

JANUARY 25, 2018

2016 ANNUAL REPORT

SUMMARY OF OCCUPATIONAL
DISEASE REPORTS TO
THE MICHIGAN DEPARTMENT OF
LICENSING AND REGULATORY AFFAIRS



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

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Occupational Disease Surveillance Program

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There are many resources available to help employers, employees, healthcare professionals and others understand more about work-related diseases. Links to these resources can be found at: www.oem.msu.edu.

Background

This is the 25th annual report on occupational diseases in Michigan, and is based upon the reports submitted to the Michigan Department of Licensing and Regulatory Affairs (LARA) in calendar year 2016. Since 1978, phy-

Acronyms

- BLS** Bureau of Labor Statistics
- LARA** MI Department of Licensing and Regulatory Affairs
- MDHHS** Michigan Department of Health and Human Services
- MIOSHA** Michigan Occupational Safety and Health Administration
- MSU OEM** Michigan State University Occupational and Environmental Medicine
- NAICS** North American Industrial Classification System
- NIOSH** National Institute for Occupational Safety and Health
- OD Report** Occupational Disease Report
- WCA** Workers' Compensation Agency



This report was funded by the National Institute for Occupational Safety & Health, under cooperative agreement U60-OH008466.

There are many ways to report occupational diseases to the state:

ONLINE:
www.oem.msu.edu

EMAIL:
ODReport@ht.msu.edu

FAX:
517.432.3606

TELEPHONE:
1.800.446.7805

MAIL:
LARA, MIOSHA
Technical Services
Division
530 W Allegan St
PO BOX 30649
Lansing, MI 48909

sicians, 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. LARA designates Michigan State University's College of Human Medicine, Occupational and Environmental Medicine Division (MSU OEM) as its bona fide

Part 56 of the Michigan Public Health Code requires reporting of all known or suspected occupational illnesses or work-aggravated health conditions to the Michigan Department of Licensing and Regulatory Affairs within 10 days of discovery.

Background continued...

agent to compile and analyze the occupational disease reports.

A standard form is used to report individuals with a known or suspected work-related condition. It requests medical and demographic information on the affected employee as well as information about the facility at which the employee became ill. Figure 1 is a copy of the

Known or Suspected Occupational Disease reporting form.

Reports received are reviewed by MSU OEM staff and computerized.

In some cases, additional follow-up is conducted. The reported patient may be contacted and interviewed by staff at MSU OEM to obtain more information about their illness. A Michigan Occupational Safety and

Health Administration (MIOSHA) enforcement inspection may be initiated at the patient's workplace to assess current working conditions and determine if other employees are experiencing similar health issues.

Reports are analyzed on a yearly basis and the results are shared with health professionals and other stakeholders.

Figure 1. Occupational Disease Reporting Form



In 2016, 971 (1.5%) of the 65,900 human exposure-related calls to the Michigan Poison Control Center were related to occupational exposures.

Michigan Department of Licensing and Regulatory Affairs
Known or Suspected Occupational Disease Report
 (Information will be held confidential as prescribed in Public Act 368 of 1978.)

MIOSHA Technical Services Division

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: Mo Day Year To: Mo Day Year
Employee's Job Title or Description of Work	

ILLNESS INFORMATION

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

ADDITIONAL COMMENTS

REPORT SUBMITTED BY

If Report Submitted by Non-Physician, Did Employee See a Physician?
 If yes, record information below.

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

METHODS

An occupational disease (OD) report is initiated when a clinician knows or suspects that a patient's illness is work-related. Reports are submitted by or requested from a variety of sources, listed below. Additional reports are generated through annual review of the Michigan Health and Hospital Association inpatient database.

SOURCES TO IDENTIFY PATIENTS

- ◆ **Health Care Providers** Private practice, working for industry, NIOSH-certified “B” readers, audiologists, clinics
- ◆ **Employers**
- ◆ **Hospitals** for International Classification of Diseases—10th Revision (ICD-10)¹ beginning October 1, 2015 and includes J45, J62, J63, J64, J65, J66, J67, J68, Z57.2, Z57.3, Z57.5 and other select work-related conditions
- ◆ **Workers’ Compensation Agency**
- ◆ **Poison Control Center** data for work-related poisonings
- ◆ **Reports from Co-Workers or MIOSHA Field Staff** confirmed by a health care provider
- ◆ **Death Certificates** for ICD-10 Cause of Death (COD) or contributing COD J61, J62.8, J63, J64, J65, J67; if Underlying COD J45, J68
- ◆ **3rd Judicial Circuit State Court of Michigan** for asbestos-related disease
- ◆ **Mine Safety and Health Administration**
- ◆ **Michigan Cancer Registry** for mesothelioma
- ◆ **Clinical Laboratories** for blood lead analyses, and specific IgE allergy testing

OD reports are used to direct surveillance, intervention and prevention activities. The computerized OD report information includes: 1) employee name, age, sex, race, zip code and optional partial social security number; 2) employer name, worksite address, city, zip code, number of persons employed at the facility and an assigned North American Industry Classification System (NAICS) code; 3) details of the illness, diagnosis date, suspected causative agent(s), vital status, and assigned ICD-10 code; and 4) information about the report submitter, including whether they are employed by the company, an outside medical department contracted by the company, or a private practice health professional.

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 several reports are submitted for acute illnesses for a single individual, all of the reports are included in our statistics. In contrast, 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 (see list below for chronic diseases).

CHRONIC OCCUPATIONAL DISEASES COUNTED ONLY ONCE

ICD-10	DESCRIPTION
A15.0	Pulmonary TB
A18.0	TB of Bones & Joints
D86	Sarcoidosis
B90	TB, Late Effects of
C00-D49	Cancer
E20-E35	Diseases of Other Endocrine Glands
E50-E64	Nutritional Deficiencies
E70-E88	Metabolic & Immunity Disorders except E86.0 [276], Dehydration
D50-D89	Diseases of the Blood & Blood Forming Agents
F01-F99	Mental Disorders except F43 [308 (Acute Reaction to Stress) & 309 (Adjustment Reaction)]
G00-G99	Select Diseases of the Nervous System & Sense Organs
H90-H91	Noise-Induced Hearing Loss, Tinnitus
I00-I99	Select Diseases of the Circulatory System
J40-J47, J60-J70	Select Diseases of the Respiratory System, Pleural Plaques w/no Parenchymal Abnormality on ILO form
J80-J84	Interstitial Lung Disease, Pulmonary Fibrosis
L94.9	Connective Tissue Lung Disease
K00-K95	Diseases of the Digestive System
N00-N99	Diseases of the Genitourinary System

The 2015 Annual Report on Silicosis & Other Work-Related Lung Disease contains information on Asbestos-related lung disease that was formerly in the OD Annual Reports. The report can be found at: www.oem.msu.edu

RESULTS

A total of 8,539 occupational disease reports were submitted to LARA in calendar year 2016. Figure 2 shows the number of reports received each year since 1985.

