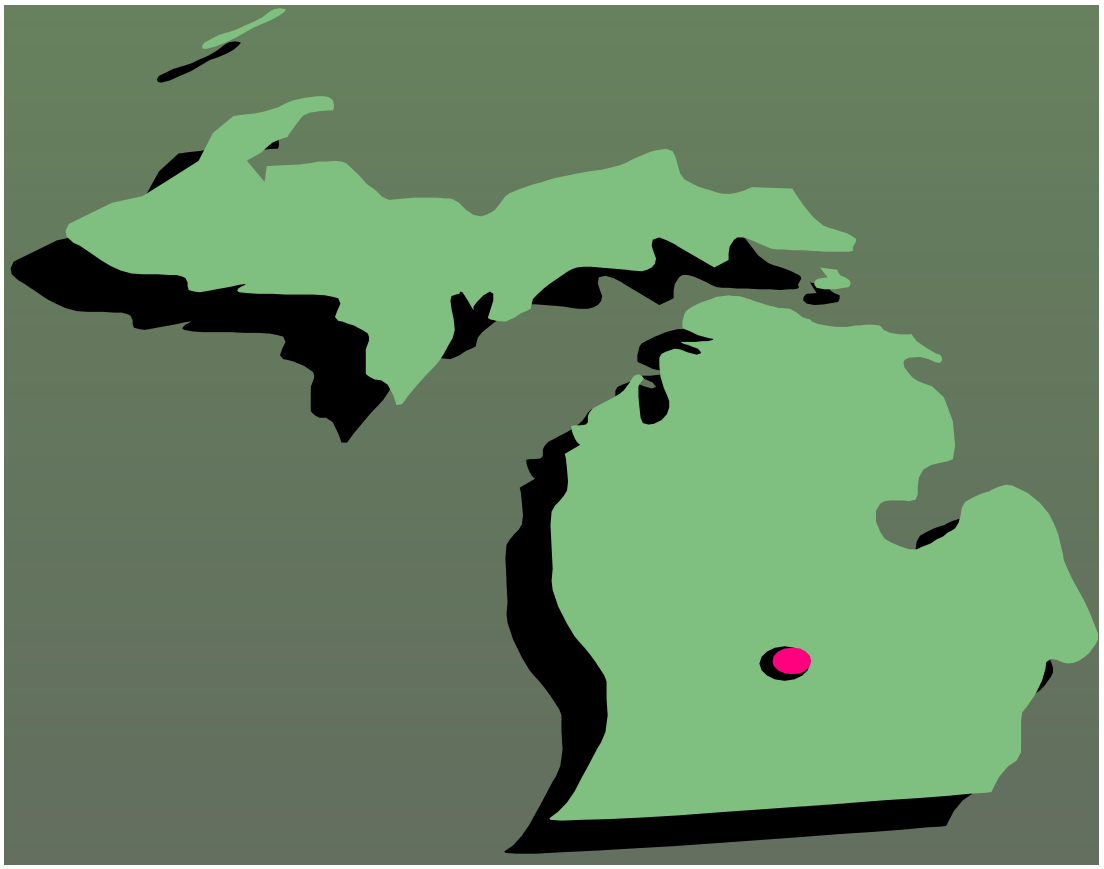
February 27, 2023

2021
ANNUAL REPORT

SUMMARY OF OCCUPATIONAL DISEASE REPORTS TO THE MICHIGAN DEPARTMENT OF LABOR & ECONOMIC OPPORTUNITY



2021 Annual Report

Summary of Occupational Disease Reports to the Michigan Department of Labor & Economic Opportunity

February 27, 2023

2021 ANNUAL REPORT SUMMARY OF OCCUPATIONAL DISEASE REPORTS TO THE MICHIGAN DEPARTMENT OF LABOR & ECONOMIC OPPORTUNITY

Occupational Disease Surveillance Program

TABLE OF CONTENTS

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

ONLINE:
www.oem.msu.edu

EMAIL:
ODReport@msu.edu

FAX:
517.432.3606

TELEPHONE:
1.800.446.7805

MAIL:
MIOSHA Technical Services Division
530 W Allegan St
PO BOX 30643
Lansing, MI 48909

Michigan State University Department of Medicine
West Fee Hall
909 Fee Road, Room 117
East Lansing, MI 48824
517.353.1846

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Michigan Department of Labor and Economic Opportunity (LEO)
PO Box 30643
Lansing, MI 48909
517.284.7777

Barton G. Pickelman
Director MIOSHA

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**.

Acronyms

BLS Bureau of Labor Statistics

LARA MI Department of Licensing & Regulatory Affairs

LEO MI Department of Labor and Economic Opportunity

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

WDCA Workers' Disability Compensation Agency

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

Background

This is the 30th annual report on occupational diseases in Michigan and is based upon the reports submitted to the Michigan Department of Labor and Economic Opportunity (LEO, formerly the Department of Licensing and Regulatory Affairs, LARA) in calendar year 2021. 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 disease. LEO designates Michigan State University's College of Human Medicine, Occupational and Environmental Medicine Division (MSU OEM) as its bona fide agent to compile and analyze the occupational disease reports.

Background continued...

A standard form is used to report employees 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 are reviewed by MSU OEM staff and computerized. In some cases, additional follow-up is conducted. The reported employee 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 employee'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.

Michigan Department of Labor and Economic Opportunity — Technical Services Division

Known or Suspected Occupational Disease Report

(Information will be held confidential as prescribed in Public Act 368 of 1978.)

EMPLOYEE AFFECTED

Name (Last, First, Middle)	Age	Sex M F	Race: White Black Hispanic 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 <25 25-100 100-500 >500			
Employee's Work Unit/Department	Dates of Employment From: Mo Day Year To: Mo Day Year		
Employee's Job Title or Description of Work			

ILLNESS INFORMATION

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

ADDITIONAL COMMENTS

REPORT SUBMITTED BY

If Report Submitted by Non-Physician, Did Employee See a Physician? *If yes, record information below.* Yes No Don't Know			
Physician's Name	Phone		
Office Address	City	State	Zip
Name of Person Submitting Report Physician Non-Physician			
Address	City	State	Zip
Signature	Phone		Date

The Michigan Department of Labor and Economic Opportunity is an equal opportunity, affirmative action employer, service provider and buyer. Return completed form to:

Michigan Department of Labor and Economic Opportunity (LEO)
Michigan Occupational Safety and Health Administration (MIOSHA)
Technical Services Division (TSD)
530 W. Allegan Street, P.O. Box 30649, Lansing, MI 48909-8149
Overnight Mail Address: 2407 N. Grand River Avenue, Lansing, MI 48906

MIOSHA-TSD-51 (08/19)

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

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 Labor and Economic Opportunity *within 10 days of discovery*.

In 2021, 787 (1.5%) of the 53,716 calls to the Michigan Poison Control Center were related to exposures at work.

METHODS

An occupational disease (OD) report should be 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' Disability 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 LEO 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 ON FIRST REPORT (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, Dehydration; D50-D89: Diseases of the Blood and Blood-Forming Agents; F01-F99: Mental Disorders except F43, Reaction to Severe Stress; G00-G99: Select Diseases of the Nervous System and Sense Organs; H90-H91: Noise-Induced Hearing Loss, Tinnitus; I00-I99: Select Diseases of the Circulatory System; J40-J47: Select Diseases of the Respiratory System; J60-J70: Pleural Plaques w/no Parenchymal Abnormality; J80-J84: Interstitial Lung Disease; L94.9: Connective Tissue Lung Disease; K00-K95: Diseases of the Digestive System; and N00-N99: Diseases of the Genitourinary System.

ICD-10 codes were used to classify the diagnosis or clinical impression recorded on the OD reports submitted to LEO. 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 listed under the Injury section of codes (ICD-10 S00-T88 Injury, poisoning and certain other consequences of external causes).

RESULTS

A total of 5,197 OD Reports, 4,910 non-COVID-19 and 287 COVID-19 were submitted to LEO in calendar year 2021. Figure 2 shows the number of reports since 1985.

Reporting Source

Company or contract medical departments submitted 43% of the reports (2,217 cases); non-company-associated health care practitioners submitted 57% of the reports (2,980 cases). Figure 3 shows the trends by reporting source (company or non-company associated) since 1991.

Company Size

Of the 3,477 OD reports that listed company size, 41% (1,425 reports) were submitted on individuals who worked in companies with > 500 employees (Table 1). For companies with 500 or fewer employees, a greater proportion of reports came from non-company health practitioners compared to company clinicians. About 80% of the 1,321 reports with known company size that were submitted by non-company practitioners involved companies with < 500 employees, while about 46% of the 2,156 reports with known company size submitted by company practitioners involved companies with < 500 employees.

Non-Company Clinicians

Fourteen non-company-associated clinicians reported 37 incidents of occupational disease. Twenty-four labs were responsible for identifying 1,384 reports of elevated blood lead levels.

