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2019 ANNUAL REPORT

Tracking Work-Related Deaths in Michigan

MICHIGAN
State FACE Program
Fatality Assessment & Control Evaluation

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2019 Annual Report

Tracking Work-Related Deaths in Michigan

A Joint Report
of
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Executive Summary

The Division of Occupational and Environmental Medicine (OEM) at Michigan State University (MSU) began tracking work-related fatalities in the state of Michigan in January 2001. This is the 19th annual Michigan Fatality Assessment and Control Evaluation (MIFACE) report on acute traumatic work-related deaths in Michigan. There were **163 work-related deaths in 2019**, an increase of 4 deaths compared to 2018. There were 155 separate incidents (two deaths occurred in each of four separate incidents, with one further incident resulting in five deaths) and 160 separate employers. A narrative summary of each work-related fatality is in Appendix I. MIFACE educational material, including on-site Investigation Reports, Summaries of MIOSHA Investigations, and Hazard Alerts are located on the MIFACE webpage on the Michigan State University Division of Occupational & Environmental Medicine (MSU OEM) website. Key findings for 2019:

- The number of work-related deaths (163) was up compared to 2018 (159 work-related fatalities). The fatal injury rate (3.4 deaths/100,000 workers) stayed constant.
- The *overall* rate of work-related deaths in Michigan is lower than the rate in the United States (3.5 deaths/100,000 workers).
- The industry sector with the highest employment-based industry rate was Agriculture, Forestry, Fishing, and Hunting (38.8 deaths/100,000 workers), followed by Mining (36.1 deaths/100,000 workers) and then Construction (17.9/100,000 workers). Agriculture also had the largest number of work-related deaths (32 deaths, 19.6% of all fatalities) followed by Construction (31 deaths, 19.0%).
- Motor vehicle crashes were the leading cause of work-related death (31, 19.0%), followed by suicides (23, 14.1%), struck-by incidents (21, 12.9%) machine-related incidents (20, 12.3%).
- Illegal drugs, alcohol or side effects of prescribed and over-the-counter medication were potential factors in 18.2% of the non-suicide and non-drug abuse deaths.
- By occupational group, Management had the largest number of work-related deaths (44) followed by Transportation & Material Moving (33) and then Construction & Extraction (23).
- Fifty-six of Michigan's 83 counties (67.5%) had a work-related fatality. Wayne County had the highest number of deaths (25, 15.3%), followed by Oakland (12, 7.4%), Macomb (7, 4.3%), Washtenaw, Genesee, and Kent (6, 3.7%), and Clinton and Ingham (5, 3.1%).
- Of the 163 work-related fatalities, 39 (23.9%) were MIOSHA program-related and were investigated by a MIOSHA compliance officer.

Definitions

A **traumatic injury** is any unintentional or intentional wound or damage to the body resulting from acute exposure to energy or from the absence of such essentials as heat or oxygen caused by a specific event, incident, or series of events within a single workday or shift.

Work is defined as legal duties, activities, or tasks that produce a product as a result and that are done in exchange for money, goods, services, profit, or benefit.

A **work relationship** exists if an event or exposure results in the fatal injury or illness of a person:
(1) ON the employer's premises and person is there to work; or
(2) OFF the employer's premises and person is there to work, or the event or exposure was related to the person's work or status as an employee.

Incidence means the number of new cases of an illness, injury, or other health-related event that commences during a specified period in a specified population.

Background

In 2001, MSU OEM instituted a tracking program for all traumatic work-related deaths, first with financial assistance from LARA and then from the National Institute of Occupational Safety and Health (NIOSH). This is a joint project of LARA/MIOSHA and MSU OEM.

The purpose of the MIFACE tracking project is three-fold:

- Identify the types of industries and work situations where workers are dying from acute traumatic incidents,
- Identify the underlying causes of the work-related fatality, and
- Formulate and disseminate prevention strategies to reduce future work-related fatalities.

MIFACE uses the National Institute of Occupational Safety and Health (NIOSH) Fatality Assessment and Control Evaluation (FACE) as a model. Since 1982, NIOSH has funded selected states to operate a state FACE program. MIFACE investigations have provided aggregate data to identify high-risk industries and work practices as well as provided the stories or "faces" necessary to make the statistics real and influence change in the workplace. Emphasis on information dissemination and translation of information into user-friendly materials is an important part of the MIFACE program.

The MSU OEM webpage has many resources available to assist employers, employees, safety and health professionals and others to understand more about work-related illnesses, injuries and deaths.

Who is Included? Any individual of any age who meets the criteria of "at work", including volunteers and prison inmates, who are exposed to the same work hazards and perform the same duties or functions as paid employees. Suicides are included, following the protocol established by the NIOSH FACE program and the Bureau of Labor Statistics (BLS), which collects the official work-related death statistics in all states.

Who is Not Included? Individuals who die while "at work" from diseases, such as a heart attack or stroke, individuals commuting to/from work, volunteers not working for a non-profit, students, and homemakers.

Methods

MIFACE utilizes multiple sources to identify work-related fatalities in Michigan: MIOSHA, Death Certificates, Newspapers, Medical Examiners, Police/Fire/EMT Departments, Workers' Compensation Agency, MSU Extension, Michigan Farm Bureau, Federal Agencies (MSHA, NTSB, etc.), Internet searches, and Michigan citizens reporting a work-related death.

IDENTIFY INDIVIDUALS

◊ **Receive Report of Death**

◊ **Determine if WR Death**

- Paid employee, self–employed?
- Working at job or family business?
- Traveling "while on-the-clock" or compensated travel?
- Volunteer?
- In parking lot of business?

GATHER INFORMATION

Contact MIOSHA

-If fatality is program-related

Gather source documents

- Reports from agencies that investigated the death/provided emergency services when event occurred
- Death certificate
- Medical examiner report and, when appropriate
- MIOSHA fatality investigation narrative

CONTACT EMPLOYER/FARM FAMILY

◊ **Send MIFACE Introduction Letter and Brochure**

◊ **Follow-up phone contact**

- Answer questions
- Ask if employer and/or family will voluntarily participate
  - ➢ If Yes, schedule date and time for MIFACE site visit
  - ➢ If No, write case summary or MIFACE Summary of MIOSHA Investigation

MIFACE SITE VISIT

◊ **Explain MIFACE program**

◊ **Complete appropriate research forms**

◊ **Conduct interviews with appropriate personnel**

- Learn about process, equipment involved, work activities of deceased, training, safety programs, etc.

◊ **Observe area and/or equipment involved**

◊ **Take pictures, ensuring identifiers are removed**

ALL work-related deaths MUST be reported to MIOSHA within 8 hours of the death.

The toll-free hotline to report a work-related death is: 1-800-858-0397

MIFACE INVESTIGATION REPORT

Site Visit Report Includes:

- Summary statement
- Background information
- Detailed investigation narrative
- Cause of death as determined by the Medical Examiner
- Prevention recommendations, including discussion
- References
- Pictures, drawings, sketches
- Review process

FOLLOW-UP ACTIVITIES

◊ **Identify Stakeholders**
- Internet search for similar companies and/or trade groups

◊ **Update Database**
- Information collected from each site visit and statewide tracking entered into a database

◊ **Analyze Data**
- Annual Report developed analyzing and discussing data

◊ **Educational Outreach**
- MIFACE Summary of MIOSHA Investigation if MIOSHA investigation takes place
- Hazard Alert
- Post on MSU OEM website:
  - Investigation Report
  - MIFACE Summary of MIOSHA Investigation
  - Hazard Alert
- Send notice of posted publications to MIFACE e-mail distribution list
- Guest speaker, display booths at health and safety conferences, industry trade group training programs

The level of information collected for each fatality depended on the type of incident.

For homicides, suicides and most transportation-related fatalities that occurred while the individual was at work, MIFACE collected only source documents.

For many of the remaining work-related fatalities including agricultural fatalities, MIFACE initiated contact with employers or farm family members to request permission for an on-site investigation. It is important to note that MIFACE investigators did not enforce compliance with Michigan Occupational Safety and Health Act (MIOSHA) rules and regulations and did not assign fault or blame. However, to decrease the burden to the employer of multiple investigations, MIFACE accompanied the MIOSHA compliance officer with employer agreement. In addition, MIFACE interviewed the compliance officers about their investigation.

All photographs used in this annual report are courtesy of MIOSHA, the responding police department or pictures taken at the time of the MIFACE investigation. Photographs have been modified as necessary to remove identifiers.

Results

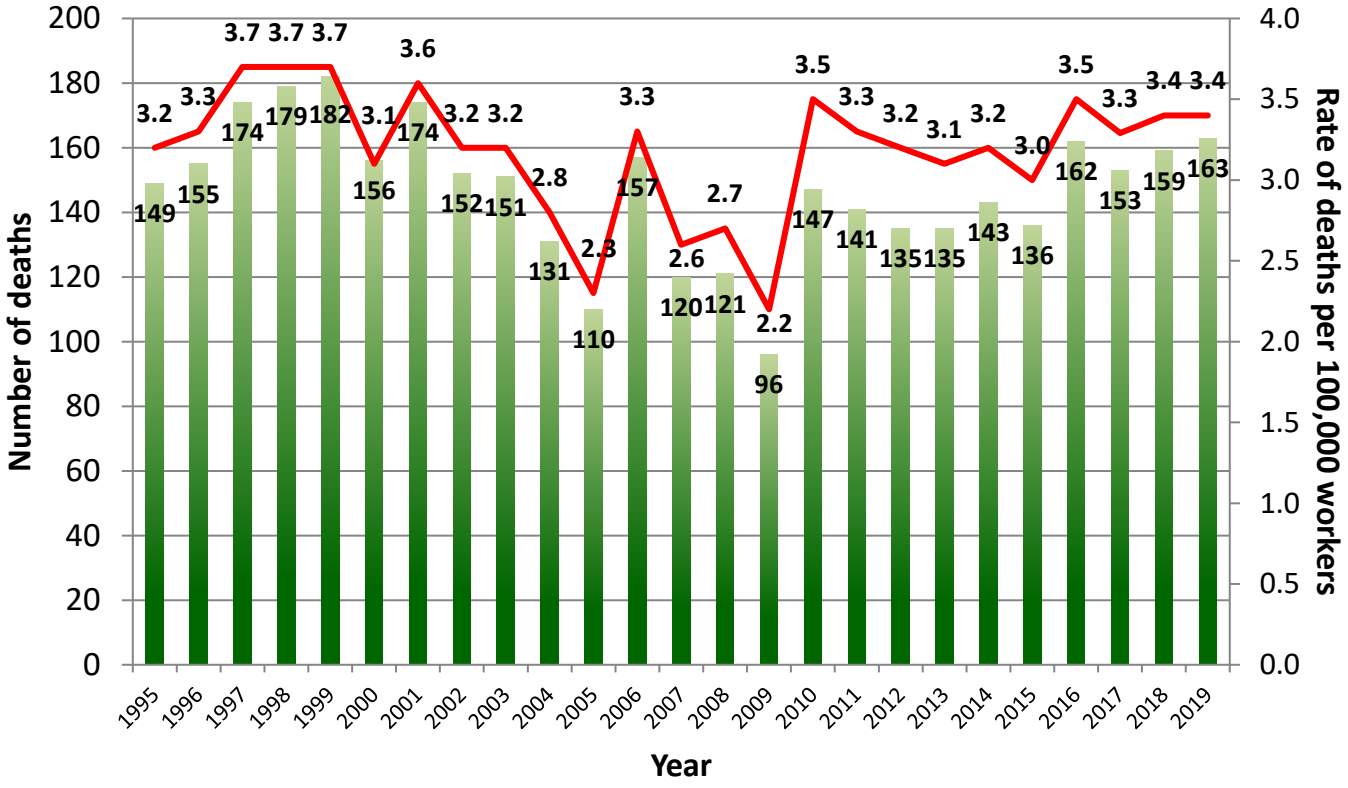
There were 163 acute traumatic work-related fatalities in 2019. One hundred fifty-nine (97.5%) of the 163 work-related traumatic incidents occurred in 2019; a description of the four individuals who died in 2019 due to complications from a work-related injury sustained in a previous year follows:

- An employee of an auto parts supplier in his 70s died from complications of a motor vehicle collision in 1978.
- A roofer in his 40s died from complications of a fall he sustained in 1990.
- A driver/security officer died from complications of a motor vehicle collision in 2012.
- A farmer in his 70s died from complications of a head injury sustained when he was struck by a tree branch in 2018.

The 163 individuals who died had 160 different employers. An engineering firm, a construction contractor, and a stone wholesaler each had an incident in which two employees died.

Figure 1 shows the number of acute traumatic work-related deaths and incidence rate per year in Michigan since 1995. Incidence rates shown from 1995-2000 were obtained from the BLS website. Rates since 2001 were determined from MIFACE statistics.

Figure 1. Number and Incidence Rate of Work-Related Fatalities in Michigan, 1995-2019



Demographics

Table 1 shows the demographic characteristics of the 163 traumatic work-related fatalities in Michigan in 2019. Demographic characteristics were obtained from the individual's death certificate.

Race

Of the 150 males who died, 127 were Caucasian, 15 were African American, 4 were Hispanic, 2 were Asian Indian, one was Asian/Pacific Islander, and one was an American Indian/Alaskan Native. Nine Caucasian women and 4 Black women died in a work-related incident.

Seven individuals were of Hispanic ethnicity, six men and one woman. Death certificates indicated the race as Caucasian for 3 of the 7 Hispanic individuals.

Age

The age at time of death ranged from 15 to 89 years. The average age was 48.7 years, down by less than a year from 49.2 years of age in 2018. For men, the ages ranged from 15-89 years, and for women, the ages ranged from 19-68 years. The average age for men at the time of death was 49.5 years; for women, it was 40.4 years (**Table 1**).

Twenty-six individuals were 66 years of age or older when they died compared to 20 individuals in 2018; the average age of these was 73.2 years and included 25 men and one woman. Seven (26.9%) of the 26 individuals aged 66 years or older died due to a machine-related incident, four (15.4%) due each to a motor vehicle collision and fall, three (11.5%) due each to struck-by and animal incidents, two (7.7%) from aircraft incidents, and one (3.8%) each to suicide, asphyxiation, and homicide.

Table 1. Demographic Characteristics* of 163 Work-Related Fatalities, Michigan 2019

Demographic Characteristics	Number	Percent
Gender		
Male	150	92.0
Female	13	8.0
Race		
White	136	83.4
Black	19	11.7
Hispanic	4	2.5
Asian Indian	2	1.2
Asian/Pacific Islander	1	0.6
American Indian/Alaskan Native	1	0.6
Age		
<20	5	3.1
20-29	22	13.5
30-39	23	14.1
40-49	31	19.0
50-59	35	21.5
60-69	32	19.6
70-79	12	7.4
80-89	3	1.8
Education		
Less than High School	29	17.8
High School Graduate	62	38.0
GED	7	4.3
Some College (1-4 years)	57	35.0
Post College (5+ years)	3	1.8
Vocational School	4	2.5
Specialized Training	1	0.6
Country of Origin		
United States	152	93.3
Iraq	3	1.8
Mexico	2	1.2
Pakistan	1	0.6
Netherlands	1	0.6
India	1	0.6
Afghanistan	1	0.6
Burkina Faso	1	0.6
Bangladesh	1	0.6
Totals	**163**	

* Source: Death Certificate (percent may not add to 100 due to rounding)

Table 2 describes the age distribution of the victims across industry sectors.

Table 2. Traumatic Work-Related Fatalities by Age of Victim and Industry Sector, Michigan 2019				
Industry Sector (NAICS Code)	**0-17**	**18-65**	**66+**	**Total**
	Number	**Number**	**Number (%)**	
Agriculture, Forestry, Fishing & Hunting (11)	--	18	14 (43.8%)	**32**
Mining (21)	--	2	--	**2**
Utilities (22)	--	1	--	**1**
Construction (23)	--	28	3 (9.7%)	**31**
Manufacturing (31-33)	--	13	--	**13**
Wholesale Trade (42)	--	9	--	**9**
Retail Trade (44-45)	--	12	2 (14.3%)	**14**
Transportation & Warehousing (48-49)	--	18	3 (14.3%)	**21**
Information (51)	--	1	--	**1**
Real Estate & Rental & Leasing (53)	--	2	--	**2**
Professional/Science/Technology (54)	--	3	--	**3**
Administrative & Support & Waste Management & Remediation Services (56)	--	7	--	**7**
Educational Services (61)	--	2	1 (33.3%)	**3**
Health Care & Social Assistance (62)	--	5	--	**5**
Arts, Entertainment & Recreation (71)	1	2	--	**3**
Accommodation & Food Services (72)	1	3	--	**4**
Other Services (except Public Administration) (81)	--	7	1 (12.5%)	**8**
Public Administration (92)	--	3	1 (25%)	**4**
Totals	**2**	**136**	**25 (15.3%)**	**163**

Nationally, the hours-based fatal work injury rate (per 100,000 FTE workers) for individuals aged 65 and over was 9.4 (https://www.bls.gov/charts/census-of-fatal-occupational-injuries/rate-of-fatal-work-injuries-per-100000-fte-by-age.htm). Although not directly comparable, Michigan's employment-based fatality rate for workers aged 65 and over was 11.3/100,000 in 2019. While the percentage of individuals 65 years of age and older who were employed (17.0%) was smaller than other age categories, this age group had the highest fatality rate of all age groups (**Table 3**).

Table 3. Employment Number, Percent of the Civilian Non-institutional Population Employed and Fatality Rate by Age Group[a], Michigan 2019				
Age Range (in years)	Employment		Number of Deaths	Fatality Rate (per 100,000)
	Number (in thousands)	% of Civilian non-institutional Population within age category that is employed		
16-19	203	38.4	4	2.0
20-24	437	69.3	9	2.1
25-34	1,086	79.2	27	2.5
35-44	880	79.5	20	2.3
45-54	1,058	79.3	40	3.8
55-64	806	59.2	30	3.7
65 and older	282	17.0	32	11.3

[a] Employment by age from https://www.bls.gov/lau/table14full19.pdf

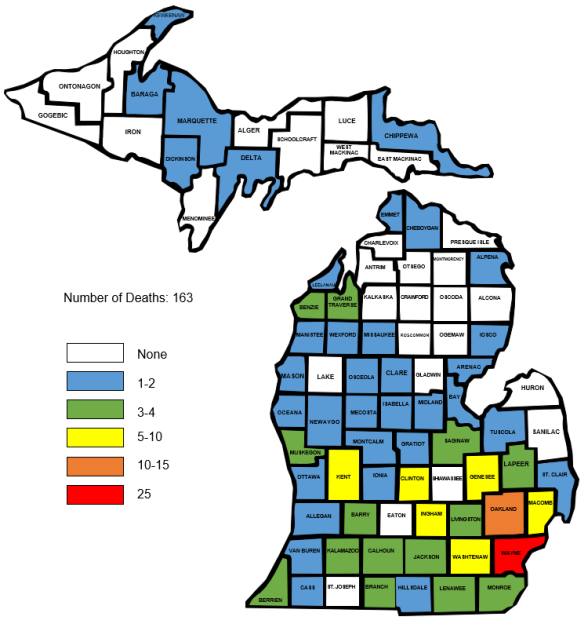
Geographic Distribution

Fifty-six (67%) of the 83 Michigan counties had at least one work-related injury that led to the death of the worker **(Figure 2** and **Table 4)**.

Table 4. County of Fatal Work-Related Injury, Michigan 2019

County	Number	Percent*	County	Number	Percent	County	Number	Percent	County	Number	Percent
Alcona	--	--	Dickinson	2	1.2	Lake	--	--	Oceana	2	1.2
Alger	--	--	Eaton	--	--	Lapeer	3	1.8	Ogemaw	--	--
Allegan	2	1.2	Emmet	2	1.2	Leelanau	1	0.6	Ontonagon	--	--
Alpena	1	0.6	Genesee	6	3.7	Lenawee	3	1.8	Osceola	1	0.6
Antrim	--	--	Gladwin	--	--	Livingston	3	1.8	Oscoda	--	--
Arenac	2	1.2	Gogebic	--	--	Luce	--	--	Otsego	--	--
Baraga	1	0.6	Grand Traverse	3	1.8	Mackinac	--	--	Ottawa	1	0.6
Barry	3	1.8	Gratiot	1	0.6	Macomb	7	4.3	Presque Isle	--	--
Bay	2	1.2	Hillsdale	2	1.2	Manistee	1	0.6	Roscommon	--	--
Benzie	3	1.8	Houghton	--	--	Marquette	1	0.6	Saginaw	3	1.8
Berrien	4	2.5	Huron	--	--	Mason	1	0.6	St. Clair	2	1.2
Branch	4	2.5	Ingham	5	3.1	Mecosta	1	0.6	St. Joseph	--	--
Calhoun	4	2.5	Ionia	1	0.6	Menominee	--	--	Sanilac	--	--
Cass	2	1.2	Iosco	1	0.6	Midland	1	0.6	Schoolcraft	--	--
Charlevoix	--	--	Iron	--	--	Missaukee	1	0.6	Shiawassee	--	--
Cheboygan	1	0.6	Isabella	1	0.6	Monroe	3	1.8	Tuscola	1	0.6
Chippewa	2	1.2	Jackson	3	1.8	Montcalm	2	1.2	Van Buren	1	0.6
Clare	1	0.6	Kalamazoo	3	1.8	Montmorency	--	--	Washtenaw	6	3.7
Clinton	5	3.1	Kalkaska	--	--	Muskegon	3	1.8	Wayne	25	15.3
Crawford	--	--	Kent	6	3.7	Newaygo	1	0.6	Wexford	2	1.2
Delta	1	0.6	Keweenaw	1	0.6	Oakland	12	7.4	Unknown	--	--

Figure 2. County of Fatal Work-Related Injury, Michigan 2019

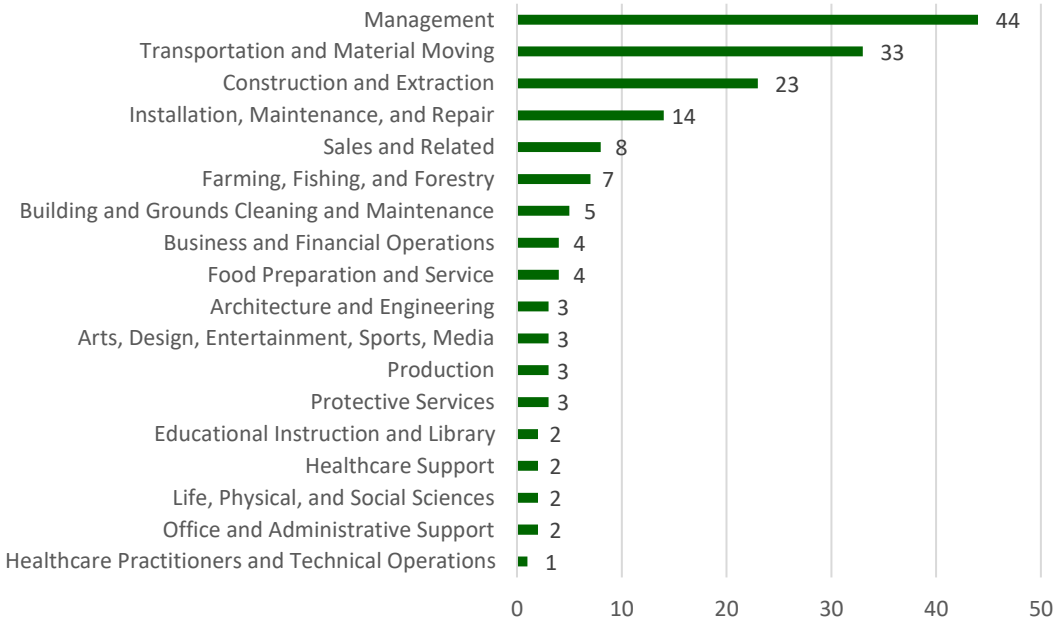


Collectively, the four southeast Michigan Counties of Macomb, Oakland, Washtenaw, and Wayne had 50 (30.7%) of all work-related deaths. Wayne County had the highest number of deaths (25, 15.3%), followed by Oakland (12, 7.4%), Macomb (7, 4.3%), Washtenaw, Genesee, and Kent (6, 3.7%), and Clinton and Ingham (5, 3.1%).