Reporting Source

Company or contract medical departments submitted 57% of the reports (4,849 cases); non-company associated health care practitioners submitted 43% of the reports (3,690 cases). Figure 3 shows the trends by reporting source (company or non-company associated) since 1991.

Company Size

Half of the reports were submitted on individuals who worked in large companies (Table 1) with 2,710 of the 5,448 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 85% of the 791 reports with known company size that were submitted by non-company practitioners involved companies with < 500 employees, while about 44% of the 4,657 reports with known company size submitted by company practitioners involved facilities with < 500 employees.

Non-Company Clinicians

One hundred thirty-two non-company-associated clinicians reported 220 incidents of occupational disease. Twenty-four

Figure 2
OD Reports to LARA by Year Reported: 1985-2016

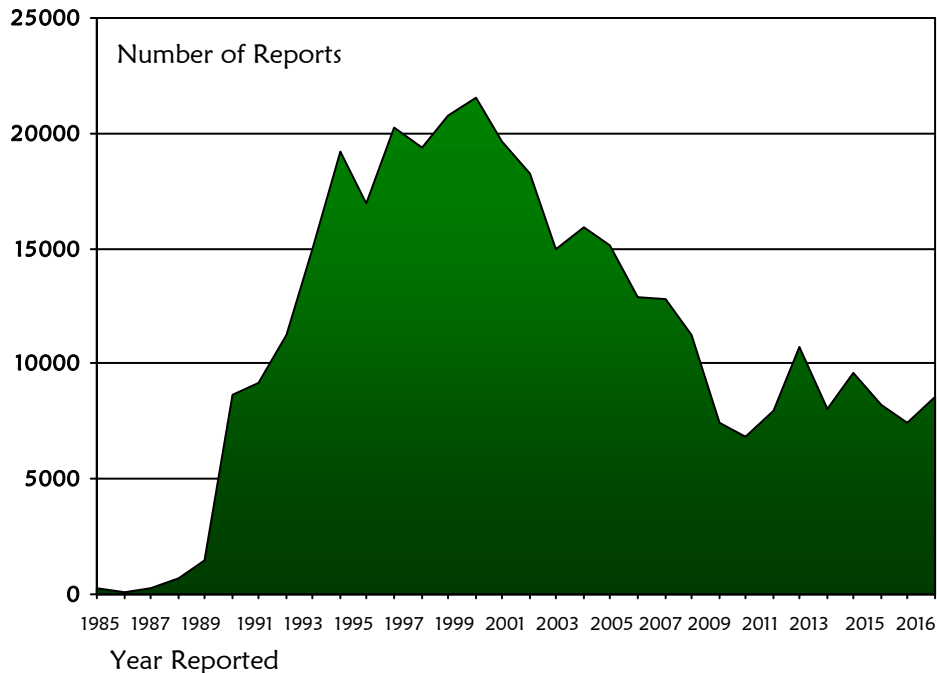
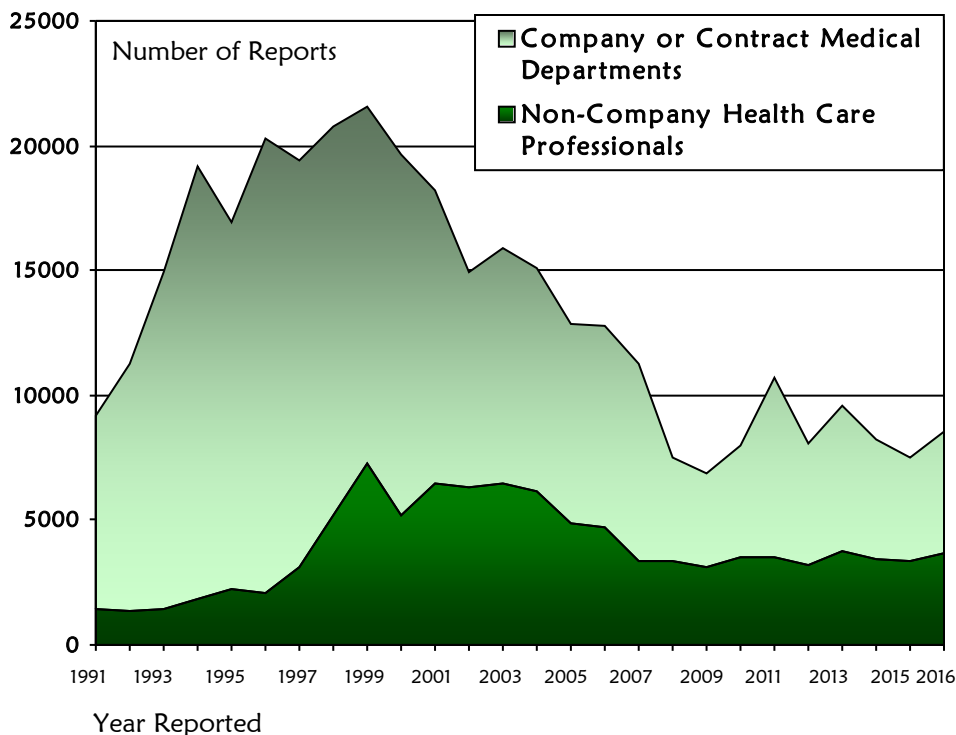


Figure 3
OD Reports by Year and Reporting Source: 1991-2016



RESULTS, continued...

labs were responsible for identifying 2,067 reports of lead poisoning. In addition, the Michigan Poison Control Center reported 928 incidents of work-related poisonings, the 3rd Circuit Court of Michigan reported 318 asbestos-related claims, hospitals reported 151 patients with work-related illnesses and two labs reported six latex allergies. One hundred eighteen (89%) of the clinicians reported only one patient each in calendar year 2016 (Table 2); one clinician reported 52 patients; this clinician is certified to interpret chest x-rays for dust-related lung disease (“B” reader). 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. In 2016, there were five Michigan physicians who were listed as a “B” reader on the NIOSH “B” reader website (<https://www.cdc.gov/niosh/topics/chestradiography/breader-list.html>).

