

2009

**Annual Summary of
Occupational Disease Reports
to the Michigan Department of
Energy, Labor and Economic Growth**



Summary of 2009 Occupational Disease Reports to the Michigan Department of Energy, Labor and Economic Growth

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SUMMARY

There were 6,837 occupational disease (OD) reports submitted to the Michigan Department of Energy, Labor and Economic Growth (MDELEG) in calendar year 2009 as required under the Michigan Occupational Disease Reporting Law. Only occupational diseases, not injuries are included in this report. These reports were submitted by company medical departments or clinics under contract to companies to provide occupational health services to their employees, as well as health care practitioners not providing services to companies. The percentage of reports received that were submitted from company medical departments or clinics under contract has decreased from 84-91% in the early 1990s to approximately 53-70% in the last eight years.

The most frequent reports were repetitive trauma (26%), toxic effects of substances (26%), and respiratory diseases (10%). The reports submitted in 2009 are much lower than the number of reports received from 1994-2001. Since 1999, there has been a downward trend of reporting; 21,538 reports were received in 1999 versus 6,837 reports received in 2009. Some of this decline is probably secondary to the development of fewer occupational illnesses particularly in recent years relating to the closure of manufacturing facilities in Michigan from the economic recession. Some component of the reduction may also be from poorer compliance with the reporting law. To address reporting compliance, MIOSHA enforcement of the Occupational Disease Reporting Law began in April 2009. Site visits to 10 non-reporting clinics were conducted in 2009 to enforce the requirement to report. Additional clinic audits are planned for 2011.

Company-associated health care practitioners report different types of illnesses than non-company associated health care practitioners. For example, there were 1,739 (56%) reports from non-company providers for toxic effects of substances (poisonings) while only 43 (1%) such reports were received from employer-associated providers (Table 4). In contrast, company-related providers reported 1,771 (48%) cases of repetitive trauma compared to 10 (<1%) of non-company provider reported cases.

The average age of individuals reported was 44 years, ranging from 13 to 95. Sixty-nine percent of individuals reported were between the ages of 25 and 54, and 66% were for male workers.

There were differences in the types of reports received through the OD reporting system compared to illnesses identified through either the Bureau of Labor Statistics' Annual Survey of a sample of employers or the Michigan Workers' Compensation Agency (Table 8). The OD reporting system had much higher percentages of illnesses from poisonings and dust diseases of the lung than the other two reporting systems. Reliance on multiple reporting systems presents a more complete picture of the spectrum of work-related illnesses in our state.

Beginning in 1997, Michigan laboratories were required to report blood lead levels; beginning in 2005, the labs were also required to report blood and urine levels of arsenic, cadmium and mercury, as well as plasma and red cell cholinesterase levels. In 2002, Michigan's two Poison Control Centers began to submit work-related reports; there is now only one center based in Detroit that covers the whole state. In 2009, there were 961 reports received from this Center. Given the complementary nature of all the existing programs, we are able to combine data across systems to better characterize the extent and distribution of individuals who become sick and injured at work. This is an essential first step in reducing the burden of these preventable injuries and illnesses in our state. A previous publication of ours highlighted the potential incompleteness of the official national statistics on occupational injuries and illnesses. The official statistics are based solely on reporting from employers. Our study indicated that the true occurrence of occupational injuries and illnesses may be undercounted by as much as two-thirds.¹ More recent work on amputations in the state found that in 2007 the BLS only identified 22% and in 2008 only 59% of the work-related amputations identified through our multi-source surveillance

system (see Amputation Annual Reports at www.oem.msu.edu).

For 2009, the most recent year available, the Bureau of Labor and Statistics (BLS) survey reported 127,600 occupational injuries and illnesses in Michigan. If this represents only one-third of the true number of occurrences, then one would estimate almost 400,000 occupational injuries and illnesses in Michigan in 2009.

INTRODUCTION

Since 1978, physicians, hospitals, clinics, other health professionals and employers have been required by the Michigan Public Health Code (Article 368, Part 56, P.A. 1978, as amended) to report known or suspected cases of occupational diseases. Until 1996, these reports were submitted to the Michigan Department of Public Health. Reports are now submitted to the Michigan Department of Energy, Labor and Economic Growth (formerly the Michigan Department of Consumer and Industry Services). During the initial years after the reporting law was enacted, the number of reports received was generally fewer than one hundred each year. Following the 1988 implementation of the Sentinel Event Notification System for Occupational Risks (Project SENSOR), a statewide initiative for occupational disease surveillance began, with active solicitation of occupational disease reports. MDELEG designates the Michigan State University's College of Human Medicine, Occupational and Environmental Medicine Division as its bona fide agent to compile and analyze the occupational disease reports.

Figure 1 is a copy of the Known or Suspected Occupational Disease Report form submitted to MDELEG by company-associated and non company-associated health care providers. The form requests medical and demographic information on the affected employee and information about the facility at which the employee became ill. In 1991, computerization of the OD reports began, to allow a more efficient handling of the high volume of reports submitted and facilitating the use of these reports to direct surveillance, intervention and prevention. This is the eighteenth annual report on occupational diseases in Michigan, and is based upon the reports submitted to the MDELEG in calendar year 2009.

On-line occupational disease reporting has been available since 2001 through the Michigan State University Occupational and Environmental Medicine website: www.oem.msu.edu. A secure server is used to maintain the confidentiality of the information submitted on-line. The ability to submit audiogram results was added to on-line reporting in 2003, for cases of occupational noise-induced hearing loss. The health professional electronically submitting occupational disease reports is first given a choice between submitting an occupational disease report for hearing loss or for any other illness. If hearing loss is selected, the user is directed to a screen to report the standard occupational disease report information. Next, the user is asked whether audiogram results will be submitted electronically or via fax or mail. If submitted electronically, a screen to enter audiogram results can be used to report right and left ear hearing thresholds ranging from 250 Hz to 8000 Hz.

In addition to completing the OD report form (Figure 1) on-line, information can be submitted by:

*Email: ODREPORT@ht.msu.edu

*Fax: (517) 432-3606

*Phone-in: 1-800-446-7805

*Request postage paid envelopes: 1-800-446-7805

*Mail directly to: MDELEG, MIOSHA

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METHODS

The computerized OD records contain: 1) the employee's name, age, sex, race, zip code and social security number; 2) the employer's name, work site address, city, zip code, number of persons

employed at the facility and an assigned standard industrial classification code (SIC)² for each facility; 3) details of the illness, including diagnosis date, suspected causative agent(s), whether the employee died, and an assigned diagnosis or clinical impression coded according to the International Classification of Diseases (ICD-9th Revision³); and 4) information about the individual who submitted the report, including whether the reporter is employed by the company, an outside medical department contracted by the company, or a private practice health professional. Beginning in 2008, the company's type of industry has been coded to the 2007 North American Industry Classification System-United States (NAICS) scheme in lieu of the 1987 SIC coding scheme.

An OD report is initiated when a clinician knows or suspects that a patient's illness is work related. Reports are submitted by physicians, audiologists, employers, hospitals, clinics, laboratories, the 3rd Judicial Court of Michigan (which processes the majority of the asbestos-related claims in Michigan), the Michigan Poison Control Center and the Federal Mine Safety and Health Administration. Additional reports are generated through annual review of death certificates, the Michigan Health and Hospital Association inpatient database, and the Michigan Cancer Registry (for cases of mesothelioma).

Since October 11, 1997, all clinical laboratories doing business in Michigan have been required to report all blood lead analysis results for both adults and children, to the Michigan Department of Community Health. Through calendar year 2008, the blood lead results of 10 µg/dL or greater for adults were incorporated into the OD reports submitted each year to the MDELEG. Starting in 2009, the blood lead levels of 5 µg/dL or greater for adults are now incorporated into the OD reports submitted to the MDELEG; this reflects the growing body of evidence that even low levels of lead poisoning can have adverse health effects on individuals. Many adults reported through this system have had blood lead testing as part of their company's monitoring program. However, it is the clinical laboratories that actually submit the results to the state, not the employers. Aside from the clinical laboratory reports, employers themselves almost never submit an elevated blood lead level report to the MDELEG, even though they would be required to do so under the Michigan Occupational Disease Reporting Law. In light of this, blood lead reports submitted by the clinical laboratories are all considered as non-company reports, even though the company may have initially ordered the blood lead test.

In 2004, we began counting each individual one time regardless of the number of blood lead tests he or she may have had throughout the year. Prior to 2004, if an individual had multiple blood lead tests performed throughout the year, and they were all reported to the state, each of those reports was counted in the year's statistics.

Beginning in 2005, regulations requiring laboratories to report arsenic, cadmium, mercury and cholinesterase testing went into effect. Procedures to handle these reports were developed in 2005. Nine work-related elevations of mercury, six work-related elevations of arsenic and 21 work-related elevations of cadmium have been identified since the establishment of these new regulations. In addition, there have been 38 reports of cases with a 20% or greater decrease in cholinesterase levels and a work place exposure to organophosphate pesticides.

Collection of information on work-related illnesses from Michigan's Poison Control Center (PCC) began in 2002. On a monthly basis, the work-related reports are incorporated into the occupational disease reporting database. In 2008 (most recent year available), for example, 1,096 (1.3%) of the 84,361 human exposure-related PCC calls were related to occupational exposures.

More than one report on a given individual with different work-related diseases may be submitted to the MDELEG within a given year and across multiple years. If more than one report is submitted in a given year for a chronic disease in a single individual, only one of the submissions is included in our statistics. If multiple reports are submitted over several years on that individual's chronic disease, only the earliest report is included in our statistics. In contrast, if several reports are submitted for acute

illnesses for a single individual, all of the reports are included in our statistics. Appendix A lists the chronic disease categories for which duplicate reports within and across years are removed.

RESULTS

A total of 6,837 occupational disease reports were submitted to the MDELEG in calendar year 2009. Figure 2 shows the number of reports received each year since 1985.

Source of Reports

Company or contract medical departments submitted 55% of the reports (3,731 cases); non company-associated health care practitioners submitted 45% of the reports (3,106 cases) (Figure 3). Over half reports were submitted on individuals who worked in large companies (Table 1) with 58% of the 4,315 reports that listed company size coming from businesses with > 500 employees. A greater proportion of reports for companies with 500 or fewer employees come from non-company health practitioners. About 58% of the 890 reports with known company size that were submitted by non-company practitioners involved companies with < 500 employees, while about 38% of the 3,425 reports with known company size submitted by company practitioners involved facilities with < 500 employees.

Two hundred fourteen non company-associated clinicians reported 382 incidents of occupational disease. Thirty labs were responsible for identifying 1,446 reports of lead poisoning. In addition, the Michigan Poison Control Center reported 961 incidents of work-related poisonings, and the 3rd Circuit Court of Michigan reported 307 asbestos-related claims. One hundred eighty-eight (88%) of the clinicians reported only one patient each in calendar year 2009 (Table 2); three clinicians reported 21-100 patients each. One of the clinicians runs an occupational medicine clinic. Two of the clinicians are certified to interpret chest x-rays for dust related lung disease (“B” readers). A “B” reader is a licensed physician who has passed a test on interpreting chest x-rays for pneumoconiosis and maintains certification by passing an additional test every four years. As of August 2009, there were nine Michigan physicians who were listed as “B” readers on the NIOSH “B” reader website.

There are approximately 260 occupational health clinics in Michigan. Since June 2005, the number of such clinics reporting occupational disease cases to the State has increased from 21 to 56. With the first two rounds of audits of non-reporting clinics in 2009, and the next round of audits planned for 2011, we expect the number of reporting clinics to increase.

Demographics

Table 3 shows the age, gender and race distribution of the workers with occupational diseases reported in the year 2009. The mean age of reported patients was 44 ± 14 years (range, 13 to 95 years) with approximately two-thirds of the patients (69%) between the ages of 25 and 54 years. One hundred nineteen reports were submitted for patients under age 20, and 91 reports were submitted for patients age 80 and older.

Sixty-six percent of all reports submitted were for male workers. Sixty-nine percent of the submitted reports (4,731 cases) did not indicate the worker’s race. Of the 2,106 reports that did indicate race, 33% were Caucasian, 5% were African American, 3% were Hispanic and 59% were listed as “other.”

Younger workers. Of the 63 workers age 18 and younger, one was 13, one was 15 years old, 10 were 16 years old, 15 were 17 years of age, and 36 were 18 years old. Thirteen (21%) of the reported patients under age 19 were female and 50 (79%) were male. Place of employment was unknown for 61 of the 63 younger workers. Of the two with known employment type, one worked in public administration

and the other in automotive services.

