Road traffic noise and risk for cardiovascular disease and diabetes

Mette Sørensen, Senior Researcher
Danish Cancer Society Research Centre
Road traffic noise and heart attack

Wolfgang Babisch, Noise and Health, 2008

- Meta-analyses of 7 case-control and cohort studies on road traffic noise and heart attacks
- Nice dose-response relationship

Brussels, December 2012
Mechanisms

SOUND EXPOSURE

Direct and indirect disturbance

Stress indicators

Biological risk factors

Cardiovascular disease

- ↑ Blood pressure, blood viscosity, blood clotting factors
- ↑ Cardiac output
- Arteriosclerosis
- Hypertension
- Heart attack
- Stroke?

Indirect e.g. disturbances of sleep and communication

E.g. stress hormones

Brussels, December 2012
# Stroke and diabetes

## Stroke
- Blood clot or breaking of blood vessel in the brain
- Many risk factors in common with heart attacks
- Major risk factor is hypertension
- WHO: 15 million people suffer stroke each year

## Diabetes
- Stress and sleep disturbances has been associated with
  - Insulin resistance
  - High morning glucose
  - Appetite regulation
  - Type 2 diabetes
- WHO: at least 171 million people worldwide have diabetes

*Brussels, December 2012*
Hypotheses

Road traffic noise increases the risk for:
1. Stroke
2. Heart attacks
3. Diabetes
Diet, Cancer and Health cohort

- Enrolment in 1993-1997
- Aged 50-64 years at invitation
- Copenhagen and Aarhus
- 57,053 participated
- Questionnaire (diet, smoking, alcohol, education etc.)
- Weight and height measured

-> **Therefore**, in **all results** lifestyle habits such as smoking, BMI and dietary habits have been taken into account
Identification of cases

• Danish National Hospital Registry (1977):
  • registers ALL discharges from Danish hospitals
  • In total 1881 stroke cases and 1600 heart attacks

• The National Diabetes Registry (1995)
  • Registers all diabetes cases
  • In total 3869 cases
Noise exposure

SoundPLAN – the Nordic Prediction Method

• All addresses from 1988 – 2006 (≈ 62,000 addresses)
• Geographical coordinates for each address
• Height (floor) for each address
• Building polygons
• All road lines with > 1000 vehicles
  • Traffic composition
  • Yearly average daily traffic
  • Traffic speed
## Results, cardiovascular

<table>
<thead>
<tr>
<th>Road traffic noise $L_{den}$ per 10 dB</th>
<th>Stroke Cases</th>
<th>Stroke Adjusted IRR (95% CI)</th>
<th>Heart attack Cases</th>
<th>Heart attack Adjusted IRR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>1881</td>
<td>1.14 (1.03–1.25)</td>
<td>1600</td>
<td>1.12 (1.02-1.22)</td>
</tr>
<tr>
<td>Age at event</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 65 y</td>
<td>952</td>
<td>1.02 (0.91–1.14)*</td>
<td>871</td>
<td>1.06 (0.95-1.18)</td>
</tr>
<tr>
<td>≥ 65 y</td>
<td>929</td>
<td>1.27 (1.13–1.43)*</td>
<td>729</td>
<td>1.19 (1.06-1.34)</td>
</tr>
</tbody>
</table>

Adjusted for age, sex, BMI, lifestyle habits, socioeconomic factors, railway and airport noise, **air pollution**
Results, cardiovascular

Stroke

Heart attack
## Results, diabetes

<table>
<thead>
<tr>
<th>Road traffic noise $L_{den}$, per 10 dB</th>
<th>Diabetes Cases</th>
<th>Diabetes Adjusted IRR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All diabetes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise at diagnosis</td>
<td>3869</td>
<td>1.08 (1.02-1.14)</td>
</tr>
<tr>
<td>5-y noise average preceding diagnosis</td>
<td>3869</td>
<td>1.11 (1.05-1.18)</td>
</tr>
</tbody>
</table>

Adjusted for age, sex, BMI, waist circumference, lifestyle habits, socioeconomic factors, railway and airport noise, air pollution

*Brussels, December 2012*
Results, diabetes

Brussels, December 2012
Conclusions

• Exposure to residential road traffic noise was associated with a higher risk for stroke, heart attacks and diabetes

• For stroke the association was strongest among the oldest

• For stroke indications of threshold limit around 60 dB

• For heart attacks and diabetes no threshold limit
How many extra cases?

Calculations for Denmark

• 5.5 mill inhabitants

• Distribution of road traffic noise of all dwellings in Denmark (Danish EPA)

• In DK: 12 400 strokes/9 000 heart attacks/28 000 diabetes per year
  • 600 strokes each year due to road traffic noise (5 %)
  • 330 heart attacks each year due to road traffic noise (4 %)
  • 1 400 diagnosed with diabetes each year due to road traffic noise (5 %)

Brussels, December 2012