

4 USING OCCUPATIONAL STUDIES TO ASSESS EXPOSURE-RESPONSE RELATIONS IN THE LOW EXPOSURE REGION

Jelle Vlaanderen, Hans Kromhout, Roel Vermeulen *Utrecht University, Utrecht, The Netherlands*

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Objectives The assessment of the effect of low level exposures on human health is a considerable challenge for risk assessment. This is mainly due to large uncertainty regarding the human dose-response relationship at low exposures. High quality occupational studies and biomarker data can play an important role in exposure-response analysis for the low-exposure region.

Methods We developed approaches to improve the contribution of occupational studies to exposure-response analysis for the low-exposure region by a) developing a method for the assessment of the shape of the exposure response curve with a flexible meta-regression, and b) exploring the effect on exposure-response relations of integrating predictive models of relevant biomarkers of exposure into the epidemiological analysis of occupational studies.

Results Application of the developed approaches on studies of benzene and leukaemia demonstrated that the flexible meta-regression allowed us to comprehensively evaluate the shape of the benzene-leukaemia exposure response relation in the low exposure region. Furthermore, substitution of biomarker levels for external estimates of benzene exposure reduced the heterogeneity between studies that provided risk estimates to the exposure-response analysis.

Conclusions Application of the developed approaches in risk assessment would likely improve the overall quality of risk assessment for occupational and environmental exposures. However, a strong focus on high quality quantitative exposure assessment in the design of occupational epidemiological studies, and availability of relevant biomarkers is essential for the successful implementation of our approaches.