Occupation

Figure 3 shows the occupation distribution of the 163 work-related deaths utilizing 2019 Standard Occupational Classification (SOC) categories. Occupation was determined from the reporting source data. The SOC categories are divided into 23 major groups. These major groups combine occupations according to the nature of the work performed, placing all people who work together into the same group regardless of their skill level.

Figure 3. Number of Deaths by Standard Occupational



The Management occupations major group had the largest number of deaths (44, 27.0%). Management occupations are varied, such as general managers, legislators, sales and marketing managers, education, and childcare administrators as well as the self-employed and owner/co-owner of a business, farmers, ranchers, and other agricultural managers.

The Transportation and Material Movers group had the second highest number of deaths (33, 20.2%), followed by Construction and Extraction Occupations (23, 14.1%), and Installation, Maintenance and Repair Occupations (14, 8.6%).

Five of the twenty-three SOC major groups (Personal Care and Service, Computer and Mathematical Occupations, Military Specific, Legal, and Community and Social Services) had no deaths this year.

Working Status of the Decedent

The 163 individuals who died had 160 different employers. The employer/employee status was known for 156 of the 163 (95.7%) work-related deaths. Ninety-five (58.3%) individuals were employees. Fifty-seven (35%) were self-employed or the owner/co-owner of the business, and four (2.4%) individuals were volunteer workers.

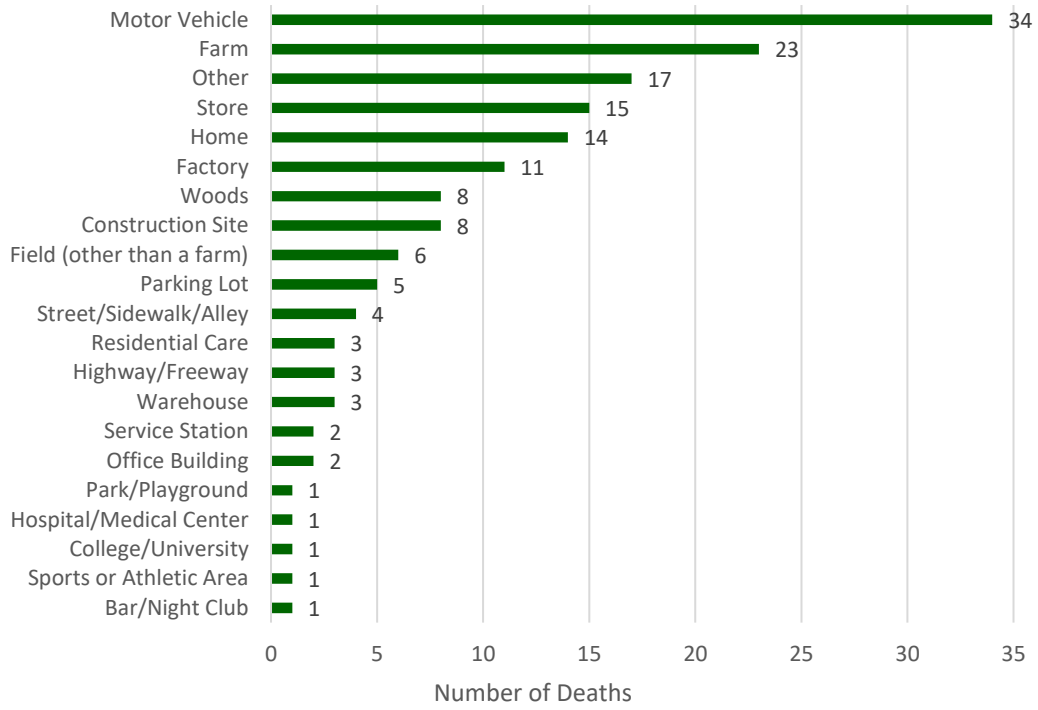
The decedent was working alone in 108 (66.2%) incidents and with a coworker in 44 (27%) incidents. The work status was unknown in eleven incidents. For homicides, the decedent was working alone in seven (63.6%) incidents and with a coworker in 3 (27.3%) incidents. For one homicide, it was unknown if the decedent was working alone or with a coworker at the time of the incident.

Location of Injury

The location of injury for the fatal incident was identified for all the 163 deaths. Beginning in 2012, MIFACE began using a coding system for location as follows: a) Designations of specific buildings (such as "house, apartment" or "bar, nightclub") include both the building itself and the area directly outside, such as a driveway, porch, or front walk; b) If a victim was injured in a variety of locations (e.g., the victim was stabbed on a bus and was pursued by the attacker off the bus and into a store and stabbed a second time), the location at which the victim was first injured was coded; c) Events that occurred on public sidewalks were coded as "street," with the exception of those occurring on sidewalks that were the private property of an adjacent building, which were coded to the building. For example, an incident that occurred on a walkway on the front lawn of a home was coded as "house, apartment". If an incident occurred in a garage at a private home, "house, apartment" was coded. If an incident occurred in a commercial parking garage, parking lot, or a garage used by four or more different households (e.g., a garage serving a large apartment building), the location "parking lot/public parking garage" was used; d) If an incident occurred while the victim was in a motor vehicle, the place of injury was coded as a "motor vehicle" - for annual report years 2001-2011, MIFACE coded the location (street/road) rather than "motor vehicle".

Figure 4 depicts the distribution of incident locations for the 2019 traumatic deaths. A motor vehicle was the location where the largest number of the fatal injuries occurred (34, 20.8%). A farm was the site of 23 (14.1%) incidents. Fifteen (9.2%) of the incidents occurred at a store and fourteen (8.6%) at home. Seventeen (10.4%) locations did not strictly meet the locations used by medical examiners on death certificates; examples include a truck stop, military base, quarry, fire station, recording studio, etc.

Figure 4. Location and Number of Fatal Work-Related Injuries, Michigan 2019



Location of Death

For 107 (65.6%) individuals, the death certificate indicated the death occurred at the scene of the traumatic incident, for 50 (30.7%), in the hospital, four (2.4%), at home, one (0.6%) in the ambulance, and one (0.6%) in a nursing home.

Illegal Drug/Alcohol/Medication Use

Of the 132 individuals whose death was not a suicide (23 deaths) or a drug overdose (8 deaths), 53 (40.2%) individuals had detectable levels of alcohol, marijuana, illegal drugs or medications in their system. Twenty-four (45.3%, 18.2% of total non-suicide/drug overdose deaths) of these in turn had levels that were considered on review to possibly have contributed to the fatal incident (**Table 5**).

Several states have adopted a legal limit of 5 µg/l (5 ng/ml) for marijuana (THC) in blood for being impaired while driving. Although this level does not directly correlate with impairment as does blood alcohol levels, the THC level of 5 µg/l was used to define that marijuana use was possibly related to the death. It was unknown if the presence of hydrocodone, oxycodone, fentanyl, amphetamine, morphine and marijuana was from the use of a prescribed medication or from illegal use.

Table 5. Type of Work-Related Fatal Incident and Drug Found in Toxicological Analysis Among 24 Individuals Where the Substance Detected was Considered a Possible Contributor to the Individual's Death, Michigan 2019

Incident Type	Alcohol level (blood %)	Prescription	Marijuana &/or marijuana metabolite	Cocaine, Heroin, metabolites	Other Illegal	Unknown Prescription/ Non-Prescription
Aircraft						Fentanyl
Electrocution			√			Amphetamine
Electrocution		Topiramate	√			Amphetamine
Fall						Fentanyl
Fall		Levetiracetam	√			Morphine
Fall		Levetiracetam				
Fire/Explosion		Alprazolam	√			Amphetamine
Homicide		Phentermine, Midazolam				Fentanyl
Homicide			√			
Homicide			√			
Homicide	0.016	Doxylamine	√			
Homicide	0.094			√		
Machine		Gabapentin, Memantine, Citalopram	√			
Machine			√			
Motor Vehicle			√	√		
Motor Vehicle		Levetiracetam	√			
Motor Vehicle			√		Meth-amphetamine	Amphetamine
Motor Vehicle	0.202		√			
Struck-By						Hydrocodone
Struck-By						Fentanyl
Struck By			√			
Struck By				√		
Toxic Exposure						Oxycodone
Toxic Exposure					Meth-amphetamine	Amphetamine

Work-Related Fatality Incidence Rates by Industry

Employment-based incidence rates measure the risk of fatal injury for those employed during a given period, regardless of hours worked.

Hours-based incidence rates measure fatality risk per standardized length of exposure. Hours-based rates use the average number of employees at work and the average hours each employee works (40 hours/week, 50 weeks/year).

The BLS uses hours-based incidence rates to measure fatality risk for industry sectors.

Employment-based and hours-based incidence rates will be similar for industries which tend to have full-time employees. However, differences will be observed for industries that tend to have a high percentage of part-time workers, such as in the fast-food industry.

The number of hours worked was not available for several industry sectors. When provided, MIFACE calculated the hours-based work-related fatality incidence rate (See **Table 6**).

Michigan data shows that in industry sectors with many part-time workers (30 hours or less), the work-related fatality hours- based rate is higher than the employment- based incidence rate, such as in Retail Trade and Accommodation & Food Service. When the number of hours worked is 40 hours or more, the hours-based incidence rate is similar to or lower than the employment-based incidence rate, such as in Construction, Manufacturing, and Wholesale Trade.

Industry Highlights, Michigan 2019

Table 6 shows the number of traumatic work-related fatalities and Michigan's annual incidence rate by industry sector for number of employees and hours worked.

Highlights from Table 6:

Seven industry sectors had fewer work-related deaths and a lower employment-based incidence rate in 2019 compared to 2018:

Industry	Decrease in Number of Deaths from 2018	Number of 2019 WR Deaths	2019 Incidence Rate	Number of 2018 WR Deaths	2018 Incidence Rate
Utilities	3	1	4.9	4	19.7
Manufacturing	5	13	2.1	18	2.9
Real Estate & Rental & Leasing	2	2	3.6	4	7.3
Admin & Support & Waste & Remediation	7	7	2.5	14	4.8
Arts, Entertainment & Recreation	2	3	5.6	5	9.4
Accommodation & Food Services	3	4	1.1	7	1.8
Other Services	4	8	5.7	12	8.6

Seven industry sectors had a higher number of work-related deaths and a higher employment-based incidence rate in 2019 compared to 2018:

Industry	Increase in Number of Deaths from 2018	Number of 2019 WR Deaths	2019 Incidence Rate	Number of 2018 WR Deaths	2018 Incidence Rate
Agriculture	9	32	38.8	23	26.9
Construction	7	31	17.9	24	14.2
Wholesale Trade	5	9	5.3	4	2.3
Retail Trade	1	14	3.0	13	2.8
Transportation & Warehousing	2	21	15.4	19	12.9
Professional, Scientific & Technical Services	3	3	1.0	0	--
Health Care & Social Assistance	3	5	0.8	2	0.3

Four industry sectors had the same number of work-related deaths in 2019 compared to 2018 (although the incidence rate varies due to fluctuating levels of employment).

Industry	Number 2018 & 2019 WR Deaths	Incidence Rate 2019	Incidence Rate 2018
Mining	2	36.1	36.6
Information	1	1.8	1.8
Educational Services	3	0.8	0.8
Public Administration	4	1.5	1.6

The industry sector with the highest employment-based industry rate was Agriculture (38.8 deaths/100,000 workers), followed by Mining (36.1 deaths/100,000 workers), and then Construction (17.9/100,000 workers). The industry subsector with the highest overall incidence rate was Forestry and Logging (under Agriculture), which had an incidence rate of 257.3 deaths/100,000 workers.

Table 6. Number of Traumatic Work-Related Fatalities by Industry and Incidence Rates by Number of Employees and by Hours Worked, Michigan 2019						
Industry Sector (NAICS Code)	**Number**	**Percent**	**Employment-Based**		**Hours-Based**	
			Number Employees[a]	**Rate[d]**	**Number Hours[e]**	**Rate[g]**
Agriculture, Forestry, Fishing & Hunting (11)	**32**	**19.6**	**82,387[b]**	**38.8**	**	**
Crop Production (111) (Owners/Operators)	14	8.6	51,156[b]	27.4	**	**
Crop Production (111) (Hired Workers)	1	0.6	59,903[b]	1.7	38.5[f]	5.4
Animal Production (112) (Hired Workers)	3	1.8	17,572[b]	17.1		
Animal Production (112) (Owners/Operators)	7	4.3	29,276[b]	23.9	**	**
Forestry & Logging (113)	5	3.1	1,943	257.3	**	**
Support Activities for Agriculture (115)	2	1.2	2,969	67.4	**	**
Mining (21)	**2**	**1.2**	**5,541**	**36.1**	**	**
Mining (Except Oil and Gas) (212)	1	0.6	3,429	29.2	**	**
Support Activities for Mining (213)	1	0.6	1,577	63.4	**	**
Utilities (22)	**1**	**0.6**	**20,591**	**4.9**	**	**
Utilities (221)	1	0.6	20,591	4.9	**	**
Construction (23)	**31**	**19.0**	**173,015**	**17.9**	**40.0**	**17.9**
Construction of Buildings (236)	7	4.3	42,942	16.3	40.5	16.1
Heavy & Civil Engineering Construction (237)	4	2.5	18,881	21.2	**	**
Specialty Trade Contractors (238)	20	12.3	111,262	17.8	39.2	18.3
Manufacturing (31-33)	**13**	**8.0**	**625,769**	**2.1**	**42.5**	**2.0**
Food Processing (311)	2	1.2	38,249	5.2	**	**
Beverage and Tobacco Products (312)	1	0.6	8,673	11.5	**	**
Primary Metal (331)	3	1.8	22,349	13.4	**	**
Fabricated Metal Products (332)	2	1.2	79,660	2.5	41.5	2.4
Machinery (333)	1	0.6	73,266	1.4	42.6	1.3
Transportation Equipment (336)	4	2.5	189,826	2.1	46.6	1.8
Wholesale Trade (42)	**9**	**5.5**	**171,233**	**5.3**	**37.7**	**5.6**
Merchant Wholesalers, Durable Goods (423)	8	4.9	105,591	7.6	39.3	7.7
Merchant Wholesalers, Non-durable Goods (424)	1	0.6	51,020	2.0	**	**
Retail Trade (44-45)	**14**	**8.6**	**463,435**	**3.0**	**29.4**	**4.1**
Motor Vehicle & Parts Dealers (441)	2	1.2	64,447	3.1	37.0	3.4
Furniture and Home Furnishings Stores (442)	1	0.6	12,592	7.9	**	**
Electronics and Appliance Stores (443)	1	0.6	13,568	7.4	**	**
Food & Beverage Stores (445)	3	1.8	76,982	3.9	**	**
Gasoline Stations (447)	3	1.8	27,486	10.9	**	**
General Merchandise Stores (452)	2	1.2	104,465	1.9	**	**
Non-store Retailers (454)	2	1.2	8,953	22.3	**	**
Transportation & Warehousing (48-49)	**21**	**12.9**	**136,245**	**15.4**	**	**
Air Transportation (481)	4	2.5	15,192	26.3	**	**
Truck Transportation (484)	14	8.6	48,382	28.9	**	**
Transit & Ground Passenger Transportation (485)	1	0.6	10,220	9.8	**	**
Support Activities for Transportation (488)	1	0.6	15,953	6.3	**	**
Warehousing and Storage (493)	1	0.6	27,006	3.7	**	**

Table 6. Number of Traumatic Work-Related Fatalities by Industry and Incidence Rates by Number of Employees and by Hours Worked, Michigan 2019, Cont.						
Industry Sector (NAICS Code)	**Number**	**Percent**	**Employment-Based**		**Hours-Based**	
			Number Employees[a]	**Rate**[d]	**Number Hours**[e]	**Rate**[g]
Information (51)	**1**	**0.6**	**55,298**	**1.8**	**34.5**	**2.1**
Broadcast (except Internet) (515)	1	0.6	4,818	20.8	**	**
Real Estate & Rental & Leasing (53)	**2**	**1.2**	**55,978**	**3.6**	**	**
Real Estate (531)	2	1.2	41,454	4.8	**	**
Professional, Scientific, and Technical Services (54)	**3**	**1.8**	**299,168**	**1.0**	**35.4**	**1.2**
Professional, Scientific and Technical Services (541)	3	1.8	299,168	1.0	35.4	1.2
Administrative & Support & Waste Management & Remediation Services (56)	**7**	**4.3**	**285,188**	**2.5**	**	**
Administrative & Support Services (561)	4	2.5	272,277	1.5	**	**
Waste Management & Remediation Services (562)	3	1.8	12,911	23.2	**	**
Educational Services (61)	**3**	**1.8**	**377,004**	**0.8**	**	**
Educational Services (611)	3	1.8	377,004	0.8	**	**
Health Care & Social Assistance (62)	**5**	**3.1**	**597,379**	**0.8**	**31.5**	**1.1**
Ambulatory Health Care (621)	1	0.6	206,701	0.5	**	**
Nursing and Residential Care Facilities (623)	3	1.8	106,899	2.8	**	**
Social Assistance (624)	1	0.6	73,796	1.4	**	**
Arts, Entertainment, & Recreation (71)	**3**	**1.8**	**53,493**	**5.6**	**21.7**	**10.3**
Performing Arts, Spectator Sports, & Related Industries (711)	3	1.8	9,452	31.7	**	**
Accommodation & Food Services (72)	**4**	**2.5**	**380,806**	**1.1**	**23.5**	**1.8**
Food Services & Drinking Places (722)	4	2.5	336,596	1.2	**	**
Other Services (except Public Administration) (81)	**8**	**4.9**	**140,351**	**5.7**	**31.0**	**7.4**
Repair & Maintenance (811)	6	3.7	42,460	14.1	**	**
Personal and Laundry Services (812)	1	0.6	41,786	2.4	**	**
Religious, Grantmaking, Civic, Professional & Similar Organizations (813)	1	0.6	42,746	2.3	**	**
Public Administration (92)	**4**	**2.5**	**267,500**[c]	**1.5**	**	**
Executive, Legislative, and Other General Governmental Support (921)	1	0.6	**	**	**	**
Justice, Public Order, & Safety Activities (922)	1	2.5	**	**	**	**
Administration of Environmental Quality Programs (924)	1	0.6	**	**	**	**
Administration of Economic Programs (926)	1	0.6	**	**	**	**
Totals	**163**		**4,748,000**[i]	**3.4**	**34.3**	**4.0**

[a] Employment numbers from Michigan Department of Technology, Management and Budget (DTMB), Bureau of Labor Market Information and Strategic Initiatives, QCEW Industry Employment and Wages (https://milmi.org/DataSearch/QCEW) unless otherwise noted.

[b] 2017 United States Department of Agriculture Census of Agriculture, Michigan-level data, Table 75. Summary by North American Industry Classification System (https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_State_Level/Michigan/st26_1_0075_0075.pdf). Number of owners/operators are defined as the number of "producers" in Table 75 summed by industry group (crop or animal). Hired workers are defined as the number of "hired farm labor" in Table 75 by industry group. Total number of employees in NAICS Sector 11 defined as total number of producers (owner/operators) for crop and animal production added to the number of employees in sectors 113 and 115, excluding the count of "hired workers". See below for discussion.

[c] Public Administration employment from Michigan DTMB, Bureau of Labor Market Information and Strategic Initiatives, Current

Employment Statistics (CES) (https://milmi.org/DataSearch/CES). Total employment for NAICS 92 defined as the sum of Federal, State, and Local government workers less the number employed in state and local education and hospitals.
[d] Employment-based incidence rates calculated per 100,000 full-time equivalent (FTE) workers.
[e] Average number of hours worked per week by industry taken from Michigan DTMB CES estimates (https://milmi.org/DataSearch/CES) unless otherwise noted.
[f] Number of hours worked per week by hired farm workers in the Lake Region for 2018 as reported in the Quick Stats Search Option from the USDA National Agricultural Statistics Service. https://quickstats.nass.usda.gov/#254B031F-6509-33A5-90C1-BB38DB46B6A6. Corresponding hours-based rate is calculated using the number of hired farm worker fatalities from the Crop and Animal production sectors combined.
[g] Hours-based incidence rates calculated as (N/EH)*200,000,000, where N is the number of fatalities, EH is the total employee-hours (number of employees * average number of hours worked per week * 50 weeks), and 200,000,000 is the benchmark number of hours worked by 100,000 FTE (40 hour/week) employees in one year.
[h] The number of workers in the Public Administration sector was calculated as the sum of Federal, State, and Local government employees in Michigan, minus the number of USPS, state and local hospital, and state and local education workers. All numbers from Michigan DTMB CES estimates (https://milmi.org/DataSearch/CES).
[l] Total 2018 state employment taken from Michigan DTMB LAUS report (https://milmi.org/DataSearch/LAUS).
[J] Michigan CFOI 2018 hours-based incidence rate
https://www.bls.gov/iif/oshwc/cfoi/staterate2018.htm
** No data available from corresponding sources.

Table 7 compares the employment-based and hours-based work-related fatality incidence rates by industry in Michigan to national hours-based rates for 2019 as computed by the Bureau of Labor Statistics (BLS). When calculating the fatal injury rates for the United States, BLS excludes workers under the age of 16 years, volunteers, and the resident military.

