

2011

**Annual Summary of
Occupational Disease Reports
to the Michigan Department of
Licensing & Regulatory Affairs**



Summary of 2011 Occupational Disease Reports to the Michigan Department of Licensing & Regulatory Affairs

A Joint Report
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January 9th, 2013

*This report was funded by the National Institute for Occupational Safety & Health,
under cooperative agreement 60-OH008466.*

SUMMARY

There were 10,701 occupational disease (OD) reports submitted to the Michigan Department of Licensing and Regulatory Affairs (LARA) in calendar year 2011 as required under the Michigan Occupational Disease Reporting Law. This is an increase of 2,749 from 2010 and represents a reversal, since 2009, of the decrease in reports seen every year since 2003. Only occupational diseases, *not injuries* are included in this report. Requirements to report *injuries* are in the Public Health Code and are administered by the Michigan Department of Community Health. Occupational disease 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 nine years.

The most frequent reports were repetitive trauma (32%), toxic effects of substances (16%), and musculoskeletal diseases (11%). The reports submitted in 2011 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 10,701 reports received in 2011. 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, with approximately 6-10 occupational health clinic audits being conducted across the state each year to ensure continued compliance with the reporting law.

Company-associated health care practitioners report different types of illnesses than non-company associated health care practitioners. For example, there were 1,610 (46%) reports from non-company providers for toxic effects of substances (poisonings) while only 106 (2%) such reports were received from employer-associated providers (Table 4). In contrast, company-related providers reported 3,412 (48%) cases of repetitive trauma compared to 1 (<1%) non-company provider reported case.

The average age of individuals reported was 44 years, ranging from 14 to 101. Seventy 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 2011, there were 1,088 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 from exposures at work. This is an essential first step in reducing the burden of these preventable 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%, in 2008 only 59% and in 2009 only 35% of the work-related amputations identified through our multi-source surveillance system. Similarly for work-related burns, the BLS only identified 31% of the total work-related burns that were identified through our multi-source surveillance system in 2009 (see Amputation and Burns Annual Reports at www.oem.msu.edu).

For 2011, the Bureau of Labor and Statistics (BLS) survey reported 7,500 occupational illnesses and 107,600 occupational injuries in Michigan. If this represents only one-third of the true number of occurrences, then one would estimate 345,300 occupational injuries and illnesses in Michigan in 2011.

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 Licensing and Regulatory Affairs (formerly the Michigan Department of Energy, Labor and Economic Growth). 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. LARA 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 LARA 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 20th annual report on occupational diseases in Michigan, and is based upon the reports submitted to LARA in calendar year 2011.

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: LARA, MIOSHA

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METHODS

The computerized OD records contain: 1) the employee's name, age, sex, race, zip code and partial 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 LARA. Starting in 2009, the blood lead levels of 5 µg/dL or greater for adults are now incorporated into the OD reports submitted to LARA; 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 LARA, 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 LARA 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 10,701 occupational disease reports were submitted to LARA in calendar year 2011. Figure 2 shows the number of reports received each year since 1985.

Source of Reports

Company or contract medical departments submitted 67% of the reports (7,171 cases); non company-associated health care practitioners submitted 33% of the reports (3,530 cases) (Figure 3). Almost two-thirds of reports were submitted on individuals who worked in large companies (Table 1) with 66% of the 7,805 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 56% of the 1,090 reports with known company size that were submitted by non-company practitioners involved companies with < 500 employees, while about 30% of the 6,715 reports with known company size submitted by company practitioners involved facilities with < 500 employees.

Two hundred forty-four non company-associated clinicians reported 540 incidents of occupational disease. Thirty labs were responsible for identifying 1,334 reports of lead poisoning. In addition, the Michigan Poison Control Center reported 1,088 incidents of work-related poisonings, 69 reports were obtained through death certificate review, and the 3rd Circuit Court of Michigan reported 381 asbestos-related claims. Two hundred nineteen (90%) of the clinicians reported only one patient each in calendar year 2011 (Table 2); two clinicians reported 34-192 patients each. One of the clinicians runs an occupational medicine clinic. One of the clinicians is 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 November 2012, there were six Michigan physicians who were listed as "B" readers on the NIOSH "B" reader website.

There are approximately 169 occupational health clinics in Michigan. From June 2005 to 2009, the number of such clinics reporting occupational disease cases to the State increased from 21 to 56. In 2010, the number of reporting clinics dropped to 25, and in 2011 dropped again to 22. With the first two rounds of audits of non-reporting clinics in 2009, and the next round of audits planned for 2011, we expected the number of reporting clinics to increase, not decrease.

Demographics

Table 3 shows the age, gender and race distribution of the workers with occupational diseases reported in the year 2011. The mean age of reported patients was 44 ± 13 years (range, 14 to 101 years) with approximately two-thirds of the patients (70%) between the ages of 25 and 54 years. One hundred twenty-four reports were submitted for patients under age 20, and 113 reports were submitted for patients age 80 and older.

Sixty-six percent of all reports submitted were for male workers. Eighty-one percent of the submitted reports (8,667 cases) did not indicate the worker's race. Of the 2,034 reports that did indicate race, 35% were Caucasian, 4% were African American, 6% were Hispanic and 55% were listed as "other."

Younger workers. Of the 74 workers age 18 and younger, two were 14, one was 15 years old, four were 16 years old, 22 were 17 years of age, and 45 were 18 years old. Thirty (41%) of the reported patients under age 19 were female and 44 (59%) were male. Place of employment was unknown for 59 of the 74 younger workers. Of the 15 with known employment type, three each worked in manufacturing and the trades industry, two each worked in education, arts and entertainment, and miscellaneous service industries, and one each worked in construction, agriculture and food services.

Eleven of the younger workers were reported by a company-affiliated clinician or clinic. Forty-eight were reported by the Poison Control Center, 11 were for an elevated blood lead level (serum lead levels were between six and 30 micrograms per deciliter), four were for respiratory symptoms, three for skin diseases, one each was for tenosynovitis and hearing loss, and six were for general symptoms. Two fatalities under the age of 19 from an acute traumatic injury were identified through a review of 2011 death certificates; these deaths are accounted for in a separate Michigan reporting system for acute traumatic work-related fatalities.

Older workers. Of the 113 workers age eighty and older, 106 (94%) were between the ages of 80 and 89, and 7 (6%) were between 90 and 101 years of age. Ninety-eight were men and 15 were women. Forty-eight of the older patients worked in or were retired from manufacturing, 22 worked in construction, four worked in health care, three worked in education, two each worked in agriculture, information services, and other services, and one each worked in utilities, transportation, the arts, and public administration. Industry or former industry was not indicated in 26 reports.

A company-affiliated clinician or contract medical clinic reported five of the patients. Ninety-one of the older workers were reported for dust-related lung disease (including 64 with asbestosis, 20 with lung cancer, and seven with another dust disease of the lung), 17 for elevated blood lead levels (serum lead levels were between 5 and 30 micrograms per deciliter), three for general symptoms and one each for an infectious lung disease and noise-induced hearing loss.

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, repetitive trauma conditions (sprains and strains) were the most frequently reported conditions, with 3,413 cases representing 32% of all OD reports submitted.

Toxic effects of substances (poisoning) were the second most frequently reported conditions, with 1,716 cases representing 16% of all reports. Musculoskeletal diseases were the third most frequently reported condition, representing 1,187 (11%) of the cases. Diseases of the nervous system were the fourth most frequently reported condition, with 1,145 cases representing 11% of all reports submitted. There were 1,100 (10%) reports of symptoms, 1,094 (10%) reports of respiratory illness, 499 (5%) reports of skin diseases, 206 (2%) reports of burns to the eye and 177 (2%) stress-related illnesses. Less frequently reported conditions included neoplasms, diseases of the digestive system, infectious and parasitic diseases, 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, 46% of non-company reports are of toxic effects of substances (poisonings), compared to 1.5% of company submissions. The second, third and fourth most frequently reported diagnoses for company providers are diseases of the musculoskeletal system and connective tissue (16%), diseases of the nervous system and sense organs (16%), and ill-defined symptoms (7%). Respiratory illnesses are the second most frequently reported diagnoses by non-company providers (26%). The third and fourth most frequently reported diagnoses for non-company providers are symptoms (18%) and welding flash or chemical burn to the eye (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 (71% and 44%, respectively), primarily automobile production. The second and third most frequently reported industries by company providers are health care and social assistance (8%) and educational services (4%). The second and third industry types most frequently reported by non-company providers are construction (30%), and utilities (6%). Industry type was missing on 2,196 non-company and 40 company reports.

Gender differences. Repetitive trauma was the most frequently reported diagnosis for women and men, with 39% and 29% of submissions, respectively (Table 6). The second, third and fourth most frequent diagnoses for men were poisonings (21%), respiratory diseases (13%), and diseases of the sense organs (12%). For women, the second, third and fourth most frequently submitted diagnoses were ill-defined symptoms (15%), musculoskeletal diseases (15%) and diseases of the sense organs (8%). Thirty-six reports did not indicate gender.

Fatalities. Fatalities related to occupational illnesses were reported for 152 workers (Table 7). None of the illness-related fatalities reported were from acute incidents. Non-company clinicians reported all 152 individuals with occupational illnesses who died. The workers who died ranged in age from 54 to 95 years. Sixty-six died from asbestos-related cancer, 77 from asbestosis, 5 from silicosis, and 4 from other lung conditions. Seventy-four of the deceased workers had been employed in manufacturing, 31 in construction, 5 in utilities, 4 in transportation, 3 each in educational services and public administration, two each in information and other services, and one each in agriculture, entertainment and health care services. Former occupation was not specified for 25 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 140 acute work-related fatalities from injuries in 2011 that occurred in Michigan (report in progress). A separate report for the most recent work-related fatalities (2010 calendar year) can be found at: www.oem.msu.edu. Two deaths among youths were identified in the MIFACE Program in 2011.

