



**WHO Environmental noise guidelines for the European  
Region - What is new?  
Guideline recommendations and supporting evidence - What  
is new?**

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## ABSTRACT

The Guidelines will include recommendations on transportation noise (air, road, rail), leisure noise and wind turbine noise, focusing on the exposure-response functions for the assessment of health impacts, and/or noise exposure levels above which there is an increased risk of adverse health effects. They will also include a recommendation of measures to be implemented by policy makers in order to reduce adverse effects of exposure to environmental noise in the population. General considerations and best practice statements that apply to the implementation of all specific recommendations will also be provided. WHO has adopted internationally recognized standards and methods for guideline development to ensure that guidelines are free from biases and meet public health needs. Building on the GRADE approach, a specific decision making framework has been developed to assess the quality of evidence of the relationship between source-specific environmental noise and health outcomes. The approach is also used to agree on factors influencing the recommendations, namely certainty about harms and benefits, values and preferences, as well as feasibility and resource implications. Based on these dimensions, the strength of the recommendation is set as either “strong” or “conditional”.

Keywords: Noise, Guidelines, Evidences. I-INCE Classification of Subjects Number(s): 84.1

## 1. GUIDELINES DEVELOPMENT

### 1.1 Scoping Questions

The following two main questions, which identify the issues to be addressed by the guideline recommendations, were developed by the Guideline Development Group (GDG), which is the group composed of leading experts and end-users responsible for the process of developing the evidence-based recommendations:

1. In the general population exposed to environmental noise, what is the exposure response relationship between exposure to environmental noise and the proportion of persons with a validated measure of health outcome adjusted for confounders?
2. Are interventions efficient in reducing health outcomes from environmental noise?

### 1.2 Evidence Review

First, one comprehensive search was conducted for already available systematic reviews and meta-analyses on environmental noise published after 2000. If there were no good quality systematic reviews available, a new search for original papers was conducted. In the second phase, a search for individual papers was conducted, including cohort studies, case-control studies and cross-sectional studies of persons exposed to environmental noise.

In making judgments about the quality of the evidence and the strength of recommendations we used the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) (5). GRADE allows the reviewer to systematically and transparently grade the quality of the body of evidence for each relevant health outcome and type of intervention. The quality of the evidence was assessed and scored based on eight criteria:

Factors decreasing quality of evidence

1. Study limitations
2. Inconsistency of results
3. Indirectness of evidence
4. Imprecision
5. Publication bias

Factors increasing quality of evidence

1. Large magnitude of effect
2. Plausible confounding, which would reduce a demonstrated effect
3. Dose-response gradient.

There were four categories of evidence quality based on the overall GRADE scores for each comparison: High; Moderate; Low; and Very Low. High quality of evidence means that further research is very unlikely to change our confidence in the estimate of effect. Moderate quality – further research is likely to have an important impact on our confidence in the estimate

of effect and may change the estimate. Low quality – further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate. Very low quality – any estimate of effect is uncertain.

To assess the quality of the evidence, GRADE assumes an initial quality rating for the entire body of evidence and then uses the five criteria above to downgrade the quality of the evidence and the three criteria to upgrade the quality. For randomised controlled trials (RCTs), GRADE assumes high quality of evidence and then downgrades this high quality with one or more levels if the criteria are not met, but does not consider upgrades since the evidence already starts at high quality. For observational studies, GRADE puts less confidence in these and rates them initially as low quality evidence. If one or more of the criteria are met, the quality rating of the evidence can then be downgraded or upgraded.

One problem with using GRADE for environmental health is the start of all observational studies as low quality evidence. For assessing a relation between an exposure and an adverse health effect, randomized trials among humans are most often not a possibility, for ethical reasons. When they are available, they contribute limited information, as they often involve low exposures for acute time periods and measure minimally adverse health outcomes, again for ethical reasons. In the absence of RCTs, observational evidence from humans represents the best available evidence for exposure to environmental risk factors. As a result, we proposed some specific adaptations to GRADE in order to develop recommendations for environmental noise. For assessing the relation between exposure to noise and adverse health outcomes, we propose to start the quality of evidence at high for the best possible study design for a particular health outcome. Other, less valid study designs would start at low.

The systematic reviews were commissioned by WHO to experts in the systematic review team. The GDG recommended several authors to conduct the evidence reviews and summary chapters, based on their expertise.

An external peer-review group has also been assembled. It is composed of technical experts and end-users as well as stakeholders, who are also geographically and gender-balanced. Technical content experts and end users are selected for their expertise in the subject of the guidelines. The group also includes representatives from professional groups and industry associations and who will be implementing the guidelines. Members are asked to review the material at different stages of the development process.

### 1.3 Setting Recommendations

The final recommendations are developed by the GDG, and are formulated for each source of noise. In order to determine the strength of the recommendations, the GDG has to agree on the quality of evidence and certainty about harms and benefits, values and preferences, feasibility and resource implications. These can be defined as follows:

The strength of the recommendation was set as either:

- a) ‘strong’: the guideline is based on the confidence that the desirable effects of adherence to the recommendation outweigh the undesirable consequences. The quality of the evidence combined with certainty about the values, preferences, benefits and feasibility inform this recommendation, which should be implemented in most circumstances; or
- b) ‘conditional’: there was less certainty about the combined quality of evidence, values and preferences of individuals and populations affected, benefits and feasibility of this recommendation meaning there may be circumstances or settings in which it will not apply.

The Guidelines will recommend exposure levels for different noise sources together with exposure response relationships between noise exposure and specific health effects. That will allow local environmental action plans and noise mapping to predict the health effects related to specific noise levels.

The exposure response relationships included in the guidelines may serve as a good basis for the assessment of noise abatement and mitigation actions on cost-effectiveness and cost-benefit principles.

## 2. CONCLUSIONS

In comparison with the previous environmental noise related international Guidelines, this document brings three crucial novelties: 1) New recommended exposure levels of environmental noise that are related to specific health outcomes; 2) The application of an adapted GRADE system in judging the quality of evidences and 3) Recommended interventions to mitigate the health effects of environmental noise.

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