Reviewer's report

Title: Evaluation of different radon guideline values based on characterization of ecological risk and visualization of lung cancer mortality trends in British Columbia, Canada

Version: 2 Date: 16 September 2015

Reviewer: Tor Erik E Danielsen

Reviewer's report:

I thank the authors for thorough considerations concerning the points in my first report. In my opinion the manuscript has improved, but still I have some concerns about the output of this scientific work.

Let me give some examples:

To the points 1, 2, 7:

The authors claim that they visualize lung cancer mortality in several ways in the manuscript – also in the present title:

----"Visualization of lung cancer mortality trends in British Columbia"----

This is not necessarily an informative description of the content of the manuscript.

In the manuscript the authors seem to have proposed something more like a hazard model – with potential limitations regarding validity.

In the revised manuscript the authors have made some modification of the variables in the proposed model. The terms ecological risk or radon risk may have practical limitations regarding the criteria for accepted hazard and risk assessment.

The selection of references may still be limited.

The manuscript is based on an assumed consensus regarding the LNT model, reported in different ways by Darby, Krewski and others. Today there are additional scientific literature discussing the LNT model - the references 2-5 given by the authors are not necessarily central with regard to this.

These references cannot be considered an undisputed evidence for a scientific consensus regarding the LNT model. There is hardly any discussion on, or references to, updated literature on the LNT model in the present manuscript.

To exemplify the concern regarding these references:

In the studies published by Darby and Krewski et al, 7148 persons with lung cancer and 14 208 controls were enrolled. The exposure to radon in cases and
controls were estimated - some 25 years back in time with 5 years lag - in twelve countries. The estimated exposure ranges to radon - in both cases and controls - were wide both within countries and especially between countries. However, no difference in mean exposure between cases (lung cancer) and controls were found, 3.4 Bq m-3 to be exact - based on retrospective, crude estimates.

To what extent the 3.4 Bq m-3 difference is significant, is hardly discussed by Darby et al or Krewski et al. It is not likely that the degree of significance can be calculated with any method - epidemiological or others.

To extend the concerns regarding the present manuscript and the references the scientific work relies on, I would like to address the concern discussed in Science twenty years ago:

"One of the dangers of having all these fancy mathematical techniques is people will think they have been able to control for things that are inherently not controllable." a statement from biostatistician Norman Breslow of the University of Washington, Seattle (Epidemiology faces its limits, Science Vol. 269, No. 5221 (1995), pp.164-9).

So, please consider the validity and potential limitations of the scientific outcome once more and look at the possibility to extend the list of relevant references.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.