One of the younger workers was reported by a company-affiliated clinician or clinic. Thirty-one workers were reported for chemical poisonings (from the Poison Control Center), 24 were for an elevated blood lead level (serum lead levels were between five and 20 micrograms per deciliter), seven were for respiratory symptoms and one was for general symptoms. Three fatalities under the age of 19 from an acute traumatic injury were identified through a review of 2009 death certificates; these deaths are accounted for in a separate Michigan reporting system for acute traumatic work-related fatalities.

Older workers. Of the 91 workers age eighty and older, 82 (90%) were between the ages of 80 and 89, and nine were between 90 and 95 years of age. Eighty were men and 11 were women. Twenty-three of the older patients worked in or were retired from manufacturing, four worked in the gas and electric utilities industry, three worked in construction, two worked in health care services and one in mining. Industry or former industry was not indicated in 58 reports.

A company-affiliated clinician or contract medical clinic reported two of the patients. Forty-two of the older workers were reported for dust-related lung disease (including 32 with asbestosis and 10 with silicosis), 38 for elevated blood lead levels (serum lead levels were between 5 and 28 micrograms per deciliter), seven for cancer, three for respiratory conditions, and one for an infectious disease.

Illness Information

Table 4 shows the distribution of diagnoses or clinical impressions by reporting source. Diagnoses are grouped by major International Classification of Diseases categories (ICD-9th Revision). Overall, toxic effects of substances (poisoning) were the most frequently reported conditions, with 1,782 cases representing 26% of all OD reports submitted; most of those reports were for elevated lead levels.

Repetitive trauma conditions were the second most frequently reported conditions, with 1,781 cases representing 26% of all reports. Diseases of the respiratory system were the third most frequently reported condition, representing 693 (10%) of the cases. Diseases of the musculoskeletal system and connective tissue were the fourth most frequently reported condition, with 628 cases representing 9% of all reports submitted. There were 595 (9%) reports of symptoms, 525 (8%) reports of nervous system and sense organ diseases, 258 (4%) reports of skin diseases, and 246 (4%) reports of infectious and parasitic diseases. Less frequently reported conditions included neoplasms, diseases of the digestive system, welding flash (burns to the eye), and diseases of the circulatory system.

Reporting source differences. Company and non company-affiliated providers differ markedly in the types of occupational diseases reported (Table 4). Forty-eight percent of reports from company health care providers are of repetitive trauma illnesses, while less than one percent of reports by non-company providers represent these diagnoses. Conversely, 56% of non-company reports are of toxic effects of substances (poisonings), compared to one percent of company submissions. The second, third and fourth most frequently reported diagnoses for company providers are diseases of the musculoskeletal system and connective tissue (17%), diseases of the nervous system and sense organs (14%), and infectious diseases (7%). Respiratory illnesses are the second most frequently reported diagnoses by non-company providers (18%). The third and fourth most frequently reported diagnoses for non-company providers are symptoms (17%) and welding flash (6%).

Company and non-company practitioners differ by industries represented in their reports (Table 5). Company-affiliated health care providers and non company-affiliated physicians reported high percentages of patients employed in manufacturing (47% and 59%, respectively), primarily automobile production. The second and third most frequently reported industries by company providers are health

care and social assistance (16%) and public administration (5%). The second and third industry types most frequently reported by non-company providers are construction (28%), and utilities (7%). Industry type was missing on 2,068 non-company and 192 company reports.

Gender differences. Repetitive trauma was the most frequently reported diagnosis for women, with 34% of submissions (Table 6). For men, the most frequently reported diagnosis was toxic effects of substances (poisoning), with 33% of submissions. The second, third and fourth most frequent diagnoses for men were repetitive trauma illness (22%), respiratory diseases (12%), and diseases of the nervous system and sense organs (9%). For women, the second, third and fourth most frequently submitted diagnoses were diseases of the musculoskeletal system (14%), toxic effects of substances (12%) and symptoms (10%). Sixty-one reports did not indicate gender.

Fatalities. Fatalities related to occupational illnesses were reported for 35 workers (Table 7). None of the illness-related fatalities reported were from acute incidents. Non-company clinicians reported 33 of the 35 individuals with occupational illnesses who died. The workers who died ranged in age from 39 to 86 years. Eighteen died from asbestos-related cancer, 14 from asbestosis, one from silicosis, and two from other conditions. Twenty-four of the deceased workers had been employed in manufacturing, five in construction, and one in oil and gas. Former occupation was not specified for five workers.

The state has a separate program to track acute traumatic fatalities, called MIFACE (Michigan Fatality Assessment and Control Evaluation). The MIFACE program identified an additional 94 acute work-related fatalities from injuries in 2009 that occurred in Michigan. A separate report is being prepared on these deaths, and will be available in 2011. Past reports can be found at: www.oem.msu.edu. Three deaths among youths were identified in the MIFACE Program in 2009.

Comparison with Other Data Systems

Published Data in Michigan at a Disease Category Level. Table 8 compares data from the OD reporting system with Workers' Compensation Agency Claims and the BLS Annual Survey. These data illustrate the variation of reported disease categories by reporting source and suggest that the magnitude of occupational diseases among Michigan workers is greater than what currently gets reported. No one system completely captures all categories of occupational disease.

The most quoted data source on occupational injuries and illnesses available in Michigan comes from the BLS annual survey of company injury and illness logs. For this data source, the most recent data available at a disease category level is from 2009 with an estimate of 8,600 occupational illnesses and 119,000 occupational injuries in the state.

Data from the MDELEG Workers' Compensation Agency (WCA) for 2009 showed 23,462 claims for occupational injuries and illnesses with seven or more lost work days. Overall in 2009, about \$542 million in compensation was paid by insurance companies and self-insured employers on 296,156 claims for both lost work time and medical-only costs. These claims include new claims filed in 2009 as well as previous claims for workers who continue to lose work time or incur medical costs due to their injury or illness. Fifty-three percent of the total paid claims in 2009 were for medical procedures or care only and 47% for wage loss (http://www.michigan.gov/documents/wca/wca_2009_Annual_Report_316366_7.pdf).

Hospital Discharge Data – Workers' Compensation. The source of data for this section is the Michigan Health and Hospital Association (MHA). If the source of payment changed after the patient was treated and discharged from the hospital, such as might occur in a disputed workers' compensation case, it is likely that this change would not be captured in the MHA data reported in this section. Figure 4 shows the number of patients as well as hospitalizations with Workers' Compensation (WC) insurance

designated as the primary payment source at discharge for the years 1992 through 2009; the numbers of hospitalizations from 1995-2009 decreased compared to the years 1992-1994. In addition, the percentage of hospitalizations with WC insurance designated as the primary payment source at discharge decreased beginning in 1993 (Figure 5). However, for both these parameters, there was a plateau in the decrease from 2004 to 2008. However, there was a decrease in 2009 in both these parameters. In 2009, 0.30% of the 1,305,935 Michigan hospitalizations designated Workers' Compensation insurance as the primary payment source at discharge.

Table 9 shows the primary discharge diagnosis for hospitalizations from 1992 to 2009 where WC insurance was designated as the primary payment source at discharge. WC insurance covers a broad range of conditions, including mental illness, infections, heart disease and cancer. The most common two conditions covered by WC insurance are musculoskeletal diseases, accounting for approximately 32-44% of patient WC-related hospitalizations from 1992-2009 and injuries and poisoning, accounting for 36-43% of all WC-related patient hospitalizations.

Table 10 lists the demographic characteristics of patients with WC insurance designated as the primary payment source at discharge. Approximately 75% of the hospitalizations were for men, across all years from 1992 to 2009. Among hospitalizations for which race was known, approximately 85-90% were white, 10% were African American, <1% were Asian, and 1-5% were listed as "other."

The majority of hospitalizations involved workers between the ages of 40 and 59 years. Less than 1% involved workers under the age of 15 or 80 years or older, except since 2005 through 2009 where 3-4% of the workers were 80 years or older. The percentage of hospitalizations of workers under the age of 20 has decreased slightly over time, from 3% in 1992 to 1% in 2009.

Hospital Discharge Data – Pneumoconiosis. Figure 6 shows the number of individuals hospitalized in Michigan with asbestosis, coal workers' pneumoconiosis and silicosis from 1990 to 2009. Repeat admissions of the same individual within each calendar year are excluded from these counts. For most of these patients, pneumoconiosis was not the primary discharge diagnosis listed on the discharge record. From 1993 to 2004, there was a steady increase in the number of hospitalizations for asbestosis (approximately a 40% increase) (Figure 6). From 2004 to 2007, this trend reversed. In 2008 and 2009, however, the number of patients shows an increase once again. Regulations to control asbestos exposure were not promulgated until the early 1970s and were not widely implemented until the 1980s. Given the 25 year or greater latency period from the time of first exposure to the development of asbestos-related radiographic changes, the cases being identified now represent exposures from these earlier less-regulated years. The trend we are seeing in Michigan is consistent with national data published in the NIOSH 2005 Work-Related Lung Disease Surveillance Report updates on asbestosis available at: www2a.cdc.gov/drds/WorldReportData/FigureTableDetails.asp?FigureTableID=15.

Payment source from the MHA is the source of data displayed in Figure 7. Medicare is the primary payment source for hospitalizations for these dust diseases of the lung. WC insurance is very rarely the source of payment, which is consistent with findings in both Michigan and New Jersey that the majority of patients with pneumoconiosis never apply for WC insurance^{4,5}. As described in the previous section, if the source of payment for the hospitalization changes after the patient is discharged from the hospital, the change in payment source will likely not be reflected in the MHA data. For example, if the anticipated payment source was initially workers' compensation but then changed to a non-work-related payment source, the record in the MHA file would still indicate workers' compensation.

Asbestosis-Related Lung Disease and Mesothelioma. Asbestos-related lung disease is the most common dust disease reported to the Michigan Department of Energy, Labor and Economic Growth. The number of reports of asbestosis in 1999 was 3,384, decreased to 677 reports in the year 2002, increased in 2006 to 1,098, decreased in 2007 to 571, increased to 853 in 2008 and decreased in 2009 to 282

(Figure 8). The number of reports of pleural thickening decreased from 2001 to 2002, from 2,397 to 1,269 reports. In 2004, the number of reports of asbestos-related pleural thickening increased to 1,976, decreased to 223 in 2007, and increased slightly to 319 in 2008 and decreased in 2009 to 105. The reports for asbestos-related x-ray changes are largely from one of Michigan's B-readers as well as an occupational medicine physician.

In 1995, there were 16 B-readers in Michigan. Today, there are only nine physicians in Michigan who are certified as B-readers. Figure 9 shows the number of B-readers, chest x-rays that were reviewed, and x-rays that showed evidence of asbestos-related lung disease, with pleural and parenchymal changes separately and combined. On the average, since 1995 about 20% of the x-rays reviewed showed evidence of occupational disease, ranging from a low of 829 (8%) of 10,591 x-rays reviewed in calendar year 2000 and 296 (8%) of 3,570 x-rays reviewed in 2007, to a high of 3,640 (36%) of 10,575 x-rays reviewed in calendar year 1999. In 2008, 14% of the chest x-rays showed evidence of asbestos-related disease; in 2009 7.5% of 4,170 x-rays reviewed showed evidence of asbestos-related lung disease. The total number of radiographs interpreted by one B-reader was not available. Figure 9 is based on an annual survey the B-readers in Michigan complete. The numbers of reports listed in the survey are greater than the number of occupational disease reports received from B-readers that are included in the statistics of this annual report.

The association between exposure to asbestos and the risk of developing mesothelioma was first reported in the medical literature in 1943⁶. The only other exposure associated with the risk of developing mesothelioma has been the therapeutic, not diagnostic, use of x-rays. The percentage of patients with mesothelioma who have a history of occupational asbestos exposure is lower in studies that are based on review of medical records compared to studies based on a complete work history where 90% of mesothelioma has been attributed to asbestos exposure⁷. Among cohorts of asbestos-exposed workers, up to 10% of deaths have been attributed to mesothelioma.

The Michigan Cancer Registry has data to describe the demographics of mesothelioma in Michigan. From 1985 through 2007 there were 2,301 Michigan residents reported to the Michigan Cancer Registry with invasive mesothelioma. Figure 10 shows the number of men and women diagnosed with mesothelioma by year, from 1985 to 2007. Approximately one quarter (26%) of the reports of mesothelioma occurred in women. Mesothelioma occurred predominantly among Caucasians (93.5%) compared to African Americans (5.6%). Approximately 1% were classified as "other" ancestry.

Figure 11 shows the age at diagnosis separately for men and women. The peak age of occurrence of mesothelioma was for individuals 65 years and older for both men and women.

