Population attributable risk associated with lung cancer induced by residential radon in Canada: Sensitivity to relative risk model and radon probability density function choices: In memory of Professor Jan M. Zielinski.

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Author:	Mo'tassem Al-Arydah

Abstract:

Indoor radon has been identified as the second leading cause of lung cancer after tobacco smoking. The Population Attributable Risk (PAR) estimates the proportion of lung cancer cases associated with indoor radon exposure. Different relative risk (RR) models have been used in the literature to calculate PAR. The aim of this study is to assess how sensitive PAR is to the relative risk model and radon probability distribution functions choices.

Using Canadian observed first floor radon data collected by Health Canada during the period October 2010 to March 2011, seven common PAR radon models used for North American miners and dwelling scenarios were applied. The death rates used for this study were from the period 2006-2009. Smoking data (Ever Smoking ES and Never Smoking NS) collected in 2009 was also used in this study. The original discrete radon data for Canada overall and for each of its provinces are estimated using log-normal and Gaussian kernel density estimator distributions. PAR was then calculated for Canada and its provinces using the empirical, log-normal, and Gaussian kernel estimates distributions. Finally, cancer death cases attributable to radon are reported for the constant relative risk model for the three distributions and the reduction in the cases when the action level 200Bq/m(3) is applied.

PAR for the Canadian data is sensitive to the model choice, and it varies with a range of 10% for ES and 32% for NS, respectively. There is little difference in results between miners' models and dwelling models. PAR values for ES females are greater than those for ES males, except in Saskatchewan, Northwest Territories, Nunavut, and Yukon. The male-female range overlaps. Gaussian kernel estimator produces PAR estimates similar to the commonly used log-normal distribution.

Many lung cancer cases could be prevented in Canada by reducing indoor radon. PAR is sensitive to the choice of RR model. Miners' models can be used for residential radon. Empirical, log-normal, and Gaussian kernel density estimation with support [0,8) can all be applied to radon data.

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