

# 1998

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



# 1998 Annual Report on Occupational Noise Induced Hearing Loss in Michigan

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## **Summary:**

This is the fifth annual report on occupational noise-induced hearing loss (NIHL) in Michigan. Over 1,600 new people were reported in 1998 to the Michigan Department of Consumer and Industry Services (MDCIS) with hearing loss known or suspected to be caused by noise at work.

Occupational noise-induced hearing loss is affecting mainly men, with an initial onset when they are 35-64 years of age. Exposures to noise are occurring primarily in manufacturing facilities.

Twenty-five of the 60 (41.7%) companies identified for inspections by the surveillance system had no hearing conservation program or a deficient program despite the presence of noise levels above the legal limit.

Of the 713 workplace inspections conducted by the Michigan Department of Consumer and Industry Services in 1998 in Michigan, another 48 of the companies inspected were in violation of some portion of the noise standard; this is in addition to the 25 identified by the surveillance system. Thirty-three of these 48 companies were cited for having the complete absence of a hearing conservation program. It is important to recognize, however, that the majority of the 713 inspections were in response to a specific complaint or referral. Consequently the scope of these inspections were primarily limited to the complaint or referral items unless other serious issues were observed during the course of the inspection.

The data in this report indicates that a large number of small and large companies do not have hearing conservation programs despite a need for them. Follow-up of reports from non-company audiologists and otolaryngologists shows that almost half 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 (96%), although just over 40% of them were given hearing protection such as plugs or muffs. Workers exposed in more recent decades to noise in construction were more likely to be given hearing protection than workers most recently exposed to noise before the 1980's. Twenty-two 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 5 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. Through surveillance of work-related hearing loss in Michigan along with work place interventions, the state is working to reduce the burden of hearing loss among its workers. Additional protection is needed for workers in construction and other industries inadequately covered by the noise stand

## **Background:**

Facilities covered by the general industry noise standard 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. 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, (2) reports from hospitals, (3) reports from companies, and (4) reports from the Bureau of Workers' Compensation. Both private practice audiologists and otolaryngologists and those working for industry send reports to the Michigan Department of Consumer and Industry Services. Reports from hospitals are requested once each year. Hospital discharge summaries for individuals with a primary or secondary diagnosis of hearing loss (International Classification of Diseases (ICD) codes 388.10-12, 389.10-18, and 389.9) are obtained and the work-relatedness of the condition is determined. The data was obtained from the Michigan Health and Hospital Association's (MHA) Michigan inpatient data

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. If asked for guidance, the following minimum hearing loss is suggested:

- (a) a standard threshold shift (STS) of 10 dB or more in either ear at an average of 2000, 3000 and 4000 Hz, (this is related to the MIOSHA enforcement standard) or;
- (b) 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) (this recommendation was developed by the state advisory committee for occupational noise-induced hearing loss surveillance).

Patients reported by a company medical department 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 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 judgement that noise exposures at work contributed at least in part to the patient's hearing loss.

After the patient has been interviewed, an industrial hygiene investigation is conducted at the individual's workplace 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. 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 fifth annual report are presented in the following order: a description of all of the 1998 occupational disease reports submitted to the MDCIS for NIHL; results of interviews of patients with fixed loss reported by non company audiologists and otolaryngologists from 1992-1998; and, a summary of the MIOSHA inspections from 1/1/98-12/31/98 where violations of the noise standard were found.

### ***1998 Occupational Disease Reports for NIHL***

Figure 2 shows the number of reports of hearing loss since 1985. Approximately 10% 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 has been an increase in the overall number of reports received since 1989, and an increase in the number of non-company reports received, especially since 1994. In 1998, there were 1,630 reports of work-related hearing loss submitted to the Michigan Department of Consumer and Industry Services. Of the 1,630 reports submitted in 1998, 1,256 were submitted by company medical departments. The other 374 reports were submitted by private-practice audiologists and otolaryngologists. Table 1 shows the number of patients reported by the private-practice health professionals.

### ***Patient Demographics***

Eighty-nine percent (1,445) of the reports where gender was listed are for men. Although requested, information on race was missing for 1,237 (76%) of the reports. The mean age of individuals reported is 50 years, ranging from 20 to 79 years. Patients reported by companies were generally younger than patients reported by non-company audiologists and otolaryngologists. Approximately 85% of the individuals reported by company medical departments were between 30 and 59 years of age compared to 56% 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 w

### ***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 agriculture, mining, construction, trade, services, and government 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. Non-company hearing health professionals report patients from a greater range of industries, many of which do not have HCP's.

### ***Interviews of Patients with a Fixed Loss, Reported by Non-Company Audiologists and Otolaryngologists from 1992-1998***

A total of 1,845 of 1,905 (96.9%) patients reported by non-company audiologists and otolaryngologists between 1992 and 1998 have been interviewed. The interviews ask about the three most recent jobs where a person was exposed to n

#### ***Patient Demographics***

Ninety-three percent of the interviewed patients reported from 1992-1998 were men. Over 91% of the interviewed patients reported from 1992-1998 were white, 6.8% were African American, 1.0% were Hispanic, 1.0% were Asian and 0.1% were other. Race was unknown for 88 individuals. Figure 5 shows the distribution of decade of birth for the patients reported. Over 86% 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 interviewed patients were ever exposed to noise. Over 57% of the 2,586 companies where the 1,845 patients ever worked were in the manufacturing industry. The 2,586 companies 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 not receive regular hearing testing ranged from 25% to 100% within industry types. Overall, 45% of the most recent companies where the patients were exposed to noise did not regularly test their employees' hearing. The number of companies 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 large percentages of workers reporting having received no regular hearing tests, especially in the smaller companies where 75% of the workers were not regularly tested. The number of companies reported 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). Over 25% of interviewed workers reported by non-company health professionals had worked in noise for less than 15 years.

Figure 7 shows the decade of the patients' first exposure to noise. Some patients had very early exposures to noise; however, over 17% of the patients had first exposures to noise from the 1980's to present.

Table 7 shows the decade when the interviewed patients with fixed hearing loss were last exposed to noise by industry. The percentage of individuals at companies with no hearing tests decreased over time and within the industry types that have been required by OSHA (since 1972) to provide such hearing tests. Construction and agriculture industries had the highest percentages of workers with no 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 not provided hearing protection decreased in all industries. The percentage of manufacturing workers given hearing protection improved the most of any industry type, with 90% of workers not given hearing protection in the 1940's and only 9% of workers not given hearing protection in the 1980's.

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 lower percentages of workers with no 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. Nineteen 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; 36% had neither.