Figure 12 shows the distribution of the number of cases of mesothelioma among Michigan residents, by county. The south-east-and-central region of Michigan has the highest number of cases of mesothelioma. Figure 13 shows the average annual incidence rates of mesothelioma among Michigan residents, by county. The counties with the highest rates are: Midland (3.9 per 100,000); Bay (2.8 per 100,000); and Houghton (2.1 per 100,000). The annual average mesothelioma incidence rate for 1985-2007 in Michigan was 1.1 cases per 100,000.

Poison Control Center Data. In 2009, 961 calls to the Michigan Poison Control Center were identified as work-related. Table 11 describes available demographic characteristics of the individuals reported. There were more reports for males (59%). The individuals ranged in age from 13 to 73 years. Eighty-five percent of these individuals were less than age 50. More details about the nature of these poisonings is provided by the Poison Control Centers, but not in a format that is readily analyzable.

DISCUSSION

There were 6,837 Occupational Disease Reports sent to the MDELEG in calendar year 2009. This report does not include occupational injuries. The most frequent types of occupational diseases reported to the MDELEG were repetitive trauma illnesses (26%), toxic effects of substances (26%), respiratory diseases (10%), musculoskeletal disease (9%), and diseases of the nervous system and sense organs (8%). From 1988 through 1999, the number of reports sent to the State increased substantially. Figure 2 shows the number of occupational disease reports received each year since 1985. Since 1999, the number of reports has decreased. There was a large decrease in the number of reports received in 2005, with over 2,200 fewer reports received than in 2004; in 2009 the total number of reports decreased by over 640 from 2008. The initial overall decline in the number of reports reflected fewer reports from company medical departments. The number of reports from non company-affiliated practitioners remained relatively unchanged through 2004; however, from 2004 to 2009 there was a large decline of approximately 3,000 reports in the number of non company-affiliated practitioner reports as compared to 2004 (Figure 3). This decrease parallels the decreases seen in the BLS Annual Survey which is based on employer reporting and Workers' Compensation claims. The number of company-affiliated physicians or medical departments reporting in 2009 was 194, compared to 449 in 2008, 426 in 2007, 396 in 2006, 374 in 2005, 373 in 2004 and 305 in 2003.

ICD-9 codes were used to classify the diagnosis or clinical impression recorded on the occupational disease reports submitted to the MDELEG. Sprains and strains, except those involving the back, are considered by the Federal and Michigan OSHA programs as illnesses secondary to cumulative trauma, and are therefore required to be reported even though in the ICD-9 coding system, sprains and strains are classified as injuries.

Many employers, physicians and other health care providers do not report patients with occupational diseases either because they are unaware of the reporting law or choose not to report for a different reason. Currently, reports are received from approximately 190 company-affiliated physicians reporting employees from 845 different companies; there were 214 non company-affiliated physicians reporting patients to the state. There were 231,656 companies in the year 2009 and 28,903 licensed physicians in Michigan in the year 2010 (2009 data not available). Accordingly, reports are received from 0.4% of companies and 0.7% of physicians. Over the last several years, these percents have remained largely unchanged. Efforts continue to remind employers of the requirement to report by routinely distributing reporting forms during MIOSHA inspections. In addition, all new physicians receive information on the requirement to report when they apply for medical licensure in Michigan.

We know that the 6,837 occupational disease reports received this past year under-represent the actual incidence of occupational diseases in Michigan. Based on our matching of multiple data bases in Michigan for the years 1999-2001, we estimate that the BLS survey missed 50% of the total number of occupational illnesses in Michigan. In 2009, the BLS annual survey reported 8,600 illnesses. If that figure is doubled then we would have expected in excess of 17,000 occupational illnesses in Michigan in 2009 instead of the approximately 7,000 reported. Even this number is an underestimate because it assumes that all physicians recognize work-related illness in their patients and that all employers are informed when work-related conditions are diagnosed. These assumptions often go unmet, given the limited training that health care providers receive in diagnosing work-related conditions, and that many individuals never inform their employer when they are diagnosed with a work-related condition.

The type of illness and industry where occupational diseases occur as reported by non company-affiliated health care practitioners differs from company-based health care practitioners (Tables 1, 4 and 5). The differences vary depending on the specialties of the non company-affiliated physicians who submit reports. For example, in 2009 the non company-affiliated health care practitioners were more

likely to report patients with respiratory disease who work in small, non-manufacturing companies. A large percentage of the year 2009 reports from non company-affiliated health care practitioners were from physicians who are specialists in the radiographic interpretation of mineral and dust-related lung disease. Without these reports the increased diagnosis of asbestos-related lung disease would be missed (Figure 8). However, regardless of the mix of non company-affiliated specialists reporting, the data illustrates that relying on company-affiliated reports alone would cause occupational illness statistics to markedly under-count certain work related conditions. Similarly, one cannot rely on workers' compensation data for a reliable count of work-related conditions. For the years 1992-1994, only 9.6% of the workers for whom an Occupational Disease Report was submitted had definitely filed a Workers' Compensation claim, although an additional 36% may have filed a claim for a total of 45.6%⁸. This is an ongoing issue, as review of hospital discharge data for individuals with pneumoconioses shows only <1% - 8% paid by workers' compensation (Figure 7).

Review of Table 8 shows a large difference in the distribution of occupational illnesses identified through the state's OD reporting system, compared to both the Bureau of Labor Statistics' (BLS) Annual Survey of Employers and the state's Workers' Compensation Agency (WCA) claims system. For example, poisoning represents approximately 28% (1,782) of the OD reports, while that category of diseases only accounts for approximately 1% (100 cases) of the BLS survey and less than 1% (2 cases) of WCA claims. Non-employer sources such as from Poison Control Centers, "B" Readers, and laboratories provide additional occupational diseases not being reported by employers or practitioners.

In addition to tracking the overall incidence of occupational disease, a more comprehensive system allows us to identify areas of concern in our state, monitor trends, develop interventions designed to prevent additional occupational disease, and then evaluate the effectiveness of these efforts. For example, asbestos-related disease, including fibrosis and mesothelioma, is the most common lung condition from mineral dust exposures. Figures 8 and 9 suggest the number of cases of asbestosis may have peaked in previous years and is now on a downward trend. Only the presence of a comprehensive surveillance system involving review of multiple data sources allows such a trend to be identified and evaluated.

REFERENCES

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Figure 1. Occupational Disease Reporting Form

Michigan Department of Energy, Labor and Economic Growth Management and Technical Services Division

Known or Suspected Occupational Disease Report

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

EMPLOYEE AFFECTED

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

CURRENT EMPLOYER

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

ILLNESS INFORMATION

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

ADDITIONAL COMMENTS

_____ _____ _____

REPORT SUBMITTED BY

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

The Michigan Department of Energy, Labor and Economic Growth is an equal opportunity, affirmative action employer, service provider and buyer.

Return completed form to:

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

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

MIOSHA-MTSD-51 (02/09)

Figure 2. Occupational Disease Reports to the Michigan Department of Energy, Labor and Economic Growth: 1985-2009

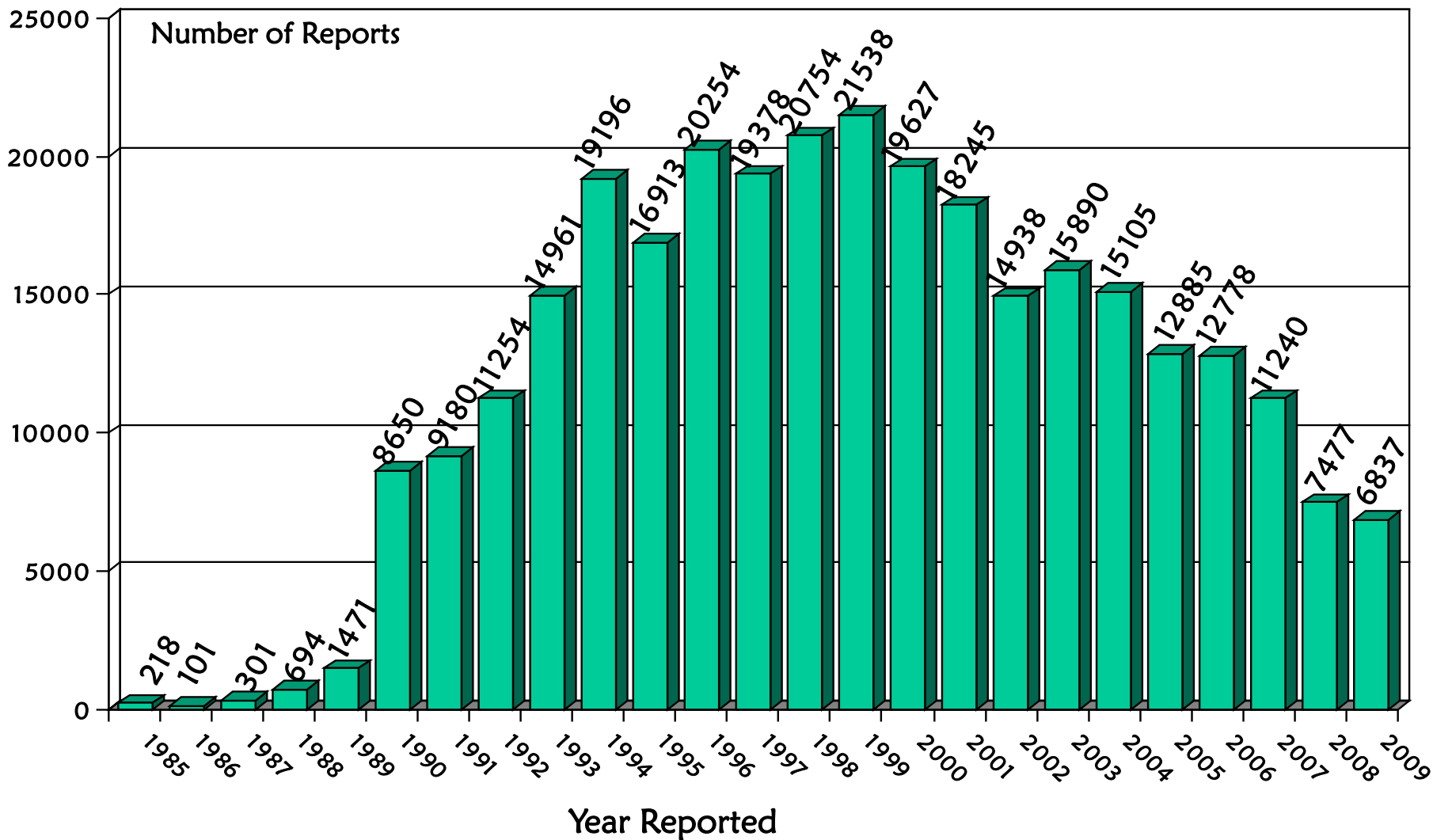
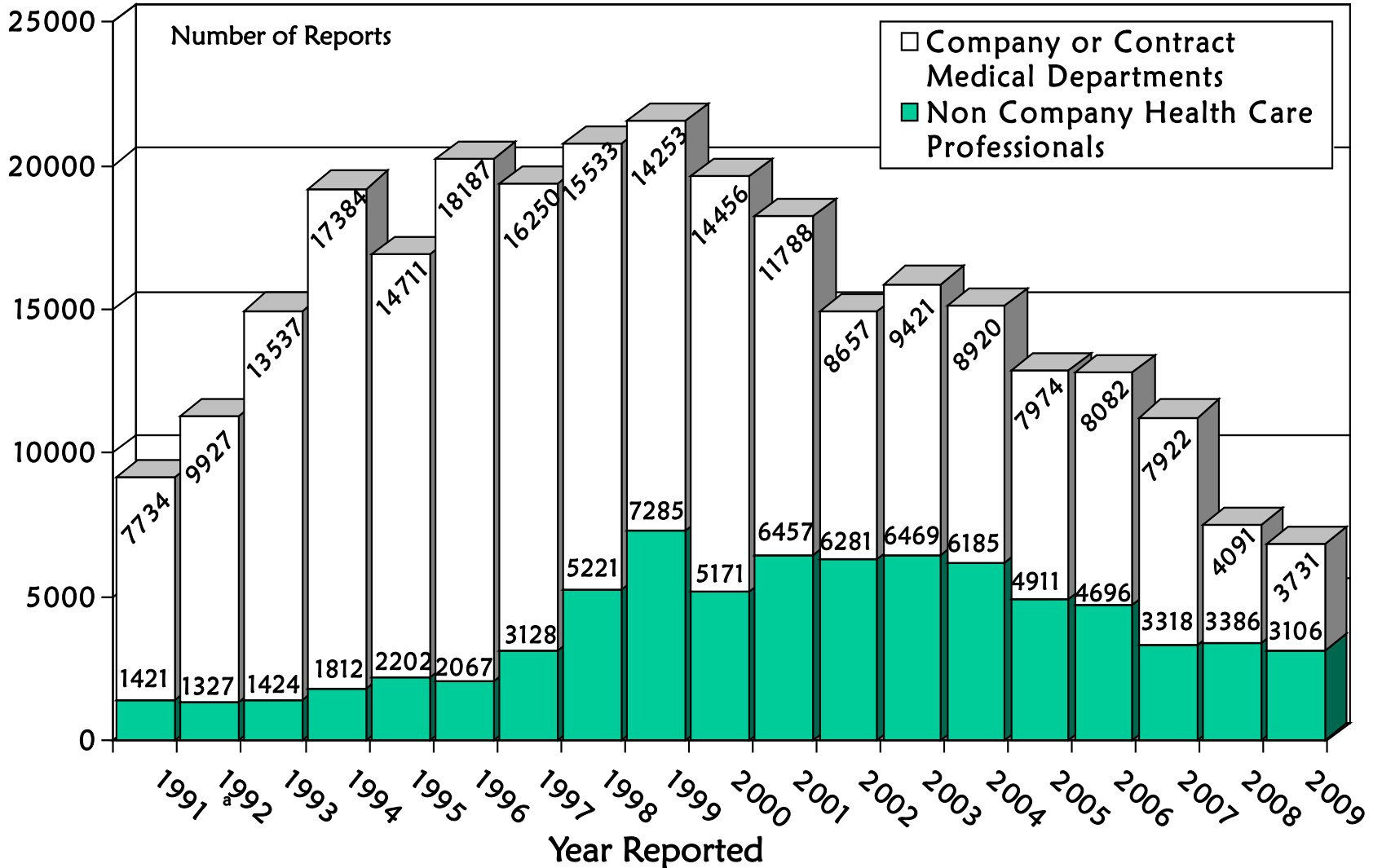


Figure 3. Occupational Disease Reports by Reporting Source, Non-Company Health Care Professionals and Company or Contract Medical Departments: 1991-2009



^aReporting source was unknown for 25 reports that are not included in this column.