Figure 2
OD Reports to LEO by Year Reported: 1985-2021

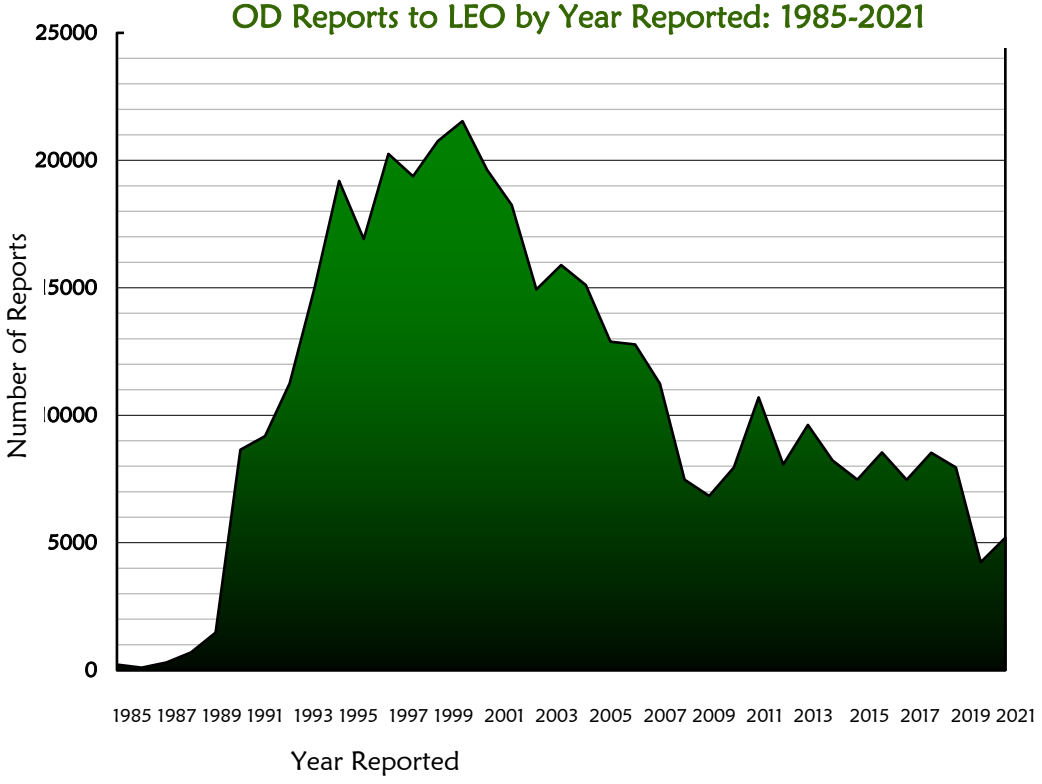
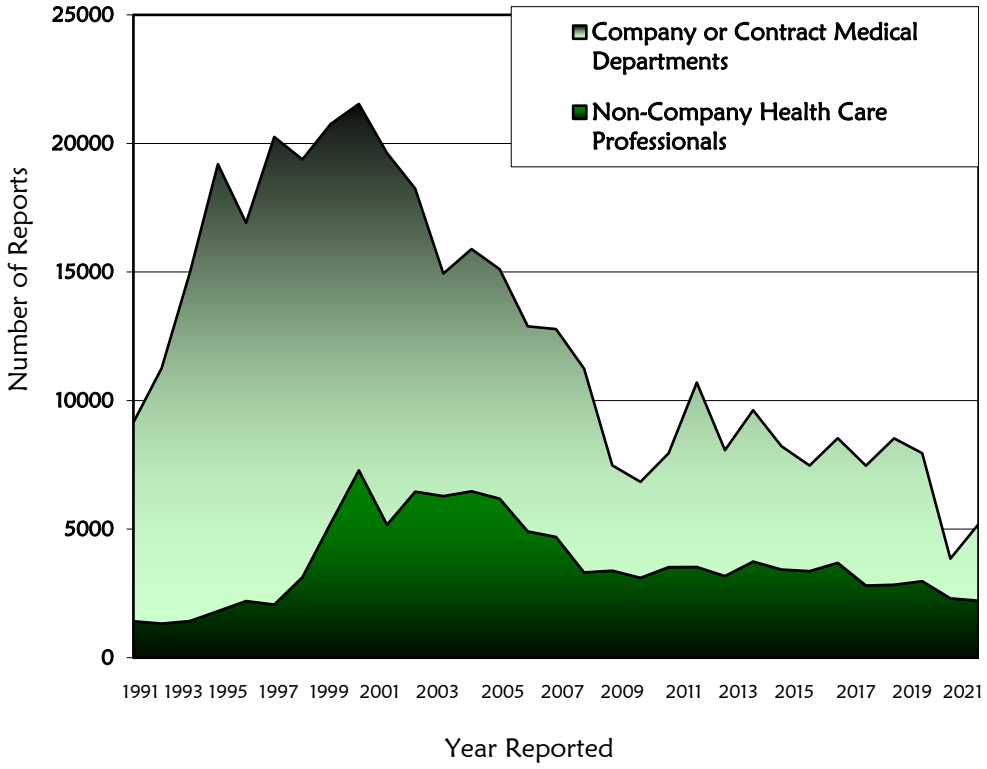


Figure 3
OD Reports by Year and Reporting Source: 1991-2021



RESULTS, continued...

In addition, the Michigan Poison Control Center reported 787 incidents of work-related poisonings, the 3rd Circuit Court of Michigan reported 147 asbestos-related claims, and hospitals submitted 625 reports of patients with work-related illnesses. Nine (64%) of the clinicians reported only one patient each in calendar year 2021 (Table 2); one clinician reported 17 patients; this clinician is certified to classify chest x-rays for dust-related lung disease (i.e., "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 five years. In 2021, there were six Michigan physicians who were listed as a "B" reader on the NIOSH "B" reader website:cdc.gov/niosh/topics/chestradiography/breader-list.html.

Table 1
Company Size at Facilities with an OD Report in 2021: Non-Company v Company Clinicians

Number of Employees	REPORTING SOURCE					
	Non-Company Clinicians		Company Clinicians		Total Reports	
	#	%	#	%	#	%
< 25	272	20.6	226	10.5	498	14.3
25-100	334	25.3	269	12.5	603	17.3
100-500	453	34.3	498	23.1	951	27.4
> 500	262	19.8	1,163	53.9	1,425	41.0
Total	1,321[a]		2,156[b]		3,477	

[a] The number of employees was missing on 1,659 reports.
[b] The number of employees was missing on 61 reports.

Occupational Health Clinics

There are approximately 190 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, in 2016 decreased to 37, in 2017 increased to 42, in 2018 decreased to 29, increased in 2019 to 38, decreased to 34 in 2020 and decreased to 21 in 2021. Biennial audits of a sample of non-reporting clinics began in 2009.

Table 2
OD Reports Submitted by Non-Company Clinicians in 2021

Number of reports	Clinicians		Patients
	#	%	#
1	9	64.3	9
2-10	4	28.6	11
>11	1	7.1	17
Total[a]	14		37

[a] Includes reports only from individual clinicians.

Demographics

Table 3 shows the age, gender and race of the employees reported in 2021. The mean age was 45 ± 16 years (range, 15 to 101 years) with approximately 62% of the patients between the ages of 25 and 54 years. Ninety-seven reports were submitted for patients age 19 or younger, and 49 reports were submitted for patients age 80 and older. Sixty-nine percent of all reports submitted were for male workers. Eighty-three percent of the submitted reports (4,304 cases) did not indicate the worker's race. Of the 893 reports that did indicate race, 27% were Caucasian, 6% were African American, 66% were listed as "other" and 1% were listed as Hispanic.

Younger Workers

Of the 49 workers *age 18 and younger*, three were 15, 10 were 16, 17 were 17, and 19 were 18 years old. Twenty-three (48%) of the reported patients age 18 and younger were female and twenty-five (52%) were male.

RESULTS, continued...

Table 3
Demographic Characteristics of Occupational Disease Cases Reported in 2021

Demographic Characteristic		
Age	#	%
≤ 19	97	2.5
20-24	282	7.4
25-29	349	9.2
30-34	409	10.7
35-39	393	10.3
40-44	389	10.2
45-49	418	11.0
50-54	395	10.4
55-59	352	9.2
60-69	481	12.6
70-79	198	5.2
≥ 80	49	1.3
Total[a]	3,812	
Gender	#	%
Male	3,579	69.1
Female	1,603	30.9
Total[b]	5,182	
Race	#	%
Caucasian	237	26.5
African American	53	5.9
Hispanic	11	1.2
Other	592	66.3
Total[c]	893	

[a]Age was unknown for 1,385 reports.
Mean age 45 ±16 yrs.
[b]Gender was unknown for 15 reports.
[c]Race was unknown for 4,304 (83%) reports.

