

2003

**Annual Report on Occupational
Noise-Induced Hearing Loss
in Michigan**



2003 Annual Report on Occupational Noise Induced Hearing Loss in Michigan

A Joint Report
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Summary:

This is the tenth annual report on occupational noise-induced hearing loss (NIHL) in Michigan. Over 1,200 new people with hearing loss known or suspected to be caused by noise at work were reported in 2003 to the Michigan Department of Labor and Economic Growth (MDLEG). Over half of the individuals reported have hearing loss that significantly affects their ability to understand speech.

Occupational noise-induced hearing loss is affecting mainly men, with an onset at 35-64 years of age. Exposure to noise occurs in many industries but particularly in manufacturing, construction and farming.

Forty-seven of the 118 (39.8%) companies inspected as part of the surveillance system had no hearing conservation program or a deficient program despite the presence of noise levels above the legal limit (Table 14). Nine of these 118 inspections were conducted in the year 2003 as part of the occupational NIHL surveillance program.

There were 812 workplace inspections identified in the Integrated Management Information System (IMIS) that were conducted by the Michigan Occupational Safety and Health Administration (MIOSHA) in calendar year 2003. These inspections were not initiated because of the noise-induced hearing loss surveillance system; 109 of the 812 companies were in violation of some portion of the noise standard. Sixty-three of these 109 companies were cited for having the complete absence of a hearing conservation program. It is important to recognize, however, that the majority of the 812 inspections were in response to a specific complaint or referral. Consequently, the scope of these inspections was primarily limited to the complaint or referral item unless other serious issues were observed during the course of each inspection.

Noise-induced hearing loss is an insidious condition that may take years to develop to a stage where it affects an individual's ability to communicate at home and in the work place. Clearly hearing loss is greater with greater duration of exposure (Figure 8). Reduction of the occurrence of noise-induced hearing loss in select high noise industries continues to be one of the strategic goals of MIOSHA.

In 2003, we expanded the scope of our surveillance to include interviews of individuals with standard threshold shifts who were reported by company medical departments in order to assess the effectiveness of existing hearing conservation programs at these facilities. Prior to 2003, interviews were limited to individuals reported by non-company health professionals. In 2003, we also began to collect the audiograms of all reported individuals. Hearing loss being reported is very significant, over half of the individuals reported meet the National Institute for Occupational Safety and Health (NIOSH) criteria of material hearing impairment (Figure 7). Through surveillance of work-related hearing loss in Michigan along with work place interventions, the State is working to reduce noise levels in industry and the occurrence of hearing loss among future generations of Michigan workers. Information collected this year highlights that noise exposure is also a problem outside of the work place. A new strategic plan to address hearing loss from all sources is planned.

Background:

Facilities covered by the general industry noise standard (Part 380 Noise Exposure) are required to institute hearing conservation programs to prevent noise-induced hearing loss if the 8 hour time weighted average noise levels are at or above 85 decibels. However, the construction industry as well as transportation, oil and gas well drilling and servicing, agriculture, and mining are exempted from this standard. Project SENSOR (Sentinel Event Notification System for Occupational Risks), the Michigan Department of Labor and Economic Growth's surveillance program for occupational noise-induced hearing loss, identifies facilities that lack hearing conservation programs despite excessive noise exposures.

Nationally, one million workers are estimated to have work-related hearing loss, primarily from manufacturing-related exposures to noise (Weeks et al, 1991). Based on data from the National Health Interview Survey, one would expect approximately 86,000 individuals in Michigan to have noise-induced hearing loss related to work place exposures (Ries, 1994).

In 1992, the Michigan Department of Labor and Economic Growth (formerly the Michigan Department of Consumer and Industry Services) with financial assistance from the National Institute for Occupational Safety and Health (NIOSH) initiated a special emphasis program for occupational noise-induced hearing loss (NIHL). Funding assistance from NIOSH ended in September 2000 but was restarted in 2002. The State continued to maintain work-related NIHL as a priority condition for targeting and intervention during the two-year lapse of federal funding.

The surveillance program is based on Michigan's Occupational Disease Reporting Law, Part 56 of P.A. of 1978, which specifies that any health professional who knows or suspects a patient has a work-related illness must report it to the MDLEG within ten days (Figure 1). The goal of the special emphasis program is to prevent additional work-related hearing loss by inspecting facilities where index individuals with NIHL have worked. The sources used to identify persons with occupational NIHL are: (1) reports from audiologists and otolaryngologists and (2) reports from companies. Both private practice audiologists and otolaryngologists and those working for industry send reports to the Michigan Department of Labor and Economic Growth.

An individual is considered to have occupational NIHL if a health professional determines the individual: (1) has audiometric findings consistent with noise-induced hearing loss and (2) has a history of exposure to sufficient noise at work to cause hearing loss.

The MIOSHA requirement for recording a standard threshold shift (STS) has been a 10 dB or greater decrease in hearing loss in either ear at an average of 2000, 3000 and 4000 Hz. Since January 1, 2003 the criteria for reporting a STS have changed. Now not only must the individual have the 10 dB STS average at 2000, 3000 and 4000 Hz in either ear but they must also have at least a 25 dB hearing loss in either ear. For consistency we recommend this same criteria be used for reporting a STS under the Michigan Occupational Disease Reporting Law.

In some cases a hearing health professional will not have access to a baseline audiogram to compare the current audiogram for changes in hearing ability. In response to this, the State advisory committee for occupational NIHL developed some guidelines for reporting hearing loss

that do not require a baseline audiogram. The following minimum hearing loss parameters can then be used as a suggested guideline:

A fixed loss (suggested definitions: a 25 dB or greater loss in either ear at an average of: 500, 1000 and 2000 Hz, or 1000, 2,000 and 3000 Hz, or 3000, 4000, and 6000 Hz; or a 15-25 dB or greater loss in either ear at an average of 3000 and 4000 Hz).

Individuals with a standard threshold shift (STS) who are reported by a company medical department or a health professional providing screening services to a company are already enrolled in their company's hearing conservation program (HCP).

Those reported with a hearing loss by a private practice audiology clinic or by an otolaryngologist not part of a company's HCP are followed up by staff working on the NIHL surveillance program to determine if the company where they are or were exposed to noise has a HCP. All individuals with a hearing loss are administered a medical and work history questionnaire, including details on their occupational and recreational exposures to noise.

Beginning in 2003, audiograms have been requested on all individuals reported. These audiograms are used to determine hearing ability. Individuals who have an average hearing loss equal to or greater than 25 decibels at 1000, 2000 and 3000 Hertz are classified as meeting the NIOSH criteria of material hearing impairment.

After the patient has been interviewed, a referral for an industrial hygiene investigation is forwarded to the appropriate MIOSHA district if: the individual reports they were exposed to noise and were not provided regular audiometric testing and hearing protection by their employer within the last five years; the facility is in MIOSHA jurisdiction; and the facility has not been inspected within the last five years where noise issues were addressed. Follow-up is typically not performed at companies for which the law does not require the provision of a comprehensive hearing conservation program such as in construction and agriculture. An industrial hygienist conducts monitoring for noise and reviews the completeness and quality of the company's hearing conservation program, if one exists. After the investigation is completed, a report of the results and any recommendations are sent to the company and union (or designated labor representative if the company does not have a union), as well as to the reporting audiologist or otolaryngologist. If the company is cited for violations of any regulations, they must post the citations at or near the location of the violations for a minimum of three days or until the items have been corrected, whichever is later.

Results:

The results in the tenth annual report are presented in the following order: a description of all of the occupational disease reports submitted to the MDLEG for NIHL in the year 2003; results of interviews of individuals with hearing loss identified through Project SENSOR in 2003; and, a summary of the MIOSHA inspections not conducted as part of project SENSOR from 01/01/2003-12/31/2003 where violations of the noise standard were found.

2003 Occupational Disease Reports for NIHL

Figure 2 shows the number of reports of hearing loss since 1985. Approximately 7.8% of all occupational disease reports submitted to the Michigan Department of Labor and Economic Growth are for hearing loss. Because of increased awareness of the reporting law by employers and health care providers there was an increase in the overall number of reports received from 1989 through 2000, and an increase in the number of non-company reports received, especially from 1994 through 2001. In the year 2003, there were 1,245 reports of work-related hearing loss submitted to the Michigan Department of Labor and Economic Growth. Company medical departments submitted 726 of the 1,245 reports in 2003. Private-practice audiologists and otolaryngologists submitted the other 519 reports. Table 1 shows the number of individuals with hearing loss reported by the private-practice health professionals.

Demographics of Individuals with Hearing Loss

Eighty-nine percent (1,111/1,245) of the reports where gender was listed are for men. Although requested, information on race was missing for 717/1,245 (58%) of the reports. Of the individuals for whom race was known, 80.1% were white, 15.7% were African American, 2.5% were Hispanic and 1.7% were of other descent. These percentages were similar for reports from companies as well as from private practice hearing health professionals. The mean age of individuals reported is 53 years, ranging from 22 to 91 years. Individuals reported by companies were generally younger than individuals reported by non-company audiologists and otolaryngologists (average age 48 and 60 years, respectively). Approximately 83% of the individuals reported by company medical departments were between 30 and 59 years of age compared to 46% of non-company health professionals in the same age range (Figure 3). Reports by non-company audiologists and otolaryngologists included retired individuals. All reports from companies were of current workers.

Industry

Table 2 and Figure 4 show the number of employees working at the companies where the individuals were exposed to noise. Most of the reports were of individuals who had worked at large companies employing 500 or more employees. Table 3 is a distribution of industry type of the individuals reported. Most of the reports were for individuals working in manufacturing facilities. This corresponds to companies that are more likely to have hearing conservation programs. However, the non-company health professionals reported more individuals from other types of industries, including construction (13.8%), transportation and communication services (6.4%), trade (1.9%), government (3.4%), and agriculture (0.5%) than the company or contract medical departments. Companies report individuals with NIHL as part of their hearing conservation program (HCP). In contrast, the individuals reported by non-company hearing health professionals would not necessarily be working at a company with a HCP.

