

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Changes in demand for emergency ambulances during a nationwide lockdown that resulted in elimination of COVID-19: an observational study from New Zealand.
AUTHORS	Dicker, Bridget; SWAIN, Andrew; Todd, Verity; Tunnage, Bronwyn; McConachy, Emma; Drake, Haydn; Brett, Michelle; Spearing, Dan; Howie, Graham John

VERSION 1 – REVIEW

REVIEWER	Frank Wong Department of Business Management, National Sun Yat-sen University, China
REVIEW RETURNED	26-Sep-2020

GENERAL COMMENTS	<p>1. For the data period, the authors should define three groups, 1) 23 March to 26 April in 2018, 2) 23 March to 26 April in 2019, and 3) 23 March to 26 April in 2020. I expect that period 1 and 2 had no difference. Period 3 was significantly different from periods 1 and 2. In the current research design, the author used five weeks' data to compare with one and a half years' data. The results could be affected by seasonality, change of policy within the period, etc. Moreover, the very large sample size probably resulted in a lot statistically significant but clinically insignificant results.</p> <p>2. In table 2, I also suggest the authors conduct post-hoc tests to find out precisely which sub-group had a significant difference. For example, the chi-square test only showed there was a significant difference in the factor of age between the pre-lockdown and lockdown period. Due to many age groups, it is difficult to say which age group had a significant difference between the two periods.</p> <p>3. You mentioned that you used the z-test. Where are the results?</p> <p>4. The figures are without title and clear labels.</p> <p>5. It would help if you could put more emphasis on the implication of the result</p> <p>6. You should also discuss the effect size of the statistical test.</p>
-------------------------	--

REVIEWER	Emily Andrew Ambulance Victoria, Australia
REVIEW RETURNED	28-Sep-2020

GENERAL COMMENTS	<p>Thank you to the authors for their efforts in compiling this manuscript. The study describes the influence of the COVID-19 lockdown in New Zealand on ambulance demand. I have only minor comments for the authors' consideration:</p> <p>1. Are some emergency phone calls in New Zealand referred to a secondary triage service? If so, presumably these cases are</p>
-------------------------	---

	<p>excluded from this study? So it is unknown whether low-acuity calls such as these also increased during lockdown?</p> <p>2. Methods: Is patient acuity defined by attending paramedics? Which categories are you defining as 'low acuity' (as used in abstract)?</p> <p>3. Methods: Please consider adjusting for seasonality & population growth in your comparisons of absolute ambulance demand between periods.</p> <p>4. Discussion – paragraph 3: Also, young adults were not going out at night / socialising.</p> <p>5. Supplementary Table 1: please consider removing the 3rd column.</p>
REVIEWER	Daniël J van Hoving Division of Emergency Medicine, Stellenbosch University, South Africa
REVIEW RETURNED	02-Nov-2020
GENERAL COMMENTS	<p>A well-written manuscript that clearly describe the effect of the national COVID-19 lockdown in New Zealand on the utilization of ambulance services.</p> <p>Two very minor things:</p> <p>1) I couldn't see the heading of the Figures. Maybe it was accidentally loss during the submission process. However, the figures and the description in the text was adequate to still understand them without the headings.</p> <p>2) It is noted that mental conditions (which includeing suicidal risk) increased significantly. It would have been nice to see a breakdown of the Mental Health conditions, since it would help one in future planning (e.g. increase in anxiety will be differently approached than delirium or dementia). Also of interest is that poisoning (including intentional poisoning) decreased. I assume that intentional poisoning is included under Poisoning and not under Mental Health as suicidal risk. A breakdown would again be appreciated, since increased suicidal attempts might be addressed in future lockdowns.</p>

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Reviewer Name: Frank Wong

Institution and Country: Department of Business Management, National Sun Yat-sen University, China

Please state any competing interests or state 'None declared': None declared

1. For the data period, the authors should define three groups, 1) 23 March to 26 April in 2018, 2) 23 March to 26 April in 2019, and 3) 23 March to 26 April in 2020. I expect that period 1 and 2 had no difference. Period 3 was significantly different from periods 1 and 2. In the current research design, the author used five weeks' data to compare with one and a half years' data. The results could be affected by seasonality, change of policy within the period, etc. Moreover, the very large sample size probably resulted in a lot statistically significant but clinically insignificant results.

