2002

Annual Report on Occupational Noise-Induced Hearing Loss in Michigan

2002 Annual Report on Occupational Noise Induced Hearing Loss in Michigan

A Joint Report
of the
Michigan State University
Department of Medicine
117 West Fee Hall
East Lansing, Michigan 48824-1315
(517) 353-1846

Kenneth D. Rosenman, M.D., Professor of Medicine
Mary Jo Reilly, M.S., Epidemiologist
Amy Sims, B.S., NIHL Program Coordinator

and

The Michigan Department
of Consumer and Industry Services
Occupational Health Division
P.O. Box 30649
Lansing, Michigan 48909-8149
(517) 322-1608

Byron Panasuk, CIH
Industrial Hygienist Specialist
Douglas J. Kalinowski, MS, CIH,
Director
Bureau of Safety and Regulation

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Summary:

This is the ninth annual report on occupational noise-induced hearing loss (NIHL) in Michigan. Over 1,100 new people were reported in the year 2002 to the Michigan Department of Consumer and Industry Services (MDCIS) with hearing loss known or suspected to be caused by noise at work. There were approximately 770 less reports this past year from audiologists and otolaryngologists in private practice compared to the reports received in calendar year 2001 and 150 fewer reports from company medical departments.

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

Forty-four of the 109 (40.4%) companies identified by and 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 11). Eight of these 109 inspections were conducted in the year 2002 as part of the occupational NIHL surveillance program.

There were 722 workplace inspections identified in the Integrated Management Information System (IMIS) which were conducted by the Occupational Health Division of the Michigan Department of Consumer and Industry Services in the calendar year 2002 that were not initiated because of the noise-induced hearing loss surveillance system; 69 of those 722 companies inspected in the year 2002 were in violation of some portion of the noise standard. Thirty-six of these 69 companies were cited for having the complete absence of a hearing conservation program. It is important to recognize, however, that the majority of the 722 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.

The data in this report indicates that there are both small and large companies that do not have hearing conservation programs despite a need for them. Follow-up of reports from non-company audiologists and otolaryngologists shows that fifty percent of the companies where patients with work related noise-induced hearing loss have worked did not have a hearing conservation program at the time the employee worked at the company.

Patients exposed to noise in construction were almost never provided hearing testing (93%), although 46% of them were given hearing protection such as plugs or muffs. Workers exposed to noise in construction in more recent decades were more likely to be given hearing protection than workers exposed to noise before the 1980's. There was no improvement in the percentage provided hearing tests. Eight percent of construction workers with noise-induced hearing loss who had no other types of job exposures to noise were exposed to construction-related noise for five or fewer years.

Noise-induced hearing loss is an insidious condition which may take years to develop to a stage where it affects an individual's ability to communicate at home and in the work place. Reduction of occurance of noise-induced hearing loss is one of the strategic goals of MDCIS. MDCIS

plans to continues its initiative to increase inspections in various industry categories likely to have noise exposure. In the year 2003, we plan to initiate interviews of individuals reported with standard threshold shifts in order to assess the effectiveness of existing hearing conservation programs. 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.

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 dBA. 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 Consumer and Industry Services' surveillance program for occupational noise-induced hearing loss (NIHL), 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 Consumer and Industry Services (MDCIS) with financial assistance from the National Institute for Occupational Safety and Health (NIOSH) initiated a special emphasis program for 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 MDCIS 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 patients 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 Consumer and Industry Services.

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).

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

Those reported with a fixed 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 patients with a fixed loss who are reported by private-practice audiologists and otolaryngologists are administered a brief questionnaire about the history of their exposures to noise. The questionnaire asks about the three most recent companies where the patient was exposed to noise; non-work exposures are not detailed, since the health professional who originally reported the individual already made a professional judgment that noise exposures at work contributed at least in part to the patient's hearing loss.

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 recently been inspected 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 ninth annual report are presented in the following order: a description of all of the occupational disease reports submitted to the MDCIS for NIHL in the year 2002; results of

interviews of patients with fixed loss identified through Project SENSOR and reported by non company audiologists and otolaryngologists from 1992-2002; and, a summary of the MIOSHA inspections not conducted as part of project SENSOR from 01/01/2002-12/31/2002 where violations of the noise standard were found.

2002 Occupational Disease Reports for NIHL

Figure 2 shows the number of reports of hearing loss since 1985. Approximately 7.9% of all occupational disease reports submitted to the Michigan Department of Consumer and Industry Services 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 2002, there were 1,179 reports of work-related hearing loss submitted to the Michigan Department of Consumer and Industry Services. Of the 1,179 reports submitted in the year 2002, 720 were submitted by company medical departments. The other 459 reports were submitted by private-practice audiologists and otolaryngologists. Table 1 shows the number of patients with a fixed hearing loss reported by the private-practice health professionals.

Patient Demographics

Ninety percent (1,057/1,179) of the reports where gender was listed are for men. Although requested, information on race was missing for 741/1,179 (63%) of the reports. Of the individuals for whom race was known, 87.9% were white, 8.2% were African American, 2.5% were Hispanic and 1.4% 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 52 years, ranging from 17 to 89 years. Patients reported by companies were generally younger than patients reported by non-company audiologists and otolaryngologists (average age 47 and 59 years, respectively). Approximately 82% of the individuals reported by company medical departments were between 30 and 59 years of age compared to 48% of non-company health professionals in the same age range (Figure 3). Some of the reports by non-company audiologists and otolaryngologists were of 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 patients were exposed to noise. Most of the reports were for large companies employing 500 or more individuals, although the non-company health professionals reported more patients from smaller companies. Table 3 is a distribution of industry type of the patients reported. Most of the reports were for patients working in manufacturing facilities. This corresponds to companies which are more likely to have hearing conservation programs. However, the non-company health professionals reported more individuals from other types of industries, including construction (11.2%), services (9.2%), transportation and communication services (5.2%), trade (3.6%), government (2.3%), and agriculture (0.8%) than the company or contract medical departments. Companies report patients with NIHL as part of their hearing conservation program (HCP). In contrast, the patients reported by non-company hearing health professionals would not necessarily be working at a company with a HCP.

Patients with a Fixed Loss, Reported by Non-Company Audiologists and Otolaryngologists from 1992-2002

A total of 4,197 of 5,749 (73%) patients reported by non-company audiologists and otolaryngologists between 1992 and 2002 have been interviewed. The interviews ask about the three most recent jobs where a person was exposed to noise. Another 877 (15%) we did not interview but were able to identify the facility where they were exposed to noise. The data on the following pages in the Patient Demographics and Industry sections are from these individuals reported between 1992-2002.

Patient Demographics

Ninety-four percent of the interviewed patients reported from 1992-2002 were men. Of the interviewed patients reported from 1992-2002, 85.3% were white, 12.2% were African American, 1.6% were Hispanic, 0.1% were Asian and 0.8% were other. Race was unknown for 334 individuals. Figure 5 shows the distribution of decade of birth for the patients reported. Over 89% of the patients reported were born between 1920 and 1959, and includes retirees with hearing loss unlike the reports from companies which only include actively working individuals.