Individuals with Hearing Loss, Reported by Company Medical Departments and Non-Company Audiologists and Otolaryngologists in 2003

A total of 1,000 of 1,342 (75%) individuals reported to the surveillance system by company medical departments and non-company audiologists and otolaryngologists in 2003 have been interviewed. 1,245 of the 1,342 individuals were diagnosed with NIHL in 2003; 97 of the 1,342 individuals were diagnosed with NIHL in 2002, yet were not reported to the surveillance system until 2003. The interviews ask about all jobs where a person was exposed to noise. The data on the following pages in the Demographics and Industry sections are from the interviewed individuals reported in 2003.

Demographics of Individuals with Hearing Loss

Ninety-two percent of the interviewed individuals reported in 2003 were men. Of the interviewed individuals reported in 2003, 83.7% were white, 11.8% were African American, 2.6% were Hispanic, 0.4% were Asian and 1.4% were other. Race was unknown for 239 individuals. Over 87% of the individuals reported were between the ages of 40 to 70 years, and includes retirees with hearing loss unlike the reports from companies that only include actively working individuals.

Industry

Table 4 shows all the industries where the individuals with hearing loss were ever exposed to noise. Overall, 76% of the 1,240 types of industries where the 1,000 individuals ever worked were in the manufacturing industry. The 1,240 industries identified are not unique companies; more than one patient may have worked at the same company. Therefore, the company would have been counted more than one time.

Table 5 shows the most recent industries in which the interviewed individuals were exposed to noise and whether the company provided regular hearing tests for their employees. The percentages of companies where the patient reported they did receive regular hearing testing ranged from 0% to 91% within industry types. Sixty-eight percent of the most recent companies where the individuals were exposed to noise regularly tested their employees' hearing. The industries that are reported in Table 5 are not unique companies; more than one patient may have worked at the same company. Therefore, the company would have been counted more than once.

Table 6 shows whether individuals reported were provided hearing tests by the number of employees working in companies where the interviewed individuals were exposed to noise. Less than half of the workers reported having received regular hearing tests, in companies with fewer than 100 employees. The industries in Table 6 are not necessarily unique companies; more than one patient may have worked at the same company. Therefore, the company would have been counted more than once.

The interviewed individuals worked in noise for a variety of durations, ranging from less than 5 years to greater than 35 years. Over 71% were exposed to noise for 20 years or more (Figure 5).

Figure 6 shows the decade of the individuals' first exposure to noise. Some individuals were first exposed to noise many years ago; however, most individuals were first exposed to noise in the 1960's and later (87.3%).

Table 7 shows the decade when the interviewed individuals with hearing loss were most recently exposed to noise by industry. The percentage of individuals at companies with hearing tests increased over time within the industry types that have been required by OSHA (since 1972) to provide such hearing tests. Construction and agriculture industries had the lowest percentages of workers with regular hearing tests; these industries are not required by MIOSHA or OSHA to provide regular hearing tests.

Table 8 shows the decade in which cases most recently worked, and whether they were provided with hearing protection (plugs or muffs) by industry type. Over time, the percentage of workers who were provided hearing protection increased in all industries. The percentage of manufacturing workers given hearing protection improved the most of any industry type, with none of the workers given hearing protection in the 1950s and 97% of workers given hearing protection in the 2000s.

Table 9 shows the decade when the interviewed individuals with hearing loss were most recently exposed to noise by company size. Companies with more than 100 employees had higher percentages of workers with regular hearing tests and had the greatest improvement over time than smaller companies.

Table 10 shows the provision of hearing testing and hearing protection, year began using hearing protection and work injuries by self-reports of how often the individual worked in a noisy environment. Hearing protection was generally not used until the late 1980s. Table 10 also shows self reports of injuries by how often the individual worked in a noisy environment.

Forty-six percent of the individuals reported with hearing loss had tinnitus (ringing in the ears) (Table 11). If tinnitus was present then 54% of the time it was daily (Table 11). Table 12 shows the occurrence of non-occupational noise exposures. Target shooting and the use of chain saws were the only two activities where half or more of the respondents indicated they used hearing protection "always or usually." If hearing protection was used, it was generally not used until the 1980s.

For the 884 individuals for whom we were able to obtain the actual audiogram, 478 (54.1%) met the NIOSH criteria of material hearing impairment (Figure 7). Race and industry type were very similar for those individuals with material hearing impairment and those with less severe hearing loss (Table 13). There was a significantly greater percent of men with material hearing impairment, 94.4% compared to women, with 89.9%. Average age for those with material hearing impairment was 59.7 years, compared to 49.6 years for those with no material hearing impairment (Table 13). Figure 8 shows hearing loss by duration of exposure to noise at work. There is a clear exposure response with increased hearing loss at greater duration. Figure 9 shows that, on the average, hearing in the left ear is worse than the right ear.

Inspections

In response to the reports of hearing loss identified through the Project SENSOR Surveillance program, inspections were conducted at 118 companies where the person reported they had never received audiometric testing within the last five years. Of the 118 companies, 63 (53.4%) were required to have a hearing conservation program (HCP) because they had noise levels at or above 85 dBA. Of those 63 companies, 47 (74.6%) had either no HCP or a deficient HCP. Fifty-two of the 63 companies requiring a HCP were in manufacturing; five were in services; four were in government; one was in the trade industry; and one was in agriculture. Fifty-five of the 118 companies were not required to have a HCP because noise levels were below 85dBA. Table 14 lists the characteristics of the 118 companies inspected as part of the surveillance efforts.

In addition, three other companies were identified where the person reported they had never received audiometric testing; however, these three companies had been inspected for noise prior to the start of the State's follow-up efforts, between 1987 and 1992. Two of the three had noise levels above 85dBA and no HCP. The other company also had noise levels above 85dBA and a deficient HCP. All three of these companies were in manufacturing.

In the year 2003, there were also industrial hygiene inspections assessing noise exposures that were conducted independently of those referred for inspections based on the patient interviews as part of Project SENSOR. In Michigan, limited scope complaint or referral MIOSHA inspections normally will include review of compliance with the noise standard if the company under investigation clearly has excessive noise levels and employees are observed not wearing hearing protection. During the 812 inspections conducted in the year 2003, 109 facilities received a citation for a violation of the noise standard. These facilities were generally small. However, 11 (10.1%) of the facilities had more than 250 employees (Table 15). In contrast, ten of the 47 (21%) companies from Table 15 that were inspected in response to hearing loss and received a citation for a violation of the noise standard had more than 250 employees. Sixty-three (57.8%) of the companies were cited for a complete lack of a hearing conservation program despite exposures to excessive levels of noise. The other companies were cited for violations of sections of the noise standard (Table 16). The manufacture of fabricated metal products, lumber, and primary metals were the most common types of companies cited (Table 17).

Table 18 shows the estimates of the number of workers in Michigan industry currently working in conditions with noise levels of 85 decibels or greater.

Discussion:

This is the tenth annual report of occupational noise-induced hearing loss in Michigan. There were 1,245 reports of hearing loss submitted to the Michigan Department of Labor and Economic Growth in the year 2003. The reports submitted probably represent a substantial underestimate of the total number of individuals with work-related hearing loss. There are approximately 443 audiologists and 148 otolaryngologists in the state. Reports were received in the year 2003 from only 3 of the 85 estimated group practices in the state, and 33 of the 490

practitioners not known to be associated with a group practice. The number of health care practitioners reporting each year has been approximately the same.

The potential number of individuals who should be reported is very likely to be much larger than the number of reports received. In Michigan, we estimate there are currently at minimum 137,100 manufacturing production workers, 25,600 construction workers, 400 oil and gas workers, 27,700 blue collar workers in wholesale and retail trade, and 9,700 workers in service industry environments exposed to daily noise levels of 85 dBA or greater (NIOSH, 1998 and Bureau of Labor Statistics, 2001). Table 18 provides estimates of blue-collar workers in Michigan who are exposed to excessive levels of noise, by industry type. Based on data from the National Health Interview Survey, we would expect approximately 86,000 workers in Michigan to have occupational noise-induced hearing loss (Ries, 1994).

The reports submitted are mainly of men between the ages of 40 and 60, who work in large manufacturing companies. Follow-up of reports from company medical departments and non-company audiologists and otolaryngologists shows that 56% of noisy companies where the individuals worked had a hearing conservation program when the individual worked there. Over time the numbers of companies that provide regular audiometric testing has increased, especially among manufacturing companies with more than 100 employees. This is not true for smaller manufacturing companies, construction companies and the farming industry (Tables 7-9).

The report of an individual with work-related hearing loss is a sentinel health event that is critical to effective occupational disease surveillance. Reports from non-company health professionals provide the base upon which meaningful information on exposures to noise at work can be gained, with the goal of intervening to prevent others from developing work-related hearing loss. There were 6,067 individuals at the worksites we inspected that had noise exposures of 85 dBA or greater, and lacked or had a deficient HCP, who would directly benefit from these inspections. The results of follow-up inspections indicate that if an individual reports not being provided hearing testing and hearing protection by his or her company, that an inspection has a high rate of success in identifying a company which although legally required to have a hearing conservation program is not in compliance with the law (Table 14).

The Michigan Department of Labor and Economic Growth has been focusing on hearing loss for 12 years now. In 1993, letters were sent to otolaryngologists, audiologists, speech and hearing clinics, occupational health nurses and mobile van units to educate these groups of health professionals about the reporting law and the importance of reporting known or suspected work-related hearing loss. In 1995, a reminder letter was sent to the state's audiologists and otolaryngologists. Other outreach efforts include presenting mini-seminars at the Michigan Speech-Language-Hearing Association's annual conferences, exhibiting an educational booth about work-related hearing loss at various conferences and providing information on the status of the surveillance efforts through various association newsletters. In 1998, we initiated a quarterly newsletter on occupational NIHL that is mailed to the state's approximately 460 audiologists, otolaryngologists, mobile vans and clinics. In 1998, an internet web site that contains the annual reports and newsletters was developed; it can be accessed at: www.chm.msu.edu/oem.