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 2011 with an estimate of 7,500 occupational illnesses and 107,600 occupational injuries in the state.

Data from Michigan's Workers' Compensation Agency (WCA) for 2011 showed 23,957 claims for occupational injuries and illnesses with seven or more consecutive days away from work. Overall in 2011, about \$497 million in compensation was paid by insurance companies and self-insured employers on 214,205 claims for both lost work time and medical-only costs. These claims include new claims filed in 2011 as well as previous claims for workers who continue to lose work time or incur medical costs due to their injury or illness. Sixty-six percent of the total paid claims in 2011 were for medical procedures or care only and 34% for wage loss (http://www.michigan.gov/documents/wca/wca_2011_Annual_Report_380689_7.pdf).

HOSPITAL DISCHARGE DATA

The hospital discharge data described next is not part of the 10,701 occupational disease reports described in the 2011 Annual Report. Hospital discharge data does not include identifiers; presumably some of the patients overlap with those in the 10,701 reports. However, especially for long latency, chronic diseases like asbestosis, it would be difficult to identify newly diagnosed patients. Therefore, the hospitalization data in the next section should be considered as supplemental to the 10,701 reports submitted to the state in 2011.

Hospital Discharge Data – Workers' Compensation. The source of data for this section is the Michigan Health and Hospital Association (MHA). The most recent data available from the MHA is for calendar year 2011. 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 2011; the numbers of hospitalizations from 1995-2011 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 2009-2011 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, and in 2011 0.28% of the 1,278,767 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 2011 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 29-44% of patient WC-related hospitalizations from 1992-2011 and injuries and poisoning, accounting for 36-44% 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 2011. 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 2011 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 2011.

Hospital Discharge Data – Pneumoconiosis. Figure 6 shows the number of individuals hospitalized in Michigan with asbestosis, coal workers' pneumoconiosis and silicosis from 1990 to 2011. 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 2009, there has been a steady increase in the number of hospitalizations for asbestosis (an almost 300% increase) (Figure 6). 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 2012 Work-Related Lung Disease Surveillance Report updates on asbestosis available at: <http://www2a.cdc.gov/drds/WorldReportData/default.asp>.

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 Licensing and Regulatory Affairs (LARA). In addition to the Hospital Discharge Data (HDC) discussed in the previous section, individual physicians certified as B Readers and the Michigan Courts report cases of asbestosis to LARA. Some of these patients reported may overlap those reported in the Hospital Discharge Data. The total number of asbestos-related cases would therefore be less than the combined total of HDC cases along with the cases reported directly to LARA. 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, decreased in 2009 to 282, increased to 398 in 2010 and decreased slightly to 388 in 2011 (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 and 129 in 2010 and increased to 206 in 2011.

In 1995, there were 16 B-readers in Michigan. Today, there are only six physicians in Michigan who are certified as B-readers. Table 11 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; 2010 9% of 2,804 x-rays reviewed showed evidence of asbestos-related lung disease and in 2011 8% of 2,862 x-rays reviewed showed evidence of asbestos-related lung disease. Table 11 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 1995 through 2009 there were 1,687 Michigan residents reported to the Michigan Cancer Registry with invasive mesothelioma. Figure 9 shows the number of men and women diagnosed with mesothelioma by year, from 1995 to 2009. Approximately one quarter 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 10 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 11 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 12 shows the average annual incidence rates of mesothelioma among Michigan residents, by county. The counties with the highest rates are: Midland (2.5 per 100,000); Bay (2.5 per 100,000); Saginaw (1.9 per 100,000); and St. Clair (1.8 per 100,000). The annual average mesothelioma incidence rate for 1995-2009 in Michigan was 1.1 cases per 100,000.

Poison Control Center Data. In 2011, 1,088 calls to the Michigan Poison Control Center (PCC) were identified as work-related. Table 12 describes available demographic characteristics and disease categories of the individuals reported. There were more reports for males (63%). The individuals ranged in age from 14 to 77 years. Eighty-three percent of these individuals were less than age 50. Of the 1,088 calls to the PCC in 2011, the top calls included: 202 (19%) for chemical burns to the eye, 208 (19%) for skin-related symptoms, 183 (17%) for nausea-vomiting, and 83 (8%) for breathing problems from exposure to toxic gases or fume.

Adult Blood Lead Epidemiology and Surveillance (ABLES). In 2011, 1,334 individuals were reported by labs as part of screening for blood lead among Michigan residents. Table 13 describes the demographic characteristics of the individuals reported with a blood lead level of 5 ug/dL and above. Most individuals were males between the ages of 30 and 59. Construction and manufacturing were the most frequently reported industries for exposure to lead. A comprehensive report on all blood lead levels in Michigan can be found at: www.oem.msu.edu, the 2010 Annual Report on Blood Lead Levels on Adults in Michigan.

DISCUSSION

There were 10,701 Occupational Disease Reports sent to LARA in calendar year 2011. This report does not include occupational injuries. The most frequent types of occupational diseases reported to LARA were repetitive trauma illnesses (32%), toxic effects of substances (16%), musculoskeletal diseases (11%), nervous system and sense organ diseases (11%), and respiratory disease (10%). 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 had been decreasing, except for the increase in 2010 and 2011. 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. In 2010, the number of reports increased to 7,952, an increase of over 1,000 reports since 2009 and in 2011 to 10,701, an increase of almost 4,000 reports. 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 2011 was 188, compared to 185 in 2010, 194 in 2009, 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 LARA. 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 188 company-affiliated physicians reporting employees from 1,114 different companies; there were 244 non company-affiliated physicians reporting patients to the state. There were 233,505 companies in the year 2011 and 29,375 licensed physicians in Michigan in the year 2011. Accordingly, reports are received from 0.5% of companies and 0.8% 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.

The 10,701 occupational disease reports received this past year under-represent the actual incidence of occupational diseases in Michigan. Based on an MSU study matching multiple data bases in Michigan for the years 1999-2001, one could estimate that the BLS survey missed 50% of the total number of occupational illnesses in Michigan¹. In 2011, the BLS annual survey reported 7,500 illnesses. If that figure is doubled then we would have expected 15,000 occupational illnesses in Michigan in 2011 instead of the approximately 11,000 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 2011 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 2011 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 16% (1,716) of the OD reports, while that category of diseases only accounts for approximately 1% (100 cases) of the BLS survey and less than 1% (9 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.

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Figure 1. Occupational Disease Reporting Form

Michigan Department of Licensing and Regulatory Affairs		Management and Technical Services Division	
Known or Suspected Occupational Disease Report			
<small>(Information will be held confidential as prescribed in Act.)</small>			
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		Last Four Digits of Social Security Number (Optional)	
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? <small>if yes, record information below.</small>			
		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
<small>The Michigan Department of Licensing Regulatory Affairs is an equal opportunity, affirmative action employer, service provider and buyer.</small>			
<small>Return completed form to:</small>			
Michigan Department of Licensing and Regulatory Affairs Michigan Occupational Safety and Health Administration Management and Technical Services Division 7150 Harris Drive, P.O. Box 30649 Lansing, MI 48909-8149			
MIOSHA-MTSD-51 (02/09)		<small>Authority: P.A. 368 of 1978 Completion: Required Penalty: Misdeamnor</small>	

Figure 2. Occupational Disease Reports to the Michigan Department of Licensing, & Regulatory Affairs: 1985-2011

