A BAYESIAN METHOD FOR MIXTURE OF SHARED MEASUREMENT ERROR MODEL IN RELATION TO DISEASE RISK AND EXPOSURE TO RADIOACTIVE FALLOUT FROM NEVADA TEST SITE

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We discuss effects of dosimetry measurement error in study of disease risk and exposure at the Nevada Test Site. There exists huge measurement error in the calculated doses in the current dosimetry model. The measurement error comes from two major sources: error due to common uncertain parameters in the dosimetry model, the Berkson error; and individual specific classical error. The situation of mixed measurement error suggests a distribution for the unobserved intermediate latent variable between true and observed dose. Furthermore, part of the uncertainty is shared within participants from the same location and milk producer groups. Combination of shared measurement error along with the latent variable distribution makes it a complex dosimetry system that models the distribution of true dose.

We look at a Bayesian approach via the Monte Carlo Markov Chain method with Brute-Force Metropolis steps to eliminate the missing latent variables. In this paper, we allow unknown correlations of uncertainty and proportions of classical measurement error, all different in each group of participants. We then to estimate the risk of thyroid disease in relation to radioactive fallout from the empirical distribution obtained from the MCMC iterations, as well as features of shared uncertainty in the Utah Thyroid Cohort Study.