Work-Related Burns in Michigan: Second Annual Report (January 2010 – December 2010)

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A Joint Report of

Michigan State University

and

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and

Michigan Department of Community Health

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Michigan State University's Occupational and Environmental Medicine Division compiles data on work-related burns in the state of Michigan. This report is the second annual report on occupational burns in Michigan. The key findings are as follows:

- In 2010, the number of work-related burns in Michigan based on multiple reporting sources was 1,908 which is 2.58 times greater than the official estimate of 740, which is based on a survey of employers by the US Bureau of Labor Statistics (BLS).
- Hospital/emergency department reports identified 1,625 work-related burns, the Michigan Workers' Compensation Agency identified 325, the Michigan Poison Control Center identified 138, and the Michigan Fatality Assessment and Control Evaluation program identified five deaths from work-related burns. Among the 2,093 reports received from the four reporting sources, 181 were reported by more than one source; thus the total number of work-related burns identified in 2010 was 1,908. Because eight individuals had two separate burn incidents, 1,900 individuals were burned at work in 2010.
- The most common type of medical encounter was an emergency department visit (75.7%).
- Sixty-four percent of all burns were in male workers and 81.7% in Caucasians.
- The most common part of the body burnt were wrists and hands (33.7%) and upper limbs (18.3%).
- Second degree (70.2%) and thermal (67.4%) burns were the most common types of work-related burn.
- Forty-seven percent of work-related burns occurred to workers in either the Accommodation and Food Services or Healthcare and Social Assistance industries.
- Workers' Compensation was the expected payer in 63.0% of the 1,625 cases for which there was a medical record. Payer source could not be determined for 13.8% of medical records reviewed.

BACKGROUND

This is the second annual report on occupational burns in Michigan for the year 2010. Occupational burns are a preventable cause of work-related injury and are among the most traumatic injuries that can occur in a workplace. A traumatic injury is "bodily damage resulting from exposure to physical agents such as mechanical energy, thermal energy, ionizing radiation, or resulting from the deprivation of basic environmental requirements such as oxygen or heat".[1] Health professionals and health facilities are required to report individuals with all injuries, including burns, regardless of cause when requested by MDCH or a local health department. This work-related burns surveillance system, based on mandatory reporting, allows the state to identify causes of work-related burns, target interventions to reduce future burns and evaluate the effectiveness of these interventions.

Nationally, BLS, the official source of work-related injury statistics, reported 21,930 work-related burns in 2010, a rate of 22 workers with burns per 100,000 full-time workers.[2] The BLS estimates are based on employer reporting. The BLS estimate includes private industry and state and local government workers but not the self-employed. BLS reported 740 work-related burns for Michigan in 2010. This corresponds to a rate of 25 per 100,000 full-time workers.

Michigan State University's Occupational and Environmental Medicine Division operates the burn surveillance system as the bona fide agent for the State. Once a work-related diagnosis is confirmed and if a case meets designated criteria, information about the employer where the burn took place is referred to the Michigan Occupational Safety and Health Administration so that they can conduct a workplace investigation.

DATA SOURCES AND METHODS

There were four reporting sources of work-related burns in 2010:

- Hospitals/Emergency Departments
- Workers' Compensation Agency (WCA)
- Poison Control Center (PCC)
- Michigan Fatality Assessment and Control Evaluation (MIFACE)[3]

All 134 acute care hospitals, including Veterans' Administration Hospitals in Michigan, were required to report work-related burns. Medical records were used to identify a work-related burn treated at a hospital/emergency department (ED) or as an outpatient visit at a hospital-based clinic. A case identified using hospital medical records was defined as an individual aged 16 years or older receiving medical treatment at a Michigan hospital/ED for whom: (a) a burn-related diagnosis code was assigned (International Classification of Diseases, Ninth Revision (ICD-9)[4] codes for burns: 940.0-.9, 941.0-.5, 942.0-.5, 943.0-.5, 944.0-.5, 945.0-.5, 946.0-.5, 947.0-.9, 948.0-.9, 949.0-.5; ICD-9 codes for accidents caused by fire: E890.0-.9, E891.0-.9, E892, E893.0-.9, E894, E895, E896, E897, E898.0-.1, E899), and (b) the incident was documented as having occurred at work in 2010.

LARA and WCA provided access to a database of claims for wage replacement due to lost work time. Individuals are eligible for wage replacement when they have had at least seven consecutive days away from work. A case identified using Michigan's Workers' Compensation system was defined as an individual who was in the lost work time wage replacement database with an accepted claim for a work-related burn that occurred in 2010.

A case identified through Michigan's PCC was defined as an individual for whom a call was made by a burned employee, family member, coworker, or healthcare provider, regarding a consultation for a work-related burn injury in 2010.

A case identified through the MIFACE program was identified as an individual who died from a work-related burn in 2010.

Information from the hospital/ED medical reports, PCC reports and MIFACE reports on each case was abstracted onto a form, including: reporting source(s), type of medical care (hospital, ED, outpatient), hospital name, type of visit, date of admission and discharge, patient demographics, city and county of residence, source of payment, employer information (name, address, NAICS code), injury date, mechanism of the injury (type of burn), part(s) of body burned, severity of burn, and percentage of burn (% Total Body Surface Area, TBSA). Once these burn data were entered into a Microsoft Access database, records were manually linked to records in the Workers' Compensation database. Matches were identified using individual's first and last name, date of birth and date of injury. Finally, WCA cases meeting the work-related burn case definition that did not match with the any of the other of the data sources (i.e. where WCA was the sole source of the case report) were identified. Information from Workers' Compensation on matched cases and new cases was added to the database. Duplicates identified by more than one reporting source were eliminated, after abstracting all information from every data source.

Individuals whose workplaces could not be identified in the records and whose case met the criteria for a MIOSHA referral (See p.18) were contacted by telephone to obtain employer information.

For cases whose employers were referred to MIOSHA, additional information was obtained about the results of the referral, including: date of referral, whether an inspection was performed, inspection date, number of violations, and total fines assessed.