Figure 4. Number of Hospitalizations and Number of Patients with Workers' Compensation Designated as Primary Payment Source at Discharge in Michigan: 1992-2009

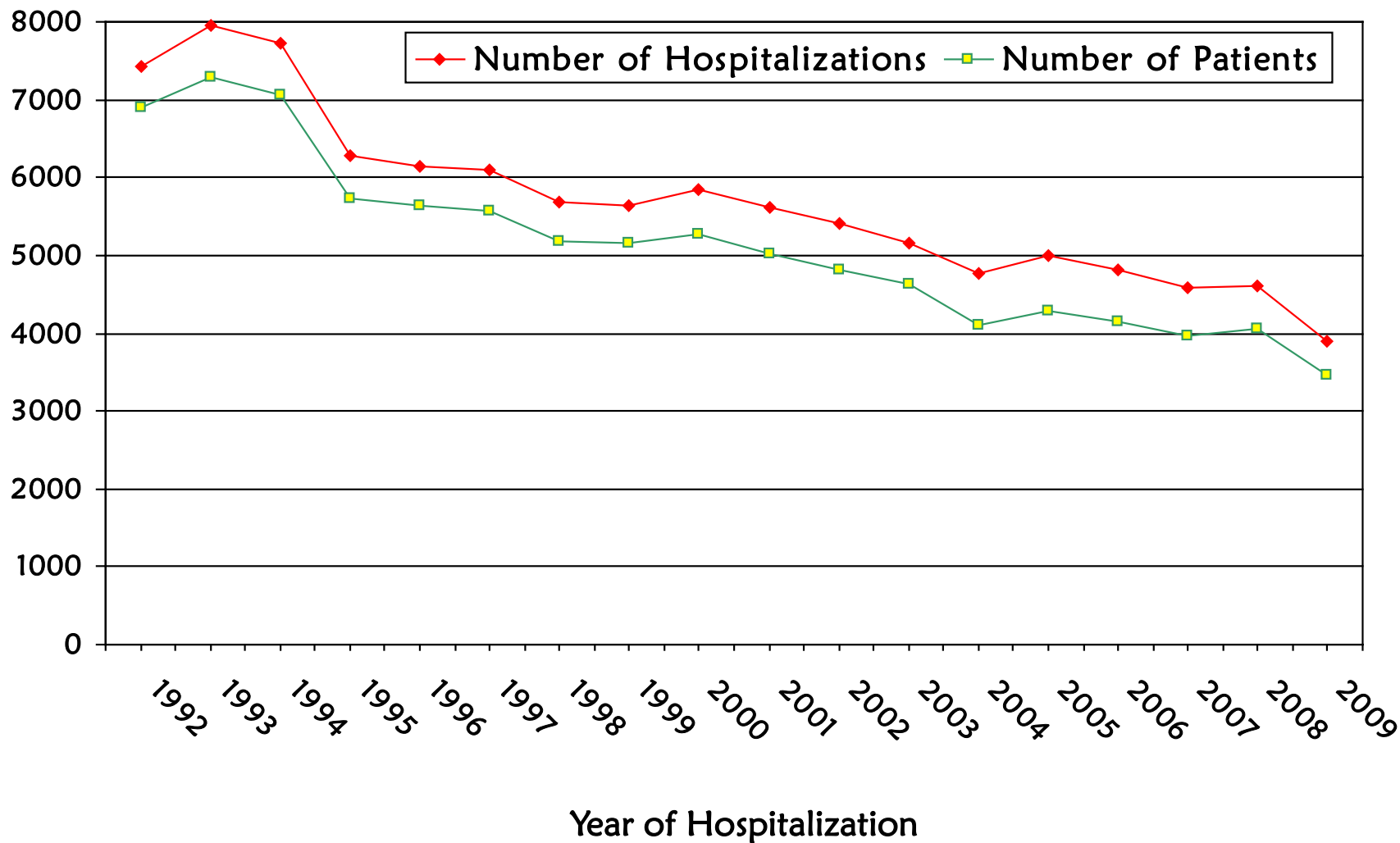


Figure 5. Percent of Total Michigan Hospitalizations with Workers' Compensation Designated as Primary Payment Source at Discharge: 1992-2009

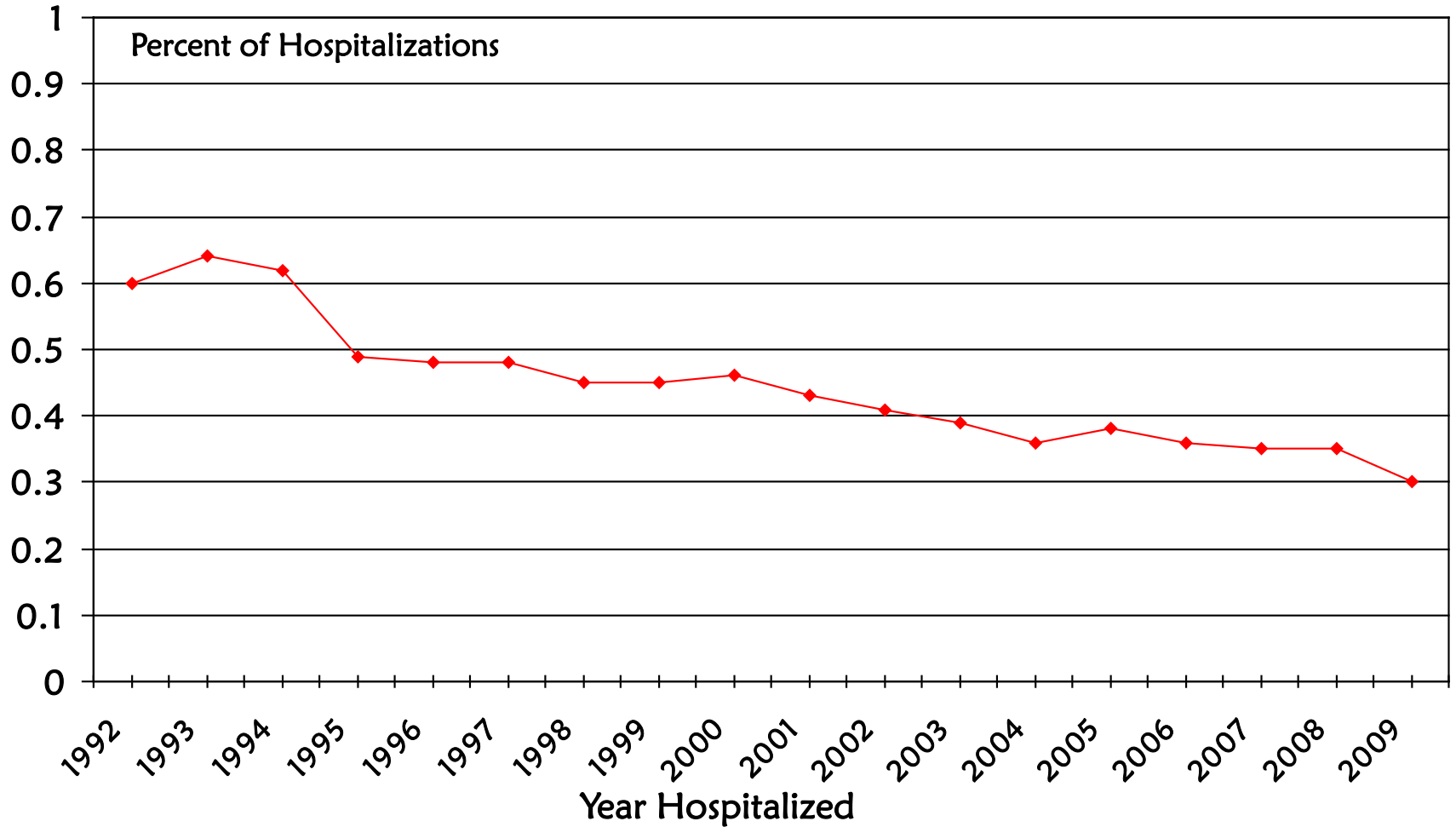


Figure 6. Number of Patients Discharged with Coal Workers' Pneumoconiosis (CWP), Asbestosis and Silicosis in Michigan: 1990-2009