We thank the reviewer for these insightful comments. Unfortunately, due to industrial action within the ambulance service, clinical data is unavailable for the period 23 March to 26 April 2019. Therefore, the suggested comparison would only be possible between two time periods, which would not be

informative as to the clinically insignificant variation at this time of year. Whilst we agree that the very large sample size of 1.5 years' data generates a lot of statistically significant but clinically insignificant results, we have updated our manuscript to only comment on the results that were greater than or equal to 1.5% difference and that were considered by the authorship team to be meaningful and/or clinically different.

2. In table 2, I also suggest the authors conduct post-hoc tests to find out precisely which sub-group had a significant difference. For example, the chi-square test only showed there was a significant difference in the factor of age between the pre-lockdown and lockdown period. Due to many age groups, it is difficult to say which age group had a significant difference between the two periods.
3. You mentioned that you used the z-test. Where are the results?

These results are now available as supplementary data (supplementary tables S4 to S6).

4. The figures are without title and clear labels.

This occurred due to the way in which the figures were uploaded to the online system. These have been reformatted and re-uploaded to now include the titles and labels as appropriate.

5. It would help if you could put more emphasis on the implication of the result

We feel the main finding of the study is the potential effect of lockdown strategies on the population's mental health. The conclusion has therefore been updated to emphasise the need to weigh up the implications of future lockdowns on a population's mental well-being.

"The lockdown was associated with an increase in ambulance attendances for Mental Health conditions and is of concern. In considering future lockdowns the potential implications on a population's mental well-being will need to be seriously considered against the benefits of elimination in community rates of virus transmission. "

6. You should also discuss the effect size of the statistical test.

The Cohen's *d* effect size has been calculated and is available in Supplementary data (supplementary data, tables S2 and S3). The effect size in all cases that had significant P-values was medium to large (>0.5). The following sentences have been added into the results section:

"For all the Clinical Impressions that exhibited statistically significant decreases, this correlated with effect sizes in the 'medium to large' range, by the Cohen's *d* test (supplementary data, table S2).

During the lockdown there was a significant increase with a large effect size in the mean weekly rate of attendance to patients with clinical presentations of Mental Health (figure 1 and supplementary data, table S2)."

Reviewer: 2

Reviewer Name: Emily Andrew

Institution and Country: Ambulance Victoria, Australia

Please state any competing interests or state 'None declared': None declared

Thank you to the authors for their efforts in compiling this manuscript. The study describes the influence of the COVID-19 lockdown in New Zealand on ambulance demand. I have only minor comments for the authors' consideration:

1. Are some emergency phone calls in New Zealand referred to a secondary triage service? If so, presumably these cases are excluded from this study? So it is unknown whether low-acuity calls such as these also increased during lockdown?

These calls have indeed been excluded from this study and this is also worthy of future investigation. We have added a sentence to the limitations to acknowledge that these calls have been excluded from the study.

"Emergency call centre data was not included within this study. We only looked at ambulance attendance to patients. As such, it is unknown if there were changes in the frequency and/or acuity of calls made to the emergency services during the lockdown period."

2. Methods: Is patient acuity defined by attending paramedics? Which categories are you defining as 'low acuity' (as used in abstract)?

Yes, that is correct. Patient acuity is defined by the attending paramedics. Patients who were Status 3 and Status 4 were considered low acuity.

This has been indicated in the abstract and the following statement has been included in the under Methods>Clinical presentation and disposition:

"Final patient acuity is defined by the attending paramedics utilising five assigned Status Codes (1-immediate threat to life, 2-potential threat to life, 3-unlikely threat to life, 4-no threat to life, 0-dead). Status 3 and Status 4 patients were considered low acuity."

3. Methods: Please consider adjusting for seasonality & population growth in your comparisons of absolute ambulance demand between periods.

We considered adjusting for seasonality and population growth as per your suggestion. However, we considered that rates of different Clinical Impressions may vary in accordance with season: for example, rates of Trauma may be increased in the summer months corresponding with holidays and increased road travel, conversely Respiratory Illness increases during the winter months. Given this we considered that wholesale adjustment based on overall ambulance utilisation could be nuanced and potentially incorrectly adjust some of these Clinical Impressions. As the objective of this research was to examine overall ambulance utilisation at a higher level, we have not performed these adjustments in the current study.