Data analysis was performed using queries conducted in Microsoft Access. Burn rates by age, gender, and industry were calculated using the U.S. Census, Department of Labor's Current Population Survey for denominators.[5, 6]

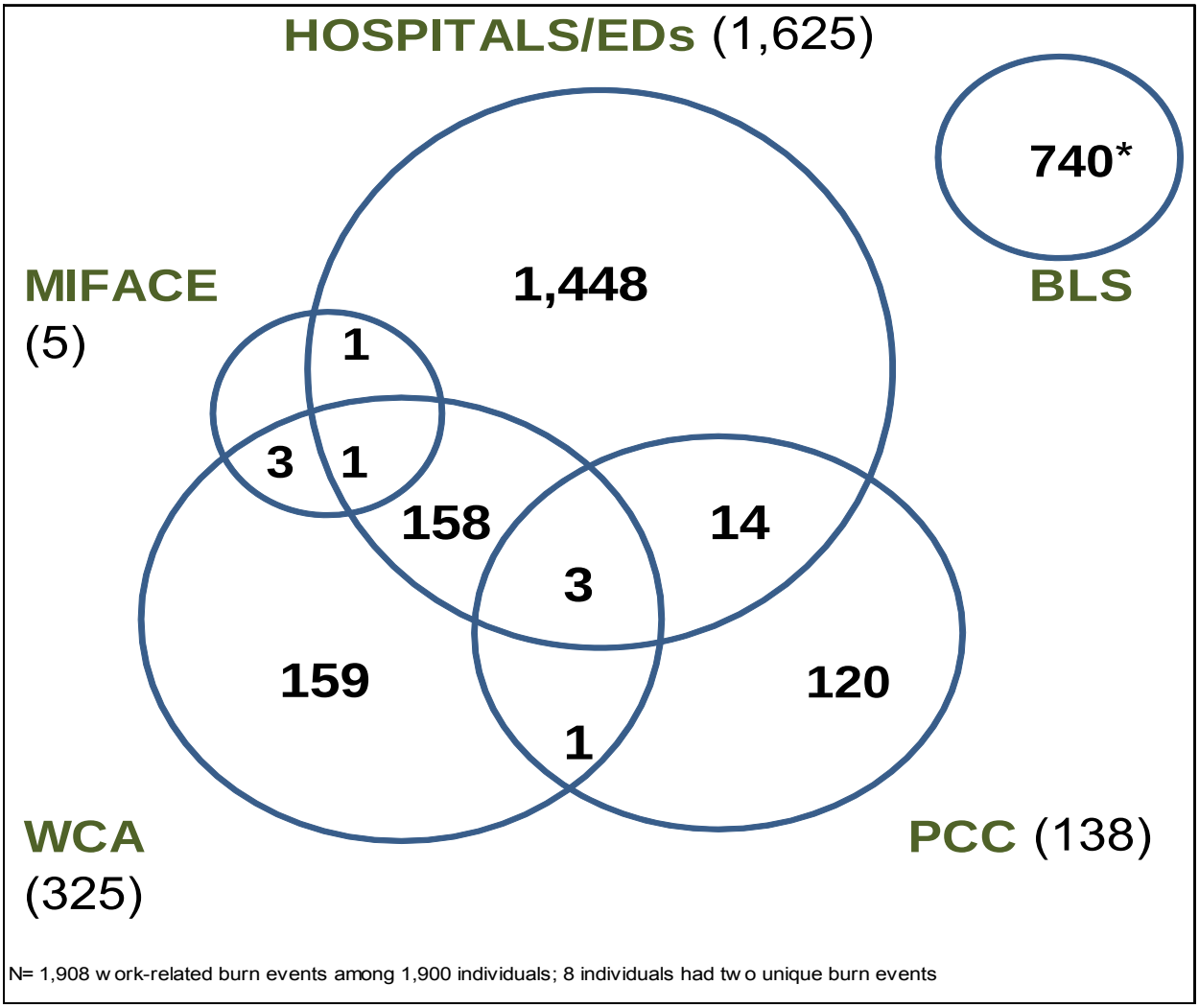
RESULTS

There were 1,908 work-related burn incidents reported from hospital/ED, PCC, WCA, and the MIFACE surveillance programs. The 1,908 events represent 1,900 people because 8 individuals each had two unique burn injuries in 2010.

Reporting Sources

The number of work-related burns in Michigan by the reporting source and a comparison with the number estimated by BLS is shown in Figure1.

Figure 1. Reporting Sources of 1,908 Work-Related Burn Incidents, Michigan 2010



*There is presumably overlap between the 740 estimate of the BLS and the other reporting sources but BLS does not allow access to their data to assess the degree of overlap.

Hospital/ED reports identified 1,625 cases, WCA 325 cases, PCC 138 cases, and MIFACE 5 fatalities. Hospital/ED reports matched 158 WCA reports and 14 PCC reports, 3 both for WCA and PCC reports, 1 both for WCA and MIFACE, and 1 MIFACE only. The other 3 fatalities were identified through the MIFACE program and WCA. One burn case was identified by both a WCA and PCC data source but not by the hospital/ED data source. Because of confidentiality restrictions, no attempt was made to match our data set with the BLS data set.

Of the 325 WCA cases, 302 were identified because they had been classified as a burn (a thermal burn (272) or a chemical burn (30)). The other 23 were included because they matched with names from one or more of the other data sources, although they had an injury description in the WCA database as something other than "burn". Nineteen were identified after matching with a burn report from a hospital/ED record. The descriptions in WCA for these 19 were: 5 "multiple injuries", 2 "cut/laceration", 2 "unclassified", 1 "abrasion/scratch", 1 "amputation", 1 "conjunctivitis", 1 "crush/contusion", 1 "dermatitis allrg", 1 "electric shock", 1 "eye diseases", 1 "fracture", 1 "inflame-joints", 1 "occup disease". Three WCA cases matched three fatalities. The description of the injury in the WCA database was "multiple injuries" for 2 cases and "electric shock" for the one case. One WCA case matched a PCC record of a burn. The description of the injury in the WCA database was "conjunctivitis".

The most common type of medical encounter was an ED visit, 1,445 (75.7%), followed by 112 outpatient visits (5.9%), and 68 hospitalizations (3.6%). For 283 (14.8%) cases, which include 159 WCA, 121 PCC records, and 3 fatalities, the type of medical care that workers received was not available.

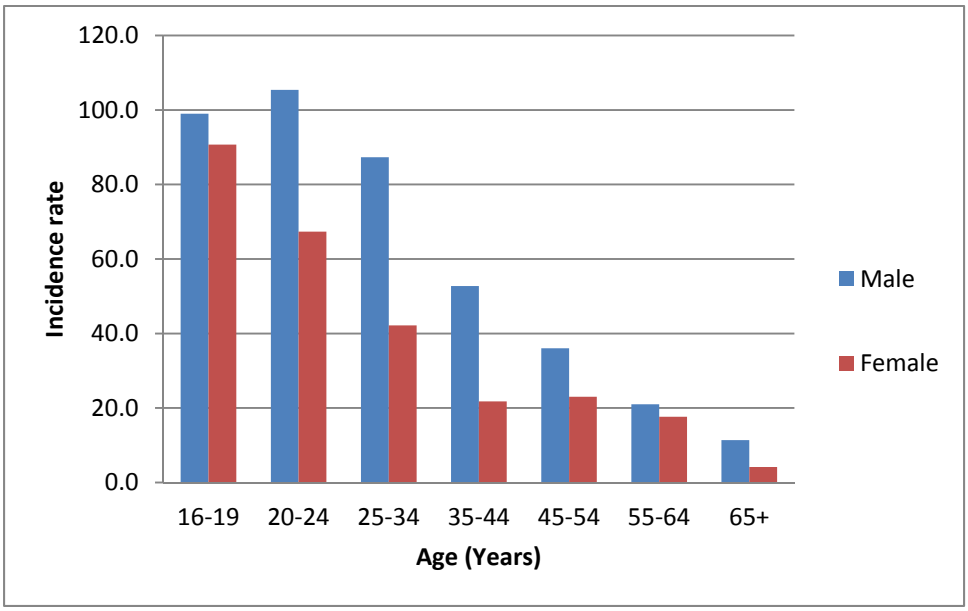
Characteristics of Injured Workers

Age and Gender

Age was available for 1,890 workers (99.0%); age was unknown for 8 males and 11 females. The age of injured workers ranged from 16 to 78 years. The average age was 34 and median was 31. One thousand two hundred and twenty-four (64.2%) of all work-

related burns were among men. Figure 2 displays burn rates by age group and gender. Among males, rates were highest for workers aged 20-24 (105.4/100,000), while for females, the age group with the highest burn rate was 16-19 (90.7/100,000).

