

# Now Hear This . . .



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## Twenty-Five Percent of Hearing Loss Caused by Noise at Work

The National Institute for Occupational Safety and Health (NIOSH) recently published an article on the prevalence of hearing loss in 18-65 year olds in the general population, and the prevalence hearing loss among individuals who worked in different industries (1). The source of the data was the National Health Interview Survey (NHIS), which is an annual cross-sectional survey of 40,000 US civilian non-institutionalized individuals. They used the data from the annual surveys for the years 1997-2003. A person was considered to have hearing loss if they responded "a little trouble" or "a lot of trouble" to the question "which statement best describes your hearing (without a hearing aid?). This question had previously been validated with audiometric testing as a good predictor of hearing loss. Individuals who answered "deaf," 131 people, were not included.

The estimated overall prevalence of hearing loss in the US general population was 11.4%. Men (14.0%) had a higher prevalence than women (8.5%), Caucasians (12.6%) than African-Americans (5.4%), current and former cigarette smokers (13.4% and 16.3%) than never smoked (8.9%), less education (12.2%) than more education (9.6%) and prevalence increased with age 18-25 year olds (5.7%) vs. 55-64 year olds (21.9%) (Table 1).

Table 2 shows the prevalence by major industries and the percent of hearing loss in each industry secondary to noise in that industry. The industries with the highest prevalence of hearing loss were railroad (34.8%), mining (24.3%), and primary metal

manufacturing (22.4%). The industries with the highest percentage of hearing loss attributed to employment were again railroads (63.6%), mining (55.3%) and primary metal manufacturing (49.6%). Overall 23.7% of hearing loss was attributable to employment. This last percentage is very similar to the percentage of 29.9% we reported for the percentage of hearing loss in Michigan attributable to noise at work (2). Our slightly high estimate was derived by asking a random sample of the Michigan population to self-report whether the respondent had ever told a health care provider, or a health care provider had ever told the respondent their hearing loss "was related to noise exposure at work". The NIOSH percentage of 23.5% was derived from calculating the population attributable fraction controlling for age, gender, education and smoking status using employment in the low noise industry category of finance, insurance and real estate with a prevalence of hearing loss of 8.3% as the prevalence of hearing loss in individuals not exposed to noise at work population.

Clearly there are limitations to the recent data from NHIS. These include the use of self-reports, industry used in the analysis was an individual's most recent job and therefore not necessarily their longest held job or the job where they were exposed to noise, and the inability to adjust for noise associated with hobbies such as firearms and household tasks such as lawn mowing. These limitations are balanced by the large sample size of 130,000 respondents, and previous validation of hearing loss self-reports. The similar percentage of

having loss attributed to noise at work from the NIOSH and the Michigan study despite different approaches suggests the validity of attributing approximately one-fourth of hearing loss to noise exposure at work.

Hearing loss remains a serious health problem in Michigan as well as the rest of the country. Noise exposure at work is a significant cause of that hearing loss.

We remain interested in receiving reports of work-related hearing loss. Identification of these index cases by audiologists is an important tool for initiating preventive actions in the workplace and we look forward to your continued cooperation with the state's mandatory reporting requirements. See under

general resources at [www.oem.msu.edu/resources.asp](http://www.oem.msu.edu/resources.asp) more details about the reporting requirement.

#### REFERENCES

1. Tak SW, Calvert GM. Hearing Difficulty Attributable to Employment by Industry and Occupation. An Analysis of the National Health Interview Survey – United States, 1997-2003. *Journal of Occupational and Environmental Medicine* 2008; 50:46-56.
2. Stanbury M, Rafferty AP, Rosenman KD. Prevalence of Hearing Loss and Work-Related Noise-Induced Hearing Loss in Michigan. *Journal of Occupational and Environmental Medicine* 2008; 50:72-79.

