

Supplementary road traffic noise metrics for practical management of awakenings by road traffic noise events

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ABSTRACT

The absence of unambiguous ways to measure, and count, events in road traffic noise signals - particularly as they would be heard indoors in bedrooms - is a major impediment to management of awakenings and sleep-stage changes. Awakenings are the acute effects of noise events on sleep. While the probability of additional awakenings is known to depend on $L_{AS,max}$ of individual traffic noise events, this is fine where there is control over stimuli in the laboratory. But this metric has never proved a feasible indicator in real-world road traffic noise management. Prediction of the maximum level of events from road traffic flow parameters is unreliable, and the metric is highly correlated with energy-based measures. A defining characteristic of a supplementary indicator is that it must be uncorrelated with conventional noise indicators. We have addressed this problem through a simulation study of time histories of sound levels for a population of exposure scenarios (500 unique traffic and distance simulation settings, simulating the equivalent of 30 independent hours of measurement for each scenario). An exhaustive set of alternative exceedance algorithms were utilized to detect and count noise events in these time histories. The conclusion is that NA50 and NA55, that detect the number of events exceeding 50 dB(A) and 55 dB(A) respectively, and a metric that detects the number of events exceeding L_{A50} by at least 10 dB(A), each have the potential for practical management of additional awakenings. They apply to events heard indoors with the windows of the dwelling open.

Keywords: Noise, Sleep disturbance, Noise events, Supplementary indicators