**Alleviating ecological bias in linking radon exposure to health outcomes**

**Background**

The relationship between indoor radon concentrations and acute childhood leukaemia is of high public health interest as many of the possible risk factors related to ionising radiation remain unknown. Associations between radon exposure and acute childhood leukaemia have been assessed in numerous ecological studies via standardized rates or regression coefficients stemming from Poisson-based generalized linear models (GLMs). There is one limiting factor in these studies: the high within-area variability of radon concentrations leading to ecological bias. Radon is a prime candidate for alleviating this bias using the within-area distribution as in many countries the indoor radon concentrations in high risk areas are monitored.

**Aims**

Development and validation of a methodology to alleviate ecological bias in ecologic studies concerning radon, using the aggregated individual risk.

**Methods**

Our method consists of calculating the aggregated individual risk in the geographical unit by explicit numerical integration of the product of the individual binomial risk and the exposure distribution in the unit. The relative risk can be estimated by maximizing the binomial likelihood using the aggregated individual risk. The aggregation makes it possible to account for ecological bias due to within-area variability. We use multiple scenarios for Monte Carlo simulations to compare our method with Poisson-based GLMs. The disease counts are generated from a binary risk model using individual exposure sampled from the measured radon distribution. The scenarios consist of a null model and several linear no threshold risk models, with increasing individual risk related to the exposure.

**Conclusions**

We use the actual within-area distribution of the radon exposure to alleviate ecological bias. Initial results show no difference for the null model but increasing bias in GLMs compared to our methodology with increasing individual risk.