In January 2000, a letter was sent to 719 Michigan hearing health professionals to provide them with a reminder about their obligation to report known or suspected occupational noise-induced hearing loss. In January 2001 a secure server was created to allow for electronic occupational disease report submission via the web site previously mentioned. In 2003, we added the ability to report the audiometric results electronically.

In June 2000, MIOSHA initiated an Occupational Noise Exposure Local Emphasis Program (LEP) to comply with their Strategic Plan Goal to reduce NIHL/STS by 15%. Twenty-six categories of manufacturing industries are the focus of this initiative; these are industries known to have large numbers of noise-exposed workers. Inspections are conducted as planned program inspections (i.e. selected because they fell within the targeted industry categories) or as rollover inspections (i.e. the inspection was initiated for a reason other than noise but the facility falls within the LEP's targeted industry categories). At each inspection, the MIOSHA enforcement industrial hygienist provides the employer with informational handouts that are appropriate to the operations carried out at that facility. Just like any other MIOSHA enforcement inspection, the company is required to correct any violations of the Michigan noise standard.

The degree of hearing loss among individuals who were reported was significant. Over half met the NIOSH criteria for material hearing impairment and would be expected to have difficulty hearing normal speech (Figure 7). Hearing was worse in the left ear as compared to the right (Figure 9) and was worse with increasing duration of exposure (Figure 8). Almost half were bothered by tinnitus. Most individuals did not begin to use hearing protection until the late 1980s and most are still not using such protection in noisy activities outside of work. We will continue to see the effects of this relatively recent initiation of the use of hearing protection. If noise cannot be engineered out of a work place or work process, then more effort is needed to ensure that individuals wear the appropriate hearing protection. This effort must cover work as well as recreational noise. Individuals must also be encouraged to use hearing protection during noisy activities outside of the work place.

A process to develop a strategic plan for all sources of noise, not just work place noise, has been prepared by the Michigan Department of Community Health. An effort to develop strategies to increase awareness of the hazards of noise exposure in both occupational and environmental situations and the development of strategies to increase preventive actions will be the goal of this strategic plan.

The number of reports of hearing loss submitted by non-company hearing health professionals increased until 1995, decreased in 1996, increased in 1997, decreased in 1998, increased in 1999, 2000, 2001, decreased in 2002, and then increased in 2003. Ongoing and renewed outreach efforts are needed to understand these trends, increase the number of workers covered by hearing conservation programs, and improve the effectiveness of existing hearing conservation programs. We will continue to encourage health care practitioners to report their patients who have work-related noise-induced hearing loss.

References:

Bureau of Labor Statistics. Annual Report on Employment, Hours and Earnings, Production Workers, Michigan 2001.

National Institute for Occupational Safety and Health. Criteria for a Recommended Standard, Occupational Noise Exposure Revised Criteria 1998. June 1998, DHHS (NIOSH) Publication No. 98-126.

Ries PW. Prevalence and Characteristics of Persons with Hearing Trouble: United States 1990-1991. Vital Health Statistics (10). 1994; No. 188. DHHS Publication PHS 94-1516.

Weeks JL, Levy BS and GR Wagner, eds. Preventing Occupational Disease and Injury. American Public Health Association, 1991.

Figure 1.

Michigan Department of Labor and Economic Growth

Management and Technical Services Division

Known or Suspected Occupational Disease Report

(Information will be held confidential as prescribed in Act.)

EMPLOYEE AFFECTED				
Name (Last, First, Middle)	Age	Sex M F	Race: <input type="radio"/> White <input type="radio"/> Black <input type="radio"/> Hispanic <input type="radio"/> Other	
Street	City		State	Zip
Home Phone Number		Social Security Number		

CURRENT EMPLOYER				
Current Employer Name			Worksite County	
Worksite Address		City	State	Zip
Business Phone		If Known, Indicate Business Type (products manufactured or work done)		
Number of Employees <input type="radio"/> < 25 <input type="radio"/> 25-100 <input type="radio"/> 100-500 <input type="radio"/> > 500				
Employee's Work Unit/Department		Dates of Employment From: _____ To: _____ Mo Day Year Mo Day Year		
Employee's Job Title or Description of Work				

ILLNESS INFORMATION		
Nature of Illness or Health Condition (Examples: Headache, Nausea, Difficulty Breathing, Cough, etc.)		Date of Diagnosis Mo Day Year
Suspected Causative Agents (Chemicals, Physical Agents, Conditions)	Did Employee Die? Yes <input type="radio"/> No <input type="radio"/>	If Yes, Date of Death Mo Day Year
If Physician, Indicate Clinical Impression for Suspected Occupational Disease, or Diagnosis of Confirmed Occupational Disease		

ADDITIONAL COMMENTS

REPORT SUBMITTED BY				
If Report Submitted by Non-Physician, Did Employee See a Physician? <i>If yes, record information below.</i>				
Yes <input type="radio"/> No <input type="radio"/> Don't Know <input type="radio"/>				
Physician's Name		Phone		
Office Address		City	State	Zip
Name of Person Submitting Report		Physician <input type="radio"/> Non-Physician <input type="radio"/>		
Address		City	State	Zip
Signature		Phone		Date

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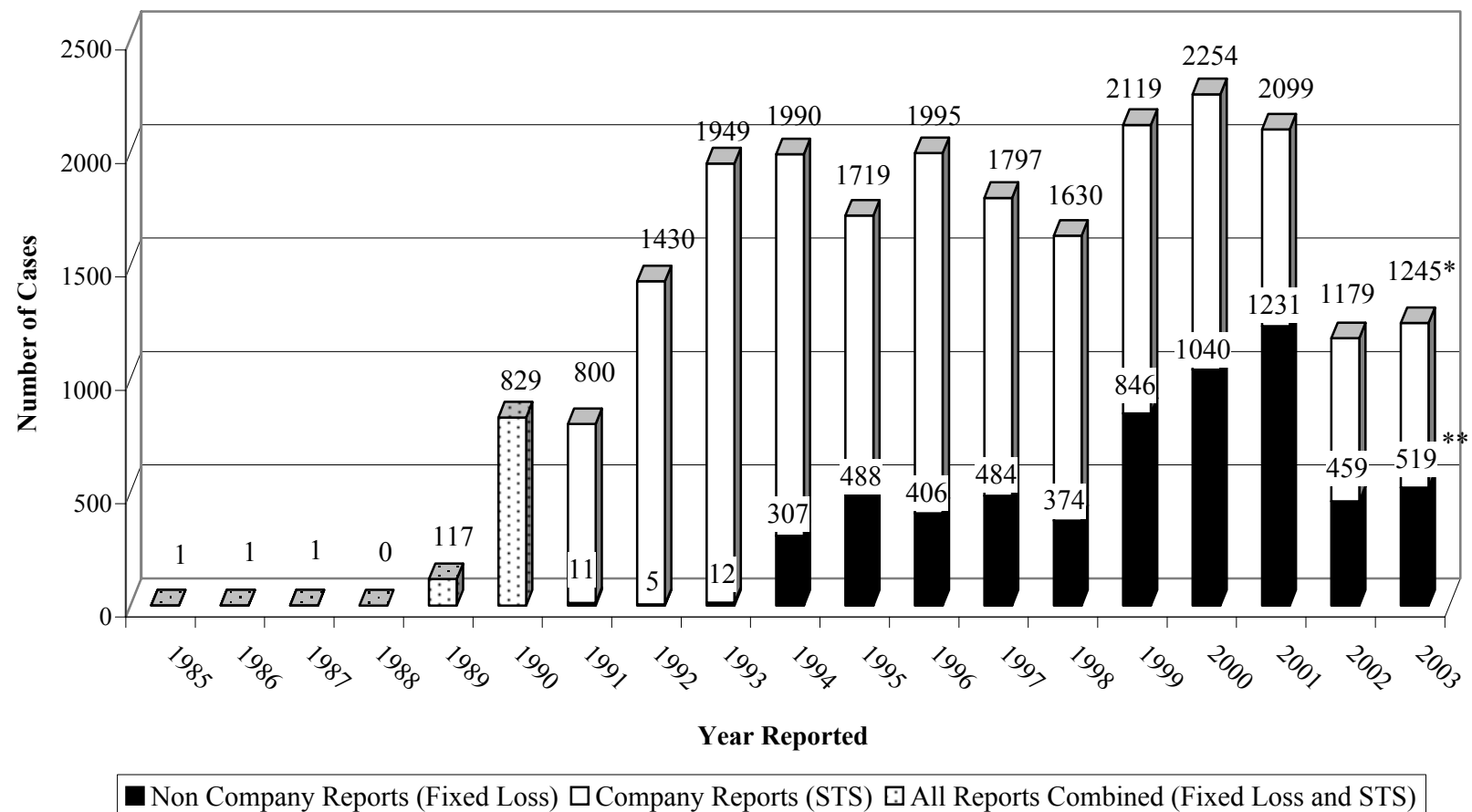
Return completed form to:

**Michigan Department of Labor and Economic Growth
Michigan Occupational Safety and Health Administration
Management and Technical Services Division
7150 Harris Drive, P.O. Box 30649
Lansing, MI 48909-8149**

MIOSHA-MTSD-51 (12/03)