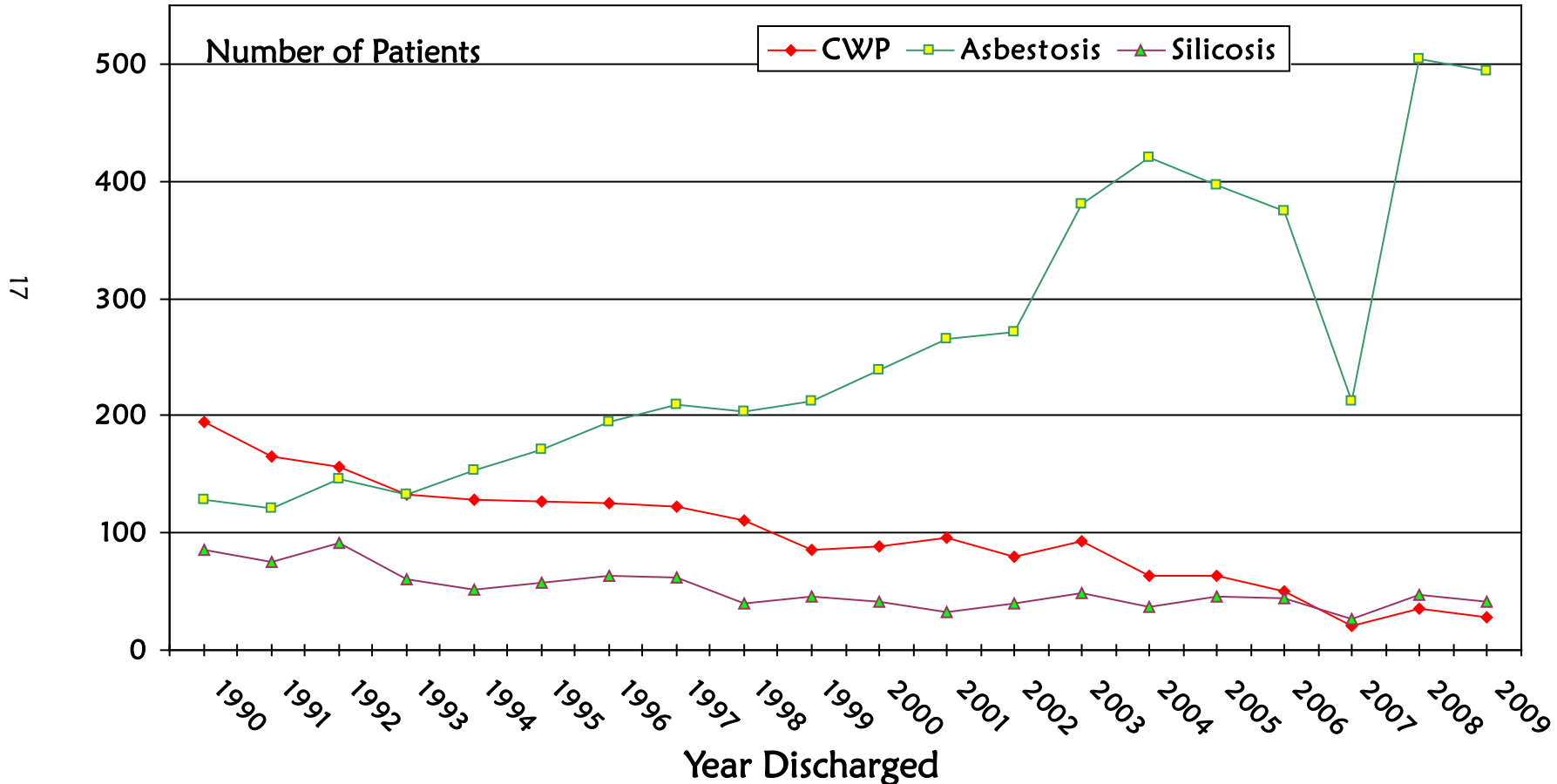
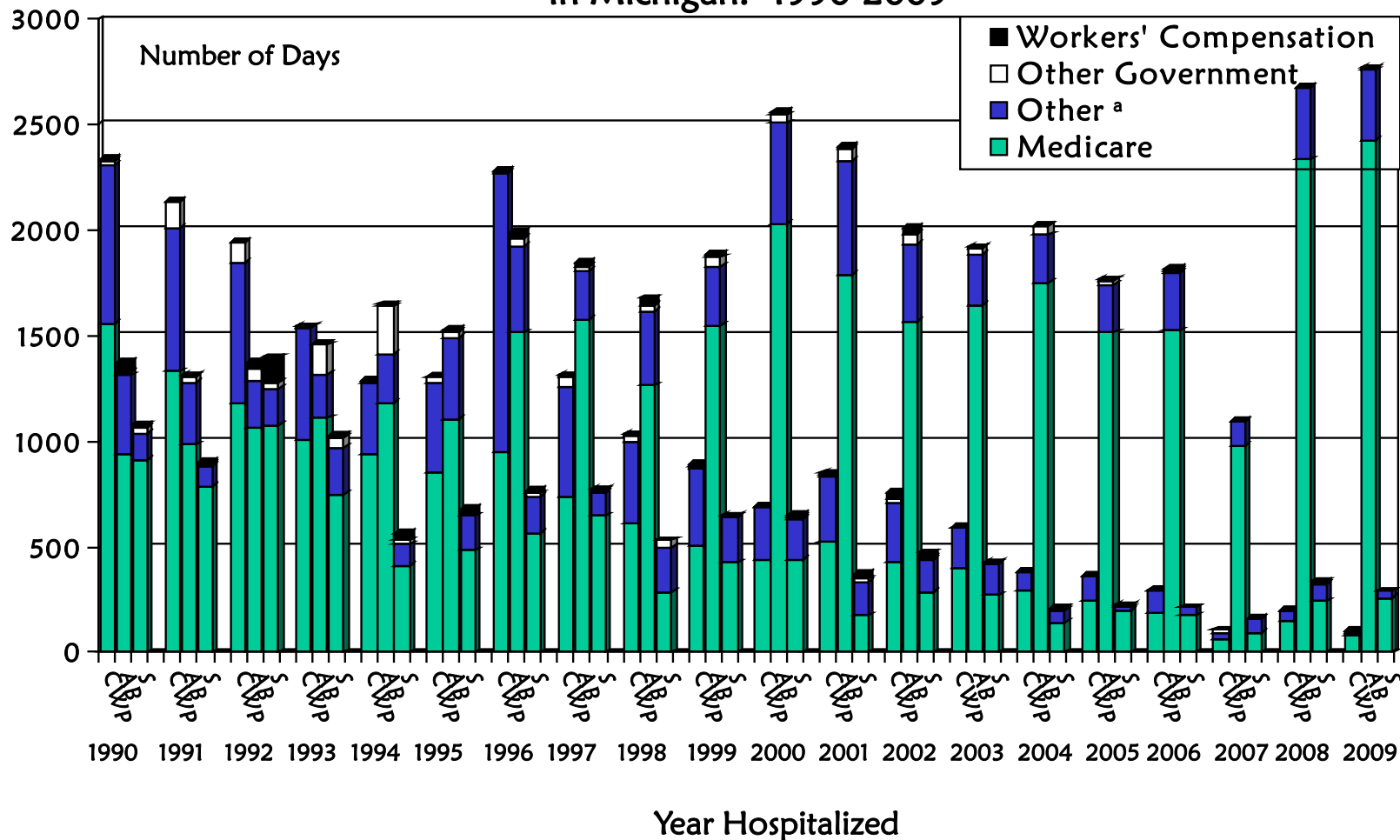


Figure 7. Number of Days Hospitalized by Payment Source at Discharge for Coal Workers' Pneumoconiosis (CWP), Asbestosis (AB) and Silicosis (S) in Michigan: 1990-2009



^a"Other" includes: Medicaid, HMOs, PPOs, Other Insurance, Self-Pay and No-Charge payment sources.

Figure 8. Asbestos-Related Cases Reported to the Michigan Department of Energy, Labor and Economic Growth: 1989-2009

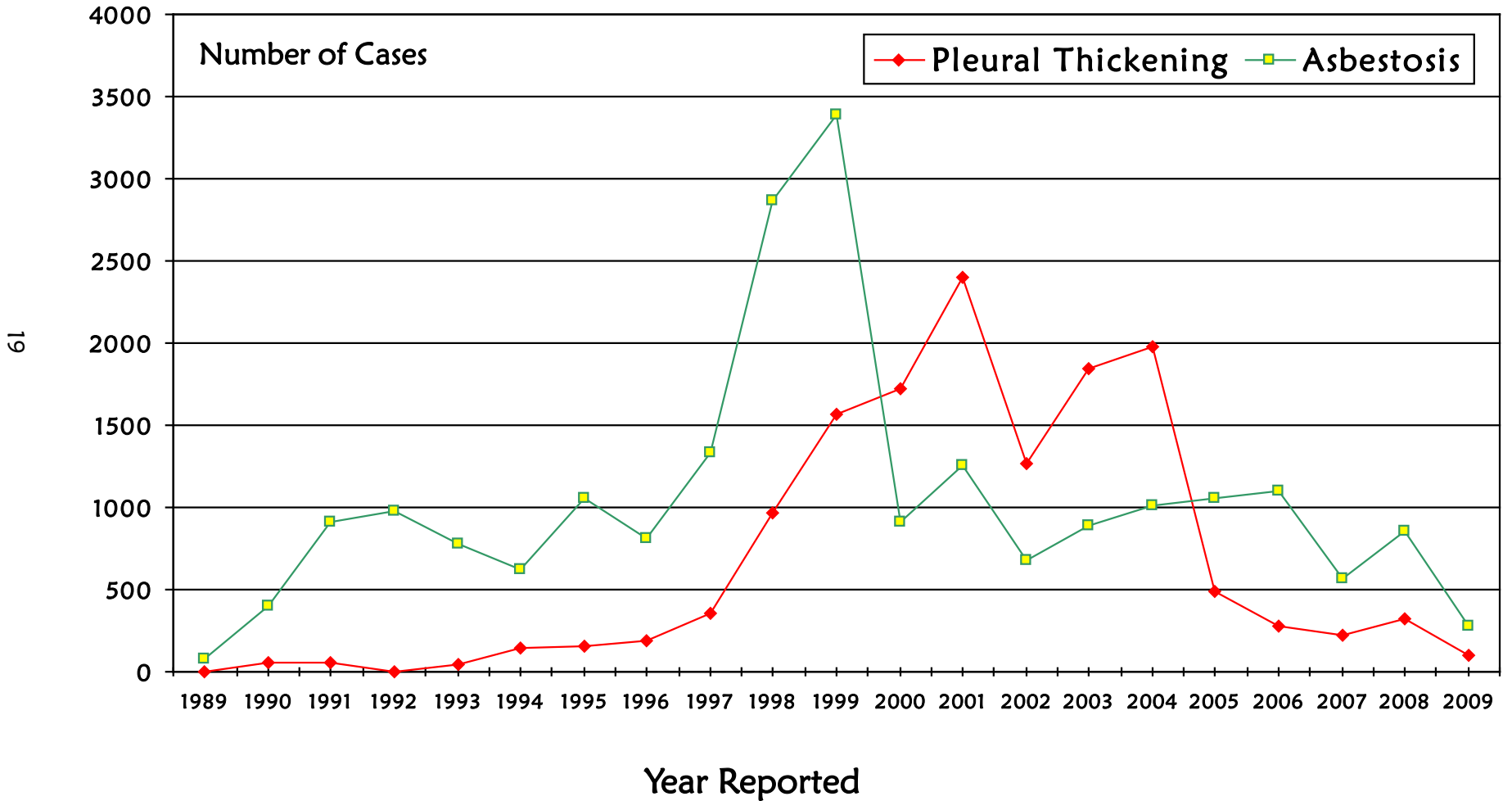


Figure 9. Summary of “B” Reading Interpretations of Chest X-rays in Michigan: 1995-2009

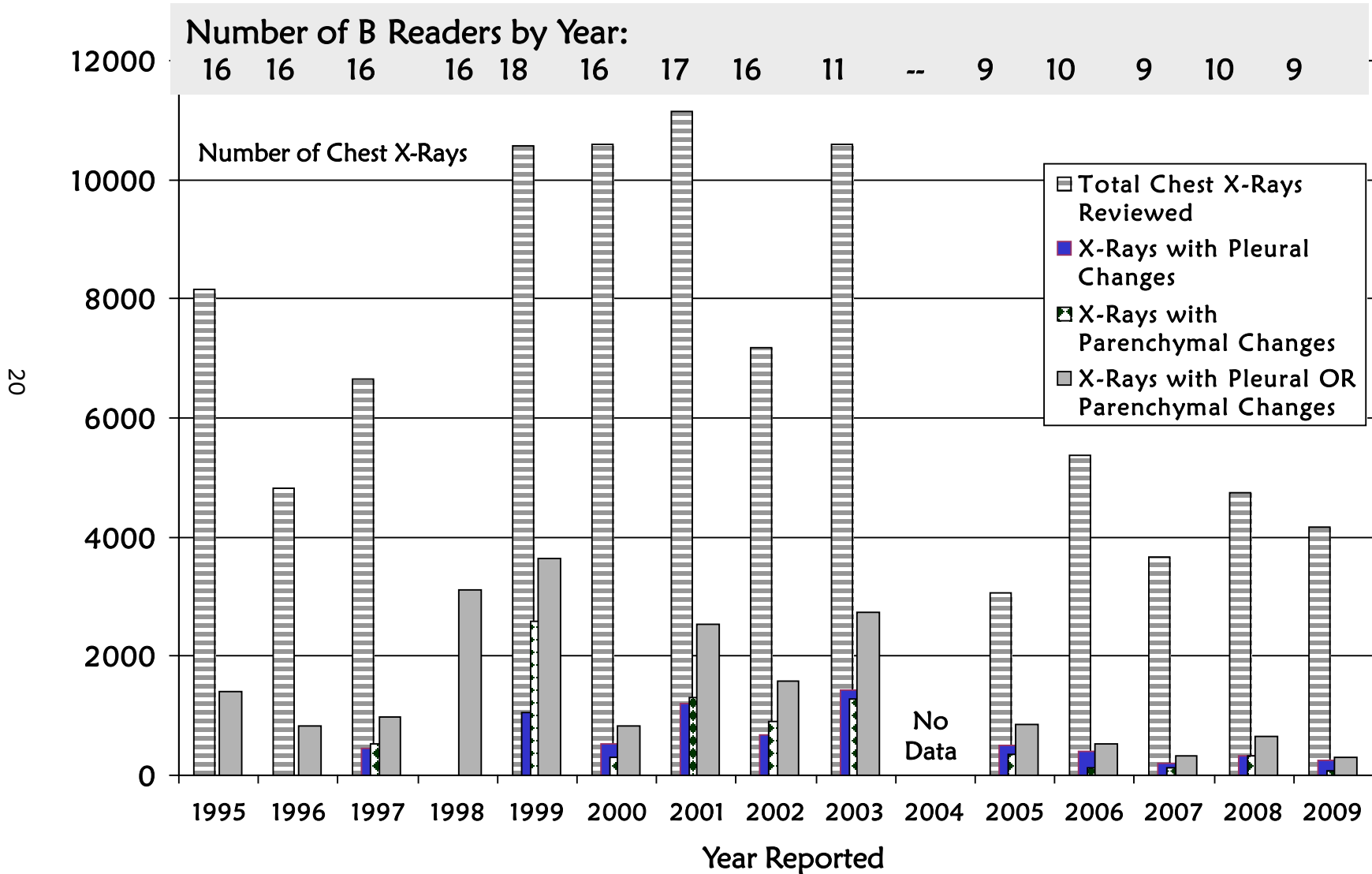


Figure 10. Number of Men and Women in Michigan Diagnosed with Mesothelioma: 1985-2007

