

DEVELOPMENT OF A PROBABILISTIC MODEL FOR PESTICIDE EXPOSURE THROUGH SHEEP DIPPING

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Background and Aims: Whereas probabilistic exposure modelling has been used in environmental epidemiology, its use in occupational settings remains limited. Sheep dippers are exposed to pesticides when they treat sheep for ectoparasites. Previous exposure assessment models have depended on a deterministic approach incorporating only few determinants, considering other uncollected variables known to be factors of exposure process as random error only. This study aims to explore whether a probabilistic model can result in a more realistic estimation of exposure intensity in sheep dipping.

Methods: A conceptual exposure model was developed to estimate pesticide exposure intensity during sheep dipping. Distributions of exposure variables were based on previously published data where possible; determinants without prior information available were set at 1 ('no effect'). Monte Carlo simulations generated 10,000 samples of semi-quantitative exposure intensity scores of different dipping tasks (plunger, chucker and helper) in the same dipping session. The probabilistic conceptual exposure model was applied to four dippers participating in the Study of Health in Agricultural Work (SHAW) and the results were compared with the deterministic estimates obtained from SHAW.

Results: Deterministic exposure scores for a plunger, chucker and helper in a same session were 3.51, 2.40, and 1.17, respectively whereas probabilistic estimates showed a considerable overlap with the 1st and 3rd quartiles (Q1,Q3) being (3.3,6.5), (2.0,5.2), and (1.0,2.9) respectively. Deterministic scores of four SHAW farmers were 13.84, 6.89, 7.38, and 3.89 respectively. In contrast, the probabilistic estimates resulted in similar exposure distributions for farmers 2 (10.2,14.5) and 4 (10.4,15.4), but higher scores for farmer 1 (19.1,22.2) and farmer 3 (14.3,19.7).

Conclusions: This study indicates that probabilistic models may give more comprehensive estimations for occupational exposures than deterministic estimations. Probabilistic models could be a solution to bridge the gap between conceptual models and applicable ones which can be used in epidemiological studies.