Hazardous Substances Emergency Events Surveillance in Michigan 2007

September 2008

Division of Environmental Health
Michigan Department of Community Health
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Michigan Department of Community Health

MDCH

Jennifer M. Granholm, Governor
Janet Olszewski, Director

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Hazardous Substances Emergency Events Surveillance in Michigan: 2007

State Of Michigan

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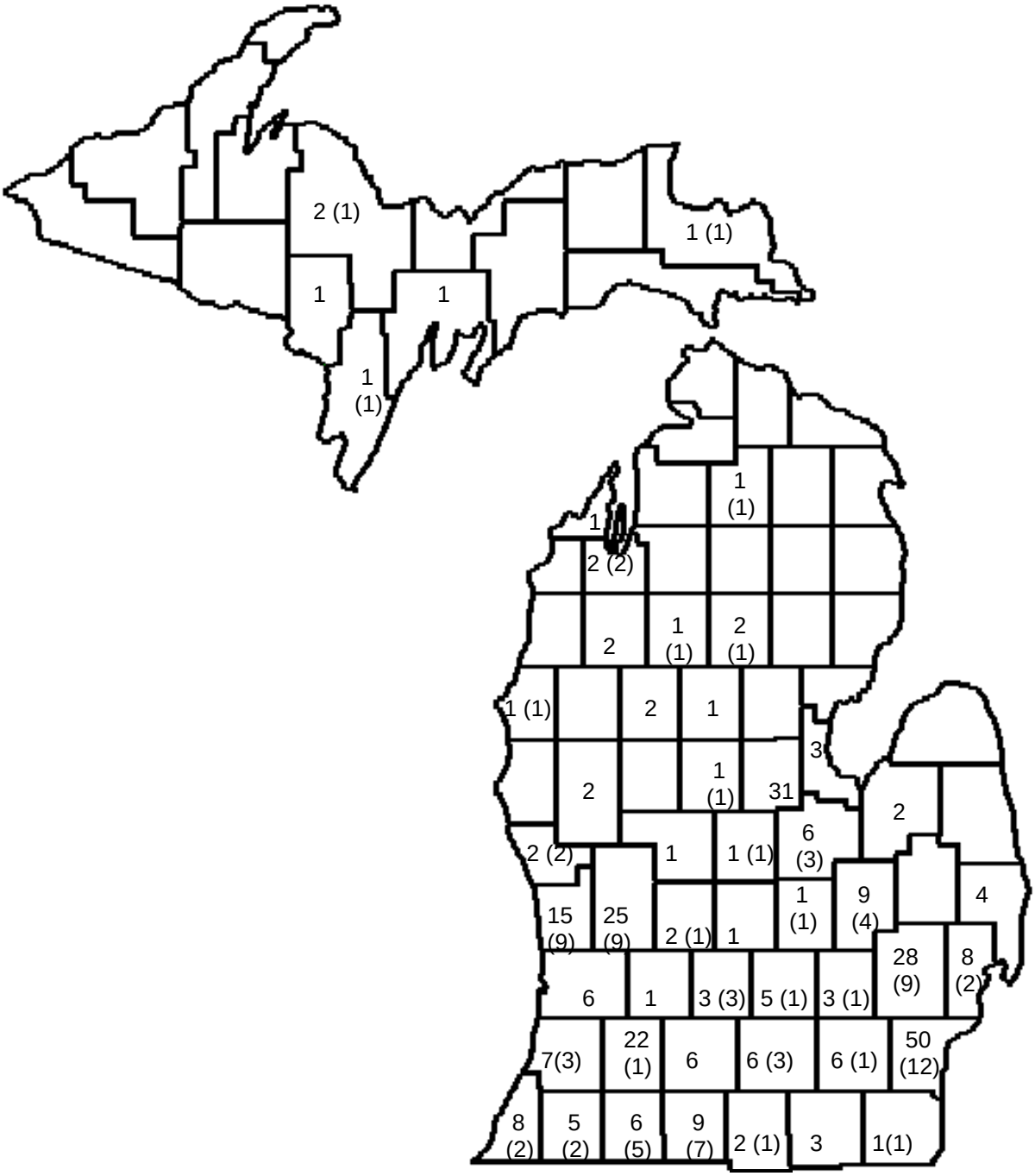
SUMMARY