Figure 2. Work-Related Burn Rates by Age Group and Gender, Michigan 2010*

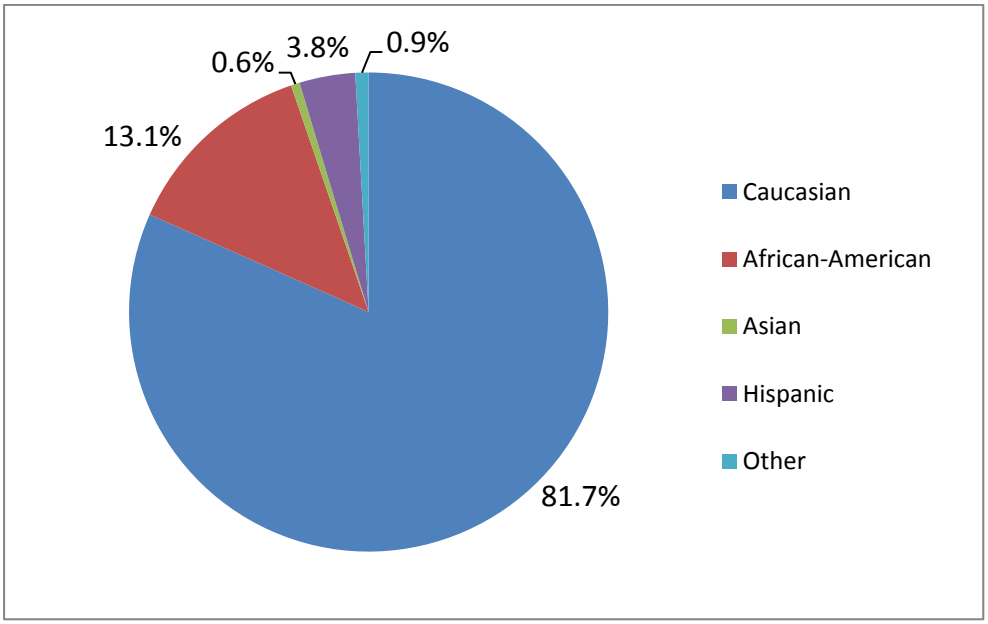


*Rates are the number of workers sustaining a burn per 100,000 workers (number of workers employed by age group used to calculate rates: Bureau of Labor Statistics' Current Population Survey).[5]

Race and Ethnicity

Race and ethnicity of injured workers is shown in Figure 3. Of the workers for whom race was available (1,009), Caucasians comprised 81.7% (824), African-Americans 13.1% (132), Hispanics 3.8% (38), Asian 0.6% (6) and individuals whose race was classified as Other 0.9% (9). Race and ethnicity information was unavailable for 899 workers (47.1%).

Figure 3. Race/Ethnicity Distribution of Work-Related Burns, Michigan 2010*



*Race/Ethnicity information available for 1,009 individuals.

Part of Body Injured

Medical records specified the part of body burned and were classified by ICD-9 codes (940.0-.9 – 949.0-.5). Medical records, which included ICD-9 codes regarding Accidents Caused by Fire, were recoded into the ICD-9 codes 940.0-.9 – 949.0-.5, which specify the part of body burned. The Workers' Compensation database did not classify injuries by ICD-9 codes but specified the part of the body burnt, which was then recoded into the ICD-9 codes. In the PCC reports, the part of the body injured was specified by the caller and coded by using the ICD-9 codes.

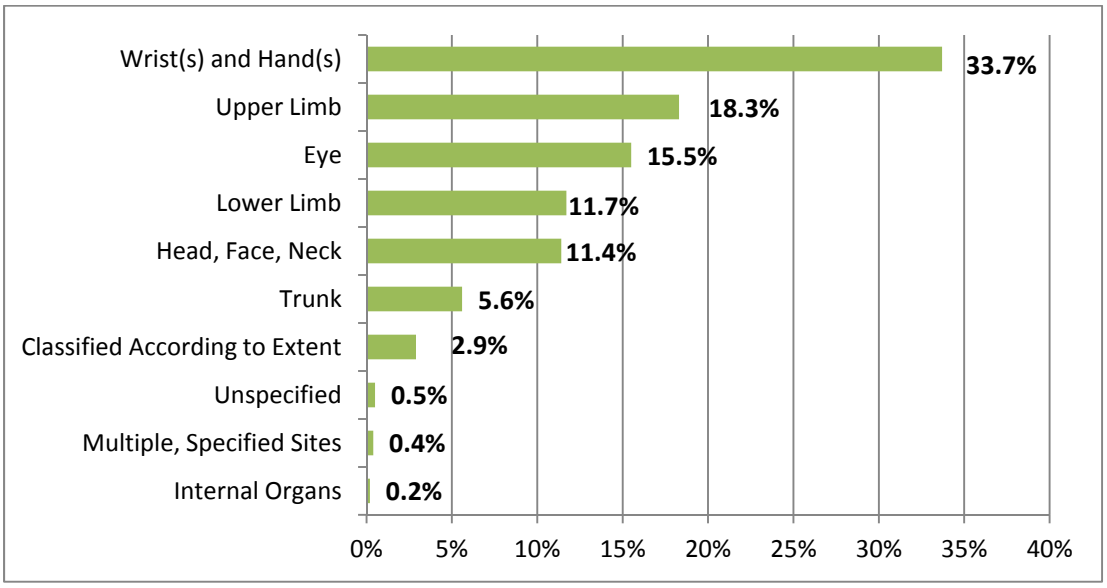
Table 1 and Figure 4 illustrate part of burned body. Part of body injured was specified for 1,905 individuals (99.8%). Burns of wrists and hands occurred most often (33.7%), followed by upper limb burns (18.3%), and then burns confined to eye (15.5%).