Place of employment was unknown for 41 of the 49 younger workers. Of the eight with known employment, four worked in manufacturing, and one each worked in agriculture, assisted living, an amusement park and fast-food services. Forty-seven of the younger workers were reported by private practice clinicians not associated with any company and two were reported by their company medical physician. Thirty-six were reported by the Poison Control Center, eight were for an elevated blood lead level (serum lead levels were between 7 and 29 micrograms per deciliter), and one each was for back sprain/strain, heart-related symptoms, neck sprain/strain, wrist sprain/strain and contact dermatitis. No work-related *fatal illnesses* for workers age 18 or younger were identified in the 2021 OD reports submitted to LEO.

Older Workers

Of the 49 workers aged eighty and older, 43 (88%) were between 80 and 89 years, four (8%) were between 90 and 91 years old and two (4%) were 101 years of age. Forty-five were men and four were women. Seven had worked in manufacturing, three in construction and one had worked for an engineering firm. Industry or former industry was not indicated in 38 reports.

Private practice clinicians not associated with any company reported all but two of the 49 patients. Ten of the older workers were reported for an elevated blood lead level (serum lead levels were between 5 and 11 micrograms per deciliter), 36 with asbestos-related diseases and one each with noise-induced hearing loss, a soft tissue disorder and 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).

Poisonings were the most frequently reported condition, with 2,875 (55%) cases. Diseases of the ear, including noise-induced hearing loss were the second most frequently reported, with 451 (9%) cases. Musculoskeletal diseases were the third most frequently reported conditions with 369 (10%) cases. Respiratory conditions were the fourth most reported, with 366 (7%) cases. There were 354 (7%) reports of signs, symptoms and ill-defined conditions, 234 (5%) skin disease reports, and 162 (3%) reports of eye diseases. Less frequently reported conditions included infectious diseases, neoplasms, nervous system diseases, mental disorders, genitourinary disorders, circulatory disorders and diseases of the digestive system.

Reporting Source Differences

Company and non-company-affiliated providers differed in the types of occupational diseases reported (Table 4). Toxic effects of substances, including lead and other poisonings, were the most common reported conditions from company health care providers (50%) and non-company providers (59%). The second, third and fourth most frequently reported diagnoses for company providers was diseases of the ear including noise-induced hearing loss (20%), musculoskeletal diseases (14%), and symptoms, signs and ill-defined conditions (7%).

RESULTS, continued...

Table 4
2021 OD Reports by Disease Type (ICD-10) and Reporting Source

DISEASE TYPE	Non-Company		Company		Total	
	#	%	#	%	#	%
Infectious & Parasitic Diseases (ICD A00 –B99)	0	--	2	0.1	2	<0.1
Neoplasms (ICD C00-D49)	35	1.2	0	--	35	0.7
Blood and Blood Forming Organs (ICD D50-D89)	0	--	0	--	0	--
Endocrine, Nutritional and Metabolic Disorders (ICD E00-E89)	0	--	0	--	0	--
Mental Disorders (ICD F01-F99)	0	--	5	0.2	5	0.1
Nervous System (ICD G00-G99)	4	0.1	14	0.6	18	0.3
Eye and Adnexa (ICD H00-H59)	143	4.8	19	0.9	162	3.1
Ear and Mastoid Process (ICD H60-H95)	8	0.3	443	20.0	451	8.7
Circulatory System (ICD I00-I99)	1	<0.1	1	<0.1	2	<0.1
Respiratory System (ICD J00-J99)	356	11.9	10	0.5	366	7.0
Digestive System (ICD K00-K95)	6	0.2	13	0.6	19	0.4
Skin & Subcutaneous Tissue (ICD L00-L99)	167	5.6	67	3.0	234	4.5
Musculoskeletal System & Connective Tissue (ICD M00-M99)	82	2.8	302	13.6	384	7.4
Genitourinary System (ICD N00-N99)	0	--	3	0.1	3	0.1
Symptoms, Signs & Ill-Defined Conditions (ICD R00-R99), Other Causes of Morbidity (V00-Y99) and Factors Affecting Health (Z00-Z99)	207	6.9	147	6.6	354	6.8
Lead Poisoning (T56)	1,384	46.4	0	--	1,384	26.6
Other Poisonings (T65)	0	--	0	--	0	--
Toxic Effects of Substances - Injury, Poisoning and Certain Other Consequences of External Causes (ICD S00-T88, except T56 and T65)	386	13.0	1,105	49.8	1,491	28.7
TOTAL	**2,980**		**2,217**		**5,197**	

Table 5
2021 OD Reports by Industry Type and Reporting Source

North American Industry Classification System		Non - Company		Company		Total	
		#	%	#	%	#	%
11	Ag, Forestry Fishing & Hunting	4	0.3	4	0.2	8	0.2
21	Mining	0	--	0	--	0	--
22	Utilities	64	4.7	16	0.7	80	2.2
23	Construction	187	13.7	89	4.0	276	7.7
31-33	Manufacturing	597	43.7	1,217	55.1	1,814	50.7
42	Wholesale Trade	54	4.0	31	1.4	85	2.4
44-45	Retail Trade	80	5.9	165	7.5	245	6.8
48-49	Transportation & Warehousing	24	1.8	178	8.1	202	5.6
51	Information	4	0.3	10	0.5	14	0.4
52	Finance & Insurance	3	0.2	3	0.1	6	0.2
53	Real Estate & Rental & Leasing	2	0.1	18	0.8	20	0.6
54	Professional, Scientific & Tech Svcs	12	0.9	37	1.7	49	1.4
55	Mgt of Companies & Enterprises	0	--	0	--	0	--
56	Administrative & Support & Waste Mgt & Remediation Svcs	43	3.1	123	5.6	166	4.6
61	Educational Services	48	3.5	31	1.4	79	2.2
62	Health Care & Social Assistance	143	10.5	232	10.5	375	10.5
71	Arts, Entertainment & Recreation	13	1.0	5	0.2	18	0.5
72	Accommodation & Food Services	7	0.5	19	0.9	26	0.7
81	Other Services (excl Public Admin)	14	1.0	10	0.5	24	0.7
92	Public Administration	68	5.0	22	1.0	90	2.5
	Total[a]	1,367		2,210		3,577	

[a]Industry was unknown for 1,613 non-company reports and 7 company reports.

Respiratory disorders were the second most frequently reported by non-company providers (12%). The third and fourth most frequently reported for non-company providers were symptoms and signs (7%) and skin disorders (6%). 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 (55%). The second and third most frequently reported industries by company providers were health care and social assistance (11%) and transportation and warehousing (8%). The top industry for non-company providers was manufacturing (44%) and the second was construction (14%). The third most frequent industry type reported by non-company providers was health care and social assistance (11%). Industry type was missing on 1,613 non-company and seven company reports.

RESULTS, continued…

Table 6
2021 OD Reports by Disease Type and Gender

DISEASE TYPE	Males		Females	
	#	%	#	%
Infectious & Parasitic Diseases (ICD A00 –B99)	1	<0.1	1	0.1
Neoplasms (ICD C00-D49)	35	1.0	0	--
Blood and Blood Forming Organs (ICD D50-D89)	0	--	0	--
Endocrine, Nutritional & Metabolic Disorders (ICD E00-E89)	0	--	0	--
Mental Disorders (ICD F01-F99)	3	0.1	2	0.1
Nervous System (ICD G00-G99)	8	0.2	10	0.6
Eye and Adnexa (ICD H00-H59)	95	2.7	67	4.2
Ear and Mastoid Process (ICD H60-H95)	395	11.0	55	3.4
Circulatory System (ICD I00-I99)	0	--	2	0.1
Respiratory System (ICD J00-J99)	255	7.1	105	6.6
Digestive System (ICD K00-K95)	18	0.5	1	0.1
Skin & Subcutaneous Tissue (ICD L00-L99)	146	4.1	88	5.5
Musculoskeletal System & Connective Tissue (ICD M00-M99)	190	5.3	194	12.1
Genitourinary System (ICD N00-N99)	2	0.1	1	0.1
Symptoms, Signs & Ill-Defined Conditions (ICD R00-R99), Other Causes of Morbidity (V00-Y99) and Factors Affecting Health (Z00-Z99)	180	5.0	171	10.7
Toxic Effects of Substances - Poisonings (ICD S00-T88)	2,156	60.2	715	44.6
COVID-19 (U07)	95	2.7	191	11.9
TOTAL[a]	**3,579**		**1,603**	

[a]Gender was not listed for 15 reports.

Gender Differences

Toxic effect of substances (poisoning) was the most frequently reported diagnosis for men and women, with 60% and 45%, respectively (Table 6). The second, third and fourth most frequent diagnoses for women were musculoskeletal disorders (12%), COVID-19 (12%), and signs and symptoms (11%). For men, the second, third and fourth most frequently reported diagnoses were noise-induced hearing loss (11%), respiratory diseases (7%), and musculoskeletal disorders 57%). Fifteen reports did not indicate gender.