In 2019, the overall employment-based fatality rate per 100,000 workers (3.4) calculated by the MIFACE program was lower than the BLS-calculated hours-based fatality incidence rate (3.5/100,000 FTEs) in the United States.

However, caution should be used when comparing hours-based and employment-based fatal injury rates because of the differences in the denominators used. When available, MIFACE used Michigan-specific hourly rates from Michigan DTMB CES; when unavailable, MIFACE used the BLS CFOI State-based hourly rate for Michigan.

Overall, Michigan's hours-based work-related fatality rate was higher than the U.S. national rate (4.0 vs 3.5). For the industries for which MIFACE or BLS calculated a Michigan-specific hour-based rate and for which BLS also calculated a nationwide hours-based rate, most Michigan industry groups had a higher hours-based rate than the U.S. rate for that industry. The exception to this was in the Accommodation and Food Services sector (1.8 vs 2.0) (**Table 7**).

Table 7. Traumatic Work-Related Fatalities by Industry Sector, Michigan Incidence Rates Compared to US Incidence Rates, 2019				
Industry Sector (NAICS Code)	**Number of Fatalities**	**2019 MI Employment-based Rate[a]**	**2019 MI Hours-Based Rate[a]**	**2019 US Hours-Based Rate[b]**
Agriculture, Forestry, Fishing and Hunting (11)	32	38.8	62.3[c]	23.1
Mining (21)	2	36.1	**	14.6
Utilities (22)	1	4.9	**	2.0
Construction (23)	31	17.9	17.9	9.7
Manufacturing (31-33)	13	2.1	2.0	**
Wholesale Trade (42)	9	5.3	5.6	4.9
Retail Trade (44-45)	14	3.0	4.1	2.0
Transportation & Warehousing (48-49)	21	15.4	**	13.9
Information (51)	1	1.8	2.1	**
Finance and Insurance (52)	0	--	--	1.0
Real Estate and Rental and Leasing (53)	2	3.6	**	2.9
Professional & Business Services (54)	3	1.0	1.2	0.7
Administrative & Support & Waste Management & Remediation Services (56)	7	2.5	**	**
Educational Services (61)	3	0.8	**	1.0
Health Care & Social Assistance (62)	5	0.8	1.1	0.8
Arts, Entertainment, & Recreation (71)	3	5.6	10.3	3.1
Accommodation & Food Services (72)	4	1.2	1.8	2.0
Other Services (except Public Administration) (81)	8	5.7	7.4	3.0
Public Administration (92)	4	1.5	**	1.8
Total	**163**	**3.4**	**4.0**	**3.5**

[a] From Table 6 unless otherwise noted

[b] US Bureau of Labor Statistics Census for Fatal Occupational Injuries (CFOI), Hours-based fatal injury rates by industry, occupation, and selected demographic characteristics, 2019 (https://www.bls.gov/iif/oshwc/cfoi/cfoi_rates_2019hb.xlsx)

[c] MI Hours-based rate taken from BLS CFOI data (https://www.bls.gov/iif/oshwc/cfoi/staterate2019.htm)

** No rate available from either MIFACE or CFOI

Means of Work-Related Death

The means of death was known for all 163 work-related deaths in Michigan in 2019 **(Table 8)**. Motor vehicle crashes were the leading cause of a work-related death (31, 19.0%) and suicides were the second leading cause of a work-related death (23, 14.1%), followed by struck by incidents (21, 12.9%) and machines (20, 12.3%).

Motor vehicle crashes were the leading (or tied for the leading) means of death in 8 of 18 (44.4%) industry sectors, including Manufacturing (23.1% of deaths within the sector), Wholesale Trade (44.4%), Transportation and Warehousing (52.4%), Administrative, Support, Waste Management & Remediation Services (28.6%), Educational Services (33.3%), Arts, Entertainment, and Recreation (33.3%), Public Administration (25.0%), and Information (100.0%).

Suicides were the, or one of the, leading causes of deaths in 5 sectors (27.8%), including Retail Trade (5 deaths, 35.7%), Educational Services (1 death, 33.3%), Health Care and Social Assistance (3 deaths, 60.0%), Accommodation and Food Services (1 death, 50.0%), and

Other Services (3 deaths, 30.0%).

Struck by incidents were the, or one of the, leading means of death in 5 sectors (27.8%), including Agriculture, Forestry, Fishing and Hunting (6 deaths, 18.75%), Wholesale Trade (3 deaths, 33.3%), Arts, Entertainment, and Recreation (1 death, 33.3%), Public Administration (1 death, 25.0%) and Other Services (3 deaths, 30.0%).

Machines were one of the leading causes of death in 3 sectors: Agriculture, Forestry, Fishing and Hunting (12 deaths, 37.5%), Construction (6 deaths, 19.4%), and Public Administration (1 death, 25.0%).

Fatal falls occurred in 9 (50.0%) of the industry sectors and were a leading means of death in Construction (10 deaths, 32.2%), Professional, Scientific, and Technical Services (1 death, 33.3%), and Accommodation and Food Services (1 death, 50.0%).

The leading means of death in Agriculture, Forestry, Fishing and Hunting were machine-related incidents (12, 37.5%); these 12 deaths comprised sixty percent of all machine-related incidents that occurred in 2019.

Table 9 displays the number of fatalities across leading means of death by year from 2001-2019. Certain means of death, such as "medical", have been omitted from this table for space due to a low number of deaths. There are variations in the means of death each year and because of small numbers in any given means of death, it is difficult to identify any temporal trends.

In 2018, a review of the MIFACE database was performed to standardize the categorization of death by motor vehicle. All motor vehicle entries were reviewed and if the death was a result of the deceased being a driver or passenger in a motor vehicle crash, the death was categorized as a motor vehicle crash. If the death was caused by a motor vehicle striking a pedestrian or a worker on a machine, then the categorization of the death was changed from motor vehicle to struck by.

In Michigan, in 2018, there was a 150% increase in the number of fatal drug overdoses at Michigan workplaces (4 in 2017 to 10 in 2018). While the number decreased in 2019 to 8, 31% of all drug overdoses in the workplace from 2001-2019 occurred in 2018-2019. This increase mirrors national trends of increasing opioid (such as fentanyl, heroin, and hydrocodone), stimulant (such as cocaine and methamphetamine) and alcohol use both at home and at work.

Table 8. Traumatic Work-Related Fatalities by Means of Death and Industry Sector, Michigan 2019

Industry Sector (NAICS)	Aircraft	Animal	Asphyxiation	Drowning	Drug Overdose	Electrocution	Explosion/ Fire	Fall	Heat/Cold	Homicide	Machine	Motor Vehicle	Struck by	Suicide	Toxic Exposure	Total
Agriculture, Forestry, Fishing & Hunting (11)	--	3	--	--	--	1	1	1	--	--	12	3	6	4	1	**32**
Mining (21)	1	--	--	--	--	--	1	--	--	--	--	--	--	--	--	**2**
Utilities (22)	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	**1**
Construction (23)	1	--	--	--	--	3	--	10	--	1	6	1	4	2	3	**31**
Manufacturing (31-33)	--	--	--	--	2	--	1	1	--	--	1	3	1	2	2	**13**
Wholesale Trade (42)	--	--	--	--	1	--	--	--	--	1	--	4	3	--	--	**9**
Retail Trade (44-45)	--	--	--	--	2	--	--	2	1	2	--	1	1	5	--	**14**
Transportation & Warehousing (48-49)	5	--	--	--	--	--	--	1	--	1	--	11	1	2	--	**21**
Information (51)	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	**1**
Real Estate, Rental, & Leasing (53)	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	**2**
Professional, Scientific, and Technical Services	2	--	--	--	--	--	--	1	--	--	--	--	--	--	--	**3**
Administrative & Support & Waste Management & Remediation Services (56)	--	--	--	1	1	1	1	1	--	--	--	2	--	--	--	**7**
Educational Services (61)	--	--	1	--	--	--	--	--	--	--	--	1	--	1	--	**3**
Health Care & Social Assistance (62)	--	--	--	--	1	--	--	--	--	1	--	--	--	3	--	**5**
Arts, Entertainment, & Recreation (71)	--	--	--	--	--	--	--	--	--	1	--	1	1	--	--	**3**
Accommodation & Food Services (72)	--	--	--	--	--	--	--	1	--	--	--	2	--	1	--	**4**
Other Services (except Public Administration) (81)	--	--	--	--	1	--	--	1	--	--	--	--	3	3	--	**8**
Public Administration (92)	--	--	--	--	--	--	--	--	--	1	1	1	1	--	--	**4**
Total	**9**	**3**	**1**	**1**	**8**	**5**	**4**	**19**	**1**	**11**	**20**	**31**	**21**	**23**	**6**	**163**

Table 9. Leading Means of Death by Year, 2001-2019

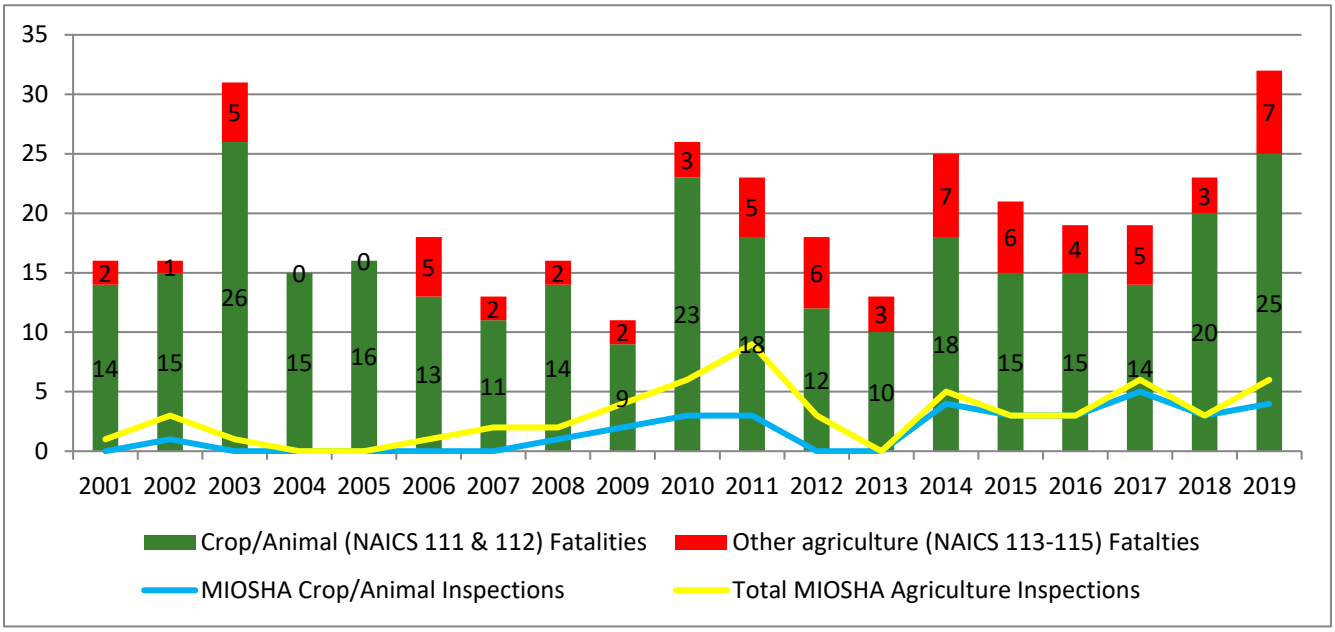
Year	Motor Vehicle	Struck-by	Fall	Homicide	Machine	Suicide	Electrocution	Aircraft	Toxic Exposure	Fire/Explosion	Drug Overdose	Drowning	Asphyxiation	Animal	Heat/Cold
2001	29	19	26	24	32	12	4	6	4	6	1	2	3	1	2
2002	28	21	21	22	20	11	8	5	4	4	--	2	1	2	2
2003	27	20	19	15	36	5	10	2	3	4	3	1	4	2	1
2004	26	16	16	22	26	4	7	4	4	3	1	--	1	1	--
2005	23	11	20	16	18	2	4	6	2	4	3	1	--	--	--
2006	32	34	24	11	14	8	10	8	6	4	1	2	1	2	--
2007	26	19	17	21	16	6	4	--	4	1	2	--	--	2	1
2008	22	23	26	14	12	9	5	--	2	3	2	1	1	1	--
2009	18	19	14	11	7	12	5	2	--	--	4	--	1	2	--
2010	23	20	24	26	16	11	7	4	6	3	2	2	--	--	1
2011	22	16	21	15	20	16	7	7	4	3	1	1	2	2	2
2012	31	19	18	28	14	12	3	--	--	--	2	3	--	--	--
2013	24	27	19	16	10	22	2	2	1	3	3	--	1	--	1
2014	26	30	24	19	11	9	5	5	--	1	4	3	3	3	--
2015	25	23	18	22	15	12	5	3	4	3	3	2	2	1	--
2016	28	19	32	22	19	13	5	1	9	2	5	3	1	1	1
2017	28	27	26	25	9	17	5	--	--	4	4	6	1	--	--
2018	24	36	21	22	10	15	5	3	2	4	10	2	4	1	--
2019	31	21	19	11	20	23	5	9	6	4	8	1	1	3	1
Total	493	420	408	362	325	219	106	67	61	56	59	32	27	24	12

Highlights and Discussion by Select Industries and Means of Death

Agriculture, Forestry, Fishing & Hunting (NAICS 11)

Figure 5 shows the number of fatalities in the Agriculture, Forestry, Fishing and Hunting sector (NAICS 11), split between crop and animal-raising industries (NAICS 111 and 112, respectively) and other agricultural industries (NAICS 113-115), by year for 2001-2019. The Figure also shows the number of fatalities which were investigated through MIOSHA fatality inspections by year.

Figure 5. Number of Agriculture Fatalities and MIOSHA Inspections, 2001-2019



In providing funding for Occupational Safety and Health Administration (OSHA) and hence the MIOSHA program, the U.S. Congress placed restrictions on use of federal funds for program activities regarding two categories of employers: small farming operations and small employers in low-hazard industries. This is solely a restriction on expending federal funds; it does not prohibit state-funded MIOSHA activities at these worksites.

The MIOSHA Act defines Agriculture as "agricultural operations as the work activity designated in major groups 01 and 02 of the Standard Industrial Classification (SIC) manual, United States Bureau of the Budget, 1972 edition. Agricultural operations include any practices performed by a farmer or on a farm as an incident to or in conjunction with farming operations including preparation for market delivery to storage or market or to carriers for transportation to market (MCL 408.10004(1))".

The federal Appropriations Act exempts small farming operations from federally-funded activities. Only State funds can be used by MIOSHA for interventions at farming operations when a farm operation:

- Employs 10 or fewer employees currently and at all times during the preceding 12 months; and

- Has not had an active temporary labor camp during the preceding 12 months.

It is important to note that immediate family members of farm employers are not counted when determining the number of employees. Most agricultural work-related deaths in Michigan have occurred on family farms with fewer than 10 employees and who did not have an active temporary labor camp. Therefore, few MIOSHA work-related fatality inspections on family farm operations have been performed.

The average age of those who died working in Agriculture in 2019 was 58.5 years, with a range of 19-89 years. **Table 10** shows the average age at the time of death for the past 19 years for those employed in Agriculture. In 15 of the 19 previous years (78.9%), the average age of the individual was in their 50s or 60s.

Table 10. Age at Time of Death, Agriculture, Michigan 2001-2019

Year	Age (in years)	Year	Age (in years)
2001	47.4	2011	56.6
2002	48.0	2012	52.2
2003	58.1	2013	56.6
2004	59.7	2014	46.8
2005	54.9	2015	55.3
2006	49.9	2016	61.0
2007	54.2	2017	52.5
2008	67.9	2018	58.4
2009	51.5	2019	58.5
2010	53.0		

Special Considerations Regarding Employment Estimates in Agriculture

Traditional farm operations (Crop and Animal Production) accounted for 25 of the 32 (78.1%) deaths in 2019. Twenty-one of the 25 (84.0%) known work-related deaths were identified as a farm owner/operator, while four (16.0%) were identified as hired labor.

Hired labor includes paid family members, bookkeepers, office workers, maintenance workers, etc., if their work was primarily associated with agricultural production on the operation. Hired labor excludes contract (migrant) laborers. Unpaid workers likely make up a significant portion of the agricultural workforce – the 2017 USDA Census of Agriculture reports 77,475 hired workers and 54,839 unpaid workers (https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_State_Level/Michigan/st26_1_0075_0075.pdf).

The number of migrant workers was not noted on the 2017 Agricultural Census, only the number of farms utilizing migrant labor. The 2013 Michigan Migrant and Seasonal Farmworker Enumeration Profiles Study estimated 49,135 migrant and seasonal farm laborers in 2013. Seasonal farm labor was described as "an individual whose principal employment is in agriculture on a seasonal basis, who has been so employed within the last twenty-four months" (https://www.michigan.gov/documents/dhs/FarmworkerReport_430130_7.pdf).

Migrant farm workers were defined as meeting the seasonal farm labor definition but "establishes for the purposes of such employment a temporary abode" (U.S. Code, Public Health Services Act, "Migrant Health"). Migrant farm workers include both individuals who met the definition of a migrant but only travel within the state of Michigan (intrastate migrants) and others who come from outside the state to work in Michigan (interstate migrants). The 2017 USDA Census of Agriculture reports that 11,907 farms in Michigan reported using hired labor, while only 828 reported using migrant labor

If the total number of Agricultural operators (80,432), hired farm labor (77,475), and unpaid workers (54,839) identified in the 2017 Agriculture Census are added to the above estimate for migrant and seasonal farm laborers (49,135), as well as to the number of employees working in Forestry & Logging (1,943), Fishing, Hunting and Trapping (199) and Agricultural Support Activities (2,969) estimated by the Michigan DTMB in 2019, the total number of workers in Agriculture was 266,992. The increase in the number of workers in Agriculture, Fishing, Forestry and Hunting would dramatically lower the NAICS 11 Agriculture, Forestry, Hunting and Fishing work-related fatality incidence rate from 38.8 deaths/100,000 workers to 12.0. Both rates are appreciably lower than the BLS CFOI hours-based rate for Michigan of 62.3, which only includes hired employees. If only employment estimates from the Michigan DTMB Industry Employment and Wages report are used, the number of workers in agriculture totals only 30,081, which would drive the employment-based rate up to 106.4.

The transient nature of crop production complicates the picture of Agricultural employment. A single farm may produce several crops utilizing hired labor to harvest. Workers may come and go (leave the state) to harvest other crops. Given that many of these work stints may be for durations significantly shorter than a year, it is possible that many hired and/or migrant workers will work at multiple farms in a year, each of which may count the worker in their reported number of hired workers, leading to overestimation of total employment in the industry.

Due to uncertainties regarding the true total number of hired, unpaid, and seasonal/migrant workers, and which of these categories may be overlapping or enveloped by others, the employment-based incidence rate of work-related fatalities across Agriculture (38.8/100,000 workers) utilizes only the total number of operators in Crop and Animal Production reported by the USDA Census combined with employee counts for Forestry & Logging, Fishing, Hunting and Trapping and Agricultural Support Activities from the Michigan DTMB. It is likely that the most accurate employment-based incidence rate lies somewhere between this number and the rate given when all possible counts of hired, unpaid, and migrant labor are combined (12.0/100,000 workers).

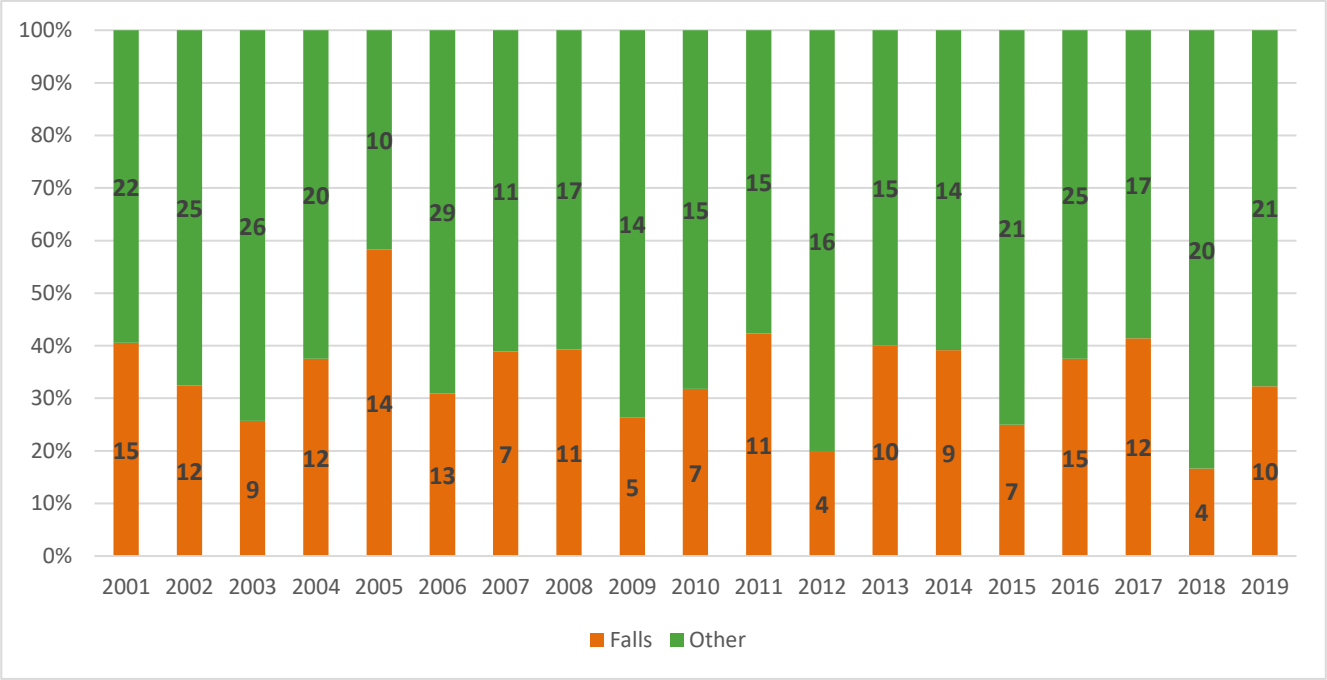
Construction (NAICS 23)

The number of deaths in Construction increased by 7 (31 deaths in 2019 compared to 24 deaths in 2018). This increase was driven by an increase in the number of deaths of the specialty trade group subsector (NAICS 238), which encompasses roofers, painters, drywall installers, carpenters, etc., with 20 deaths in 2019 compared to 13 in 2018.

Falls were the primary cause of death in Construction (10 of 31 deaths, 32.3%) in 2019. Nine of the 10 falls occurred in the specialty trade group subsector (NAICS 238), including two painters, one welder, one framer, one roofer, one drywall installer, one carpenter, and one operating engineer. **Figure 6** shows the number of fatal falls in Construction by year and the percentage of construction work-related deaths the fatal falls represent.

