G) situational crisis, and F) self harm related. The shaded areas indicates the period of increasing restrictions (light red), lockdown (dark red), and diminishing restrictions (green).

Chart, histogram

Description automatically generated

**Figure 3**. Year over year changes in Waterloo Regional Police responses for A) suicide attempts, B) substance related, C) intoxication, D) assault, E) domestic dispute, and F) calls to the Here 24/7 crisis line. The shaded areas indicates the period of increasing restrictions (light red), lockdown (dark red), and diminishing restrictions (green).

**Discussion**

This study examined the association between the COVID-19 lockdown and short-term changes in emergency mental health and social services usage in a mid-sized Canadian city. We found the following. The finding of decreased use of mental health services in the midst of pandemic restrictions is somewhat unexpected, given the current focus on acutely deteriorating mental health in young people (Son, 2020), as well as fears of increased suicide rates (Czeisler, 2020). The strengths of this study include the use of numerous independent data sources and focus on objective outcomes. It is important to note that we cannot separate the effect of pandemic itself on mental health from the effect of lockdown interventions. As an observational study, although these findings can describe correlation but not infer causation, they will at least be hypothesis generating.

We can speculate that there may be several potential contributors to this decrease in demand for emergency services. First, the reduction in use of mental health services may be framed as a general reduction in hospital activities, although the concurrent reduction in police calls argues against this. Second, the reduction in social gatherings and other opportunities for drug and alcohol intoxication and mental health crises may have resulted in an actual reduction in the community burden of mental health morbidity. Third, screening points at healthcare facilities, migration to virtual and outpatient visits, and media portrayals of overwhelmed healthcare settings may foster a perception that mental health visits are less of a priority during the pandemic (Reger, 2020).

Related to this, there may be a fear of contamination (Capuzzi, 2020) that affects the likelihood of the public to seek help through in-person channels, whether these be emergency departments or police departments. In keeping with this, only 5% of students reporting increased stress and anxiety sought help through mental health counselling (Son, 2020). There may also be a change in the threshold for hospitalization, owing to physicians using their discretion to avoid inpatient treatment when possible. Both of the latter can be seen from the perspective of a decreased ability to access care. Finally, we can speculate that there may be decreased reporting of mental health and social crises through traditional sources (i.e. child abuse and domestic abuse from teachers, family physicians, and other sources in community).

Specific to the Kitchener-Waterloo region, we note the relatively low population density of the region, meaning that many have access to backyards, patios, and green space that may be unavailable to those living in larger and more urban cities. We also cannot dismiss the role of resilience during the shared experience of a common disaster. Stress reactions resulting in visits to the Emergency Department were relatively uncommon.

**Limitations and future directions**

This study is not without limitations. These include the inherent limitations of NACRS anonymous coded diagnostic data, which precluded detailed chart review and demographic analysis of age, gender, and ethnicity. We also lacked coroner’s data on completed suicides and deaths due to non-opioid overdoses. We cannot exclude that patients may have sought help from other sources outside the community, including outside crisis lines and virtual sources. Similarly, it is unclear whether these results are generalizable outside the context of the Kitchener-Waterloo urban region. Further studies are needed to determine how these effects will unfold as both the pandemic and lockdown restrictions continue in the Kitchener-Waterloo region and elsewhere.

**Conclusion**

This observational study provides preliminary data to quantify the potential mental health and social impacts of lockdowns. The results may inform public policy decisions regarding the scope and scale of such decisions in future pandemic responses and allow a more accurate assessment of measurable harms of lockdowns versus anticipated benefit.

**Acknowledgements**

Contacts from three hospitals and health records departments. Contacts at Waterloo Regional Police, EMS, and Here 24/7.