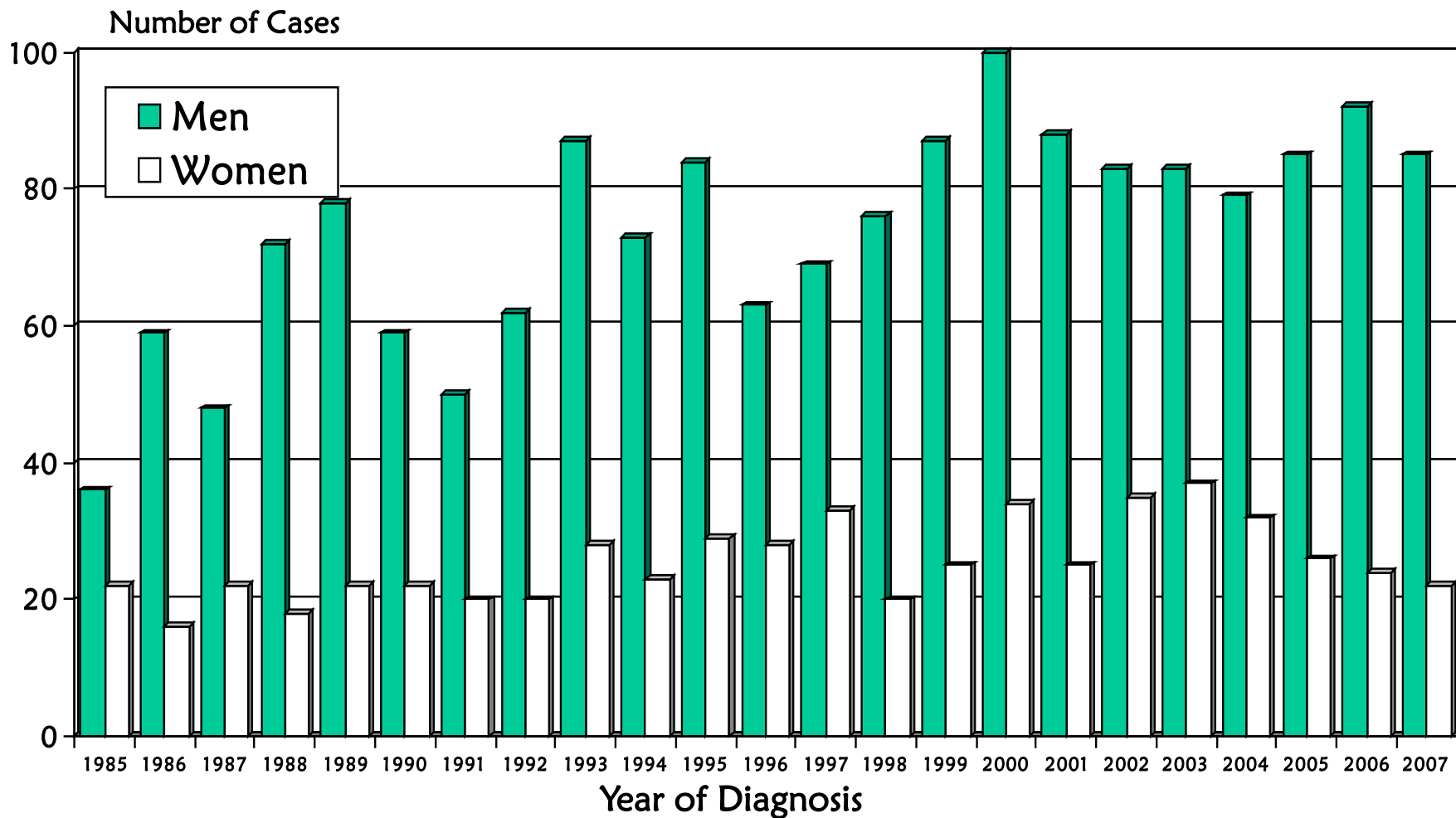
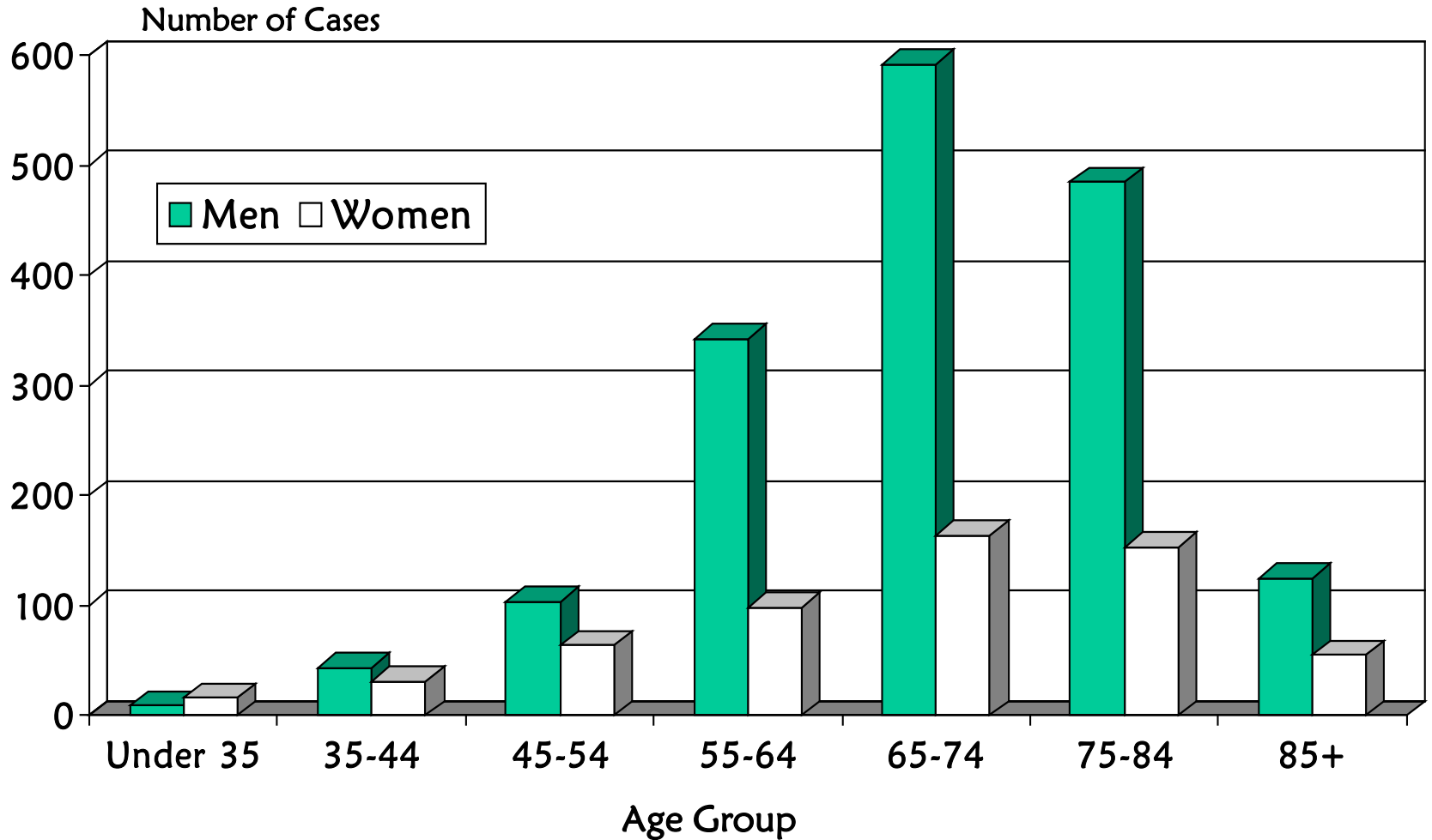
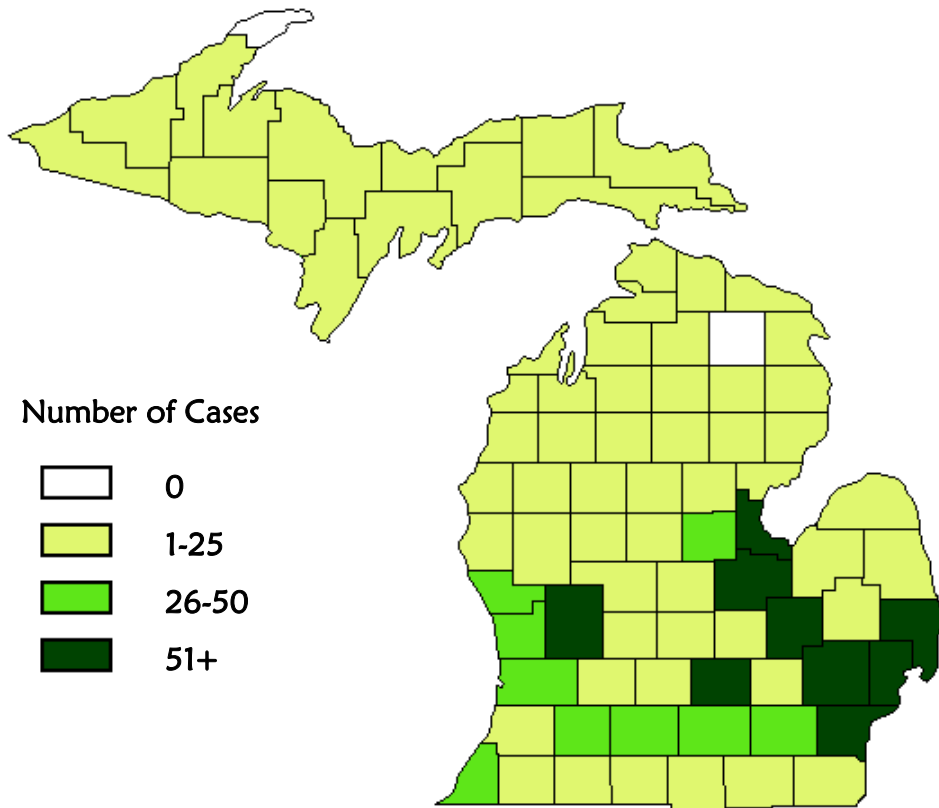


Figure 11. Cases of Mesothelioma in Michigan by Gender and Age at Diagnosis^a: 1985-2007



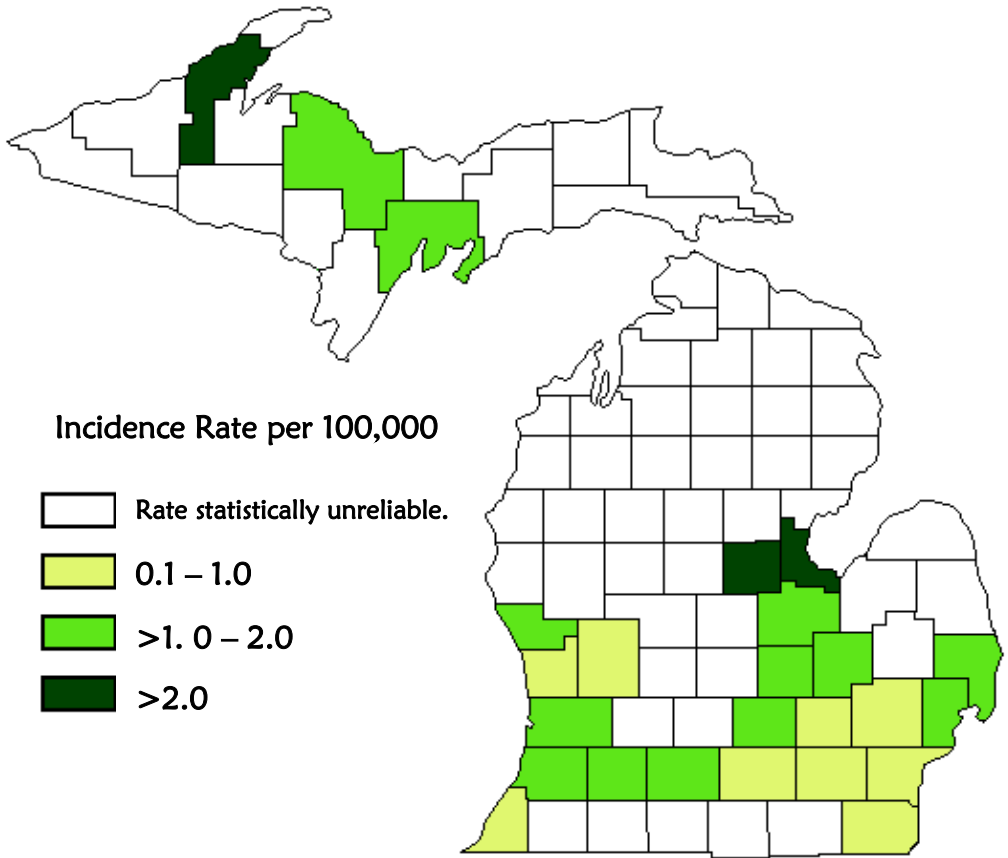
^aFor one female, age at diagnosis was unknown.