Occupational Health Clinics

There are approximately 195 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 44, in 2011 increased to 64, in 2012 decreased to 61, in 2013 increased to 66, in 2014 decreased to 46, in 2015 decreased to 39, and in 2016 decreased to 37. Biennial audits of a sample of non-reporting clinics began in 2009.

Table 1
Company Size at Facilities with an OD Report in 2016:
Non-Company v Company Clinicians

Number of Employees	REPORTING SOURCE					
	Non-Company Clinicians		Company Clinicians		Total Reports	
	#	%	#	%	#	%
< 25	204	25.8	567	12.2	771	14.2
25-100	261	33.0	717	15.4	978	18.0
100-500	209	26.4	780	16.7	989	18.2
> 500	117	14.8	2,593	55.7	2,710	49.7
Total	791 ^a	100.0	4,657 ^b	100.0	5,448	100.1 ^c

^a The number of employees was missing on 2,899 reports.
^b The number of employees was missing on 192 reports.
^c Percentage does not add to 100 due to rounding.

Table 2
OD Reports Submitted by Non-Company Clinicians in 2016

Number of Reports	Clinicians		Patients
	#	%	#
1	118	89.4	118
2-5	10	7.6	26
6-10	3	2.3	24
>11	1	0.8	52
Total ^a	132	100.1 ^b	220

^a Includes reports only from individual clinicians.
^b Percentage does not add to 100 due to rounding.

Demographics

Table 3 shows the age, gender and race distribution of the workers with occupational diseases reported in the year 2016. The mean age of reported patients was 46 ± 15 years (range, 16 to 94 years) with approximately 60% of the patients between the ages of 25 and 54 years. Eighty reports were submitted for patients age 19 or younger, and 115 reports were submitted for patients age 80 and older.

Sixty-seven percent of all reports submitted were for male workers. Ninety-six percent of the submitted reports (8,236 cases) did not indicate the worker’s race. Of the 303 reports that did indicate race, 70% were Caucasian, 27% were African American and 3% were Hispanic.

RESULTS, continued...

Table 3
Demographic Characteristics of
Occupational Disease Cases
Reported in 2016

Demographic Characteristic		
Age	#	%
≤ 19	80	1.4
20-24	355	6.2
25-29	548	9.5
30-34	550	9.6
35-39	564	9.8
40-44	587	10.2
45-49	657	11.4
50-54	561	9.7
55-59	680	11.8
60-69	795	13.8
70-79	262	4.6
> 80	115	2.0
Total ^a	5,754	100.0
Gender		
Gender	#	%
Male	5,608	67.3
Female	2,729	32.7
Total ^b	8,337	100.0
Race		
Race	#	%
Caucasian	213	70.3
African American	81	26.7
Hispanic	9	3.0
Total ^c	303	100.0

^aAge was unknown for 2,785 reports. Mean age 46 ±15 yrs.
^bGender was unknown for 202 reports.
^cRace was unknown for 8,236 reports.

Younger Workers

Of the 48 workers *age 18 and younger*, 12 were 16 years old, 11 were 17 years of age, and 25 were 18 years old. Twenty-four (50%) of the reported patients age 18 and younger were female and 24 (50%) were male. Place of employment was unknown for 42 of the 48 younger workers. Of the six with known employment, five worked in auto manufacturing and one worked at a grocery store.

Forty-three of the younger workers were reported by private practice clinicians not associated with any company and five were reported by their company medical

physician. Twenty-two were reported by the Poison Control Center, two were for respiratory symptoms, 19 were for an elevated blood lead level (serum lead levels were between five and 17 micrograms per deciliter), and five were for repetitive trauma disorders. No work-related *fatal illnesses* for workers age 18 or younger were identified in 2016.

Older Workers

Of the 115 workers age eighty and older, 104 (90%) were between 80 and 89 years, and 11 (10%) were between 90 and 94 years old. One hundred were men and 15 were women. Six of the older patients worked in or were retired from manufacturing, three worked in construction, and one worked in automotive sales. Industry or former industry was not indicated in 105 reports.

Private practice clinicians not associated with any company reported 111 of the 115 patients. Fifty-six of the older workers were reported for dust-related lung disease (including 22 with lung cancer, 24 with asbestosis, 7 with silicosis and three with other pneumoconioses), 53 for elevated blood lead levels (serum lead levels were between 5 and 17 micrograms per deciliter), three with hearing loss and one each for hypersensitivity pneumonitis, a sprain and strain, and chemical poisoning.

Illness Information

Table 4 shows the distribution of diagnoses or clinical impressions by reporting source. Diagnoses were grouped by major International Classification of Diseases categories (ICD-10th Revision). Overall, poisonings were the most frequently reported conditions, with 5,731 cases representing 67% of all OD reports submitted.

Signs, symptoms and ill-defined diseases were the second most frequently reported, with 819 (10%) cases. Respiratory diseases were the third most frequently reported conditions with 564 (7%) cases, followed by diseases of the musculoskeletal system which were the fourth most frequently reported conditions, with 437 (5%) cases. Diseases of the ear, including noise-induced hearing loss were reported for 373 cases representing 4% of all reports submitted. There were 202 (2%) skin disease reports, 144 (2%) reports of eye-related diseases, 89 (1%) neoplasms, 72 (1%) reports of mental disorders, and 65 (1%) reports of diseases of the nervous system. Less frequently reported conditions included infectious

RESULTS, continued...