Table 1. Work-Related Burns by Part of Body Injured, Michigan 2010*

Part of Body Burned (ICD-9 Code)	Number	Percent
Wrist(s) and Hand(s) (944.0-.5)	642	33.7
Upper Limb (943.0-.5)	348	18.3
Eye (940.0-.9)	295	15.5
Lower Limb (945.0-.5)	222	11.7
Head, Face, Neck (941.0-.5)	218	11.4
Trunk (942.0-.5)	106	5.6
Classified According to the Extent of Body Surface (948.0-.9)[1]	55	2.9
Unspecified (949.0-.5)	9	0.5
Multiple, Specified Sites (946.0-.5)	7	0.4
Internal Organs (947.0-.9)	3	0.2
Total	1,905	100.0

* Numbers and percentages are based on a burn-related primary diagnosis of 1,905 individuals.
[1] This category is used when the site of the burn is unspecified, or with categories 940-949 when the site is specified and the percent of body surface burned is recorded.

Figure 4. Work-Related Burns by Part of Body Injured, Michigan 2010*



*Percentages based on a burn-related primary diagnosis of 1,905 individuals.

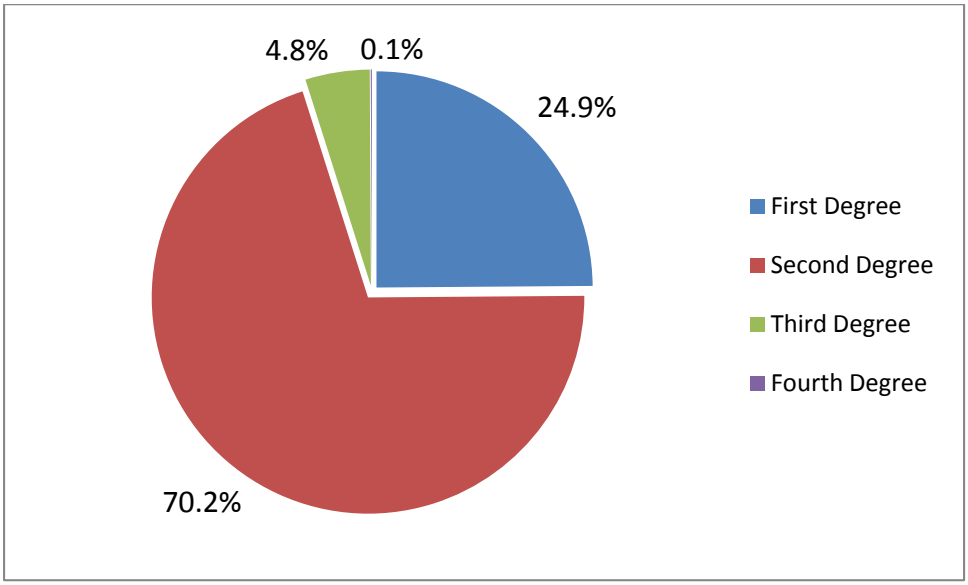
Severity

Burns can be described as first, second, third or fourth degree, or as to their thickness, e.g. superficial, partial and full.

A first-degree (superficial) burn is the least serious as it involves only the outermost layer of the skin called the epidermis. A second degree (partial thickness) burn is more serious. The burn involves epidermis and some portion of dermis (the second layer of the skin). A third degree (full thickness) burn involves the first two layers of the skin, the epidermis and dermis. It permanently destroys tissue. A fourth degree burn is the most severe burn as it extends through the epidermis, dermis, subcutaneous tissue and into muscle and bone. The skin is not able to heal by itself in a fourth degree burn.

Degree of burn was specified for 1,286 individuals (67.4%) and its distribution is illustrated in Figure 5. Nine hundred and three individuals had a second degree burn, which was the most common type of burn, followed by a first degree burn in 320 workers, a third degree burn in 62 workers, and a fourth degree burn in one worker. Percentage of body injured was largely unreported. It was specified for only 349 workers (18.3%) of whom 67 Individuals (19.2%) sustained burns to or more than 10 percent of their total body surface area.

Figure 5. Work-Related Burns by Severity, Michigan 2010*



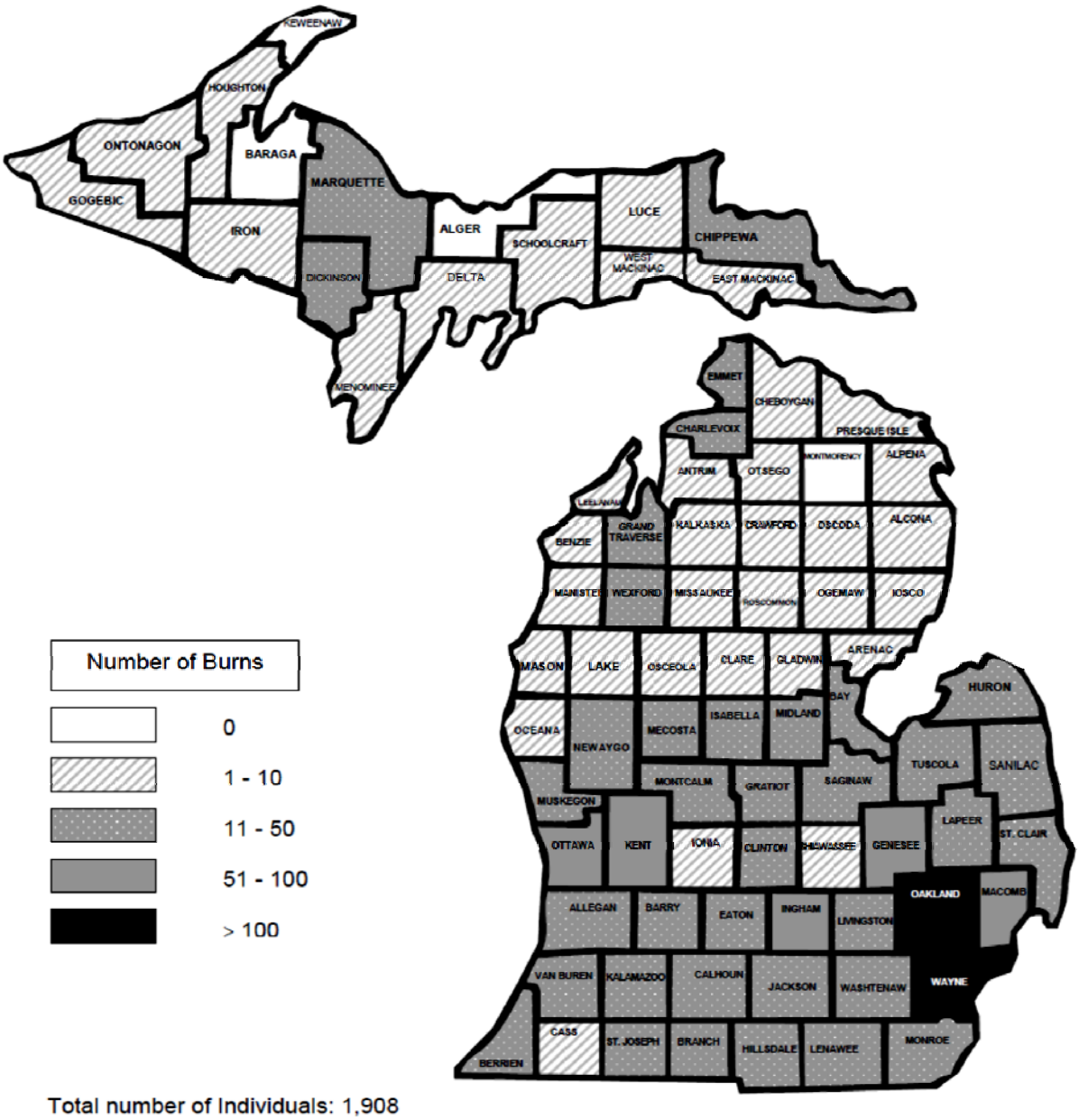
*Degree of burn was specified for 1,286 individuals.