### *Inspections*

In response to the reports of hearing loss, inspections were conducted at 60 companies where the person reported they had never received audiometric testing within the last five years. Of the 60 companies, 35 (58.3%) were required to have a hearing conservation program (HCP) because they had noise levels at or above 85 dBA; of those 35 companies, 25 (71.4%) had either no HCP or a deficient HCP. Twenty-seven of the 35 companies requiring a HCP were in manufacturing; three were in services; three were in government; one was in the trade industry; and one was in construction. Twenty-five of the 60 companies were not required to have a HCP because noise levels were below 85dBA. Table 11 lists the characteristics of the 60 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 1998, 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 713 inspections conducted in 1998, 48 facilities received a citation for a violation of the noise standard. These facilities were generally small. However, 6 (12.5%) of the facilities had more than 250 employees (Table 12). Thirty-three (68.8%) 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 13). The manufacture of fabricated metal products, transportation equipment and primary metals were the most common types of companies cited (Ta

### *Noise in Construction*

Of the 1,845 interviewed patients with a fixed loss reported to the State of Michigan from 1992-1998, 201 (10.9%) 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 201 patients.

At the most recent construction job where these 201 individuals were exposed to noise, approximately 96% had no regular hearing testing performed at their job (Table 16); however, approximately 42% 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; 19% of the 152 individuals with known decade of exposure occurred in the 1980's and 62% of the most recent noise exposures in construction occurred in the 1990's. 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.

Ninety-three (46.3%) of the 201 individuals exposed to noise in construction were also exposed to noise in other industries, primarily manufacturing. Among the 108 individuals who reported noise exposures only in construction, the same patterns exist as seen for all 201 individuals exposed to noise in construction and other jobs. Most of the patients exposed to noise only in construction were not given regular hearing testing, although half were provided with hearing protection (Table 18). Further, most of these individuals were most recently exposed to noise in the 1980's (17%) and 1990's (81%). It was in the more recent decades that these individuals were given hearing protection (Table 19). Some of these individuals had a relatively short duration of exposure to noise (Table 20), for example with 22% of these individuals working for 5 or fewer

## **Discussion:**

This is the fifth annual report of occupational noise-induced hearing loss in Michigan. There were 1,630 reports of hearing loss submitted to the Michigan Department of Consumer and Industry Services in 1998. The reports submitted probably represent a substantial underestimate of the total number of individuals with work-related hearing loss. There are approximately 450 audiologists and 150 otolaryngologists in the state. Reports have been received from only 9 of the 80 estimated group practices in the state, and 31 practioners not known to be associated with a group practice. The nine groups reporting patients represents 63 audiologists and otolaryngologists, therefore we estimate that 94 or about 16% of audiologists/otolaryngologists reported at least one case in 1998.

Further, 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 145,000 manufacturing production workers, 20,700 construction workers, 500 miners, 27,200 blue collar workers in wholesale and retail trade, and 12,100 workers in noisy service industry environments exposed to daily noise levels of 85 dBA or greater (NIOSH, 1998 and Bureau of Labor Statistics, 1996). Table 21 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 45% of noisy companies where the patients worked did not have a hearing conservation program when the individual worked there. Over time the numbers of companies that do not provide regular audiometric testing has decreased, 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 11% of the patients that have been identified and interviewed were exposed to noise in construction. Yet construction workers are minimally covered by MIOSHA and OSHA laws. Interviews of these individuals revealed that almost none were given regular hearing testing, even in the more recent decades of exposures. However, half of these workers were provided hearing protection with the percentage of workers given ear plugs or muffs much greater in the 1980's and 1990's than before the 1980's. 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 the 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 to help assess the effectiveness of the program. Additional protection for workers in the construction industry is needed.

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 4,196 individuals at the worksites we inspected that had noise levels 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 five 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 miniseminars 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, a quarterly newsletter on occupational NIHL that is mailed to the state's approximately 460 audiologists, otolaryngologists, mobile vans and clinics was initiated. In 1998, an internet web site that contains the annual reports and newsletters was developed and can be accessed at: [www.chm.msu.edu/oem/index.htm](http://www.chm.msu.edu/oem/index.htm).

The number of reports on individuals with hearing loss submitted by non company hearing health professionals increased until

1995, decreased in 1996, increased in 1997, and decreased again in 1998. Ongoing, and renewed outreach efforts are needed. Project SENSOR's initial success in identifying companies which need hearing conservation programs will hopefully 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.

## **BACKGROUND AND INSTRUCTIONS FOR COMPLETING KNOWN OR SUSPECTED OCCUPATIONAL DISEASE REPORT**

As a result of Executive Orders No. 1996-1, 1996-2 and Part 56 of P.A.368 of 1978, a physician, hospital, clinic or employer must report known or suspected cases of occupational diseases or workplace aggravated health conditions to the Michigan Department of Consumer and Industry Services within 10 days after discovery of the disease or condition on a report form furnished by the department. This requirement does not apply to occupational injuries.

This report is furnished by the Department of Consumer and Industry Services in accordance with Section 5611 (4) of P.A. 368 of 1978 and is required to be completed and submitted to the Department of Consumer and Industry Services at the address below for all such cases to fulfill the statutory mandate prescribed by Section 5611 or Part 56 of the Act.

### **Instructions for completing report:**

#### **General:**

Multiple reports on the same individual for the same illness should not be submitted. The employer should return this form only if the employee is not referred to a physician, hospital, or clinic. If a physician returns the form indicating a suspected occupational disease and at a later date confirms this occupational disease, an updated form confirming their diagnosis and causative agent should be submitted.

#### **Employers:**

If the form is being submitted by an employer, all questions, with the exception of those indicated for physicians only, should be completed. The form should be completed by the employer at the time of onset, discovery, or suspected occurrence of the employee's illness and returned directly to the Michigan Department of Consumer and Industry Services.

If the employee is referred to a physician, hospital, or clinic, the employer should complete the form as stated above and the form should then accompany the employee for completion by the medical personnel.

#### **Physician, hospital, or clinic:**

The questions on the form, with the exception of those indicated for physicians only, may be completed by the employer at the time of onset, discovery, or suspected occurrence of the employee's illness. The form should then accompany the employee at the time of referral to a physician, hospital, or clinic for medical evaluation where the remainder of the form should be completed and submitted to the Michigan Department of Consumer and Industry Services. If the employee is seen by the physician without a referral from the employer, and the physician diagnoses a suspected or confirmed occupational illness, the entire form is to be completed by the physician and submitted to the Michigan Department of Consumer and Industry Services.

