Burden of Disease from Environmental Noise

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Quiet Please: The Future of EU Noise Policies
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Relationship between noise and health

Distal cause
- Land use planning and implementation
- Transportation vehicles design and use
- Road and railway design and use
- Building design and use
- Education and public awareness

Proximal cause
- Road traffic noise
- Railway and tram noise
- Aircraft noise
- Indoor and neighborhood noise
- Leisure noise

Physiological pathway
- Direct effect
  - Inner ear damage
  - Startle response
- Indirect effect
  - Distraction
  - Stress reaction
  - Sleep deprivation

Outcome
- Hearing impairment, tinnitus
- Annoyance, sleep disturbance
- Cognitive impairment
- Cardiovascular disease
- Unintentional injuries
WHO’s work on noise and health

- Briefing pamphlets for local authorities
- Evidence-based policy guidance with limit values
  - Guidelines for Community Noise (CNG)
  - Night Noise Guidelines for Europe (NNG)
- Evidence review and health impact assessment
  - Burden of disease from environmental noise
  - Aircraft noise and health
WHO and EC collaborations on noise

- DG SANCO supported WHO for NNG development
- Joint ventures between WHO and JRC:
  - Burden of diseases from environmental noise
  - Aircraft noise and health
  - Training of noise experts in the EU, accession countries and newly independent states
  - Standardization of methods to estimate burden of disease within the framework of CNOSSOS-EU
- Joint workplan of WHO, DG ENV, JRC, and EEA
Briefing pamphlets

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### WHO Guidelines for Community Noise

<table>
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<tr>
<th>Environment</th>
<th>Critical health effect</th>
<th>Recommended maximum sound level dB(A) $L_{eq}$</th>
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<tr>
<td>Outdoor living areas</td>
<td>Annoyance</td>
<td>50 - 55</td>
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<td>Indoor dwellings</td>
<td>Speech intelligibility</td>
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<td>Bedrooms</td>
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<td>School classrooms</td>
<td>Disturbance of communication</td>
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<td>Industrial, commercial and traffic areas</td>
<td>Hearing impairment</td>
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<td>Music through earphones</td>
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<td>Ceremonies and entertainment</td>
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<tr>
<td>Occupational environment</td>
<td>Hearing impairment</td>
<td>85</td>
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</tbody>
</table>
WHO Night Noise Guidelines for Europe

- No substantial biological effects up to 30 dB $L_{\text{night}}$
- Night Noise Guideline (NNGL) 40 dB $L_{\text{night}}$
- Interim Target (IT) 55 dB $L_{\text{night}}$
  - Public health concern due to increased risk of cardiovascular diseases
Burden of disease from environmental noise

Health outcomes considered

- Cardiovascular disease
- Cognitive impairment
- Sleep disturbance
- Tinnitus
- Annoyance
Method of calculating burden of disease

\[
IF = \frac{\sum (P_e_x \cdot R_R_x) - 1}{\sum (P_e_x \cdot R_R_x)}
\]

Exposure distribution in the population

Exposure-response relationship

Impact fraction

Disease burden attributable to risk factor

Attributable incidence, mortality, DALYs

Disease burden estimates per disease

Incidence, mortality, DALYs
DALYs (Disability-Adjusted Life Years)

The sum of years of life lost due to ill-health, disability or early death

\[ \text{DALYs} = \text{YLD} + \text{YLL} \]

Years Lived with Disability + Years of Life Lost

One DALY is equivalent to one year of healthy life lost.
Results

Every year in the EU cities, at least:

- 61 000 DALYs for ischaemic heart disease
- 45 000 DALYs for cognitive impairment
- 903 000 DALYs for sleep disturbance
- 22 000 DALYs for tinnitus
- 654 000 DALYs for annoyance

1~1.6 million healthy life years are lost every year from traffic noise in the EU cities.

Sleep disturbance and annoyance related to road traffic noise comprise the main burden.
Conclusion

- Noise pollution is a major environmental and public health burden, second only to the air pollution.
- Quantification of disease burden provides health arguments for further improvement of the EU Noise Policy.
- Existing WHO guidelines are useful for policy-makers, but:
  - *WHO Night Noise Guidelines (2009)* is only for night noise;
  - *WHO Guidelines for Community Noise (1999)* needs update;
  - No guidelines address new issues like wind turbine noise.
- Upcoming revisions of the EU directives on noise can provide opportunities to base the EU Noise Policy on updated limit values using harmonized noise indicators ($L_{den}$ and $L_{night}$).
- WHO will work with the EU and the Member States to develop suitable guidelines on noise following up the Parma Declaration.
For further information

The Parma Declaration on Environment and Health:

“We call upon all stakeholders to work together to reduce children’s exposure to noise, including that from personal electronic devices, recreation and traffic, especially in residential areas, at child care centres, kindergartens, schools and public recreational settings. We urge and offer our assistance to WHO to develop suitable guidelines on noise.”


WHO/Europe Noise and Health Programme
http://www.euro.who.int/en/what-we-do/health-topics/environmental-health/noise

Burden of disease from environmental noise
http://www.euro.who.int/__data/assets/pdf_file/0008/136466/e94888.pdf

Night noise guidelines for Europe
http://www.euro.who.int/noise

Guidelines for community noise
http://whqlibdoc.who.int/hq/1999/a68672.pdf

Thank you very much!