Façades, floors and maps - Influence of exposure measurement error on the association between transportation noise and myocardial infarction

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Author(s) Vienneau, Danielle; Héritier, Harris; Foraster, Maria; Eze, Ikenna C.; Schaffner, Emmanuel; Thiesse, Laurie; Rudzik, Franziska; Habermacher, Manuel; Köpfli, Micha; Pieren, Reto; Brink, Mark; Cajochen, Christian; Wunderli, Jean Marc; Probst-Hensch, Nicole; Röösli, Martin
Author(s) at UniBasel Vienneau, Danielle ; Héritier, Harris ; Foraster Pulido, Maria ; Eze, Ikenna ; Schaffner, Emmanuel ; Probst Hensch, Nicole ; Röösli, Martin ;
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Epidemiological research on transportation noise uses different exposure assessment strategies based on façade point estimates or regulatory noise maps. The degree of exposure measurement error and subsequent potentially biased risk estimates related to exposure definition is unclear. We aimed to evaluate associations between transportation noise exposure and myocardial infarction (MI) mortality considering: assumptions about residential floor, façade point selection (loudest, quietest, nearest), façade point vs. noise map estimates, and influence of averaging exposure at coarser spatial scales (e.g. in ecological health studies).; L; den; from the façade points were assigned to >4 million eligible adults in the Swiss National Cohort for the best match residential floor (reference), middle floor, and first floor. For selected floors, the loudest and quietest exposed façades per dwelling, plus the nearest façade point to the residential geocode, were extracted. Exposure was also assigned from 10/Œ/10/m noise maps, using ”buffers” from 50 to 500/m derived from the maps, and by aggregating the maps to larger areas. Associations between road traffic and railway noise and MI mortality were evaluated by multi-pollutant Cox regression models, adjusted for aircraft noise, NO; 2; and socio-demographic confounders, following individuals from 2000 to 2008. Bias was calculated to express differences compared to the reference.; Hazard ratios (HRs) for the best match residential floor were 1.05 (1.02-1.07) and 1.03 (1.01-1.05) per IQR (11.3 and 15.0/dB) for road traffic and railway noise, respectively. In most situations, comparing the alternative exposure definitions to this reference resulted in attenuated HRs. For example, assuming everyone resided on the middle or everyone on first floor introduced little bias (%Bias in excess risk: -1.9 to 4.4 road traffic and -4.4 to 10.7 railway noise). Using the noise grids generated a bias of approximately -26% for both sources. Averaging the maps at a coarser spatial scale led to bias from -19.4 to -105.1% for road traffic and 17.6 to -34.3% for railway noise and inflated the confidence intervals such that some HRs were no longer statistically significant.; Changes in spatial scale introduced more bias than changes in residential floor. Use of noise maps to represent residential exposure may underestimate noise-induced health effects, in particular for small-scale heterogeneously distributed road traffic noise in urban settings.
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