Between 2001 and 2019, the number of fatal falls in Construction ranged from a low of four falls in 2012 and 2018 to a high of 15 falls in 2001 and 2016. The percentage of fatalities in construction secondary to a fall ranged from16.7% in 2018 to 58.3% in 2005.

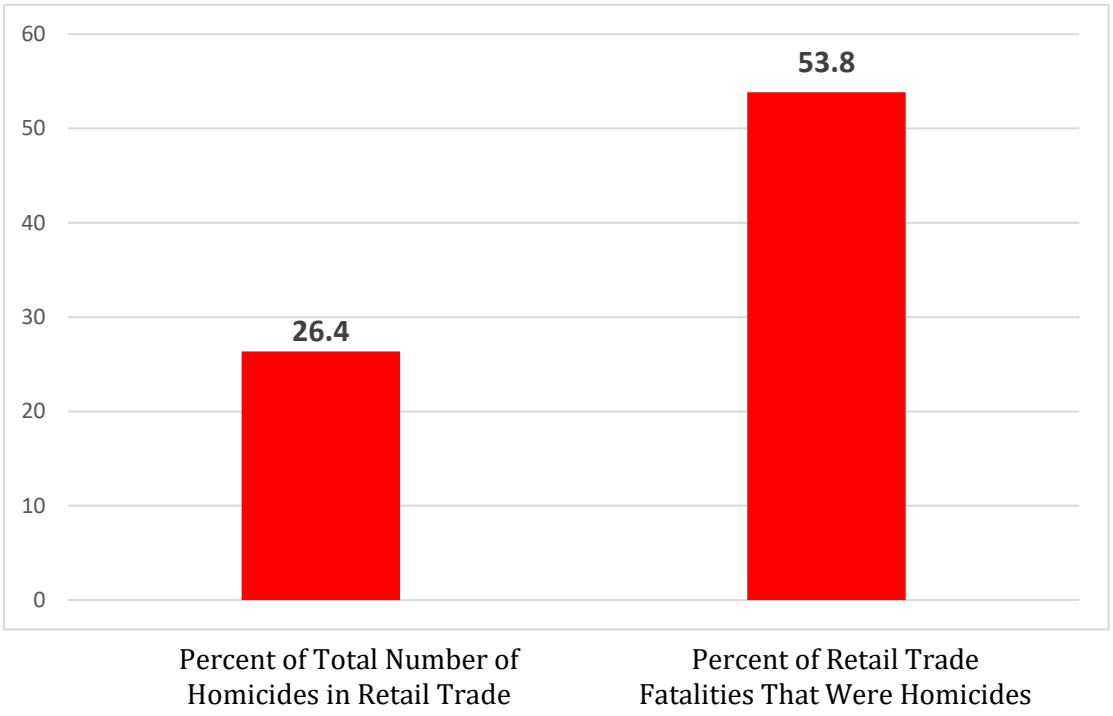
Figure 6. Fatal Falls as Percent of Total Construction Deaths by Year, 2001- 2019



Retail Trade (NAICS 44-45)

The Retail Trade industry sector (NAICS 44-45) has the largest number and percent of homicides (**Figure 7**). Homicides account for 53.8% of all fatalities in this industry sector from 2001-2019. The next most common means of death in Retail Trade are motor vehicle collisions, suicides, and falls (14.3%, 13.8%, and 12.8%, respectively). Conversely, decedents in the Retail Trade industry have made up the largest portion of total homicide deaths (26.4%) of any sector; homicides in the Accommodation and Food Service sector make up the next highest proportion of total homicides at 12.4%, less than half the proportion of Retail Trade.

Figure 7. Relationship between the Retail Trade Industry Sector and Homicides, 2001-2019



Transportation and Warehousing (NAICS 48-49)

Motor vehicle collisions were the most common means of death in the Transportation and Warehousing industry sector in 2019 (11 deaths, 52.4% of total sector deaths). These reflect overall trends, in which motor vehicle collisions comprise the most common means of death in the Transportation and Warehousing industry sector (41.0% of all deaths in the sector), with struck-by incidents being the next highest type of fatality (16.3% of all deaths). Furthermore, this industry accounts a quarter (126 deaths, 25.6%) of all motor vehicle crash deaths from 2001-2019, the largest proportion of all industry sectors, followed by Construction (62 deaths, 12.6%) (**Table 11**).

Table 11. Number of Motor Vehicle Crash Work-Related Deaths by Industry Sector, Michigan 2001-2019	
Industry	*# MV -related deaths (%)*
Agriculture	29 (5.9)
Mining	3 (0.6)
Utilities	3 (0.6)
Construction	62 (12.6)
Manufacturing	25 (5.1)
Wholesale Trade	33 (6.7)
Retail Trade	28 (5.7)
Transportation/Warehousing	126 (25.6)
Information	18 (3.7)
Finance/Insurance	6 (1.2)
Real Estate/Rental/Leasing	1 (0.2)
Professional/Scientific/Technical Services	14 (2.8)
Administrative/Support/Waste Management/Remediation	32 (6.5)
Education	11 (2.2)
Health Care/Social Assistance	21 (4.3)
Arts/Entertainment/Recreation	13 (2.6)
Accommodation/Food Service	7 (1.4)
Other Services	23 (4.7)
Public Administration	38 (7.7)

Comparisons to MIOSHA and CFOI Fatalities

MIOSHA Fatality Investigations

In 2019, MIOSHA personnel conducted a work-related fatality program-related compliance investigation for 39 (23.9%) of the 163 deaths. A fatality was recorded as a MIOSHA "Program-Related" fatality if the deceased party was employed in an occupation included under MIOSHA jurisdiction as defined in Public Act 154 of 1974, as amended, and the fatality appeared to be related to one or more of the following conditions:

- The incident was found to have resulted from violations of MIOSHA safety and health standards or the "general duty" clause.
- The incident was considered the result of a failure to follow a good safety and health practice that would be the subject of a safety and health recommendation.
- The information describing the incident is insufficient to make a clear distinction between a "Program-Related" and "non-Program-Related" incident, but the type and nature of the injury indicated that there was a high probability that the injury was the result of a failure to adhere to one or more MIOSHA standards, the "general duty" clause, or good safety and health practice.

Table 12 shows the number of work-related fatalities in Michigan in 2019 by industry sector and the number of MIOSHA work-related fatality compliance inspections for each industry sector.

MIOSHA issued a violation citation to the firm at the conclusion of the fatality investigation in 31 of the 39 (79.5%) investigations. Citation penalties assessed at the conclusion of the compliance inspection (not the penalties decided after appeal) ranged from a low of $3500 to a high of $63,000.

Table 12. Work-Related Fatalities and Number of MIOSHA Work-Related Fatality Compliance Inspections, Michigan 2019

Industry	Number of Work-Related Fatalities	Number of Work-Related Fatality MIOSHA Compliance Inspections (%)
Agriculture, Forestry, Fishing & Hunting (11)	32	6 (18.8%)
Mining (21)	2	1 (50.0%)
Utilities (22)	1	0
Construction (23)	31	15 (48.4%)
Manufacturing (31-33)	13	4 (30.8%)
Wholesale Trade (42)	9	2 (22.2%)
Retail Trade (44-45)	14	2 (14.3%)
Transportation & Warehousing (48-49)	21	3 (14.3%)
Information (51)	1	0
Real Estate & Rental & Leasing (53)	2	0
Professional, Scientific & Technical Services (54)	3	1 (33.3%)
Administrative & Support & Waste Management & Remediation Services (56)	7	1 (14.3%)
Educational Services (61)	3	0
Health Care & Social Assistance (62)	5	0
Arts, Entertainment, & Recreation (71)	3	0
Accommodation & Food Services (72)	4	0
Other Services (ex. Public Administration) (81)	8	3 (37.5%)
Public Administration (92)	4	1 (25.0%)
Total	**163**	**39 (23.9%)**

Number of 2019 Deaths Compared to Michigan CFOI

The Census of Fatal Occupational Injuries (CFOI) is the surveillance system funded in most states by the US Department of Labor, Bureau of Labor Statistics. The Michigan CFOI program reported 164 work-related deaths in 2019. (https://www.bls.gov/iif/oshwc/cfoi/tgs/2019/iiffw26.htm). Michigan CFOI included one case more than MIFACE did, due to diverging views on whether the incident was work-related.

Sensitivity of "Injury at Work" Box on Death Certificate

If the manner of death (Box 39) on the death certificate indicated accident, suicide, homicide, indeterminate or pending, the "injury at work" box (41d) is completed by the Medical Examiner with "Yes", "No", or "Unknown". "Yes" signifies that the fatal injury occurred at work, "No" signifies it did not occur at work, and "Unknown" signifies that the Medical Examiner did not know if the injury occurred at work. As described in the Methods Section, MIFACE determined a death to be work-related by compiling multiple source documents, including: Workers' Compensation forms; Police/Fire/EMT Department reports; MIOSHA 24-hour fatality log; hospital records; newspaper reports; family interviews; and Federal agencies (OSHA, NTSB, MSHA, etc.).

Table 13. Sensitivity of Death Certificate "Injury at Work" Box Predicting Fatal Injury at Work, Michigan 2001-2019

Year (# Deaths)	DC Coded as at work (%)	DC not coded at work (%)
2001 (174)*	133 (79.6%)	34 (20.4%)
2002 (151)	126 (86.9%)	19 (13.1%)
2003 (152)	110 (74.3%)	38 (25.7%)
2004 (131)	93 (74.4%)	32 (25.6%)
2005 (110)	88 (83.0%)	18 (17.0%)
2006 (157)	122 (79.2%)	32 (20.8%)
2007 (121)	99 (85.3%)	17 (14.7%)
2008 (121)	100 (84.0%)	19 (16.0%)
2009 (96)	72 (75.8%)	23 (24.2%)
2010 (147)	102 (70.3%)	43 (29.7%)
2011 (141)	95 (69.3%)	42 (30.7%)
2012 (135)	74 (55.2%)	60 (44.8%)
2013 (134)	82 (62.6%)	49 (37.4%)
2014 (143)	89 (62.7%)	53 (37.3%)
2015 (136)	89 (67.9%)	42 (32.1%)
2016 (158)	99 (62.7%)	59 (37.3%)
2017 (153)	85 (55.5%)	68 (44.4%)
2018 (152)	91 (59.9%)	61 (40.1%)
2019 (163)	95 (58.2%)	68 (41.8%)

*All death certificates were not obtained/reviewed each year. Percentages based on number of death certificates received for that year.

Table 13 shows that from 2001-2019 13.1%-44.8% of the work-related deaths would have been missed if MIFACE had solely relied on the "Injury at Work" box being completed with "Yes".

Table 14 shows that in 2019, the "Injury at Work" box was misidentified at the highest rate in the designation of an injury at work in Real Estate, Rental, and Leasing and Arts, Entertainment, and Recreation (100% of deaths misidentified in each), followed by Professional, Scientific, and Technical Services and Educational Services (66.7%) and then Agriculture (56.3%). For three industry sectors, Mining, Utilities, and Information, none of the deaths were misidentified.

Table 14. Industry and Number of Deaths and Number and Percent of Misidentified Deaths, Michigan 2019		
Industry (NAICS Code)	Number of Deaths	Number of Misidentified Deaths (%)
Agriculture, Forestry, Fishing & Hunting (11)	32	18 (56.3%)
Mining (21)	2	0
Utilities (22)	1	0
Construction (23)	31	10 (32.3%)
Manufacturing (31-33)	13	6 (46.2%)
Wholesale Trade (42)	9	4 (44.4%)
Retail Trade (44-45)	14	4 (28.6%)
Transportation & Warehousing (48-49)	21	7 (33.3%)
Information (51)	1	0
Real Estate & Rental & Leasing (53)	2	2 (100%)
Professional, Scientific & Technical Services (54)	3	2 (66.7%)
Administrative & Support & Waste Management & Remediation Services (56)	7	3 (42.9%)
Educational Services (61)	3	2 (66.7%)
Health Care & Social Assistance (62)	5	1 (20.0%)
Arts, Entertainment & Recreation (71)	3	3 (100%)
Accommodation & Food Service (72)	4	2 (50.0%)
Other Services (ex. Public Administration (81)	8	3 (37.5%)
Public Administration (92)	4	1 (25.0%)

MIFACE Activities

Importance of Using Multiple Data Sources

MIFACE used many data sources to ascertain if a fatal injury occurred "on the job". Reliance on just the information in the "Injury at Work" box on the individual's death certificate would have missed 68 (41.8%) of the work-related deaths in 2019, particularly with causes of death from motor vehicle crashes, homicides, struck-by incidents, and work-related suicides. That MIFACE can capture these work-related fatalities that would otherwise be missed when relying solely on the "Injury at Work" box supports the utility, and need, for surveillance programs that collate fatality information from multiple sources.

Prevention Material Dissemination

On the MSU OEM website (http://www.oem.msu.edu/) are copies of the completed MIFACE Investigation Reports, Hazard Alerts, and MIFACE Summaries of MIOSHA Investigations (work-related fatality compliance inspection) conducted by MIOSHA personnel.

MIFACE Investigation Reports, MIFACE Summaries of MIOSHA Investigations, Hazard Alerts, and the annual MIFACE Data Fact sheet were posted on the MSU OEM website and distributed to stakeholders. MIFACE Summaries of MIOSHA Investigations included a summary of the work-related fatality and the citations issued to the employer by MIOSHA compliance personnel at the conclusion of the fatality investigation. Hazard Alerts are 1-page documents that review work-related fatalities and provide prevention recommendations that target specific industrial sectors or repeated work-related fatality incidents. The MIFACE Data Fact Sheet summarizes information received regarding the state's work-related deaths and was updated periodically when new information was received. The most current MIFACE Data Fact Sheet can be found here.

For each MIFACE Investigation Report, MIFACE Summary of a MIOSHA Investigation, and Hazard Alert there was a dissemination plan to maximize awareness of the Report and Alert. Investigation Reports and Hazard Alerts were sent via email to appropriate trade associations, unions, trade journals, employers who did the same type of work, and to employers who have expressed interest in receiving the reports.

MIFACE presentations are regularly given to trade groups ranging from health and safety professionals in construction, agriculture, and general industry.

Case Narratives

Based on the information collected during MIFACE on-site investigations and/or from source documents, a brief narrative summary organized by industry of each of the 159 acute traumatic work-related deaths in 2019 is included in Appendix I.

Table 15 provides the narrative case number and cause of death by NAICS code found in the Appendix. Each combination of industry and cause of death is hyperlinked to the beginning of the corresponding narratives. Additionally, each cause of death label is hyperlinked to its corresponding heading in the Appendix.

When the brand name of equipment was known, MIFACE included this information in the narrative. Unless noted, the inclusion of the brand does not signify that there was a defect or other problem with the equipment. Each case narrative that was a work-related fatality that had a MIOSHA work-related fatality compliance investigation is noted by a specific MIFACE case number and hyperlinked to its MIFACE Summary of MIOSHA Investigation (MIFACE Summary) on the MSU OEM/MIFACE webpage. If a MIFACE Investigation Report was written, the MIFACE Investigation number is hyperlinked to its corresponding report on the MSU OEM/MIFACE website.

Table 15. Narratives for 2019 Work-Related Fatalities

Industry Sector (NAICS)	Aircraft	Animal	Asphyxiation	Drowning	Drug Overdose	Electrocution	Fall	Fire/ Explosion	Heat/Cold	Homicide	Machine	Motor Vehicle	Struck-By	Suicide	Toxic Exposure
Agriculture (11)		1-3				4	5	6			7-18	19-21	22-27	28-31	32
Mining (21)	33							34							
Utilities (22)										35					
Construction (23)	36					37-39	40-49			50	51-56	57	58-61	62-63	64-66
Manufacturing (31-33)					67-68		69	70			71	72-74	75	76-77	78-79
Wholesale Trade (42)					80					81		82-85	86-88		
Retail Trade (44-45)					89-90		91-92		93	94-95		96	97	98-102	
Transportation & Warehousing (48-49)	103-107						108			109		110-120	121	122-123	
Information (51)												124			
Real Estate, Rental, & Leasing (53)										125-126					
Professional, Technical & Scientific (54)	127-128						129								
Admin. & Support & Waste Management & Remediation Services (56)				130	131	132	133	134				135-136			
Educational Services (61)			137									138		139	
Health Care & Social Assistance (62)					140					141				142-144	
Arts, Entertainment, & Recreation (71)										145		146	147		
Accommodation & Food Services (72)							148					149-150		151	
Other Services (81)					152		153						154-156	157-159	
Public Administration (92)										160	161	162	163		

Conclusion

Traumatic occupational fatalities are an important public health issue in Michigan and throughout the United States. These deaths are not random events, and information about the settings and circumstances in which work-related deaths occur is necessary to prevent their occurrence in the future. There were 4 more deaths occurring in Michigan in 2019 compared to 2018. The numbers and rates of these acute traumatic fatalities have fluctuated from year to year, and there has not been a clear downward trend over multiple years. Further efforts are needed to have a meaningful reduction of the occurrence of these tragedies.

The lack of a consistent and lasting decrease in the number and incidence rate of work-related fatalities, both nationally and in Michigan, is likely a result of many factors and continued investigation of the causal factors of work-related fatalities is necessary to understand and effect a meaningful reduction in these deaths. Understanding the root cause(s) of these tragic events and sharing this information with stakeholders, from individuals to groups, employees to employers, makes these information- gathering efforts worthwhile. If what we learn from any of these deaths can help prevent further tragedies, then the surveillance program has been successful in its goal. An awareness of the hazards of one's job and an attitude of safety-mindfulness on the part of labor and management is critical to prevent future fatal events.

Some important points highlighted by the deaths:

- The workforce aged 65 and older continues to grow as individuals put off retirement and part-time workers enter the workforce due to economic or other reasons. Older workers have unique health and safety challenges, including resistance to change long standing work practices that may not be safe, medical issues, or strength issues, all likely contributing to the higher work-related fatality rate in this age group. Federal OSHA and NIOSH, among other agencies, have developed resources which can help employers address the challenges faced by older workers and provide a safe working environment for this population group.

- Fatalities from falls remain a major concern, particularly in construction. Information regarding the National Construction Fall Prevention Campaign can be found here. The campaign's goal is to prevent fatal falls from roofs, ladders, and scaffolds by encouraging construction contractors to:
    - ✓ PLAN ahead to get the job done safely.
    - ✓ PROVIDE the right equipment.
    - ✓ TRAIN everyone to use the equipment safely.

- Homicides in the retail trade and accommodations and food services sectors and workplace violence in the health care sector have been recognized as important workplace risks. OSHA and NIOSH have both developed extensive resources for employers and employees to use to address the risks associated with workplace violence, especially within certain workplaces such hospitals.

- Motor vehicle crashes are a major cause of work-related fatalities. This should not be a surprise in the Transportation and Warehousing industry sector given the nature of work tasks within this industry sector, but it is also true for many industry sectors. Employers

should create and maintain safe driving policies and offer driver safety training (including defensive driving) as part of their safety program and training. MIFACE has created a hazard alert containing recommendations and resources for employers to develop motor vehicle safety policies and programs.

- Drug abuse/overdose in the workplace is a challenging issue for employers. Solutions are not straightforward. Stakeholders, including the medical, legal, insurance, safety, and regulatory community must collaborate to develop state-specific interventions and resources that Michigan's employers and employees can utilize to address this issue. NIOSH Opioids in the Workplace webpage offers resources related to opioid use. Resources to address prescription drug use and misuse in the workplace can be obtained from the Substance Abuse and Mental Health Services Association and National Safety Council.

Each of the 163 deaths in this report could have been prevented, whether through installation of engineering controls, development and implementation of health and safety plans, changes to work practice, or the identification and assistance of individuals seeking and receiving mental health counseling so they can better cope with both work and personal stressors. The descriptions of the acute traumatic work-related deaths in Appendix I highlight these tragedies and the need to act to prevent them.

Acknowledgements

We are extremely appreciative of the support of the Michigan OSHA Safety and Health personnel, the employers, the families, and the experts who have worked with us to improve work conditions in Michigan.

We are also appreciative of our Advisory Board who provided constructive comments on each MIFACE Report who assisted us by providing thoughts on developing MIFACE policies and educational outreach activities, and their promotion of the MIFACE program to their employees and constituents.

MIFACE is a research effort and relies on the voluntary cooperation of employers and for the self-employed, their family members. We have received funds from the National Institute for Occupational Safety and Health to continue this program through 2020 and look forward to identifying ways to prevent work-related traumatic deaths and sharing what we have learned with those who may benefit from this knowledge.

APPENDIX I - Narratives

AGRICULTURE, FORESTRY, FISHING & HUNTING (NAICS 11)

ANIMAL

1. A male dairy/cattle farmer in his 70's died when a bull or cow charged and struck him. The decedent was entangled in barbed wire fencing when found by a family friend. When EMS arrived, there were seven head of cattle in the area, including a bull, two heifers and two calves.

2. A male dairy farm hand in his 70's died when he was struck by a bull and/or a dairy cow. The farm owner and the decedent were getting ready to bring in the cows from the pasture. The pasture had both bulls and cows in it. The decedent indicated he would bring in the bulls/cows while the farm owner readied feed and fed the cows in the barn. When the decedent didn't return, the farm owner went to look for him. He found him leaning on a round bale throwing up, with altered mental status, and saying he did not feel well. The farm owner drove the decedent to a nearby hospital. He was airlifted to another hospital where he died several hours later from head injuries caused by being struck by the bull/cow.

3. A male worker at a horse boarding facility in his 70's died from complications of head injuries when he was struck and knocked to the ground by a horse.

ELECTROCUTION

4. A male dairy farmhand in his teens guiding steel trusses for a hoop barn was electrocuted when a telehandler and the trusses contacted an energized 7,000-volt overhead power line. In 2018, the property owner had placed approximately 4 feet 6 inches of fill dirt in the area, reducing the height of the line from 21 feet 8 inches above the ground to 17 feet 2 inches. Two hoop barns composed of concrete walls and steel arched trusses placed on top of the concrete had been constructed; the incident occurred during construction of the third barn. A rented rough terrain forklift truck was used to transport the steel trusses to the hoop barn under construction. The energized overhead line, train tracks, and a livestock path were on the south side of the property; at this point the construction site narrowed. It was a humid day and wind gusts were recorded at 24 mph. Puddles were present on the travel path. The telehandler operator and the decedent approached the third barn from the south with the fourth steel truss secured to the telehandler with a nylon sling; the sling carried the 30-foot by 60-foot steel truss at the top of its "v". The decedent was on the ground guiding the truss by hand (without a tag line) when the telehandler and steel truss contacted the energized 7,000-volt powerline. The decedent was fatally electrocuted. MIFACE Summary of a MIOSHA Inspection #532.