Authority: P.A. 368 of 1978
Completion: Required
Penalty: Misdemeanor

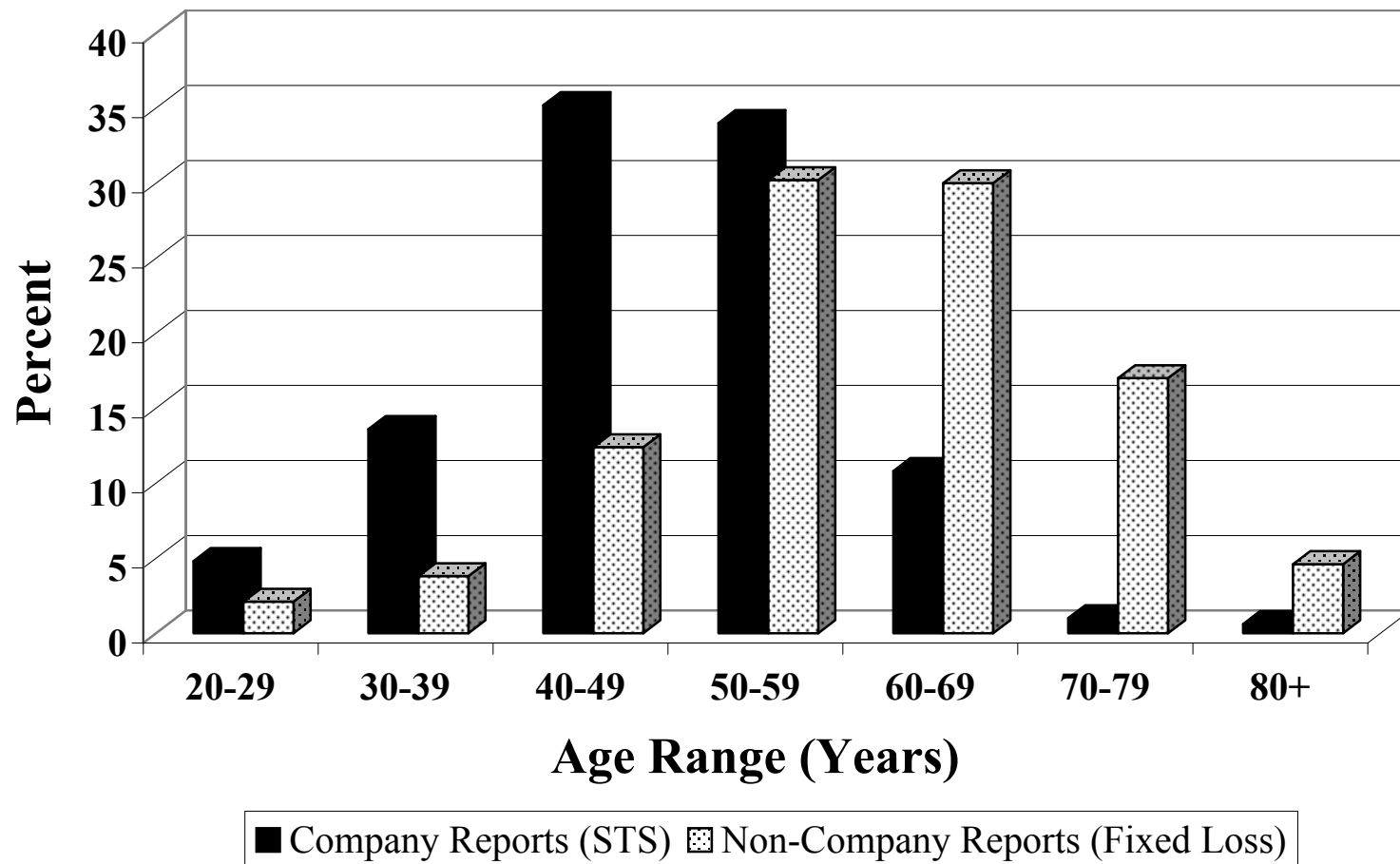
Figure 2. All Individuals with Noise-Induced Hearing Loss Reported to the Michigan Department of Labor and Economic Growth: 1985-2003



*All reports combined (Fixed Loss and STS).

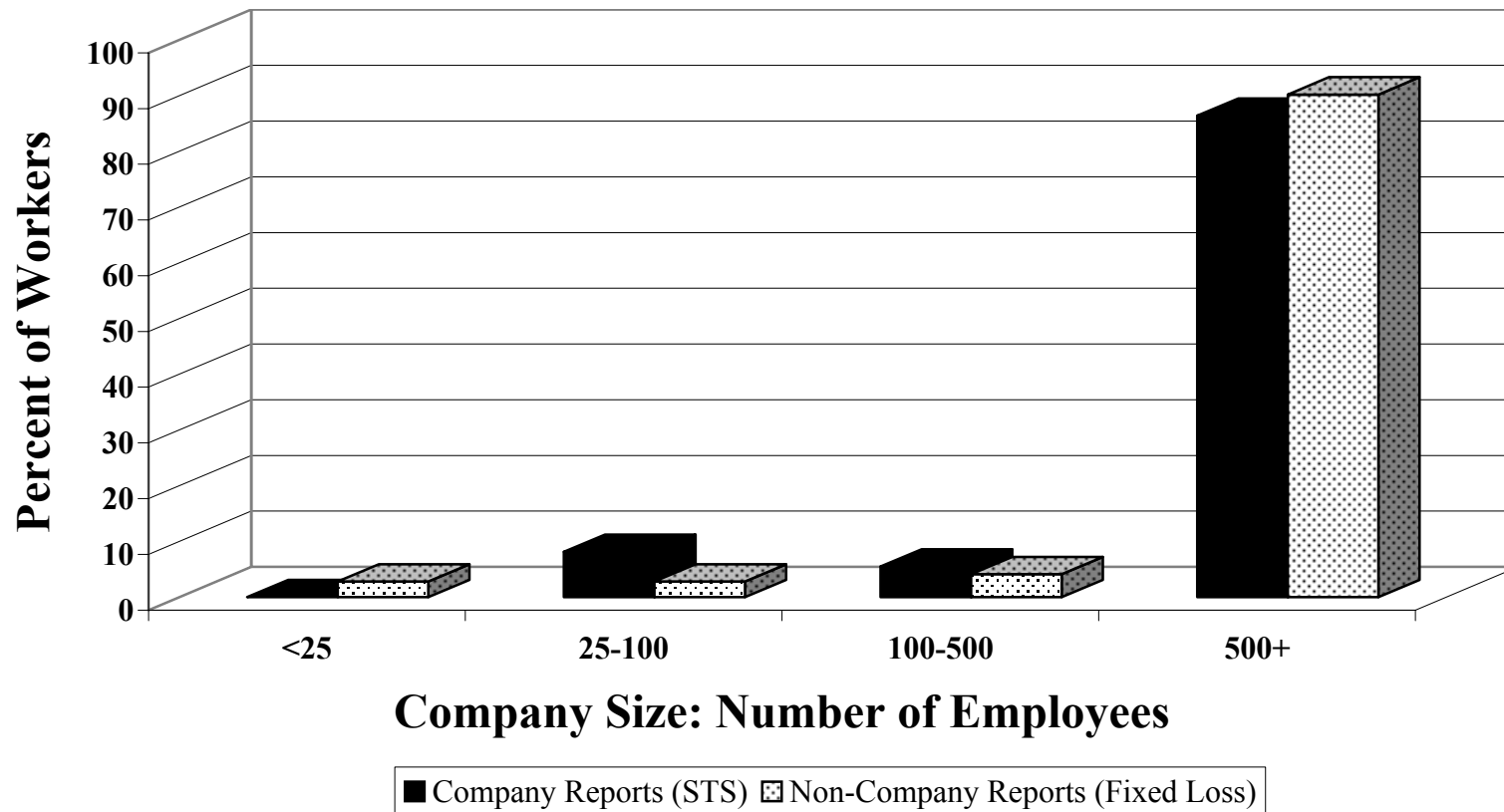
**Fixed Loss Reports.

Figure 3. All Individuals Reported with Noise-Induced Hearing Loss in 2003: Age Range* by Reporting Source



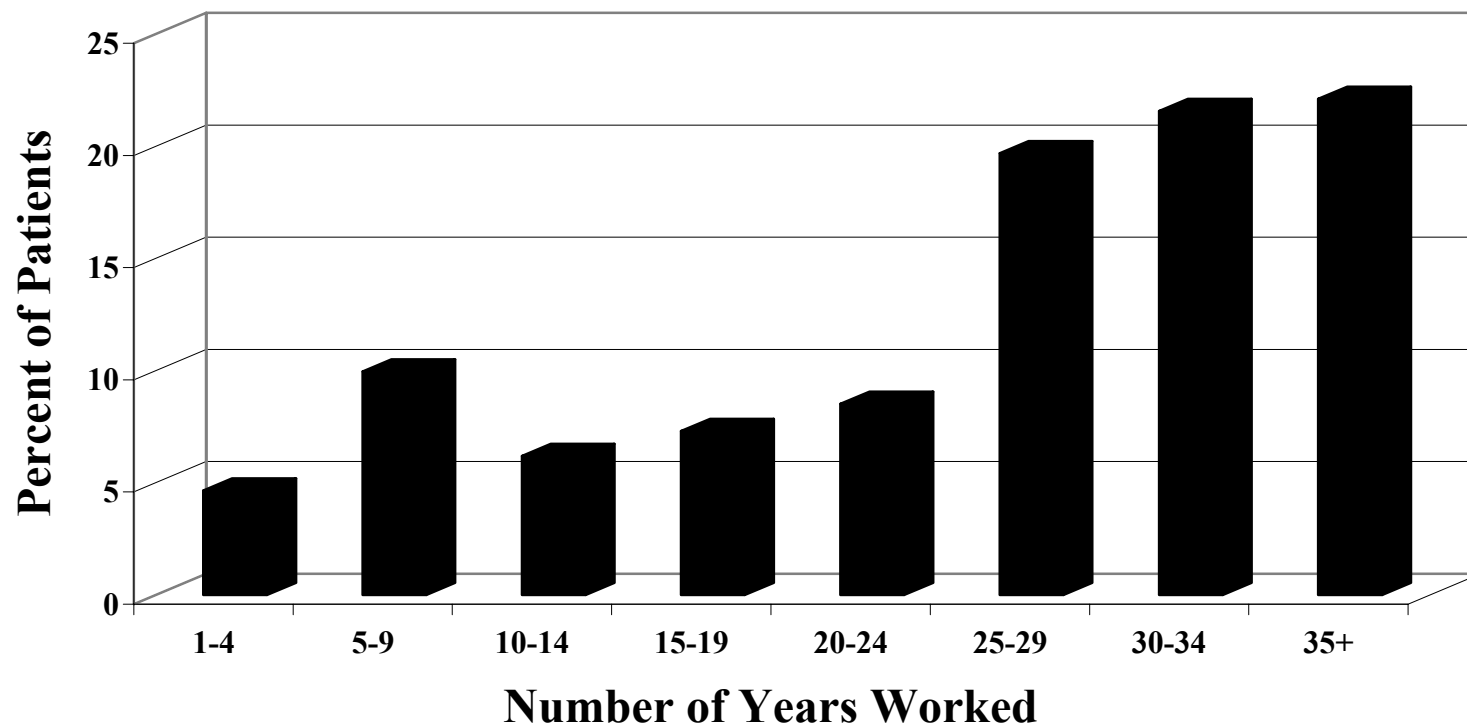
*Age was unknown for 4 individuals reported by company medical departments and 36 individuals reported by non-company hearing health professionals.

