Noise Exposure and Serious Injury in British Columbia Sawmills

Rakel N. Kling, Hugh W. Davies, Hasanat Alamgir, & Paul A. Demers
University of British Columbia
AIHce, Philadelphia, June 6th, 2007
Presentation Outline

❖ Background
  • Noise exposure
  • Mechanism to injury
  • Study population and methods

❖ Overview of study findings
  • Cumulative exposure
  • Sub acute exposure

❖ Conclusions
Background

- Workplace noise exposure is one of the most prevalent workplace exposures.
- Noise induced hearing loss is the most common health outcome associated with exposure to noise.
  - Other health effects: cardiovascular effect, psychiatric symptoms, injury.
- Occupational noise increases the risk of both fatal accidents and non-fatal workplace injury.
Mechanism-Noise and Accidents

1. Noise in the surrounding environment

2. Hearing protection

3. Noise induced hearing loss
   - Masks auditory warning signals of risk
   - Interferes with perception of sounds

4. Stress response
Study objectives

To examine the temporal impact of noise exposure for chronically exposed versus sub-acutely exposed workers

- Assess the effect of cumulative noise exposure on serious workplace injuries
- To examine the effect of sub acute noise exposure on serious workplace injuries
Methods

Study Population

- **UBC Sawmill Study:**
  - 26,000 workers, employed for at least one year, in one of 14 British Columbia sawmills between 1950-1985 (updated to 1998)
  - Work histories and personal identifiers collected from the sawmills for each member of the cohort

- **Current study:**
  - Worked at least one day, April 1989-December 1998
  - 6512 cohort members then linked to administrative healthcare database
Methods

Study cases:

- Hospitalized by a work related injury, identified by:
  - E-code (E codes E800-E900 and ICD-9 codes 800-999) indicating work-relatedness
  - Indicated the Workers’ Compensation Board under the field ‘responsibility for payment’ [Alamgir, et al. 2006]

- 173 hospitalizations for work related injuries ➔ 163 final cases
Methods

Noise exposure collection:
- Full shift personal noise dosimetry
- Compliance measurements from the local regulatory agency
- Compliance measurements made by professional noise consultants
Analysis

1. **Cumulative exposure:**
   - average noise level that a worker is exposed to in each job
   - multiplying average exposure by the length of time a worker is in that job
   - Then adding the exposure to all the jobs a worker is assigned to

2. **Sub acute exposure:**
   - Different time periods before injury of high exposure levels were considered.
   - TIME above 85 dB(A), 90 dB(A) or 95 dB(A)
   - Exposure during previous jobs were not considered

   Poisson regression was used to examine the internal comparison of noise exposure with injury
Results

- **Descriptives:**
  - 5876 sawmill workers
  - 98% male,
  - 86% Caucasian, 13% Sikh, 1.5% of Chinese or other Asian descent

- **Cumulative noise exposure**
  - Range 87.6-161.5 dB(A)-years, average of 136.1 dB(A)-years

- **Employment**
  - Range 1-49 years, average=16 years
Cumulative Exposure: Association of noise exposure on serious injury

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Univariate</th>
<th>Multivariable*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise exposure (dB(A)-years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-120</td>
<td>28</td>
<td>1</td>
</tr>
<tr>
<td>121-125</td>
<td>38</td>
<td>0.91 (0.56, 1.5)</td>
</tr>
<tr>
<td>126-130</td>
<td>38</td>
<td>0.59 (0.36, 0.97)</td>
</tr>
<tr>
<td>131-135</td>
<td>31</td>
<td>0.48(0.29, 0.81)</td>
</tr>
<tr>
<td>136+</td>
<td>28</td>
<td>0.60(0.35,1.0)</td>
</tr>
<tr>
<td>Calendar year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>1990-1994</td>
<td>101</td>
<td>0.72(0.46, 1.1)</td>
</tr>
<tr>
<td>1995-1998</td>
<td>37</td>
<td>0.47(0.28,0.78)</td>
</tr>
</tbody>
</table>

*Adjusted for age, race, calendar year, time since first exposure
Sub acute Exposure: Duration of noise exposure above 85, 90 and 95 dB(A)

<table>
<thead>
<tr>
<th>Duration of exposure</th>
<th>85 dB(A)</th>
<th>90 dB(A)</th>
<th>95 dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cases</td>
<td>RR (95% CI)</td>
<td>Cases</td>
</tr>
<tr>
<td>0-1 days</td>
<td>13</td>
<td>1</td>
<td>80</td>
</tr>
<tr>
<td>1-90 days</td>
<td>15</td>
<td>1.58 (0.74, 3.3)</td>
<td>11</td>
</tr>
<tr>
<td>90-1 year</td>
<td>38</td>
<td>2.0 (1.1, 3.8)</td>
<td>24</td>
</tr>
<tr>
<td>1-2 years</td>
<td>30</td>
<td>1.8 (0.94, 3.5)</td>
<td>20</td>
</tr>
<tr>
<td>2-5 years</td>
<td>48</td>
<td>1.7 (0.90, 3.1)</td>
<td>26</td>
</tr>
<tr>
<td>5+ years</td>
<td>17</td>
<td>1.2 (0.58, 2.5)</td>
<td></td>
</tr>
</tbody>
</table>
Discussion

- There was a negative association of injury with increasing cumulative noise
  - Develop better methods of recognizing and communicating potential risks of injury

- The risk of injury due to noise exposure increases until a worker has been exposed between 90 days and 1 year
  - More vigilant about potential risks when entering a new job
Conclusions

- More investigation is needed on the specific risks that put workers exposed to lower levels of persistent noise so that injuries can be prevented.

- Newer workers are more at risk for injury due to exposure to noise than workers more experienced at their job
  - Continual training on safety measures may help prevent injuries in these workers.
Acknowledgements

❖ Sawmill workers

❖ Funding from:
  • School of Occupational and Environmental Hygiene, UBC
  • Canadian Institutes for Health Research
  • WorkSafeBC

Study website: http://www.cher.ubc.ca/UBCsawmillstudy/