Industry

Table 4 shows all the industries where the patients with fixed hearing loss were ever exposed to noise, for the period during which surveillance has been conducted (1992-2002). Overall, 60% of the 6,334 types of industries where the 5,074 patients ever worked were in the manufacturing industry. The 6,334 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 patients 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 50% within industry types. Thirty percent of the most recent companies where the patients were exposed to noise regularly tested their employees' hearing. The number of industries identified 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 the number of employees working in companies where the interviewed patients were exposed to noise. Workers were exposed to noise in both small and large companies, with typically less than 50% of workers reporting having received regular hearing tests, especially in the smaller companies. The number of 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 patients worked in noise for a variety of durations, ranging from less than 5 years to greater than 35 years (Figure 6).

Figure 7 shows the decade of the patients' first exposure to noise. Some patients had very early exposures to noise; however, a greater percentage of patients had their first exposure to noise in the 1960's and later.

Table 7 shows the decade when the interviewed patients with fixed 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 1930's and 90% of workers given hearing protection in the 2000's. Workers in agriculture had the lowest percentage provided with hearing protection.

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

Table 10 provides a distribution of hearing testing status for interviewed patients reported by non-company health professionals. Twenty-seven percent of the most recent companies where the patients reported by non-company audiologists or otolaryngologists were exposed to noise had both baseline and regular hearing testing; 50% had neither.

Inspections

In response to the reports of hearing loss identified through the Project SENSOR Surveillance program, inspections were conducted at 109 companies where the person reported they had never received audiometric testing within the last five years. Of the 109 companies, 58 (53.2%) were required to have a hearing conservation program (HCP) because they had noise levels at or above 85 dBA. Of those 58 companies, 44 (75.9%) had either no HCP or a deficient HCP. Forty-seven of the 58 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-one of the 109 companies were not required to have a HCP because noise levels were below 85dBA. Table 11 lists the characteristics of the 109 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 2002, 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 722 inspections conducted in the year 2002, 69 facilities received a citation for a violation of the noise standard. These facilities were generally small. However, 7 (10.1%) of the facilities had more than 250 employees (Table 12). In contrast 23% of the 44 companies from Table 11 that were inspected in response to hearing loss and received a citation for a violation of the noise standard had more than 250 employees. Thirty-six (52.2%) 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 13). The manufacture of fabricated metal products, industrial and commercial machinery, and transportation equipment were the most common types of companies cited (Table 14).

Noise in Construction

Of the 5,074 interviewed patients with a fixed loss reported to the State of Michigan from 1992-2002, 688 (13.6%) had at least part of their exposure to noise in construction jobs. The following discussion and associated tables presents the details of those construction-related noise exposures. The hearing loss patients exposed to noise in construction were mostly white males, born in the 1930's-1950's. Table 15 presents the demographic characteristics of these 688 patients.

At the most recent construction job where these 688 individuals were exposed to noise, approximately 93% had no regular hearing testing performed at their job (Table 16); however, approximately 46% of these individuals were given hearing protection (plugs or muffs). Table 17 presents the decade of most recent noise in construction exposures for these individuals, as well as the status of regular hearing testing and access to hearing protection. The majority of noise exposures in construction for these individuals were recent; 23% of the 521 individuals with known decade of exposure occurred in the 1980's, 44% of the most recent noise exposures in construction occurred in the 1990's, and 19% of the most recent noise exposures occurred in the years 2000-2002. The percentages of individuals given regular hearing tests over time did not improve. However, the percentage of individuals given hearing protection over time did improve in the most recent decades. Some of these individuals had a relatively short duration of exposure to noise (Table 18), for example with almost 8% of these individuals working for 5 or fewer years.

Discussion:

This is the ninth annual report of occupational noise-induced hearing loss in Michigan. There were 1,179 reports of hearing loss submitted to the Michigan Department of Consumer and Industry Services in the year 2002. The decrease number of reports in 2002 from the 2,099 reports of hearing loss in 2001 can be attributed to two non-company providers having

appreciably fewer reports in 2002. 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 2002 from only 5 of the 85 estimated group practices in the state, and 24 of the 490 practitioners not known to be associated with a group practice.

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, 1996). Table 19 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 in their 30's to 60's, who work in large manufacturing companies. Follow-up of reports from non-company audiologists and otolaryngologists shows that 27% of noisy companies where the patients 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).

Approximately 13% of the patients that have been identified and interviewed were exposed to noise in construction. Yet construction workers are minimally covered for noise exposures by MIOSHA and OSHA laws. Interviews of these individuals reveals that almost none were given regular hearing testing, even in the more recent decades of exposures. However, nearly half of these workers were provided hearing protection with the percentage of workers given earplugs or muffs much greater in the 1980's and 1990's than before those decades. The lack of coverage for this group of workers potentially exposed to excessive levels of noise in their jobs highlights an industry that is not adequately covered by noise exposure laws and is not voluntarily providing audiometric testing to its workers. The worker using a jackhammer, which can produce noise levels of 90-130 decibels, is not required to be enrolled in a hearing conservation program that includes annual audiometric testing. The federal OSHA program has indicated its intention to initiate rule-making to address these deficiencies but no such rules were forth coming this past year.

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 6,035 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 initial follow-up inspections indicate the program has a high rate of success in identifying companies which although legally required to have a hearing conservation program are not in compliance with the law (Table 11).

The Michigan Department of Consumer and Industry Services has been focusing on hearing loss for ten 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 June, 2000, the Michigan Department of Consumer and Industry Services, Bureau of Safety and Regulation Occupational Health Division initiated an Occupational Noise Exposure Local Emphasis Program (LEP) to comply with one of MIOSHA's Strategic Planning Goals: 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 number of reports of STS from company medical departments decreased by 146 from calendar year 2001. New changes in reporting requirements beginning January 1, 2003 mean that individuals reported with standard threshold shifts will also have significant fixed loss (25 dB or greater). We have begun interviewing these individuals in 2003 to better understand why individuals in hearing conservation programs are still developing hearing loss.

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, and then decreased in 2002. 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. The State will continue to encourage practitioners to report their patients who have work-related noise-induced hearing loss.

References:

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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.

Michigan Department of Consumer and Industry Services — Occupational Health 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: ◯ White ◯ Black ◯ Hispanic ◯ 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 ◯ < 25 ◯ 25-100 ◯ 100-500 ◯ > 500			
Employee's Work Unit/Department	Dates of Employment From:_____ Mo Day Year To:_____ 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 ◯ No ◯ — 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?
If yes, record information below. Yes ◯ No ◯ Don't Know ◯

Physician's Name	Phone		
Office Address	City	State	Zip
Name of Person Submitting Report	Physician ◯ Non-Physician ◯		
Address	City	State	Zip
Signature	Phone		Date

The Michigan Department of Consumer and Industry Services is an equal opportunity, affirmative action employer, service provider and buyer.

