



17 May 2020

Professor Peter Baade and Dr Susanna Cramb

Dear Professor Peter Baade and Dr Susanna Cramb,

We recently received the document titled *ACE-19-31-R1-from-the-reviewers*, we thank you for the recommendations and changes made within this document.

Your feedback regarding our submission included a title change, please accept this resubmission with the new title "Mapping Cancer: the Potential of Cartograms and Alternative Map Displays", for inclusion in the Focused Issue on Spatial Patterns in Cancer Epidemiology in the Annals of Cancer Epidemiology.

This review paper presents an exploration of cancer mapping methods, focusing on variations on choropleths for online cancer atlases.

**Reviewer suggestion: Add a sentence about the study aims (in the abstract).**

We have included the following sentence in the abstract:

This study summarises current practices for cancer atlases and investigates the alternative map displays that could be used to accurately represent the distribution of cancer statistics across a population, as many cancer atlases lack appropriate displays for population statistics.

**Reviewer suggestion: Could we structure paper as: Introduction (also introduces cancer atlases) Measures mapped (info around Table 2) Visualisation approaches - Choropleth (mention advant and disadvant, along with figures from cancer atlases) - Cartograms - Tile maps - Geofacets - Multivariate maps Comparison & critique of alternative methods Additional considerations - Associated graphs - Displaying uncertainty measures - Interactivity Recommendations for mapping cancer Conclusion**

We have rearranged the sections from the "Introduction" to "Traditional approaches for cancer map displays" in this submission at the request of the reviewer. The discussion of choropleth maps considers the advantages and disadvantages now occurs in the same section.

The following reviewer suggestions relate to the introduction:

**Reviewer suggestion: Given the ethical and privacy considerations for small area data, it is not a straightforward process to obtain and report area-specific counts.**

We agree that it is not easy to obtain and report area-specific counts. The statement has been removed.

**Reviewer suggestion: Suggest moving paragraph to proposed choropleth maps section**

This paragraph has been moved the choropleth section under visualisation approaches.

**Reviewer suggestion: Can you include mention of how this is different to a thematic map?**

We have included in the choropleth section: Choropleth maps are a type of thematic map that show polygons for each of the groups of data points representing the geographic units, where each polygon is shaded with a color according to the area-specific values of the statistic being conveyed.

**Reviewer suggestion: Suggest also noting development of statistical methods and software** The paragraph that began the *Cancer Atlases* section has been moved to the introduction. This paragraph describes cancer atlases, and the developments of statistical methods and software.

**Reviewer suggestion: Give the actual reference for Cruikshank 1947**

This quote has been removed.

**Reviewer suggestion: Suggest including Australian Cancer Atlas** We have replaced the Bowel Cancer Australia Atlas with the Australian Cancer Atlas.

**Reviewer suggestion: This table might benefit from an additional column, which gives an example of a cancer map using this measure. Also, some of these measures can be calculated.**

Several suggestions were made regarding Table 2: Common measures for reporting cancer information. Additional columns have been included.

XXX

**Reviewer suggestion: This is the wrong reference.** The incorrect reference to the use of Statistical Areas at Level 2 for the Atlas of Cancer in Queensland has been corrected to reflect that the atlas used Statistical Local Areas.

**Reviewer suggestion:** The following paragraph was included at the suggestion of the reviewer:

As data becomes more sparse, either by increasing geographic resolution or stratifying by age/sex, obtaining reliable estimates becomes more difficult. Many atlases analyzing smaller areas use statistical modelling to produce estimates, although some continue to use simple calculations and suppress regions where estimates are unstable (e.g. (mention some)). XXX

**Reviewer suggestion: Are you referring to area-based characteristics?** This socioeconomic indicators mentioned refer to the characteristics of small areas presented in cancer atlases. The Australian cancer atlas allows filtering using socioeconomic indicators, but this statement has been removed as it is not common in other atlases.

**Reviewer suggestion: These are very different terms, so ideally should not have the same abbreviation.** The terms credible intervals and confidence intervals are no longer abbreviated to avoid dual use of the abbreviation.

**Reviewer suggestion: Which map?** The following sentence has been removed: The map focuses on displaying the statistic and lacks additional space to represent the uncertainty. As the Australian Cancer Atlas example presented in Figure 1 does include uncertainty using transparency.

**Reviewer suggestion: Can you clarify whether this recommendation holds when using a ratio measure – which has 1 as the average, and then diverging values higher and lower than the average (eg an SIR).** Diverging colour schemes have been suggested for this use by Cynthia Brewer, a reference has been included:

It is possible to allow for data to progress uniformly in both positive and negative directions from a mid point, such as the mean of the data. These diverging colour schemes pair two sequential schemes that use a common light colour at the mid point, each sequential scheme progresses to a dark hue at the extreme value in each direction XXX.

All minor comments were addressed in the process of substantial editing.

We thank you for your consideration of our changes.

Warm regards

A handwritten signature in black ink, appearing to be 'Ji' or similar, with a stylized, flowing script.