Table 4
2016 OD Reports by Disease Type (ICD-10) and Reporting Source

	Non-Company		Company		Total	
	#	%	#	%	#	%
Infectious & Parasitic Diseases (ICD A00–B99)	0	--	14	0.3	14	0.2
Neoplasms (ICD C00-D49)	88	2.4	1	<0.1	89	1.0
Blood and Blood Forming Organs (ICD D50-D89)	0	--	1	<0.1	1	<0.1
Endocrine, Nutritional and Metabolic Disorders (ICD E00-E89)	0	--	2	<0.1	2	<0.1
Mental Disorders (ICD F01-F99)	0	--	72	1.5	72	0.8
Nervous System (ICD G00-G99)	4	0.1	61	1.3	65	0.8
Eye and Adnexa (ICD H00-H59)	71	1.9	73	1.5	144	1.7
Ear and Mastoid Process (ICD H60-H95)	4	0.1	369	7.6	373	4.4
Circulatory System (ICD I00-I99)	0	--	12	0.2	12	0.1
Respiratory System (ICD J00-J99)	470	12.7	94	1.9	564	6.6
Digestive System (ICD K00-K95)	0	--	12	0.2	12	0.1
Skin & Subcutaneous Tissue (ICD L00-L99)	32	0.9	170	3.5	202	2.4
Musculoskeletal System & Connective Tissue (ICD M00-M99)	1	<0.1	436	9.0	437	5.1
Genitourinary System (ICD N00-N99)	0	--	2	<0.1	2	<0.1
Symptoms, Signs & Ill-Defined Conditions (ICD R00-R99)	596	16.2	223	4.6	819	9.6
Toxic Effects of Substances - Poisonings (ICD S00-T88)	2,424	65.7	3,307	68.2	5,731	67.1
TOTAL	3,690	100.0	4,849	99.8^a	8,539	99.9^a

^aPercent does not add to 100 due to rounding.

diseases, diseases of the blood, endocrine-related diseases, diseases of the circulatory system, diseases of the digestive system, and diseases of the genitourinary system.

Reporting Source Differences

Company and non-company-affiliated providers differed in the types of occupational diseases reported (Table 4). Sixty-eight percent of reports from company health care providers were of toxic effect of substances (poisoning), compared to 66% of reports by non-company providers representing these same diagnoses as the top most frequently reported conditions. The second, third and fourth most frequently reported diagnoses for company providers were musculoskeletal diseases (9%), ear diseases including noise-induced hearing loss (8%), and symptoms, signs and ill-defined conditions (5%). Symptoms, signs and ill-defined conditions were the second most frequently reported diagnoses by non-company providers (16%). The third and fourth most frequently reported diagnoses for non-company providers were respiratory system (13%) and neoplasms (2%).

Company and non-company practitioners differed by industries represented in their reports (Table 5). The most frequently-reported industry from company-affiliated providers was manufacturing (58%), primarily automobile production. The second and third most fre-

quently reported industries by company providers were healthcare and social assistance (7%) and retail trade (7%). The top industry for non-company providers construction (35%) and the second was manufacturing (35%). The third industry type most frequently reported by non-company providers was utilities (9%). Industry type was missing on 2,768 non-company and 17 company reports.

Gender Differences

Toxic effect of substances (poisoning) was the most frequently reported diagnosis for men and women, with 66% and 68% of submissions, respectively (Table 6). The second, third and fourth most frequent diagnoses for women were signs, symptoms and ill-defined conditions (12%), musculoskeletal diseases (8%), and respiratory diseases (4%). For men, the second, third and fourth most frequently reported diagnoses were symptoms, signs and ill-defined conditions (9%), respiratory diseases (8%) and ear disorders including noise-induced hearing loss (6%). Two hundred and two reports did not indicate gender.

RESULTS, continued...

Table 5
2016 OD Reports by Industry Type and Reporting Source

North American Industry Classification System		Non - Company		Company		Total	
		#	%	#	%	#	%
11	Ag, Forestry Fishing & Hunting	5	0.5	5	0.1	10	0.2
21	Mining	4	0.4	13	0.3	17	0.3
22	Utilities	78	8.5	18	0.4	96	1.7
23	Construction	322	34.9	157	3.2	479	8.3
31-33	Manufacturing	321	34.8	2,798	57.9	3,119	54.2
42	Wholesale Trade	7	0.8	50	1.0	57	1.0
44-45	Retail Trade	41	4.4	327	6.8	368	6.4
48-49	Transportation & Warehousing	3	0.3	211	4.4	214	3.7
51	Information	0	—	11	0.2	11	0.2
52	Finance & Insurance	2	0.2	15	0.3	17	0.3
53	Real Estate & Rental & Leasing	2	0.2	43	0.9	45	0.8
54	Professional, Scientific & Tech Svcs	8	0.9	50	1.0	58	1.0
55	Mgt of Companies & Enterprises	0	—	1	<0.1	1	<0.1
56	Administrative & Support & Waste Mgt & Remediation Svcs	9	1.0	318	6.6	327	5.7
61	Educational Services	7	0.8	116	2.4	123	2.1
62	Health Care & Social Assistance	16	1.7	330	6.8	346	6.0
71	Arts, Entertainment & Recreation	32	3.5	16	0.3	48	0.8
72	Accommodation & Food Services	6	0.7	108	2.2	114	2.0
81	Other Services (excl Public Admin)	19	2.1	111	2.3	130	2.3
92	Public Administration	40	4.3	134	2.8	174	3.0
	Total^a	922	100.0	4,832	99.9^b	5,754	100.0

^aIndustry was unknown for 2,768 non-company reports and 17 company reports.
^bPercent does not add to 100 due to rounding.

Table 6
2016 OD Reports by Disease Type and Gender

	Males		Females	
	#	%	#	%
Infectious & Parasitic Diseases (ICD A00 –B99)	4	0.1	10	0.4
Neoplasms (ICD C00-D49)	89	1.6	0	—
Blood and Blood Forming Organs (ICD D50-D89)	1	<0.1	0	—
Endocrine, Nutritional & Metabolic Disorders (ICD E00-E89)	2	<0.1	0	—
Mental Disorders (ICD F01-F99)	31	0.6	35	1.3
Nervous System (ICD G00-G99)	32	0.6	33	1.2
Eye and Adnexa (ICD H00-H59)	107	1.9	37	1.4
Ear and Mastoid Process (ICD H60-H95)	332	5.9	41	1.5
Circulatory System (ICD I00-I99)	6	0.1	6	0.2
Respiratory System (ICD J00-J99)	464	8.3	100	3.7
Digestive System (ICD K00-K95)	10	0.2	1	<0.1
Skin & Subcutaneous Tissue (ICD L00-L99)	136	2.4	66	2.4
Musculoskeletal System & Connective Tissue (ICD M00-M99)	223	4.0	214	7.8
Genitourinary System (ICD N00-N99)	1	<0.1	1	<0.1
Symptoms, Signs & Ill-Defined Conditions (ICD R00-R99)	478	8.5	337	12.3
Toxic Effects of Substances - Poisonings (ICD S00-T88)	3,692	65.8	1,848	67.7
TOTAL^a	5,608	100.0	2,729	99.9^b

^aGender was not listed for 202 individuals.
^bPercent does not add to 100 due to rounding.