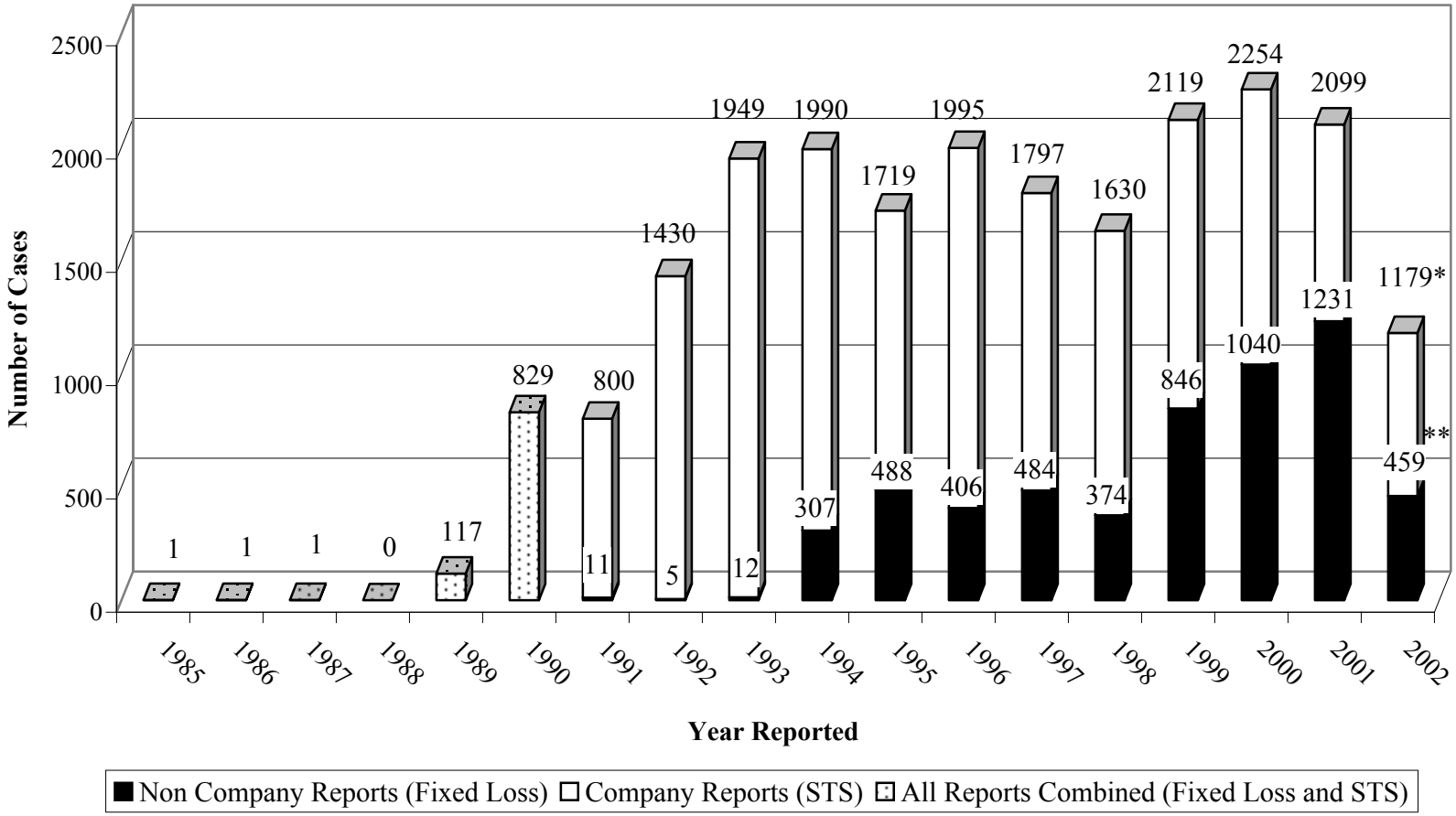
Return completed form to:

Michigan Department of Consumer and Industry Services
Occupational Health Division
Bureau of Safety and Regulation
7150 Harris Drive, P.O. Box 30649
Lansing, MI 48909-8149

OH - 51 (02/02)

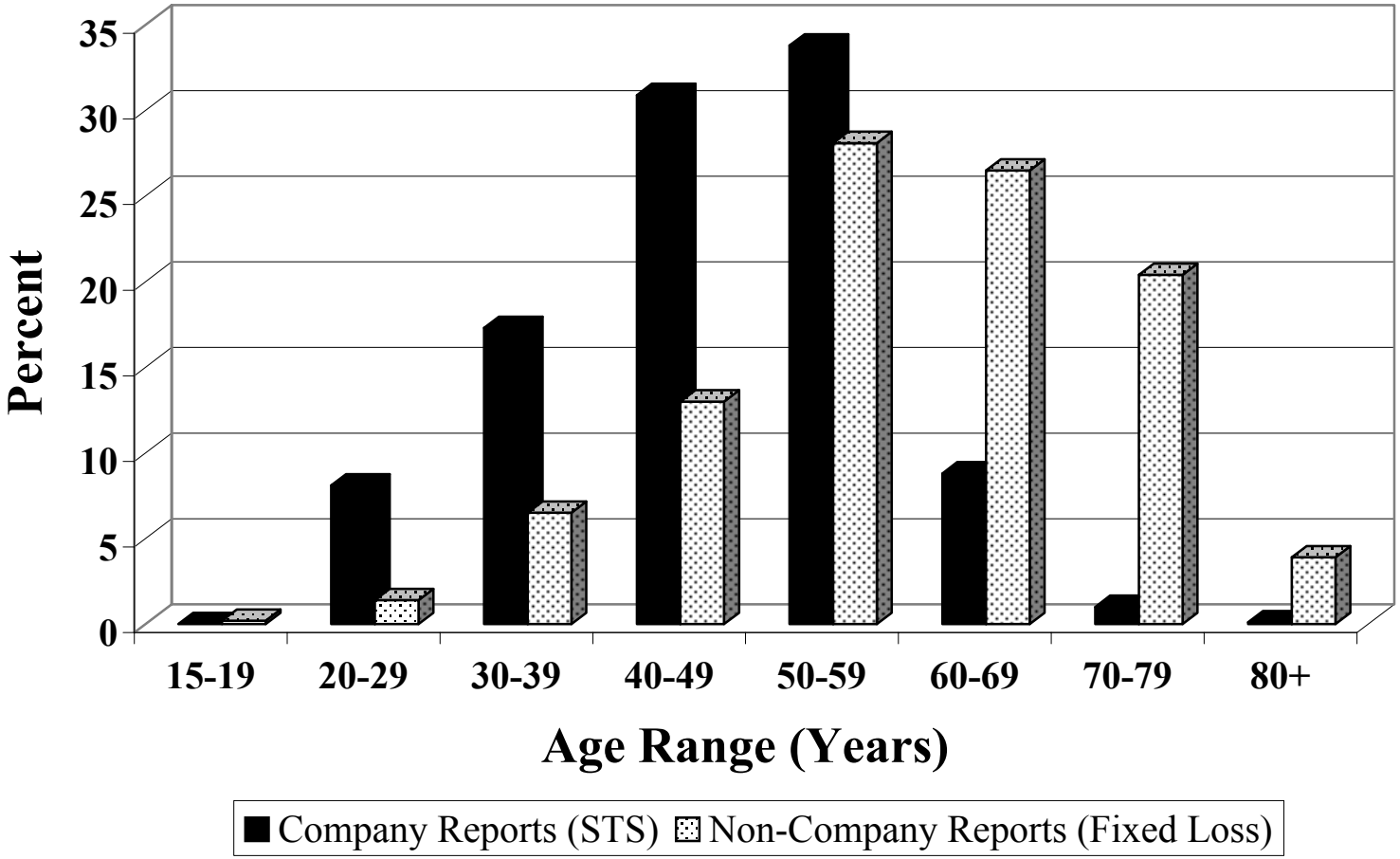
Authority: P.A. 368 of 1978
Completion: Required
Penalty: Misdemeanor