FALL

5. A male farmer in his 60's fell 20-25-feet through a storage barn's metal roof while attempting to repair a loose roof panel. The decedent's farm operation was identified as a corporation, but the storage barn where the incident occurred was a family-owned structure. The approximately 130 feet by 92 feet storage barn was divided into three bays, north, central, and south. The low-sloped roof had a 2:12 pitch. The wood that supported the area of the fall appeared dark and stained from leaking water. The incident occurred on the southwest corner of the roof over the south bay; the south bay stored: a) two corporation-owned old flatbed grain trucks that were old and no longer used as company trucks but were used for personal use to haul mulch, gravel,

yard waste, water and trash for the family; b) a disc, small combine, feed grinder and an old truck stored for a family friend; c) a three-bottom plow owned by decedent that was not used to farm but was kept as a keep sake; and d) a corporation-owned tractor with a mower and anhydrous tanks. A corner of a metal roof panel over the south bay had come loose a couple months prior to the accident. The decedent was attempting to fix the panel prior to an upcoming storm. He accessed the roof using an aluminum extension ladder and walked to the incident area to screw down the loose panel. The support lumber under the loose roof panel was rotten and when the decedent walked near the area, the wood supports broke under his weight. MIOSHA observed two roof panels folded inward, one on each side of the hole, in an area where two pieces of metal roof overlapped as well as pieces of broken wood hanging on the side of the hole in the roof. When the supporting wood broke, the decedent fell approximately 20y to 25 feet to the dirt floor below. MIOSHA found that wood located approximately four feet on each side of the resulting 3-foot by 4-foot hole looked to be rotten from possible leaking water from the seam that ran close to the center of the hole in the roof. The decedent was found by his family member/partner in the farm business when returning from the field. CPR was administered with no response.

FIRE/EXPLOSION

6. A male medical marijuana grower in his 40's died from smoke inhalation secondary to a fire caused by a competent ignition source igniting butane gas in the freezer of a refrigerator. Post-extinguishment investigation indicated that this incident was related to a Butane Hash Oil (BHO) explosion and resulting fire. The structure involved was a former retail cinderblock building with a wood and shingle roof that had been converted to a medical marijuana growing and producing facility. The building was roughly divided into three areas: the north area, which was a marijuana grow room, the middle area which contained a smaller marijuana grow room, a bathroom, den, vestibule and kitchen, and the south area (garage) provided the only access point to the interior of the structure. The building's other doors and windows had been barricaded with plywood, foamboard and metal sheeting to restrict access. The decedent and his coworker had been in the north end of the building. The north end had two worktables. The decedent had been conducting the extractions at one of the tables. The coworker was attending to the marijuana plants approximately 25 feet away from the decedent. The decedent was extracting marijuana resins from the plant using a butane-based extraction method. He had recently completed a BHO extraction. He placed a glass cooking pan containing the extracted THX/Hash oil and liquid butane in a freezer in the kitchen to facilitate the off-gassing of the butane. The decedent was performing another extraction using butane gas when the explosion occurred. The fire produced heavy smoke. Both workers successfully exited the building and the decedent's coworker called for emergency response. For reasons unknown, the decedent re-entered the building (possibly to retrieve his cell phone which was left in the north grow room when he exited the building). The decedent's coworker yelled several times for him to come out and then heard him pounding on the north building wall. The coworker and emergency responders attempted to break through a barricaded north entry. Emergency responders also attempted to access the building at various sites. Using thermal imaging, the decedent was found in the middle of the main north room grow area near the extraction table where he had been previously working. The cause of the fire was determined to be a competent ignition source igniting butane vapor and causing an explosion and subsequent fire.

MACHINE

7. A male farmer in his 40's died due to an auger entanglement. Attached to the rear of his Massey

Ferguson 265 tractor was a 3-point hitch, PTO-driven auger. The decedent was attempting to address a standing water issue by digging holes to drain the water. After not returning to the house for some time, a family member went to check on him. The family member heard the tractor running and when nearing the tractor, saw the auger "flailing around, and then saw the decedent entangled in the auger. The family member ran back to the house and called for emergency response. Another family member, who in the past had assisted the decedent when he used the auger, indicated that the auger had to be kept at low idle and that the top of the auger needed to be pushed down to keep it digging straight down. Otherwise, the auger would kick up and dig sideways. Emergency responders turned off the tractor. Subsequent investigation found that the shear pin near the universal joint at the head of the auger had been welded. The shear pin, when not welded would, in case of excessive tension, break and cause the auger to stop spinning.

8. A male farmer in his 60's died when he became entangled in a manure spreader auger. The manure spreader had not been working properly. The decedent had attached the spreader to a tractor; the tractor and spreader were in a field located near the residence. He had been working on the spreader with the tractor running and the center spreader auger rotating. A shovel was found stuck into the manure against an interior wall of the spreader. The sequence of events leading to his entanglement and subsequent death are unknown. A family member notified another family member that the decedent was not answering his cell phone. When the family member walked to the tractor/spreader location, the decedent was already deceased. The tractor was not running when emergency responders arrived. The tractor key was in the ignition in the "on" position. the decedent's lower body was found protruding from the discharge chute and his upper body was within the spreader under the auger.

9. A male certified public accountant/farm owner in his 60's died when he was pinned under an overturned mid-1950s Oliver 55 tractor while working on the family farm. The decedent attached one end of a chain to the rear top point of attachment of the tractor's three-point hitch and the other end to one side of a brush mower's PTO shaft. The other end of the PTO shaft had a slip yoke that had an attached chain that then was wrapped around a large tree trunk. It appeared that the decedent was attempting to free the brush mower's seized slip yoke from the PTO shaft by driving the tractor forward to force the parts to separate. There were two fresh marks in the ground where the tractor's rear tires were spinning prior to the tractor overturning. There was a large tree root in one of the trenches that was marred from the tires. The tractor tires were also equipped with snow chains adding to the amount of traction the tractor had with the ground. The tractor was not equipped with a rollover protection structure.

10. A male dairy farmer in his 60's died when he hit his head on a wooden beam while driving a tractor into a barn. A family member found him unresponsive in the tractor seat and called for emergency response.

11. A male farmer in his 50's died when he was pinned under the right boom arm of a skid steer loader. He was drilling holes and placing short power poles for fencing with his skid steer and tractor drilling holes. When he did not return home, a family member checked on him, observed his position, and called for emergency response. Emergency responders found him pinned in the cab of the skid steer. His legs and lower extremities were in the cab with this head and upper extremities hanging over the front of the skid steer with the loader arms laying on his back, pinning him against the machine.

12. A male farmer in his 60's died when he was run over by his tractor in a field. He was found lying on the ground between the rear tractor tires and the trailer by a family member. The family member dropped off a load of product and when he returned, he observed that the decedent's tractor had not moved, so he went to check on him. He found him deceased and called for emergency response. Approximately 50 yards of the western portion of the farm field appeared freshly and neatly tilled in a north/south parallel fashion. Further east into the field, the uniformity of the tilling stopped. The trail of the tractor and attached tillage equipment (Case 875 Ecolo-Tiger) appeared to slowly veer off course while traveling southbound in the field. Approximately 200 yards north of the end of the field, the path of the tractor slowly turned left (eastbound) almost reaching the end of the field and continued turning until pointing north. The tractor continued north while still turning left and eventually came to a stop. The field the tractor had been traveling in during the start of this wide turn had not been previously tilled. The decedent was located immediately behind the rear left tractor tires, lying on his left side. The tractor was running when he was found. None of the tires were spinning. The cab door was ajar. The attached tillage was engaged into the dirt and had been actively tilling the field prior to the tractor stopping. No portion of the tillage overran the decedent. Upon climbing the ladder of the cab, responding police observed an open bottle of alcohol approximately ¾ of the way empty lying next to the operator's seat. The drive train controls were housed to the left of the steering column; the tractor was in the forward drive position. On autopsy, his blood alcohol level was 0.283%.

13. A male manufacturing foreman/farmer in his 80's went to the barn around 1-1:30pm to fix a lawn tractor for his brother. He chained the lawn tractor to the bucket of his Bobcat skid steer and lifted it off the ground. He was under the lawn tractor when it appears the Bobcat slipped into gear and ran over him.

14. A male farmer in his 70's died while removing a pin from a New Holland haybine while lying under the implement. The decedent intended to use the part to repair another machine. Responding police found that a pin had been removed from one end of a spring, which appeared to have snapped back in the direction that he would have been in if he was working under the machine. When the decedent did not return home, a family member went looking for him. Finding him under the haybine, the family member called another family member who responded to the scene with a jack. The haybine was raised and the family members removed the decedent from under the unit.

15. A male farmer in his 80's died when he was pinned under and dragged 75 yards under a harrow plow. It appeared that the decedent was attempting either attach or detach a harrow plow to the rear of a running Ford 4600 tractor equipped with a front-end loader located approximately 40 feet in front of a barn. A known work practice to line up the pin holes at the attachment point was to stand between the tractor and the attachment and to bump the transmission lever to cause the tractor to move forward or rearward; it appeared to responding police that this was the work practice being used by the decedent. When the decedent "bumped" the transmission forward, he was knocked to the ground and then dragged, entangled beneath the harrow plow approximately 75 yards before the tractor lodged against a utility pole guide wire. The lodged tractor was noted by individuals travelling in a vehicle. The tractor's front tire was elevated several inches off the ground and the back tires were buried several inches in the ground. The passersby were able to turn off the still-running tractor and removed the decedent from under

the plow. They then called for emergency response. Subsequent responding police investigation found a threaded ½-inch diameter, 12-inch-long bolt, a pair of glasses and two wooden blocks approximately 10 feet from the start of the gouge marks in the grass/driveway next to a barn.

16. A male part-time farmer in his 40's died when the elevated lawn mower he was repairing fell onto him. The decedent had elevated the lawn mower onto concrete blocks and was under the mower on a mechanic creeper performing repairs. It appeared that the corner of one of the concrete blocks may have failed, causing the lawnmower to fall; one of the cement blocks had a corner missing from it and the piece was found under the mower. He was found by a family member who used a nearby floor jack to raise the mower so he could be removed from under it.

17. A male farmer in his 60's died when he was crushed between a tractor and forklift. The incident occurred in a pole barn driveway. A trailer with a bin of grain for cattle was in the driveway. The decedent had been operating a large tractor. One of the decedent's family members found him pinned between the tractor pedals and the rear of the roll cage of a front-end loader. The tractor was against the garage door of the barn and had crashed into the loader and other equipment. There were tire marks from the tractor on the pavement that traveled from the back of the trailer. The trailer's tailgate was not on the trailer; it was thought that he may have been attempting to take the grain bin off the trailer. The tractor made a "hard right" turn to the pole barn's front garage door and then hit the pole barn leaving tire marks on the door. It appeared that the tractor had been running for quite some time due to the large amount of rubber pellet that had been worn off the tractor's left drive tire. The sequence of events is unknown. A family member stated to police that the decedent had bypassed the starter on the tractor in the past. She also stated that she was unsure why he was performing this task without her present as it was his typical routine to have her assist him with this task.

18. A male logger in his 60's died when he was crushed by his tractor when the tractor rolled to its side. The decedent harvested and sold firewood. He was using a Case Farmall Model DX60 tractor. The tractor was a front loader with two forks in place of where the bucket would be. Between the forks was a large, downed tree. It appeared that the decedent had been using the tractor to push against a tree that had not been fully felled with a chainsaw. The tree may have started to fall in a different direction than planned. The decedent ran to the tractor to try to lower the boom. The tractor tipped over to its right side, pinning him under the cab area of the tractor.

MOTOR VEHICLE COLLISION

19. A tree service general foreman in his 20's died when a southbound vehicle struck his vehicle head-on. The incident occurred on a wet, two-lane divided highway without a barrier and a posted speed limit of 75 mph. The southbound vehicle left the roadway, traveled through the median at an angle and entered the northbound lanes of traffic at a high rate of speed. The decedent's pickup truck was traveling in the right lane. As the southbound vehicle entered the northbound lanes, the decedent attempted evasive maneuvers but was unsuccessful in avoiding the collision. The decedent was wearing a shoulder harness/seat belt and the pickups airbags deployed.

20. A male logging laborer in his 30s died because of a motor vehicle crash. The decedent was driving his pickup southbound on a dry, not-physically divided two-lane roadway with an

unposted speed limit of 55 mph when his vehicle crossed the centerline and continued to the opposite shoulder down an embankment. The vehicle began to rotate clockwise and continued southbound until striking a tree at a slight angle on the driver's side fender. The force of the impact with the tree crushed the driver's side compartment and trapped the decedent inside of the cab. The pickup then burst into flames. Responding police determined that the seatbelt/shoulder harness had not been used but could not determine airbag use due to the fire.

21. A male farmer in his 80's died when his flatbed farm truck struck the rear of a school bus. The crash occurred on a dry, two-lane non-physically divided roadway with a posted speed limit of 55 mph. The bus driver had activated the alternately flashing lights on the school bus prior to the required 200-feet because the roadway routinely had high traffic volumes. The bus began to slow down and came to a stop. The stop sign on the school bus driver's side was extended. The school bus driver opened the door and as the students getting off at the bus stop began standing up, the decedent's truck rear-ended the school bus. Witnesses indicated that the decedent did not apply the vehicle brakes prior to the crash.

STRUCK BY

22. A male truck mechanic for a logging firm in his 50's died when he was struck by the steel lever arm responsible for lifting and lowering a logging trailer axle. The axle broke at the pivot point due to an uncontrolled expanding air lift bag system. The logging trailer being worked on utilized air lift bags for suspension. The incident occurred on the furthest most rear axle. Three air lift bags were positioned on each axle. One air lift bag in front of the axle lifted the axle and rear tires and the two air lift bags in the back pushed downward on the axle with the tires down to allow more support on the trailer during transport of the logs. An air valve on each axle controlled the pressure being applied to the air bags. There was a steel lever arm approximately 5 feet in length, 4 inches in width and depth that raised and lowered the rear axle. A steel pin approximately 1 inch in diameter and 6 inches in length allowed the lever arm to move up and down. The logging truck driver who was assisting the decedent indicated that the decedent heard a noise coming from the air line system. To investigate the source of the noise, the decedent placed his body under the trailer to inspect it. The air valve was not working properly and was holding constant pressure on all three of the rear axle air lift bags, resulting in force on both sides of the pivoting steel lever arm. The force placed on the lever arm by the inflated air lift bags resulted in the lever arm breaking and allowing the air lift bag to fully expand/extend. The decedent was struck by the lever arm when it broke. MIFACE Summary of a MIOSHA Inspection #526.

23. A male farmer in his 40's died from a chain saw injury to his neck while cutting a piece of lumber stacked on a fence rail in his barn.

24. A male corn farmer in his 70's died when he was engulfed by corn in an approximately half-full 20,000-bushel silo. The decedent had needed help shoveling corn in his silo because the conveyor was not working. The decedent and a family member entered the top of the silo to level the corn because it was too heavy on one side and to keep the silo from tipping over. The decedent had tied a rope around his waist and attached the rope to the ladder. The family member was tied off wearing a traditional harness. At some point the conveyor at the bottom of the silo engaged and the corn under the men began to move and empty evenly. The family member exited the silo and yelled to stop the auger. When he returned to the interior of the silo, the decedent had been engulfed by the draining corn. The family member alerted another family

member and they both went into the silo to rescue the decedent, who was several feet under the surface. They were able to find and grasp one of his hands. The decedent was alive and after several unsuccessful attempts to extricate the decedent, 911 was called by another family member. Rescue personnel cut holes into the silo sides to drain the corn and the decedent was found. He was declared dead at the scene.

25. A male subcontractor logger in his 50's died when he was struck on his head by a dead tree that had been knocked over by the tree, he had just felled with his chain saw. He routinely worked alone and had been at this jobsite for several days. He was cutting larger diameter trees for a timber buyer. He cut down a large tree, and as it fell, it struck and slid down an approximately 40-foot-tall dead cherry tree. As the large tree slid off it, the cherry tree sprang back and due to root rot, uprooted and fell in the opposite direction. The decedent was walking away with his back facing the big tree as it was falling and, most likely, did not see the dead tree spring back. The dead tree landed on top of the decedent's head.

26. A male logger in his 50's died when he was struck by a tree while clearing downed trees after a storm. The decedent was working alone at the time of the incident. The tree involved in the incident was on the ground and he was lying approximately 10 feet away from it. It appeared that the decedent had cut through a portion of the tree and was using wedges to assist in getting the tree to fall. It was quite windy on the day of the incident, and it was postulated that the wind caused the tree to fall in an unexpected direction, striking him.

27. A male farmer in his 70's was struck by a tree or tree branch in 2018. He died from complications of his head injury in 2019.

SUICIDE

28. A male farm employee in his 20's died from a self-inflicted hanging.

29. A male farmer in his 30's died from a self-inflicted hanging.

30. A male farmer in his 50's died from a self-inflicted hanging.

31. A male dairy farmer in his 60's died from a self-inflicted gunshot wound.

TOXIC EXPOSURE

32. A male dairy farmer in his 40's was asphyxiated when he was exposed to chemicals while cleaning a milk tank. Attached to the milking barn was a shed containing the 1,500-gallon milk holding tank. The approximate measurements of the tank were 6-feet wide by 6-feet long by 6-feet in height. There was a 16-inch diameter hatch opening at the top of the tank. The tank needed to be cleaned, so the decedent first rinsed it using an automated rinsing system utilizing the untreated well water serving the farm. He then mixed up the caustic chemical product he would use to clean the tank. Without testing the tank's atmosphere, he entered the tank and began to apply the cleaning paste to the tank walls. Approximately 20 minutes after the decedent entered the tank, another family member found him unresponsive at the base of the tank. This family member contacted another family member and together they removed him from the tank and began CPR while awaiting emergency responders. Blood toxicology found a fatal level of a hydrogen sulfide metabolite in his blood. The well water was tested and was found to have 1,000 ppm of hydrogen sulfide. While giving breaths during CPR, a family

member sustained a small burn to his lips.

MINING (NAICS 21)

AIRCRAFT

33. A male copper mine president in his 50's and his pilot in his 60's died when their single-engine plane crashed into one of the Great Lakes. The pilot, who was the registered owner of the plane, reported an "engine failure" to air traffic control. Air traffic control gave him two nearby airports to which to land. After the pilot selected one the of the airports, air traffic control gave him his heading, destination airport weather, and clearance to land at the airport. As he neared the shoreline, and he was cleared to descend to the minimum safe altitude for the area "at pilot's discretion". He requested that emergency equipment stand by. Air traffic control requested his altitude and the pilot reported it as 3,800 feet. At 19:46, he reported he was at 3,300 ft, and at 19:47 he reported he was at 1,800 ft. This was the last radio contact. FlightAware continued to track the aircraft until 19:49, when the airplane was about 4 miles west of the airport at an altitude of 700 ft and at an airspeed of 77 knots. The U.S. Coast Guard conducted a search of the Great Lake for the missing airplane in its last radar contact. Based on buoy readings, water depth in that area was 600 ft, and the water temperature varied between 39° and 42°F. The Coast Guard suspended the search two days after the crash. Michigan State Police located the airplane wreckage at a water depth of 540 feet using a remotely operated underwater vehicle (ROV). The passenger's but not the pilot's body was recovered.

FIRE/EXPLOSION

34. A male oil field consultant in his 60's died from burn complications one week after a flash fire occurred while a mechanical integrity test was performed on a well casing. A second individual sustained burns that required hospitalization. The work crew was in the process of cleaning the lines (pushing oil out) with heated brine water. The brine water was pushed through the line and as a result, residual vapors of natural gas came out with the brine water and into a large metal holding tank. Two vehicles were present at the scene, a vehicle to hold waste and the semi-tractor with a tanker holding heated liquid brine. It was cold that day. The natural gas was blown out of the holding tank. It was postulated that just prior to the explosion, a gust of wind blew the natural gas toward the nearby parked, running semi-tractor/tanker. A spark ignited the natural gas vapor. The decedent and one of his coworkers were standing near the rear of the tanker when the explosion occurred. Responding officers observed the ground surrounding the tanker and the area surrounding the holding tank were burned and heavily damaged.

UTILITIES (NAICS 22)

HOMICIDE

35. A male utility systems technician in his 20's died from multiple gunshot wounds. He was shot while making a visual inspection and report on the electrical system running along the roadway.

CONSTRUCTION (NAICS 23)

AIRCRAFT

36. Five men, a pharmaceutical key account manager in his 40's, a construction project manager in his 20s, an operations general manager in his 60s, a consulting engineering firm owner in his 50s and a senior HVAC designer in his 40s were killed in a fixed wing single engine aircraft

crash. The pharmaceutical key account manager was piloting the plane and the general operations manager was the copilot (pilot-rated passenger). Both individuals held a commercial pilot certificate with single-engine land and instrument airplane ratings. The pilot passenger also held a flight instructor certificate for single-engine land and instrument. When the aircraft approached the runway, it was not properly aligned with the runway. When the landing was missed, airport procedure required the aircraft to make a "left hand turn" and then re-approach. During its descent, it turned left, rapidly lost speed and altitude, according to data collected from the plane, and crashed in an open field northwest of the runway. At the time of the crash, there was a calm wind, 1.25 miles surface visibility and light rain and mist. The cause of the crash has not been determined. NTSB investigators determined that the aircraft was about 232 pounds over the maximum allowable takeoff weight and was about 126 pounds over the maximum allowable landing weight.

ELECTROCUTION

37. A male journeyman substation technician in his 50's was electrocuted by induced voltage from a nearby 345KV energized line when removing the ground wire from a de-energized line. The standard method to removing a ground wire from a de-energized line is to remove the wire from the "hot" line side first and then the grounded steel side. The substation was being enlarged and the firm for whom the decedent worked was contracted to, among other work, remove ground wires from de-energized lines. The firm's employees were instructed to treat de-energized lines as "hot"; maintain minimum approach distances, use a hot stick, leather gloves, hard hat, boots, and fire-resistant clothing. The firm indicated that because the lines being worked on were not energized, rubber gloves were not required. The firm required three workers to be present when removing the ground leads; the two workers in the basket and a spotter. The firm also required a "qualified spotter" when removing ground leads; the individual asked was not trained to be a "qualified spotter", one who would be familiar with electrical issues concerning electrical lines. The decedent asked another worker to be his spotter, while he was using an aerial lift to access the ground wire location. This spotter noted that the lift was not grounded and asked the decedent if he wanted to ground the lift; the decedent replied no. The decedent accessed the ground wire for removal. A hot stick was in the aerial lift platform. He was wearing leather gloves, not wearing rubber gloves. The decedent removed the de-energized line's ground wire from the steel side first using an un-insulated screwdriver. An energized line can cause an induced voltage hazard on a nearby de-energized line. When the decedent removed the protective ground wire from the steel side, he was electrocuted by the induced voltage from the nearby energized 345KV line. The spotter noted that after the ground lug was removed from the steel side, the decedent slumped over. Fellow employees lowered the aerial lift platform and performed CPR until paramedics arrived and took over. He was pronounced dead at the hospital. A ground lug was seen in his hand by several employees. MIFACE Summary of a MIOSHA Inspection #533.

