

Now Hear This . . .



Volume 12, No. 1

Spring 2009

Characteristics of Individuals with More Severe Noise-Induced Hearing Loss

OSHA defines material hearing impairment as an average hearing threshold level of 25 dB at the frequencies of 1000, 2000 and 3,000 hertz. In this issue we examine the personal and work factors associated with material hearing impairment from work-related noise among Michigan citizens. Since 2003 we have received 5,476 audiograms on the individuals reported with work-related noise-induced hearing loss. Among these 5,476 individuals 1,792 met the OSHA definition of material hearing impairment in both ears, and another 1,499 in just one ear. The remaining 2,185 did not meet the OSHA definition in either ear.

Table I compares the basic demographics of the three groups. Individuals with material hearing impairment in both ears were on the average older, more likely to be a man and less likely to be African-American.

Table I. Demographics of Individuals with Average Hearing Threshold Level \geq 25dB in Both Ears, One Ear or Neither Ear

CHARACTERISTICS	MATERIAL HEARING IMPAIRMENT (Avg 1000, 2000, 3000 HZ \geq 25dB)		
	BOTH EARS	ONE EAR	NEITHER EAR
Average Age (SD)	60.5 (\pm 10.7)	54.2 (\pm 9.8)	50.8 (\pm 9.7)*
Gender (Male)	94.9%	92.3%	89.0%*
Race (African American)	11.8%	13.4%	17.2%*

*p <0.05

Table II shows that those with material hearing impairment had a longer duration of exposure to noise at work, were more likely to have served in the military and were more likely to have worked in industries that typically do not have hearing conservation programs (i.e. agriculture, construction and transportation) versus an industry that typically does have a hearing conservation program (i.e. manufacturing, particularly auto and auto parts manufacturing). Although there was no overall difference in material hearing impairment by the four categories of employer size, working for the largest employers with > 500 employees was associated with a lower percentage of material hearing impairment. Consistent with the finding that working in an industry which was more likely to

have a hearing conservation program was associated with a lower prevalence of material hearing impairment were additional analyses that showed less material hearing impairment if the individual with hearing loss worked at a company that provided audiometric testing on hire (31.5% vs 44.5%), provided regular audiometric testing (34.7% vs 42.2%) and provided hearing protection devices (34.6% vs 49.3%).

Table II also includes data on noise outside of work. No increase in material hearing impairment was found with all noise hobbies such as hunting, target shooting, snowmobiling, or work around the house such as lawn work, etc. combined. We examined each of the hobbies and home duties separately and found that only using a chain saw was associated with material hearing impairment.

Table II. Noise Exposure with Average Hearing Threshold Level \geq 25dB in Both Ears, One Ear or Neither Ear			
NOISE EXPOSURE CHARACTERISTICS	MATERIAL HEARING IMPAIRMENT (Avg 1000, 2000, 3000 HZ \geq 25dB)		
	BOTH EARS	ONE EAR	NEITHER EAR
Average Duration of Noise Exposure at Work (SD)	29.9 (\pm 10.5)	27.2 (\pm 10.8)	24.6 (\pm 10.8)*
Military Service	47.6%	38.3%	28.1%*
Any Noisy Hobby	83.9%	87.0%	84.1%
Chain Saw	54.4%	53.1%	38.0%*
Industry Worked			
Agriculture	55.6%	22.2%	22.2%
Construction	47.2%	22.4%	30.4%
Transportation	45.4%	21.9%	32.8%
Manufacturing	30.7%	28.3%	41.0%
Size of Employer			
<25 Employees	34.5%	25.9%	39.7%
26-100 Employees	31.1%	34.9%	34.1%
101-500 Employees	38.1%	24.4%	37.5%
>500 Employees	29.7%	28.1%	42.2%

*p<0.05

Table III shows more severe hearing loss among individuals who were also exposed to a number of solvents and lead. The tendency for more severe hearing loss was seen for all the solvents but only trichloroethane and trichloroethylene were statistically significant. The lack of statistical significance for the other solvents could be related to sample size.

