BETA VERSUS LOG-NORMAL MODELLING: IMPROVING RADON MAPPING TECHNIQUES

Patrick Murphy[1] and Catherine Organo[2]
[1]*School of Mathematical Sciences, University College Dublin, Ireland*
[2] *Radiological Protection Institute of Ireland, Dublin, Ireland*

The World Health Organisation estimates that between 6% and 15% of all lung cancer deaths per year are caused by exposure to indoor radon. Globally it is estimated that this equates to up to 170,000 cases per annum. Once a house has been established to have high radon concentrations, mitigation is relatively easy with consequent significant reductions in the risk of death due to lung cancer being eminently feasible. The challenge therefore is to establish with as much accuracy as possible which houses are at risk.

The statistical task involved in producing radon maps is to estimate the proportion of homes P_{RL} in a particular region which exceed the reference level of 200 Bqm^3 and consequently require remediation.

Early work in the UK established that radon levels could be modelled using a Log-Normal distribution. This paper will describe alternative modelling approaches using the Log-Normal, Gamma and Beta distributions to produce point estimates for P_{RL}. We will then report on the results of recent work that was conducted in collaboration with the RPII which investigates the effect of outliers on predictions of P_{RL}. We also provide for the first time accurate determinations of appropriate sample sizes to be used in surveys for the construction of radon maps.