**Table 1. Estimated population prevalence of hearing difficulty, the adjusted prevalence ratio (PR\*), and 95% confidence intervals for hearing difficulty by risk factor, United States, 1997-2003**

Risk Factor	Weighted Prevalence*	95% CI	Adjusted PR	95% CI
<b>Sex</b>				
Male	14.0	13.6-14.4	1.59	1.54-1.65
Female	8.5	8.2-8.8		
<b>Race</b>				
White	12.6	12.3-12.9	2.14	1.99-2.29
African American	5.4	5.0-5.8	1.00	
Other	7.2	6.6-7.9	1.38	1.23-1.54
<b>Age categories (yr)</b>				
18-25	5.7	5.3-6.2	1.00	
25-34	7.1	6.7-7.4	1.29	1.17-1.41
35-44	10.8	10.4-11.2	1.92	1.77-2.08
45-54	16.8	16.3-17.3	2.93	2.70-3.17
55-64	21.9	21.1-22.8	3.68	3.37-4.01
<b>Smoking status</b>				
Current smoker	13.4	12.9-14.0	1.33	1.27-1.39
Former smoker	16.3	15.7-16.8	1.31	1.25-1.37
Never smoker	8.9	8.6-9.2	1.00	
<b>Education</b>				
16 yr or more	9.6	9.2-10.0	1.00	
< 16 yr	12.2	11.8-12.5	1.33	1.27-1.39
<b>Total</b>	11.4	11.2-11.7		

\*Prevalence ratios (PR) are adjusted for all other covariates.

Adapted from reference 1, only weighted prevalence shown.

**Table 2. Estimated prevalence of hearing difficulty, the adjusted prevalence ratio (PR), and the attribution to employment by industrial sectors, United States, 1997-2003**

Industrial Sector	Weighted Prevalence					
	N*	(%)	PR‡	95%CI	AC§	AF
<b>Agriculture</b>	2,783.2	14.5	1.43	1.25-1.63	120.9	29.9
<b>Forestry and Fisheries</b>	143.8	15.0	1.45	0.92-2.27	6.7	31.0
<b>Mining</b>	475.3	24.3	2.23	1.76-2.81	63.9	55.3
<b>Construction</b>	8,722.2	15.1	1.43	1.31-1.57	401.3	30.4
<b>Manufacturing-Durable Goods</b>						
<b>Primary Metal Industries</b>	759.5	22.4	1.98	1.64-2.38	84.2	49.6
<b>Furniture, Lumber, Wood</b>	1,410.7	17.3	1.75	1.50-2.05	105.4	43.1
<b>Transportation Equipment</b>	2,268.8	16.9	1.65	1.45-1.87	151.2	39.4
<b>Fabricated Metal Industries, including ordnance</b>	1,086.1	15.8	1.45	1.22-1.73	53.5	31.2
<b>Machinery, except electrical</b>	2,064.3	15.6	1.49	1.30-1.70	105.9	32.9
<b>Transportation, Communications, and Other Public Utilities</b>						
<b>Railroads</b>	270.8	34.8	2.73	2.25-3.32	59.9	63.6
<b>Utilities and Sanitary</b>	1,374.3	17.2	1.61	1.36-1.91	90.4	38.2
<b>Trucking Service and Warehousing</b>	2,422.5	13.2	1.31	1.14-1.51	76.5	23.9
<b>Wholesale Trade</b>	3,993.5	12.1	1.24	1.10-1.39	93.9	19.4
<b>Retail Trades</b>						
<b>Automotive Dealers and Gasoline Stations</b>	1,908.7	12.2	1.25	1.07-1.48	47.3	20.4
<b>Services</b>						
<b>Repair Services</b>	1,833.2	16.7	1.53	1.33-1.76	106.7	34.9
<b>Elementary and Secondary Schools and Colleges</b>	10,284.1	9.3	1.21	1.09-1.33	166.7	17.3
<b>Public Administration</b>	5,858.8	12.4	1.37	1.23-1.53	196.6	27.2
<b>Finance, Insurance, and Real Estate¶</b>	8,014.5	8.3	1.00		0.0	0.0
<b>Total Working Population</b>	122,156.2	11.4			3,316.5	23.7

\*Estimated number of US working population in 1,000s.

‡Prevalence ratios (PR) are adjusted for all other covariates (age, sex, race group, smoking status, and education).

§Attributable case (AC), number of hearing difficulty cases attributable to employment in 1,000s.

|| Attributable fraction (AF), percent of hearing difficulty cases attributable to employment.

¶Reference group.

Adapted from reference 1, not all industrial sectors shown.

*Now Hear This...*

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**Address service requested.**

In this issue:  
v11n1: Twenty-five percent of hearing loss  
caused by noise at work

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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:

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