Fatalities

Fatalities related to occupational illnesses were reported for 70 workers (Table 7). None of the illness-related fatalities reported were from acute incidents. Non-company clinicians reported 69 of the 70 fatalities. The workers who died ranged in age from 21 to 92 years. Fifty-five died from asbestos-related cancer, 12 from asbestosis, two from other lung diseases, and one from silicosis. Nine of the deceased workers had been employed in construction, two in manufacturing, and one in wholesale trade. Former occupation was not specified for 58 workers.

Michigan has a separate program to track acute traumatic fatalities, called MIFACE (Michigan Fatality Assessment and Control Evaluation). The MIFACE program identified an additional 162 traumatic work-related fatalities from injuries in 2016 that occurred in Michigan. A separate report for the most recent work-related fatalities (2015 calendar year) can be found at: www.oem.msu.edu. There were three acute work-related injuries resulting in deaths among youths in the MIFACE Program in 2016.



RESULTS, continued...

Comparison with Other Data Systems

No one reporting system captures the true burden of occupational disease. The following section looks at other reporting systems and the contribution each makes to the overall characterization of work-related illness in our state.

Published Aggregate Data in MI

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 is currently reported by any one system.

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. In 2015, there were a total of 109,700 injuries and illnesses of which 53,400 were severe enough to cause loss of work days, job transfer or restriction. Of the 109,700 total, 6,500 were occupational illnesses and 103,200 were occupational injuries.

Data from Michigan's Workers' Compensation Agency (WCA) for 2016 showed 20,453 claims for occupational injuries and illnesses with seven or more consecutive days away from work; 12,314 of those claims are for illnesses (Table 8). Overall in 2016, about \$457 million in compensation was paid by insurance companies and self-insured employers on 180,895 claims for both lost work time and medical-only costs. These claims include new claims filed in 2016, as well as previous claims for workers who continue to lose work time or incur medical costs due to their injury or illness. Sixty-nine percent of the total paid claims in 2016 were for medical procedures or care only and 31% for wage loss (http://www.michigan.gov/documents/wca/wca_2016_Annual_Report_556164_7.pdf).

Other Sources-Hospital Discharge Data

The hospital discharge data described in this next section is not part of the 8,539 occupational disease reports described in this 2016 Annual Report of Occupational Diseases. Hospital discharge data does not include identifiers; presumably some of the patients overlap with those in the 8,539 OD reports. However, especially for long latency, chronic diseases like asbestosis, it would be difficult to identify newly diagnosed patients. Therefore, the hospitalization data in this section should be considered as supplemental to the 8,539 OD reports submitted to the state in 2016. The most recent data available from the MHA is for calendar year 2015. The following section looks at hospital data where Workers' Compensation is the expected payer.

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 2015; the numbers of hospitalizations from 1995

Table 7

Demographic Characteristics of Reported Occupational Disease Fatalities in 2016

DEMOGRAPHIC CHARACTERISTIC		
Vital Status	#	%
Fatal	70	0.8
Non-Fatal	8,469	99.2
Total	8,539	100.0
Age	#	%
20 - 39	2	2.9
40 - 59	6	8.7
60 - 69	20	29.0
70 - 79	22	31.9
≥ 80	19	27.5
Total	69^a	100.0
Disease Type	#	%
Neoplasm-lung	55	78.6
Asbestos-related	12	17.1
Other- lung	2	2.9
Silicosis	1	1.4
Total	70	100.0
Industry	#	%
Manufacturing	2	22.2
Construction	6	66.7
Wholesale Trade	1	11.1
Total	9^b	100.0

^aAge was missing on one report.
^bIndustry was missing on 61 reports.

RESULTS, continued...

Table 8
Comparison of 2015 Bureau of Labor Statistics (BLS) Occupational Illness Survey Data and 2016 LARA Workers' Compensation Agency (WCA) Claims with 2008—2016 LARA Occupational Disease (OD) Reports

Disease Category															
	Skin		Lung—Dust		Lung—Toxic		Poisoning		Physical Agents		Repeated Trauma		All Other		Total
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
BLS Survey															
Year	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
2015	1,400	21.5	ND	--	700	10.8	100	1.5	ND	--	ND	--	4,300	66.2	6,500
WCA Claims															
Year	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
2016	38	0.3	1	<0.1	93	0.8	3	<0.1	25	0.2	9,976	81.0	2,178	17.7	12,314
LARA OD Reports															
Year	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
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
2012	378	5.0	328	4.3	419	5.5	1,442	18.9	46	0.6	2,892	38.0	2,106	27.7	7,611
2013	347	4.0	274	3.2	439	5.1	2,192	25.5	45	0.5	3,263	37.9	2,041	23.7	8,601
2014	338	4.5	371	4.9	458	6.1	1,808	23.9	181	2.4	2,547	33.7	1,863	24.6	7,566
2015	185	2.8	340	5.1	261	3.9	1,826	27.6	99	1.5	2,307	34.9	1,598	24.2	6,616
2016	259	3.5	341	4.6	427	5.7	2,325	31.3	202	2.7	2,601	35.0	1,280	17.2	7,435