This report summarizes the characteristics of hazardous substances emergency events reported to the Michigan Department of Community Health (MDCH) for 2007, the third year of this surveillance program in Michigan. The Hazardous Substances Emergency Events Surveillance (HSEES) system, supported by the Agency for Toxic Substances and Disease Registry (ATSDR), actively collects and compiles information about acute releases of hazardous substances and their public health consequences in 14 participating states. Information collected about acute events involving hazardous substances includes the substance(s) released, number of victims, number and types of injuries, and number of evacuations. Reports of releases come from a variety of sources, primarily other state and federal agencies that are mandated to receive reports from industry and the public.

A total of 310 reported events met HSEES criteria for inclusion in 2007 in Michigan. Two hundred twenty-four of the events occurred at fixed facilities and the remainder were associated with transportation. More than one substance was released in 51 (16.5%) of these 310 events. The most commonly reported substances were carbon monoxide and mercury. During this reporting period, 67 events (21.6% of all reported events) resulted in an injury, involving a total of 167 victims, one of whom died. The most frequently reported injuries were headache and gastrointestinal problems. Evacuations were ordered for 40 (12.9%) events. Twenty-eight individuals exposed but not injured in a single event were decontaminated. The map on the facing page shows the numbers of events in each county in Michigan and the subset of events in each county that involved an injury, evacuation, sheltering in place, and/or decontamination.

Distribution of all events (N=310) by county and, in parenthesis, events resulting in injury, evacuation, shelter-in-place, and/or decontamination (N=94) Michigan Hazardous Substances Emergency Events Surveillance, 2007



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INTRODUCTION

Since 1990, the Agency for Toxic Substances and Disease Registry (ATSDR) has supported and maintained a state-based surveillance system through cooperative agreements with state health departments to describe the public health consequences of releases of hazardous substances. The system is titled "Hazardous Substances Emergency Events Surveillance," or HSEES. In October, 2004 the Michigan Department of Community Health (MDCH) was funded to establish HSEES in Michigan, joining 13 other states.[1] This report summarizes data on hazardous substance releases in Michigan during 2007, the third year of the surveillance system.

ATSDR implemented the HSEES system to more fully describe the public health consequences of releases of hazardous substances than was possible using existing data. The overall goal of HSEES is to reduce injury and illness from acute hazardous substance releases by linking the data to prevention programs. The objectives of the surveillance system are:

- To describe the distribution of hazardous substances emergencies within the participating states, and nationally.
- To describe the types and causes of morbidity and mortality experienced by employees, responders, and the general public as a result of hazardous substances emergencies.
- To analyze and describe risk factors associated with morbidity and mortality.
- To develop strategies to reduce subsequent morbidity and mortality when comparable events occur in the future. [2]

Surveillance is …"*the on-going, systematic collection, analysis and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know. The final link of the surveillance chain is the application of these data to prevention and control. A surveillance system includes a functional capacity for data collection, analysis and dissemination linked to public health programs.*"
-Centers for Disease Control and Prevention

This report summarizes the characteristics of hazardous substance releases and their associated public health consequences of events that occurred in 2007 in Michigan. The highlights of the 2007 data and associated public health prevention activities are provided in the discussion. The appendices include additional details about the data, and a brief narrative of each of the events that involved an injury, decontamination, evacuation or shelter-in-place.
The 2005 annual report is available at
http://www.michigan.gov/documents/mdch/HSEESAnnual_Report_174705_7.pdf
The 2006 annual report is available at
http://www.michigan.gov/documents/mdch/HSEES_AR_2006_222479_7.pdf

[1] The other participating states are Colorado, Florida, Iowa, Louisiana, Minnesota, New Jersey, New York, North Carolina, Oregon, Texas, Utah, Washington, and Wisconsin.