Figure 2. All Individuals with Noise-Induced Hearing Loss Reported to the Michigan Department of Consumer and Industry Services: 1985-2002



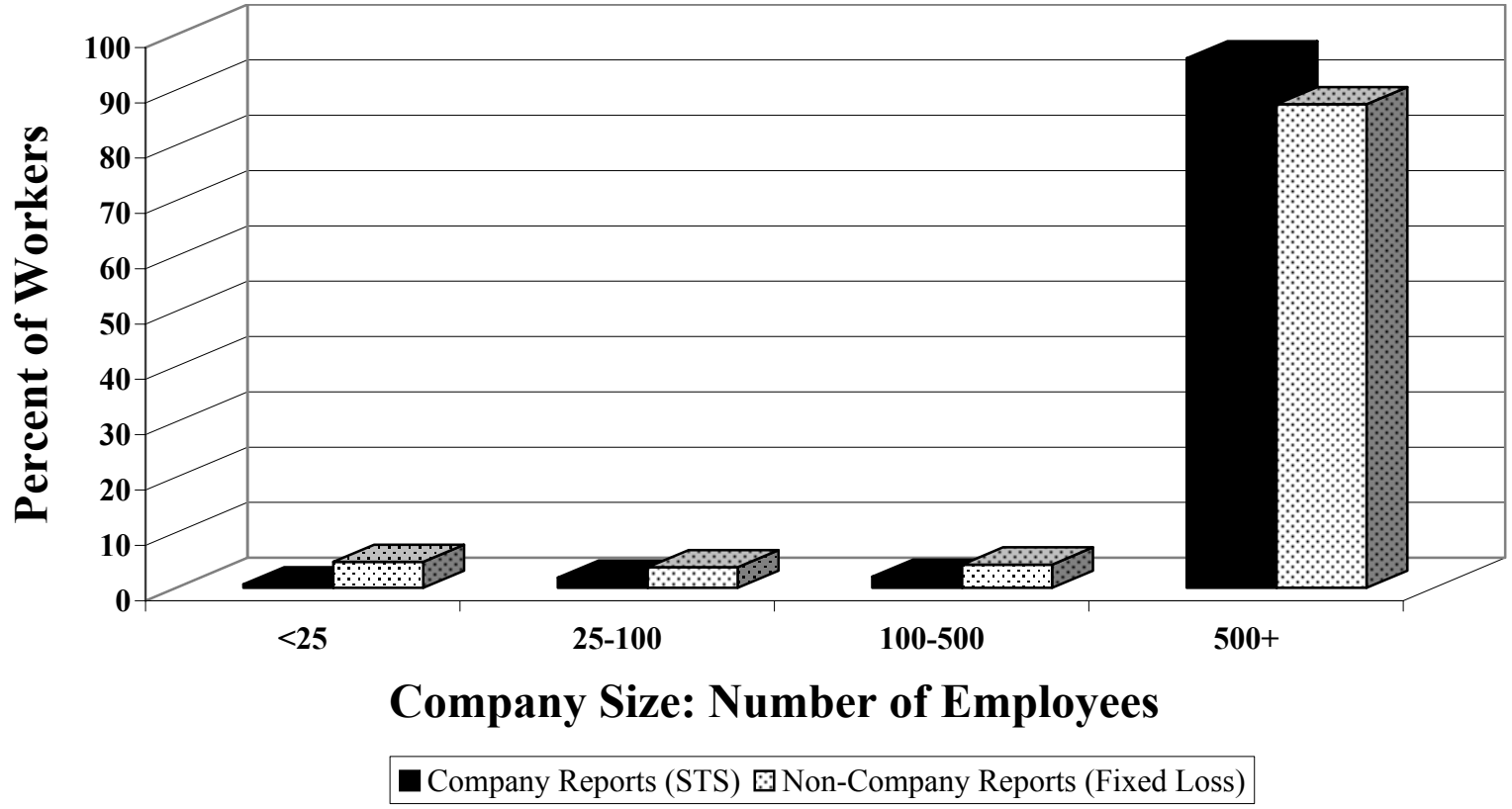
*All reports combined (Fixed Loss and STS).
**Fixed Loss Reports.

Figure 3. All Individuals Reported with Noise-Induced Hearing Loss in 2002: Age Range* by Reporting Source



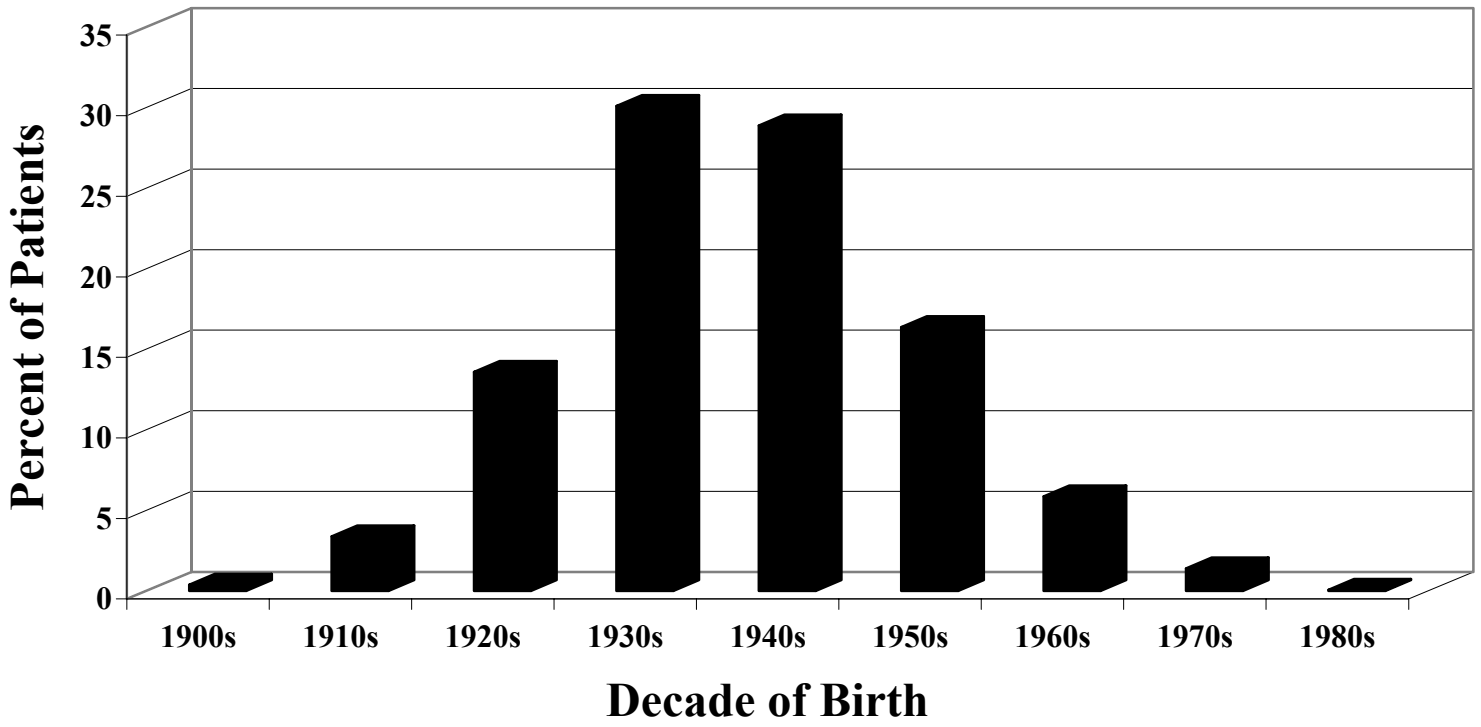
*Age was unknown for 15 individuals reported by company medical departments and 28 individuals reported by non-company hearing health professionals.