Table 7
Demographic Characteristics of Reported Occupational Disease Fatalities in 2021

DEMOGRAPHIC CHARACTERISTIC		
VITAL STATUS	**#**	**%**
Fatal	66	1.3
Non-Fatal	5,131	98.7
Total	**5,197**	
AGE	**#**	**%**
20 – 39	2	3.2
40 – 59	4	6.3
60 - 69	11	17.5
70 - 79	21	33.3
≥ 80	25	39.7
Total	**63**[a]	
DISEASE TYPE	**#**	**%**
Asbestosis	29	43.9
Lung Cancer - asbestos exposure	25	37.9
COVID-19	10	15.2
Other Lung Disease - asbestos exposure	2	3.0
Total	**66**	
INDUSTRY	**#**	**%**
Manufacturing	10	45.5
Construction	5	22.7
Retail Trade	4	18.2
Prof., Sci. & Tech	2	9.1
Other Svcs (Ex PA)	1	4.5
Total	**22**[b]	

[a]Age was missing on 3 reports.
[b]Industry was missing on 44 reports.

Fatalities

Sixty-six of the 5,197 OD reports were for fatal occupational illnesses (Table 7). None of the illness-related fatalities reported were from acute incidents. Non-company clinicians reported all of the 66 fatalities. The workers who died ranged in age from 33 to 101 years. Twenty-nine died from asbestosis, 25 from asbestos-related lung cancer, 10 from COVID-19 and two from other asbestosis-related lung disease. Four of the deceased workers had been employed in manufacturing and seven in construction. Former industry was not specified for 44 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 140 (preliminary data) traumatic work-related fatalities from injuries in 2021 that occurred in Michigan. Separate annual reports on the traumatic work-related fatalities for injuries can be found at: www.oem.msu.edu. There were four acute work-related injuries resulting in death among youths in the MIFACE Program in 2021.

RESULTS, continued…

Comparison with Other Data Systems

No one reporting system captures the true burden of occupational disease. This 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' Disability Compensation Agency (WDCA) paid 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 "All Other" illness column in Table 8 for BLS data includes everything but skin diseases, respiratory conditions and poisonings. For the WDCA and OD reports, the "All Other" illness column includes every illness that cannot be categorized into one of the first six illness categories.

The most quoted data source on occupational injuries and illnesses available in Michigan is extrapolated from the BLS Annual Employer Survey of a sample of Michigan companies. In 2021, there were a total of 102,700 injuries and illnesses of which 51,500 were severe enough to cause a loss of workdays, job transfer or restriction. Of the 102,700 total, 21,900 were occupational illnesses likely including COVID-19 and 80,800 were occupational injuries. Based on past BLS data we estimate that 17,500 of the 18,100 cases listed under the Lung-Toxic column were for COVID-19.

For 2021, WDCA reported 19,363 new paid claims for occupational injuries and illnesses with seven or more consecutive days away from work; 12,605 of those paid claims are for illnesses (Table 8). Four thousand eighteen of the 12,605 WDCA claims were for COVID-19.

Table 8

Comparison of 2021 Bureau of Labor Statistics (BLS) Occupational Illness Survey Data and 2021 LEO Workers' Disability Compensation Agency (WDCA) Claims with 2008—2021 LEO Occupational Disease (OD) Reports

	Disease Category														
	Skin		Lung—Dust		Lung—Toxic		Poisoning		Physical Agents		Repeated Trauma		All Other		Total
BLS Survey															
Year	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
2021	500	2.3	ND	--	18,100	82.6	ND	--	700	3.2	ND	--	2,600	11.9	21,900
WDCA Claims[a]															
Year	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
2021	16	0.1	0	--	4,037	32.0	1	<0.1	7	0.1	7,772	61.7	772	6.1	12,605
LEO OD Reports[a]															
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
2017	157	3.7	170	4.0	205	4.8	2,470	58.4	73	1.7	488	11.5	666	15.7	4,229
2018	153	4.1	384	10.4	33	0.9	1,925	52.0	65	1.8	577	15.6	565	15.3	3,702
2019	320	7.1	336	7.5	253	5.6	1,920	42.8	78	1.7	552	12.3	1,028	22.9	4,487
2020	163	4.8	226	6.7	604	17.9	1,330	39.5	72	2.1	204	6.1	768	22.8	3,367
2021	257	6.9	174	4.7	458	12.3	1,424	38.2	100	2.7	401	10.8	909	24.4	3,723

ND = No data for this disease category. NS = Data too small to be displayed.

[a] Includes 4,018 COVID-19 cases reported to the WDCA in 2021. Totals for LEO OD Reports are less than the total number of submitted reports for each year because some of the reports cannot be assigned to the disease categories used by BLS and the WDCA. In 2021, there were 1,474 reports that could not be classified for this table. Appendix 1 shows BLS and WDCA counts from 2010-2021.

RESULTS, continued…

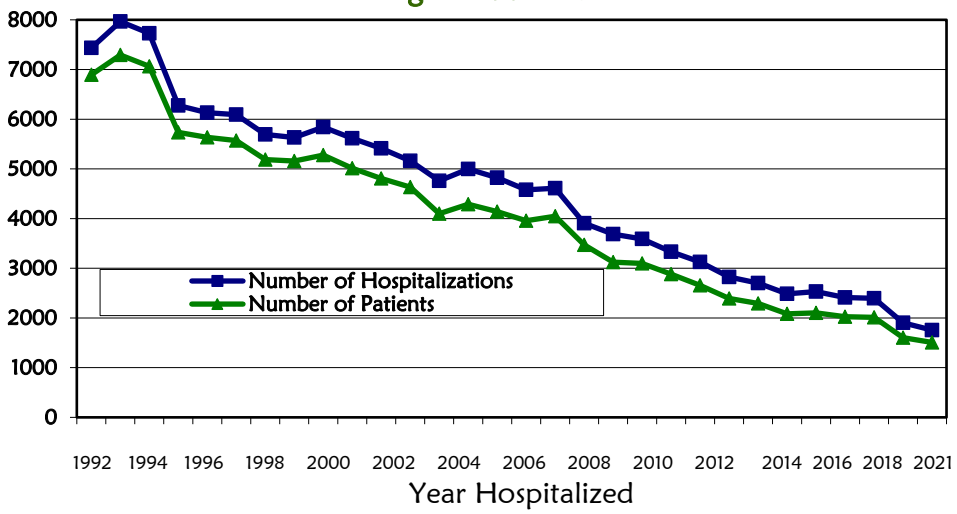
Overall, in 2021, about $399 million in compensation was paid by insurance companies and self-insured employers on 134,666 claims for both lost work time and medical-only costs. These 134,666 paid claims include new claims for injuries and illnesses filed in 2021, as well as ongoing payments for claims from previous years for workers who continue to lose work time or incur medical costs due to their injury or illness. Sixty-five percent of the total paid claims in 2021 were for medical procedures or care only and 35% for wage loss (https://www.michigan.gov/leo/bureaus-agencies/wdca/resources-and-reports).

Other Sources-Hospital Discharge Data

The hospital discharge data described in this next section is not part of the 5,197 occupational disease reports described in this 2021 Annual Report of Occupational Diseases. Hospital discharge data does not include identifiers; presumably some of the hospitalized patients overlap with those in the 5,197 OD reports. Especially for long latency, chronic diseases like asbestosis, it would be difficult to identify newly diagnosed patients in the hospitalized data set. Therefore, the hospitalization data in this section should be considered as supplemental to the 5,197 OD reports submitted to the State in 2021. 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 2021; the numbers of hospitalizations from 1995-2021 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 2009-2016 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 2021 0.16% of the 1,096,667 Michigan hospitalizations designated WC insurance as the primary payment source at discharge. Table 9 shows the primary discharge diagnosis for hospitalizations from 2015 to 2021 where WC insurance was designated as the primary payment source at discharge. Data for 2002 through 2015 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 60%, and musculoskeletal diseases, accounting for 14% of all WC-related patient hospitalizations in 2021. In 2021, there were 71 (4.0%) cases of COVID-19.