[2] *Hazardous Substances Emergency Events Surveillance (HSEES) Protocol*. March 2001. Available at www.atsdr.cdc.gov/HS/HSEES/protocol_2004.pdf

METHODS

All participating states follow the ATSDR HSEES protocol for collection and processing of information about releases.[3]

The ATSDR definition of a HSEES event is "…an uncontrolled or illegal acute release of any hazardous substance (except petroleum when petroleum is the only substance released), in any amount for substances listed on the HSEES Mandatory Chemical Reporting List or, if not on the list, in an amount greater than or equal to 10 lbs or one gallon. Threatened releases of qualifying amounts will be included if the threat led to an action (e.g., evacuation) to protect the public health."

In 2007, the HSEES Mandatory Chemical Reporting list was updated to include all chemicals found on the Environmental Protection Agency's Emergency Planning and Community Right-to-Know Act (EPCRA) Section 302 Extremely Hazardous Substances list, all chemicals found on the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) list with a reporting quantity of more than one pound, and certain substances that ATSDR and HSEES states found important to monitor at any quantity. A copy of the HSEES Mandatory Chemical Reporting List is available at: http://www.michigan.gov/documents/mdch/HSEES_mandatory_Chemical_Reporting_List_247153_7.pdf. Petroleum is excluded because the of the Petroleum Exclusion clause in CERCLA, under which the HSEES program has been funded. Starting in 2007, the Michigan HSEES program began data collection of petroleum releases greater than or equal to 25 gallons, even though these data are not included in the natonal HSEES data.

Various sources are used to identify and obtain information about HSEES-eligible events in Michigan. These include reports to the National Response Center (NRC)[4], the Federal Department of Transportation, the Michigan Department of Environmental Quality (DEQ), the Michigan Department of Agriculture, the Michigan State Police, the media, and others. Hospital discharge data are used to identify carbon monoxide releases. Beginning in late 2007, MI-HSEES began receiving and reviewing selected reports from the two state Poison Control Centers to identify spills related to carbon monoxide, disinfectants, mercury, and ammonia.

Information collected on each HSEES event includes the following:

- Type of event: Events are classified according to whether they occur at fixed facilities or during transportation. Fixed-facility events involve hazardous substances released at industrial sites, schools, farms, or other permanent facilities. Transportation-related events involve hazardous

[3] http://www.atsdr.cdc.gov/HS/HSEES/hsees.html
[4] The NRC is the single portal for mandatory reporting of hazardous spills and releases to 16 federal agencies. See: www.nrc.uscg.mil

materials released during transport by surface, air, or water. The type of area or equipment within fixed facilities involved in the release is also recorded (e.g., piping, storage tank, laboratory).

- Event location: The location of the event is identified by longitude and latitude coordinates where possible, and an ATSDR-maintained Geographic Information System (GIS) uses this information to identify nearby population groups and institutions (e.g. schools). If the exact location is not available, nearby population groups are estimated based on incident information.
- Date and time of the release, and current weather conditions: If weather information is not provided by the reporting agency, weather conditions at the time of the release are determined from historical weather data available on www.weather.com.
- Responsible party: If the responsible party for the release is a business, it is classified using the North American Industry Classification System (NAICS)[5].
- Response: Response actions are categorized including what activities were taken to protect public health (e.g., issuance of health advisories, health investigations, and environmental sampling), and the groups responding to the incident (e.g., fire department, HazMat, health agency).
- Substance(s) released: Released substances are identified by chemical name or chemical category, including "mixture." Chemical constituents of brand name products are ascertained. The quantity released, type of release (e.g., spill, fire, volatilization), and whether the substance was actually released or a threatened release are also recorded.
- Causes: A primary or root cause of the release is assigned (e.g., human error, equipment failure, bad weather) and, when appropriate, a secondary or immediate cause of the release (e.g., improper mixing, vehicle collision, explosion).
- Victim(s): The number of individuals injured in the event is noted and which population group(s) were involved (e.g., the public, emergency responders, school children). Also recorded are the type(s) of injuries, severity of medical outcome, and demographics (age, gender) of injured individuals.
- Evacuation, sheltering-in-place, and decontamination: The numbers of individuals evacuated, sheltered in place, and decontaminated are recorded.