Figure 4. All Individuals Reported with Noise-Induced Hearing Loss in 2002: Number of Employees* at the Company Where Exposure to Noise Occurred



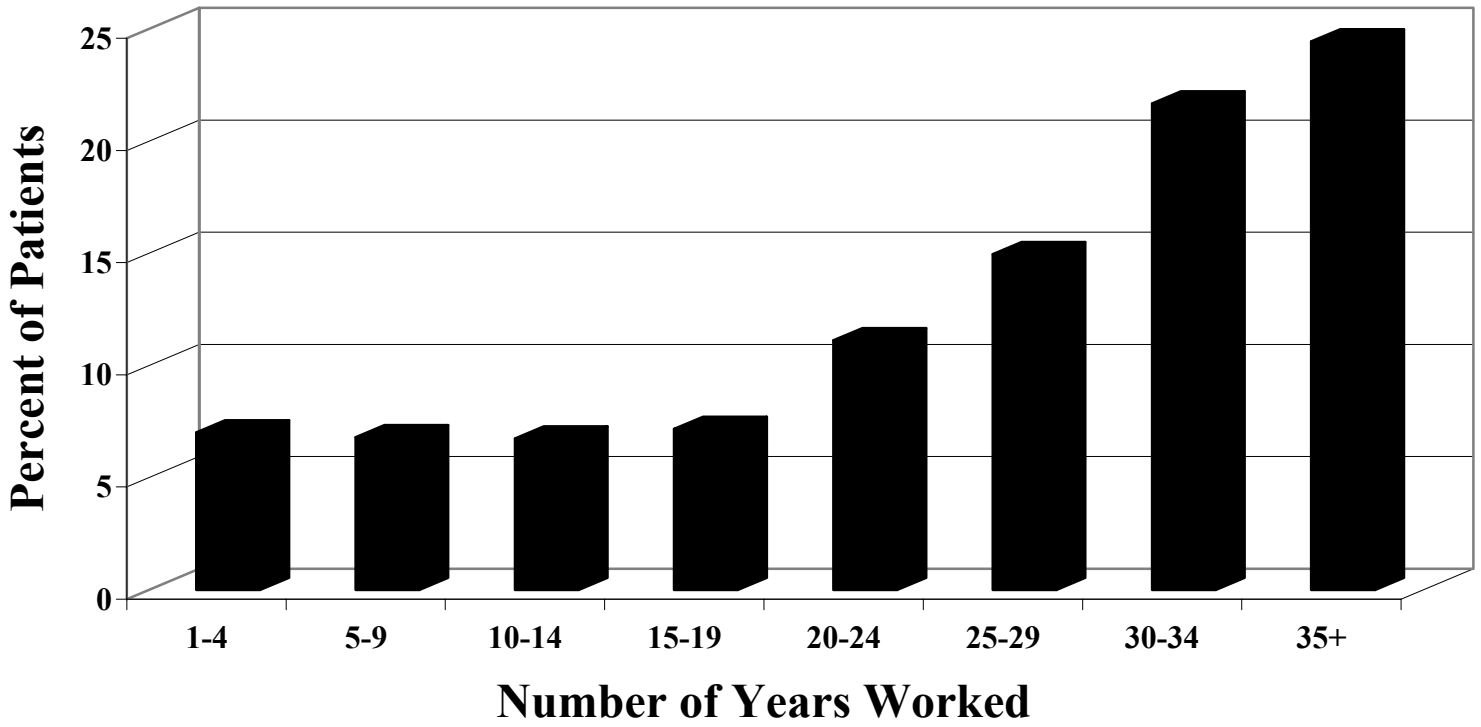
*Number of employees was unknown for 3 individuals reported by company medical departments and 245 individuals reported by non-company hearing health professionals.

Figure 5. Individuals with a Fixed Hearing Loss: Distribution of Decade of Birth,* Michigan: 1992-2002



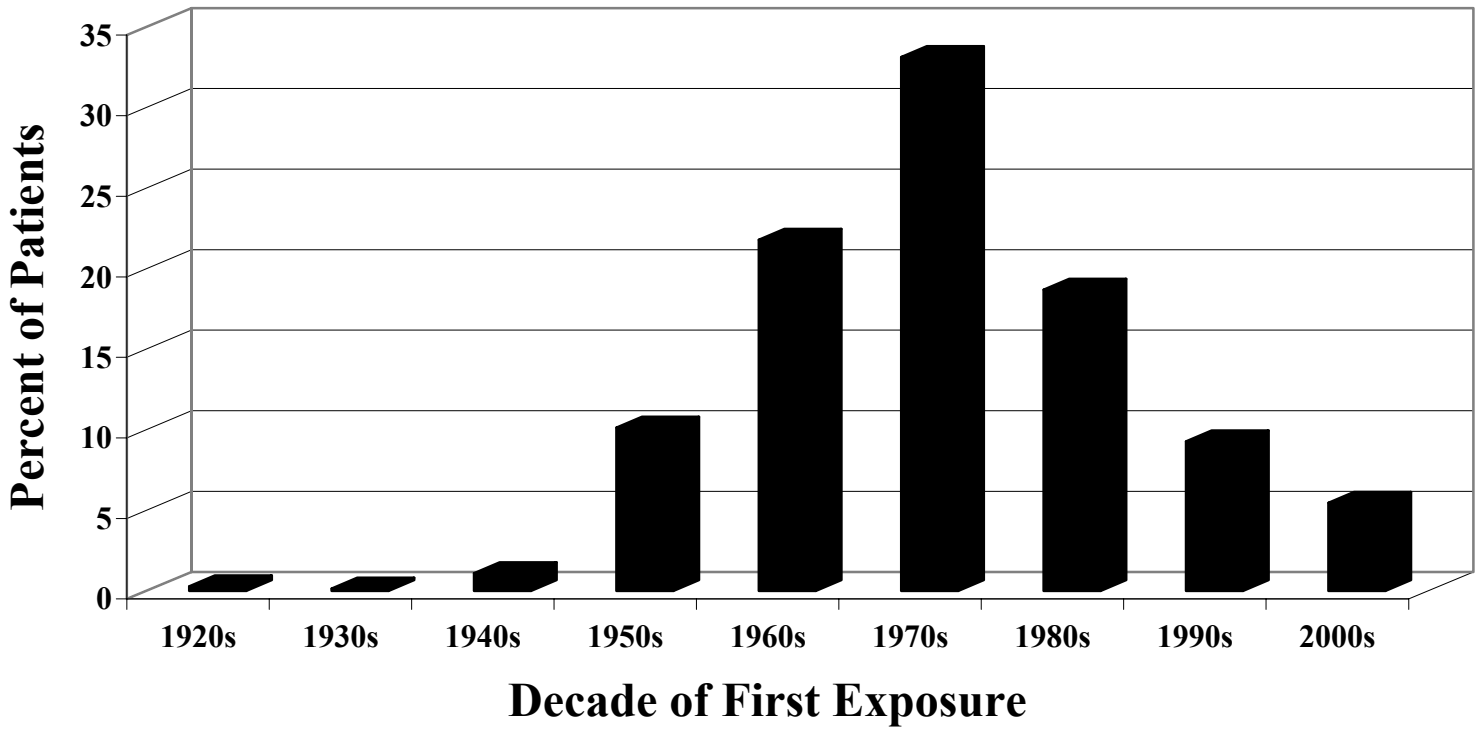
*Decade of birth was unknown for 46 individuals.