**References**

1. Fong MW, Gao H, Wong JY, Xiao J, Shiu EYC, Ryu S, et al. Nonpharmaceutical measures for pandemic influenza in nonhealthcare settings—social distancing measures. Emerg Infect Dis. 2020 May. <https://doi.org/10.3201/eid2605.190995>
2. Maharaj, S., Kleczkowski, A. Controlling epidemic spread by social distancing: Do it well or not at all. *BMC Public Health* **12,**679 (2012). <https://doi.org/10.1186/1471-2458-12-679>
3. Wilder-Smith, A, Freedman, DO, Isolation, quarantine, social distancing and community containment: pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak, Journal of Travel Medicine, 27 (2), March 2020, taaa020, <https://doi.org/10.1093/jtm/taaa020>
4. Bensimon, CM and Upshur, REG. Am J Public Health. 2007 April; 97(Suppl 1): S44–S48. doi: [10.2105/AJPH.2005.077305](https://dx.doi.org/10.2105%2FAJPH.2005.077305)
5. Kass, NE. An ethics framework for public health. Am J Public Health. 2001; 91: 1780.
6. Ferguson NM, Laydon D, Nedjati-Gilani G, Imai N, Ainslie K, Baguelin M, et al. 2020. Impact of non-pharmaceutical interventions (NPIs) to reduce COVID19 mortality and healthcare demand. <https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-NPI-modelling-16-03-2020.pdf>
7. Petherick, A, Hale, T, and Phillips, T. Variation in government responses to COVID-19. BSG Working Paper Series. 2020.
8. Islam, N, et al. 2020. Physical distancing interventions and incidence of coronavirus disease 2019: natural experiment in 149 countries. BMJ. 370:m2743. doi: 10.1136/bmj.m2743.
9. Holt-Lunstad, J, Smith TB, and Layton. 2010. Social relationships and mortality risk: a meta-analytic review. PLoS Medicine.
10. Deming, J. A community profile on suicide and self-harm in Waterloo Region. Waterloo Region Suicide Prevention Council Research Committee. 2019.
11. Interventions for Community Containment. 2004. Centres for Disease Control <https://www.cdc.gov/sars/guidance/d-quarantine/app1.html> accessed 14 February 2020.
12. Flaxman, S, Mishra, S, Gandy, A, et al. Estimating the number of infections and the impact of non-pharmaceutical interventions on COVID-19 in 11 European countries. Imperial College COVID-19 Response Team. 2020. <https://doi.org/10.25561/77731>
13. Brooks, SK, Webster, RK, Smith, LE, et al. 2020. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. The Lancet 395 (10227): 912-920.
14. Reger, MA, Stanley, IH, Joiner, TE. 2020. Suicide mortality and coronavirus disease 2019 – a perfect storm? JAMA Psychiatry 77(11): 1093-1094. Doi: 10.1001/jamapsychiatry.2020.1060.
15. Oxford COVID-19 Government Response Tracker, BBC Research.
16. Bradley, NL, DiPasquale, AM, Dillabough, K, and Schneider, PS. Health care practitioners’ responsibility to address intimate partner violence related to the COVID-19 pandemic. Canadian Medical Association Journal 2020 June 1;192:E609-10 doi: 10.1503/CMAJ.200634
17. Capuzzi, E, Di Brita, C, et al. 2020. Psychiatric emergency care during Coronavirus 2019 (COVID 19) pandemic lockdown: results from a Department of Mental Health and Addiction of northern Italy. Psychiatry Research 293: 113463. Doi: 10.1016/j.psychres.2020.113463.
18. Mahase, E. Covid-19: EU states report 60% rise in emergency calls about domestic violence. BMJ 369:m1872. Doi: 10/1136/bmj.m1872.
19. Patel, Raisa. Minister says COVID-19 is empowering domestic violence abusers as rates rise in parts of Canada. Retrieved from [https://www.cbc.ca/news/politics/domestic-violence -rates rising-due-to-covid19-1.5545851](https://www.cbc.ca/news/politics/domestic-violence%20-rates%20rising-due-to-covid19-1.5545851) on November 17, 2020.
20. Clerici, M, Durbano, et al. 2020. Psychiatric hospitalization rates in Italy before and during COVID-19: did they change? An analysis of register data. Irish Journal of Psychological Medicine 1-8. Doi: 10.1017/ipm.2020.29.
21. Pignon, B, Gourevitch, R, et al. Dramatic reduction of psychiatric emergency consultations during lockdown linked to COVID-19 in Paris and suburbs. Psychiatry and Clinical Neurosciences 74(10). Doi: 10.1111/pcn.13104.
22. Hartnett, KP, Kite-Powell, A, et al. Impact of the COVID-19 pandemic on Emergency Department Visits – United States, January 1, 2019 – May 30, 2020. US Department of Health and Human Services/Centers for Disease Control and Prevention Morbidity and Mortality Weekly Report June 12, 2020. 69(23).
23. Czeisler, ME, Lane, RI, Petrosky E, et al. Mental health, substance use, and suicidal ideation during the COVID-19 pandemic – United States, June 24-30, 2020. MMWR Morb Mortal Wkly Rep 2020; 69: 1049-1057. Doi: <http://dx.doi.org/10.15585/mmwr.mm6932a1>.
24. Son, C, Hegde, S, Smith, A, et al. Effects of COVID-19 on College Students’ Mental Health in the United States: Interview Survey Study. J Med Internet Res 2020; 22(9):e21279. Doi: 10.2196/21279.

**Appendix 1**: Public health interventions in the Kitchener-Waterloo region.

* Three-week closure of public schools (March 12)
* University closure and prohibition of gatherings over 250 people (March 13)
* Prohibition of public gatherings over 50 people (March 16)
* Self isolation for 14 days if travel outside Canada (March 16)
* Ontario announces declaration of state of emergency and closures of public gathering places, municipal facilities and seating in bars, cafes, and restaurants (March 17)
* Closure of all non-essential businesses and cultural institutions (March 24)
* Region of Waterloo declares state of emergency (March 25)
* Prohibition of non-essential public gatherings over 5 people (April 5)
* Re-opening of garden centres, landscaping, essential construction, automatic car washes, auto dealerships by appointment (May 4)
* All construction, all retail except indoor malls (with physical distancing), vehicle dealerships, media operations, scheduled surgeries and diagnostic imaging, in-person counselling, individual sports (except high contact and team sports), general maintenance, repair, and household services (May 19)
* Resumption of elective and non-essential care (May 26)
* Increased limit on social gatherings from 5 to 10 persons, places of worship opened with 30% building capacity, personal care, shopping malls, cultural and recreational activities (June 2, excluding Greater Toronto Area)