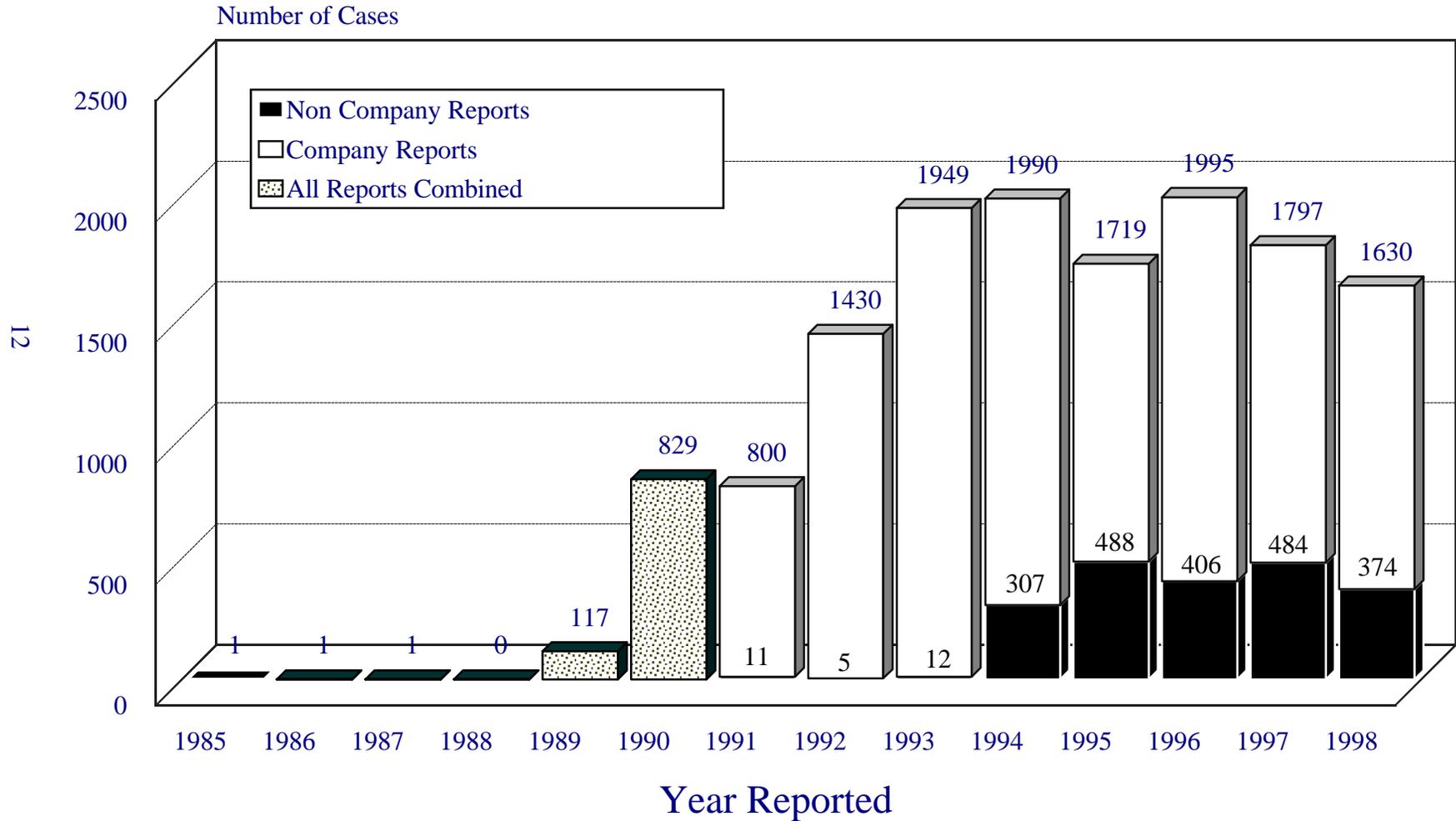
It is the responsibility of the employer and of physicians, hospitals, and clinics to insure that the form is properly completed, signed, and submitted to the Michigan Department of Consumer and Industry Services within 10 days after the onset of the disease, suspected occurrence of the disease, or a workplace aggravated health condition. The form must be completed for all suspected or actual occupational diseases or health conditions aggravated by workplace exposure, including death of the employee as a result of the disease or health condition aggravated by workplace exposure.

Completion of this report form does not relieve the employer of the requirements of notification of fatalities and catastrophes and to maintain records of each recordable occupational injury or illness pursuant to the requirements of Public Act 154 of 1974, as amended, the Michigan Occupational Safety and Health Act.

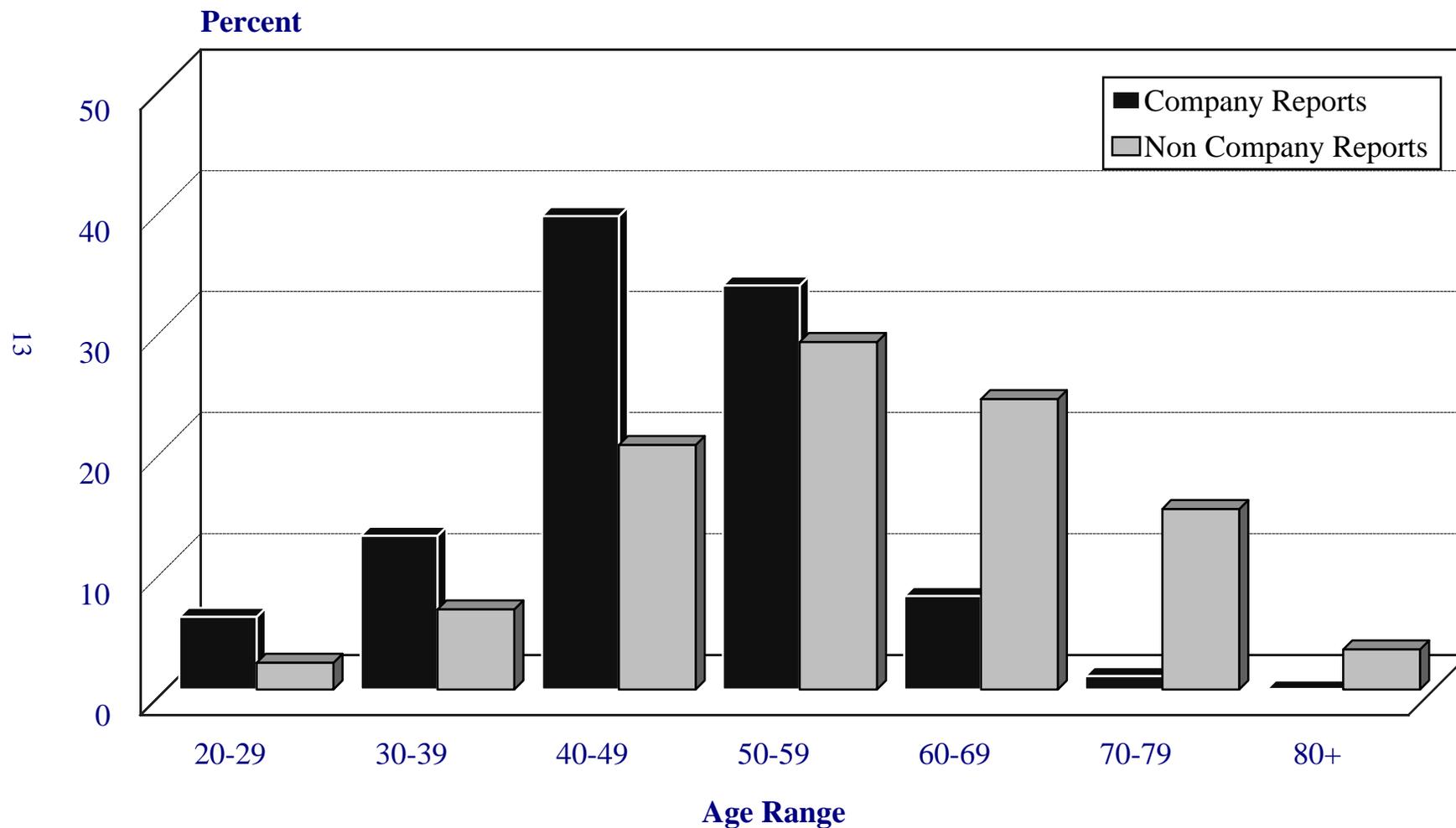
**ADDITIONAL REPORT FORMS ARE AVAILABLE FROM THE MICHIGAN DEPARTMENT OF CONSUMER AND INDUSTRY SERVICES**