Figure 6. All Interviewed Individuals with a Fixed Hearing Loss: Total Duration of Years Worked* in Noise, Michigan: 1992-2002



*Duration was unknown for 1,354 individuals identified between 1992 and 2002.

Figure 7. All Interviewed Individuals with a Fixed Hearing Loss: Distribution of Decade of First Exposure* to Noise, Michigan: 1992-2002



*Decade was unknown for 1,485 individuals identified between 1992 and 2002.

Table 1. Number of Non-Company Based Health Professionals Reporting Individuals with a Fixed Noise-Induced Hearing Loss in Michigan, in Calendar Year 2002

Range of Individuals Reported	Health Professionals		Total Number of Individuals Reported
	Number	Percent	
1	22	56.4	22
2-10	14	35.9	57
11-50	1	2.6	13
51+	2	5.1	318
TOTAL	39 *	100.0	410

*Includes five group practices.

Table 2. All Company and Non-Company Individuals with Noise-Induced Hearing Loss Reported in Calendar Year 2002: 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	14	1.5	4	0.6	10	4.7
25-100	21	2.3	13	1.8	8	3.7
100-500	23	2.5	14	2.0	9	4.2
501+	873	93.8	686	95.7	187	87.4
TOTAL*	931	100.0	717	100.0	214	100.0

* Number of employees was unknown for 3 individuals reported by company medical departments and 245 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 2002 Occupational Disease Reports of Noise-Induced Hearing Loss: Industry of Individuals Reported

			STS***		Fixed Loss****	
Standard Industrial Classification (SIC)*	Number of Individuals	Percent	Number of Individuals	Percent	Number of Individuals	Percent
Agriculture/Forestry (01-08)	3	0.3	0	--	3	0.8
Mining (10)	1	0.1	1	0.1	0	--
Oil and Gas Extraction (13)	1	0.1	0	--	1	0.3
Construction (15-17)	43	3.9	0	--	43	11.2
Manufacturing (20-39)						
Lumber (24)	1	0.1	0	--	1	0.3
Paper (26)	2	0.2	1	0.1	1	0.3
Printing (27)	3	0.3	0	--	3	0.8
Chemicals (28)	58	5.2	15	2.1	43	11.2
Rubber (30)	29	2.6	27	3.8	2	0.5
Stone/Clay/Glass (32)	1	0.1	0	--	1	0.3
Primary Metals (33)	100	9.0	38	5.3	62	16.1
Metal Fabrication (34)	152	13.8	144	20.0	8	2.1
Machinery (35)	13	1.2	7	1.0	6	1.6
Electronics (36)	50	4.5	49	6.8	1	0.3
Transportation (37)	548	49.6	430	59.7	118	30.6
Miscellaneous Mfg Industries (39)	11	1.0	0	--	11	2.9
Transport./Comm. Svcs. (40-49)	23	2.1	3	0.4	20	5.2
Retail Trade (50-59)	14	1.3	0	--	14	3.6
Finance, Insurance & Real Estate (60-67)	3	0.3	0	--	3	0.8
Services (70-89)						
Hotels (70)	1	0.1	1	0.1	0	--
Personal Services (72)	1	0.1	0	--	1	0.3
Business (73)	2	0.2	0	--	2	0.5
Automotive Repair (75)	3	0.3	0	--	3	0.8
Recreation (79)	1	0.1	0	--	1	0.3
Health (80)	1	0.1	0	--	1	0.3
Legal Services (81)	1	0.1	0	--	1	0.3
Education (82)	18	1.6	1	0.1	17	4.4
Membership Organizations (86)	2	0.2	0	--	2	0.5
Engineering/Management (87)	3	0.3	0	--	3	0.8
Private Households (88)	4	0.4	0	--	4	1.0
Public Administration (91-97)						
Government (91)	7	0.6	0	--	7	1.8
Police (92)	2	0.2	0	--	2	0.5
Admin. Economic Programs (96)	3	0.3	3	0.4	0	--
Total	1,105	100.0	720	100.0	385 **	100.0

*Standard Industrial Classification (1987 Manual).

**SIC was unknown for 74 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 a Fixed Hearing Loss: Type of Industry Where Exposed to Noise: Michigan 1992-2002

Standard Industrial Classification (SIC)*	1992 - 2002 Number of Reports by Industry	Percent
Agricultural Production & Services (01-07)	135	2.1
Forestry (08)	5	0.1
Mining (10-14)	31	0.5
Construction (15-17)	776	12.3
Manufacturing (20-39)		
Food (20)	61	1.0
Apparel (23)	8	0.1
Wood (24)	36	0.6
Furniture (25)	19	0.3
Paper (26)	68	1.1
Printing (27)	45	0.7
Chemicals (28)	113	1.8
Petroleum Refining (29)	9	0.1
Rubber (30)	67	1.1
Leather (31)	4	0.1
Stone/Clay/Glass (32)	45	0.7
Primary Metals (33)	911	14.4
Metal Fabrication (34)	296	4.7
Machinery (35)	263	4.2
Electronics (36)	38	0.6
Transportation (37)	1,788	28.2
Measuring Instruments (38)	8	0.1
Miscellaneous Mfg Industries (39)	162	2.6
Transportation/Communication Services (40-49)	453	7.2
Retail Trade (50-59)	117	1.8
Finance, Insurance & Real Estate (60-67)	13	0.2
Services (70-89)		
Hotels (70)	3	0.0
Personal Services (72)	5	0.1
Business (73)	13	0.2
Automotive Repair (75)	87	1.4
Repair (76)	22	0.3
Motion Pictures (78)	1	0.0
Recreation (79)	37	0.6
Health (80)	59	0.9
Education (82)	224	3.5
Social Services (83)	2	0.0
Parks (84)	1	0.0
Membership Organizations (86)	3	0.0
Engineering/Management (87)	14	0.2
Geology (89)	2	0.0
Public Administration (91-97)	390	6.2
Total	6,334 **	100.0

*Standard Industrial Classification (1987 Manual).