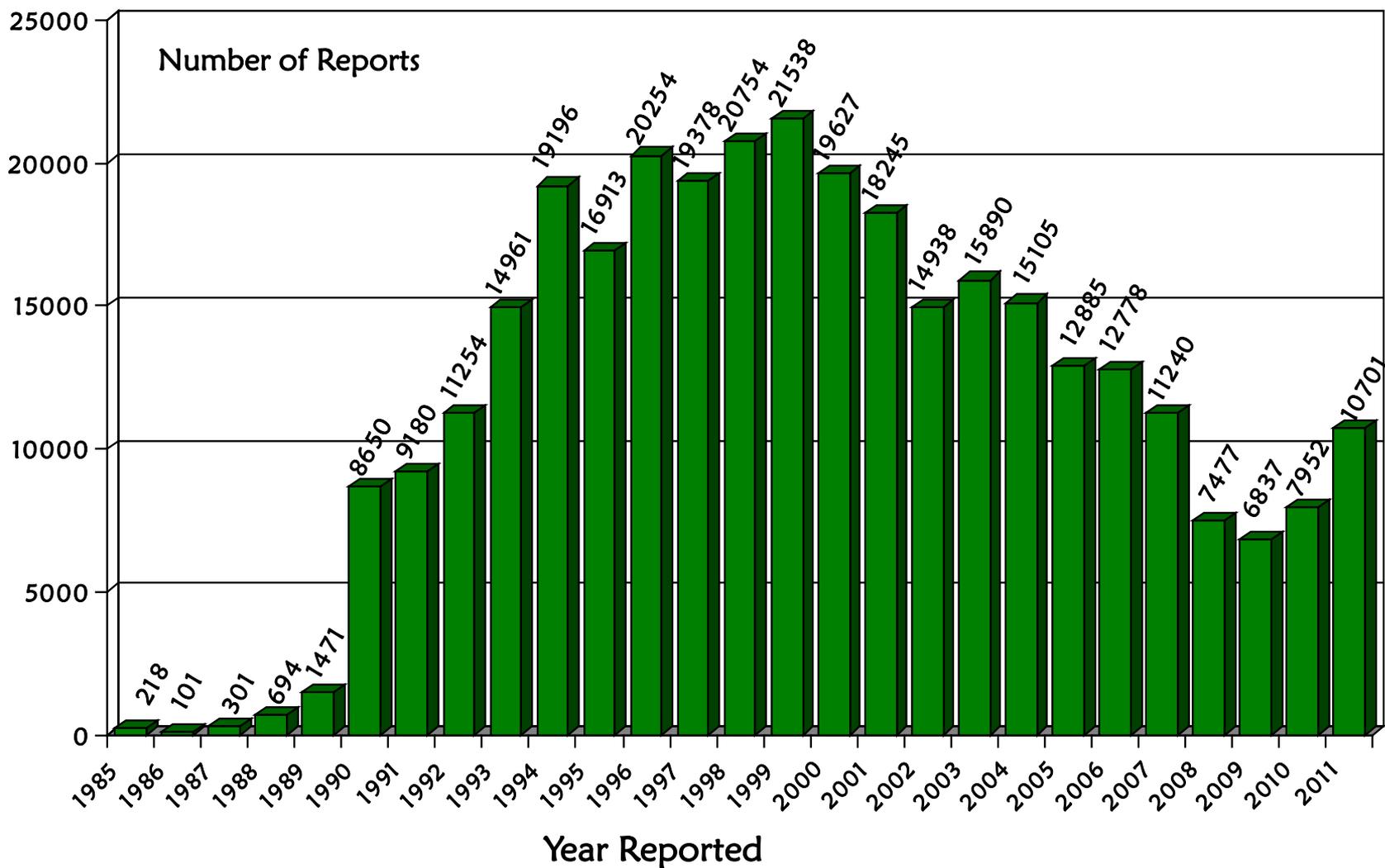
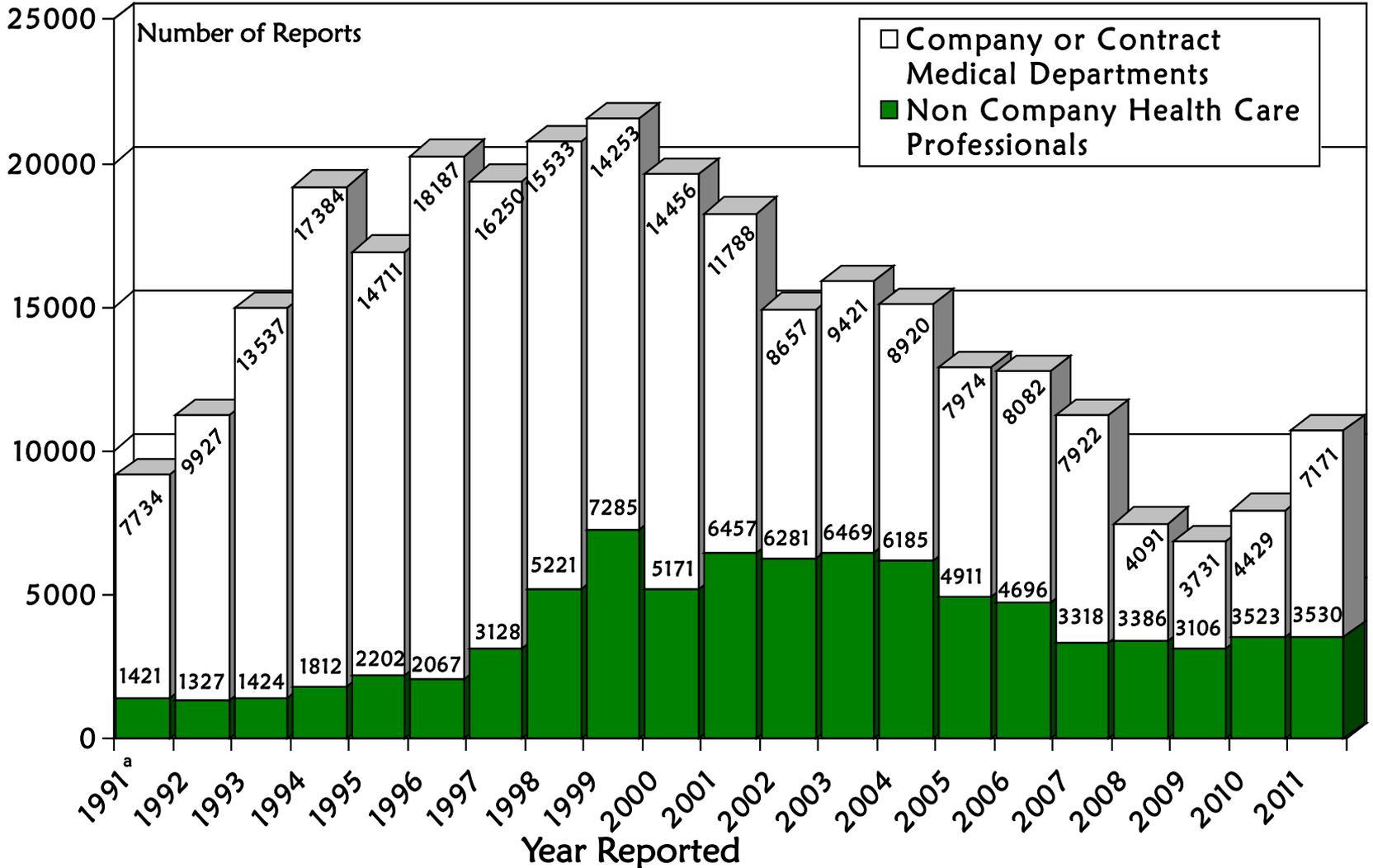


Figure 3. Occupational Disease Reports by Reporting Source, Non-Company Health Care Professionals and Company or Contract Medical Departments: 1991-2011



^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: 1992-2011

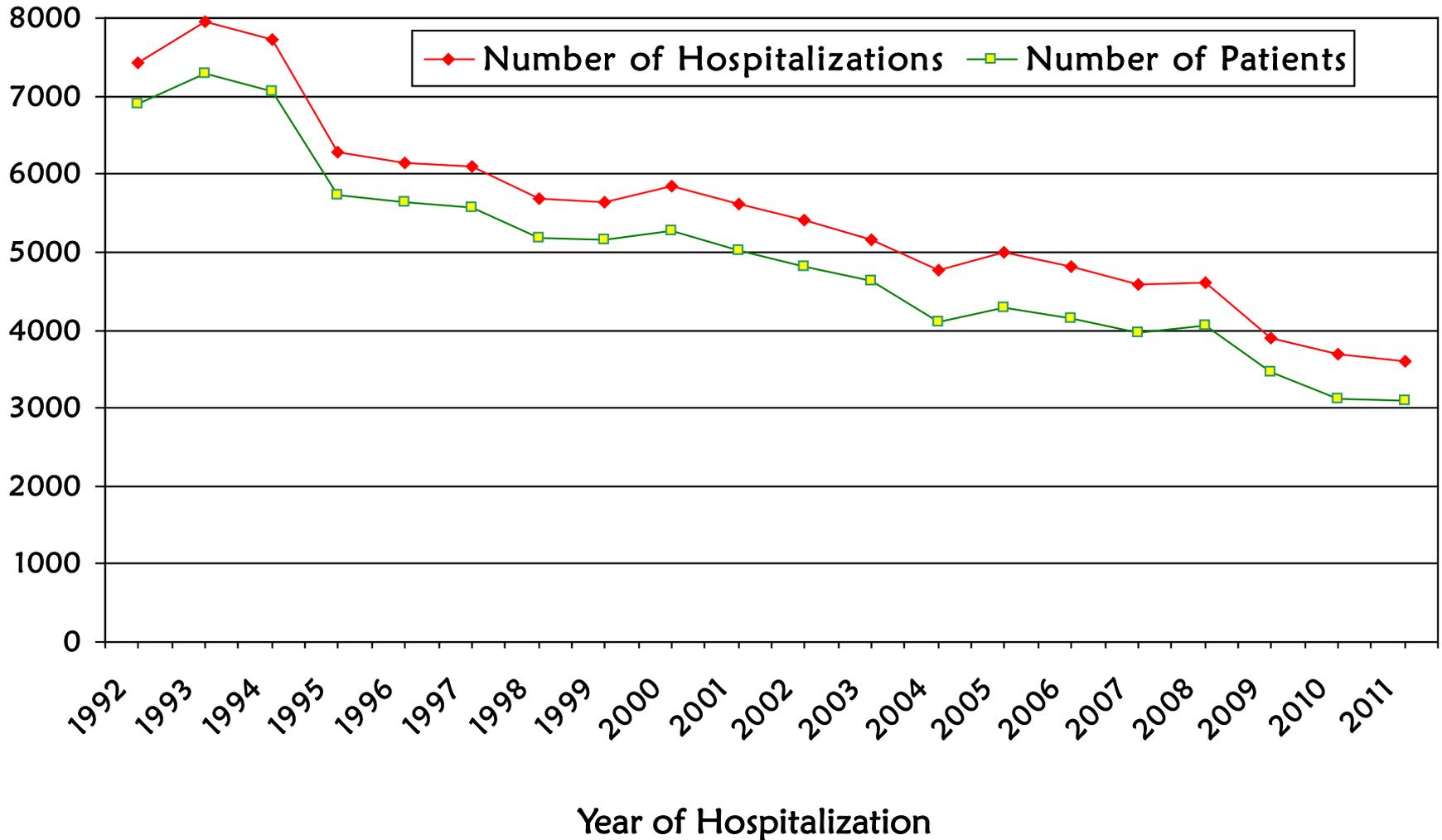


Figure 5. Percent of Total Michigan Hospitalizations with Workers' Compensation Designated as Primary Payment Source at Discharge: 1992-2011