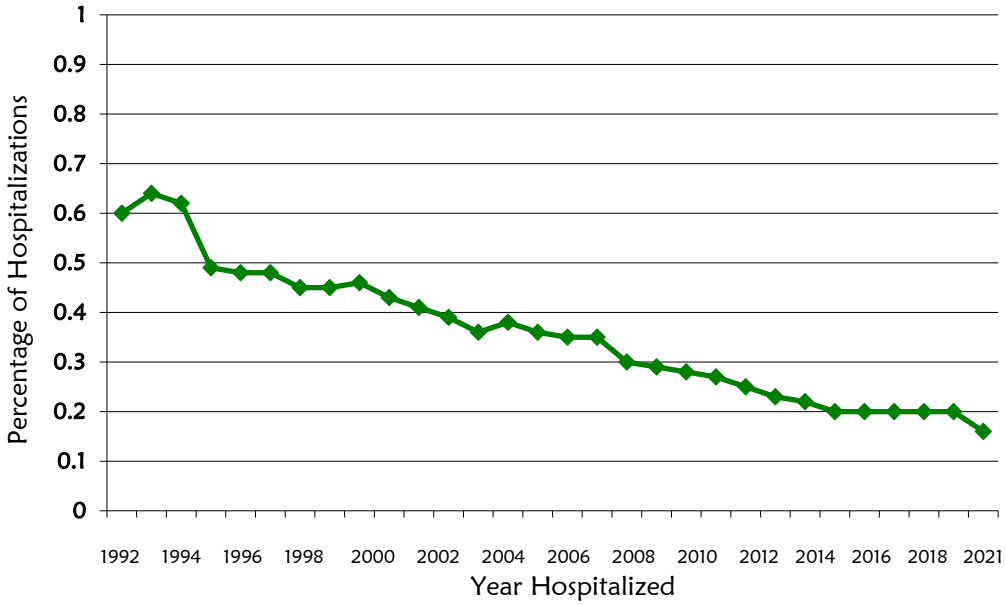
Figure 4
Hospitalizations and Patients with Workers' Compensation Designated as the Primary Payment Source at Discharge in Michigan: 1992-2021



RESULTS, continued…

Figure 5

Percent of Total Michigan Hospitalizations with Workers' Compensation Designated as the Primary Payment Source at Discharge in Michigan: 1992-2021



In 2021, 0.16% of the 1,096,667 hospitalizations in Michigan were paid for by Workers' Compensation. The percent of hospitalizations paid for by Workers' Compensation in Michigan has declined from the 1990's and has plateaued since 2016.

Table 9

Primary Diagnosis of Hospitalizations in Michigan from 2015 Q4-2021, with Workers' Compensation Designated as Primary Payment Source at Discharge

	Year of Hospitalization						
	2015 Q4	2016	2017	2018	2019	2020	2021
1º Discharge Diagnosis ICD-10	%	%	%	%	%	%	%
Infectious & Parasitic Diseases (A00 –B99)	4.1	2.5	2.4	3.1	2.5	4.4	3.2
Neoplasms (C00-D49)	0.2	0.3	0.3	0.2	0.3	0.3	0.4
Blood & Blood Forming Organs (D50-D89)	—	0.2	0.1	0.3	<0.1	0.1	0.1
Endocrine & Metabolic (E00-E89)	0.3	0.5	0.3	0.5	0.8	0.9	0.7
Mental Disorders (F01-F99)	0.9	0.3	0.3	0.4	0.6	0.8	0.6
Nervous System (G00-G99)	1.7	2.1	2.3	1.3	1.9	2.1	1.5
Eye and Adnexa (H00-H59)	0.2	<0.1	<0.1	0.1	0.1	0.1	0.1
Ear and Mastoid Process (H60-H95)	—	<0.1	0.1	--	--	0.1	--
Circulatory System (I00-I99)	2.7	3.8	3.4	3.7	4.1	4.3	3.8
Respiratory System (J00-J99)	2.4	2.5	2.4	2.6	1.9	2.6	2.1
Digestive System (K00-K95)	1.7	2.5	2.1	1.5	1.8	1.3	2.3
Skin & Subcutaneous Tissue (L00-L99)	5.8	4.5	5.2	4.4	4.6	2.5	3.1
Musculoskeletal (M00-M99)	22.9	20.6	19.2	18.8	16.5	14.3	14.0
Genitourinary System (N00-N99)	0.5	1.2	0.6	1.1	0.8	0.7	0.8
Pregnancy and Perinatal (O00-P96)	0.9	0.3	0.2	0.2	0.2	0.3	0.5
Congenital Anomalies (Q00-Q99)	0.2	0.1	--	--	<0.1	0.1	0.2
Symptoms, Signs (R00-R99)	1.6	1.4	1.9	1.3	1.3	1.5	1.2
Toxic Effects - Poisonings (S00-T88)	53.9	56.1	57.8	59.4	61.0	51.8	60.4
COVID-19 (U07.1)	--	--	--	--	--	10.8	4.0
Factors Affecting Health (Z00-Z99)		1.1	1.2	1.1	1.5	1.1	1.1
Total	**634**	**2485**	**2531**	**2412**	**2396**	**1903**	**1756**

RESULTS, continued…

Table 10 lists the demographics of patients with WC insurance as the primary payment source at discharge: 74-77% of the hospitalizations were for men, across all years from 2011 to 2021. Data for 2002 through 2010 can be found in prior reports. Among hospitalizations for which race was known, approximately 76-89% were white, 8-12% were African American, <1%-2% were Asian, and 3-11% were listed as "other."

Most hospitalizations involved workers between 40-59 years. There was one hospitalized worker 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, increased to 2% in 2016 and 2017, decreased to 1% in 2018 and 2019, to <1% in 2020, and increased to 2% in 2021 (1992 data not shown).

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

Table 10
Demographics of Hospitalizations in Michigan, 2011-2021, with Workers' Compensation Designated as Primary Payment Source at Discharge

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Gender	**%**	%	%	%	%	%	%	%	%	%	%
Male	74	75	75	76	77	77	77	77	75	70	75
Female	26	25	25	24	23	23	23	23	25	30	25
Total[a]	**3589**	**3333**	**3127**	**2823**	**2701**	**2485**	**2531**	**2412**	**2396**	**1903**	**1756**
Race	**%**	%	%	%	%	%	%	%	%	%	%
White	89	87	88	87	86	87	81	80	80	76	81
African Am	8	9	9	8	9	10	11	12	12	12	8
Asian	<1	<1	<1	1	<1	<1	<1	1	<1	2	1
Other	3	4	3	4	5	3	8	7	7	11	10
Total[a]	**2659**	**2557**	**2532**	**2286**	**2402**	**2323**	**2494**	**2412**	**2396**	**1903**	**1756**
Age	**%**	%	%	%	%	%	%	%	%	%	%
< 15	<1	<1	<1	<1	<1	<1	<1	--	--	--	<1
15-19	1	1	1	1	1	2	2	1	1	1	2
20-39	27	25	25	27	26	28	25	27	24	23	25
40-59	53	55	54	54	53	49	50	47	47	48	46
60-79	15	17	18	17	19	20	23	24	27	26	27
≥ 80	4	1	1	1	1	1	1	1	1	<1	1
Total[a]	**3589**	**3333**	**3127**	**2823**	**2701**	**2485**	**2531**	**2412**	**2394**	**1903**	**1756**
Avg Age ± standard deviation	48±15	48±13	48±14	47±14	48±14	48±15	49±14	49±15	50±15	50±14	49±15

[a]Totals vary due to missing information.

Poison Control Center Data

In 2021, 787 calls to the Michigan Poison Control Center (PCC) were identified for individuals with work-related symptoms. Table 11 describes available demographic characteristics and exposures of the individuals reported. There were more reports for males (59%). The individuals ranged in age from 15 to 88 years. Eighty-two percent of these individuals with known age were less than age 50. Of the 787 calls to the PCC in 2021, the top calls included exposures to: cleaning agents (232, 30%), medications (73, 9%), acids (47 (6%) and fuels/gases/oil (45, 6%).

Adult Blood Lead Epidemiology and Surveillance (ABLES)

Table 12 describes the demographic characteristics of the 1,384 individuals reported with a blood lead level

of ≥ 5 ug/dL. Most individuals were males between the ages of 30 and 59. Construction and manufacturing were the most frequently reported industries of lead exposure. Comprehensive reports on elevated blood lead levels in Michigan can be found at: www.oem.msu.edu.

Table 11
Demographic Characteristics of 787 Individuals Reported by the Michigan Poison Control Center in 2021

Demographic Characteristics		
Age	#	%
14-19	71	9.7
20-29	254	34.8
30-39	157	21.5
40-49	115	15.8
50-59	83	11.4
60-69	39	5.3
≥ 70	10	1.4
Total	**729**[a]	
Gender	#	%
Male	464	59.4
Female	317	40.6
Total	**781**[b]	
Top Exposures at Work	#	%
Cleaning Agents	232	29.5
Medication	73	9.3
Acids	47	6.0
Fuel/Gases/Oil	45	5.7
Solvents	27	3.4
Carbon Monoxide	26	3.3
Building/Construction	26	3.3
Caustics	22	2.8
Insecticides/Pesticides	21	2.7
Metal Fume	20	2.5
All Other Exposures	248	31.5
Total	**787**	

[a]Age was unknown for 58 reports.
[b]Gender was missing on 6 reports.