**SIC was unknown for 85 work locations from individuals identified between 1992-2002.

Table 5. All Interviewed Individuals with a Fixed Hearing Loss: Type of Industry and Performance of Regular Hearing Testing at Most Recent Company Exposed to Noise: Michigan 1992-2002

Standard Industrial Classification (SIC)*	1992 - 2002 Number of Reports by Industry	Percent Have Hearing Testing
Agricultural Production & Services (01-07)	94	8
Forestry (08)	1	0
Mining (10-14)	19	35
Construction (15-17)	586	7
Manufacturing (20-39)		
Food (20)	39	39
Apparel (23)	4	25
Wood (24)	28	12
Furniture (25)	10	25
Paper (26)	51	42
Printing (27)	25	25
Chemicals (28)	88	40
Petroleum Refining (29)	7	43
Rubber (30)	42	38
Leather (31)	2	0
Stone/Clay/Glass (32)	34	23
Primary Metals (33)	801	35
Metal Fabrication (34)	204	38
Machinery (35)	164	27
Electronics (36)	20	21
Transportation (37)	1,494	38
Measuring Instruments (38)	6	29
Miscellaneous Mfg Industries (39)	93	23
Transportation/Communication Services (40-49)	360	34
Retail Trade (50-59)	84	12
Finance, Insurance & Real Estate (60-67)	11	0
Services (70-89)		
Hotels (70)	2	0
Personal Services (72)	4	20
Business (73)	9	17
Automotive Repair (75)	46	6
Repair (76)	12	0
Motion Pictures (78)	1	0
Recreation (79)	25	9
Health (80)	55	23
Education (82)	202	29
Social Services (83)	2	0
Parks (84)	1	50
Membership Organizations (86)	3	0
Engineering/Management (87)	8	25
Geology (89)	2	33
Public Administration (91-97)	325	23
Total	4,964 **	30

*Standard Industrial Classification (1987 Manual).

**SIC was unknown for 84 work locations from individuals identified between 1992-2002.

Table 6. All Interviewed Individuals with a Fixed Hearing Loss: Number of Employees in Most Recent Company Exposed to Noise by Status of Hearing Testing: Michigan 1992-2002

Company Size: Number of Employees	Number of Reports by Size of Company	1992-2002 Have Hearing Testing Number	Percent
<25	459	62	(14)
25-100	335	80	(21)
100-500	492	218	(33)
501+	2,487	722	(37)
TOTAL	3,773 *	1,082	(45)

*This total excludes 1,203 individuals identified 1992-2002 with unknown number of employees and 307 individuals who we were unable to determine if they had been provided hearing testing while working.

Table 7. All Interviewed Individuals with a Fixed Hearing Loss: Decade Last Worked and Status of Regular Hearing Testing at Most Recent Company Exposed to Noise, by Industry Type*: Michigan 1992-2002

	Decade Last Exposed to Noise and Hearing Testing Status															
	1930's		1940's		1950's		1960's		1970's		1980's		1990's		2000's	
Industry Type (SIC)**	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	No. of Pts.	% Have RHT
Agriculture/Forestry (01-08)	0	--	1	0	1	0	2	0	3	0	6	17	40	8	12	0
Mining (13-14)	0	--	0	--	0	--	0	--	1	0	4	33	9	67	1	100
Construction (15-17)	1	--	0	--	2	0	6	0	19	8	98	9	215	5	103	12
Manufacturing (20-39)	2	100	14	8	25	5	57	0	158	15	488	46	1185	66	294	77
Transportation (40-49)	0	--	0	--	0	--	3	33	13	27	45	34	162	60	66	47
Trade (50-59)	0	--	0	--	1	0	1	100	4	0	3	0	46	14	9	14
Finance (60-67)	0	--	0	--	0	--	0	--	1	0	0	--	3	0	1	0
Services (70-89)	0	--	1	0	2	0	2	0	3	0	30	11	199	32	61	40
Public Administration (91-97)	0	--	4	0	4	0	5	0	10	0	18	39	98	36	27	24

*For 1,468 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 a Fixed Hearing Loss: Decade Last Worked and Status of Hearing Protection at Most Recent Company Exposed to Noise, by Industry Type*: Michigan 1992-2002

	Decade Last Exposed to Noise and Offered Hearing Protection Device															
	1930's		1940's		1950's		1960's		1970's		1980's		1990's		2000's	
Industry Type (SIC)**	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	No. of Pts.	% Have HPD
Agriculture/Forestry (01-08)	0	--	1	****	1	****	2	0	3	33	6	0	40	38	12	40
Mining (13-14)	0	--	0	--	0	--	0	--	1	100	4	75	9	100	1	100
Construction (15-17)	1	0	0	--	2	50	6	33	19	36	98	27	215	64	103	70
Manufacturing (20-39)	2	0	14	7	25	9	57	15	158	46	488	69	1185	86	294	90
Transportation (40-49)	0	--	0	--	0	--	3	0	13	18	45	23	162	56	66	58
Trade (50-59)	0	--	0	--	1	0	1	0	4	0	3	0	46	62	9	14
Finance (60-67)	0	--	0	--	0	--	0	--	1	0	0	--	3	0	1	--
Services (70-89)	0	--	1	0	2	0	2	50	3	0	30	15	199	66	61	64
Public Administration (91-97)	0	--	4	****	4	50	5	0	16	22	19	77	98	70	27	85

*For 1,468 individuals, either industry type or decade last exposed to noise was unknown.
**Standard Industrial Classification (1987 Manual).
***Hearing Protection Device (ear plugs or muffs).
****There is no percentage in this column because the availability of hearing protection was unknown.

Table 9. All Interviewed Individuals with a Fixed Hearing Loss: Decade Last Worked and Status of Regular Hearing Testing at Most Recent Company Exposed to Noise, by Industry Size*: Michigan 1992-2002

	Company Size (Number of Employees)							
	<25		25-100		100-500		500+	
Decade	No. of Pts.	% with RHT**	No. of Pts.	% with RHT	No. of Pts.	% with RHT	No. of Pts.	% with RHT
1930's	0	--	3	100	0	--	0	--
1940's	1	0	1	0	0	--	13	11
1950's	6	0	3	0	6	17	15	0
1960's	8	0	5	25	10	11	40	0
1970's	18	0	23	9	25	8	107	21
1980's	48	17	43	19	74	36	390	47
1990's	244	17	196	27	282	55	992	67
2000	86	17	40	41	67	64	217	70

*For 1,468 individuals, either company size or decade last exposed to noise was unknown.
**Regular Hearing Testing.