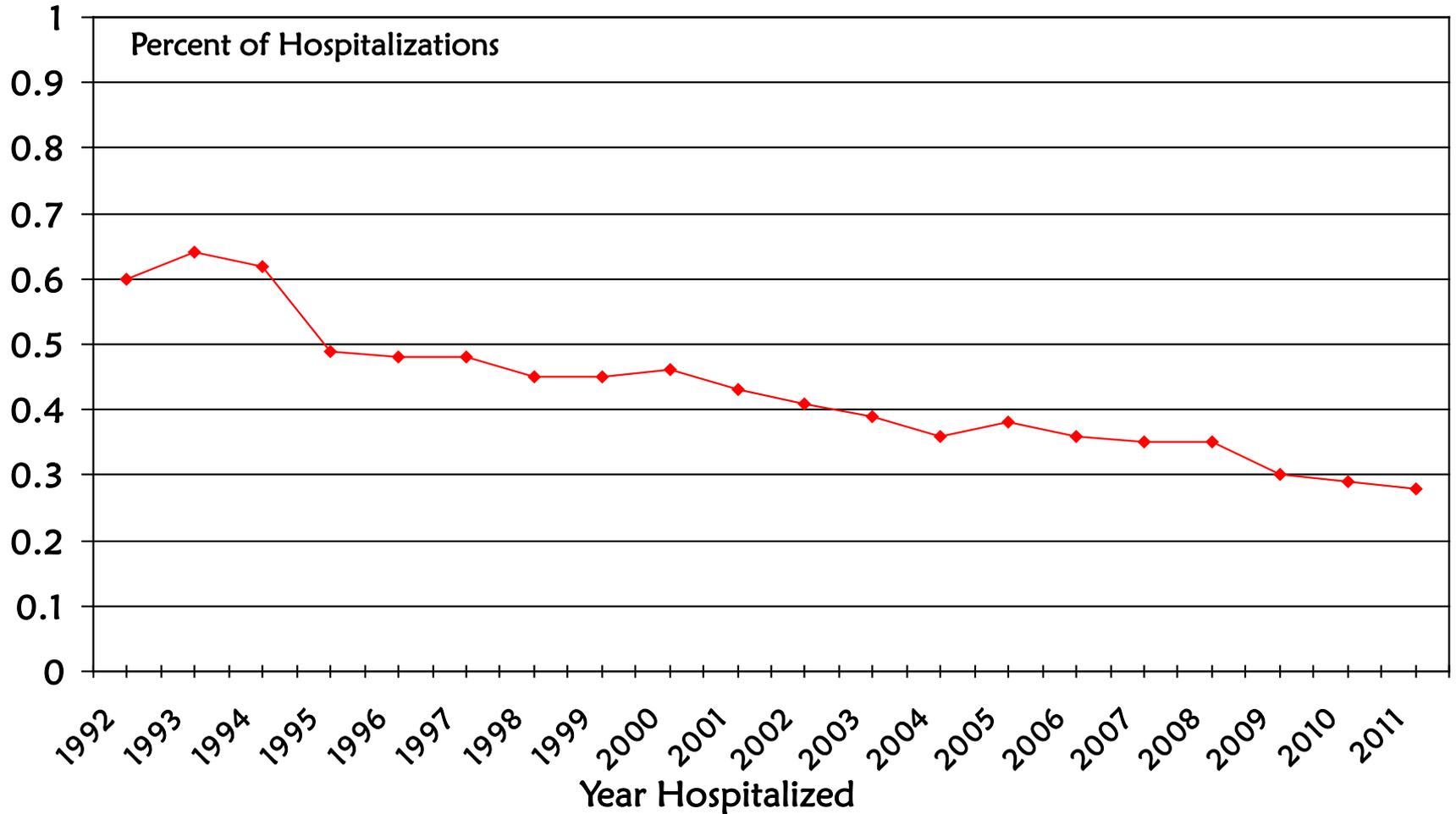


Figure 6. Number of Patients Discharged with Coal Workers' Pneumoconiosis (CWP), Asbestosis and Silicosis in Michigan: 1990-2011

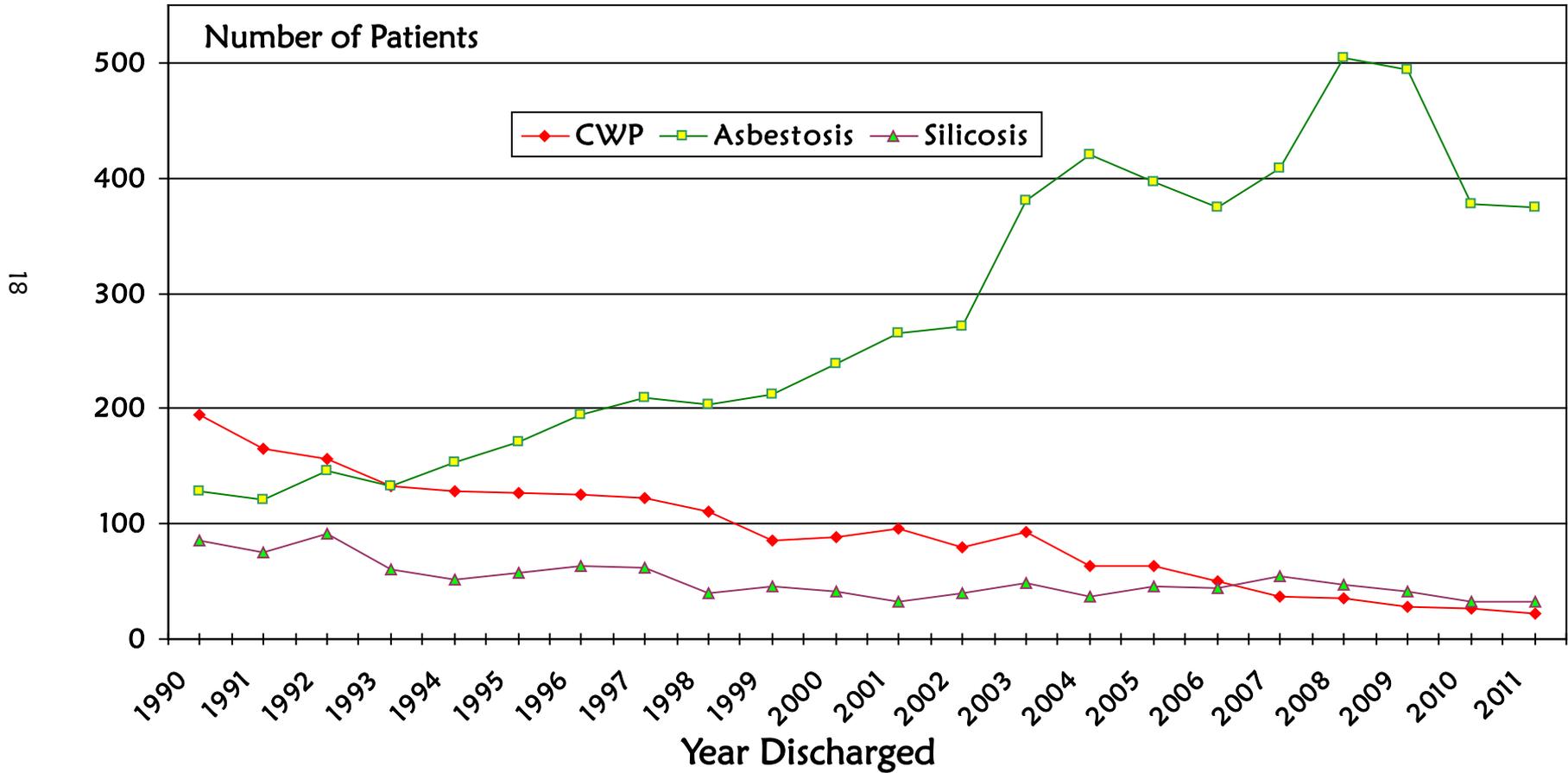
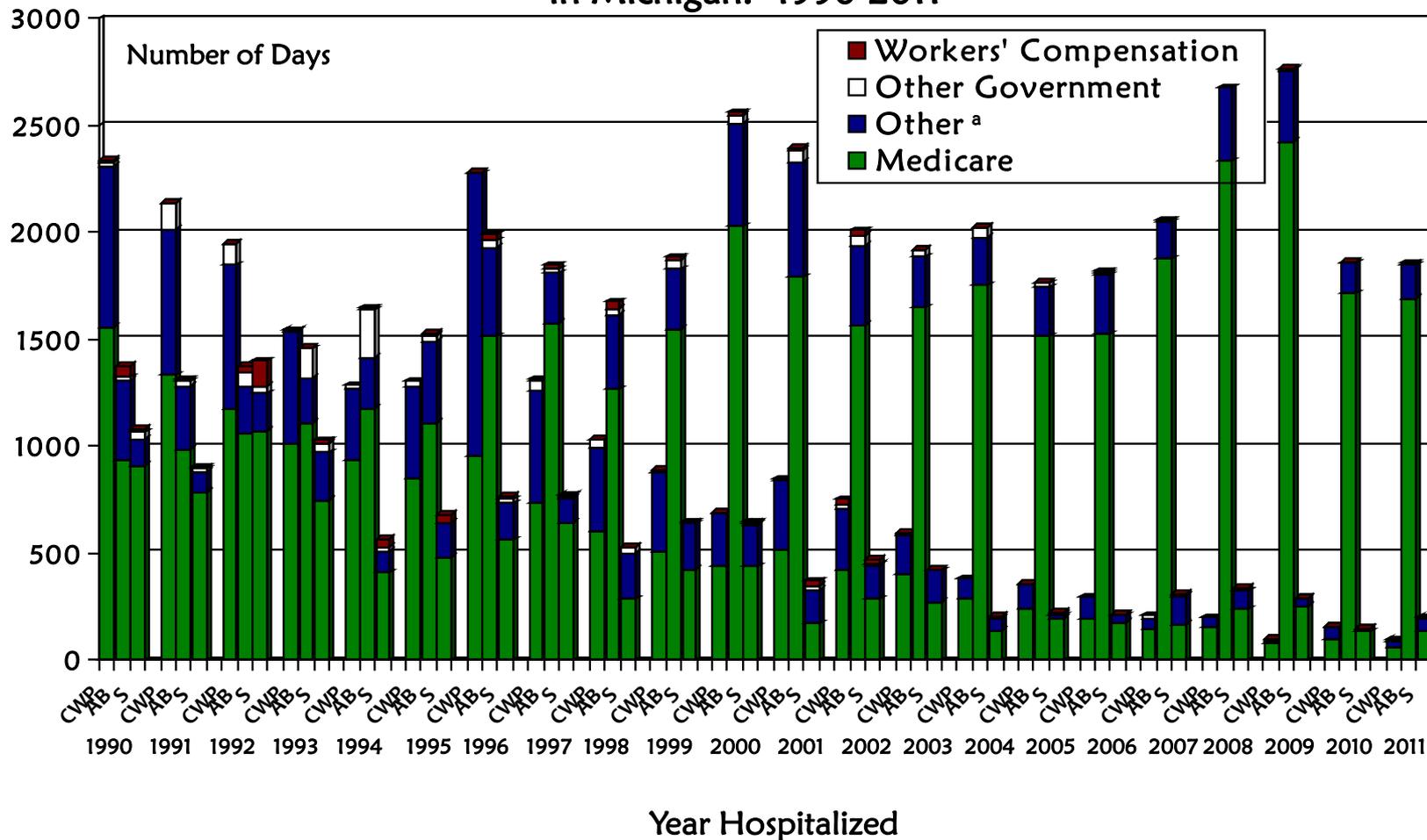


