Now Hear This...

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Noise, Hearing Impairment and Work-Related Trauma

A New Initiative in Michigan

Recently, researchers in the Department of Medicine at Michigan State University and the Department of Occupational and Environmental Health Sciences at Wayne State University received funding to institute an epidemiologic surveillance system for workplace fatalities. The program involves the identification of individuals who died at their jobs, selected on-site investigations and the development of strategies to prevent similar occurrences. An important part of this system will be to assess the role of noise and hearing impairment in these fatalities.

In 1998, 179 workplace fatalities occurred in Michigan. The majority of the victims (83%) were men, and 63% occurred among workers from 25 to 54 years of age. However, nine victims were less than 20 years old and 18 were older than 65 years of age.

Michigan data collected by the Michigan Department of Consumer and Industry Services for the year 1998 shows that transportation-related fatalities led all other fatal events, accounting for 30% of all deaths. Being struck by an object or being caught or compressed by equipment or collapsing material, which accounted for 20% of the deaths, were the second leading type of fatal events. Assaults and violent acts accounted for 18% of all fatal injuries at work. Falls made up 12% of the deaths, electrocutions made up 8%, fires and explosions accounted for 8% and exposure to chemicals was responsible for 4% of the fatalities.

The distribution of fatalities in Michigan differs from that in the nation as a whole and underscores the importance of state data in setting state priorities. Nationwide, transportation incidents account for 45% of the deaths while explosions and fire account for only 3%, and electrocutions only 5%.

Manufacturing and construction are the leading industries in Michigan where these deaths occur. Both industries have a high potential for excessive noise exposures. However, typical Michigan OSHA inspections of work-related fatalities do not examine the role of noise as an underlying contributor to the death; rather the enforcement inspections are geared to determining violations of MIOSHA programmatic standards.

An interdisciplinary team from Michigan State University and Wayne State University composed of an occupational medicine physician/epidemiologist, two industrial hygienists, a farm safety specialist, an epidemiologist, a communications expert, and a

professor of engineering have been brought together to carry out the fatality surveillance project.

Michigan has it's share of noisy work places, the extent of which has been at least partly documented through Project SENSOR NIHL surveillance data. Exposure to excessive noise at work not only affects an individual's social and communication skills, but also may increase the risk of injuries at work. The relationship of noise and hearing impairment to workplace traumatic injuries and fatalities has been suggested by a number of studies.

Literature Review: The Link Between Noise, Hearing Impairment and Injuries

Published studies implicate noise and hearing loss and a combination of the two as contributing factors in the occurrence of injuries and deaths at work. A nested case-control study of fatal work-related injuries among Brazilian steelworkers published by Baretto and colleagues in 1997 showed a significant trend of increasing risk with increasing exposure to noise. A job based score was used to adjust for the relative danger of different jobs in the steelmaking process. Further evidence of the contribution of noise to occupational injuries is presented in the Cordis Study, a 2-year study conducted in Israel and published in 1992 by Melamed and colleagues. The study indicated the frequency of injuries and illness-related absences increased with increasing noise levels for both men and women.

A 1997 study by Zwerling and colleagues, based on the results of a retrospective cohort study nested within the National Health Interview Survey reported the risk of occupational injuries is increased by hearing impairment. The authors found that, in workers aged 18 to 65 years, the highest risk of occupational injuries came from those with disabilities classified as sensory impairments. The odds ratio for blindness was 3.21, for deafness was 2.19, for hearing impairment was 1.55 and for visual impairment was 1.37.

The risk of noise and hearing loss together accounted for 43% of the injuries from 1986 to 1987 in a shipyard in the Netherlands, according to a 1990 case-control study published by Moll Van Charante and Mulder. Alcohol consumption, hearing loss greater than 20 decibels, and noise exposure greater than 82 decibels based on an 8-hour time-weighted average exposure were found to be safety hazards.

The scientific literature documents the relationship of noise, hearing impairment and injuries at work. However, more can be done to provide greater insights into these relationships in order to help prevent fatal as well as nonfatal injuries at work. The Michigan State University and Wayne State University team will work to understand the relationship to workplace fatalities and share information with stakeholders who would benefit from this knowledge.

References

Baretto SM, Swerdlow AJ, Smith PG and Higgins CD. A nested case-control study of fatal work related injuries among Brazilian steel workers. Occupational and Environmental Medicine 1997; 54:599-604.

