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BAYESIAN CORRECTION FOR MEASUREMENT ERROR FOLLOWING GROUP-BASED EXPOSURE ASSESSMENT IN A CASE-REFERENT STUDY

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Objectives We applied Bayesian analysis to case-referent data on occupational noise exposure and death from ischaemic heart disease (IHD) and contrast analyses with and without correction for measurement error in group-level noise exposure estimates.

Methods A 1:1 matched case-referent study nested in an industrial cohort in England resulted in 117 matched sets; 7225 area noise measurements in dBA from 215 buildings were the basis of modeling building-specific average exposures during the decade of in service IHD death. An additive quasi-Berkson error model was assumed. Bayesian analysis was conducted under varying assumptions about magnitude of error (with SD of error (SDe) up to 10 dBA) and a prior strength of hypothesis (flat vs informative -- 98% range (1.00,1.02) -- prior on OR). All analyses ignored matching and were conducted without adjustment for confounders to estimate log(OR)/dBA in a logistic disease model.

Results Analysis not corrected for measurement error with flat prior yielded OR 0.99 (95% CrI 0.96–1.02). With flat prior on OR with measurement error correction, OR had 95% CrI 0.97–1.02; with informative prior on the association, the corresponding OR is 1.01, 95% CrI 1.00–1.02, same as prior. The posterior distribution of SDe had median 1.6 (95% CrI 1.2–2.0) dBA.

Conclusions Measurement error did not bias the uncorrected results. Conditional logistic regression with adjustment for confounders is congruent with Bayesian analysis (115 pairs, OR 0.98, 95% CI 0.94 to 1.02). Analysis provided insights into plausible magnitudes of measurement error in the study. Extension of this methodology to consider matching, confounders and retrospective nature of data is required.