Figure 7. Number of Days Hospitalized by Payment Source at Discharge for Coal Workers' Pneumoconiosis (CWP), Asbestosis (AB) and Silicosis (S) in Michigan: 1990-2011



^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 Licensing & Regulatory Affairs: 1989-2011

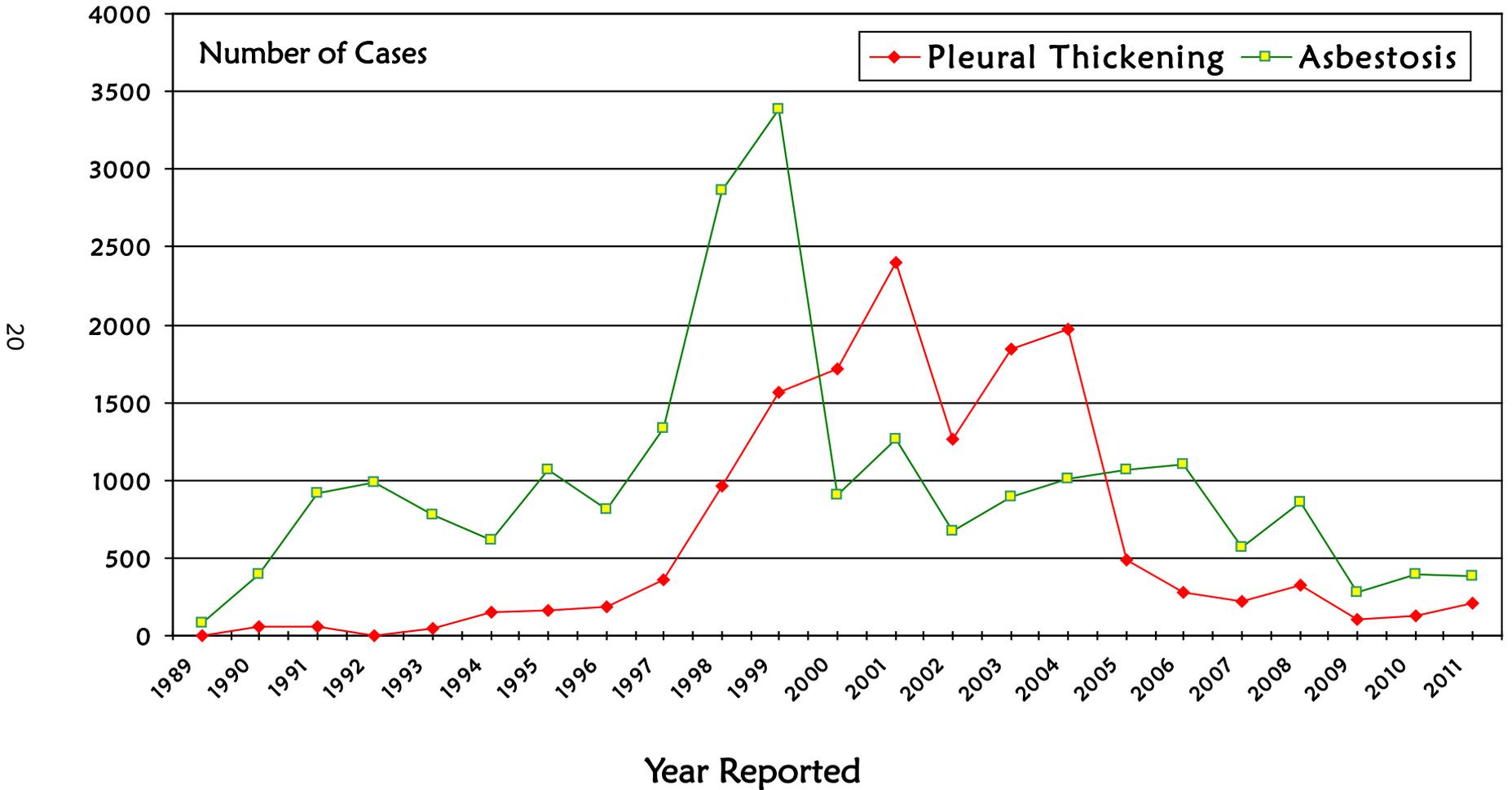


Figure 9. Number of Men and Women in Michigan Diagnosed with Mesothelioma: 1985-2009