**Figure 4. All Individuals Reported with Noise-Induced Hearing Loss in 2003:
Number of Employees* at the Company Where Exposure to Noise Occurred**



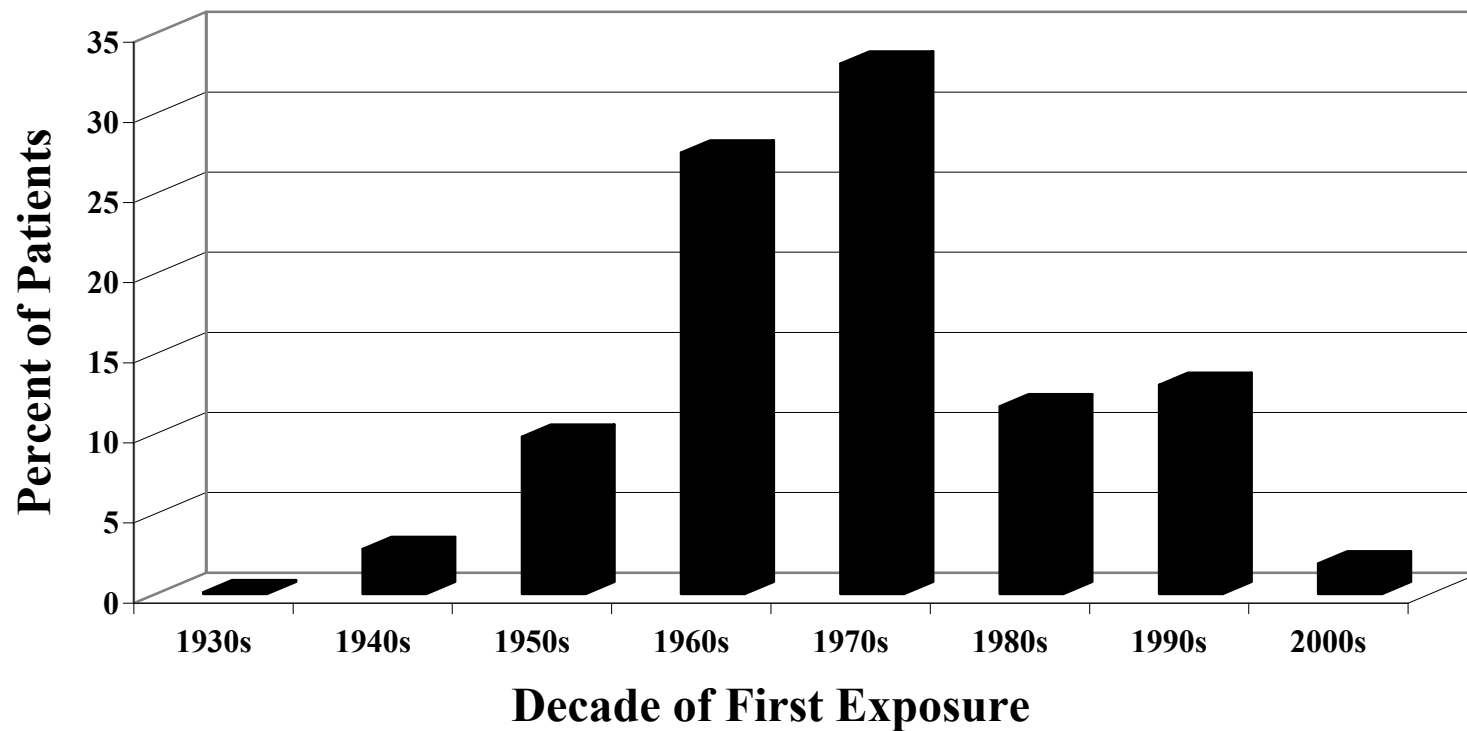
*Number of employees was unknown for 273 individuals reported by non-company hearing health professionals.

**Figure 5. All Interviewed Individuals with Hearing Loss:
Total Duration of Years Worked* in Noise, Michigan: 2003**



*Duration was unknown for 96 individuals identified in 2003.

**Figure 6. All Interviewed Individuals with Hearing Loss:
Distribution of Decade of First Exposure* to Noise, Michigan: 2003**



*Decade was unknown for 103 individuals identified in 2003.

Figure 7. Distribution of the Average of the Hearing Threshold Level (HTL) at 1000, 2000, 3000 Hz in Both Ears, for 884 individuals with Audiometric Testing Results, Michigan: 2003

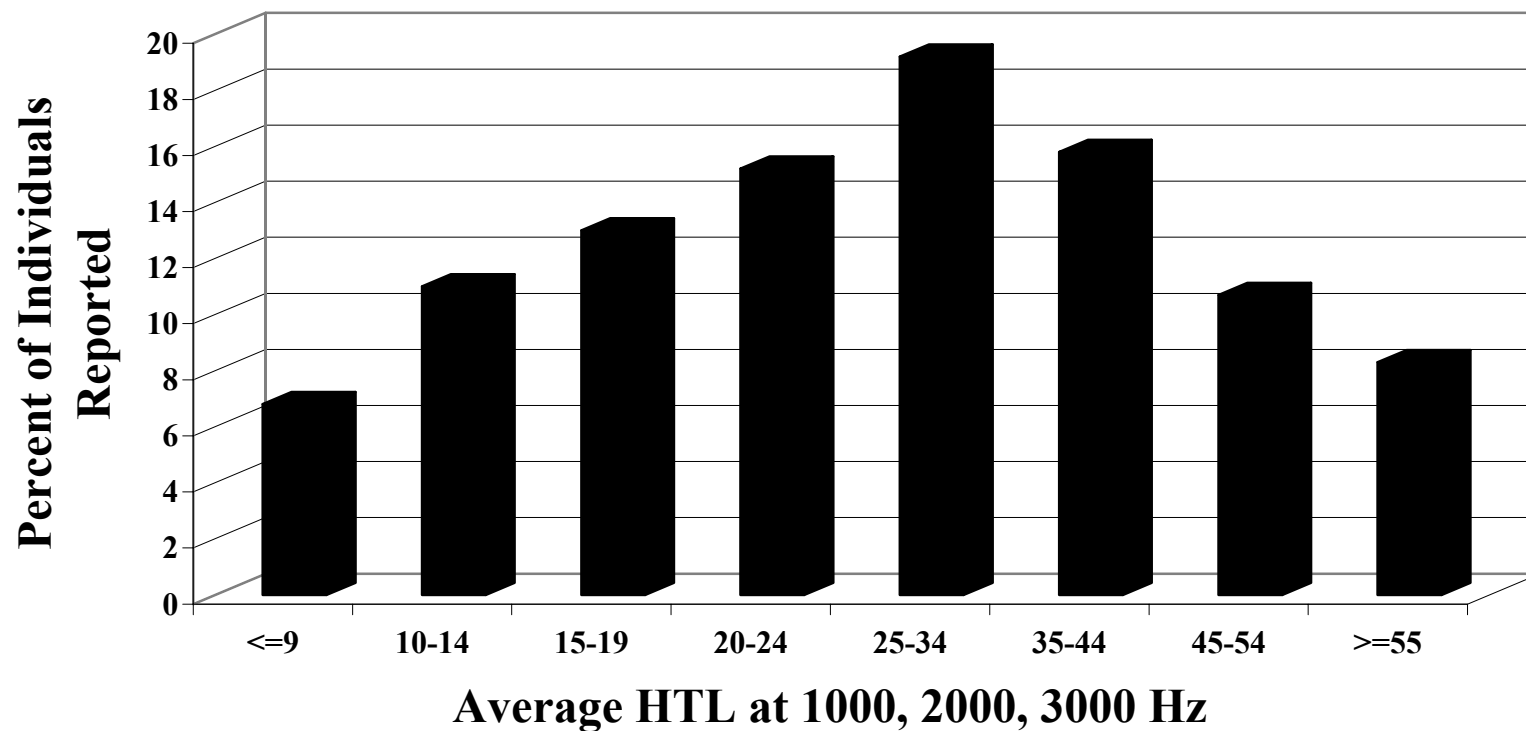


Figure 8. Average Hearing Threshold Levels at 250 to 8000 Hz by Years Worked in Noisy Environment (Worst Ear), Michigan: 2003