**Michigan Department of Consumer and Industry Services  
Division of Occupational Health  
Bureau of Safety and Regulation  
7150 Harris Drive, P.O. Box 30649  
Lansing, Michigan 48909-8149  
(517) 322-1608**

**Figure 2. Patients with Noise-Induced Hearing Loss Reported to the Michigan Department of Consumer and Industry Services: 1985-1998**

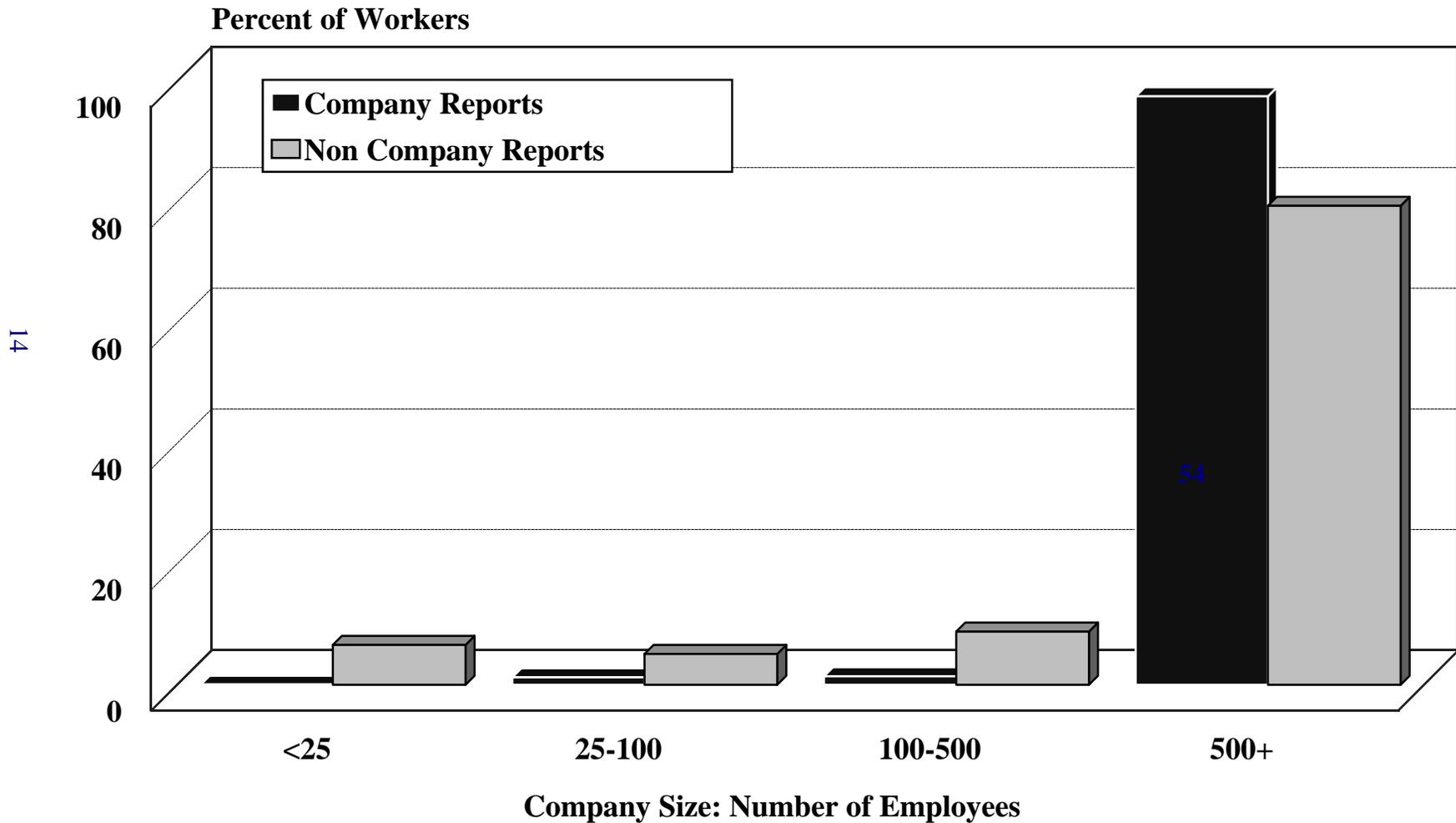


**Figure 3. 1998 Occupational Disease Reports of Noise-Induced Hearing Loss:  
Age Range\* of Patients by Reporting Source**