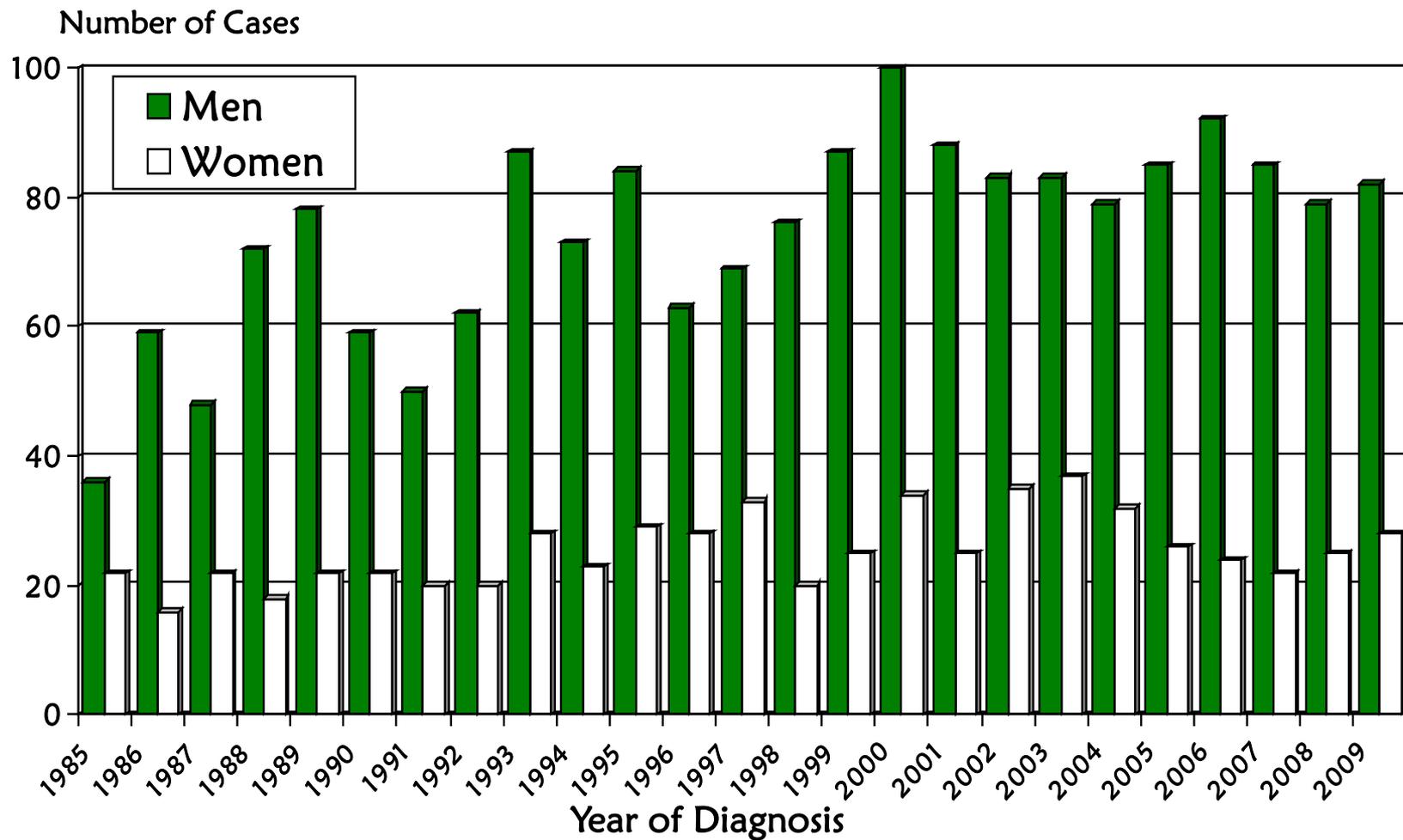
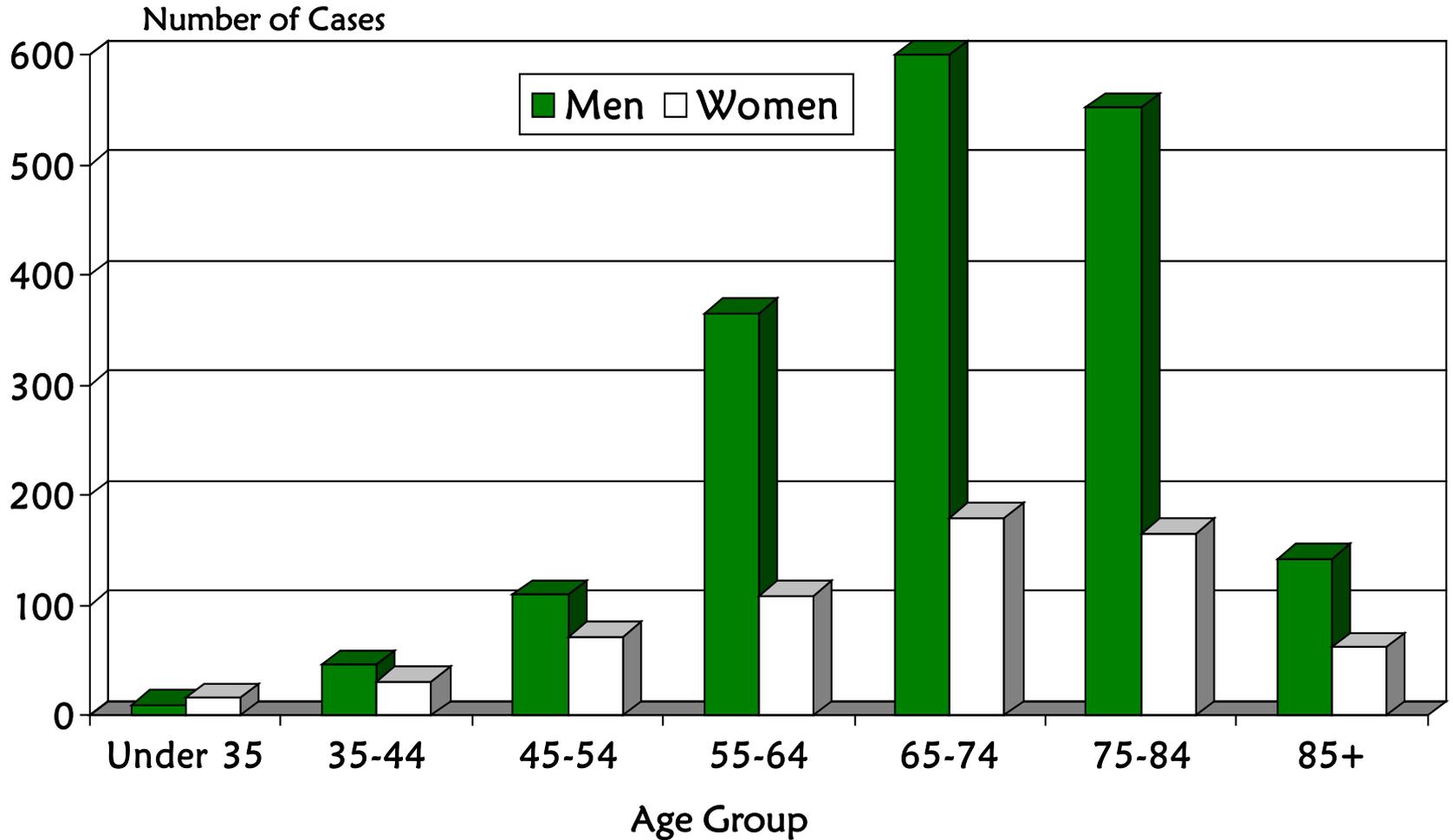
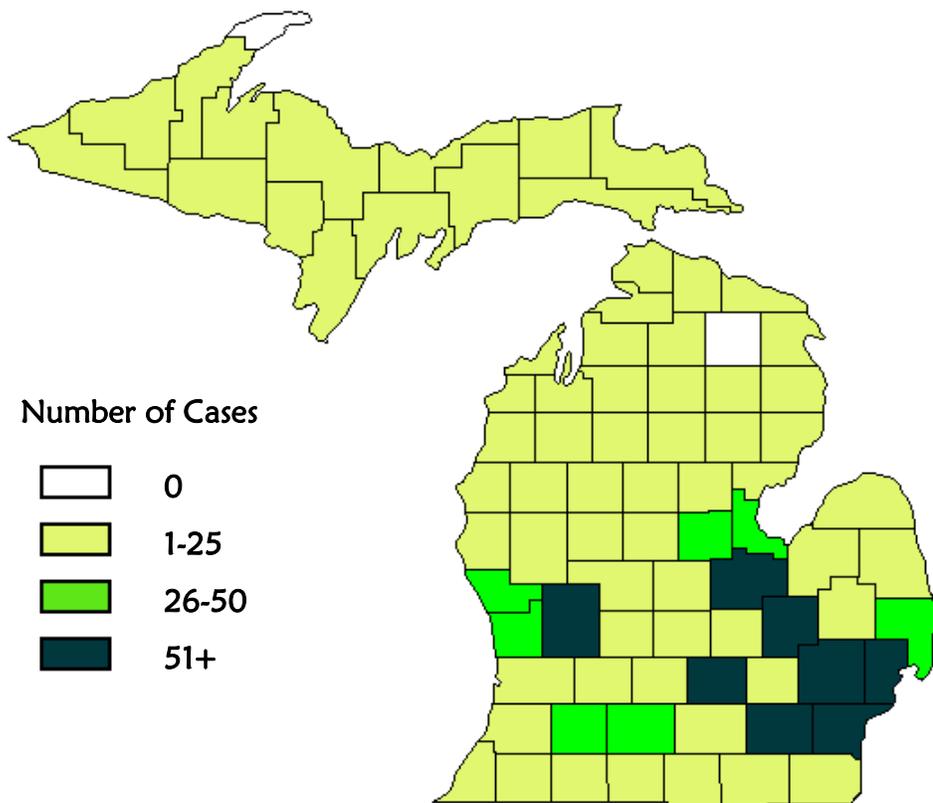


Figure 10. Cases of Mesothelioma in Michigan by Gender and Age at Diagnosis^a: 1985-2009



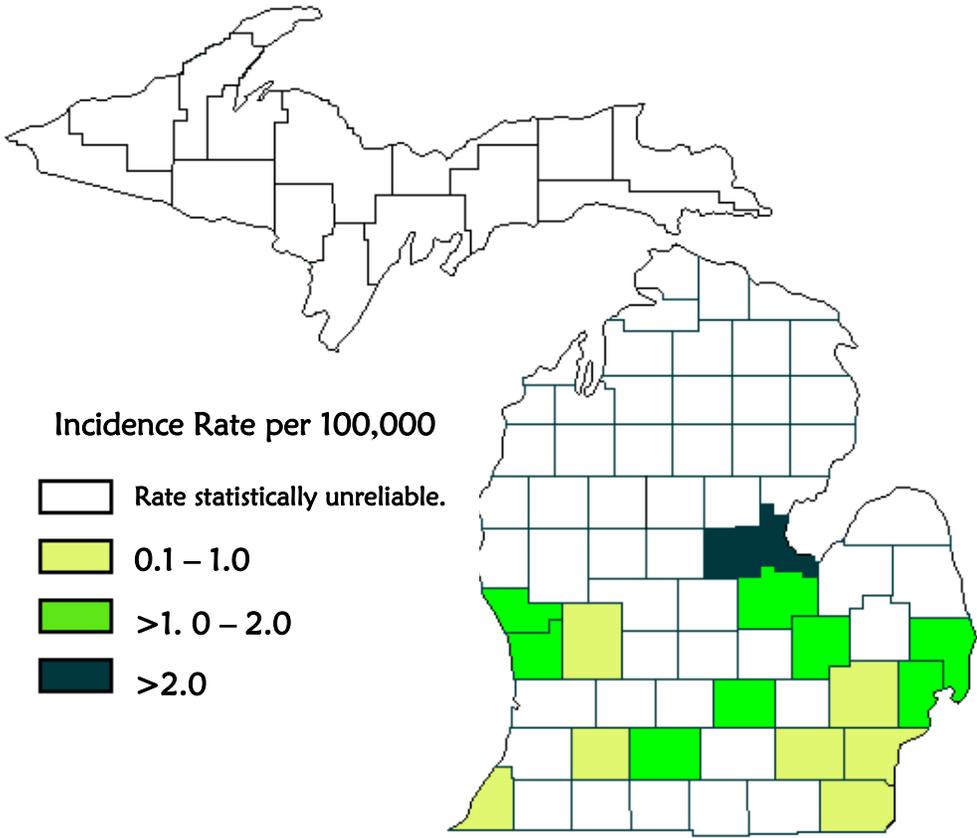
^aFor one female, age at diagnosis was unknown.

Figure 11. Distribution of Michigan Residents Diagnosed with Mesothelioma by County: 1995-2009



Total number of cases: 1,687. Source: Michigan Resident Cancer Incidence File. Includes cases diagnosed in 1995-2009 and processed by the Michigan Department of Community Health (MDCH), Division for Vital Records and Health Statistics by December 29, 2011. Generated by MDCH: August 27th, 2012.

Figure 12. 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 1995-2009. 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 1995-2009 and processed by the Michigan Department of Community Health (MDCH), Division for Vital Records and Health Statistics by December 29th, 2011. Generated by MDCH: August 27th, 2012.

**Table 1. Number of Employees at Facilities Where
an Occupational Illness Occurred in 2011, 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	146	13.4	201	3.0	347	4.4
25-100	195	17.9	598	8.9	793	10.2
100-500	271	24.9	1,216	18.1	1,487	19.1
> 500	478	43.9	4,700	70.0	5,178	66.3
Total	1,090^a	100.1^b	6,715^c	100.0	7,805	100.0

^a The number of employees was missing on 2,440 reports.

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

^c The number of employees was missing on 456 reports.