Table III. Exposure to Ototoxins with Average Hearing Threshold Level \geq 25dB in Both Ears, One Ear or Neither Ear			
	MATERIAL HEARING IMPAIRMENT (Avg 1000, 2000, 3000 HZ \geq 25dB)		
OTOTOXIC EXPOSURE	BOTH EARS	ONE EAR	NEITHER EAR
Lead	39.5%	29.8%	30.7%*
Toluene	48.3%	21.0%	30.8%
Acetone	38.8%	27.6%	33.6%
Methylethyl Ketane	45.6%	24.6%	29.8%
Trichloroethane	48.6%	26.0%	25.3%*
Trichloroethylene	41.2%	30.0%	28.8%*
Perchloroethylene	45.8%	25.3%	28.9%
Styrene	46.7%	23.9%	29.5%

*p<0.05

Table IV shows that diabetes, high cholesterol, high blood pressure and use of pain medication, which would include aspirin and non-steroidal anti-inflammatories, were more common in individuals with material impairment. No association was found with cigarette smoking. Given the cross sectional nature of the data it is not possible to determine if the association with high blood pressure means high blood pressure is a risk factor or a consequence of hearing loss caused by noise exposure.

Table IV. Personal Health Issues with Average Hearing Threshold Level \geq 25dB in Both Ears, One Ear or Neither Ear			
	MATERIAL HEARING IMPAIRMENT (Avg 1000, 2000, 3000 HZ \geq 25dB)		
MEDICAL CONDITION OR LIFESTYLE HABIT	BOTH EARS	ONE EAR	NEITHER EAR
Diabetes	18.9%	14.1%	12.1%*
High Cholesterol	47.4%	40.4%	38.0%*
High Blood Pressure	43.5%	40.3%	35.6%*
Cigarette Smoking	70.6%	66.7%	65.1%
Use Pain Medication	50.7%	46.7%	43.1%*

*p<0.05

These data on the risk factors for material hearing impairment support the utility of hearing conservation programs to reduce the severity of hearing loss in noisy industries. The data also are consistent with previous reports on the ototoxicity of various chemicals and lead and the contribution of certain medical conditions in increasing the risk of hearing loss.

We appreciate the cooperation of all the Michigan audiologists and otolaryngologists who take the time to comply with the reporting law. The data reported and compiled continue to prove useful in examining trends in work-related noise-induced hearing loss and in profiling potential interventions to reduce the burden of hearing loss in the state.

Now Hear This...

Michigan State University
College of Human Medicine
117 West Fee Hall
East Lansing, MI 48824-1316
Phone (517) 353-1846

Address service requested.

In this issue: v12n1: Characteristics of Individuals with More Severe Noise Induced Hearing Loss

Printed on recycled paper.

1. A history of significant exposure to noise at work; AND
 2. A STS of 10 dB or more in either ear at an average of 2000, 3000 & 4000 Hz. And the employee's total hearing level is 25 dB or more at the same three frequencies. OR
 3. A fixed loss.*
- *Suggested definitions: a 25 dB 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 15 dB or greater loss in either ear at an average of 3000 & 4000 Hz.

Suggested Criteria for Reporting Occupational NIHL

Internet
www.oem.msu.edu
E-Mail
ODREPORT@ht.msu.edu
FAX
517-432-3606
Telephone
1-800-446-7805
Mail
MIOSHA-MTS Division
P.O. Box 30649
Lansing, MI 48909-8149

Michigan Law Requires the Reporting of Known or Suspected Occupational NIHL
Reporting can be done by:

Project SENSOR Staff
At the Michigan Occupational Safety & Health Administration (MIOSHA)
Douglas J. Kahanowski, M.S., C.I.H., Director MIOSHA, Project SENSOR, Co-Director
John Peck, M.S., Director MTS Division
Byron Panasuk, C.I.H., C.S.P., Project SENSOR Specialist
At Michigan State University—College of Human Medicine
Kenneth D. Rosenman, M.D., Professor of Medicine
Project SENSOR, Co-Director
Mary Jo Reilly, M.S., Project SENSOR Coordinator
Melissa May, Ph.D., Project SENSOR Office Staff:
Tracy Carey
Amy Krizek
Ruth VanderWals
Patient Interviewers:
Mario Espindola
Michael Moffat
Maureen O'Brien
Sarah Schrauben
Liz Wilson

Now Hear This is published quarterly by Michigan State University-College of Human Medicine with funding from the Michigan Occupational Safety & Health Administration (MIOSHA) and is available at no cost. Suggestions and comments are welcome.
(517) 353-1846
MSU-CHM
117 West Fee Hall
East Lansing, MI 48824-1316

Advisory Board
Phyllis Berryman, R.N., Michigan Occupational Nurses' Association
Greg Flammé, Ph.D., Representative
Michigan Speech-Language-Hearing Association
Jerry Punch, Ph.D., Michigan State University
Constance Spak, M.A., CCC-A, University of Michigan
Michael Stewart, Ph.D., Central Michigan University
Jeffrey Weingarten, M.D., Michigan Oto-Laryngological Society