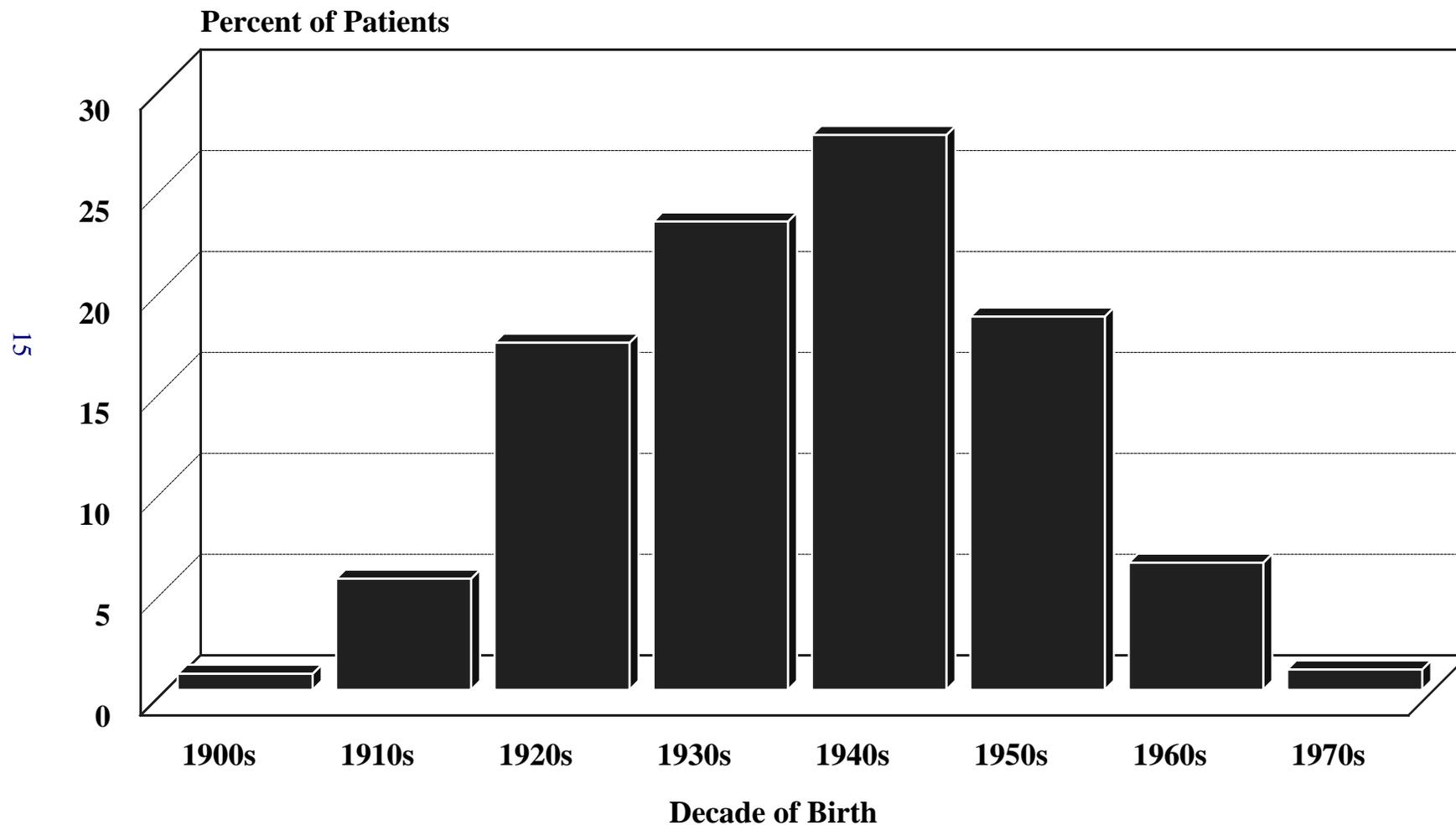
\* Age was unknown for 31 individuals reported by company medical departments and 12 individuals reported by non company hearing health professionals.

**Figure 4. Occupational Disease Reports of Noise-Induced Hearing Loss:  
Number of Employees\* at the Company where Exposure to Noise Occurred**



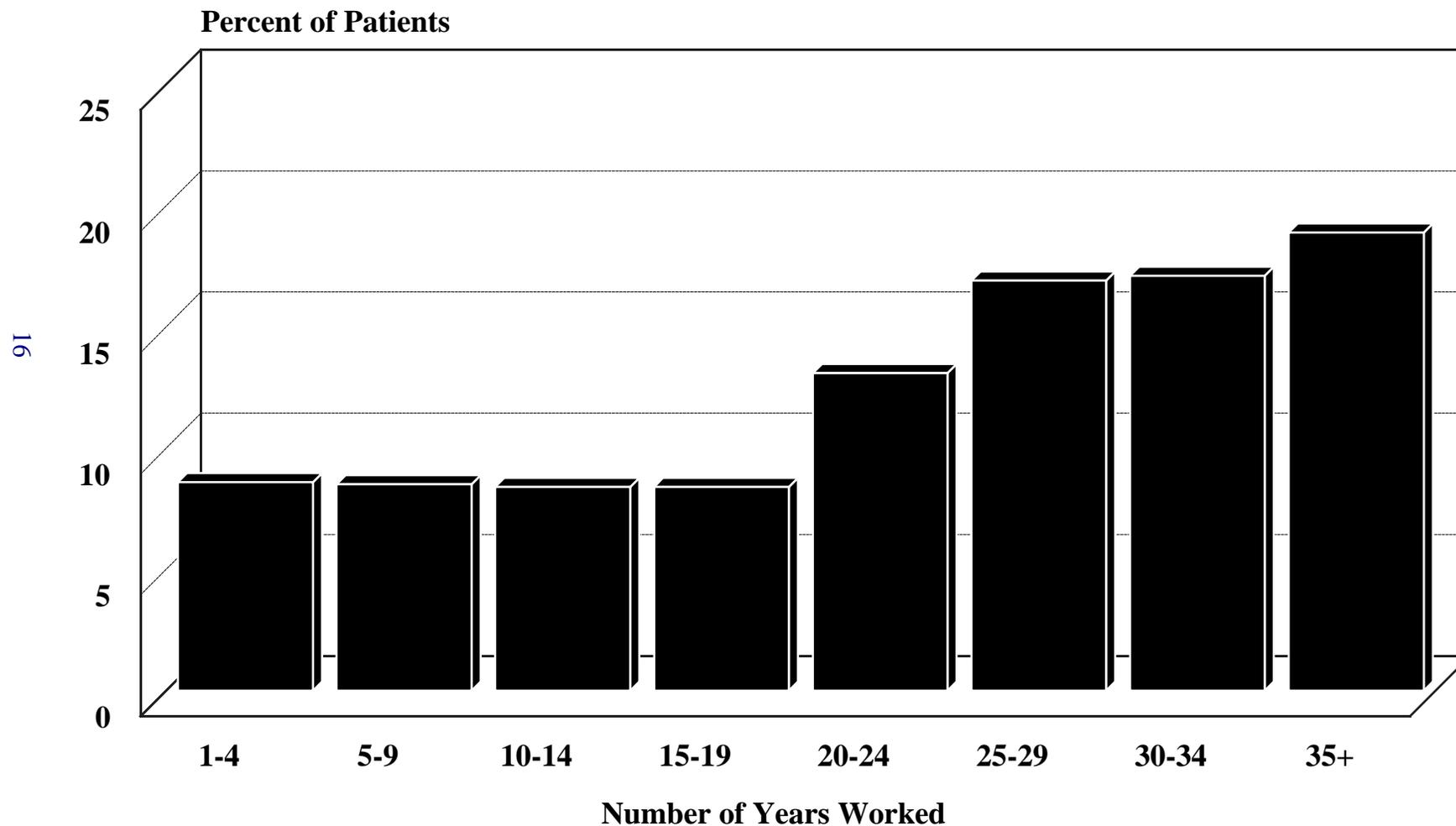
\* Number of employees was unknown for 238 individuals reported by non company hearing health professionals.