Table 2. Number of Occupational Disease Reports Submitted by Non-Company Health Care Practitioners in 2011

Number of Reports	Health Care Practitioners		Number of Patients Represented
	<i>Number</i>	<i>Percent</i>	
1	219	89.8	219
2-5	19	7.8	47
6-10	1	0.4	8
11-20	3	1.2	40
21-200	2	0.8	226
Total^a	244	100.0	540

^a Not included in the above statistics: 1,334 reports submitted by labs for lead poisoning, representing 30 labs; 1,088 reports submitted by Michigan's Poison Control Center; 381 reports from the 3rd Judicial Court of Michigan; 69 reports obtained through death certificate review; and 118 reports from doctors associated with hospitals that automatically report on a quarterly basis.

Table 3. Demographic Characteristics of Occupational Disease Cases Reported in 2011

Demographic Characteristic		
Age	<i>Number</i>	<i>Percent</i>
≤ 19	124	1.4
20-24	569	6.2
25-29	703	7.7
30-34	884	9.7
35-39	1,051	11.5
40-44	1,178	12.9
45-49	1,194	13.1
50-54	1,416	15.5
55-59	1,004	11.0
60-69	697	7.6
70-79	197	2.2
≥ 80	113	1.2
Total	9,130^a	100.0
Gender	<i>Number</i>	<i>Percent</i>
Male	7,051	66.1
Female	3,614	33.9
Total	10,665^b	100.0
Race	<i>Number</i>	<i>Percent</i>
Caucasian	721	35.4
African American	81	4.0
Hispanic	119	5.9
Other	1,113	54.7
Total	2,034^c	100.0

^aAge was missing on 1,571 reports. Mean age = 44± 13 years.

^bGender was missing on 36 reports.

^cRace was missing on 8,667 reports.

**Table 4. Number of Occupational Disease Reports in 2011,
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)	2	0.1	46	0.6	48	0.4
Neoplasms (ICD 140-239)	94	2.7	1	<0.1	95	0.9
Metabolic Disorders (ICD 270-279)	0	--	0	--	0	--
Diseases of the Blood and Blood Forming Organs (ICD 280-289)	0	--	4	0.1	4	<0.1
Mental Disorders (ICD 290-319)	1	<0.1	176	2.5	177	1.7
Diseases of the Nervous System & Sense Organs (ICD 320-389)	26	0.7	1,119	15.6	1,145	10.7
Diseases of the Circulatory System (ICD 390-459)	0	--	1	<0.1	1	<0.1
Diseases of the Respiratory System (ICD 460-519)	926	26.2	168	2.3	1,094	10.2
Diseases of the Digestive System (ICD 520-579)	1	<0.1	15	0.2	16	0.1
Diseases of the Genitourinary System (ICD 580-629)	0	--	0	--	0	--
Diseases of the Skin & Subcutaneous Tissue (ICD 680-709)	24	0.7	475	6.6	499	4.7
Diseases of the Musculoskeletal System & Connective Tissue (ICD 710-739)	24	0.7	1,163	16.2	1,187	11.1
Symptoms, Signs & Ill-Defined Conditions (ICD 780-799)	619	17.5	481	6.7	1,100	10.3
Repetitive Trauma: Sprains & Strains (ICD 800-999 except ICD 940 & ICD 980-989)	1	<0.1	3,412	47.6	3,413	31.9
Burn Confined to Eye (ICD 940)	202	5.7	4	0.1	206	1.9
Toxic Effects of Substances (ICD 980-989)	1,610	45.6	106	1.5	1,716	16.0
Total	3,530	99.9^a	7,171	100.0	10,701	99.9^a

^aPercentage does not add to 100 due to rounding.

**Table 5. Number of Occupational Disease Reports in 2011,
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	4	0.3	14	0.2	18	0.2
21	Mining	0	--	13	0.2	13	0.2
22	Utilities	73	5.5	69	1.0	142	1.7
23	Construction	400	30.0	118	1.7	518	6.1
31-33	Manufacturing	584	43.8	5,067	71.1	5,651	66.8
42	Wholesale Trade	30	2.2	86	1.2	116	1.4
44-45	Retail Trade	17	1.3	167	2.3	184	2.2
48-49	Transportation & Warehousing	16	1.2	80	1.1	96	1.1
51	Information	4	0.3	22	0.3	26	0.3
52	Finance & Insurance	0	--	24	0.3	24	0.3
53	Real Estate & Rental & Leasing	1	0.1	25	0.4	26	0.3
54	Professional, Scientific & Technical Services	7	0.5	43	0.6	50	0.6
56	Administrative & Support & Waste Management & Remediation Services	31	2.3	161	2.3	192	2.3
61	Educational Services	23	1.7	247	3.5	270	3.2
62	Health Care & Social Assistance	26	1.9	590	8.3	616	7.3
71	Arts, Entertainment & Recreation	21	1.6	11	0.2	32	0.4
72	Accommodation & Food Services	12	0.9	88	1.2	100	1.2
81	Other Services (except Public Admin.)	14	1.0	72	1.0	86	1.0
92	Public Administration	71	5.3	234	3.3	305	3.6
	Total	1,334	99.9^a	7,131	100.2^a	8,465	100.2^a
00	Unknown	2,196	--	40	--	2,236	--

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

Table 6. Number of Occupational Disease Reports in 2011, 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)	13	0.2	36	1.0
Neoplasms (ICD 140-239)	95	1.3	0	--
Metabolic Disorders (ICD 270-279)	0	--	0	--
Diseases of the Blood and Blood Forming Organs (ICD 280-289)	4	0.1	0	--
Mental Disorders (ICD 290-319)	53	0.8	106	2.9
Diseases of the Nervous System & Sense Organs (ICD 320-389)	863	12.2	282	7.8
Diseases of the Circulatory System (ICD 390-459)	0	--	1	<0.1
Diseases of the Respiratory System (ICD 460-519)	883	12.5	209	5.8
Diseases of the Digestive System (ICD 520-579)	12	0.2	4	0.1
Diseases of the Genitourinary System (ICD 580-629)	0	--	0	--
Diseases of the Skin & Subcutaneous Tissue (ICD 680-709)	348	4.9	151	4.2
Diseases of the Musculoskeletal System & Connective Tissue (ICD 710-739)	638	9.0	547	15.1
Symptoms, Signs & Ill-Defined Conditions (ICD 780-799)	546	7.7	553	15.3
Repetitive Trauma Injuries (ICD 800-999 except ICD 940 & ICD 980-989)	2,015	28.6	1,395	38.6
Burn Confined to Eye (ICD 940)	123	1.7	82	2.3
Toxic Effects of Substances Chiefly Non-Medicinal (ICD 980-989)	1,458	20.7	248	6.9
Total^a	7,051	99.9^b	3,614	100.0

^a Gender was missing on 36 reports.

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

Table 7. Demographic Characteristics of Reported Occupational Disease Fatalities in 2011

Vital Status	<i>Number</i>	<i>Percent</i>
Fatal	152	1.4
Non-Fatal	10,549	98.6
Total	10,701	100.0
Age	<i>Number</i>	<i>Percent</i>
50-59	10	6.9
60-69	27	18.6
70-79	52	35.9
≥ 80	56	38.6
Total	145^a	100.0
Disease Type	<i>Number</i>	<i>Percent</i>
Asbestosis	77	50.7
Neoplasm--Lung	66	43.4
Silicosis	5	3.3
Other--Lung	4	2.6
Total	152	100.0
Industry Type	<i>Number</i>	<i>Percent</i>
Manufacturing	74	58.3
Construction	31	24.4
Utilities	5	3.9
Transportation	4	3.1
Educational Services	3	2.4
Public Administration	3	2.4
Information	2	1.6
Other Services	2	1.6
Other	3	2.4
Total	127^b	100.1 ^c

^aAge was unknown for 7 reports.

^bIndustry was missing on 25 reports.

^cPercentage does not add to 100 due to rounding.

Table 8. Comparison of 2011 BLS Occupational Illness Survey Data and 2011 LARA Workers' Compensation Agency (WCA) Claims with 1992-2011 LARA 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
LARA	<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>
2011 BLS Survey	1,100	14.7	No Data	--	400	5.3	100	1.3	No Data	--	No Data	--	5,900	78.7	7,500
2011 WCA Claims ^b	45	0.3	0	--	107	0.7	9	0.1	34	0.2	12,427	80.2	2,867	18.5	15,489
LARA 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
2010	263	3.5	440	5.9	841	11.3	1,750	23.5	190	2.5	2,394	32.1	1,573	21.1	7,451
2011	499	4.9	459	4.5	634	6.3	1,716	17.0	237	2.3	3,974	39.3	2,589	25.6	10,108

^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 LARA 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 1992-2011, 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	2001
	%	%	%	%	%	%	%	%	%	%
Infectious Diseases (001-139)	0.2	0.3	0.3	0.4	0.3	0.2	0.3	0.2	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	0.3
Endocrine Diseases (240-279)	0.3	0.4	0.3	0.3	0.3	0.2	0.4	0.3	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	<0.1
Mental Disorders (290-319)	1.5	1.4	1.4	1.1	0.9	1.0	0.8	1.2	1.1	0.9
Nervous System Diseases (320-389)	2.8	2.3	2.4	2.3	1.6	1.9	1.5	1.1	1.1	1.0
Circulatory Diseases (390-459)	2.7	2.6	2.3	2.5	2.8	2.3	2.3	2.3	2.2	2.6
Respiratory Diseases (460-519)	1.0	1.4	1.0	1.3	1.3	1.3	1.2	1.4	1.1	1.2
Digestive Diseases (520-579)	2.0	2.2	1.9	2.0	1.7	1.9	1.8	2.0	1.5	1.7
Genitourinary Diseases (580-629)	0.8	1.0	0.5	0.7	0.8	0.6	0.5	0.4	0.5	0.5
Pregnancy Complications (630-676)	1.4	1.6	0.3	0.5	0.5	0.9	1.1	1.0	0.7	0.4
Skin Diseases (680-709)	2.7	2.6	3.5	3.7	3.5	3.5	3.4	3.7	3.7	3.2
Musculoskeletal Diseases (710-739)	42.5	42.9	42.3	41.7	42.7	41.5	42.0	40.7	40.3	43.3
Congenital Anomalies (740-759)	0.5	0.5	0.4	0.4	0.2	0.3	0.2	0.4	0.2	0.2
Perinatal Complications (760-779)	<0.1	<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	1.2
Injury & Poisoning (800-999)	36.6	35.5	39.1	40.0	40.0	40.8	40.0	40.6	43.3	41.0
V Codes	3.4	3.4	2.7	1.2	1.3	1.7	2.6	2.6	2.0	2.0
Total^b	6891	7282	7058	5726	5631	5567	5183	5153	5278	5013

