Characteristics of occupational fatalities from inhalation injury in confined versus non-confined spaces-2003 to 2010

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Disclaimer

• This research was conducted with restricted access to Bureau of Labor Statistics (BLS) data. The views expressed here do not necessarily reflect the views of the BLS.

• No data or data that do not need BLS publication criteria will be presented.

• The authors have no known conflicts of interest to disclose.
Confined spaces

• Limited means of entry/exit
• Large enough for an employee to enter fully and perform assigned work
• Not intended for continuous occupancy
Toxicants in Confined Spaces

- Agent in manufacturing
- Product of manufacturing
- Storage
- Cleaning
Confined spaces

- Fatality rate: 0.07 per 100,000 workers
- Agriculture, manufacturing and construction
- Frequent events:
  - Caught or crushed in collapsing materials
  - Exposure to chemicals

Toxicant-related deaths

• 1.27% of all reported work-related deaths

• Identified toxicants:
  • Carbon monoxide- 35.8%
  • Hydrogen sulfide- 7.7%

Census of Fatal Occupational Injuries (CFOI)

- US Bureau of Labor Statistics
- Fatal work-related injuries
- Multiple data sources
  - Death certificate
  - News media
  - Coroner report
Confined Spaces
Study objective

Compare the characteristics of occupational fatalities from inhalation injury in confined versus non-confined spaces
Methods

- CFOI file data: 2003 to 2010
- Inhalation fatalities in confined space vs open or non-confined space
- Exclusion of cases
  - Unspecified location
  - Illicit drug use
Variables

- Worker characteristics
  - Demographics
  - Occupation
- Identified toxicant
Statistical analysis

- Descriptive analysis
- Chi-square test
Results

- 43,025 work-related deaths reported in this study period
- 510 inhalation-related deaths
  - 28 cases were excluded
- 482 cases remaining

Pie chart showing:
- Non-confined Spaces: 56%
- Confined Spaces: 44%
# Demographics

<table>
<thead>
<tr>
<th></th>
<th>Confined</th>
<th>Non-confined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (male)</td>
<td>159 (96.5%)</td>
<td>245 (90.4%)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>35-44</td>
<td>45-54</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>171 (81%)</td>
<td>217 (80.1%)</td>
</tr>
<tr>
<td>Black</td>
<td>20 (9.5%)</td>
<td>40 (14.8%)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>44 (20.9%)</td>
<td>37 (13.8%)</td>
</tr>
</tbody>
</table>
## Occupation

<table>
<thead>
<tr>
<th>OCCUPATION</th>
<th>CONFINED SPACE</th>
<th>NON-CONFINED SPACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>111 (43%)</td>
<td>145 (57%)</td>
</tr>
<tr>
<td>Transportation</td>
<td>36 (49%)</td>
<td>37 (51%)</td>
</tr>
<tr>
<td>Professional</td>
<td>31 (44%)</td>
<td>40 (56%)</td>
</tr>
<tr>
<td>Agriculture</td>
<td>22 (92%)</td>
<td>*</td>
</tr>
<tr>
<td>Protective Service &amp; Military</td>
<td>8 (36%)</td>
<td>14 (64%)</td>
</tr>
<tr>
<td>Service</td>
<td>*</td>
<td>33 (92%)</td>
</tr>
</tbody>
</table>

*No data or data that do not meet BLS publication criteria.

Fatal injury data were calculated by the Division of Medical Toxicology with restricted access to BLS CFOI microdata.
## Identified Toxicant

<table>
<thead>
<tr>
<th>TOXICANT</th>
<th>CONFINED SPACE</th>
<th>NON-CONFINED SPACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide</td>
<td>32 (19%)</td>
<td>134 (81%)</td>
</tr>
<tr>
<td>Halogens and halogen compounds</td>
<td>*</td>
<td>28 (90%)</td>
</tr>
<tr>
<td>Chemical products, including cleaning agents, paint and varnishes</td>
<td>9 (28%)</td>
<td>23 (72%)</td>
</tr>
<tr>
<td>Coal, natural gas, and petroleum</td>
<td>8 (57%)</td>
<td>6 (43%)</td>
</tr>
</tbody>
</table>

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Discussion

• Occupational inhalation exposures are important causes of death in both confined and non-confined spaces

• There was a relationship between confined or non-confined location and occupational group

• Carbon monoxide is the most common toxicological cause
  • Non-confined spaces > confined spaces
Limitations

● Potential for reporting bias
● Potential for misclassification bias
● External validity
Conclusions

• Inhalational exposures in non-confined spaces may be as dangerous as confined spaces

• Carbon monoxide is still responsible for a majority of workplace inhalation death

• Continued research to identify characteristics of inhalational fatal injuries in all spaces for prevention by workplace education and training
References


Questions?