PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Geographic Variation in Preventable Hospitalizations Across Canada: A Cross-sectional Study
AUTHORS	Wilk, Piotr; Ali, Shehzad; Anderson, Kelly; Clark, AF; Cooke, Martin; Frisbee, Stephanie; Gilliland, Jason; Haan, Michael; Harris, Stewart; Kiarasi, Soushyant; Maltby, Alana; Norozi, Kambiz; Petrella, Robert; Sarma, Sisira; Singh, Sarah; Stranges, Saverio; Thind, Amardeep

VERSION 1 – REVIEW

REVIEWER	Benjamin Rodwin Yale University School of Medicine, United States
REVIEW RETURNED	03-Feb-2020

GENERAL COMMENTS	• Spell out ACSC when first used in the abstract • In abstract results, would put the actual number of patients with ACSCs who were hospitalized, then note the statistical significance • The conclusion in the abstract seems to be that rural and remote areas are more likely to have higher rates of preventable hospitalization and this this can inform regional, provincial….etc. (not that knowledge on the magnitude and patter can inform decision makers…. this was known before the study was done and presumably that is why it was done). • Limitations should also include that ACSCs may sometimes require hospitalization (this is noted in the first paragraph of the intro that many, but not all, of these hospitalizations can be avoided) and that ACSCs do not capture all preventable hospitalizations. Would also note that you cannot account for differences in health behaviors related to low socioeconomic status. • Page 5 line 30: would say "between CDs" rather than "across CDs" which may be misinterpreted (similarly, would change on page 9 of results as well and in the discussion) • Please clarify the sentence on page 12, lines 25-32. It sounds like you are saying the hot and cold spots are related to primary care availability and that primary care availability is known to be a major driver of geographic variation in preventable hospitalizations?

REVIEWER	William B Weeks Microsoft, USA
REVIEW RETURNED	16-Feb-2020

GENERAL COMMENTS	This is a straightforward paper that examines ACSC hospitalization rates per capita for Canada, excluding Quebec. The authors use Moran's I to determine whether there is non-randomness in the geographic distribution of the outcome variable (there is) and they identify 'hot-spots' and one 'cold-spot' with very high and low ACSC admission rates, respectively.

| | I have three recommendations regarding the paper. First, the "hot-spot-cold-spot" analysis is not motivating. There is one cold-spot, and all of the hot-spots are seemingly in rural, hard to access areas. While the latter has policy implications, it's not clear to me that you need a second graphic that largely replicates the first. Perhaps add the cold-spot and hot-spot designations to the first graphic, in a different color, to call them out.

Second, and perhaps a bit more of a revision, but something that would make the paper much more interesting: instead of simply aggregating all the ACSC admission types, disaggregate them. Readers (and policymakers) will want to know WHICH ACSCs account for most admissions....While the authors note that, overall, COPD was the most common followed by CHF, was the distribution about equal? Did those 2 account 50% of all ACSCs? Was the distribution different in 'hot' and 'cold' areas? While the high-level number is interesting, it's not too actionable. Providing some level of detail on distribution of drivers over overall ACSCs would be more meaningful.

Finally, and again policy relevant, might the rates be associated with the per-capita availability of PCPs (as has been shown in most countries). Given the hot and cold spots, that (and per capita income) would be good bets on explanatory variables. Assuming those data are available (I think they are in the CITI dataset), the authors should use them to try to explain findings. |
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VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: Benjamin Rodwin
Institution and Country: Yale University School of Medicine, United States
Please state any competing interests or state 'None declared': None declared

• Spell out ACSC when first used in the abstract

  ➤ **Response**: Thank you, we have corrected this error in the abstract

• In abstract results, would put the actual number of patients with ACSCs who were hospitalized, then note the statistical significance

  ➤ **Response**: Thank you for this suggestion, we have included this number in the abstract

• The conclusion in the abstract seems to be that rural and remote areas are more likely to have higher rates of preventable hospitalization and this this can inform regional, provincial….etc. (not that knowledge on the magnitude and patter can inform decision makers…. this was known before the study was done and presumably that is why it was done).