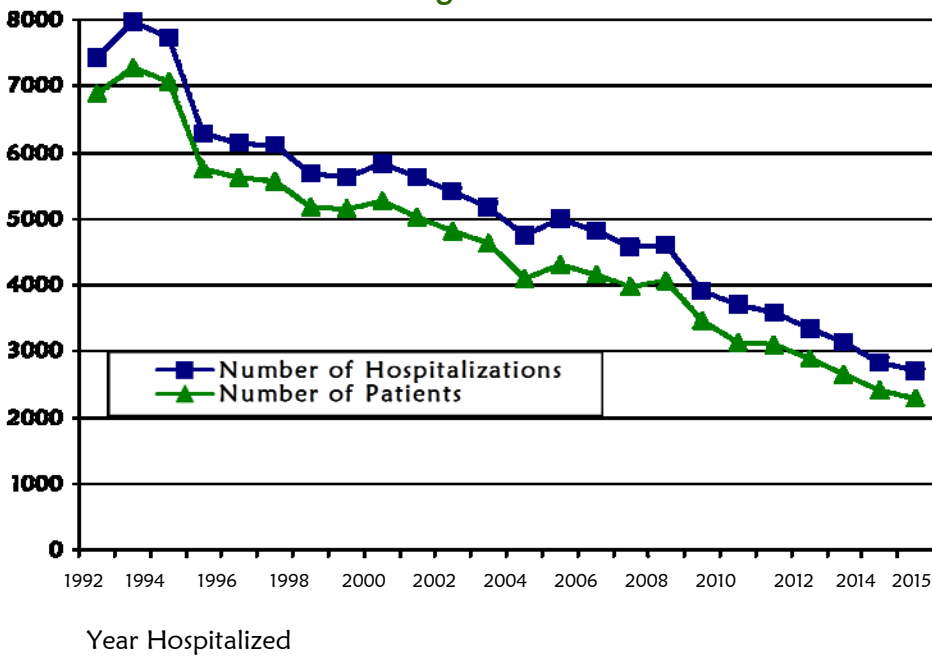
ND = There was no data for this disease category. NS = Data too small to be displayed.

-2015 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 after 1993 (Figure 5). For both these parameters, there was a plateau in the decrease from 2004 to 2008. However, there was also a decrease in 2009-2015 in both these parameters. In 2009, 0.30% of the 1,305,935 Michigan hospitalizations designated WC insurance as the primary payment source at discharge; in 2015 0.22% of the 1,249,113 Michigan hospitalizations designated WC insurance as the primary payment source at discharge. Table 9 shows the primary discharge diagnosis for hospitalizations from 2010 to 2015 where WC insurance was designated as the primary payment source at discharge. Data for 2002 through 2009 can be found in prior reports. In the 4th quarter of 2015 hospitals converted to the ICD-10 coding system; therefore reports from the 4th quarter of 2015 forward will be coded to ICD-10 disease categories. WC insurance covers a broad range of conditions, including mental

illness, infections, heart disease and cancer. The most common hospitalized conditions covered by WC insurance were injuries and poisoning accounting for 50-53%, and musculoskeletal diseases, accounting for 23-24% of all WC-related patient hospitalizations in 2015. Table 10 lists the demographics of patients with WC insurance as the primary payment source at discharge. From 70-76% of the hospitalizations were for men, across all years from 2010 to 2015. Data for 2002 through 2009 can be found in prior reports. Among hospitalizations for which race was known, approximately 85-90% were white, 7-11% were African American, <1% were Asian, and 2-5% were listed as "other." Most hospitalizations involved workers between the ages of 40 and 59 years. Less than 1% involved workers under the age of 15. The percentage of workers 80 years or older has ranged over time from <1-4%. The percentage of hospitalizations of workers under the age of 20 has decreased slightly over time, from 3% in 1992 to 1% in 2015 (1992 data not shown).

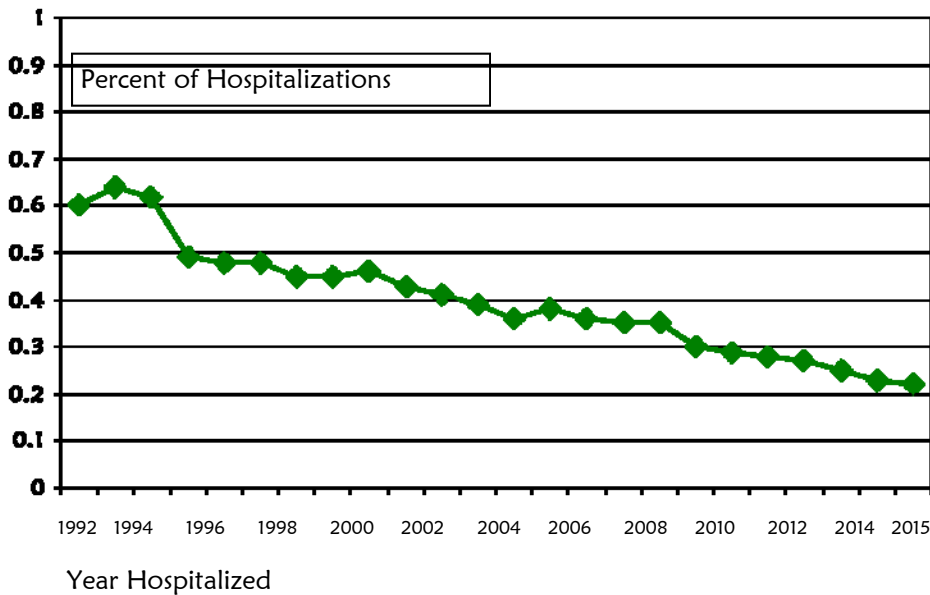
RESULTS, continued...

Figure 4
Hospitalizations and Patients with Workers' Compensation Designated as the Primary Payment Source at Discharge in Michigan: 1992-2015



The number of hospitalizations and patients with Workers' Compensation as the primary source of payment in Michigan has steadily declined over time.

Figure 5
Percent of Total Michigan Hospitalizations with Workers' Compensation Designated as the Primary Payment Source at Discharge in Michigan: 1992-2015



In calendar year 2015, there were 1,249,113 hospitalizations in Michigan. Of those, only 0.22% were paid for by Workers' Compensation. The percent of hospitalizations paid for by Workers' Compensation in Michigan has steadily declined over time.

RESULTS, continued...

