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Traffic noise exposure usefully assessed by END digital maps

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Contact:
Charlotta.eriksson@ki.se

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Digital noise maps developed under the EU's Environmental Noise Directive (END) are a useful way of assessing traffic noise exposure for local residents, according to a recent Swedish study. The END maps could also be used to standardise noise exposure information in noise and health research.

Environmental noise, from sources including road, rail and air traffic, not only causes annoyance and sleep disturbance, but may also increase risks of some health problems. Previous studies have linked long-term noise exposure to the release of stress hormones, high blood pressure and heart disease. Detrimental effects on concentration, memory and learning have also been found.

Digital noise maps have been produced by EU Member States as a requirement of the END[1] to show estimated levels of noise from road and railway traffic and industrial sources, and can reveal areas with high noise levels. When combined with population data, the maps can be used to estimate the number of people affected by disturbing levels of noise.

In the past, different methods to assess noise exposure have been used, which makes it difficult to compare their results. This study therefore investigated whether digital END maps can harmonise the assessment of traffic noise exposure in population health studies.

The researchers assessed noise annoyance among individuals in relation to their exposure to environmental noise estimated from END maps. The study was based on responses to the 2007 Swedish National Environmental Health Survey, which included questions on noise annoyance from road and rail traffic. This study focused on 2496 respondents to the survey, aged 18 to 80 years and living in three Swedish cities. Additional information on their type of housing and its orientation in relation to the environment, e.g. windows facing roads and railways, or gardens, was taken from the survey.

The researchers used two methods to estimate traffic noise exposure. Firstly, they assessed noise levels manually for each home by locating a respondent's address on the digital END maps of road and railway traffic. Secondly, an automated method was developed to search and select noise exposure from the noise maps. For each respondent, noise levels were assessed at the most exposed façade of the building and at the entrance of the building. In the manual assessment, noise levels were also estimated at the building façade by taking the additional information on apartment orientation into account. Noise levels were measured using L_{den}, (Day-Evening-Night noise level) which gives an average noise level over 24 hours in decibels.

When comparing the manual and automated methods, the average L_{den} exposure from road and railway traffic differed by 1 dB or less. Furthermore, for both methods, the proportion of people who reported being annoyed in the environmental health survey compared well with the proportion of people predicted to be disturbed by noisy road and rail traffic. However, the annoyance was higher than expected at noise levels below 50 dB, indicating a reduced precision of the END maps at the lower range of exposure.

Reported and predicted noise annoyance were closest when the apartment orientation was taken into account. This highlights the importance of accounting for the orientation of the dwelling when estimating residential noise exposure from traffic.

This study used Swedish END maps, which exceed the minimum standards set by the END Directive. The methodology might not be suitable for areas that do not have the detail of the Swedish END maps, but the methods could be applied to European cities of similar structure that have comparable END maps.

1.http://ec.europa.eu/environment/noise/directive.ht