Primary Discharge Diagnosis (ICD-9 ^a)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	%	%	%	%	%	%	%	%	%	%
Infectious Diseases (001-139)	0.1	0.4	0.4	0.7	1.3	0.8	1.3	1.6	1.2	1.5
Neoplasms (140-239)	0.2	0.2	0.2	0.4	0.3	0.1	0.3	0.3	0.1	0.4
Endocrine Diseases (240-279)	0.4	0.3	0.4	0.2	0.5	0.7	0.7	0.7	0.7	0.7
Blood Diseases (280-289)	<0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	<0.1	0.1
Mental Disorders (290-319)	0.9	0.7	0.8	0.6	0.9	1.0	0.9	0.9	0.8	1.0
Nervous System Diseases (320-389)	1.1	1.1	1.2	1.0	1.1	1.4	1.7	1.6	2.0	1.8
Circulatory Diseases (390-459)	2.1	2.6	2.9	4.0	3.8	4.6	4.1	4.7	4.8	4.7
Respiratory Diseases (460-519)	1.4	1.7	2.0	2.2	2.1	2.2	2.6	2.5	2.8	1.9
Digestive Diseases (520-579)	1.7	1.8	2.0	2.5	1.9	1.8	2.3	2.5	2.6	1.9
Genitourinary Diseases (580-629)	0.5	0.6	0.6	0.8	0.8	1.1	1.3	1.2	1.1	1.3
Pregnancy Complications (630-676)	0.5	0.4	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.3
Skin Diseases (680-709)	3.2	3.5	3.3	3.6	4.7	4.7	3.8	4.0	4.3	5.2
Musculoskeletal Diseases (710-739)	43.9	39.3	38.5	34.2	36.9	33.1	32.2	31.8	29.8	28.7
Congenital Anomalies (740-759)	0.2	0.2	0.3	0.1	0.4	0.3	0.2	0.3	0.3	0.3
Perinatal Complications (760-779)	--	--	--	--	--	<0.1	--	--	--	--
Symptoms & Signs (780-799)	1.2	1.7	1.5	1.8	2.3	1.7	1.9	1.4	1.8	1.6
Injury & Poisoning (800-999)	40.1	40.6	41.1	42.4	38.8	42.3	41.8	42.4	43.1	44.2
V Codes	2.2	4.7	4.6	5.5	4.1	3.9	4.6	3.8	4.3	4.6
Total^b	4809	5160	4760	4996	4825	4578	4611	3906	3688	3589

^aInternational Classification of Diseases, 9th Revision.

^bTotals vary due to missing information.

Table 10. Demographic Characteristics of Patients Hospitalized in Michigan from 1992-2011, with Workers' Compensation Designated as Primary Payment Source at Discharge

	1992 ^a	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	%	%	%	%	%	%	%	%	%	%	%	%
Gender												
Male	74	74	76	76	78	75	76	76	77	76	76	74
Female	26	26	24	24	22	25	24	24	23	24	24	26
Total #	6895	7291	7063	5736	5634	5570	5186	5156	5277	5014	4809	4635
Race												
White	85	86	87	85	84	85	85	85	85	85	86	85
African Am	9	8	9	10	11	10	11	9	10	10	9	11
Asian	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Other	6	6	4	5	5	5	4	5	4	5	5	4
Total #	6056	6245	5966	4370	3991	3845	3561	3405	3557	3343	3123	3046
Age												
< 15	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
15-19	2	2	2	2	2	2	2	2	2	2	1	1
20-29	18	16	16	16	14	14	14	15	13	13	11	12
30-39	31	30	30	29	29	29	28	27	26	24	25	24
40-59	40	42	43	45	47	48	48	48	51	53	54	53
60-79	7	8	8	7	8	7	7	8	8	8	8	10
≥ 80	<1	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total #	6794	7162	7040	5718	5621	5544	5132	4999	5252	4999	4792	4635
Avg Age	40	41	41	41	42	42	42	42	43	43	43	44
SD-Age	+13	+13	+12	+12	+12	+12	+12	+12	+12	+12	+12	+13

	2004	2005	2006	2007	2008	2009	2010	2011
	%	%	%	%	%	%	%	%
Gender								
Male	76	75	73	73	70	71	73	74
Female	24	25	27	27	30	29	27	26
Total #	4760	4996	4825	4578	4611	3906	3688	3589
Race								
White	86	87	87	87	90	89	90	89
African Am	10	9	9	9	8	9	7	8
Asian	<1	<1	<1	<1	<1	<1	<1	<1
Other	3	3	4	4	2	2	2	3
Total #	3172	3465	3261	3233	3255	2761	2671	2659
Age								
< 15	<1	<1	<1	<1	--	--	<1	<1
15-19	2	1	1	1	1	1	1	1
20-29	11	11	11	11	10	9	9	10
30-39	22	20	19	18	17	17	18	17
40-59	55	53	52	54	54	55	53	53
60-79	10	11	12	12	14	14	16	15
≥ 80	1	4	3	3	4	4	3	4
Total #	4760	4986	4825	4578	4602	3902	3688	3589
Avg Age	44	46	47	47	48	49	48	48
SD-Age	+12	+15	+15	+15	+15	+15	+14	+15

^aTotals vary due to missing information.

**Table 11. Summary of “B” Reading Interpretations of
Chest X-Rays in Michigan: 1995-2011**

YEAR	# “B” Readers	Pleural Changes Only	Parenchymal Changes- With & Without Pleural Changes	Pleural or Parenchymal Changes	Total X-Rays Reviewed	% of Total w/ any Changes
1995	16	--	--	1,406	8,165	17
1996	16	--	--	837	4,825	17
1997	16	446	522	968	6,652	15
1998	16	--	--	3,111	--	--
1999	18	1,045	2,595	3,640	10,575	34
2000	16	532	297	829	10,591	8
2001	17	1,211	1,316	2,527	11,149	23
2002	16	683	905	1,588	7,189	22
2003	11	1,440	1,289	2,729	10,589	26
2004	--	--	--	--	--	--
2005	9	502	343	845	3,060	28
2006	10	391	127	518	5,382	10
2007	9	201	130	331	3,661	9
2008	10	337	320	657	4,757	14
2009	9	247	66	313	4,170	8
2010	6	202	45	247	2,804	9
2011	6	183	46	229	2,862	8

Table 12. Demographic Characteristics of 1,088 Individuals Reported by the Michigan Poison Control Center in 2011

Demographic Characteristics		
Age	<i>Number</i>	<i>Percent</i>
14-19	69	7.2
20-29	337	35.0
30-39	211	21.9
40-49	178	18.5
50-59	136	14.1
60-69	29	3.0
≥ 70	3	0.3
Total	963^a	100.0
Gender	<i>Number</i>	<i>Percent</i>
Male	675	62.7
Female	402	37.3
Total	1,077^a	100.0
Disease Type	<i>Number</i>	<i>Percent</i>
Skin Rash and Burns	208	19.1
Chemical Burns to the Eye	202	18.6
Nausea & Vomiting	183	16.8
Respiratory Symptoms	83	7.6
General Symptoms	73	6.7
Cardiovascular Symptoms	64	5.9
Toxic Effects of Corrosives	62	5.7
Carbon Monoxide Poisoning	33	3.0
Toxic Effects of Petroleum Products	22	2.0
Toxic Effects of Other Metals	14	1.3
Lead Poisoning/Exposure to Lead	4	0.4
Toxic Effects from Other Substances	140	12.9
Total	1,088	100.0

^a Age was missing on 125 reports. Gender was missing on 11 reports.

Table 13. Demographic Characteristics of 1,334 Individuals Reported by Laboratories Screening for Blood Lead Among Michigan Residents in 2011

Demographic Characteristics				
	Blood Lead Level			
	≥5 & <10 ug/dL		≥10 ug/dL	
Age	#	%	#	%
13-19	8	1.1	6	1.0
20-29	111	15.5	80	12.9
30-39	128	17.9	158	25.5
40-49	167	23.4	134	21.6
50-59	171	23.9	149	24.1
60-69	85	11.9	72	11.6
≥ 70	45	6.3	20	3.2
Total	715	100.0	619	99.9
Gender	#	%	#	%
Male	622	87.0	589	95.2
Female	93	13.0	30	4.8
Total	715	100.0	619	100.0
Industry				
Construction	135	48.4	204	45.0
Manufacturing	71	25.4	150	33.1
Utilities	34	12.2	17	3.8
Public Administration	14	5.0	30	6.6
Trade	11	3.9	18	4.0
Administrative & Support	6	2.2	2	0.4
Professional & Scientific	4	1.4	2	0.4
Educational Services	2	0.7	2	0.4
Arts & Entertainment	1	0.4	17	3.8
Other Services	1	0.4	8	1.8
Transportation	0	--	3	0.7
Mining	0	--	0	--
Total	279^a	100.0	453^a	100.0

^a Industry was missing on 436 reports of blood leads < 10 ug/dL and on 166 reports of blood leads ≥10ug/dL.

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