Figure 12. Distribution of Michigan Residents Diagnosed with Mesothelioma by County: 1985-2007



Total number of cases: 2,301. Source: Michigan Resident Cancer Incidence File. Includes cases diagnosed in 1985-2007 and processed by the Michigan Department of Community Health (MDCH), Division for Vital Records and Health Statistics by December 30, 2009. Generated by MDCH: January 25th, 2010.

Figure 13. Age-Adjusted Incidence Rates of Mesothelioma Among Michigan Residents, by County



Numerator is the average number of Michigan residents by county, diagnosed with mesothelioma from 1985-2007. Age-adjusted rates are computed by the direct method, and are age-adjusted to the 2000 U.S. standard population. Rates are per 100,000 population in the specified group.

Source: Michigan Resident Cancer Incidence File. Includes cases diagnosed in 1985-2007 and processed by the Michigan Department of Community Health (MDCH), Division for Vital Records and Health Statistics by December 30, 2009.
Generated by MDCH: January 25th, 2010.

**Table 1. Number of Employees at Facilities Where
an Occupational Illness Occurred in 2009, by Reporting Source:
Company vs. Non-Company Clinician**

Number of Employees	Reports from Non-Company Practitioners		Reports from Companies		Total Reports	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
< 25	173	19.4	220	6.4	393	9.1
25-100	143	16.1	452	13.2	595	13.8
100-500	202	22.7	645	18.8	847	19.6
> 500	372	41.8	2,108	61.5	2,480	57.5
Total	890^a	100.0	3,425^b	99.9	4,315	100.0

^a The number of employees was missing on 2,216 reports.

^b The number of employees was missing on 306 reports.

Table 2. Number of Occupational Disease Reports Submitted by Non-Company Health Care Practitioners in 2009

Number of Reports	Health Care Practitioners		Number of Patients Represented
	<i>Number</i>	<i>Percent</i>	
1	188	87.9	188
2-5	20	9.3	47
6-10	1	0.5	6
11-20	2	0.9	23
21-100	3	1.4	118
Total^a	214	100.0	382

^a Not included in the above statistics: 1,446 reports submitted by labs for lead poisoning, representing 30 labs; 961 reports submitted by Michigan's Poison Control Center; 307 reports from the 3rd Judicial Court of Michigan; and 10 reports that did not list physician name.

Table 3. Demographic Characteristics of Occupational Disease Cases Reported in 2009

Demographic Characteristic		
Age	<i>Number</i>	<i>Percent</i>
≤ 19	119	2.0
20-24	406	6.9
25-29	477	8.2
30-34	559	9.6
35-39	690	11.8
40-44	667	11.4
45-49	774	13.2
50-54	888	15.2
55-59	536	9.2
60-69	454	7.8
70-79	187	3.2
≥ 80	91	1.6
Total	5,848^a	100.1^d
Gender	<i>Number</i>	<i>Percent</i>
Male	4,476	66.1
Female	2,300	33.9
Total	6,776^b	100.0
Race	<i>Number</i>	<i>Percent</i>
Caucasian	702	33.3
African American	98	4.7
Hispanic	65	3.1
Other	1,241	58.9
Total	2,106^c	100.0

^aAge was missing on 989 reports. Mean age = 44± 14 years.

^bGender was missing on 61 reports.

^cRace was missing on 4,731 reports.

^dPercentage does not add to 100 due to rounding.

**Table 4. Number of Occupational Disease Reports in 2009,
by Disease Type and Reporting Source**

Disease Type	Non-Company		Company		Total	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
Infectious & Parasitic Diseases (ICD 001-139)	1	<0.1	245	6.6	246	3.6
Neoplasms (ICD 140-239)	40	1.3	6	0.2	46	0.7
Metabolic Disorders (ICD 270-279)	0	--	1	<0.1	1	<0.1
Mental Disorders (ICD 290-319)	0	--	95	2.5	95	1.4
Diseases of the Nervous System & Sense Organs (ICD 320-389)	22	0.7	503	13.5	525	7.7
Diseases of the Circulatory System (ICD 390-459)	0	--	3	0.1	3	<0.1
Diseases of the Respiratory System (ICD 460-519)	567	18.3	126	3.4	693	10.1
Diseases of the Digestive System (ICD 520-579)	1	<0.1	11	0.3	12	0.2
Diseases of the Genitourinary System (ICD 580-629)	0	--	1	<0.1	1	<0.1
Diseases of the Skin & Subcutaneous Tissue (ICD 680-709)	22	0.7	236	6.3	258	3.8
Diseases of the Musculoskeletal System & Connective Tissue (ICD 710-739)	7	0.2	621	16.6	628	9.2
Symptoms, Signs & Ill-Defined Conditions (ICD 780-799)	526	16.9	69	1.8	595	8.7
Repetitive Trauma: Sprains & Strains (ICD 800-999 except ICD 940 & ICD 980-989)	10	0.3	1,771	47.5	1,781	26.0
Burn Confined to Eye (ICD 940)	171	5.5	0	--	171	2.5
Toxic Effects of Substances (ICD 980-989)	1,739	56.0	43	1.2	1,782	26.1
Total	3,106	100.0	3,731	100.0	6,837	100.0

**Table 5. Number of Occupational Disease Reports in 2009,
by Industry Type and Reporting Source**

2007 North American Industry Classification System		Non-Company		Company		Total	
		<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
11	Agriculture, Forestry Fishing & Hunting	0	--	9	0.3	9	0.2
21	Mining	2	0.2	13	0.4	15	0.3
22	Utilities	77	7.4	18	0.5	95	2.1
23	Construction	292	28.1	52	1.5	344	7.5
31-33	Manufacturing	491	47.3	2,078	58.7	2,569	56.1
42	Wholesale Trade	16	1.5	37	1.0	53	1.2
44-45	Retail Trade	13	1.3	137	3.9	150	3.3
48-49	Transportation & Warehousing	3	0.3	25	0.7	28	0.6
51	Information	1	0.1	8	0.2	9	0.2
52	Finance & Insurance	2	0.2	17	0.5	19	0.4
53	Real Estate & Rental & Leasing	1	0.1	20	0.6	21	0.5
54	Professional, Scientific & Technical Services	8	0.8	22	0.6	30	0.7
56	Administrative & Support & Waste Management & Remediation Services	42	4.0	71	2.0	113	2.5
61	Educational Services	9	0.9	169	4.8	178	3.9
62	Health Care & Social Assistance	18	1.7	556	15.7	574	12.5
71	Arts, Entertainment & Recreation	4	0.4	10	0.3	14	0.3
72	Accommodation & Food Services	2	0.2	52	1.5	54	1.2
81	Other Services (except Public Admin.)	9	0.9	56	1.6	65	1.4
92	Public Administration	48	4.6	189	5.3	237	5.2
	Total	1,038	100.0	3,539	100.1^a	4,577	100.1^a
00	Unknown	2,068	--	192	--	2,260	--

^a Percentage does not add to 100 due to rounding.

Table 6. Number of Occupational Disease Reports in 2009, by Disease Type and Gender^a

Disease Type	Males		Females	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
Infectious & Parasitic Diseases (ICD 001-139)	74	1.7	171	7.4
Neoplasms (ICD 140-239)	41	0.9	5	0.2
Metabolic Disorders (ICD 270-279)	1	<0.1	0	--
Mental Disorders (ICD 290-319)	37	0.8	51	2.2
Diseases of the Nervous System & Sense Organs (ICD 320-389)	387	8.6	137	6.0
Diseases of the Circulatory System (ICD 390-459)	2	<0.1	1	<0.1
Diseases of the Respiratory System (ICD 460-519)	549	12.3	143	6.2
Diseases of the Digestive System (ICD 520-579)	11	0.2	1	<0.1
Diseases of the Genitourinary System (ICD 580-629)	1	<0.1	0	--
Diseases of the Skin & Subcutaneous Tissue (ICD 680-709)	156	3.5	102	4.4
Diseases of the Musculoskeletal System & Connective Tissue (ICD 710-739)	306	6.8	321	14.0
Symptoms, Signs & Ill-Defined Conditions (ICD 780-799)	355	7.9	237	10.3
Repetitive Trauma Injuries (ICD 800-999 except ICD 940 & ICD 980-989)	996	22.3	785	34.1
Burn Confined to Eye (ICD 940)	101	2.3	70	3.0
Toxic Effects of Substances Chiefly Non-Medicinal (ICD 980-989)	1,459	32.6	276	12.0
Total^a	4,476	100.0	2,300	100.0

^a Gender was missing on 61 reports.

Table 7. Demographic Characteristics of Reported Occupational Disease Fatalities in 2009

Demographic Characteristic		
	<i>Number</i>	<i>Percent</i>
Fatal	35	0.5
Non-Fatal	6,802	99.5
Total	6,837	100.0
Age		
	<i>Number</i>	<i>Percent</i>
30-39	1	2.9
40-49	0	--
50-59	3	8.8
60-69	6	17.6
70-79	12	35.3
≥ 80	12	35.3
Total	34^a	99.9^b
Disease Type		
	<i>Number</i>	<i>Percent</i>
Neoplasms	18	51.4
Asbestosis	14	40.0
Silicosis	1	2.9
Other	2	5.7
Total	35	100.0
Industry Type		
	<i>Number</i>	<i>Percent</i>
Manufacturing	24	80.0
Construction	5	16.7
Oil & Gas Extraction	1	3.3
Total	30^a	100.0

^aAge was unknown for 1 report.

^bPercentage does not add to 100 due to rounding.

^cIndustry was missing on 5 reports.

Table 8. Comparison of 2009 BLS Occupational Illness Survey Data and 2009 MDELEG Workers' Compensation Agency (WCA) Claims with 1992-2009 MDELEG Occupational Disease (OD) Reports

Disease Category															
	Occupational Skin Disease		Dust Diseases of the Lung		Respiratory Conditions Due to Toxic Agents		Poisoning		Disorders Due to Physical Agents		Disorders Due to Repeated Trauma		All Other Occupational Illnesses		Reports per Year ^a
MDELEG	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>
2009 BLS Survey	900	10.5	No Data	--	1,000	11.6	100	1.2	No Data	--	No Data	--	6,600	76.7	8,600
2009 WCA Claims ^b	48	0.3	1	<0.1	98	0.6	2	<0.1	27	0.2	13,302	80.2	3,113	18.8	16,591
MDELEG OD Reports	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>
1992-1993 ^{c,d}	776	6.1	914	7.2	290	2.3	207	1.6	469	3.7	7,151	56.0	2,972	23.3	12,779 ^e
1994-1995 ^{c,d}	1,034	5.9	966	5.5	570	3.2	315	1.8	419	2.4	10,601	60.3	3,680	20.9	17,585
1996-1997 ^{c,d}	1,405	7.3	1,159	6.0	799	4.1	631	3.3	414	2.1	11,293	58.3	3,668	18.9	19,369
1998-1999 ^c	1,307	6.3	3,225	15.6	1,481	7.2	1,120	5.4	328	1.6	9,644	46.7	3,541	17.2	20,646
2000-2001 ^c	953	5.1	1,165	6.3	2,334	12.5	1,246	6.7	231	1.2	9,068	48.7	3,639	19.5	18,636
2002-2003 ^c	426	2.9	861	5.9	1,800	12.3	2,858	19.6	105	0.7	5,942	40.8	2,587	17.7	14,579
2004-2005 ^c	377	2.8	1,105	8.2	1,602	11.9	2,267	16.9	46	0.3	5,094	37.9	2,938	21.9	13,429
2006	322	2.7	1,146	9.6	580	4.9	2,011	16.8	55	0.5	4,606	38.6	3,226	27.0	11,946
2007	232	2.3	623	6.2	493	4.9	1,890	18.9	35	0.4	4,182	41.9	2,522	25.3	9,977
2008	196	2.9	905	13.2	600	8.7	1,811	26.4	13	0.2	2,305	33.5	1,042	15.2	6,872
2009	258	4.1	321	5.1	372	5.9	1,782	28.1	176	2.8	1,892	29.8	1,544	24.3	6,345

^aTotals do not match those in Figure 2 due to the classification method for disease categories in this table.