Some of this Information is available from the initial reporting source, and the rest is usually obtained by contacting response agencies such as local fire or police departments or other individuals knowledgeable about the event. Information on petroleum-only events is limited to the information provided in the initial report because no follow-up is conducted.

[5] http://www.census.gov/epcd/www/naics.html

All information is entered into a web-based application used by the HSEES-participating states and maintained by ATSDR. This system ensures uniformity of data classification and standards for quality control.

Michigan data collection for 2007 events was completed in May 2008. A descriptive analysis of the data was conducted using SAS®[6]. Selected data were compared to data from previous years.

[6] Statistical Analysis Software (SAS®) version 9.1

RESULTS

For 2007, 310 hazardous substance emergency events in Michigan were HSEES-eligible events and were included in the Michigan HSEES (MI-HSEES) data set: 305 (98.4%) were actual releases, 3 (1.0%) were threatened releases and 2 (0.6%) had both an actual release and a threatened release. The counties with the most frequent number of events were Wayne with 50 (16.1%) events, Midland with 31 (10.0%) events and Oakland with 28 (9.0%) events. A complete list of counties and event frequencies can be found in Appendix 1. An additional 206 events involved petroleum releases. Petroleum release events are discussed separately on page 19.

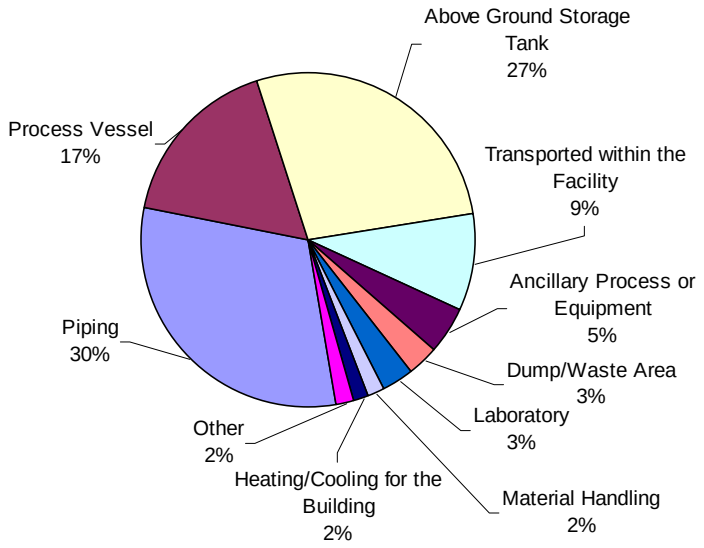
Compared to the previous two years, there were fewer events reported in 2007 (383 events in 2005 and 338 events in 2006 compared to 310 events in 2007). Wayne and Midland counties have continued to report the greatest number of events.

Facility type

A total of 224 (72.3%) events occurred in fixed facilities. This is similar to previous years, where fixed facility events counted for 67% and 70.7% of all events in 2005 and 2006 respectively.

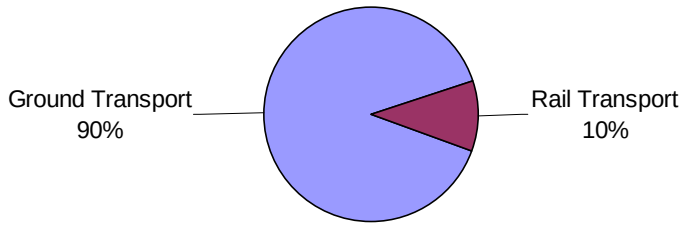
One hundred and fifty-nine (71.0%) of the 224 fixed facility events did not identify an area in the facility where the release occurred. The main locations identified for the 65 events that included an area are as follows: piping- 20 (30.8%), above ground storage area- 18 (27.7%), process vessel- 11 (16.9%), transported within the facility- 6 (9.2%), ancillary process/equipment- 3 (4.6%), dump waste area- 2 (3.1%), laboratory- 2 (3.1%), other- 1 (1.5%) heating/cooling for the building- 1 (1.5%), and material handling- 1 (1.5%), (Figure 1).