County of Residence

Figure 6 and Table 2 illustrate the number of workers sustaining a burn and the corresponding percentage by a worker's county of residence. There were 1,588

Michigan residents for whom the county of residence was known (83.2%). There were 28 out-of-state workers and 1 out-of-country worker. County of residence was unknown for 291 Michigan residents (15.3%). Wayne county had the highest number of residents who sustained a work-related burn (226), followed by Oakland (132), and then Kent (75).

Figure 6 Work-Related Burns by County of Residence, Michigan 2010



Total number of Individuals: 1,908
Out of State Individuals: 28; Out of Country Individuals: 1
County was unknown for 291 Individuals

Table 2. Work-Related Burns by County of Residence, Michigan 2010

County	Number	Percent	County	Number	Percent
Alcona	2	0.1	Leelanau	4	0.2
Alger	0	−−	Lenawee	27	1.4
Allegan	25	1.3	Livingston	38	2.0
Alpena	6	0.3	Luce	2	0.1
Antrim	4	0.2	Mackinac	5	0.3
Arenac	6	0.3	Macomb	59	3.1
Baraga	0	−−	Manistee	5	0.3
Barry	14	0.7	Marquette	30	1.6
Bay	15	0.8	Mason	7	0.4
Benzie	10	0.5	Mecosta	11	0.6
Berrien	12	0.6	Menominee	3	0.2
Branch	13	0.7	Midland	16	0.8
Calhoun	18	0.9	Missaukee	3	0.2
Cass	4	0.2	Monroe	36	1.9
Charlevoix	12	0.6	Montcalm	17	0.9
Cheboygan	2	0.1	Montmorency	0	−−
Chippewa	12	0.6	Muskegon	47	2.5
Clare	5	0.3	Newaygo	11	0.6
Clinton	18	0.9	Oakland	132	6.9
Crawford	7	0.4	Oceana	10	0.5
Delta	6	0.3	Ogemaw	5	0.3
Dickinson	12	0.6	Ontonagon	2	0.1
Eaton	22	1.2	Osceola	6	0.3
Emmet	11	0.6	Oscoda	2	0.1
Genesee	59	3.1	Otsego	3	0.2
Gladwin	5	0.3	Ottawa	52	2.7
Gogebic	2	0.1	Presque Isle	1	0.1
Grand Traverse	16	0.8	Roscommon	5	0.3
Gratiot	12	0.6	Saginaw	26	1.4
Hillsdale	11	0.6	Saint Clair	21	1.1
Houghton	9	0.5	Saint Joseph	13	0.7
Huron	19	1.0	Sanilac	17	0.9
Ingham	55	2.9	Schoolcraft	1	0.1
Ionia	6	0.3	Shiawassee	6	0.3
Iosco	5	0.3	Tuscola	13	0.7
Iron	4	0.2	Van Buren	26	1.4
Isabella	18	0.9	Washtenaw	40	2.1
Jackson	44	2.3	Wayne	226	11.8
Kalamazoo	45	2.4	Wexford	12	0.6
Kalkaska	6	0.3	Out of State	28	1.5
Kent	75	3.9	Out of Country	1	0.1
Keweenaw	0	−−	Unknown	291	15.3
Lake	2	0.1			
Lapeer	19	1.0	**Total**	1,908	

Industry

Table 3 illustrates the number, percent and rate of work-related burns by industry. For 1,499 individuals (78.6%), there was sufficient information for industry classification using the North American Industry Classification System (NAICS) industry codes. Thirty-five workers were self-employed. Accommodation and Food Services (two-digit NAICS industry sector (72) had the highest number of work-related burns (508). The industry with the second highest number of work-related burns was the Health Care and Social Assistance sector (62), which had 196 burns. The two industries combined accounted for almost half of all work-related burns. Most of the burns identified in the Health Care and Social Assistance sector occurred while dealing with food. Firefighters accounted for the majority of burns occurring in the Public Administration industry. Accommodation and Food Services industry had the highest rate (174.1 per 100,000 workers) of burns, followed by Food, Beverage and Textile Manufacturing (95.4 per 100,000 workers).

Table 3. Work-Related Burns by Industry, Michigan 2010*

Industry Classification (NAICS)	Number	Percent	Rate*
Accommodation and Food Services (72)	508	33.9	174.1
Health Care and Social Assistance (62)	196	13.1	29.0
Primary Metal Manufacturing (33)	106	7.1	21.7[1]
Retail Trade (44)	76	5.1	23.4[2]
Wood Products/ Paper/ Petroleum and Coal Products Manufacturing (32)	69	4.6	62.1[1]
Public Administration (92)	68	4.5	47.0
Construction (23)	67	4.5	33.4
Administrative and Support and Waste Management and Remediation Services (56)	66	4.4	39.7
Wholesale Trade (42)	61	4.1	70.5
Other Services (except Public Administration) (81)	60	4.0	29.5
Food, Beverage, Textile Manufacturing (31)	50	3.3	95.4[1]
Educational Services (61)	44	2.9	10.7
Arts, Entertainment, and Recreation (71)	27	1.8	33.1
Agriculture, Forestry, Fishing and Hunting (11)	21	1.4	31.1
Transportation and Warehousing (48-49)	19	1.3	13.1
Sporting Goods, Hobby, Book, and Music Stores (45)	16	1.1	10.4[2]
Professional, Scientific, and Technical Services (54)	15	1.0	6.4
Real Estate and Rental and Leasing (53)	9	0.6	12.1
Utilities (22)	8	0.5	22.7
Finance and Insurance	7	0.5	4.5
Information (51)	5	0.3	6.1
Mining, Quarrying, and Oil and Gas Extraction (21)	1	0.1	13.3
Total of All Burns	1,908**	100.0	45.1

*Rates are the number of workers sustaining a burn per 100,000 workers (number of workers by industry used to calculate rates: Bureau of Labor Statistics' Current Population Survey).[6]

[1] Rates do not include 4,486 individuals from "Not specified manufacturing industries (Part of 31, 32, and 33)". This is 0.7% of workforce with NAICS 31, 32 and 33.

[2] Rates do not include 5,150 individuals from "Not specified retail trade (Part of 44, 45)". This is 1.1% of workforce with NAICS 44 and 45.