^bThe method used to classify diseases in the WCA database, starting with calendar year 2007 data in last year's report, differs from previous years; the new categorization is modeled after the classification system used to group the MDELEG OD Reports.

^cNumber of reports per year (averaged over the 2 years).

^dCounts published in previous years' OD reports for 1992-1997 have been corrected here.

^eType of occupational disease was missing for 97 reports.

Table 9. Primary Diagnosis of Patients Hospitalized in Michigan from 1992-2009, with Workers' Compensation Designated as Primary Payment Source at Discharge

Primary Discharge Diagnosis (ICD-9 ^a)	1992	1993	1994	1995	1996	1997	1998	1999	2000
	%	%	%	%	%	%	%	%	%
Infectious Diseases (001-139)	0.2	0.3	0.3	0.4	0.3	0.2	0.3	0.2	0.2
Neoplasms (140-239)	0.3	0.5	0.2	0.3	0.3	0.3	0.3	0.3	0.2
Endocrine Diseases (240-279)	0.3	0.4	0.3	0.3	0.3	0.2	0.4	0.3	0.3
Blood Diseases (280-289)	0.1	<0.1	0.1	<0.1	0.1	0.1	0.2	0.1	<0.1
Mental Disorders (290-319)	1.5	1.4	1.4	1.1	0.9	1.0	0.8	1.2	1.1
Nervous System Diseases (320-389)	2.8	2.3	2.4	2.3	1.6	1.9	1.5	1.1	1.1
Circulatory Diseases (390-459)	2.7	2.6	2.3	2.5	2.8	2.3	2.3	2.3	2.2
Respiratory Diseases (460-519)	1.0	1.4	1.0	1.3	1.3	1.3	1.2	1.4	1.1
Digestive Diseases (520-579)	2.0	2.2	1.9	2.0	1.7	1.9	1.8	2.0	1.5
Genitourinary Diseases (580-629)	0.8	1.0	0.5	0.7	0.8	0.6	0.5	0.4	0.5
Pregnancy Complications (630-676)	1.4	1.6	0.3	0.5	0.5	0.9	1.1	1.0	0.7
Skin Diseases (680-709)	2.7	2.6	3.5	3.7	3.5	3.5	3.4	3.7	3.7
Musculoskeletal Diseases (710-739)	42.5	42.9	42.3	41.7	42.7	41.5	42.0	40.7	40.3
Congenital Anomalies (740-759)	0.5	0.5	0.4	0.4	0.2	0.3	0.2	0.4	0.2
Perinatal Complications (760-779)	<0.1	<0.1	--	<0.1	--	<0.1	--	--	--
Symptoms & Signs (780-799)	1.2	1.3	1.3	1.6	1.7	1.5	1.3	1.6	1.6
Injury & Poisoning (800-999)	36.6	35.5	39.1	40.0	40.0	40.8	40.0	40.6	43.3
V Codes	3.4	3.4	2.7	1.2	1.3	1.7	2.6	2.6	2.0
Total^b	6891	7282	7058	5726	5631	5567	5183	5153	5278

Primary Discharge Diagnosis (ICD-9 ^a)	2001	2002	2003	2004	2005	2006	2007	2008	2009
	%	%	%	%	%	%	%	%	%
Infectious Diseases (001-139)	0.2	0.1	0.4	0.4	0.7	1.3	0.8	1.3	1.6
Neoplasms (140-239)	0.3	0.2	0.2	0.2	0.4	0.3	0.1	0.3	0.3
Endocrine Diseases (240-279)	0.3	0.4	0.3	0.4	0.2	0.5	0.7	0.7	0.7
Blood Diseases (280-289)	<0.1	<0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Mental Disorders (290-319)	0.9	0.9	0.7	0.8	0.6	0.9	1.0	0.9	0.9
Nervous System Diseases (320-389)	1.0	1.1	1.1	1.2	1.0	1.1	1.4	1.7	1.6
Circulatory Diseases (390-459)	2.6	2.1	2.6	2.9	4.0	3.8	4.6	4.1	4.7
Respiratory Diseases (460-519)	1.2	1.4	1.7	2.0	2.2	2.1	2.2	2.6	2.5
Digestive Diseases (520-579)	1.7	1.7	1.8	2.0	2.5	1.9	1.8	2.3	2.5
Genitourinary Diseases (580-629)	0.5	0.5	0.6	0.6	0.8	0.8	1.1	1.3	1.2
Pregnancy Complications (630-676)	0.4	0.5	0.4	0.1	0.2	0.1	0.1	0.2	0.1
Skin Diseases (680-709)	3.2	3.2	3.5	3.3	3.6	4.7	4.7	3.8	4.0
Musculoskeletal Diseases (710-739)	43.3	43.9	39.3	38.5	34.2	36.9	33.1	32.2	31.8
Congenital Anomalies (740-759)	0.2	0.2	0.2	0.3	0.1	0.4	0.3	0.2	0.3
Perinatal Complications (760-779)	<0.1	--	--	--	--	--	<0.1	--	--
Symptoms & Signs (780-799)	1.2	1.2	1.7	1.5	1.8	2.3	1.7	1.9	1.4
Injury & Poisoning (800-999)	41.0	40.1	40.6	41.1	42.4	38.8	42.3	41.8	42.4
V Codes	2.0	2.2	4.7	4.6	5.5	4.1	3.9	4.6	3.8
Total^b	5013	4809	5160	4760	4996	4825	4578	4611	3906

^aInternational Classification of Diseases, 9th Revision.

^bTotals vary due to missing information.

Table 10. Demographic Characteristics of Patients Hospitalized in Michigan from 1992-2009, with Workers' Compensation Designated as Primary Payment Source at Discharge

	1992 ^a	1993	1994	1995	1996	1997	1998	1999	2000
	# (%)	# (%)	# (%)	# (%)	# (%)	# (%)	# (%)	# (%)	# (%)
Gender									
Male	5103 (74)	5388 (74)	5388 (76)	4387 (76)	4381 (78)	4205 (75)	3919 (76)	3907 (76)	4042 (77)
Female	1792 (26)	1903 (26)	1675 (24)	1349 (24)	1253 (22)	1365 (25)	1267 (24)	1249 (24)	1235 (23)
Total	6895	7291	7063	5736	5634	5570	5186	5156	5277
Race									
White	5173 (85)	5346 (86)	5179 (87)	3708 (85)	3355 (84)	3274 (85)	3016 (85)	2899(85)	3036 (85)
African Am	519 (9)	515 (8)	544 (9)	417 (10)	425 (11)	378 (10)	387 (11)	323 (9)	366 (10)
Asian	11 (<1)	9 (<1)	10 (<1)	12 (<1)	7 (<1)	5 (<1)	14 (<1)	9 (<1)	16 (<1)
Other	353 (6)	375 (6)	233 (4)	233 (5)	204 (5)	188 (5)	144 (4)	174 (5)	139 (4)
Total	6056	6245	5966	4370	3991	3845	3561	3405	3557
Age									
< 15	57 (1)	45 (1)	41 (1)	7 (<1)	9 (<1)	10 (<1)	2 (<1)	6 (<1)	4 (<1)
15-19	147 (2)	140 (2)	159 (2)	121 (2)	87 (2)	87 (2)	113 (2)	107 (2)	109 (2)
20-29	1248 (18)	1176 (16)	1104 (16)	903 (16)	810 (14)	801 (14)	722 (14)	725 (15)	666 (13)
30-39	2115 (31)	2157(30)	2097 (30)	1684 (29)	1636 (29)	1597 (29)	1421 (28)	1358 (27)	1362(26)
40-59	2695(40)	3025(42)	3058 (43)	2565 (45)	2645 (47)	2635 (48)	2482(48)	2397 (48)	2682(51)
60-79	509 (7)	579 (8)	544 (8)	428 (7)	425 (8)	402 (7)	384 (7)	394 (8)	418 (8)
≥ 80	23 (<1)	40 (1)	37 (1)	10 (<1)	9 (<1)	12 (<1)	8 (<1)	12 (<1)	11 (<1)
Total	6794	7162	7040	5718	5621	5544	5132	4999	5252
Avg. SD	40 ±13	41 ±13	41 ±12	41 ±12	42 ±12	42 ±12	42 ±12	42 ±12	43 ±12

	2001	2002	2003	2004	2005	2006	2007	2008	2009
	# (%)	# (%)	# (%)	# (%)	# (%)	# (%)	# (%)	# (%)	# (%)
Gender									
Male	3797 (76)	3635 (76)	3427 (74)	3634 (76)	3748 (75)	3524 (73)	3363 (73)	3239 (70)	2778 (71)
Female	1217 (24)	1174 (24)	1208 (26)	1126 (24)	1248 (25)	1301 (27)	1215 (27)	1372 (30)	1128 (29)
Total	5014	4809	4635	4760	4996	4825	4578	4611	3906
Race									
White	2833 (85)	2697 (86)	2598 (85)	2737 (86)	3016 (87)	2837 (87)	2800 (87)	2924 (90)	2461 (89)
African Am	335 (10)	276 (9)	324 (11)	319 (10)	319 (9)	288 (9)	305 (9)	267 (8)	236 (9)
Asian	3 (<1)	9 (<1)	6 (<1)	11 (<1)	11 (<1)	9 (<1)	12 (<1)	10 (<1)	4 (<1)
Other	172 (5)	141 (5)	118 (4)	105 (3)	119 (3)	127 (4)	116 (4)	54 (2)	60 (2)
Total	3343	3123	3046	3172	3465	3261	3233	3255	2761
Age									
< 15	8 (<1)	8 (<1)	16 (<1)	6 (<1)	1 (<1)	4 (<1)	5 (<1)	0 --	0 --
15-19	75 (2)	69 (1)	51 (1)	74 (2)	60 (1)	63 (1)	43 (1)	40 (1)	37 (1)
20-29	629 (13)	540 (11)	537 (12)	513 (11)	573 (11)	550 (11)	513 (11)	463 (10)	343 (9)
30-39	1224 (24)	1188 (25)	1102 (24)	1057 (22)	987 (20)	925 (19)	846 (18)	777 (17)	660 (17)
40-59	2640 (53)	2570 (54)	2451 (53)	2612 (55)	2620 (53)	2518 (52)	2456 (54)	2488 (54)	2137 (55)
60-79	408 (8)	399 (8)	458 (10)	474 (10)	553 (11)	602 (12)	558 (12)	640 (14)	565 (14)
≥ 80	15 (<1)	18 (<1)	20 (<1)	24 (1)	192 (4)	163 (3)	157 (3)	194 (4)	160 (4)
Total	4999	4792	4635	4760	4986	4825	4578	4602	3902
Avg. SD	43 ±12	43 ±12	44 ±13	44±12	46±15	47±15	47±15	48±15	49±15

^aTotals vary due to missing information.

Table 11. Demographic Characteristics of 961 Individuals Reported by the Michigan Poison Control Center in 2009

Demographic Characteristics		
Age	<i>Number</i>	<i>Percent</i>
13-19	60	7.9
20-29	259	34.3
30-39	185	24.5
40-49	139	18.4
50-59	92	12.2
60-69	17	2.3
≥ 70	3	0.4
Total	755^a	100.0
Gender		
	<i>Number</i>	<i>Percent</i>
Male	534	58.6
Female	378	41.4
Total	912^a	100.0

^a Age was missing on 206 reports. Gender was missing on 49 reports.

APPENDIX A

Chronic Occupational Diseases

Multiple reports for an individual patient with one of the following diseases may be submitted within and across years, but only one of these submissions is counted in the reported statistics.

<u>ICD-9 Code</u>	<u>Description</u>
011	Pulmonary Tuberculosis
015	Tuberculosis of the Bones and Joints
135	Sarcoidosis
137	Tuberculosis, Late Effects of
140-239	Neoplasms (Cancers)
250-259	Diseases of Other Endocrine Glands
260-269	Nutritional Deficiencies
270-279	Metabolic and Immunity Disorders Except 276, Dehydration
280-289	Disease of the Blood and Blood Forming Organs
290-319	Mental Disorders Except 308: Acute Reaction to Stress, and 309: Adjustment Reaction
320-340	Selected Diseases of the Nervous System and Sense Organs
388-389	Disorders of the Ear: Noise Induce Hearing Loss, Tinnitus
390-409	Selected Diseases of the Circulatory System
491-505	Selected Diseases of the Respiratory System
509	Pleural Plaques with No Parenchymal Abnormality Marked on the ILO Form
515	Interstitial Lung Disease, Pulmonary Fibrosis
517	Connective Tissue Lung Disease
520-579	Diseases of the Digestive System
580-629	Diseases of the Genitourinary System