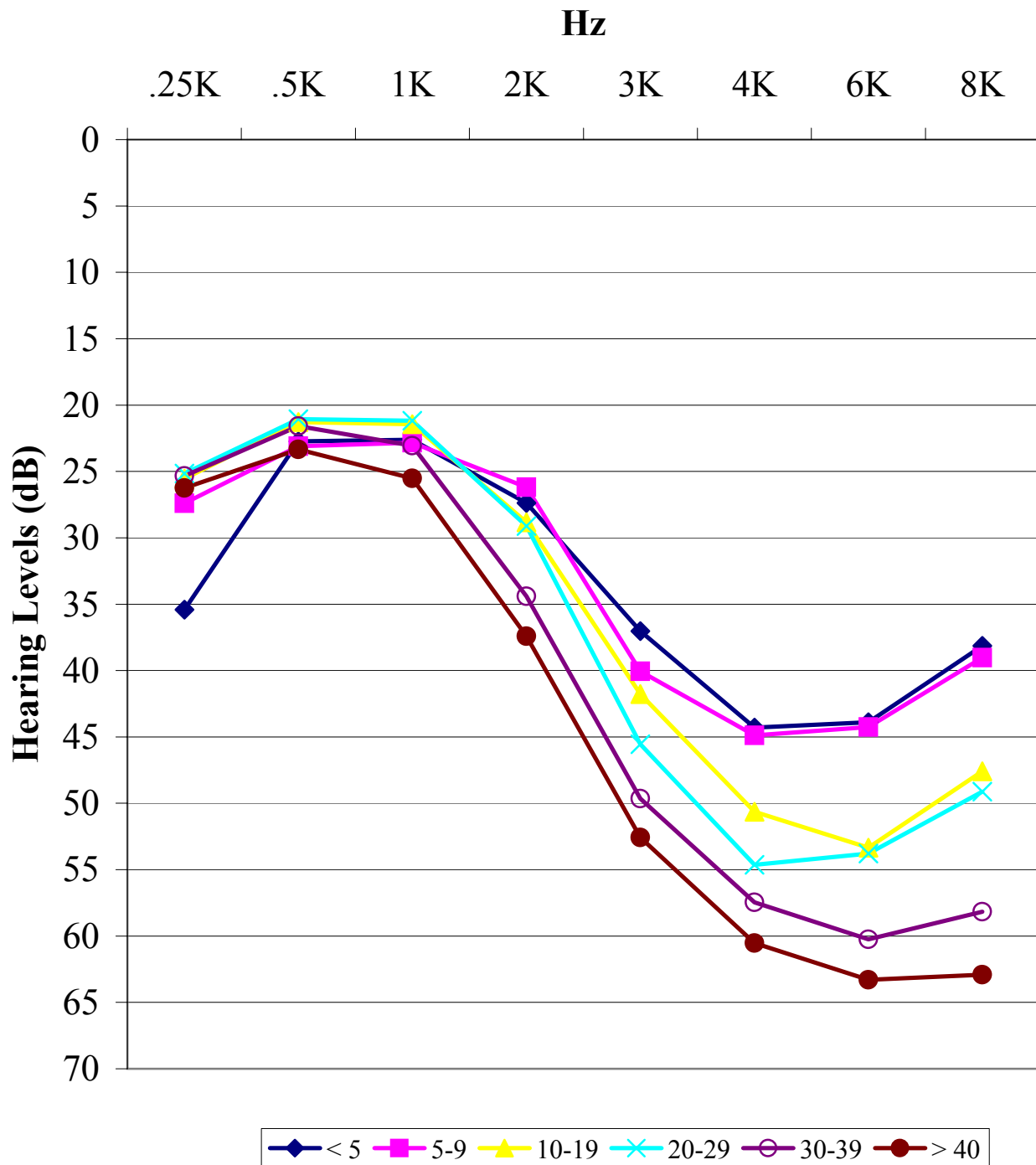


Figure 9. Average Hearing Threshold Levels at All Test Frequencies, Michigan: 2003

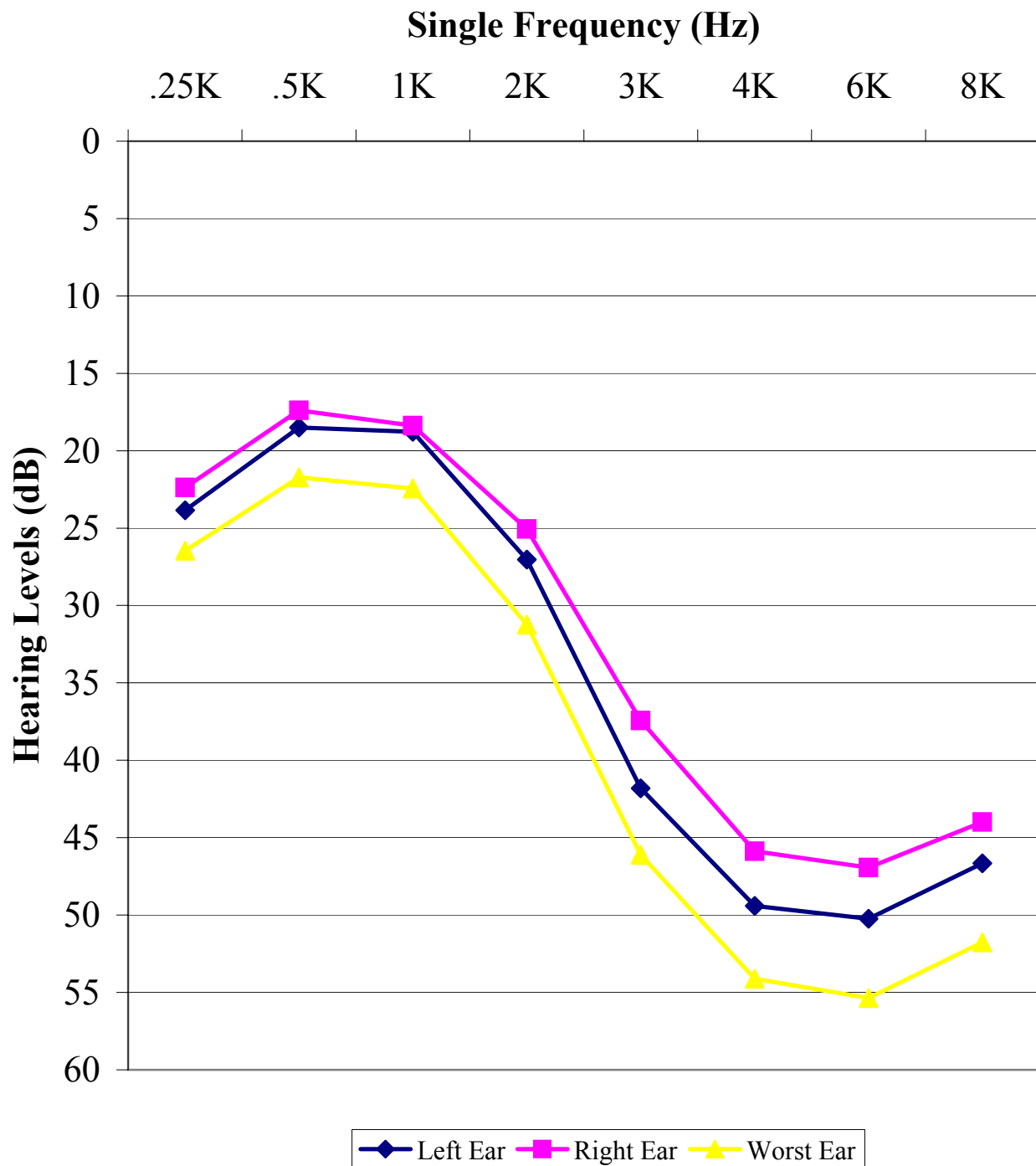


Table 1. Number of Non-Company Based Health Professionals Reporting Individuals with Noise-Induced Hearing Loss in Michigan, in Calendar Year 2003

Range of Individuals Reported	Health Professionals Number	Percent	Total Number of Individuals Reported
1	18	50.0	18
2-10	13	36.1	61
11-50	2	5.6	49
51+	3	8.3	391
TOTAL	36	100.0	519

Table 2. All Company and Non-Company Individuals with Noise-Induced Hearing Loss Reported in Calendar Year 2003: Number of Employees at the Company Where Exposure to Noise Occurred

Number of Employees	Total		STS**		Fixed Loss***	
	Number	Percent	Number	Percent	Number	Percent
<25	7	0.7	0	0.0	7	2.8
25-100	66	6.8	59	8.1	7	2.8
101-500	50	5.1	40	5.5	10	4.1
>500	849	87.3	627	86.4	222	90.2
TOTAL*	972	100.0	726	100.0	246	100.0

* Number of employees was unknown for 273 individuals reported by non-company hearing health professionals.

** STS=Standard Threshold Shift, reported by company.

*** Fixed=reported by audiologist/otolaryngologist in private practice.

**Table 3. Calendar Year 2003 Occupational Disease
Reports of Noise-Induced Hearing Loss:
Industry of Individuals Reported**

<u>Standard Industrial Classification (SIC)*</u>			STS***		Fixed Loss****	
	<u>Number of Individuals</u>	<u>Percent</u>	<u>Number of Individuals</u>	<u>Percent</u>	<u>Number of Individuals</u>	<u>Percent</u>
Agriculture/Forestry (01-08)	2	0.2	0	--	2	0.5
Construction (15-17)	58	5.1	0	--	58	13.8
Manufacturing (20-39)						
Textile Mill Products (22)	1	0.1	0	--	1	0.2
Furniture (25)	30	2.6	28	3.9	2	0.5
Paper (26)	3	0.3	0	--	3	0.7
Chemicals (28)	21	1.8	13	1.8	8	1.9
Petroleum Refining and Related Industries (29)	2	0.2	0	--	2	0.5
Rubber (30)	13	1.1	12	1.7	1	0.2
Stone/Clay/Glass (32)	1	0.1	0	--	1	0.2
Primary Metals (33)	79	6.9	18	2.5	61	14.6
Metal Fabrication (34)	215	18.8	206	28.5	9	2.1
Machinery (35)	5	0.4	1	0.1	4	1.0
Electronics (36)	22	1.9	22	3.0	0	--
Transportation (37)	515	45.1	345	47.7	170	40.6
Miscellaneous Mfg Industries (39)	14	1.2	2	0.3	12	2.9
Transport./Comm. Svcs. (40-49)	27	2.4	0	--	27	6.4
Retail Trade (50-59)	9	0.8	1	0.1	8	1.9
Finance, Insurance & Real Estate (60-67)	4	0.4	0	--	4	1.0
Services (70-89)						
Automotive Repair (75)	2	0.2	0	--	2	0.5
Recreation (79)	1	0.1	0	--	1	0.2
Health (80)	11	1.0	0	--	11	2.6
Education (82)	89	7.8	74	10.2	15	3.6
Engineering/Management (87)	2	0.2	0	--	2	0.5
Private Households (88)	1	0.1	0	--	1	0.2
Public Administration (91-97)						
Government (91)	4	0.4	0	--	4	1.0
Police (92)	5	0.4	1	0.1	4	1.0
Admin. Economic Programs (96)	3	0.3	0	--	3	0.7
National Security and International Affairs (97)	3	0.3	0	--	3	0.7
Total	1,142	100.0	723 **	100.0	419 **	100.0

*Standard Industrial Classification (1987 Manual).