Table 12
Demographic Characteristics of 1,384 Individuals Reported by Laboratories with Elevated Blood Lead in Michigan, 2021

	Blood Lead Level			
	>=5 & <10 ug/dL		>=10 ug/dL	
Age	#	%	#	%
16-19	3	0.4	6	0.9
20-29	94	13.0	69	10.4
30-39	182	25.2	150	22.7
40-49	146	20.2	156	23.6
50-59	131	18.1	143	21.6
60-69	102	14.1	100	15.1
≥ 70	65	9.0	37	5.6
Total	**723**		**661**	
Gender	#	%	#	%
Male	653	90.3	612	92.6
Female	70	9.7	49	7.4
Total	**723**		**661**	
Industry	#	%	#	%
Construction	56	18.5	88	20.0
Manufacturing	155	51.3	281	63.9
Utilities	39	12.9	21	4.8
Trade	23	7.6	25	5.7
Public Admin	10	3.3	10	2.3
Arts & Entertainment	2	0.7	5	1.1
Admin & Support	10	3.3	1	0.2
Transportation	0	--	0	--
Other Services	1	0.3	6	1.4
Prof & Scientific	3	1.0	1	0.2
Educational Services	1	0.3	0	--
Health Care	2	0.7	2	0.5
Accomod & Food Svc	0	--	0	--
Mining	0	--	0	--
Total	**302**[a]		**440**[a]	

[a] Industry was missing on 421 reports of blood lead levels <10 ug/dL and on 221 reports of blood leads >=10ug/dL.

Work-Related COVID-19

As of 12/31/22, in Michigan there have been 1,963,842 confirmed COVID-19 cases and 28,026 deaths since the Pandemic began; of which 1,261,853 cases were confirmed in 2021 and 15,007 deaths confirmed in 2021 (https://www.michigan.gov/coronavirus/stats). Skilled Nursing, Home for the Aged and Adult Foster Care facilities are required to report COVID-19 cases and deaths to MDHHS. Since the Pandemic began, these facilities have reported 31,340 confirmed cases and 6,372 confirmed deaths among residents; of which 9,840 were confirmed in 2021 and 1,495 deaths confirmed in 2021. Among staff, these facilities have reported 33,170 cases and 93 deaths since the Pandemic began, of which 15,970 cases were confirmed in 2021 along with 41 deaths (https://www.michigan.gov/coronavirus/stats/data-about-places/long-term-care-data). As of May 2021, there were

331 reported outbreaks in schools, with 8,139 of the outbreaks involving both students and staff, 2,767 involving student cases only and 25 involving staff only. As of 6/21/2022, school-related outbreak reporting is no longer being updated (https://www.michigan.gov/coronavirus/stats/school-outbreak). In 2020, there were 11,362, and in 2021 there were 13,614 deaths with COVID-19 listed as the underlying cause of death, representing 9.7% of all 117,087 Michigan deaths from any cause in 2020 and 11.6% of all 117,756 Michigan deaths from any cause in 2021 (https://vitalstats.michigan.gov/osr/CVD19/CVD19Sum.asp). The number of deaths reported by the Michigan Division for Vital Records and Health Statistics are less than the number of deaths presented above, which counts deaths of all individuals with confirmed COVID-19 who died within 30 days of the diagnosis of COVID-19.

Of the 19,947 deaths reported through 8/31/2021, 4,004 (20.1%) died from COVID-19 between the ages of 25-64. Although people begin working at an earlier age and may continue working to an older age, and certainly not all COVID-19 deaths within the 25-64 age group were work-related, this number and percent provide a potential of COVID -19 deaths that might have been work-related. The above numbers provide a framework of possible work-related COVID-19 cases in Michigan: 23,475 cases and 77 deaths among long term care facility staff; 8,139 school outbreaks involving both students and staff cases; and 4,004 deaths among those aged 25-64. To determine what gets counted as a work-related COVID-19 case, we compiled the Michigan data on work-related COVID-19 cases from: 1) workers' compensation paid claims for COVID-19 where seven or more consecutive days in a row of work were missed; 2) direct reports by employers of COVID-19 cases and deaths submitted to Michigan OSHA; and 3) reports of Occupational Disease submitted to MIOSHA by hospitals.

Health care workers, first responders and correction officers who were diagnosed with COVID-19 between 3/30/2020 and 3/20/2021 were presumed to have developed their COVID-19 from a work exposure unless proven otherwise. This presumption ended on 3/20/2021, and now all workers are required to provide the same proof of work exposure to receive workers' compensation for COVID-19.

From 3/2/2020 through 12/31/2020 there were 10,127 paid workers' compensation claims for COVID-19, including 25 fatalities. In 2021 there were 4,046 paid WC claims for COVID-19, including 10 fatalities. Figure 6 shows the number of paid workers' compensation claims per month for 2020 and 2021. The median age was 41 (range 16-88), 65% were women, 61% worked in health care (36% hospitals, 19% long term care facility, 6% outpatient), 30% worked in government (police, fire and correctional officers) and 6% in administrative, employment and building services. Thirty-two percent of the paid claims were in the spring of 2020 during the first surge of COVID-19 (March through May 2020) and 61% were in the fall of 2020 (September through December). In 2021, 36% of the claims were in the winter (January through March) and 39% of the claims were in the fall (October through December).

For 2020, there were 437 reports, including 71 fatalities made by employers to Michigan OSHA. In 2021, there were 123 reports, including 35 fatalities. The median age was 50 (range 19-82), 63% were women, 75% worked in health care (58% hospitals, 13% long term care facility, 4% outpatient), 12% worked in government and 5% in manufacturing. Fifty-seven percent of the employer reports were in the spring of 2020 during the first surge of COVID-19, and 36% were in the fall. In 2021, 33% of the claims were in the winter and 33% of the claims were in the fall.

For 2020, hospitals reported 137 work-related COVID-19 cases including six fatalities; in 2021 hospitals reported 132 cases and no fatalities. The median age was 47 (range 20-76), 59% were women, 66% worked in health care (50% hospitals, 9% long term care facility, 7% outpatient) and 19% worked in government. Forty-nine percent of the hospital and emergency medical responders' reports were in the spring of 2020 during the first surge of COVID-19, and 50% were in the fall. In 2021, 34% of the hospitalizations were in the winter and 30% were in the

Figure 6
Month of Injury for Individuals Who Received WC for COVID-19 for Seven or More Days Away from Work in Michigan: 3/2020-12/2021