Table 9 Primary Diagnosis of Hospitalizations in Michigan from 2010-2015, with Workers' Compensation Designated as Primary Payment Source at Discharge

	Year of Hospitalization						2015 Q123	2015 Q4
	2010	2011	2012	2013	2014	2015		
1^o Discharge Diagnosis ICD-9	%	%	%	%	%	%	1^o Discharge Diagnosis ICD-10	%
Infectious Diseases (001-139)	1.2	1.5	1.7	2.2	2.6	2.0	Infectious & Parasitic Diseases (A00-B99)	4.1
Neoplasms (140-239)	0.1	0.4	0.2	0.1	0.1	0.1	Neoplasms (C00-D49)	0.2
Endocrine Diseases (240-279)	0.7	0.7	0.7	0.7	0.6	0.5	Blood & Blood Forming Organs (D50-D89)	—
Blood Diseases (280-289)	<0.1	0.1	0.2	0.1	0.2	0.1	Endocrine & Metabolic (E00-E89)	0.3
Mental Disorders (290-319)	0.8	1.0	0.6	1.0	0.9	0.6	Mental Disorders (F01-F99)	0.9
Nervous System Diseases (320-389)	2.0	1.8	2.1	2.1	1.9	1.4	Nervous System (G00-G99)	1.7
Circulatory Diseases (390-459)	4.8	4.7	3.9	3.1	4.0	3.5	Eye and Adnexa (H00-H59)	0.2
Respiratory Diseases (460-519)	2.8	1.9	2.4	1.8	2.1	2.3	Ear and Mastoid Process (H60-H95)	—
Digestive Diseases (520-579)	2.6	1.9	2.0	1.8	1.9	1.9	Circulatory System (I00-I99)	2.7
Genitourinary Diseases (580-629)	1.1	1.3	0.9	0.8	1.0	0.7	Respiratory System (J00-J99)	2.4
Pregnancy Complications (630-676)	0.2	0.3	0.1	0.3	0.4	0.3	Digestive System (K00-K95)	1.7
Skin Diseases (680-709)	4.3	5.2	5.6	5.0	5.0	4.8	Skin & Subcutaneous Tissue (L00-L99)	5.8
Musculoskeletal Diseases (710-739)	29.8	28.7	28.5	24.7	23.6	24.0	Musculoskeletal (M00-M99)	22.9
Congenital Anomalies (740-759)	0.3	0.3	0.2	0.2	0.1	0.1	Genitourinary System (N00-N99)	0.5
Perinatal Complications (760-779)	--	--	--	--	—	—	Pregnancy and Perinatal (O00-P96)	0.9
Symptoms & Signs (780-799)	1.8	1.6	1.4	1.3	1.4	1.5	Congenital Anomalies (Q00-Q99)	0.2
Injury & Poisoning (800-999)	43.1	44.2	44.0	48.9	48.5	50.0	Symptoms, Signs (R00-R99)	1.6
V Codes	4.3	4.6	5.3	5.9	5.8	6.4	Toxic Effects - Poisonings (S00-T88)	53.9
Total^b	3688	3589	3333	3127	2823	2053	Total	634

^aTotals vary due to missing information.

Table 10 Demographics of Hospitalizations in Michigan from 2010-2015, with Workers' Compensation Designated as Primary Payment Source at Discharge

	2010	2011	2012	2013	2014	2015
Gender	%	%	%	%	%	%
Male	73	74	75	75	76	77
Female	27	26	25	25	24	23
Total^a #	3688	3589	3333	3127	2823	2701
Race	%	%	%	%	%	%
White	90	89	87	88	87	86
African Am	7	8	9	9	8	9
Asian	<1	<1	<1	<1	1	<1
Other	2	3	4	3	4	5
Total^a #	2671	2659	2557	2532	2286	2402
Age	%	%	%	%	%	%
< 15	<1	<1	<1	<1	<1	<1
15-19	1	1	1	1	1	1
20-29	9	10	10	11	11	11
30-39	18	17	15	14	16	15
40-59	53	53	55	54	54	53
60-79	16	15	17	18	17	19
≥ 80	3	4	1	1	1	1
Total^a #	3688	3589	3333	3127	2823	2701
Avg Age	48	48	48	48	47	48
SD-Age	±14	±15	±13	±14	±14	±14

^aTotals vary due to missing information.

RESULTS, continued...

Poison Control Center Data

In 2016, 928 calls to the Michigan Poison Control Center (PCC) were identified for individuals with work-related symptoms. Table 11 describes available demographic characteristics and disease categories of the individuals reported. There were more reports for males (67%). The individuals ranged in age from 16 to 91 years. Eighty-one percent of these individuals with known age were less than age 50. Of the 928 calls to the PCC in 2016, the top calls included: 288 (31%) for general symptoms, 209 (23%) for exposure to gases and fumes, 131 (14%) for skin-related exposures, and 99 (11%) for respiratory symptoms.

Table 11
Demographic Characteristics of
928 Individuals Reported by the
Michigan Poison Control Center in 2016

Demographic Characteristics		
Age	#	%
15-19	37	5.4
20-29	246	36.1
30-39	165	24.2
40-49	102	15.0
50-59	100	14.7
60-69	27	4.0
≥ 70	4	0.6
Total	681^a	100.0
Gender		
	#	%
Male	491	66.6
Female	246	33.4
Total	737^c	100.0
Disease Type		
	#	%
General Symptoms	288	31.0
Toxic Effect of Gases and Fumes	209	22.5
Skin Rash and Burns	131	14.1
Respiratory Symptoms	99	10.7
Digestive Symptoms	86	9.3
Vision-Related Symptoms	70	7.5
Musculoskeletal Symptoms	18	1.9
Head and Neck Symptoms	17	1.8
Heavy Metals and Lead Poisoning	10	1.1
Total	928	99.9^b

^aAge was unknown for 247 reports.
^bPercent does not add to 100 due to rounding.
^cGender was missing on 191 reports.

Adult Blood Lead Epidemiology and Surveillance (ABLES)

In 2016, there were 36,601 adult Michigan residents reported by labs as having their blood tested for lead. Table 12 describes the demographic characteristics of the 2,067 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 of lead exposure. A comprehensive report on all blood lead levels in Michigan can be found at: www.oem.msu.edu, the 2015-2016 Annual Report on Blood Lead Levels on Adults in Michigan.