38. A male apprentice in his teens was installing 277-volt LED lighting assemblies in an office when he contacted a live conductor and was electrocuted. The work crew had been at the site for two weeks replacing the firm's old fluorescent lighting fixtures with the new LED fixtures. The journeyman electrician held a meeting that morning to explain the job tasks to be completed. Each crewmember was also informed that they would be installing the fixtures "hot" or energized because they were working in the main office and the people working in the office needed lights. The journeyman told them to "Be Careful". The decedent had worked with the person in charge, a journeyman electrician for the past five days changing fixtures; on the day

prior to the incident, the decedent had changed out "hot" fixtures. The decedent was standing on one of the firm's four-foot portable fiberglass ladders attempting to install the LED "hot" fixture inside a dropped ceiling. The journeyman electrician indicated to MIOSHA that the ground wire and neutral wire were both connected to the LED fixture. The decedent's non-insulated wire snips were found fused to the one live 277-volt 12-gauge wire in the location where he was trying to strip insulation. When contact was made with the live 277-volt wire, the circuit breaker did not detect a fault condition and open the contacts immediately, perhaps because there was a poor path to ground since the decedent was standing on the fiberglass ladder and touching the metal ceiling tile grid with his body. A coworker working with the decedent in the same room approximately 15 feet away heard a strange noise and then falling ceiling tiles. As the decedent fell, he took part of the ceiling with him, the circuit opened, and all lights went dark. The decedent was found on the floor with the ceiling tiles on him. CPR was initiated by his coworkers while awaiting emergency responders. He was declared dead at the scene. Subsequent investigation did not find a system deficiency or failure.

39. A male apprentice electrician in his 20's was electrocuted when he contacted 277 volts while converting overhead fluorescent light fixtures to overhead LED fixtures. The incident scene was a walkway between two large dryers in a large industrial laundry. The master electrician for the decedent's employer discussed the light conversion operation with the building owner and a plan was developed for turning off the lights in sequence so other lights could be operational. The master electrician instructed the decedent about the plan and the procedure to change out/replace the fluorescent bulbs with the LED bulbs. The decedent worked from an aerial work platform. Lockout/tagout was not performed to de-energize the location. The fluorescent light fixture had been turned off and the back shield/cover had been partially removed so that the decedent could re-wire the ballast to allow for direct connection of the LED bulbs. At some point during the re-wire, the decedent contacted 277 volts. A coworker went to check on him when he did not respond to communication attempts. The coworker found him slumped over in the aerial lift. An industrial laundry employee found a ladder and climbed up to the basket controls and lowered the lift. CPR was initiated while awaiting emergency response. MIFACE Summary of a MIOSHA Inspection #528.

FALL

40. A male painter in his 40's died when he fell approximately 30 feet on concrete from a 32-to 36-foot aluminum extension ladder. The firm for whom the decedent worked had been contracted by the owner of a log home to power wash the logs and place a clear coat on the logs to protect their finish. The foreman, project manager and the decedent were working at the site. The foreman, prior to leaving the site for a few minutes, told the decedent and project manager to wait for his return to proceed. While the foreman was gone, the decedent wanted to continue to work, so he set the ladder. The ladder feet were on concrete and the top of the ladder was at the top of the facia. A small clear coat bubble was located. While the decedent ascended the ladder the project manager held the base of the ladder. The project manager let go of the ladder and stepped back several feet to point out the bad spot. The decedent overreached to his right, past the side rail (his belly button was also past the side rail). The left foot of the ladder came off the ground and the ladder spun 180 degrees. The decedent fell approximately 30 feet to the concrete. Emergency response was summoned. The decedent was transported to a local hospital where he died later that day.

41. A male commercial drywall installer in his 50's fell nine to10 feet from a second-floor loft in a

condominium building under construction to a concrete floor. Another firm had previously installed a guardrail that was missing the mid-rail; the decedent and/or his coworkers had removed the guardrail so the drywall could be installed. The decedent worked for a family member who owned the company. The decedent was working with another family member who told the company owner that they had been drywalling the second floor when the decedent stepped backward off the floor while hanging a piece of drywall he had just cut. MIFACE Summary of a MIOSHA Inspection #527.

42. A male roofer in his 50's died after falling approximately 23 feet when he stepped on rotted wood on a second story roof during shingle removal. The decedent and several coworkers were involved in tearing off roof shingles on a 10-/12-pitch roof. The roof had two layers of shingles over a layer of cedar shake shingles. The decedent was working with his coworkers in a line from the top of the roof to the roof edge, removing the shingles with a scraper and shovel. He was standing nearest to the edge of the roof. He stepped onto a roof section that had a rotted piece of wood and when he placed his weight on it, the wood broke and he fell headfirst to the concrete driveway below.

43. A male construction framer in his 30's died when he fell approximately 32 feet to concrete from an elevated box on a forklift. The decedent was a member of a nine-person work crew performing rough carpentry/framing for a hotel under construction. The rest of his crew members were waiting in the parking lot for him to finish cleaning the construction debris on the 4th floor of the building. A crew from another company constructed a wooden three-sided box to contain construction debris. The box had been placed on the forks of a forklift and lifted to the 4th story. The box was not secured to the forklift forks. The decedent was "throwing" debris into the box, which was located approximately 12-to 18-inches away from a window opening that did not have a guardrail. The incident was unwitnessed. When he did not come to the parking lot, the crew went to look for him and found him on the ground with the box nearby and the forklift forks still elevated into the air. It was hypothesized that the decedent entered the box (reason unknown) by stepping over construction debris located by the window. When in the box, he altered the center of gravity of the box on the forklift tines and the box tipped from the forks and the decedent and the box fell to the ground.

44. A male in his 50's was working alone on a roof and had an unwitnessed 12-foot fall to a concrete driveway. He was found unresponsive by neighbors lying on the ground amongst several ladders.

45. A male welding company construction foreman in his 70s died from complications of a fall that occurred in 1981. The decedent fell 17 feet from steel joists that were improperly set for a one-story addition to a warehouse. The joists collapsed and he fell sustaining serious injuries. He died from complications of these injuries in 2019.

46. A male crane operator/operating engineer in his 60's fell from an unknown height, but at least six feet to concrete from the deck of the crane he was operating. The work crew were taking down a three-lane wide overhead truss for an expressway sign on an on-ramp. The exact sequence of events is unknown but based on employee interviews several months after the incident occurred, it appeared that the decedent had swung the boomed crane to the right (so the cab was on the left). The crane hook was over the deck. He stepped out of the cab to place the D-ring onto the hook, which was approximately three feet above the deck. For reasons

unknown, he fell off the crane deck prior to attaching the D-ring. He died several months later from injury complications sustained at the time of the fall.

47. A male in his 40's died from medical complications of injuries he sustained when he fell from a roof in 1990.

48. A male self-employed carpenter in his 50's was working a "side job" when he fell approximately 20 feet to concrete from a ladder. The ladder extended to the second story of a home. The decedent was installing a window on the second story when the window began to fall out of the window opening. He tried to catch the window but lost his balance on the ladder and fell to the ground. The window broke when it landed on him.

49. A male construction company president in his 70's died from complications of a fall on a company construction site. On the day of the incident, the decedent stopped by to have a piece of molding cut (size unknown). The molding was unrelated to the construction project but was for personal use. A carpenter subcontractor cut the molding/board inside the garage. He witnessed the incident. After chatting with the carpenter, the decedent was assumed to have been carrying the molding/board and was walking out of the garage. At the threshold of the garage and driveway, he fell to the ground. The witness did not mention he tripped, was struck by anything but that he just fell. The witness went over and spoke to the decedent who said he was alright. The witness told him to seek medical attention.

HOMICIDE

50. A male home remodeler in his 60's died from sustained multiple stab wounds.

MACHINE

51. A male worker in his 60's died when the Ford 8N tractor he was using to remove stumps while preparing a future business site overturned to the rear. The decedent was clearing stumps with a tractor. The decedent had attached a chain to the hitch on the rear of the tractor and had then wrapped the chain around a small stump to be pulled from the ground. Upon attempting to pull the stump out, the tractor overturned to the rear and lit on fire. The decedent was trapped between the tractor and the ground until first responders arrived approximately 30 minutes later due to the rural location of the property. The decedent had borrowed the tractor from an acquaintance, from whom he received general instruction on operating the tractor. The tractor was not equipped with roll-over protection.

52. A male barn restoration company owner in his 50's died when a fifth-wheel dump box lowered and pinned him against the trailer frame due to a hydraulic line leak. The firm had begun dismantling a barn and had loaded the 5th-wheel, 18-foot-long dump trailer with construction debris. The trailer/dump box was ready to be emptied, so the decedent and the barn owner drove a pick-up truck with the attached loaded 5th wheel trailer to a local landfill. The decedent backed the truck/trailer to the dumping location. The controls for the dump trailer were on the right side of the gooseneck. After actuating the hydraulics to raise the dump box, the decedent walked back to the rear of the trailer. When the dump box was almost fully raised, a witness noted that a hydraulic hose ruptured, spraying hydraulic fluid all over the driver's side of the pickup and causing the dump box to begin to lower. The decedent ran back to the small hydraulic pump located on the gooseneck to shut it off. The dump box came down, pinning him between the dump box and the trailer frame. A landfill employee blew the horn of the

equipment he was operating to warn the decedent of the lowering dump box. Landfill employees, using their equipment, attempted to keep the box from lowering further. Emergency responders were summoned and when they arrived, they used blocks under the trailer box to secure it and remove the decedent. MIOSHA personnel found that the hydraulic hoses for the trailer pump were severely chaffed/weathered and in disrepair. MIFACE Summary of a MIOSHA Inspection #536.

53. A male laborer in his 50's died when he was pinned against the cap/roof of a New Holland Model 3930 tractor while digging a post hole. The decedent was operating a New Holland Model 3930 tractor with a cap/roof equipped with a front Loader Model M346 and a 1199B Super Long digger attached by a 3-point attachment. Responding police found that the attachment to the backhoe/tractor and the digger was rusted which may have given the mechanism the feel that the attachment would stay in the straight position. Further investigation determined that there had not been a bolt in any of the attachment holes for some time. Once the shovel was extended and then brought back for the digger to scoop out the dirt, the digger and the backhoe/tractor snapped together. It appeared that the digger portion of the backhoe tractor, when it was fully extended, had caused the attachment mechanism to buckle as it was not properly secured, crushing the decedent between the control panel of the digger and the cap/roof of the tractor/backhoe. It was clear from the marks in the grass that the two stabilizer arms of the digger were in one place and moved when the mechanism buckled. Responding police were unable to locate a pin or bolt anywhere on the ground that went to the attachment mechanism.

54. A male heavy equipment operator in his 50's died when the vibratory soil compactor he was operating overturned to the side, and he was pinned by the machine's roll cage pillar. Operators were only able to enter the machine from the driver's side; on the passenger side of the machine were elevated control levers, including the throttle. The machine had a drum on the front and two large rubber tires on the rear; the machine was steered by turning the tires. The decedent had made multiple passes as part of his "balancing operation", moving and compacting the ground near a sandy ridge. As he was operating the machine westbound, the rear driver's side tire began to slide down the two- to three-foot embankment. Unable to correct, the decedent, according to a witness, tried to exit the machine as it tipped to the driver's side (toward the south). The machine's roll cage pillar pinned the decedent's head against the ground.

55. A male construction laborer in his 40's was pinned between a skid steer frame and the bucket while attempting to clear snow from the skid steer pedals. The decedent's employer had been subcontracted to build the hoop greenhouses. The owner of the business had contacted the decedent's employer to survey and fix damage caused by a large, heavy snowfall. The decedent had been using a skid steer to remove snow from the greenhouses and aisleways. The owner of greenhouses and the business owner for whom the decedent worked were both on-site. After clearing some of the snow, the decedent indicated to his employer that the pedals of the skid steer which control the bucket and arms were iced and snow-covered and that the machine was becoming inoperable. The decedent's employer instructed the decedent to stop using the skid steer. The decedent placed the bucket in the air and turned off the machine. With coworkers standing nearby, he went to the front of the machine and leaned over into the cab (his stomach and chest area was against the skid steer frame) and began to chip away to remove the snow and ice from around the pedals. At some point the pedal for raising and lowering the skid arms was activated causing the bucket to lower, pinning the decedent against the frame of the machine. Another coworker saw what appeared to be the decedent's jacket and then slowly

approached putting his hand on the back of it. Realizing it wasn't just the jacket, he yelled for help to lift the bucket from him. Coworkers had difficulty raising the bucket but were able to move it just enough so the decedent could be removed from the machine.

56. A male construction drywaller in his 30's died when the 1957-1960 model Allis Chalmers D14 tractor overturned to the rear. The decedent was using the tractor to pull out an approximately three-inch diameter tree with a chain. It is unknown where on the tractor the chain was placed. The tractor did not have a rollover protection structure. Another individual raking leaves nearby heard the tractor when it overturned and struck the ground. This individual ran to the scene, and noted what happened, called the decedent's family members who lived nearby. The family members told the individual to call for emergency response while they drove to the incident scene. He was declared dead at the scene.

MOTOR VEHCILE COLLISION

57. A male seal-coat laborer is his 20's died when the seal-coating tanker truck he was driving rolled over. The crash occurred in the daytime, on a dry, not physically divided two-lane roadway with an unposted speed limit of 55 mph. The decedent and his passenger had just left a job site after seal-coating a residential driveway. The decedent was upset from an argument between him and another coworker that had occurred moments prior and was driving erratically. The decedent took a curve in the road at a high rate of speed and lost control of the truck. The truck exited the road off the east side and into the ditch hitting a large pile of rocks and a tree before overturning and coming to rest on the passenger side. The decedent, who was not wearing a seatbelt, was ejected through the front window of the truck as it traveled through trees and brush before coming to rest. The truck's front airbags deployed. The passenger, who was also not wearing a seatbelt, survived the crash. The initial loss of control was believed to be from the speed being too fast in the curve (due to the driver's anger), and the lack of shoulder and weight distribution of the liquid tar load in the truck.

STRUCK-BY

58. A male demolition laborer in his 60's was performing work for the owners of a single-family residence. The decedent was cutting a concrete slab from the porch when the 4-inch thick, 6-foot by 3-foot piece of concrete fell, pinning him underneath. An individual in the home heard a crash and investigated. Seeing the decedent, the individual jumped in the 6- to 8-foot hole under the porch and attempted to lift the concrete from the decedent. Unable to lift it, this individual exited the hole, retrieved his cell phone, and called for emergency response. He then ran to a neighboring residence and asked for help. Another similar size piece of concrete was in danger of falling into the hole next to where the decedent was laying. Emergency responders and individuals from the neighboring house entered the hole and were able to lift the concrete slab off the decedent. Fire department personnel arrived on scene and attempted to shore up the remaining slab but were not able to do it with the equipment on scene. The decedent was removed from the hole and transported to the hospital, where he died.

59. An excavation contractor in his 30's died from trauma to the head during an excavation. The decedent had been working inside of a trench to install PVC pipe. The trench collapsed, and a coworker called for emergency responders. During the autopsy, the medical examiner concluded that head injuries on the decedent were likely caused by the excavator, that there was no dirt in the decedent's breathing passages, and that the decedent may have been dead before the trench collapsed, ruling the manner of death as indeterminate.

60. A male heavy equipment operator in his 50's died while operating a concrete saw during a concrete patching operation on a dry, two-lane divided highway with a barrier. The incident occurred in the late evening; the expressway was lit by overhead lighting. There were two lanes designated for eastbound travel with a wide paved shoulder on the south side of the roadway and a narrow shoulder and cable barrier on the north side of the roadway. The crash occurred in a partially curved portion of the freeway. At the time of the crash, the right lane was closed for construction. Responding police found the following signs in the following order: road work ahead, right lane closed ahead, reduced speed ahead, a pictured sign indicating a lane merger, the work zone begins sign, speed limit 60 mph sign, a lighted arrow board sign with the left indicating arrow, then reflective construction barrels indicating a left lane merger and right lane closed. Where the lane closure began to take place and before the active work zone was a sign stating where workers present speed limit 45 mph. The decedent was sitting in the operator's seat, operating the concrete cutting machine in the right lane, near the centerline between the right and left eastbound lanes. An oncoming car in the left lane, whose driver fell asleep, struck the machine and the decedent as he fell from the machine upon impact. The decedent was thrown to the right shoulder, landing near the fog line. After the impact, the driver awoke, swerved left, and contacted the cable barrier against which the car came to rest. The decedent was wearing a neon yellow colored t-shirt. The concrete cutting machine was not equipped with a seatbelt.

61. A male electric company foreman in his 60's died when he was struck by a vehicle in a construction zone. The incident occurred on a dry, four-lane not physically divided roadway with a posted speed limit of 30 mph. The decedent had just placed cones on the roadway in preparation for working on underground utility lines. He was standing near the open driver's side door of his work truck that was facing east and parked in the right lane of roadway. A passenger car drove around the construction cones and struck him, propelling him approximately 90 feet away from his truck. He sustained fatal head injuries.

SUICIDE

62. A male self-employed commercial construction contractor in his 40's died from a self-inflicted hanging.

63. A male dredging company owner in his 60's died from a self-inflicted carbon monoxide overexposure in his company's truck

TOXIC EXPOSURE

64. **(&65.)** A male construction laborer in his 20's and a female companion in her teens died from carbon monoxide poisoning. A homeowner had hired a contractor to update/remodel his two-story home (e.g., drywall, paint, etc.). The contractor hired the male decedent to perform some of the work. The home had no heat, so the contractor used a gasoline-powered generator and a diesel-powered salamander to heat the home while working. The contractor arrived at the home around noon and worked until approximately 7:00p.m. Shortly before stopping work for the day, the contractor brought the generator and salamander, which were located outside, inside the home. Just prior to the contractor leaving the house, the female worker (decedent's girlfriend), who had been driven to the worksite by a friend, arrived. The friend indicated that the decedent's girlfriend was going to stay to help the decedent with the work. The contractor left the work site. When the contractor arrived the next day, he found that both the generator

and the salamander had been moved from the location where they were placed the previous evening. Walking through the home, he found the decedent and his girlfriend unresponsive in the living room on the first floor. He called for emergency response. When fire department personnel entered the residence, air testing showed carbon monoxide readings of over 700 ppm. Fire department and police department personnel began opening doors and windows and then went upstairs to ensure no other individuals were present in the home. Air testing revealed carbon monoxide levels to be over 900 ppm on the second floor. Police found no fuel in either the generator or the salamander. The male decedent's carboxyhemoglobin level was 75.8% and the female decedent's carboxyhemoglobin level was 76.3%.

66. A male electrician in his 40's died from carbon monoxide poisoning with methamphetamine and amphetamine as contributing factors. His carboxyhemoglobin was 70%. The decedent was contracted to perform electrical work in a two-stall garage. The decedent used a gasoline-powered generator, located behind a piece of drywall to power his tools. When the decedent did not return home, a family member called his cell phone at approximately 1:00 a.m. The decedent did not answer. The family member called the garage owner later in the morning, and the owner went to the garage and found him deceased. The police were told that the decedent would turn the generator off when not needed. When police arrived, the generator's key was in the "on" position and was not running. Responding police could not detect any exhaust odor from the generator at the time of garage entry.

MANUFACTURING (NAICS 31-33)

DRUG OVERDOSE

67. An engineer for an automobile manufacturer in his 20's died from a drug overdose.

68. A male custom fabrication business owner in his 30's died from multiple drug intoxication. He was found dead in his business office.

FALL

69. A male commissary production team member in his 50's was carrying an empty bread tray back to his work area when he slipped and fell backwards onto a concrete floor, striking the back of his head. Food safety requirements mandated that the commissary area average temperature be maintained between 35°-37°F. The production area surfaces including the floor, were damp, but not wet. The concrete floor surface was textured to avoid slipping while walking. The firm required employees in this area to wear slip-resistant footwear. The decedent had a medical/physical condition that required specialized orthopedic shoes and caused him to drag one of his feet when he walked. It appears, that over time, the textured surface wore away the soles of his shoes, especially the sole of the shoe of his dragged foot. The decedent was walking back to his workstation with an empty bread tray when he slipped and fell backwards, striking his head. Coworkers heard him shout out, and then responded when they saw him on the floor. Emergency response was called, and the decedent was transported to a local hospital where he died a week later. MIFACE Summary of a MIOSHA Inspection #523.

FIRE/EXPLOSION

70. A male fabricated wire plant laborer in his 20's was found dead in a fire at his employer's business

MACHINE

71. A male recycling/alloy manufacturing facility supervisor/furnace operator in his 60's was struck and run over by a front-end loader. The decedent had gone into the yard for a "smoke break". He spoke with a forklift driver while in the yard, instructing him for his next duty. While in the yard, the driver of a John Deere front end loader noticed the decedent on his left near the opening of a 24-foot-wide overhead door The front-end loader driver was taking a full load of scrap in the 9-foot by 4-foot bucket to the furnace and after he passed the decedent, the decedent entered the doorway and was bent over, presumably picking up debris in the doorway. After dropping off the load, and with the bucket estimated to be 12-18 inches above the concrete, the front-end loader driver had to turn the loader to exit through the door. As he was turning, due to the limited space, the driver was looking toward the wall and to where he had previously seen the decedent. As the front-end loader turned, the operator sounded the horn. The loader's bucket struck the decedent and knocked him to the ground. The loader's left wheels ran over and crushed him. The front-end loader proceeded to drive into the yard. The driver indicated that he felt a bump as he drove out the door but thought the loader had run over a pallet or debris. Contributing factors to the fatality include: (1) the front-end loader's Lexan windshield was dirty, mud-splattered, scuffed and opaque, which limited the visibility for the operator; (2) the decedent, wearing a high visibility garment, was bent over in the doorway; (3) the loader bucket was carried 12-18 inches above the ground, limiting forward visibility; (4) limited turning space for the heavy machinery to exit; (5) change in light levels from the inside of the plant (dark environment) to the outdoor-lit (bright) yard; and (6) the size of the bucket of the loader took up much of the width of the doorway especially when turning. The forklift driver saw the decedent on the ground and called on the radio for assistance. Production personnel administered CPR and called for emergency response. He was declared dead at the scene. MIFACE Summary of a MIOSHA Inspection #534.

