

Publication

Back-extrapolated and year-specific NO2 land use regression models for Great Britain - do they yield different exposure assessment?

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Robust methods to estimate historic population air pollution exposures are important tools for epidemiological studies evaluating long-term health effects. We developed land use regression (LUR) models for NO2 exposure in Great Britain for 1991 and explored whether the choice of year-specific or backextrapolated LUR yields 1) similar LUR variables and model performance, and 2) similar national and regional address-level and small-area concentrations. We constructed two LUR models for 1991 using NO2 concentrations from the diffusion tube monitoring network, one using 75% of all available measurement sites (that over-represent industrial areas), and the other using 75% of a subset of sites proportionate to population by region to study the effects of monitoring site selection bias. We compared, using the remaining (hold-out) 25% of monitoring sites, the performance of the two 1991 models with back-extrapolation of a previously published 2009 model, developed using NO2 concentrations from automatic chemiluminescence monitoring sites and predictor variables from 2006/2007. The 2009 model was back-extrapolated to 1991 using the same predictors (1990 & 1995) used to develop 1991 models. The 1991 models included industrial land use variables, not present for 2009. The hold-out performance of 1991 models (mean-squared-error-based-R(2): 0.62-0.64) was up to 8% higher and $1\mu g/m(3)$ lower in root mean squared error than the back-extrapolated 2009 model, with best performance from the subset of sites representing population exposures. Year-specific and back-extrapolated exposures for residential addresses (n=1.338,399) and small areas (n=10.518) were very highly linearly correlated for Great Britain (r>0.83). This study suggests that year-specific model for 1991 and back-extrapolation of the 2009 LUR yield similar exposure assessment.

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