Table 12
Demographic Characteristics of
2,067 Individuals Reported by Laboratories with
Elevated Blood Lead in Michigan, 2016

	Blood Lead Level				
	≥5 & <10 ug/dL		≥10 ug/dL		
Age	#	%	#	%	
16-19	21	1.6	5	0.7	
20-29	149	11.4	106	14.0	
30-39	228	17.4	152	20.1	
40-49	261	19.9	178	23.6	
50-59	295	22.5	166	22.0	
60-69	221	16.8	104	13.8	
≥ 70	137	10.4	44	5.8	
Total	1,312	100.0	755	100.0	
Gender		#	%	#	%
Male		1,035	78.9	693	91.8
Female		277	21.1	62	8.2
Total		1,312	100.0	755	100.0
Industry		#	%	#	%
Construction		132	39.2	125	32.7
Manufacturing		97	28.8	158	41.4
Utilities		45	13.4	32	8.4
Trade		18	5.3	21	5.5
Public Admin		27	8.0	5	1.3
Arts & Entertainment		5	1.5	27	7.1
Admin & Support		2	0.6	0	—
Transportation		0	—	0	—
Other Services		7	2.1	8	2.1
Prof & Scientific		4	1.2	1	0.3
Mining		0	—	0	—
Health Care		0	—	4	1.0
Accomod & Food Svc		0	—	1	0.3
Total		337^b	100.1^a	382^b	100.1^a

^aPercent does not add to 100 due to rounding.
^bIndustry was missing on 975 reports of blood lead levels <10 ug/dL and on 373 reports of blood leads ≥10ug/dL.

DISCUSSION

There were 8,539 Occupational Disease Reports sent to LARA in calendar year 2016. These reports do not include occupational injuries. The most frequent types of occupational diseases reported to LARA were toxic effects of substances (67%), signs and ill-defined conditions (10%), respiratory diseases (7%), and repetitive trauma (musculoskeletal) illnesses (5%). 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 increases in 2003, 2010, 2011, 2013 and 2016. 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, a decrease of 2,548 reports in 2012, an increase of 1,554 reports in 2013, a decrease of 1,395 reports in 2014, a decrease of 756 reports in 2015, and an increase of 1,067 reports in 2016.

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). The number of company-affiliated physicians or medical departments reporting decreased in 2016 to 88, compared to 100 in 2015, 190 in 2014, 210 in 2013, 179 in 2012, 188 in 2011, 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-10 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-10 coding system, sprains and strains are classified as injuries.

Many employers, physicians and other healthcare 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 88 company-affiliated physicians reporting employees from 1,056 different companies; there were 132 non-company-affiliated physicians reporting patients to the state. There were 241,103 companies in the year 2016 and 30,572 licensed physicians in Michigan in the year 2016. Accordingly, reports are received from 0.4% of companies and 0.4% of physicians. Over the last several years, these percentages 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 8,539 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 Michigan². For 2015, the most recent year available, the BLS annual survey reported 6,500 illnesses; by extension one would expect 13,000 illnesses in 2015 instead of the approximately 7,500 reported in 2015. Even these types of estimates are 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 healthcare 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 healthcare practitioners differs from company-based healthcare 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 2016 the non-company-affiliated health care practitioners were more likely to report patients

DISCUSSION

with respiratory disease who work in small, non-manufacturing companies. A large percentage of the year 2016 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. 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 undercount certain work-related conditions. Similarly, one cannot rely on Workers' Compensation data alone for a reliable count of work-related conditions. First, in Michigan unlike many other states, only injuries (20,453) or illnesses with seven or more days away from work are computerized. Therefore, all the injuries and illnesses with less lost work time or those who received medical care only (180,895) cannot be analyzed as to type of injury. Second, in a study covering the years 1992-1994, only 9.6% of the workers for whom an Occupational Disease Report was submitted had definitely filed a WC claim, although an additional 36% may have filed a claim for a total of 45.6%³. In that study, limits of the data did not allow for a more precise estimate of the claims filed, but the range underscores the point that a large number of workers do not file WC claims even though they are seen by a physician for their illness. This is an ongoing issue, as review of hospital discharge data for individuals with pneumoconioses shows only <1% - 8% paid by WC (2015 Annual Report: Tracking Silicosis and Other Work-Related Lung Diseases in Michigan, available at: www.oem.msu.edu).

Review of Table 8 shows differences in the distribution of occupational illnesses identified through the state's OD reporting system, compared to both the

BLS Annual Survey of Employers and the state's WCA claims system. For example, poisoning represents approximately 31% (2,325) of the OD reports, while that category of diseases only accounts for approximately 2% (100 cases) of the BLS survey and <1% (3 cases) of WCA claims. Non-employer sources such as from the Poison Control Center, "B" Readers and laboratories provide additional occupational diseases not being reported by employers or practitioners.

A new report from the National Academies of Sciences was released on January 9, 2018⁴. Implementation of the recommendations in this report would markedly improve the tracking of occupational injuries and illnesses nationwide. The report discusses the role of states and makes numerous recommendations for activities at the state level.

Although it has been reassuring to see the drop in hospitalizations related to work (Figures 4 and 5), our 2015 Annual Report showed that the drop is due to a decrease in minor but not severe injuries (2015 Annual Report—Summary of Occupational Diseases Reported to the MI Department of Licensing and Regulatory Affairs). Increased effort to reduce these severe injuries may be assisted by the new requirements that were implemented in Michigan on 9-1-2015 for employers to report acute work-related hospitalizations (http://www.michigan.gov/lara/0,4601,7-154-10573_11472-370952--,00.html). 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 subsequently evaluate the effectiveness of these efforts.

REFERENCES

1. www.icd10data.com/ICD10CM/codes
2. Rosenman KD, Kalush A, Reilly MJ, Gardiner JC, Reeves M, Luo Z. *How Much Work-Related Injury and Illness is Missed by the Current National Surveillance System?* J Occup Environ Med 2006; 48:357-365.
3. Biddle J, Roberts K, Rosenman KD, Welch EM. *What Percentage of Workers With Work-Related Illnesses Receive Workers' Compensation Benefits?* J Occup Environ Med 1998; 40:325-331.
4. National Academies of Sciences: <https://www.nap.edu/catalog/24835/a-smarter-national-surveillance-system-for-occupational-safety-and-health-in-the-21st-century>