**SIC was unknown for 3 individuals reported by company medical departments and 100 individuals reported by private practice health professionals.

***STS=Standard Threshold Shift, reported by company.

****Fixed=reported by audiologist/otolaryngologist in private practice.

**Table 4. Individuals with Hearing Loss: Type of Industry
Where Exposed to Noise: Michigan 2003**

<u>Standard Industrial Classification (SIC)*</u>	<u>Number of Reports by Industry</u>	<u>Percent</u>
Agricultural Production & Services (01-07)	11	0.9
Mining (10-14)	8	0.6
Construction (15-17)	93	7.5
Manufacturing (20-39)		
Food (20)	7	0.6
Wood (24)	3	0.2
Furniture (25)	14	1.1
Paper (26)	5	0.4
Printing (27)	2	0.2
Chemicals (28)	35	2.8
Petroleum Refining (29)	2	0.2
Rubber (30)	20	1.6
Stone/Clay/Glass (32)	5	0.4
Primary Metals (33)	125	10.1
Metal Fabrication (34)	127	10.2
Machinery (35)	28	2.3
Electronics (36)	22	1.8
Transportation (37)	527	42.5
Measuring Instruments (38)	1	0.1
Miscellaneous Mfg Industries (39)	18	1.5
Transportation/Communication Services (40-49)	37	3.0
Retail Trade (50-59)	32	2.6
Services (70-89)		
Personal Services (72)	1	0.1
Business (73)	3	0.2
Automotive Repair (75)	7	0.6
Repair (76)	3	0.2
Recreation (79)	7	0.6
Health (80)	5	0.4
Legal Services (81)	1	0.1
Education (82)	63	5.1
Social Services (83)	1	0.1
Public Administration (91-97)	27	2.2
Total	1,240 **	100.0

*Standard Industrial Classification (1987 Manual).

**SIC was unknown for 51 work locations from individuals identified in 2003.

**Table 5. All Interviewed Individuals with Hearing Loss:
Type of Industry and Performance of Regular Hearing
Testing at Most Recent Company Exposed to Noise:
Michigan 2003**

<u>Standard Industrial Classification (SIC)*</u>	<u>Number of Reports by Industry</u>	<u>Percent Have Hearing Testing</u>
Agricultural Production & Services (01-07)	5	25
Mining (10-14)	5	33
Construction (15-17)	53	3
Manufacturing (20-39)		
Food (20)	1	0
Wood (24)	2	50
Furniture (25)	13	91
Paper (26)	5	67
Printing (27)	1	0
Chemicals (28)	28	68
Petroleum Refining (29)	1	0
Rubber (30)	14	75
Stone/Clay/Glass (32)	4	67
Primary Metals (33)	107	65
Metal Fabrication (34)	106	88
Machinery (35)	12	11
Electronics (36)	22	83
Transportation (37)	446	85
Miscellaneous Mfg Industries (39)	8	25
Transportation/Communication Services (40-49)	21	46
Retail Trade (50-59)	14	14
Services (70-89)		
Business (73)	3	0
Automotive Repair (75)	1	0
Repair (76)	1	0
Recreation (79)	3	0
Health (80)	4	0
Legal Services (81)	1	0
Education (82)	61	47
Public Administration (91-97)	14	31
Total	956 **	68

*Standard Industrial Classification (1987 Manual).

**SIC was unknown for 44 work locations from individuals identified in 2003.

**Table 6. All Interviewed Individuals with
Hearing Loss: Number of Employees in Most
Recent Company Exposed to Noise by Status
of Hearing Testing: Michigan 2003**

Company Size: Number of Employees	Number of Reports by Size of Company	Have Hearing Testing Number	Percent
<25	32	3	11
25-100	34	9	36
101-500	33	16	64
>500	658	335	83
TOTAL	757 *	363	76

*This total excludes 209 individuals identified in 2003 with unknown number of employees and 278 individuals who we were unable to determine if they had been provided hearing testing while working.

Table 7. All Interviewed Individuals with Hearing Loss: Decade Last Worked and Status of Regular Hearing Testing at Most Recent Company Exposed to Noise, by Industry Type*: Michigan 2003

Industry Type (SIC)**	Decade Last Exposed to Noise and Hearing Testing Status													
	1940's		1950's		1960's		1970's		1980's		1990's		2000's	
	No. of Pts.	% Have RHT***	No. of Pts.	% Have RHT	No. of Pts.	% Have RHT	No. of Pts.	% Have RHT	No. of Pts.	% Have RHT	No. of Pts.	% Have RHT	No. of Pts.	% Have RHT
Agriculture/Forestry (01-08)	1	0	0	--	1	0	0	--	1	100	0	--	2	0
Mining (10-14)	0	--	0	--	0	--	0	--	2	0	1	0	2	100
Construction (15-17)	0	--	0	--	0	--	2	0	8	25	14	0	25	0
Manufacturing (20-39)	0	--	2	0	7	0	16	0	61	33	89	76	563	89
Transportation (40-49)	0	--	0	--	0	--	1	0	1	0	4	67	12	44
Trade (50-59)	0	--	0	--	0	--	0	--	1	0	0	--	7	17
Finance (60-67)	0	--	0	--	0	--	0	--	0	--	0	--	0	--
Services (70-89)	0	--	0	--	0	--	0	--	2	0	3	0	65	43
Public Administration (91-97)	0	--	0	--	0	--	0	--	0	--	4	50	9	22

*For 94 individuals, either industry type or decade last exposed to noise was unknown.

**Standard Industrial Classification (1987 Manual).

***Regular Hearing Test.

Table 8. All Interviewed Individuals with Hearing Loss: Decade Last Worked and Status of Hearing Protection at Most Recent Company Exposed to Noise, by Industry Type*: Michigan 2003

Industry Type (SIC)**	Decade Last Exposed to Noise and Offered Hearing Protection Device													
	1940's		1950's		1960's		1970's		1980's		1990's		2000's	
	No. of Pts.	% Have HPD***	No. of Pts.	% Have HPD	No. of Pts.	% Have HPD	No. of Pts.	% Have HPD	No. of Pts.	% Have HPD	No. of Pts.	% Have HPD	No. of Pts.	% Have HPD
Agriculture/Forestry (01-08)	1	100	0	--	1	--	0	--	1	0	0	--	2	0
Mining (10-14)	0	--	0	--	0	--	0	--	2	100	1	0	2	100
Construction (15-17)	0	--	0	--	0	--	2	0	8	25	14	36	25	63
Manufacturing (20-39)	0	--	2	0	7	40	16	43	61	57	89	93	563	97
Transportation (40-49)	0	--	0	--	0	--	1	0	1	0	4	100	12	63
Trade (50-59)	0	--	0	--	0	--	0	--	1	0	0	--	7	33
Finance (60-67)	0	--	0	--	0	--	0	--	0	--	0	--	0	--
Services (70-89)	0	--	0	--	0	--	0	--	2	50	3	50	65	84
Public Administration (91-97)	0	--	0	--	0	--	0	--	0	--	4	75	9	44

*For 94 individuals, either industry type or decade last exposed to noise was unknown.

**Standard Industrial Classification (1987 Manual).

***Hearing Protection Device (ear plugs or muffs).

**Table 9. All Interviewed Individuals with Hearing Loss:
Decade Last Worked and Status of Regular Hearing
Testing at Most Recent Company Exposed to Noise, by
Industry Size*: Michigan 2003**

Decade	Company Size (Number of Employees)							
	<25		25-100		101-500		>500	
	Number of Patients	% Have RHT**	Number of Patients	% Have RHT	Number of Patients	% Have RHT	Number of Patients	% Have RHT
1940's	1	0	0	--	0	--	0	--
1950's	0	--	0	--	0	--	2	0
1960's	0	--	1	0	1	0	4	0
1970's	1	0	1	0	2	0	10	0
1980's	3	33	3	0	3	0	27	48
1990's	8	0	3	100	5	80	60	81
2000's	17	13	22	35	19	92	536	88

*For 271 individuals, either company size or decade last exposed to noise was unknown.

