

Methodology 2

143

INFORMATIVE PRIORS: A SIMPLE APPROACH FOR UTILISING ANIMAL AND CELLULAR EVIDENCE IN OBSERVATIONAL RESEARCH VIA ORDER CONSTRAINED PRIORS

Ghassan Hamra,¹ David Richardson,¹ Richard MacLehose² ¹University of North Carolina, Chapel Hill, USA; ²University of Minnesota, Minneapolis, USA

10.1136/oemed-2011-100382.143

Objectives Informative priors can be a simple and useful tool for epidemiologists to handle sparse data problems in regression modeling. It is sometimes the case that previous research may indicate the direction of effect or magnitude of one exposure's effect relative to another but may not provide enough information to specify the distribution of a prior in absolute terms. When considering human carcinogens, for example, an important source of knowledge is derived from toxicological studies and experimental research. Incorporating this knowledge as a prior in regression analysis of epidemiologic data often is difficult since the findings cannot be considered exchangeable across species or from cellular level outcomes to mortality and morbidity.

Methods We present a method to help bridge the gap between animal and cellular studies and epidemiological research by specification of an order constrained prior via truncation, illustrating how external information from toxicological and experimental research regarding parameter associations may be usefully incorporated.

Results and conclusions Our approach is illustrated using data from studies of the relative biological effectiveness of β and γ radiation on the excess relative rate of leukemia. When the prior is non-informative, the estimated ERR/10 mSv due to β radiation for leukemia and leukemia excluding CLL are 0.141 (90% CI: -0.323 to 0.649) and -0.281 (90% CI: -1.136 to 0.548), respectively. When we truncate estimation of the ERR for β radiation based on γ radiation, the estimated ERR/10 mSv for leukemia and leukemia excluding CLL are 0.298 (90% CI: 0.027 to 0.702) and 0.344 (90% CI: 0.049 to 0.817), respectively.