Figure 1.- Areas of fixed facilities involved in events, Michigan Hazardous Substances Emergency Event Surveillance, 2007 (N=65)



Of the 86 transportation-related events, 77 (89.5%) occurred during ground transport and 9 (10.5%) involved transport by rail. The largest proportion of transportation related events occurred during unloading from a vehicle, which had 32 (37.2%) events. Twenty-eight (32.6%) events occurred while moving, 17 (19.8%) occurred while moving and were later discovered at a fixed facility, and 9 (10.5%) occurred in a stationary vehicle.

Figure 2.- Distribution of transportation-related events, by type of transport- Michigan Hazardous Substances Emergency Events Surveillance, 2007 (N=86)



Nearby populations

Information on populations within ¼ mile was available for 293 (94.5%) of the 310 events. Residences were within ¼ mile of 284 (96.9%) of 293 events. Businesses were within ¼ mile of 253 (86.3%) events; Schools- 47 (16.0%), daycare centers- 50 (17.1%), hospitals- 1 (0.3%) and nursing homes- 6 (2.0%). Recreational areas were within ¼ mile of 29 (9.9%) events.

Causes of events

Primary or root cause factors were reported in all but four of the 310 events. Secondary or immediate causal factors were identified in 141 (46.1%) of the 306 events where a primary factor was known. Of the reported primary factors in the 220 fixed facility events, human error and equipment failure accounted for most of the factors with 91 (41.4%) and 70 (31.8%) entries, respectively. Illicit drug production was the secondary cause of 44 (20.0%) fixed facility events. These primary and secondary factor distributions for fixed facilities are similar to those in the two previous years.

Out of the 86 transportation-related events, the majority (57.0%) were primarily due to human error, and improper filling/loading/packing was the leading secondary cause of 19 (22.1%) transportation-related events (Tables 1a and 1b).

Table 1a.- Primary factors associated with events by event type- Michigan Hazardous Substances Emergency Events Surveillance, 2007

	Event Type					
	Fixed Facility*		Transportation		All Events	
Primary Factor	No. of Events	%	No. of Events	%	No. of Events	%
Human Error	91	41.4	49	57.0	140	45.8
Equipment Failure	70	31.8	34	39.5	104	34.0
Intentional	52	23.6	2	2.3	54	17.6
Bad Weather	5	2.2	1	1.2	6	2.0
Illegal Act	1	0.5	0	0.0	1	0.3
Other	1	0.5	0	0.0	1	0.3
Total	220	100	86	100	306	100

*Primary factor was unknown for 4 fixed facility events

Table 1b.- Secondary factors associated with events by event type- Michigan Hazardous Substances Emergency Events Surveillance, 2007

	Event Type					
	Fixed Facility		Transportation		All Events	
Secondary Factor	No. of Events	%	No. of Events	%	No. of Events	%
No Secondary Factor	128	58.1	37	43.0	165	53.9
Illicit Drug Production	44	20.0	1	1.2	45	14.7
Equipment Failure	14	6.4	15	17.4	29	9.5
Improper Fill/Load/Pack	7	3.2	19	22.1	26	8.5
Forklift Puncture	6	2.7	4	4.7	10	3.3
Vehicle/Vessel Collision	1	0.5	6	7.0	7	2.2
Improper Mixing	5	2.2	0	0.0	5	1.6
Human Error	4	1.8	0	0.0	4	1.3
Performing Maintenance	4	1.8	0	0.0	4	1.3
Unauthorized Dumping	3	1.4	0	0.0	3	1.0
Explosion	2	0.9	0	0.0	2	0.7
Fire	1	0.5	0	0.0	1	0.3
Overspray/Misapplication	1	0.5	0	0.0	1	0.3
Loadshift	0	0.0	2	2.3	2	0.7
Vehicle Roll Over	0	0.0	2	2.3	2	0.7
Total	220	100	86	100	306	100

Substances

A single substance was released in 259 (83.5%) of the 310 events. Two substances were released in 19 (6.1%) events and 32 (10.3%) events involved the release of more than two substances. Table 2 illustrates the number of substances released per event by type of event (fixed or transportation). Almost all (98.8%) transportation events and 77.7% of events at fixed facilities involved only one substance.