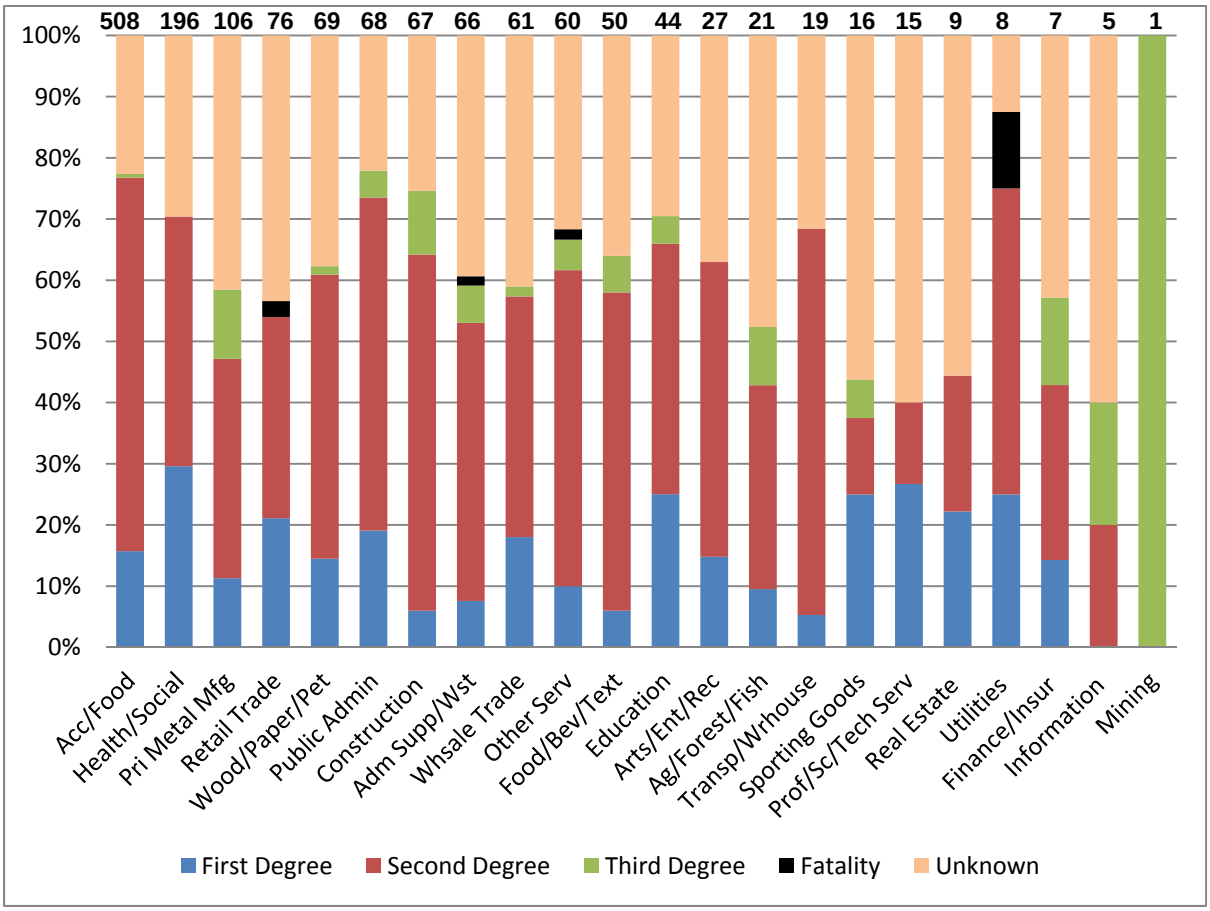
**Sufficient information for industry classification was only available for 1,499 individuals.

Severity of Burns within Specific Industries

Figure 7 illustrates severity of burns within specific industries (1,499 individuals). The severity of burns was specified for 1,029 individuals (68.6%). The predominant degree of burn across all industries was second degree in 735 individuals. Of the five fatalities, two were reported in the Retail Trade sector (NAICS: 44), followed by the Administrative and Support and Waste Management and Remediation Services (56), Other Services

(except Public Administration) (81) and Utilities (22) sectors which each reported one fatal burn. The fourth degree burn is not illustrated in Figure 7 due to the lack of information on the worker's employer and industry.

Figure 7. Severity of Burns within Specific Industries, Michigan 2010*



*Numbers above the bars are the total number of fatal and nonfatal burns by industry.

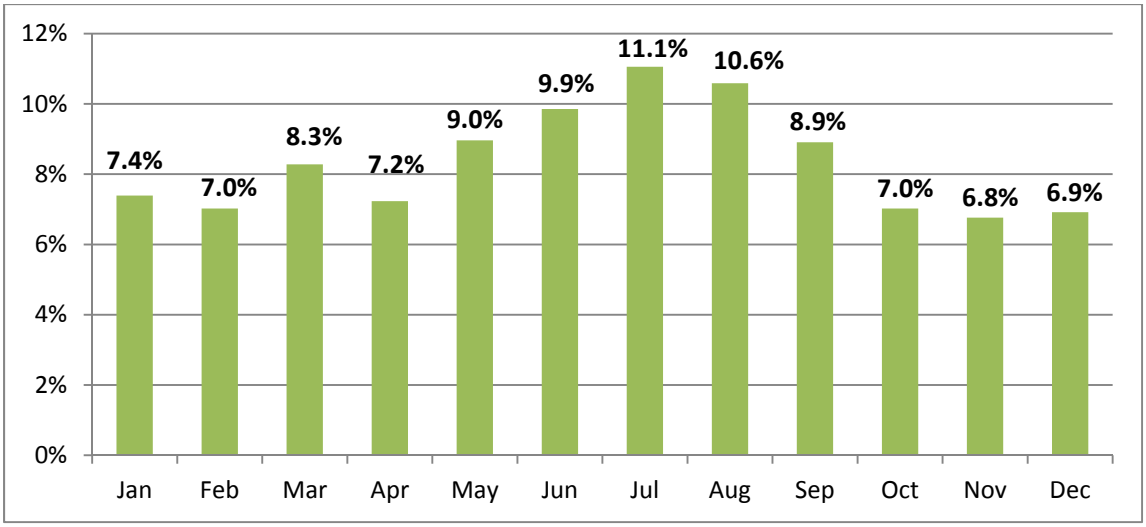
Month of Injury

Month of injury was known for all (1,908) individuals (Table 4 and Figure 8). The most common month for injury occurred in July, 211 (11.1%), and August, 202 (10.6%). The lowest numbers were in late fall and winter months, November being the lowest with 129 (6.8%) individuals.