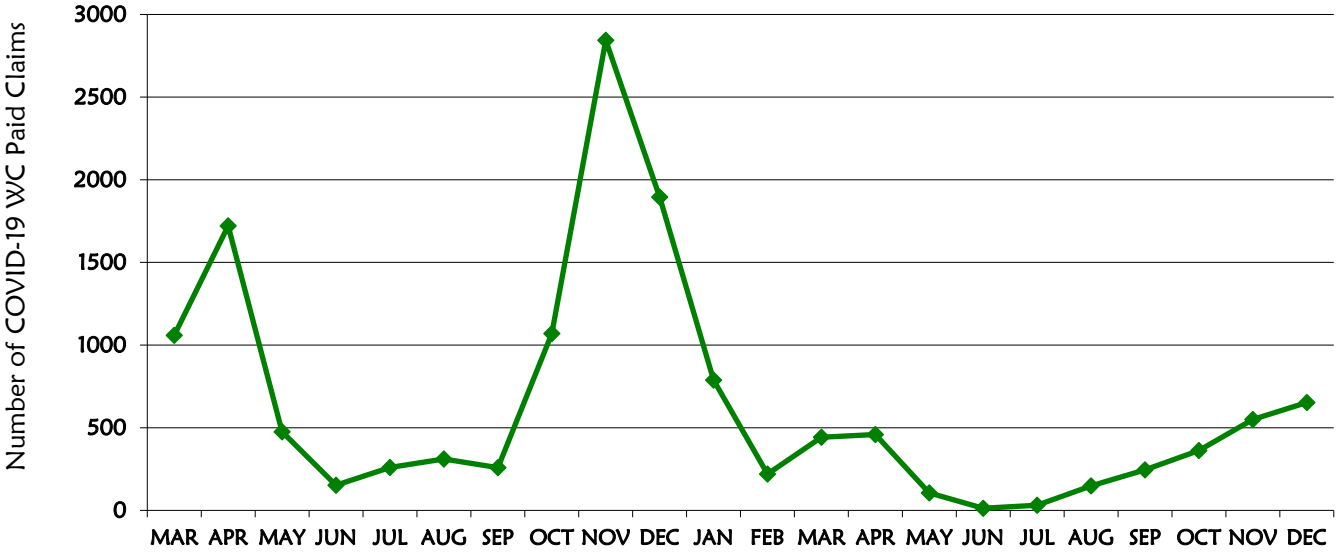
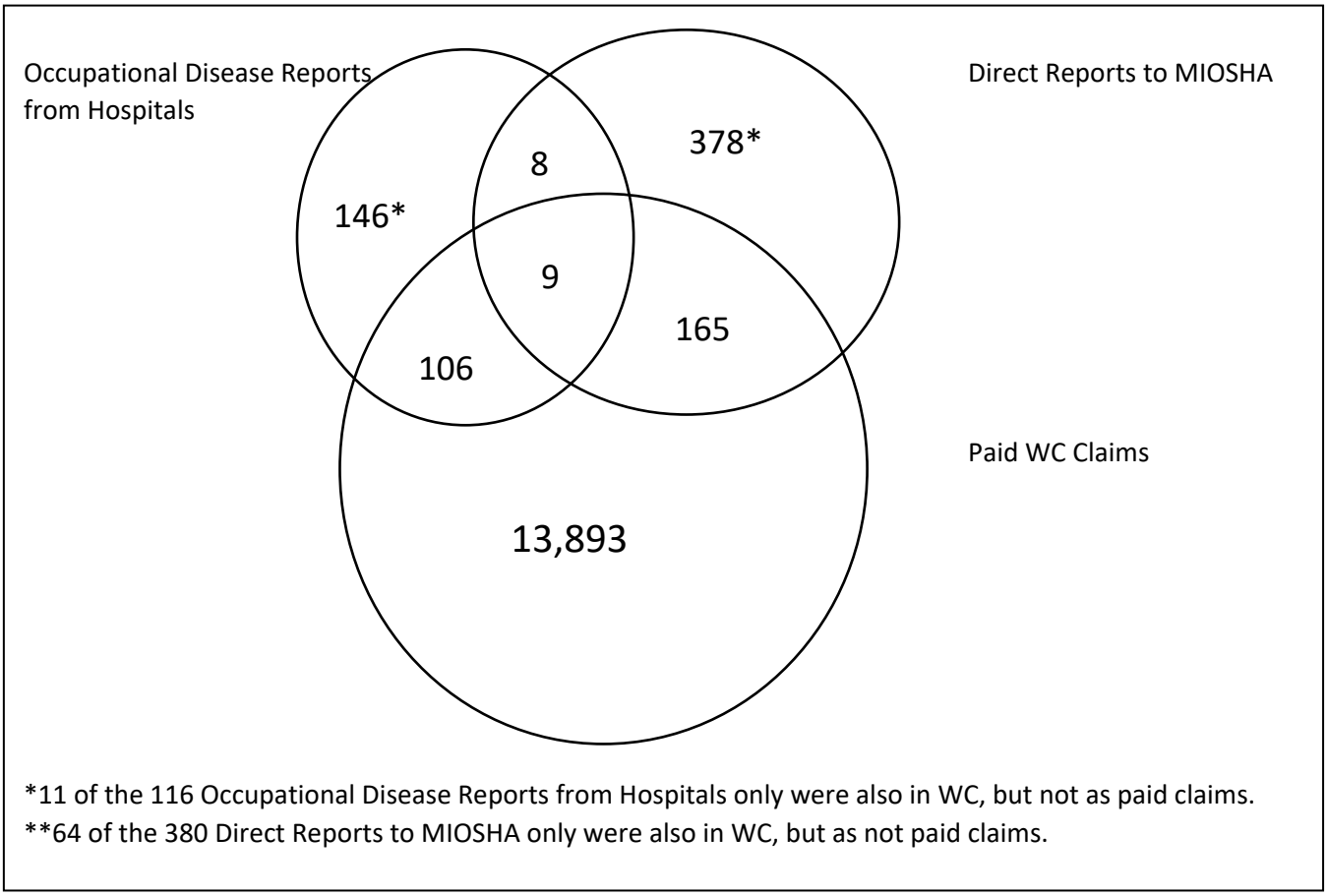


Figure 7
Venn Diagram of Work-Related COVID-19 Cases, Michigan: Calendar Years 2020 and 2021, 15,002 Cases Representing 14,705 Unique Individuals



*11 of the 116 Occupational Disease Reports from Hospitals only were also in WC, but not as paid claims.
**64 of the 380 Direct Reports to MIOSHA only were also in WC, but as not paid claims.

fall. Figure 7 shows a Venn diagram of the overlap of cases from the three sources for 2020 and 2021 combined. The total unique number after accounting for reports from more than one source was 14,705 cases, including 114 fatalities. This number is presumed to be a marked undercount as these 14,705 cases, which included first responders, all health workers and correction officers is smaller than just the 33,170 COVID-19 cases among staff at long term care facilities on the MDHHS website for 2020 and 2021. That the 14,705 is an undercount is confirmed by the BLS employer survey which reported 29,600 toxic lung cases in 2020 and 18,100 toxic lung cases in 2021. In years prior to the Pandemic, there were typically 400-700 cases under this category; therefore approximately 29,000 COVID-19 cases were identified through the BLS employer survey in Michigan.

Another measure of the connection of COVID-19 to work is the number of complaints and referrals received by Michigan OSHA about COVID-19. Since March 2020, Michigan OSHA processed a total of 16,871 complaints and referrals for COVID-19. In 2021, an estimated 85% of this year's complaints/referrals were COVID-related. MIOSHA mailed 4,387 recommendation letters, conducted 3,131 letter investigations, and conducted 1,876 COVID-19 onsite inspections, issuing 370 citations. In comparison, for the five preceding years 2015-2019, the agency processed 15,415 total complaints and referrals, which amounts to approximately 3,100 complaints and referrals per year.

DISCUSSION

There were 5,197 Occupational Disease Reports, with 4,910 non-COVID-19 and 287 COVID-19 sent to LEO in calendar year 2021. These reports do not include occupational injuries. The most frequent types of occupational diseases reported to LEO were toxic effects of substances (55%), ear-related conditions, including noise-induced hearing loss (9%), musculoskeletal conditions (7%) and respiratory conditions (7%). Figure 2 shows the number of occupational disease reports received each year since 1985. From 1988 through 1999, the number of reports sent to the State increased substantially to 21,538 and then decreased to 6,837 in 2009. Since 2009, the number of reports has plateaued with variations of approximately 600 to 4,000 each year. 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, an increase of 1,067 reports in 2016, a decrease of 1,072 reports in 2017, an increase of 1,063 reports in 2018, and a decrease of 577 reports in 2019 (which had 7,953 total reports). With the onset of the COVID-19 pandemic in 2020 and many workplaces having to shut down and lay off workers, the number of OD reports in 2020 was less than half the number of reports submitted during 2019. In 2021, the number of OD reports increased to 5,197.

The initial overall decline in the number of reports reflected fewer reports from company medical departments consistent with facilities temporarily shutting down. 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 increased slightly to 54 in 2021, decreased to 51 in 2020 and 62 in 2019, compared to 68 in 2018, 70 in 2017, 88 in 2016, 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. In 2020, the primary source of OD reports, which typically has been from company-affiliated physicians, reversed so that non-company-affiliated physicians submitted a greater number of OD reports than company-affiliated physicians.

The largest increase in work-related COVID-19 cases was seen in the workers' compensation system where there were 10,127 paid lost work time workers' compensation claims for seven or more days for COVID-19 in 2020 and 4,046 in 2021, including 25 fatalities in 2020 and 10 in 2021. COVID-19 paid workers' compensation cases were 41.5% of all paid lost work time claims for seven or more days in 2020 and 20.7% of all claims in 2021. The impact of COVID-19 was also reflected in Michigan OSHA activity where 85% of the complaints and referrals were COVID-19 related in 2020, and 54% of the complaints and referrals were COVID-19 related in 2021.

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 54 company-affiliated physicians reporting employees from 594 different companies; there were 14 non-company-affiliated physicians reporting patients to the state. There were 264,043 companies in the year 2021 and 44,945 licensed physicians practicing in Michigan in the year 2021. Accordingly, reports are received from 0.2% of companies and <0.1% of physicians. Over the last several years, these very low 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 5,197 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 Michigan[2]. For 2021, the BLS annual survey reported 21,900 illnesses; by extension one would expect 43,800 illnesses in 2021 instead of the approximately 5,200 reported in 2021. The difference in COVID-19 reports received by LEO, with 287 COVID-19 reports, with 4,018 paid WC claims for COVID-19, and with 18,100 COVID-19 cases in the BLS employer survey shows that this underreporting was even greater for COVID-19. Underreporting is probably even greater than that seen in comparing different data systems because these comparisons assume 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 2021 the non-company-affiliated health care practitioners were more likely to report patients with respiratory disease who work in small, non-manufacturing companies.

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, only injuries (19,375 in 2021) 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 (134,666 in 2021) 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 a pneumoconiosis shows only <1% - 8% paid by WC (2019 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 38% (1,424) of the OD reports, while that category of diseases accounts for no cases in the BLS survey and <1% (1 case) 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.

In 2018, the National Academies of Science issued a comprehensive report on the status of occupational injury and illness surveillance in the United States. The report found that the US surveillance system markedly undercounted work-related injuries and illnesses and accordingly missed many opportunities to prevent these conditions[4]. 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).