MOTOR VEHICLE COLLISION

72. A male sales account manager for a soft drink manufacturer in his 30's died when his vehicle rear-ended a semi-trailer. The crash occurred on a straight, flat, wet two-lane paved divided roadway with a posted speed limit of 55 mph. The crash location had four lanes, as the inner two lanes allowed northbound traffic to turn back south. There were two traffic lights to control traffic for those making the turn and to stop the southbound traffic. The northbound semi-tractor and trailer had stopped in the right lane of the two left turn lanes, waiting to make the left turn. The driver's side of the decedent's vehicle struck the passenger side rear of the trailer. There were no obvious signs of skid marks left by the decedent's vehicle at the scene. He was wearing his seatbelt/shoulder harness and the front airbags of his vehicle deployed.

73. A male rail prep for a logistics and transportation firm in his 20's died in a motor vehicle crash on a wet, private road. It was dark but the roadway was lit. No speed limit was posted. The decedent was traveling northbound. The decedent passed a car on the road while traveling at a high rate of speed. His vehicle hit a patch of ice and then hit a concrete pylon at the bottom of a lighting fixture. The vehicle continued traveling forward until it came to stop at a fence and burst into flames. He was trapped inside. The decedent's restraint use is unknown. The vehicle's airbags deployed.

74. A female aircraft parts distributor in her 20's died in a motor vehicle crash as she was driving to the airport with a customer's product. The incident occurred on a dry, dark, unlit, not-physically-divided 2-lane road with a posted speed limit 50 mph. The crash occurred at an

intersection; the eastbound and westbound roadway had stop signs. The northbound and southbound roadway had the right of way. The decedent was traveling westbound. She disregarded the stop sign and entered the northbound road where she was struck broadside on the driver's side of her van by a northbound tow truck. The northbound driver indicated his visibility regarding westbound vehicles was obscured by a house and tree at the intersection. The decedent's vehicle left the roadway and overturned into a ditch. The decedent was wearing a shoulder harness/lap belt and the vehicle's airbags deployed.

STRUCK-BY

75. A male foundry maintenance/laborer in his 50's was crushed by air handling ductwork on a roof when the four angle iron stanchions supporting the ductwork crumbled. The 100-yard-long ductwork involved in the incident was a fine dust collection system from a Wheelabrator, a large "sand blaster" type unit. The ductwork was not straight; it had bends along the path to the dust collector bags. The ductwork was elevated above the roof by 6-foot-high angle iron stanchions. The roof was covered by rubber sealant. Several weeks earlier, an individual on the roof noted that a stanchion was sinking and notified the supervisor. The decision was made to address the issue when the firm had its shutdown. The decedent and his coworker were on the roof to check the dust collector bags and to determine how "full" – how much dust - was in the ductwork. The coworker and decedent had removed a six-foot section of ductwork so they could get a vacuum in the ductwork. The decedent was walking along the side of the 16-foot-long, 4-foot diameter duct tapping it with a screwdriver to see how "full" it was. As the decedent walked under the duct to get to the other side, the four stanchions crumbled as the roof collapsed. The ductwork was approximately half-full, and its' estimated weight was 35,000 pounds. It was determined that the same section of ductwork had collapsed several years prior.

SUICIDE

76. A male automotive manufacturing support business owner in his 50's died from a self-inflicted gunshot wound.

77. A male automotive quality control technician in his 50's died from a self-inflicted hanging.

TOXIC EXPOSURE

78. A male technician in his 50's died when he fell into a 53-foot long, 5-foot wide and 6-foot deep, 6,000-gallon tank containing a sulfuric acid-based pickling solution for steel tubes. The pickling solution was maintained at a temperature of approximately 160°F. The decedent, who was working alone, was retrieving a sulfuric acid sample from the tank using a plastic syringe. While working from a 11-inch-wide polyurethane ledge, the decedent reached down with one hand approximately 25 inches to pull the sulfuric acid mixture sample with the syringe while holding onto a nearby railing with the other hand. After drawing the syringe plunger out fully, he lost his balance/slipped and fell into the tank. The decedent screamed for help and was eventually rescued by fellow employees, who escorted him to a nearby emergency shower approximately 20 seconds/86 feet away. Emergency response was summoned, and he was transported to the hospital where died several hours later from chemical and thermal burns. MIFACE Summary of a MIOSHA Inspection #529.

79. A male machine operator for a dried fruit manufacturer in his 40's died from overexposure to carbon monoxide while in his parked vehicle with an impaired exhaust system. The decedent had a medical condition that was causing him pain and he asked his supervisor if he could go

on break earlier than scheduled. After receiving permission, the decedent went to his car and started it, as it was cold outside. When he did not return to his workstation, a coworker notified his supervisor and his supervisor went outside to the decedent's car, which was still running. He found the decedent in a reclined position, knocked on the window and told the decedent to get back to work. Later, his coworker went to the car because the decedent did not return to work. When he arrived, he opened the car door, he smelled vehicle exhaust. He found the decedent slumped over unresponsive. The decedent was carried into the building and CPR was initiated. The decedent had spoken with another employee earlier that evening about fixing his exhaust system. He stated that "he was starting to smell "fumes" in his vehicle and explained that a piece of "flex pipe" on his exhaust had a large hole in it".

WHOLESALE TRADE (NAICS 42)

DRUG OVERDOSE

80. A male auto salvage tire technician in his 30's died from an overdose of fentanyl and heroin.

HOMICIDE

81. A male owner of a pallet wholesale business in his 40's died from multiple gunshot wounds during an argument with a neighbor about storing pallets on his property.

MOTOR VEHICLE COLLISION

82. A male produce delivery truck driver in his 40's died in a motor vehicle crash. The crash occurred during the day on a dry, three-lane divided highway with a barrier and a posted speed limit of 70 mph. The decedent had been traveling eastbound in the right lane. His truck left the roadway to his right and then collided with a light pole. After colliding with the pole, the truck re-entered the roadway, crossed over the tree lanes of traffic and then struck a tree on north side of the road in the center median. The truck then caught fire. His restraint use was unknown. The truck was not equipped with airbags.

83. A male sales engineer for an HVAC equipment wholesaler in his 60's died when his vehicle hauling a trailer containing plumbing and electrical supplies rear-ended a school bus. The crash occurred on an icy, two-lane divided highway with a barrier and a posted speed limit of 70 mph. There was moderate to heavy snowfall at the time of the crash. Blowing snow caused by 15-20 mph winds created limited visibility. Northbound traffic was stopped or nearly so for multiple crashes ahead. The school bus had been traveling in the left lane. Seeing the stopped/slowing traffic ahead, the school bus driver drove partially onto the shoulder of the highway until sure that the bus could be safely stopped. Noting he could stop in time the driver began moving back into the left lane. The decedent's vehicle/trailer was traveling in the left lane at excessive speed and could not stop in time when he approached the slowing/stopped traffic. As the decedent approached the incident scene, his vehicle sideswiped a vehicle in the right lane and then rear-ended the passenger side of the school bus on the driver's side of the decedent's vehicle. The collision pushed the bus off the roadway and into the cable barrier and peeled the roof back exposing the passenger compartment of the decedent's vehicle. The decedent's vehicle travelled several feet under the bus before exiting the passenger side of the bus and coming to a stop adjacent to the front door. The decedent was wearing his shoulder harness/lap belt. The vehicle's airbags deployed.

84. A male used auto parts buyer in his 40's died when the pickup truck he was driving struck a

guardrail on the driver's side. The incident occurred during the day on a snow-covered, icy, three-lane divided highway with a concrete barrier and a posted speed limit of 70 mph. At the time of the incident, the decedent was traveling eastbound. Crash reconstruction determined the pickup truck's speed was between 57 mph and approximately 67 mph when the decedent attempted to change lanes. The pickup began to slide sideways on the icy road. The front of the pickup was facing south when the truck eventually settled into a "sideways" skid on the freeway. As the truck skidded, it went slightly off the road and into the gore (triangular area located in between the lanes of a highway and either an entrance or an exit ramp) when the driver's side door struck the end of a guardrail separating an exit ramp from the highway. The decedent was not wearing a shoulder harness/seat belt and was ejected. His passenger wearing a seatbelt survived the crash. The truck was equipped with front airbags (no side airbags); the front airbags did not deploy.

85. A male electrical service technician in his 30's for a crane and hoist sales and servicing firm died in a multiple motor vehicle crash. The crash occurred at dusk, on a dry six-lane not-physically-divided road with a posted speed limit of 55 mph. The decedent, driving a van that had a large scissor-type lift in the cargo area, was travelling westbound. A westbound vehicle (Vehicle #1) had stopped due to a red light. The decedent's van rear-ended Vehicle #1, pushing it into the intersection. Vehicle #2 struck Vehicle #3, which then struck Vehicle #4. The decedent was pinned between the dashboard and the large scissor-type lift that had broken loose from its tracks, coming forward and into the passenger compartment. Emergency responders noted that he had been holding an operating cellphone. Additionally, emergency responders found an open pint of liquor positioned between his legs. The decedent was wearing a shoulder harness/lap belt. His vehicle was not equipped with airbags.

STRUCK-BY

86. A male repair shop supervisor for a salvage firm in his 20's died when he was struck by a tire/rim assembly that separated during inflation of the tire. The tire/rim assembly had been placed flat on the concrete floor. A new tire was being placed on a used agricultural rim. The compressor regulator read 160 psi. The decedent used an airline without a clip-on chuck or in-line valve with a gauge or pressure regulator. During inflation, there was a violent separation of the tire/rim assembly. The decedent was in the trajectory of the exploding tire/rim assembly and was struck by the tire/rim assembly. MIFACE Summary of a MIOSHA Inspection #524.

87. **(&88.)** Two male laborers for a stone slab wholesaler, Individual 1 (in his 30's) and Individual 2 (in his 50's) died when they were crushed by falling granite slabs. There were six rows of unsecured A-frame storage racks spaced approximately two feet apart holding the granite slabs; the granite slabs overlapped between the storage racks. There was a walkway along the face of the granite. The two individuals were in the process of moving five granite slabs. They had placed a synthetic web sling attached to a leveling bar and two hooks on each end around five slabs of granite. Using an overhead crane with a 5-ton limit to move the slabs, Individual 1 was on the south side of the load and Individual 2 was on the north side of the load. The two individuals were located near the center of the warehouse. When the slabs were lifted from the A-frame storage rack, the A-frame storage rack buckled and the slabs on the opposite side of the A-frame fell, creating a domino effect of slabs (due to the slabs overlapping) to fall. The two workers were pinned by the falling slabs. Individual 1 was found to be in a crouched position trapped in a granite slab pile and Individual 2 was found to be in a standing position trapped between granite slabs. The granite slabs were removed by using a combination of multiple

forklifts and cranes.

RETAIL TRADE (NAICS 44-45)

DRUG OVERDOSE

89. A male gas station attendant in his 30's died from a drug overdose.

90. A male appliance salesman in his 30's died from a drug overdose (mixed drug toxicity).

FALL

91. A male laborer for an auto parts store in his 60's slipped and fell hitting his head in the business's parking lot. He died from complications of his head injury several weeks later.

92. A female store clerk in her 60's died when she fell approximately six feet from an 8-foot step ladder in a storage room. The incident occurred in a small backroom that had storage racks for merchandise storage and an office. On top of the office was additional storage space, referred to as a "loft". The decedent and her coworker, the store manager, were cleaning up the backroom so space could be made for an upcoming delivery. A toilet paper box, approximately 7 7/8 inches thick by 18 inches wide by 27 inches long and weighing approximately 22 pounds was being moved from the storage room floor to the loft. The store manager lifted the toilet paper box to the decedent. The store manager had one hand on the decedent's ankle and one hand on the box. The decedent turned and grabbed the box with both hands and placed the box on the loft floor, expecting to push the rest of box back so it would be fully positioned on the loft floor. The decedent had one hand on the box and one hand on the ladder when the box began to fall from the loft toward her coworker. The decedent let go of the ladder with both hands attempting to catch the falling box. She fell backwards to the floor, striking her head. Emergency response was summoned, and the decedent was transported to a local hospital where she died several days later from the injuries sustained at the time of the fall.

HEAT/COLD

93. A female salesclerk in her 50's died from hypothermia. It was hypothesized that the decedent had been drinking alcohol placed in a water bottle while at work; video showed that she was having trouble keeping her balance and had trouble counting her till. She decided to walk home after her shift. She was found lying face down in the snow of her employer's parking lot the next morning, not breathing. An empty vodka bottle was in her bag. Resuscitation efforts by medical personnel were unsuccessful.

HOMICIDE

94. A male gas station automotive mechanic in his 30's died from multiple gunshot wounds during an argument over a parking space. Prosecutors determined that automotive mechanic was the aggressor and that the person who shot him was acting in self-defense.

95. A male liquor store owner in his 70's died from multiple gunshot wounds.

MOTOR VEHICLE COLLISION

96. A male in his 70's, who worked for an auto parts supplier, was struck by a vehicle while riding a motorcycle to a meeting in 1978. He died from complications of the 1978 crash in 2020.

STRUCK-BY

97. A male vending machine route driver in his 40's died when he was struck by a passenger vehicle near his delivery truck. The decedent had parked the truck in a parking lot near the shipping and receiving dock adjacent to one of his designated delivery stops. He had made several trips into the building and had stocked the vending machine. He placed the cart into the truck, and it appears, that while he was returning to the driver's seat, he was struck by the vehicle. After hitting the decedent, the vehicle left the scene. Subsequent police investigation found that the vehicle driver had been following the decedent's delivery truck and were preparing to steal the truck. The driver was charged with felony murder and failure to stop at the scene of an accident causing death; his passenger was charged with attempted larceny from an automobile. MIFACE Summary of a MIOSHA Inspection #525.

SUICIDE

98. A male convenience store owner in his 50's died from a self-inflicted gunshot wound.

99. A male mirror shop owner in his 30's died from a self-inflicted hanging.

100. A male gas station attendant in his 20's died from a self-inflicted gunshot wound.

101. A female machine operator at a warehouse fulfillment center in her 20's died from a self-inflicted gunshot wound.

102. A female convenience store clerk in her 50's died from self-inflicted knife wounds.

TRANSPORTATION AND WAREHOUSING (NAICS 48-49)

AIRCRAFT

103. A male copper mine president in his 50's and his pilot in his 60's died when their single-engine plane crashed into one of the Great Lakes. The pilot, who was the registered owner of the plane, reported an "engine failure" to air traffic control. Air traffic control gave him two nearby airports to which to land. After the pilot selected one the of the airports, air traffic control gave him his heading, destination airport weather, and clearance to land at the airport. As he neared the shoreline he was cleared to descend to the minimum safe altitude for the area "at pilot's discretion". He requested that emergency equipment stand by. Air traffic control requested his altitude and the pilot reported it as 3,800 feet. At 19:46, he reported he was at 3,300 ft, and at 19:47 he reported he was at 1,800 ft. This was the last radio contact. FlightAware continued to track the aircraft until 19:49, when the airplane was about 4 miles west of the airport at an altitude of 700 ft and at an airspeed of 77 knots. The U.S. Coast Guard conducted a search of the Great Lake for the missing airplane in its last radar contact. Based on buoy readings, water depth in that area was 600 ft, and the water temperature varied between 39° and 42°F. The Coast Guard suspended the search two days after the crash. Michigan State Police located the airplane wreckage at a water depth of 540 feet using a remotely operated underwater vehicle (ROV). The passenger's but not the pilot's body was recovered.

104. **(&105**.) A male commercial pilot in his 60's and a male pilot-rated passenger/mechanic in his 60's died when the single-engine Rockwell Commander M200 aircraft crashed during a maintenance test flight. The airplane had recently undergone maintenance, including the installation of a new field overhauled engine and a 3-bladed propeller. The mechanic had

performed the recent work on the airplane. The airplane was flown earlier in the day and was then fueled with 34.4 gallons of fuel. It is unknown if any adjustments or maintenance items were accomplished before the second flight. Witnesses reported that the airplane departed the runway and stated that when the airplane was about 200 to 300 ft in the air, the airplane appeared to stop its climb and was silent. One witness reported that it looked like the airplane tried to turn back to the runway, before entering a rapid decent. The airplane crashed about 600 ft beyond the departure end of the runway. The responding Federal Aviation Administration inspector, the NTSB Investigator-in-Charge, and a technical representative from the engine manufacturer examined the airplane wreckage on site. The examination found the engine air filter element was displaced and in the engine intake tube.

106. (&107.) Five men, a pharmaceutical key account manager in his 40's, a construction project manager in his 20's, an operations general manager in his 60's, a consulting engineering firm owner in his 50's and a senior HVAC designer in his 40's were killed in a fixed wing single engine aircraft crash. The pharmaceutical key account manager was piloting the plane and the general operations manager was the copilot (pilot-rated passenger). Both individuals held a commercial pilot certificate with single-engine land and instrument airplane ratings. The pilot passenger also held a flight instructor certificate for single-engine land and instrument. When the aircraft approached the runway, it was not properly aligned with the runway. When the landing was missed, airport procedure required the aircraft to make a "left hand turn" and then re-approach. During its descent, it turned left, rapidly lost speed and altitude, according to data collected from the plane, and crashed in an open field northwest of the runway. At the time of the crash, there was a calm wind, 1.25 miles surface visibility and light rain and mist. The cause of the crash has not been determined. NTSB investigators determined that the aircraft was about 232 pounds over the maximum allowable takeoff weight and was about 126 pounds over the maximum allowable landing weight.

FALL

108. A male forklift driver for a warehousing and storage firm in his 50's died when he fell and struck his head while getting off a forklift. After the incident, he was sent home, where he developed symptoms leading to hospitalization. He died several days after the fall from head injury complications.

HOMICIDE

109. A male taxi driver in his 50's died from multiple gunshot wounds.

MOTOR VEHICLE COLLISIONS

110. A male semi-truck driver in his 50's died when his semi rear-ended a pickup truck. The crash occurred during early morning darkness on an unlit, dry, divided highway with two-lane eastbound/westbound travel and a posted speed limit of 55 mph. The incident occurred at an intersection controlled by a traffic signal. A vehicle in the left eastbound lane was stopping for the traffic signal. A pickup truck was traveling behind the vehicle. To avoid the stopping vehicle, the pickup moved to the right lane and began to brake for the light. The semi-truck, which had a flatbed trailer loaded with steel rods secured with straps was travelling in the right lane and subsequently rear-ended the pickup truck. The impact propelled the pickup through the intersection and into the grassy lawn on the southeast corner of the intersection. While still braking, the semi continued through the intersection and came to a controlled stop in the right lane and right shoulder of the eastbound highway. The force of the semi's braking and impact

with the pickup caused the steel bar stock on the flatbed trailer to break free from their straps and push through the sleeper berth and the cab of the semi's passenger area. The steel struck the rear of the driver's seat, forcing the seat forward approximately 1.5 to 2 feet. The decedent was pinned between the seatback and the dashboard, collapsing the steering wheel/column. He was wearing a seatbelt/shoulder harness. The semi was not equipped with airbags.

111. A male semi-truck driver in his 40's died when his semi rear-ended another semi that had just left a rest stop and was merging into the right lane of the expressway. The crash occurred on a dry, dark, unlit 2-lane divided highway with a barrier and a posted speed limit of 65 mph. The cab of the decedent's tractor was sheared off the frame and the decedent was ejected from the cab through the windshield upon impact. The decedent was not wearing a shoulder harness/lap belt. The cab was not equipped with airbags.

112. A male truck driver in his 50's died when his semi struck a disabled semi on the side of the road. The crash occurred on a dry, three-lane expressway with a posted speed limit of 65 mph. A semi had broken down and was parked in the right line of the expressway. The driver of the disabled semi had placed traffic triangles behind the semi and had activated his emergency flashers. The disabled semi had called for tow service and had been waiting for approximately 1.5 hours for the tow truck to arrive. The decedent semi had recently merged into the right lane when the semi cab struck the rear of the disabled semi-trailer. The decedent was not wearing a seatbelt/shoulder harness. It is unknown if his semi cab's airbags deployed.

113. A male semi/dump truck driver in his 50's died when his dump truck collided with a guardrail. The crash occurred during the day on a dry one-way traffic four-lane expressway with a posted speed limit of 70mph. The decedent was travelling southbound in the right lane when a vehicle that was in a dedicated exit lane abruptly changed lanes into the decedent's travel lane. The abrupt change "cut him off" and caused him to lose control of the truck when he swerved left to avoid the collision. The truck overturned on the freeway on the driver's side, dumping its load of sand. The truck continued to slide forward and eventually slid off the roadway to the right, striking a guardrail. The decedent was wearing a shoulder harness/lap belt. It is unknown if the truck had airbags.

114. A male semi-truck driver in his 60's died when his semi-trailer jackknifed causing the semi tractor-trailer to overturn. The incident occurred on a dark, unlit, wet three-lane divided highway with a barrier and a posted speed limit of 55 mph. It was raining at the time of the crash. The decedent's vehicle was traveling eastbound in the right lane. The decedent, traveling too fast for the wet road condition, made a lane change from the right lane to the left lane. While doing so, he lost control and the trailer began to sway side to side, and then overturned on its passenger side. The tractor and trailer slid on the passenger side creating sparks and spilling diesel fuel. The vehicle collided with a concrete barrier and then struck another vehicle. The decedent's truck caught fire and burned. The decedent was not wearing a shoulder harness/seatbelt. It was unknown if the truck airbags deployed.

115. A male semi-truck driver in his 30's died in a motor vehicle crash. The decedent was traveling westbound on a dark, unlit two-lane divided highway with a posted speed limit of 70 mph. At the time of the incident, it was snowing and, based on witness statements, the roads were icy. The semi was traveling in the right lane. A car also traveling westbound had "spun out" and was facing the eastbound in the right lane. The decedent attempted to avoid striking the car. The

decedent applied the brakes but could not stop due to the icy road conditions. The semi sideswiped the car, left the freeway entered the right shoulder, struck a guard rail, and overturned over a bridge, falling approximately 50 feet and landed upside down. The decedent was wearing his lap belt/shoulder harness. The cab's airbags deployed.

116. A male semi-truck driver in his 50's died when his semi-truck rear-ended another semi-truck/trailer (Semi #1), then ran off the roadway to the right, hit a guardrail and struck a tree. The crash occurred during the day on a dry, 4-lane divided highway without a barrier and a posted speed limit of 70 mph. Both trucks were traveling southbound in the right lane. Semi #1 was traveling at approximately 30 mph. Its trailer had no lights on it, although Semi #1 driver indicated the hazard lights were operational. Witnesses indicated that Vehicle #1 was traveling slowly, and the vehicles had to make evasive maneuvers to avoid the collision. The decedent's vehicle rear-ended the trailer hauled by Semi #1, ran off the roadway right, struck the guardrail, and when the guardrail ended, overturned onto its side, and collided with some trees. The decedent was wearing a shoulder harness/lap belt. The cab was not equipped with airbags.