Table 4. Work-Related Burns by Month of Injury, Michigan 2010

Month of Injury	Number	Percent
January	141	7.4
February	134	7.0
March	158	8.3
April	138	7.2
May	171	9.0
June	188	9.9
July	211	11.1
August	202	10.6
September	170	8.9
October	134	7.0
November	129	6.8
December	132	6.9
Total	1,908	100.0

Figure 8. Work-Related Burns by Month of Injury, Michigan 2010



Source of Payment

Workers' Compensation was the expected payer in 1,023 (63.0%) of the 1,625 cases for which there was a medical record (Table 5). For 224 cases, payment source could not be identified. Of the 602 cases for which Workers' Compensation was not listed as a payment source in medical records, 42 were linked to Workers' Compensation claims

database. Of those 42 cases, 38 were classified as a burn and 4 had an injury description in the WCA database as something other than “burn”. Workers’ Compensation was the expected payer for 64.3% of the 1,590 patients that were not self-employed.

Table 5. Work-Related Burns by Payment Source, Michigan 2010

Expected Source of Payment	Total		Non-Self-Employed	
	Number	Percent	Number	Percent
Workers' Compensation	1,023	63.0	1,023	64.3
Commercial Insurance	200	12.3	181	11.4
Self Pay	136	8.4	128	8.1
Other	42	2.6	40	2.5
Not Specified	224	13.8	218	13.7
Total	1,625	100.0	1,590	100.0

Data Source: Michigan hospital/ED medical records

Causes of Burns

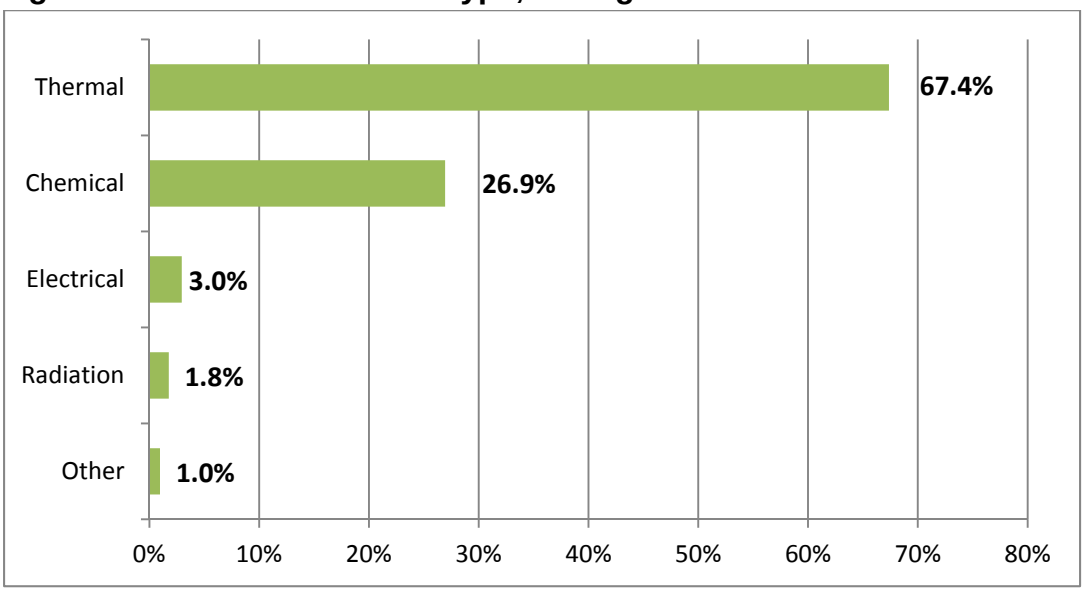
Burns can be caused by a variety of substances and external sources, e.g. heat, chemicals, electricity and radiation. There are 4 major types of burns:

- Thermal – Caused by contact with hot surfaces, flames, hot liquids.
- Chemical – Caused by acids and other skin damaging chemicals, molten metal compounds, hydrocarbons such as gasoline or hot tar.
- Electrical – Caused by contact with electric current.
- Radiation – Caused by ultraviolet radiation generated by the electric arch in the welding process.

Burn type was specified for 1,860 (97.5%) workers (Figure 9). The predominant burn type was thermal in 1,253 workers, followed by chemical in 501 workers, electrical in 55 workers, and radiation in 33 workers (all from exposure to ultraviolet rays from welding). When the industry was specified, Accommodation and Food Services industry had the highest percentage of thermal burns (87.0%). Thirty-percent of chemical burns occurred in the Primary Metal Manufacturing industry, followed by 23.5% chemical burns in the

Health Care and Social Assistance industry. Some of the kinds of chemicals involved in chemical burns included sulfuric acid, sodium hydroxide, hydrofluoric acid, potassium chloride and potassium hydroxide. Among hospitalized individuals, thermal exposure was the cause for 68 or 63.2%, electrical for 16.2% and chemical for 14.7% of the burns. An electrical burn was more likely to require hospitalization as compared to a thermal, radiation or chemical burn, 20%, 3.4%, 3.0% and 1.9%, respectively. Thermal burns in three individuals and electrical burns in two individuals were the cause of death of five individuals in 2010.

Figure 9. Work-Related Burn Type, Michigan 2010*



*Burn type specified for 1,860 individuals.

Referrals to MIOSHA

The MIOSHA referral criteria for a work-related burn that occurred in 2010 was that the individual had to have (1) been hospitalized, and (2) the burn had to have taken place within six months of the referral. MIOSHA inspected 2 workplaces where fatalities occurred and 1 where non-fatal burns occurred.

Table 6 illustrates the distribution of violations and penalties assessed by the industry type of the three inspected workplaces.

Table. 6 Workplaces Inspected by MIOSHA: Violations and Penalties Assessed by Industry, Michigan 2010

Industry Type (NAICS)	Number of Violations	Total Penalties Assessed
Landscaping Services (561730)*	1	$7,000
Sewage Treatment Facilities (221320)*	2	$2,000
Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers (332812)	5	$5,400

*Fatality

Narratives: Work-Related Burn MIOSHA Enforcement Inspections

- *Landscaping Services:* A male in his mid-thirties, whose occupation was safety supervisor, died after grabbing energized power lines. The deceased was clearing downed trees from recent high winds to allow access to the power lines by local electrical companies. He was pronounced dead at the scene. MIOSHA's enforcement inspection found one violation for not ensuring that an electric conductor or communication line shall be considered energized unless the systems utility or owner indicates otherwise and they have visibly grounded the conductor or line (the deceased grabbed a down power line without verifying that it was de-energized).

- *Sewage Treatment Facilities*: A male in his late fifties died after sustaining 89% TBSA third degree burns. The deceased was cutting a metal rod with a chop saw when an explosion occurred. The accident happened indoors. MIOSHA found 2 violations, including not storing flammable or combustible liquids in tanks or closed containers; and not ensuring that adequate precautions were taken to prevent the ignition of flammable vapors (the deceased was cutting metal rod with a spark producing saw within a 2-feet of a waste oil drum and 10-feet of a parts washer that contained lacquer thinner).

