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Statistical Methods in Radiation Epidemiology

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As a result of the 1986 Chornobyl accident, significant territory of Ukraine was under radioactive contamination and the inhabitants of that territory suffered from radioactive exposure. Even 5-6 years after the accident, an inflation of the incidence of thyroid cancer cases was observed for children and adolescents, who lived in the territories where the estimated thyroid exposure doses were quite high, see [1]. In fact, the growth of thyroid cancer prevalence for children and adolescents caused by internal irradiation from Chornobyl fallouts turned out to be the main (if not the unique) statistically reliable effect of the Chornobyl accident. Consequently this effect was of great interest for radiation epidemiologists all over the world, leading to a series of studies in Ukraine.

However, interpretation of the results for most of the radiation epidemiological studies was based on risk estimation methods which do not take into account the presence of significant uncertainties in doses. One of the consequences of the assumption about the absence of errors in doses can be that the risk estimates are biased and the dose-response curve is distorted. The reasons for risk estimates distortions are not only systematic, but also due to random errors in the dose estimates, see [2]. The aim of present work is the analysis of the methods of radiation risk estimation in models with measurement errors in exposure doses.

[1] Likhtarev, I. A., Sobolev, B. G., Kairo, I. A., Tronko, N. D., Bogdanova, T. I., Oleinic, V. A., Epshtein, E. V. and Beral, V., *Nature* **375**, (1995), p. 365–378.

[2] Kukush, A., Shklyar, S., Masiuk, S., Likhtarov, I., Kovgan, L., Carroll R. J. and Bouville, A., *The International Journal of Biostatistics*, **1,** (2011), Article 15.