Melamed S, Luz J and Green MS. Noise exposure, noise annoyance and their relation to psychological distress, accident and sickness absence among blue-collar workers - The Cordis Study. Israel Journal of Medical Sciences 1992; 28:629-635.

Moll Van Charante AW and Mulder PGH. Perceptual acuity and the risk of industrial accidents. American Journal of Epidemiology 1990; 131:652-663.

Zwerling C, Whitten PS, Davis CS and Sprince NL. Occupational injuries among workers with disabilities. Journal of the American Medical Association 1997; 278:2163-2166.

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Individuals who work in jobs besides those in construction and manufacturing may be exposed to high levels of noise at work. Table I shows noise levels in a few occupations that may not typically be thought to be associated with excessive noise exposures.

Table I. NOISE LEVELS REPORTED IN SELECTED OCCUPATIONS

OCCUPATION	*NOISE LEVELS (dBA)*	*REFERENCES*
Truck Drivers	78-89 dBA; Average 82.7-88.6 dBA	Van Den Heever DJ, Roets FJ. Noise Exposure of Truck Drivers: A Comparative Study. American Industrial Hygiene Association Journal 1996; 57:564-566. Seshagiri B. Occupational Noise Exposure of Operators of Heavy Trucks. American Industrial Hygiene Association Journal 1998; 59:205-213.
Firefighters	Average 77-105 dBA	Tubbs RL. Noise and Hearing Loss in Firefighters. Occupational Medicine: State of the Art Review 1995; 10:843-856.
Music Clubs	Average 91.9-99.8 dBA Peaks up to 106.7 dBA during performances	Gunderson E, Moline J, Catalano P. Risks of Developing Noise-Induced Hearing Loss in Employees of Urban Music Clubs. American Journal of Industrial Medicine 1997; 31:75-79.
Removing a Cast	88.0-95.2 dBA	Wiggens CE, Brown KD. Hearing Protection and Cast Saw Noise. Journal of the Southern Orthopedic Association 1996; 5:1-4.

An often overlook occupation associated with noise and hearing loss is farming. Noise levels at farms reach levels as high or greater than noise levels at factories. Farming operations typically fall outside of OSHA jurisdiction and therefore do not have the same requirements for hearing conservation programs. Table II below presents noise levels for some farming activities.

Table II. NOISE LEVELS ASSOCIATED WITH FARMING ACTIVITIES

NOISE SOURCE	*NOISE LEVELS (dBA)*	*REFERENCES*
Tractor with cab	73-90 dBA	Sampson BT. Nebraska and OECD Tractor Test Data for 1999 (containing test data to December 1998). Institute of Agriculture & Natural Resources: University of Nebraska, Lincoln TTL 1-99.
Orchard Sprayer	85-100 dBA	Safety on the Farm: Farm Noise -Topic 9. http://www.saftek.com/worksafe/farm_13.htm.
Tractor without a Cab	91-99 dBA	Sampson BT. Nebraska and OECD Tractor Test Data for 1999 (containing test data to December 1998). Institute of Agriculture & Natural Resources: University of Nebraska, Lincoln TTL 1-99.
All Terrain Vehicle	100 dBA	Brusnighan MS et al. Farming with a Hearing Impairment. Technology and Disability 1994; 3:39-46.
Full Throttle Tractor	105 dBA	Jones HH, Oser JL. Farm Equipment Noise Exposure Levels. AIHA Journal 1968; 29:144-151.
Tractor at Full Load	120 dBA	Cyr DL, Johnson SB. Hearing Protection for Farmers. Maine Farm Safety Program, Bulletin #2293 University of Maine Cooperative Extension. http://www.cdc.gov/niosh/nasd/docs3/me97059.html.

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Michigan Law Requires the Reporting of Known or Suspected Occupational NIHL

Reporting can be done by:

FAX (517) 432-3606
Telephone 1-800-446-7805
E-Mail Rosenman@msu.edu
Mail MDCIS Occ. Health Division
PO Box 30649
Lansing, MI 48909-8149

Suggested Criteria for Reporting Occupational NIHL

1. A history of significant exposure to noise at work; AND
2. A STS of 10dB or more in either ear at an average of 2000, 3000 & 4000 Hz. OR
3. A fixed loss.*

*Suggested definitions: a 25dB or greater loss in either ear at an average of: 500, 1000 & 2000 Hz; or 1000, 2000 & 3000 Hz; or 3000, 4000 & 6000 Hz; or a 15dB or greater loss in either ear at an average of 3000 & 4000 Hz.

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