**Figure 5. Distribution of Decade of Birth\* of Patients with a Fixed Hearing Loss: Michigan 1992-1998**



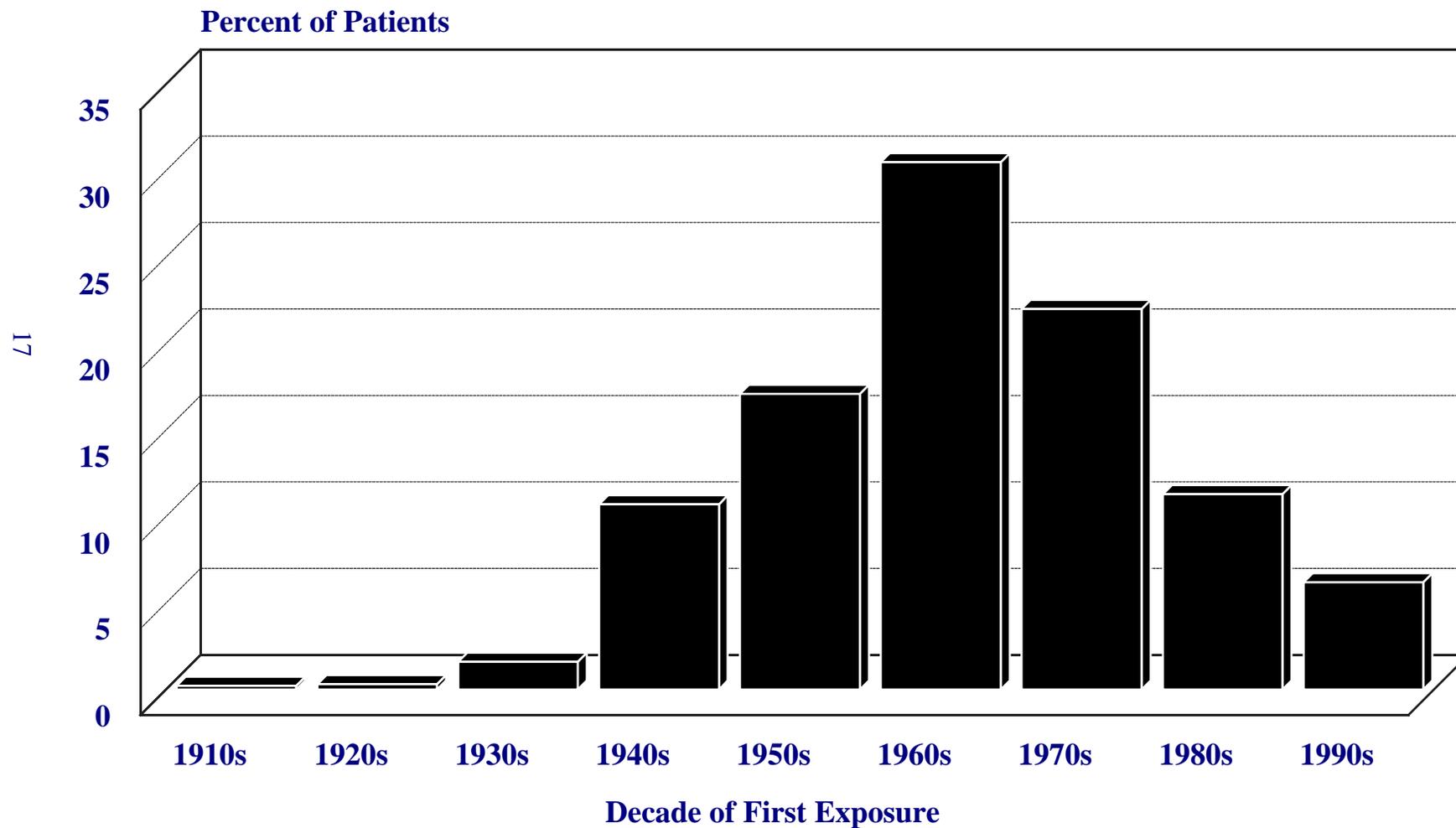
\* Decade of birth was unknown for 25 patients.

**Figure 6. Total Duration of Years Worked\* in Noise for Patients with a Fixed Hearing Loss: Michigan 1992-1998**



\* Duration was unknown for 421 patients.

**Figure 7. Decade of First Exposure\* to Noise for Patients with a Fixed Hearing Loss: Michigan 1992-1998**



\* Decade was unknown for 388 patients.

Table 1. 1998 Occupational Disease Reports of Noise-Induced Hearing Loss: Number of Non-Company Based Health Professionals Reporting Patients in Michigan

<u>Number of Patients Reported</u>	<u>Health Professionals</u>		<u>Total Number of Patients Reported</u>
	<u>Number</u>	<u>Percent</u>	
1	26	(65.0)	26
2-10	11	(27.5)	39
11-50	2	(5.0)	46
51+	1	(2.5)	263
<hr/>			
Total	40*	(100.0)	374

\*Includes 9 group practices.

Table 2. 1998 Occupational Disease Reports of Noise-Induced Hearing Loss: Number of Employees at the Company Where Exposure to Noise Occurred

<u>Number of Employees</u>	Total		Company Medical Department		Non Company Audiologist/ENT	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
<25	9	(0.6)	0	(B)	9	(6.6)
25-100	22	(1.6)	15	(1.2)	7	(5.1)
100-500	29	(2.1)	17	(1.4)	12	(8.8)
500+	1332	(95.7)	1224	(97.5)	108	(79.4)
Total*	1392	(100.0)	1256	(100.1)**	136	(99.9)**

\*Number of employees was unknown for 238 companies reported by private practice health professionals.

\*\*Percent does not add to 100 due to rounding.