  ➤ **Response**: Thank you for this comment, we have clarified this sentence in the abstract

• Limitations should also include that ACSCs may sometimes require hospitalization (this is noted in the first paragraph of the intro that many, but not all, of these hospitalizations can be avoided) and that ACSCs do not capture all preventable hospitalizations. Would also note that you cannot account for differences in health behaviors related to low socioeconomic status.

  ➤ **Response**: We appreciate these suggestions and have included them in the limitation and conclusion sections.

• Page 5 line 30: would say "between CDs" rather than "across CDs" which may be misinterpreted (similarly, would change on page 9 of results as well and in the discussion)

> **Response**: Thank you for this suggestion, we have adjusted the wording throughout.

• Please clarify the sentence on page 12, lines 25-32. It sounds like you are saying the hot and cold spots are related to primary care availability and that primary care availability is known to be a major driver of geographic variation in preventable hospitalizations?

> **Response**: Thank you for your feedback, we have revised this sentence to clarify our discussion.

Reviewer: 2
Reviewer Name: William B Weeks
Institution and Country: Microsoft, USA
Please state any competing interests or state 'None declared': None declared

This is a straightforward paper that examines ACSC hospitalization rates per capita for Canada, excluding Quebec. The authors use Moran's I to determine whether there is non-randomness in the geographic distribution of the outcome variable (there is) and they identify 'hot-spots' and one 'cold-spot' with very high and low ACSC admission rates, respectively.

I have three recommendations regarding the paper. First, the "hot-spot-cold-spot" analysis is not motivating. There is one cold-spot, and all of the hot-spots are seemingly in rural, hard to access areas. While the latter has policy implications, it's not clear to me that you need a second graphic that largely replicates the first. Perhaps add the cold-spot and hot-spot designations to the first graphic, in a different color, to call them out.

> **Response**: Thank you for your suggestion, we feel having two separate maps better depicts two different sets of results: 1) the Census Division-level observed rates of ACSC hospitalization across Canada, and 2) the locations of clusters of Census Divisions that have significantly higher levels of ACSC hospitalization and significantly lower levels of ACSC hospitalization. We also believe that displaying both sets of results on a single map would make it more challenging to assess differences in the distribution of these two sets of results.

Second, and perhaps a bit more of a revision, but something that would make the paper much more interesting: instead of simply aggregating all the ACSC admission types, disaggregate them. Readers (and policymakers) will want to know WHICH ACSCs account for most admissions....While the authors note that, overall, COPD was the most common followed by CHF, was the distribution about equal? Did those 2 account 50% of all ACSCs? Was the distribution different in 'hot' and 'cold' areas? While the high-level number is interesting, it's not too actionable. Providing some level of detail on distribution of drivers over overall ACSCs would be more meaningful.

> **Response**: Thank you for this recommendation. Unfortunately, we will not be able to assess geographic variation for specific conditions or distribution of these conditions in each cluster due to data constraints. The total number of ACSC-related hospitalization events observed in many Census Divisions is too small to produce stable estimates of rates at that level of geography. Moreover, the objective of this study was to focus on preventable hospitalizations, not on hospitalizations related to specific conditions. However, we provided overall distribution of ACSC-related hospitalization across the condition (lines 224-228).

Finally, and again policy relevant, might the rates be associated with the per-capita availability of PCPs (as has been shown in most countries). Given the hot and cold spots, that (and per capita income) would be good bets on explanatory variables. Assuming those data are available (I think they are in the CITI dataset), the authors should use them to try to explain findings.

➢ **Response**: Thank you for this suggestion, we agree it would be worth examining further. We intend on conducting another follow-up study that will include individual- and community-level (including availability of primary care) factors to determine which factors account for the geographic variation. The focus of this study, however was to quantify and explore the nature of geographic variation in preventable hospitalizations.

VERSION 2 – REVIEW

REVIEWER	Benjamin Rodwin Yale University School of Medicine, United States
REVIEW RETURNED	26-Mar-2020

GENERAL COMMENTS	It appears the authors have taken into account the suggested revisions. No further revisions recommended.

REVIEWER	William B Weeks Microsoft, USA
REVIEW RETURNED	27-Mar-2020

GENERAL COMMENTS	The authors addressed my initial concerns and comments and I have no further ones.