Table 10. All Interviewed Individuals with a Fixed Hearing Loss: Status of Hearing Testing in Most Recent Company Exposed to Noise: Michigan 1992-2002

Regular Hearing Tests Conducted	Baseline Hearing Test Conducted			
	Yes	No	Unknown	Total
Yes	583	319	217	1,119 (28%)
No	182	1,104	171	1,457 (36%)
Unknown	33	31	1,421	1,485 (37%)
Total	798 (20%)	1,454 (36%)	1,809 (45%)	4,061

Table 11. One Hundred-Nine Companies Inspected Where Individuals Reported They Had Not Received Audiometric Testing: Michigan 1992-2002

Industry (SIC)*	Total Inspections		Hearing Conservation Program (HCP) Required		Citation Issued				Total Number of Employees Exposed to Noise	
					HCP Deficient		HCP Absent		HCP Deficient	HCP Absent
	#	%	#	%	#	%	#	%	#	#
Agricultural Services (07)	1	(0.9)	1	(100.0)	0	--	0	--	--	--
Construction (15-17)	2	(1.8)	**	--	0	--	1	(50.0)	--	562
Manufacturing (20-39)	78	(71.6)	47	(60.3)	24	(51.1)	12	(25.5)	3,251	1,460
Transportation (40-49)	3	(2.8)	0	--	0	--	0	--	--	--
Trade (50-59)	8	(7.3)	1	(14.3)	0	--	1	(100.0)	--	14
Services (70-89)	11	(10.1)	5	(55.6)	0	--	3	(60.0)	--	40
Government (91-97)	6	(5.5)	4	(66.7)	3	(75.0)	0	--	708***	--
TOTAL	109	(100.0)	58	(53.2)	27	(46.6)	17	(29.3)	3,959	2,076

* Standard Industrial Classification (1987 Manual).
** Construction has separate regulations that require a less comprehensive program.
*** Number employees unknown for 1 company.

Table 12. Size of Companies Cited for Violations of the Noise Standard in Michigan: MIOSHA Inspections Conducted 01/01/2002 to 12/31/2002

	Companies	
Number of Employees	Number	Percent
≤ 50	37	53.6
51 - 250	25	36.2
251+	7	10.1
TOTAL	69	100.0

Table 13. Violations of the Noise Standard in Michigan: MIOSHA Inspections Conducted 01/01/2002 to 12/31/2002

Standard Violated (Part 380. Occupational Noise Exposure)	Number of Citations	Companies Cited for Standard Percent*	Percent**
Hearing conservation program (R325.60107)	36	23.1	52.2
Employee training program (R325.60123)	26	16.7	37.7
Access to information and training materials (R325.60124)	19	12.2	27.5
Permissible noise exposure; noise controls (R325.60104)	17	10.9	24.6
Follow-up procedures (R325.60116)	17	10.9	24.6
Noise monitoring program (R325.60108)	10	6.4	14.5
Annual audiogram (R325.60114)	9	5.8	13.0
Audiometric testing program (R325.60112)	8	5.1	11.6
Impact or impulse noise (R325.60106)	5	3.2	7.2
Evaluation of audiogram (R325.60115)	3	1.9	4.3
Baseline audiogram (R325.60113)	2	1.3	2.9
Hearing protectors (R325.60121)	2	1.3	2.9
Hearing protector attenuation (R325.60122)	2	1.3	2.9
Total	156	100.0	

*Percentages based on a total of 156 violations.
**A company may be cited for more than one type of violation, therefore these percentages are based on a total of 69 companies cited.

Table 14. Type of Industry Cited for Violations of the Noise Standard in Michigan: MIOSHA Inspections Conducted 01/01/2002 to 12/31/2002

	Companies	
Industry (SIC Code)*	Number	Percent
Manufacture of:		
Fabricated Metal Products (34)	33	47.8
Industrial and Commercial Machinery (35)	12	17.4
Transportation Equipment (37)	9	13.0
Rubber/Plastics (30)	3	4.3
Primary Metal (33)	3	4.3
Lumber (24)	2	2.9
Food (20)	1	1.4
Furniture (25)	1	1.4
Paper (26)	1	1.4
Printing (27)	1	1.4
Chemicals (28)	1	1.4
Retail Trade (50-59)	2	2.9
TOTAL	69	100.0

*Standard Industrial Classification (1987 Manual).

Table 15. Demographic Characteristics of 688 Individuals with Noise-Induced Hearing Loss, with Noise Exposure Ever in Construction: Michigan 1992-2002

Gender

	Number	Percent
Male	684	99.4
Female	4	0.6
Total	688	100.0

Race

	Number	Percent
White	604	90.1
African American	54	8.1
Hispanic	7	1.0
Other	5	0.7
Total	670 *	100.0

*Race was unknown for 18 individuals.

Decade of Birth

	Number	Percent
1910-1919	23	3.4
1920-1929	115	16.8
1930-1939	191	27.9
1940-1949	171	25.0
1950-1959	123	18.0
1960-1969	50	7.3
1970-1979	12	1.8
Total	685 **	100.0

**Decade was unknown for 3 individuals.

Table 16. Status of Regular Hearing Testing and Use of Hearing Protection at Most Recent Construction Job Where 688 Individuals with Noise-Induced Hearing Loss Were Exposed to Noise: Michigan 1992-2002

Regular Hearing Testing

	Number	Percent
Yes	26	7.0
No	346	93.0
Total	372 *	100.0

*Status of testing was unknown for 316 individuals.

Given Hearing Protection

	Number	Percent
Yes	167	45.9
No	197	54.1
Total	364 **	100.0

**Status of hearing protection unknown for 324 individuals.

Table 17. Most Recent Decade Where 688 Patients With Noise-Induced Hearing Loss Were Exposed to Noise in the Construction Industry: Status of Regular Hearing Tests and Use of Hearing Protection: Michigan 1992-2002

	Total Individuals		Regular Hearing Tests				Given Hearing Protection			
			No		Yes		No		Yes	
Decade	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1930-1949	2	(0.4)	1	(100)	0	--	2	(100)	0	--
1950-1959	8	(1.5)	7	(100)	0	--	6	(86)	1	(14)
1960-1969	24	(4.6)	18	(100)	0	--	16	(94)	1	(6)
1970-1979	39	(7.5)	28	(93)	2	(7)	22	(76)	7	(24)
1980-1989	120	(23.0)	67	(91)	7	(9)	50	(72)	19	(28)
1990-1999	227	(43.6)	151	(96)	7	(4)	55	(38)	88	(62)
2000-2002	101	(19.4)	49	(88)	7	(12)	19	(30)	45	(70)
Total	521*	(100.0)	321**	(93)	23**	(7)	170***	(51)	161***	(49)

*Decade was unknown for 167 individuals.
**Whether or not provided regular hearing tests was unknown for 177 individuals.
***Whether or not provided hearing protection was unknown for 190 individuals.

Table 18. Duration of Years Worked for 517 Individuals with Noise-Induced Hearing Loss Who Were Only Exposed to Noise in Construction Jobs: Michigan 1992-2002

Duration	Number	Percent
1-5	32	8.1
6-10	22	5.6
11-15	16	4.0
16-20	36	9.1
21-25	26	6.6
26-30	56	14.1
31-35	75	18.9
36-40	70	17.7
41-45	46	11.6
46-50	14	3.5
51+	3	0.8
Total	396 *	100.0

*Duration was unknown for 121 individuals.

Table 19. 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 Prodcution/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 defines as at or above 85dBA.