Table 3. 1998 Occupational Disease Reports of Noise-Induced Hearing Loss: Industry of Patients Reported

Standard Industrial Classification (SIC)	Total		Company		Non Company	
	Number of Patients	Percent	Medical Department Number of Patients	Percent	Audiologist/ENT Number of Patients	Percent
Agriculture (01-07)	7	(0.5)	--		7	(2.4)
Mining (10-14)	1	(0.1)	--		1	(0.3)
Construction (15-17)	30	(1.9)	--		30	(10.4)
Manufacturing (20-39)						
Food (20)	4	(0.3)	2	(0.2)	2	(0.7)
Paper (26)	14	(0.9)	14	(1.1)	--	
Printing (27)	4	(0.3)	--		4	(1.4)
Chemicals (28)	9	(0.6)	6	(0.5)	3	(1.0)
Rubber (30)	52	(3.4)	50	(4.0)	2	(0.7)
Stone/Clay/Glass (32)	8	(0.5)	6	(0.5)	2	(0.7)
Primary Metals (33)	72	(4.7)	63	(5.0)	9	(3.1)
Metal Fabrication (34)	164	(10.6)	160	(12.7)	4	(1.4)
Machinery (35)	38	(2.5)	30	(2.4)	8	(2.8)
Electronics (36)	53	(3.4)	50	(4.0)	3	(1.0)
Transportation (37)	926	(59.9)	828	(65.9)	98	(33.9)
Miscellaneous Mfg Industries (39)	13	(0.8)	--		13	(4.5)
Transport./Comm. Svcs. (40-49)	22	(1.4)	--		22	(7.6)
Wholesale Trade (50-51)	2	(0.1)	--		2	(0.7)
Retail Trade (52-59)	4	(0.3)	--		4	(1.4)
Finance, Insurance & Real Estate (60-67)	3	(0.2)	--		3	(1.0)
Services (70-89)						
Business (73)	5	(0.3)	--		5	(1.7)
Automotive Repair (75)	3	(0.2)	--		3	(1.0)
Repair (76)	4	(0.3)	--		4	(1.4)
Recreation (79)	4	(0.3)	--		4	(1.4)
Health (80)	9	(0.6)	--		9	(3.1)
Legal (81)	1	(0.1)	--		1	(0.3)
Education (82)	64	(4.1)	45	(3.6)	19	(6.6)
Engr./Mgt. (87)	5	(0.3)	2	(0.2)	3	(1.0)
Public Admin. (91-97)						
Government (91)	6	(0.4)	<b>B</b>		6	(2.1)
Police (92)	3	(0.2)	--		3	(1.0)
Military (97)	15	(1.0)	--		15	(5.2)
<b>Total</b>	<b>1545</b>	<b>( 100.2)**</b>	<b>1256</b>	<b>(100.1)**</b>	<b>289***</b>	<b>(99.8)**</b>

\*Standard Industrial Classification (1987 Manual).

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

\*\*\*SIC was unknown for 85 patients reported by private practice health professionals.

Table 7. Decade Last Worked and Status of Regular Hearing Testing at Most Recent Company Where Hearing Loss Patients\* With a Fixed Loss Were Exposed to Noise, by Industry Type: Michigan 1992-1998

Industry Type (SIC)**	Decade Last Exposed to Noise and Hearing Testing Status													
	1940's		1950's		1960's		1970's		1980's		1990's		Total	
	No. of Pts.	% no RHT***	No. of Pts.	% no RHT										
Agriculture (01-07)	1	100	1	100	2	50	1	100	5	80	27	89	37	86
Mining (14)	0	--	0	--	0	--	0	--	1	100	4	25	5	40
Construction (15-17)	0	--	1	100	1	100	3	67	18	89	89	89	112	88
Manufacturing (20-39)	10	80	16	81	25	96	73	74	187	46	573	33	884	42
Transportation (40-49)	0	--	0	--	2	50	8	63	11	64	93	37	114	41
Trade (50-59)	0	<b>B</b>	1	100	1	****	1	****	3	67	36	86	42	81
Finance (60-67)	0	--	0	--	0	--	1	100	0	--	3	100	4	100
Services (70-89)	0	--	0	--	1	100	0	--	18	89	147	62	166	65
Public Administration (91-97)		****	3	100	4	100	5	60	11	36	77	64	102	64

\*For 379 Patients, either industry type or decade last exposed to noise was unknown.

\*\*Standard Industrial Classification (1987 Manual).

\*\*\*Regular Hearing Test.

\*\*\*\*There is no percentage in this column because the status of regular hearing testing was unknown.

Table 8. Decade Last Worked and Status of Hearing Protection Availability at Most Recent Company Where Hearing Loss Patients\* With a Fixed Loss Were Exposed to Noise, by Industry Type: Michigan 1992-1998

Industry Type (SIC)**	Decade Last Exposed to Noise and Percent with No Hearing Protection											
	1940's		1950's		1960's		1970's		1980's		1990's	
	No. of Pts.	% no HPD***	No. of Pts.	% no HPD								
Agriculture (01-07)	1	****	1	****	2	100	1	100	5	60	27	41
Mining (14)	0	<b>B</b>	0	<b>B</b>	0	<b>B</b>	0	<b>B</b>	1	****	4	****
Construction (15-17)	0	--	1	100	1	100	3	67	18	50	89	24
Manufacturing (20-39)	10	90	16	75	25	72	73	47	187	23	573	9
Transportation (40-49)	0	--	0	--	2	50	8	63	11	36	93	31
Trade (50-59)	0	--	1	100	1	100	1	100	3	67	36	39
Finance (60-67)	0	--	0	--	0	--	1	100	0	--	3	33
Services (70-89)	0	--	0	--	1	****	0	--	18	72	147	23
Public Administration (91-97)	2	****	3	****	4	25	5	40	11	9	77	19

\*For 379 Patients, 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. Decade Last Worked and Status of Regular Hearing Testing at Most Recent Company Where Hearing Loss Patients\* With a Fixed Loss Were Exposed to Noise, by Industry Size: Michigan 1992-1998

	Company Size (Number of Employees)							
	<25		25-100		100-500		500+	
	No. of Pts.	% with no HCP**	No. of Pts.	% with no HCP	No. of Pts.	% with no HCP	No. of Pts.	% with no HCP
1940's	1	100	1	100	0	--	5	80
1950's	4	75	3	100	3	67	10	90
1960's	5	80	5	60	3	67	19	100
1970's	8	100	15	87	16	88	42	64
1980's	31	81	27	74	31	65	138	43
1990's	178	75	136	73	192	46	458	32

\*For 368 patients, either company size or decade last exposed to noise was unknown.

\*\*Hearing Conservation Program.

Table 10. Status of Hearing Testing for the Most Recent Company  
 Where Hearing Loss Patients with a Fixed Loss  
 Were Exposed to Noise: Michigan 1992-1998

<u>Regular Hearing Tests Conducted</u>	<u>Baseline Hearing Test Conducted</u>			Total
	Yes	No	Unknown	
Yes	321	178	90	589 (34.3%)
No	112	616	78	806 (46.9%)
Unknown	14	17	292	323 (18.8%)
<hr/>				
Total	447 (26.0%)	811 (47.2%)	460 (26.8%)	1718*

\*For 127 patients, either baseline hearing testing status or regular hearing testing status was unknown.

