広島統計談話会

Hiroshima Statistics Study Group

第 302 回談話会を下記のように開催致しますので
御参集下さいますようご案内申し上げます。
You are cordially invited to the 302nd meeting as scheduled below.

日　時：　2017 年 1 月 20 日（金）15:00 –
Date　：　January 20, 2017 (Fri) 15:00 –

場　所：　放射線影響研究所　講堂
Place　：　RERF Auditorium

演　者：　古川 恭治　(放射線影響研究所 統計部 副主任研究員)
Speaker　：　Kyoji Furukawa, Ph.D.
Associate Senior Scientist
Department of Statistics, RERF

演　題：　「許容曝露レベル評価のためのセミパラメトリック線量反応モデル」
Title　：　“A semiparametric dose-response model to assess an acceptable exposure level”

要　約：

Summary:

“How much exposure is acceptable?” is a question of great interest, however yet to be clarified in radiation risk assessment. While the acceptable exposure level is typically considered in context of whether a threshold dose (below which no dose effect is assumed) exists or not, threshold detection is far less straightforward than one would expect, often with substantial bias and/or reduced efficiency, complicatedly depending on both the (true but unknown) threshold location and how the risk increases after the threshold. Even when a threshold is significantly detected, the estimated threshold value may not provide a direct answer to the question about the acceptable exposure level due to the statistical uncertainty involved in the estimation, which however may not be accurately evaluated by the standard approach based on a single preferred model chosen among simple parametric dose-response models (e.g., of the linear non-threshold and linear threshold functions).

As an alternative approach, a Bayesian semiparametric model [1] is focused on. Having a dose-response function of connected piecewise linear form allowed for autocorrelation between adjacent line sections, this model can flexibly fit reasonably smooth dose-response curves and adequately handle the estimation uncertainty. A simulation study under various threshold hypotheses shows that, compared to the parametric approach, this model tends to yield relatively small type I and type II errors before and after the threshold, respectively. As an illustration, analysis of the Life Span Study cohort of Japanese atomic-bomb survivors is considered, where estimated risks are applied to projecting lifetime risks under some exposure scenarios. The low dose associated risk is likely small if any but the impact of mishandled risk uncertainty may not be small, especially, if the risk is projected on a large population of high background rate.

[1] Furukawa et al. A Bayesian semi-parametric model for radiation dose-response estimation. Risk Anal. 36(6):1211-23, 2016.