Similarly, with population growth, there is not necessarily a direct correlation with overall population growth and ambulance utilisation, as increases in the elderly population may have a greater impact on ambulance demand than increases within the younger population. To this end we have included the potential adjustment factors for overall utilisation as a supplementary table. However, we have not adjusted the data presented in this study. Future studies based on individual Clinical Impression groups will be conducted and adjusted accordingly. We have added the below paragraph to the limitations section:

"The data set has not been adjusted for seasonality or population growth. The broad Clinical Impressions and population ages analysed meant that any such adjustment could be nuanced: changes in different Clinical Impressions may differ by season, and changes in population growth in accordance with age may also impact ambulance utilisation differently (for example, older populations have a higher utilisation of the ambulance service). Future studies will focus on single Clinical Impressions and their sub-categories, and these will be adjusted based on seasonality and population growth accordingly. Potential factors to adjust for overall demand have been included within the supplementary data however the data-set (supplementary data, table S7.)"

4. Discussion – paragraph 3: Also, young adults were not going out at night / socialising.

Thank you for this suggestion, we have altered the discussion to include this suggestion:

"A reduction in ambulance attendance to young people may be attributable to a potential decrease in usual injuries, recreational or accidental, as they may have been less exposed to sport or risk. Young people were also less exposed to endemic community infections through the closure of schools, workplaces, bars and night clubs, and confinement within the home. Studies have demonstrated an increased frequency of illness in association with school attendance¹²⁻¹⁴. Any going out at night, gathering and socialising of young adults in the 16 to 25 age group was prevented during lockdown. Additionally, increased hygiene practices such as handwashing could be expected to reduce the frequency of community acquired illnesses^{15 16}."

5. Supplementary Table 1: please consider removing the 3rd column.

This has been removed.

Reviewer: 3

Reviewer Name; Daniël J van Hoving

Institution and Country: Division of Emergency Medicine, Stellenbosch University, South Africa
Please state any competing interests or state 'None declared': None declared

A well-written manuscript that clearly describe the effect of the national COVID-19 lockdown in New Zealand on the utilization of ambulance services.

Two very minor things:

1) I couldn't see the heading of the Figures. Maybe it was accidentally lost during the submission process. However, the figures and the description in the text was adequate to still understand them without the headings.

Apologies, this has been corrected it appears to have occurred during the upload process.

2) It is noted that mental conditions (which including suicidal risk) increased significantly. It would have been nice to see a breakdown of the Mental Health conditions, since it would help one in future planning (e.g. increase in anxiety will be differently approached than delirium or dementia). Also of interest is that poisoning (including intentional poisoning) decreased. I assume that intentional poisoning is included under Poisoning and not under Mental Health as suicidal risk. A breakdown would again be appreciated, since increased suicidal attempts might be addressed in future lockdowns.

This is a very good suggestion; our intention is to investigate mental health conditions in a distinct paper and this secondary analysis will break this down further by the individual clinical impression. You are correct in the assumption regarding intentional poisoning, this is not included within the mental health category but rather included under poisoning. Alcohol intoxication is also included within the poisoning category which may explain why this category decreased significantly during lockdown. I agree that this up-grouping of our Clinical Impressions is a limitation of this paper.

The following text has been added to the limitations section:

"In addition, the Poisoning category includes intentional poisoning and alcohol intoxication. This categorisation may remove some potential suicide risk or self-harm cases from the Mental Health group, and the reduction in alcohol consumption during lockdown may be obscuring smaller increases in other types of poisoning within this broad Clinical Impression."

VERSION 2 – REVIEW

REVIEWER	Emily Andrew Ambulance Victoria
REVIEW RETURNED	01-Dec-2020
GENERAL COMMENTS	Thank you to the authors for their amendments to the manuscript. I think Supplementary Table 7 could be removed, but other than that I have no further comments.
REVIEWER	Niël van Hoving Division of Emergency Medicine, Stellenbosch University, South Africa
REVIEW RETURNED	08-Dec-2020
GENERAL COMMENTS	All queries were adequately dealt with