Table 11. Sixty Companies Inspected Where Patient Reported They Had Not Received Audiometric Testing: Michigan 1992-1998

<u>Industry (SIC)*</u>	<u>Hearing Conservation Program (HCP)</u>				<u>Citation Issued Re: HCP</u>	<u>Total Number of Employees Exposed to Noise</u>
	<u>Total Number of Inspections</u>		<u>Required</u>			
	<u>#</u>	<u>%</u>	<u>#</u>	<u>(%)</u>		
Construction (15-17)	1	(1.7)	**	**	Deficient - None 1	- 562
Manufacturing (20-39)	45	(75.0)	27	(60.0)	Deficient 10 (37.0) None 9 (33.3)	1835(# employees unknown companies) 1056
Transportation (40-49)	2	(3.3)	0	(B)		
Trade (50-59)	5	(8.3)	1	(20.0)	Deficient - None 1 (100.0)	<b>B</b> 14
Services (70-89)	4	(6.7)	3	(75.0)	Deficient - None 2 (66.7)	<b>B</b> 29
Government (91-97)	3	(5.0)	3	(100.0)	Deficient 2 (66.7) None -	700 (# employees unknown company) -

\*Standard Industrial Classification (1987 Manual).

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

Table 12. Size of Companies Cited for Violations of the Noise Standard in Michigan: 1/1/98 to 12/31/98

<u>Number of Employees</u>	<u>Companies Number</u>	<u>Percent</u>
0 - 50	24	(50.0)
51 - 250	18	(37.5)
251 +	6	(12.5)
Total	48	100.0

Table 13. Violations of the Noise Standard in Michigan:  
1/1/98 to 12/31/98

<u>Standard Violated</u>	<u>Number of Citations</u>	<u>Percent*</u>	<u>Percent**</u>
No hearing conservation program	33	(68.8)	(46.5)
Exceeded noise level	11	(22.9)	(15.5)
Training	8	(16.7)	(11.3)
Access to medical records	5	(10.4)	(7.0)
Noise monitoring	5	(10.4)	(7.0)
Provide hearing protection	3	(6.3)	(4.2)
Any audiometric testing	3	(6.3)	(4.2)
Follow-up on annual audiometric testing	1	(2.1)	(1.4)
Audiometry on an annual basis	1	(2.1)	(1.4)
Recordkeeping	1	(2.1)	(1.4)

\*A company may be cited for more than one type of violation, therefore these percentages are based on a total of 48 companies cited.

\*\*Percentage based on a total of 71 violations.



**Table 14. Type of Industry Cited for Violations of the Noise Standard  
in Michigan: 1/1/98 to 12/31/98**

<u>Industry (SIC Code)*</u>	<u>Number</u>	<u>Companies</u>	<u>Percent</u>
<u>Manufacture of:</u>			
Fabricated Metal Products (34)	20		(41.7)
Transportation Equipment (37)	8		(16.7)
Primary Metal (33)	5		(10.4)
Food and Kindred Products (20)	2		(4.2)
Industrial and Commercial Machinery (35)	4		(8.3)
Rubber/Plastics (30)	3		(6.3)
Lumber and Wood Products (24)	1	(2.1)	
Stone, Clay, Glass (32)	1		(2.1)
<u>Trade:</u>			
Wholesale Trade (50)	1		(2.1)
<u>Services:</u>			
Business (73)	1		(2.1)
Automotive Repair (76)	1		(2.1)
<u>Government:</u>			
Police (92)	1	(2.1)	
<b>Total</b>	<b>48</b>		<b>100.2**</b>

\*Standard Industrial Classification (1987 Manual).

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

Table 15. Demographic Characteristics of 201 Patients with Noise-Induced Hearing Loss, with Noise Exposure in Construction: Michigan 1992-1998

**Gender**

	<u>Number</u>	<u>Percent</u>
Male	199	(99.0)
Female	2	(1.0)
<hr/>		
Total	201	(100)

**Race**

	<u>Number</u>	<u>Percent</u>
White	181	(93.8)
African American	1	(4.7)
Hispanic	1	(0.5)
Other	2	(1.0)
<hr/>		
Total	193	(100)

Race was unknown for 8 individuals.

**Decade of Birth**

Decade	<u>Number</u>	<u>Percent</u>
1910-1919	6	(3.0)
1920-1929	26	(13.1)
1930-1939	40	(20.1)
1940-1949	49	(24.6)
1950-1959	53	(26.6)
1960-1969	21	(10.6)
1970-1979	4	(2.0)
<hr/>		
Total	199	(100)

Decade was unknown for 2 individuals.

Table 15. Demographic Characteristics of 201 Patients with Noise-Induced Hearing Loss, with Noise Exposure in Construction: Michigan 1992-1998

**Gender**

	<u>Number</u>	<u>Percent</u>
Male	199	(99.0)
Female	2	(1.0)
	-----	-----
Total	201	(100)

**Race**

	<u>Number</u>	<u>Percent</u>
White	181	(93.8)
African American	1	(4.7)
Hispanic	1	(0.5)
Other	2	(1.0)
	-----	-----
Total	193	(100)

Race was unknown for 8 individuals.

**Decade of Birth**

Decade	<u>Number</u>	<u>Percent</u>
1910-1919	6	(3.0)
1920-1929	26	(13.1)
1930-1939	40	(20.1)
1940-1949	49	(24.6)
1950-1959	53	(26.6)
1960-1969	21	(10.6)
1970-1979	4	(2.0)
	-----	-----
Total	199	(100)

Decade was unknown for 2 individuals.

Table 17. Most Recent Decade Where 201 Patients With Noise-Induced Hearing Loss Were Exposed to Noise in the Construction Industry, and Status of Regular Hearing Tests and Use of Hearing Protection: Michigan 1992-1998

Decade*	Total Patients		Regular Hearing Tests					Given Hearing Protection				
	<u>Number</u>	<u>Percent</u>	No		Yes		Unk.	No		Yes		Unk.
			<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>
1950-1959	5	(3.3)	4	(100)	--	--	1	4	(100)	--	--	1
1960-1969	9	(5.9)	9	(100)	--	--	--	7	(100)	--	--	2
1970-1979	15	(9.9)	13	(93)	1	(7)	1	9	(90)	1	(10)	5
1980-1989	29	(19.1)	25	(93)	2	(7)	2	15	(68)	7	(32)	7
1990-1998	94	(61.8)	84	(97)	3	(3)	7	26	(38)	43	(62)	25
Total			135	(96)	6	(4)	11	61	(54)	51	(46)	40

\*Decade was unknown for 49 individuals.