117. A male car hauler in his 20's died when a northbound semi-truck lost control, crossed the median and overturned, and landed on the decedent's southbound pickup truck hauling a "car hauler" trailer with two vehicles on it. The incident occurred during the day on a wet, three-lane divided highway with a barrier and a posted speed limit of 70 mph. Per witnesses, the semi rode up and over the median wall and became airborne and landed on the decedent's vehicle. Witnesses indicated that there was no possibility that the decedent could have avoided the collision. The impact caused one of the vehicles on the car hauler to become unsecured. The decedent was wearing his shoulder harness/seat belt. The pickup's airbags did not deploy.

118. A male semi-truck driver in his 60's died when his tractor/trailer left the roadway, struck a guardrail and when the truck cleared the guardrail, left the roadway to the right through a ditch and struck a tree causing the tractor to catch fire. The incident occurred on a dry, three-lane divided roadway with a barrier and a posted speed limit of 70 mph. He had been traveling westbound. His restraint use was unknown. The cab was not equipped with an airbag. When emergency responders arrived, the passenger side of the cab was on fire. As emergency responders approached, the fuel tank of the tractor/trailer ignited. The decedent was unable to get out of the vehicle and was found deceased inside the cab. Emergency responders noted an oily residue, thought to be diesel fuel, on the ground alongside the entire roadway shoulder where the semi-truck was riding along the guardrail, this suggested that the impact with the truck into the guardrail cut open one of the diesel fuel tanks on the truck and that it leaked fuel.

119. A male gravel hauler in his 60's died when the gravel hauler units overturned during his attempt to avoid a collision with a vehicle making a "U" turn. The incident occurred during daylight hours on a dry, 4-lane not physically divided roadway with a posted speed limit of 55 mph. The semi-tractor was hauling tandem dump trailers filled with sand. The decedent's truck was traveling southbound in the right lane. A driver that had been traveling northbound missed his turn and attempting to retrace his steps, he made a right turn onto a side road to make a "U" turn. Without stopping, he crossed the two northbound lanes of traffic and entered the southbound lanes. The decedent's attempted evasive maneuvers to avoid striking the vehicle caused the tractor and tandems to overturn onto the passenger side and slide along the roadway. The decedent was not wearing a shoulder harness/seat belt. The tractor was not equipped with an airbag.

120. A male semi-truck driver in his 50's died after his truck left the roadway and struck a utility pole. The decedent was traveling eastbound on a dry 2-lane highway with a posted speed limit of 65 MPH in daylight in a semi-trailer hauling hot asphalt. The decedent was conversing with another driver several vehicles behind him using a hands-free device when the other driver heard the decedent coughing and then swearing as the vehicle veered off the road to the left. The truck traveled into a roadside ditch, struck a utility pole head-on, and came to a stop. The contents of the trailer spilled out, filling the ditch. The decedent was not wearing a seat belt, and it is unknown whether the vehicle's airbags deployed.

STRUCK-BY

121. A male refuse hauler semi-truck driver in his 30's died when he was run over by his disabled truck that was being pushed by a bulldozer at a landfill. The road to the working face of the landfill was snowy and muddy; only one refuse truck at a time was permitted on the road. To access the working face, landfill employees utilized CB radio communication with the truck drivers to control traffic on the hill. It was a hectic day at the landfill; many trucks were waiting for permission at the bottom of the hill and there were several trucks at the top of the landfill waiting to unload. The decedent was positioning his truck at the working face of the landfill to dump his load when, approximately 20 feet away from the working face, the truck's drive shaft broke. A landfill employee pulled the decedent's truck-trailer to the working face. The decedent dumped his load, and a landfill employee used a bulldozer to push him to holding area at the top of the landfill to assess truck damage and wait for a push down the hill. The bulldozer operator gave the decedent instructions regarding how to prepare the truck for the push down the hill, and that they would push him down the hill when they had a free moment. The owner of the trucking firm was also at the landfill face and was parked next to the decedent's truck. There were several radio calls requesting the push of the disabled truck down the hill; it is unclear who made these calls, the decedent or the firm's owner. Landfill standard operating procedure required the equipment providing the push to communicate with the driver, make eye contact with the driver and have a spotter to watch both vehicles. After another insistent radio call for a push, a bulldozer responded. The bulldozer operator assumed that the decedent was in the driver's seat because the call had just been made. The bulldozer was positioned at the rear of the truck in the center of the truck trailer. The decedent, who was not wearing landfill-required personal protective equipment, was positioned in front of the passenger side dual wheels of the truck. The bulldozer pushed the truck-trailer forward and when the truck rolled, the decedent was run over by the tires. After the incident, employee interviews indicated it was unclear who made the last CB radio call for the push – the firm owner or the decedent. MIFACE Summary of a MIOSHA Inspection #531.

SUICIDE

122. A male truck driver in his 50's died from a self-inflicted gunshot wound.

123. A male semi-truck driver in his 60's died from a self-inflicted gunshot wound.

INFORMATION (NAICS 51)

MOTOR VEHICLE COLLISION

124. A male satellite service technician in his 40's died when his vehicle crashed into a semi-trailer that had slowed down. The crash occurred on a dry, not physically divided two-lane roadway

with a posted speed of 55 mph. Due to a line of traffic coming southeast a northwest-bound van had to wait for traffic to clear to make a left turn into a driveway. When the van slowed/stopped the traffic behind him also slowed, including a semi-truck and trailer. The decedent's vehicle was directly behind the semi-truck and trailer. Witnesses indicated seeing the trailer's brake lights. The decedent did not stop for reasons unknown and struck the rear of the trailer. He was wearing a seatbelt/shoulder harness and the vehicle's airbags deployed.

REAL ESTATE, RENTAL, AND LEASING (NAICS 53)

HOMICIDE

125. A female housing property manager in her 40's died from complications of a gunshot wound.

126. A male real estate agent in his 60's died from multiple stab wounds.

PROFESSIONAL, TECHNICAL, AND SCIENTIFIC SERVICES (NAICS 54)

AIRCRAFT

127. (&128.) Five men, a pharmaceutical key account manager in his 40's, a construction project manager in his 20's, an operations general manager in his 60's, a consulting engineering firm owner in his 50's and a senior HVAC designer in his 40's were killed in a fixed wing single engine aircraft crash. The pharmaceutical key account manager was piloting the plane and the general operations manager was the copilot (pilot-rated passenger). Both individuals held a commercial pilot certificate with single-engine land and instrument airplane ratings. The pilot passenger also held a flight instructor certificate for single-engine land and instrument. When the aircraft approached the runway, it was not properly aligned with the runway. When the landing was missed, airport procedure required the aircraft to make a "left hand turn" and then re-approach. During its descent, it turned left, rapidly lost speed and altitude, according to data collected from the plane, and crashed in an open field northwest of the runway. At the time of the crash, there was a calm wind, 1.25 miles surface visibility and light rain and mist. The cause of the crash has not been determined. NTSB investigators determined that the aircraft was about 232 pounds over the maximum allowable takeoff weight and was about 126 pounds over the maximum allowable landing weight.

FALL

129. A male laborer in his 20's died when he fell 30 feet from an extension ladder while removing a holiday wreath from a residence. The decedent placed the ladder at the appropriate angle away from the home but did not ensure the ladder's safety feet were in contact with the ground. The sequence of events leading to the fall were unwitnessed. Several hypotheses include that the decedent was leaning outside of the rails to reach for the wreath and/or holiday light clips, or that he removed the wreath and the weight of the wreath (15 pounds) caused him to lose his balance as he was lifting or bringing the wreath back towards the ladder. Coworkers heard the decedent utter an expletive. The decedent landed feet first in the mulch around the home and then fell to the cement sidewalk. The ladder stayed upright. Emergency response was called, and the decedent was transported to a nearby hospital where he died five days later. MIFACE Summary of a MIOSHA Inspection #513.

ADMINISTRATION, SUPPORT, WASTE MANAGEMENT, AND REMEDIATION SERVICES (NAICS 56)

DROWNING

130. A male seasonal general laborer for an aquatic remediation firm in his 20's drowned after hitting his head on a dock. The decedent had asked the owner, who was working in a nearby shed housing the aeration compressor if he wanted him to go out and start working on the filters that needed replacement. The firm owner indicated that if the decedent was comfortable performing the task, he could go ahead and do it. To access the 1/2-acre pond's aerator, a firm-owned rowboat was placed in the water near a 15-foot dock. While entering the rowboat the decedent fell, striking his head against the dock. He then fell into the water face down. He was not wearing a personal flotation device. The firm owner heard a splash and immediately ran to the dock. He found the decedent face down in 2-3 feet of water, 10 feet from shore. The owner jumped in the pond to attempt to get the decedent out of the water but could not lift him out without assistance. A bystander called for emergency response. While awaiting emergency responder arrival, the owner had attempted mouth to mouth ventilations and compressions. It took several emergency responders to extricate the decedent from the water. EMS took over CPR and he was transported to a local hospital where he died soon thereafter. MIFACE Summary of a MIOSHA Inspection #537.

DRUG OVERDOSE

131. A male groundskeeper in his 30's died from ingestion of fentanyl and heroin.

ELECTROCUTION

132. A male tree trimmer in his 20's died from an electrical shock when he contacted a 4,800-volt electrical wire while trimming a tree. The decedent, in addition to being an employee of a tree trimming and landscaping firm, was also a sole proprietor of a tree trimming business. The decedent borrowed the tree trimming equipment he was using from his employer. Wearing his harness, the decedent climbed the tree to perform the trimming. His groundman indicated to responding police that the decedent was approximately 30 feet up in the tree when he placed his bare hand on the power line that was hanging close to the tree.

FALL

133. A male laborer in his 40's died from complications sustained when he fell approximately 12 feet to concrete while shoveling snow from a roof.

FIRE/EXPLOSION

134. A male in his 40's, who performed general maintenance for a building, died from acute smoke inhalation during a structural fire in the building when he was trapped in the building.

MOTOR VEHICLE COLLISION

135. A male refuse hauler in his 40's died when the garbage truck he was driving left the roadway and rolled over into a ditch, coming to rest on its passenger side. The garbage truck was traveling west on a two-lane, mud/dirt/gravel not physically divided roadway with a non-posted speed limit of 55 mph. It was raining at the time of the crash. The roadway shoulders had been freshly graded; the distance from the usable compacted portion of the road to the edge of the road was two feet. It appeared to the responding officers that the decedent's truck was too far right on the roadway causing the passenger side tires to leave the compacted portion of the road. The garbage truck began to slide down on the graded road edge. Once off the roadway, the decedent attempted to steer back onto the road. The truck traveled over two road signs and

then overturned. Prior to the overturn, the decedent, who was not wearing a seat belt, was ejected from the truck. The truck rolled over on top of him. Post-crash truck inspection found violations regarding the brakes and the annual inspections showed that the truck should have been out of service at the time of the crash.

136. A male executive marketer for a waste disposal company in his 60's died from a motor vehicle crash. The crash occurred on a dry, three-lane divided highway with a median strip and traffic barrier. The posted speed limit was 70 mph, but traffic had backed up due to regular congestion. The driver striking the decedent had been traveling at/near posted speeds when a pickup in front of him swerved out of the lane. The driver striking the decedent's vehicle did not see that traffic had been slowing down in front of him. Immediately after the pickup swerved out of the lane, his vehicle rear-ended the decedent's vehicle, pushing it into the vehicle ahead. The decedent was wearing his seatbelt/shoulder harness and the vehicle's airbags deployed.

EDUCATIONAL SERVICES (NAICS 61)

ASPHYXIATION

137. A female university instructor/researcher in her 60's died when she choked on a piece of food during lunch. She showed the universal sign of choking, and her coworkers performed the Heimlich maneuver without success. She became unresponsive and coworkers initiated CPR. Emergency responders arrived and initiated emergency care. The decedent was transported to the hospital and surgery was required to remove the food bolus.

MOTOR VEHICLE COLLISION

138. A female university admissions representative in her 20's died when her car was struck on the passenger side by a pickup truck. The crash occurred within an intersection. The decedent was traveling eastbound on a dry, two-lane roadway with a posted speed limit of 55 mph. Both the eastbound and westbound roadway had two sets of rumble strips and stop signs at the intersection. The pickup truck was traveling northbound, and the north-south roadway had the right-of-way with a posted speed limit of 55 mph. The decedent failed to stop at the stop sign and entered the intersection. The pickup truck unsuccessfully attempted to avoid the collision and struck the passenger side of the decedent's vehicle. The decedent was wearing a seatbelt/shoulder harness and the car's airbags deployed. When rescue personnel freed her from her vehicle, a cell phone fell out of her hand.

SUICIDE

139. A male music teacher in his 20's died from a self-inflicted gunshot wound.

HEALTH CARE AND SOCIAL ASSISTANCE (NAICS 62)

DRUG OVERDOSE

140. A female foster care caregiver in her 20's died from a drug overdose.

HOMICIDE

141. A male plasma donation center worker in his 30's died from multiple gunshot wounds.

SUICIDE

142. A male independent living assistant community manager in his 40's died from a self-inflicted

gunshot wound.

143. A male senior center maintenance supervisor in his 50's died from a self-inflicted gunshot wound.

144. A male caregiver in his 30's died from a self-inflicted hanging.

ARTS, ENTERTAINMENT, AND RECREATION (NAICS 71)

HOMICIDE

145. A female music artist manager in her 40's died from multiple gunshot wounds.

MOTOR VEHICLE COLLISION

146. A male derby car driver in his 20's died when his derby car left the roadway and entered a ditch. The decedent was traveling northbound on a dark, unlit wet, two-lane not physically divided roadway with a posted speed limit of 55 mph. It was raining at the time of the incident. The derby car did not have a windshield, side or rear windows, front bumper, front headlights or rear taillights, no door handles (doors were wired shut), and no registration plate. The decedent's vehicle left the roadway to the right, down the ditch and crashed into an embankment for a driveway in the ditch. The decedent was not wearing a shoulder harness/seat belt. The vehicle did not have airbags.

STRUCK-BY

147. A male motocross dirt bike racer in his teens died when, after crashing his motorcycle, he was struck and run over by another race participant. The rider who struck the decedent hit a jump and when he was in the air, he saw the decedent on the ground in front of him, trying to get up on his hands and knees. The decedent was directly in front of rider, and he had no way to avoid him. When he landed the jump, his bike struck and ran over the decedent.

ACCOMODATION AND FOOD SERVICES (NAICS 72)

FALL

148. A male worker at a pizza restaurant in his 30's died from complications of head injuries sustained in a fall.

MOTOR VEHICLE COLLISION

149. A male in his 50's was driving an ice cream truck when he was struck by a car making a left turn within an intersection. The incident occurred on a non-physically divided, dry, five-lane roadway with a posted speed limit of 40 mph. The intersection was controlled by a traffic light. The decedent was driving northbound in the far left through lane; he had the green light. The car striking him had been traveling southbound. The car driver stopped at the red light, then began to make a left turn. His car struck the left rear corner of the ice cream truck. The collision caused the truck contents to shift to the passenger side of the truck. The ice cream truck overturned onto its passenger side, slid approximately 70 feet, and then burst into flames. The decedent was thrown from the driver's seat to the rear of the vehicle and was trapped in the burning vehicle by three freezer chests. The police report indicated that the decedent's seat belt/shoulder harness use was unknown. The van was not equipped with airbags.

150. A male in his teens delivering pizzas died when his vehicle was broadsided on the driver's side by a car traveling at a high rate of speed. The crash occurred at an intersection on a dry, non-physically divided, 2-lane roadway with a posted speed limit of 55 mph. The victim had delivered a pizza and was returning to the store when the crash occurred. The decedent was travelling eastbound and had stopped at the roadway stop sign. Due to high weeds, north and southbound roadway travel was obscured. It is unknown if the decedent "inched forward" to determine if oncoming traffic was present. Investigating police officers noted that visuals of oncoming traffic were not impaired if they "inched forward". As the decedent's vehicle entered the intersection, the southbound driver with the right of way broadsided his vehicle, striking it on the driver's side. The decedent was wearing a shoulder harness/lap belt. The vehicle's airbags deployed.

SUICIDE

151. A female bartender/waitress in her 40's died from a self-inflicted gunshot wound.

OTHER SERVICES (NAICS 81)

DRUG OVERDOSE

152. A male auto mechanic in his 30's died from a multiple drug intoxication.

FALL

153. A male church volunteer in his 70's died when he fell approximately 10 feet onto his back from the edge of the roof of his church to the church's parking lot pavement. He and other volunteers had been repairing the one-story roof when the incident occurred.

STRUCK-BY

154. A male car wash quality technician in his 40's was struck by a pickup truck exiting a car wash conveyor. A quality technician inspects the vehicles coming off the conveyor to ensure they were cleaned and then hand dries the vehicles with cloths. As vehicles exit the conveyor, the driver shifts the vehicle from neutral to drive and then drives up to a speed bump, located approximately 20 feet from the end of the conveyor and stops. The driver is then directed by another car wash employee to one of two bays where the inspection/drying takes place. Between the two inspection/drying bays and directly in front of the speed bump was an area of approximately 10 feet in width depending on the vehicles. Joining two employees in the center area between the bays, the decedent was returning to center area dry rags from the wringer to the drying area and had just begun dumping the barrel the rags were in into another container. At the time of the incident, the pickup truck had been directed to the "right side" bay. The driver's first attempt to drive over the speed bump failed; the truck rolled back. After rolling back, the truck driver pressed more firmly on the accelerator, and the truck accelerated much faster to clear the speed bump. The truck entered the center area. The pickup struck two individuals, killing one and injuring another. The injured employee was standing between the two bay doors near the exit when he was hit by the front passenger side of the pickup. The decedent was standing with his back to the pickup truck when it hit him. The decedent was pushed and pinned against a bollard and wall between the two bay doors, and then was subsequently pushed out the building onto the ground. The pickup driver then backed up the truck and parked it. Emergency response was summoned.

155. A male crane service technician in his 30's died when struck by and caught in between a steel

girder and the motor housing/brake cover of an overhead crane. The firm for whom the decedent worked had been contracted to perform annual inspections on Firm 1's overhead cranes. The decedent was a member of a two-person crew. There were two overhead cranes located in a bay at Firm 1; a larger capacity crane (Crane 1) located above a smaller capacity crane (Crane 2). The decedent was performing maintenance on Crane 2. Crane 1 was operational on runways which ran east-west, Crane 2 had been locked out. The decedent had been performing work under Crane 2 in an elevated aerial lift basket, but out of the travel path of Crane 1 which was operated by a Firm 1 employee. Unknown to the Firm 1 employee, the decedent, who was facing east towards the motor housing/brake, was raising the aerial lift basket to perform work. The basket was raised into the travel path of Crane 1 just as the girder of Crane 1 traveled overhead. The eastern most girder on Crane 2 struck the decedent as it traveled overhead, causing the decedent's head to be pinned in the 2- to 3-inch space between Crane 2's motor housing and Crane 1's steel girder. MIFACE Summary of a MIOSHA Inspection #530.

156. A shaker-board worker for an oil change business in his 60's died when he was struck by a vehicle that swerved over a street curb while he was standing on the grass at the edge of a busy street. The shaker board sign was 24 inches by 18 inches in size. The incident area was just south of the facility's entry driveway. It was a grass covered area with a patch of dirt at the edge of the street that showed evidence of the path he walked while showing the shaker board. The decedent would use the shaker board to direct drivers to the oil change business. He would sometimes enter the roadway with the board, but also stay on the grass and flip/move the sign. The decedent did not wear a high visibility vest during these activities. It appears a distracted driver swerved and jumped a curb, striking the decedent and dragging him in the roadway for 50 feet. The driver then left the scene and was later apprehended by police. MIFACE Summary of a MIOSHA Inspection #535.

SUICIDE

157. A female hair salon owner in her 30's died from a self-inflicted hanging.

158. A male tire sales representative in his 40's died from a self-inflicted hanging.

159. A male auto body repair worker in his 40's died from a self-inflicted hanging.

PUBLIC ADMINISTRATION (NAICS 92)

HOMICIDE

160. A male police officer in his 40's died from a gunshot wound while responding to a domestic violence call in which a woman's boyfriend had broken into her home and threatened the occupants with a firearm.

MACHINE

161. A male parks commission member in his 70's was cutting the grass in a township park when his lawnmower struck a slide. The collision caused a leg injury in addition to him falling from the lawnmower seat. His resting position caused him to have trouble breathing and he died due to positional asphyxia.

MOTOR VEHICLE COLLISION

162. A male driver and security officer for a county executive in his 60's was severely injured in 2012 when the car he was driving was struck by another car making a left turn at an intersection. The decedent's car (Car 1) was traveling eastbound on a dry, five-lane roadway; two lanes each for east and westbound travel and a center turn lane. The north/south roadway was similarly constructed. A traffic signal controlled the traffic flow at the intersection. The intersection used a left turn arrow as part of the light cycle and the left turn signals were cycling in the proper order. When a driver approached the intersection from any direction and wanted to make a left turn, the turn arrow light cycled first. For example, if a motorist traveling W/B and wanted to make a left turn and is stopped at the red traffic light, the driver must wait for N/B and S/B traffic to stop for their respective red light. Once the light changed to red for N/B and S/B, the left turn arrow for W/B and E/B would then cycle. When the green turn arrow is activated, the traffic for W/B and E/B still had a red light. The left turn arrow then cycled to a solid yellow arrow. After the solid yellow arrow, the light changed to a solid red turn arrow light. Once the light changed to a solid red, the light for E/B and W/B changed to green, while the left turn traffic arrow would flash with a flashing yellow turn arrow light. Car 1 was traveling E/B and approached the intersection. While the decedent traveled through the intersection, Car 2 was in the process of making a left turn on a flashing yellow light. The light was green for the roadway on which the decedent was traveling. When Car 2 was making the left turn, it was struck on the passenger side front door by the decedent's vehicle. In 2019, the decedent died from the injuries sustained in the crash. He was not wearing a seatbelt/shoulder harness at the time of the crash and the car's airbags deployed.

STRUCK-BY

163. A male road maintenance worker in his 40's died when he was struck by a passing semi-truck's tire and rim when it came off the semi-truck trailer. The decedent and a coworker had parked the work truck on the side of an expressway to pick up a large piece of debris. Their truck's lights were activated. The decedent was standing at the back of the truck wearing his high visibility vest when the semi truck's trailer lost two tires and rims. One of the two tires struck the decedent. He was found between the guardrail and the work truck; the tire with the rim was laying behind him. The semi-truck/trailer pulled over immediately when the driver noticed sparks where the tires should have been.