**Regular Hearing Test.

Table 10. All Interviewed Individuals with Hearing Loss: Provision of Regular Hearing Testing, Hearing Protection, Year Began Using Hearing Protection and Occurrence of Work Injuries by Self Report of Noise: Michigan 2003

	Noisy All the Time		Noisy Most of Time		Noisy Sometimes		Noisy Seldom		Noisy Rarely/Never	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Regular Hearing Testing	337	63.1	50	49.5	61	40.1	15	48.4	4	26.7
Hearing Protection	448	81.5	79	76.0	107	65.2	25	65.8	7	29.2
Avg Year Began Use	351	1986	54	1988	75	1987	12	1992	5	1981
Work Injuries	242	44.6	40	38.1	42	26.3	7	17.9	3	13.0

**Table 11. All Interviewed Individuals with Hearing Loss:
Bothered by Ringing, Roaring or Buzzing: Michigan 2003**

	Number	Percent
No	336	53.8
Yes	288	46.2
Daily Symptoms	153	(54.4)
Weekly Symptoms	59	(21.0)
Monthly Symptoms	39	(13.9)
Seldom Symptoms	30	(10.7)

**Table 12. All Interviewed Individuals with Hearing Loss:
Non-Work Noise Exposures: Michigan 2003**

	Yes		Hearing Protection Always or Usually		Average Year Began	
	Number	Percent	Number	Percent	Always or Usually	
Hunting	258	41.2	51	20.2	45	1979
Target Shooting	139	22.2	117	84.8	99	1981
Snowmobiling	86	13.8	19	22.1	11	1974
Power Tools	144	23.0	64	44.8	59	1986
Chain Saw	138	22.1	73	53.7	58	1988
Loud Music	85	13.6	1	1.2	1	1993
Motor Boat/Jet Ski	76	12.1	3	4.1	2	1984
Lawn Work	430	68.7	109	25.6	100	1991
Other	97	15.7	32	33.3	28	1985
Any	520	83.1	266	51.2	234	1984

**Table 13. All Interviewed Individuals with Hearing Loss:
Meet NIOSH's Criteria of "Material Hearing
Impairment": Michigan 2003**

	Average 1000, 2000 and 3000 Hertz			
	< 25 dB		≥ 25 dB	
	Number	Percent	Number	Percent
<i>Gender</i>				
Male	365	89.9 **	451	94.4 **
Female	41	10.1	27	5.6
<i>Race</i>				
White	246	83.4	319	83.9
African American	37	12.5	42	11.1
Asian/Pacific Islander	1	0.3	1	0.3
White Hispanic	8	2.7	11	2.9
Alaskan/American Indian	0	0.0	2	0.5
Other Hispanic	1	0.3	0	0.0
Other	2	0.7	5	1.3
<i>Age (Years)</i>	49.6 **		59.7 **	
<i>Standard Industrial Classification (SIC)*</i>				
Agriculture, Forestry and Fishing (01-09)	2	0.5	4	0.9
Mining (10-14)	2	0.5	3	0.7
Construction (15-17)	16	4.0	39	8.7
Manufacturing (20-39)	314	79.3	357	79.9
Transport./Comm. Svcs. (40-49)	7	1.8	8	1.8
Wholesale Trade (50-51)	3	0.8	1	0.2
Retail Trade (52-59)	6	1.5	8	1.8
Services (70-89)	35	8.8	20	4.5
Public Administration (91-97)	11	2.8	7	1.6

*Standard Industrial Classification (1987 Manual).

**p < 0.05

Table 14. One Hundred Eighteen Companies Inspected Where Individuals Reported They Had Not Received Audiometric Testing: Michigan 1992-2003

Industry (SIC)*	Total Inspections		Hearing Conservation Program (HCP) Required		<u>Citation Issued</u>				<u>Total Number of Employees Exposed to Noise</u>	
					HCP Deficient		HCP Absent		HCP Deficient	HCP Absent
	#	%	#	%	#	%	#	%	#	#
Agricultural Services (07)	1	(0.8)	1	(100.0)	0	--	0	--	--	--
Construction (15-17)	2	(1.7)	***	--	0	--	1	(50.0)	--	562
Manufacturing (20-39)	87	(73.7)	52	(59.8)	24	(46.2)	15	(28.8)	3,251	1,492
Transportation (40-49)	3	(2.5)	0	--	0	--	0	--	--	--
Trade (50-59)	8	(6.8)	1	(14.3)	0	--	1	(100.0)	--	14
Services (70-89)	11	(9.3)	5	(55.6)	0	--	3	(60.0)	--	40
Government (91-97)	6	(5.1)	4	(66.7)	3	(75.0)	0	--	708****	--
TOTAL	118	(99.9)**	63	(53.4)	27	(22.8)	20	(16.9)	3,959	2,108

* Standard Industrial Classification (1987 Manual).

** Percentage does not add to 100% due to rounding.

*** Construction has separate regulations that require a less comprehensive program.

**** Number employees unknown for 1 company.

Table 15. Size of Companies Cited for Violations of the Noise Standard in Michigan: MIOSHA Inspections Conducted 01/01/2003 to 12/31/2003

Number of Employees	Companies	
	Number	Percent
≤ 50	48	44.0
51 - 250	50	45.9
251+	11	10.1
TOTAL	109	100.0

**Table 16. Violations of the Noise Standard in Michigan:
MIOSHA Inspections Conducted 01/01/2003 to 12/31/2003**

Standard Violated (Part 380. Occupational Noise Exposure)	Number of Citations	Companies Cited for Standard	
		Percent*	Percent**
Hearing conservation program (R325.60107)	63	31.7	57.8
Employee training program (R325.60123)	23	11.6	21.1
Permissible noise exposure; noise controls (R325.60104)	18	9.0	16.5
Annual audiogram (R325.60114)	17	8.5	15.6
Noise monitoring program (R325.60108)	16	8.0	14.7
Access to information and training materials (R325.60124)	16	8.0	14.7
Follow-up procedures (R325.60116)	14	7.0	12.8
Baseline audiogram (R325.60113)	12	6.0	11.0
Audiometric testing program (R325.60112)	8	4.0	7.3
Impact or impulse noise (R325.60106)	3	1.5	2.8
Evaluation of audiogram (R325.60115)	3	1.5	2.8
Hearing protectors (R325.60121)	3	1.5	2.8
Protection from noise exposure (R325.60103)	1	0.5	0.9
Determination of permitted daily exposure time (R325.60105)	1	0.5	0.9
Recordkeeping (R325.60125)	1	0.5	0.9
Total	199	100.0	

*Percentages based on a total of 199 violations.

**A company may be cited for more than one type of violation, therefore these percentages are based on a total of 109 companies cited.

Table 17. Type of Industry Cited for Violations of the Noise Standard in Michigan: MIOSHA Inspections Conducted 01/01/2003 to 12/31/2003

Standard Industrial Classification (SIC)*	Companies	
	Number	Percent
<i>Manufacture of (20-39):</i>		
Fabricated Metal Products (34)	56	51.4
Lumber (24)	14	12.8
Primary Metal (33)	7	6.4
Industrial and Commercial Machinery (35)	6	5.5
Transportation Equipment (37)	6	5.5
Rubber/Plastics (30)	6	5.5
Stone/Clay/Glass (32)	3	2.8
Furniture (25)	2	1.8
Chemicals (28)	2	1.8
Measuring Instruments (38)	1	0.9
<i>Transport./Comm. Services (40-49)</i>	2	1.8
<i>Retail Trade (50-59)</i>	1	0.9
<i>Services (70-89):</i>		
Automotive Repair (75)	1	0.9
Repair (76)	1	0.9
<i>Nonclassifiable Establishment (99)</i>	1	0.9
TOTAL	109	100.0

*Standard Industrial Classification (1987 Manual).

Table 18. Estimates of the Number of Blue-Collar Workers in Michigan Exposed to Excessive Levels of Noise, by Industry Type

Industry (SIC)*	Total No. of Workers**	% Exposed to Noise***	No. Workers Noise-Exposed
MINING			
Oil and Gas Extraction (13)	1,600	23.1	370
CONSTRUCTION			
General Building Contractors (15)	31,000	15.8	4,898
Heavy Construction (16)	15,600	24.0	3,744
Special Trade Contractors (17)	108,600	15.6	16,942
MANUFACTURING			
Food and Kindred Products (20)	26,900	28.9	7,774
Textile Mill Products (22)	1,000	42.6	426
Apparel and Other Textiles (23)	15,100	13.9	2,099
Lumber and Wood Products (24)	13,400	41.3	5,534
Furniture and Fixtures (25)	28,200	28.3	7,981
Paper and Allied Products (26)	13,900	33.8	4,698
Printing and Publishing (27)	22,800	21.4	4,879
Chemicals and Allied Products (28)	20,100	17.3	3,477
Petroleum and Coal Products (29)	800	19.9	159
Rubber and Plastics (30)	43,200	22.8	9,850
Leather (31)	3,000	6.5	195
Stone, Clay and Glass (32)	14,200	21.5	3,053
Primary Metals (33)	28,100	32.7	9,189
Fabricated Metals (34)	96,000	29.3	28,128
Industrial Machinery (35)	80,700	14.9	12,024
Electronic Equipment (36)	25,600	8.1	2,074
Transportation Equipment (37)	188,300	18.2	34,271
Instruments and Related (38)	9,400	8.7	818
Miscellaneous Manufacturing (39)	5,200	9.4	489
TRANSPORTATION			
Freight (42)	41,500	7.0	2,905
TRADE			
Wholesale Durable Goods (50)	113,200	20.9	23,659
Wholesale Nondurable Goods (51)	57,100	5.3	3,026
Retail (55)	71,900	1.4	1,007
SERVICES			
Business (73)	278,800	1.5	4,182
Automotive Repair and Parking (75)	33,900	10.6	3,593
Health Services (80)	324,700	0.6	1,948

*Standard Industrial Classification (1987 Manual).

**Source: Bureau of Labor Statistics, Michigan Employment Security Commission, Current Employment Statistics. 2001 Annual Report of Michigan Production/NonSupervisory Workers.

***Source: National Institute for Occupational Safety and Health, Criteria for a Recommended Standard, Occupational Noise Exposure Revised Criteria 1998. June 1998, DHHS (NIOSH) Publication No. 98-126, Table 2-1. Percentages are estimates based on data collected in the National Occupational Exposure Survey (NOES). Excessive noise is defined as at or above 85dBA.