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# Effects of road traffic noise on health: from Burden of Disease to effectiveness of interventions

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**Abstract**

Road traffic noise is one of the most ubiquitous urban environmental pollutants. This paper brings together three related works – in which the author has been involved or is currently completing - that together illustrate essential input to good policy development for the management of the health consequences of this pollutant. These include a guidance document on burden of disease from environmental noise; an assessment of exposure, response, and exposure-response, to road traffic noise in a densely-populated Asian city; and a current systematic evidence review of the effectiveness, in health terms, of interventions to control environmental noise. These provide examples of the nature of the quantitative evidence available to promote noise management through policy interventions.


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*Keywords:noise; health outcome; exposure; exposure-response relationships; annoyance; sleep disturbance;DALY; risk assessment; environmental burden of disease; EBD; transport; road traffic; urbanization; mitigation.*

## 1. Introduction

Noise is a major environmental issue affecting large numbers of people [1], particularly in urban areas. To date, most assessments of the effects of environmental noise have been based on the annoyance it causes to humans, or the extent to which it disturbs various human activities. Its consideration at a policy level as a problem with specific

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health outcomes has been limited [2]. In recent years, evidence has accumulated regarding health effects of environmental noise. In order to inform future policy, and to develop management strategies and action plans for its control, national and local governments need to understand and consider this new evidence.

## 2. Burden of disease from environmental noise

Environmental health risk assessment can be based on the Environmental Burden of Disease (EBD) methodology using the metric Disability-Adjusted Life Years, or DALY [3]. The EBD combines the concepts of potential years of life lost due to premature death plus equivalent years of 'healthy' life lost by virtue of being in states of poor health or disability. Estimation of EBD for road traffic noise requires knowledge of the distribution of exposure to noise in the population, an exposure-response relationships for each health outcome of interest, and an estimate of a disability weight (DW) for each outcome.

Disability weights allow non-fatal health states and deaths to be measured under a common currency. Disability weights allow time lived in various health states to be valued and quantified. Weights that are commonly used for calculating disability adjusted life years (DALYs) are measured on a scale of 0 to 1 where 1 represents death and 0 represents ideal health. The values of disability weights for various disease states have been the subject of considerable discussion and work – including those for the health outcomes of environmental noise exposure. A detailed introduction to the calculation of EBD is available elsewhere [4].

An example of the use of EBD to compare various environmental health risk factors, including noise, averaged over six countries in Europe, is shown in Fig. 1 (The EBD for noise is significantly underestimated in this diagram as it is calculated on a limited range of health outcomes and sources: severe sleep disturbance only for road, rail and aircraft noise sources, and ischemic heart disease for road sources).

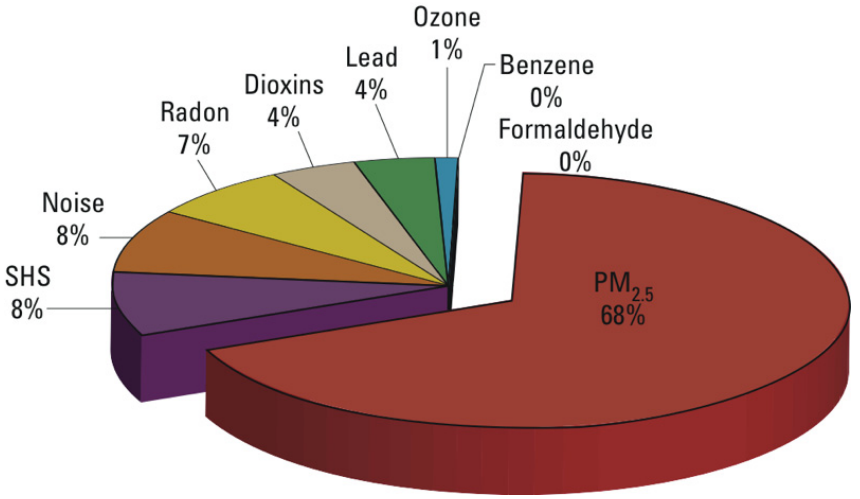


Fig. 1. (Reproduced fromHänninen et al., [5]) Relative contributions of nine targeted risk factors (SHS = secondhand smoke) to the estimated burden of disease attributed to these risk factors, averaged over the six participating countries.