ASSESSMENT OF INDOOR RADON CONCENTRATIONS WITH A RADON PREDICTION MODEL

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Background and Aims: Whether indoor radon exposure is associated with childhood cancer is unclear. Within the framework of a cohort study on residential radon and childhood cancer, we aimed to develop a prediction model to assess indoor radon concentrations in Switzerland.

Methods: Our study is based on 45,437 measurements from the Swiss radon database collected between 1994 and 2004 all over Switzerland. Thereof, 36,053 (80%) randomly selected measurements were used for model development and the remaining 9,015 measurements for an independent model validation. We fitted a multivariable log linear regression model and selected relevant predictors according to knowledge from the literature, on the adjusted R^2 and on the AIC criteria.
We evaluated the prediction model by calculating Spearman rank correlation between measured and predicted values. Additionally, we categorized the predicted values into three categories (50th, 50th-90th and 90th percentile) and compared with measured categories using weighted Kappa statistic.

Results: Most relevant predictors for indoor radon levels were tectonic units, soil texture and construction year of the building, followed by degree of urbanisation, floor of residency and housing type (p-values: <0.001).
Median predicted radon values was 70 Bq/m³ (interquartile range 59 – 79 Bq/m³) in the lowest exposure category, 122 Bq/m³ (104 – 145 Bq/m³) in the medium category, and 209 Bq/m³ (194 - 239 Bq/m³) in the highest category. Spearman correlation was 0.45 (95%-CI: 0.44; 0.45) for the development dataset and 0.44 (95%-CI: 0.42; 0.45) for the validation dataset. Kappa coefficients were 0.30 and 0.29 for the development and the validation dataset, respectively.

Conclusions: There is a substantial variability in residential radon levels. Validation of the prediction model in an independent dataset demonstrated that the model is robust. However, random exposure misclassification is unavoidable and has to be taken into account when interpreting the results from the future cohort study.