We have not seen a decrease in acute work-related hospitalizations since the requirement initiated on 9-1-2015 for employers to report acute work-related hospitalizations directly to MIOSHA, although MIOSHA has been able to inspect many of the workplaces where these injuries occur which has presumably resulted in safer conditions at these workplaces (http://www.michigan.gov/lara/0,4601,7-154-10573_11472-370952—,00.html). Despite comprehensive outreach by MIOSHA to let employers know about the reporting law, not all employers have complied in reporting work-related hospitalizations. We recently conducted an analysis of the first three full years of Michigan data, 2016-2018, matching the hospitalized injuries and illnesses reported by employers to OSHA to the hospitalized injuries and illnesses reported by the 134 hospitals in Michigan by employee first and last name, company name, injury date and type of injury.[5] There were 2,887 workers hospitalized with severe injuries/illnesses from 2016-2018 in Michigan; 1,260 workers were reported by employers to OSHA, 2,238 workers were reported by hospitals. Employers only reported 1,260 of the 2,887 (43.6%) work-related hospitalizations. The median length of stay for the workers reported by hospitals was three days, ranging from a low of two days among workers with head injuries including skull fractures to three days for all other types of injuries. The total number of days hospitalized was 10,435 with an estimated hospital cost of $24,222,334. The percent of hospitalizations reported by employers did not significantly improve over the three years; 42.0% in 2016, 43.6% in 2017 and 45.0% in 2018. Companies with 250 or more employees were significantly more likely to comply (68.4%) and small companies with 10 or fewer employees were significantly less likely to comply (32.9%). Employers in manufacturing (64.7%), wholesale trade (57.5%) and public administration (66.2%) were significantly more likely to comply with the reporting requirement than employers in agriculture, forestry, fishing and hunting (8.2%); construction (38.2%); finance and insurance (21.4%); real estate and rental and leasing (27.3%); administrative and support and waste management and remediation services (33.9%); arts, entertainment and recreation (10.8%); accommodation and food services (20.8%); and other services except public administration (20.3%). Of the 465 inspections conducted in response to a work-related hospitalization, 246 (52.9%) of the employers had not corrected the hazard causing the injury and hospitalization prior to the inspection even though the inspection was conducted months after the hospitalization. Although not included in the published paper but because reporting by hospitals was also not complete, we have subsequently used capture-recapture analysis[4] to estimate the total number of hospitalizations in Michigan for the three years. We estimate that there were another 1,505-1,953 work-related hospitalizations not identified either by the hospitals or employers. The low compliance with the regulation was across all three years, with no appreciable improvement in compliance from 2016 to 2018. Disproportionate reporting in manufacturing, wholesale trade and public administration as well as companies with a large number of employees suggests lack of awareness of the requirement among employers less familiar with workplace safety and health issues, and/or who do not have a dedicated health and safety specialist. Better reporting lays the groundwork to fully characterize the industries where injuries and acute illnesses result in a hospitalization, which can then be used to target and evaluate preventive interventions in the workplace. Given the usefulness of these reports to identify workplace hazards, it would be beneficial if employer compliance with the reporting requirement increased at a national level. Our study was conducted in Michigan; we have no reason to expect that employers in other states are more or less likely to comply with the regulation. As described in our paper, we also identified the following primary factors to strengthen the utility of the data being reported: 1) Improve compliance with employer reporting through enforcement and employer educational efforts and 2) Add hospital names to the OSHA reporting requirement. A severe occupational injury and illness that leads to a hospitalization is an important sentinel event to capture in surveillance data. Our evaluation of the OSHA rule on the reporting of acute work-related hospitalizations showed the benefit of this reporting requirement while at the same time showed how the rule could be improved.

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. In 2021, we added data from a new source, the Michigan Emergency Medical Services System (MI EMS). This new source provides data from the approximately 800 ambulance companies in the state on their emergency transports and will provide additional information for work-related conditions among the approximately one million annual ambulance runs each year.

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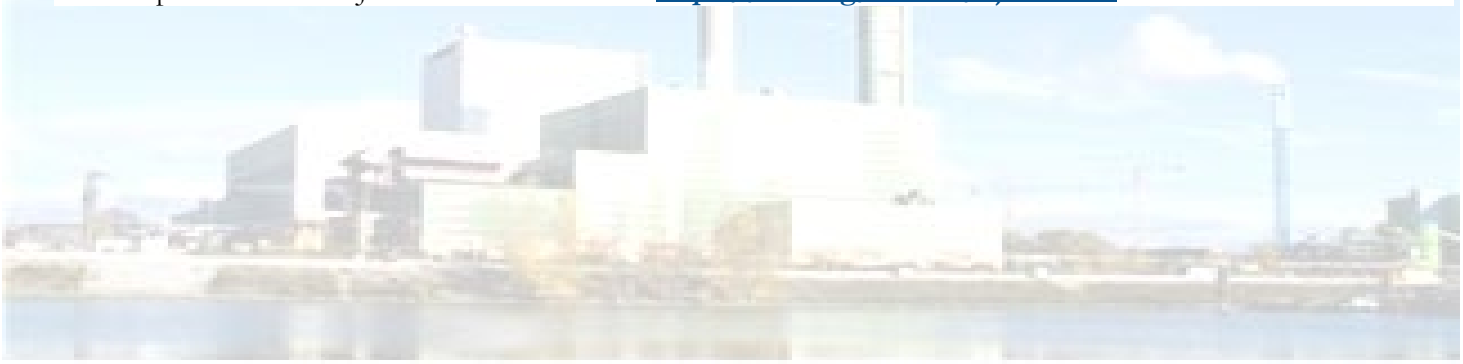

Appendix 1.

Bureau of Labor Statistics (BLS) Occupational Illness Survey Data and LEO Workers' Disability Compensation Agency (WDCA) Claims, Michigan 2010-2021

	Disease Category														
	Skin		Lung—Dust		Lung—Toxic		Poisoning		Physical Agents		Repeated Trauma		All Other		Total
BLS Survey															
Year	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
2010	1,200	14.0	ND	--	700	8.1	100	1.2	ND	--	ND	--	6,600	76.7	8,600
2011	1,100	14.7	ND	--	400	5.3	100	1.3	ND	--	ND	--	5,900	78.7	7,500
2012[a]															
2013	1,100	13.4	ND	--	600	7.3	200	2.4	ND	--	ND	--	6,300	76.8	8,200
2014	900	15.0	ND	--	700	11.7	NS	--	ND	--	ND	--	4,400	73.3	6,000
2015	1,400	21.5	ND	--	700	10.8	100	1.5	ND	--	ND	--	4,300	66.2	6,500
2016	900	14.4	ND	--	400	7.8	0	--	ND	--	ND	--	5,100	79.7	6,400
2017	900	14.8	ND	--	300	4.9	200	3.3	1,000	16.4	ND	--	3,700	60.7	6,100
2018	1,000	18.5	ND	--	600	11.1	NS	--	ND	--	ND	--	3,800	70.4	5,400
2019	800	15.1	ND	--	400	7.5	100	1.9	800	15.1	ND	--	3,200	60.4	5,300
2020	700	2.0	ND	--	29,600[b]	85.3	200	0.6	600	1.7	ND	--	3,600	10.4	34,700
2021	500	2.3	ND	--	18,100[b]	82.6	ND	--	700	3.2	ND	--	2,600	11.9	21,900
WDCA Claims[a]															
Year	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
2010	55	0.3	0	--	60	0.3	8	<0.1	28	0.2	14,571	81.9	3,075	17.3	17,797
2011	45	0.3	0	--	107	0.7	9	0.1	34	0.2	12,427	80.2	2,867	18.5	15,489
2012	54	0.3	0	--	103	0.7	13	0.1	27	0.2	11,863	76.7	3,411	22.0	15,471
2013	57	0.4	0	--	110	0.7	4	<0.1	28	0.2	12,062	80.3	2,766	18.4	15,027
2014	30	0.2	0	--	89	0.6	4	<0.1	39	0.3	12,006	80.6	2,734	18.3	14,902
2015	38	0.3	1	<0.1	53	0.4	5	<0.1	36	0.3	10,749	80.2	2,515	18.8	13,397
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
2017	25	0.2	1	<0.1	54	0.4	3	<0.1	28	0.2	9,998	80.9	2,246	18.2	12,355
2018	39	0.3	9	0.1	49	0.3	3	<0.1	22	0.2	11,450	81.5	2,480	17.6	14,052
2019	9	0.1	ND	--	22	0.2	ND	--	23	0.2	8,476	85.8	1,353	13.7	9,883
2020[c]	8	<0.1	0	--	10,062[b]	55.0	2	<0.1	12	0.1	7,195	39.3	1,012	5.5	18,291
2021	16	0.1	0	--	4,037[b]	32.0	1	<0.1	7	0.1	7,772	61.7	772	6.1	12,605

ND = No data for this disease category. NS = Data too small to be displayed.

[a]Data not available.

[b]Includes COVID-19 cases.

[c]2020 WDCA numbers have been updated since the 2020 Annual Report, after a data entry backlog was resolved.