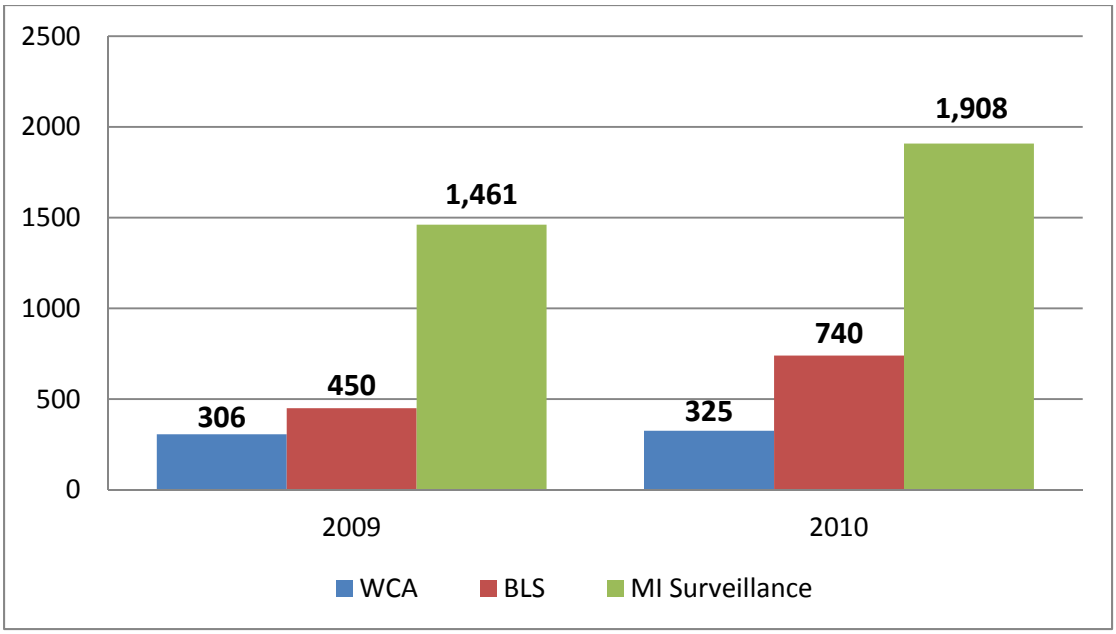
- *Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers:* A male in his mid-thirties was hospitalized for five days after he accidentally fell into a container of heated alkali solution. He landed on both feet and was submersed to the midpoint of his shins. The length of this submersion

was about 30 seconds. He sustained 8% TBSA second and third degree burns to his feet and first degree burns to the right ankle despite wearing boots. MIOSHA's enforcement inspection found 5 violations including 2 "repeat serious" violations: Not using appropriate personal protective equipment by employees where a hazard existed due to flying objects or particles; Harmful contacts with molten metal, liquid chemicals, acids or caustic liquids, chemical gasses or vapors, glare, injurious radiation, or electrical flash; Disposing of waste rags impregnated with acetone into a standard waste receptacle without a lid; A partially blocked fire exit door because material and pallets were stored in the area in front of the doorway; An opening from an inside storage room to other rooms or outside the building was not provided with approved self-closing fire doors; A highway truck and trailer did not have its wheels blocked or restrained from movement.

DISCUSSION

This is the second annual report on work-related burn data in Michigan. The Michigan comprehensive surveillance system of work-related burns provides a more accurate estimate of the true number of work-related burns than the employer-based reporting system maintained by BLS, which is the official source of work-related statistics.[7] The Michigan system identified 1,908 work-related burns in 2010 in comparison to 740 reported by BLS (Figure 10). There was a 30.6% increase in the number of all work-related burns since 2009, including the increase of occupational fatalities from two in 2009 to five in 2010. There was also a 64.4% increase in the work-related burns recorded by BLS, but still the employer-based system identified far fewer work-related burns.

Figure 10. Number of Work-Related Burns by Three Surveillance Systems, Michigan 2009 - 2010



The BLS's undercount of work-related burns is partially explained by the fact that BLS includes in its statistics only cases with one or more days away from work or with altered work duties, whereas the Michigan multi-source surveillance system counted all work-related burn injuries. Secondly, the BLS excludes self-employed, independent contractors and farm workers who work on farms with less than 11 employees. Michigan's burn surveillance identified only 35 self-employed and 21 farmers with burns so the difference in the type of workers covered in the BLS survey does not explain the undercount in the BLS data. Other possible explanations for the BLS undercount may be that employers are not providing complete reporting, the statistical sampling procedure of BLS, or employers are not properly identifying employees' injuries as burns.

Michigan's Workers' Compensation data also identified many fewer cases than the other data sources combined. Reasons contributing to the Workers' Compensation undercount include: 1) The WCA data set only included burns that caused 7 or more consecutive days away from work; 2) WCA excluded the self-employed, but again there were only 35 self-employed workers in our more complete reporting system; 3) Coding or miscoding errors in the WCA data. The matching with other data sources showed that 23 work-related burns identified from medical records or PCC were not classified as

burns in the WCA data. Presumably there were other injuries in the WCA database that were similarly misclassified; 4) It is possible that some companies are handling burn injuries unofficially and not reporting them to Workers' Compensation insurance companies or the WCA.

Michigan OSHA Strategic Goal #1.1 for Fiscal Year 2009-2013[8] is to reduce by 20% the rate of worker injuries and illnesses in high-hazard industries, which include: Beverage and Tobacco Product Mfg. (312), Wood Products Mfg. (321), Plastics and Rubber Products Mfg. (326), Nonmetallic Mineral Product Mfg. (327), Primary Metal Mfg. (331), Fabricated Metal Product Mfg. (332), Machinery Mfg. (333), Transportation Equipment Mfg. (336), Recyclable Material Merchant Wholesalers (423930), Merchant Wholesalers, Nondurable Goods (424), Landscaping Services (561730), Hospitals (622) and Nursing and Residential Care Facilities (623). Some of the highest rates for work-related burns were not included in these high-hazard industries (i.e. Accommodation and Food Services and Public Administration (Table 2)).

Surveillance of work-related burns is crucial to the recognition and prevention of these conditions. In the first year of Michigan's work-related burns surveillance system, seven worksites were identified by the surveillance data where a subsequent intervention by MIOSHA likely reduced burn risks to other employees. The number of follow up investigations in this second year of surveillance was small (three inspections) but these inspections identified major correctible problems.

The small number of MIOSHA investigations was partially limited by the delay in identifying and confirming the burn before referral to MIOSHA, and partly because of more restrictive criteria for referral. In 2009, second or third degree burns treated in a hospital, emergency department or in an outpatient clinic were eligible, whereas in 2010 only hospitalized burns were. One modification in the surveillance system that has since been made is to require hospitals to report every 3 months rather than once a year to increase the timeliness of reports so as to increase efficacy of follow up investigations. A second modification is to lower the reporting requirement from age 16 to age 14 in order to capture burn injuries among working teens, a group that frequently works in food services, the industry with the highest burn rate in Michigan's 2009 and 2010 data.

In addition to strengthening the worksite intervention component of the system, we plan to develop educational materials including hazard alerts where we see patterns in causes for the burns.

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