Reviewer's report

Title: Different radon thresholds and their associations with geographic risk characterization and lung cancer mortality trends in British Columbia, Canada

Version: 1 Date: 3 August 2015

Reviewer: Aaron Porter

Reviewer's report:

I found this to be a well-written manuscript based on a well-designed study. I was especially pleased by the extensive discussion of the results and limitations of the study. That being said, I feel that there are a couple points that require further justification or discussion before this manuscript is ready to be published.

Major Compulsory Revisions:

1. The authors use a balanced random forest to classify radon vulnerability. This method assumes independent and identically distributed observations. I feel it is important to justify the assumption that the observations are spatially independent given the independent variables if this method is to be used for classification.

2. In the section “Lung Cancer Mortality Trends”, it is not surprising to me that lowering the radon vulnerability resulted in decreased separation between the lung cancer trends between the high and low vulnerability locations, and this is telling of the issue at hand. If radon exposure presents a health risk at any concentration, then mitigating as much radon exposure as possible is ideal. However, this is, of course, not plausible. Therefore, I think it is important to explicitly frame the problem as a population-based classification problem and less as a problem of determining a guideline for acceptable radon exposure. I felt that lines 360-365 were worded a bit strongly given the results of the classification. I think the language should be one of providing additional information to the guidelines discussion, and not one of suggesting new guidelines.

Minor Essential Revisions:

1. Line 22 lists the radon concentration units as Bq/m^3, whereas the rest of the paper uses the convention BQ m^-3. This should be made consistent.

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: Yes, and I have assessed the statistics in my report.

Declaration of competing interests:
I declare that I have no competing interests