Estimation of Radiation Risk in the Presence of Classical and Berkson Errors in Exposure Doses

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We study the effect of measurement errors in exposure doses in a regression model with binary response. Recently it has been recognized that uncertainty in exposure dose is characterized by measurement errors of two types: (a) classical additive errors, and (b) Berkson multiplicative errors. In a simultion study based on data from radio-epidemiological research of thyroid cancer in Ukraine caused by Chornobyl accident, it is shown that ignoring measurement errors in doses leads to oversetimation of background prevalence and underestimation of excess relative risk. We propose several methods to reduce bias: (a) new Regression Calibration, (b) SIMEX (simulation-extrapolation) that takes into account errors of both types, and (c) novel Corrected Score method.

The results are joint with Prof. I.A. Likhtarev, Dr. S.V. Masiuk, Dr. L.N. Kovgan (Radiation Protection Institute of ATSc of Ukraine), and Dr. S.V. Shklyar (Taras Shevchenko National University of Kyiv).