Table 2.- Number of substances involved per event, by event type- Michigan Hazardous Substances Emergency Events Surveillance, 2007

	Type of Event								
	Fixed Facility			Transportation			All Events		
No. of Substances	No. of Events	%	Total Substances	No. of Events	%	Total Substances	No. of Events	%	Total Substances
1	174	77.7	174	85	98.8	85	259	83.5	259
2	19	8.5	38	0	0.0	0	19	6.1	38
3	17	7.6	51	0	0.0	0	17	5.5	51
4	7	3.1	28	0	0.0	0	7	2.3	28
5	4	1.8	20	0	1.0	0	4	1.3	20
>5	3	1.3	18	1	1.2	13	4	1.3	31
Total	224	100	329	86	100	98	310	100	427

A total of 427 substances were associated with the 310 events, of which 17 (5.5%) were threatened rather than actually released. The leading ten

substances released and the number of releases of each substance are listed in Table 3.

Table 3.- Ten most frequently released substances involved in Michigan Hazardous Substances Emergency Events Surveillance, 2007

Substance	# of times released
Carbon Monoxide	39
Mercury	33
Ammonia	29
Hydrochloric Acid	19
Sodium Hydroxide	15
Sulfuric Acid	14
Acetone	10
Coleman® Fuel	10
Ethyl Ether	7
Iodine	7

In addition, only groups rather than specific substances could be identified in some events, including paints (21 releases), solvents (22 releases) and meth chemicals (18 releases).

Carbon monoxide had the greatest number of releases (39) followed by mercury and ammonia. Ammonia, sodium hydroxide, hydrochloric (muriatic) acid, acetone, Coleman® Fuel and iodine were frequently associated with methamphetamine laboratory seizures. A complete list of chemicals and the frequency of their releases are in Appendix 2.

Carbon monoxide has been the most frequently released substance in the 3 years of MI-HSEES data collection. However, MI-HSEES received almost half as many CO reports in 2007 as 2006 (39 compared to 75).

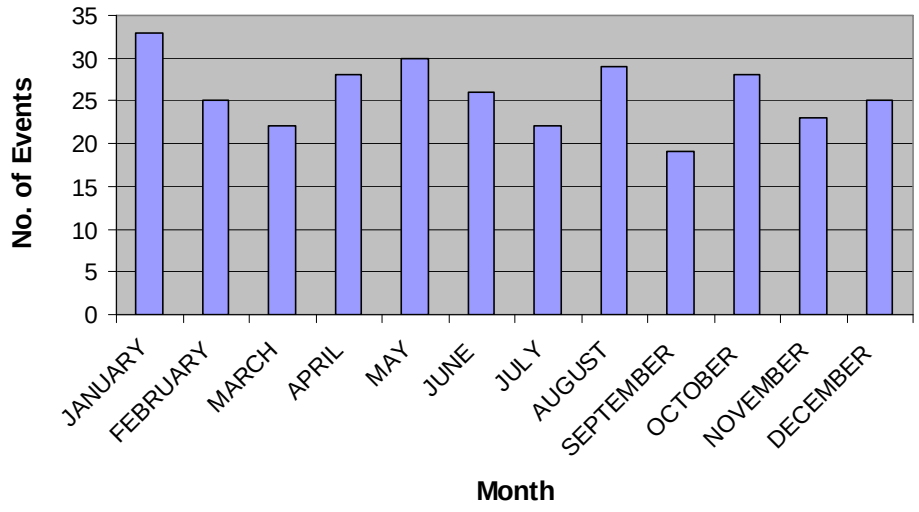
Mercury was the second most frequently released substance in 2007, unlike previous years. The increase in the number of mercury reports in 2007 compared to 2006 (from 21 to 34) is likely due to a change in the quantity threshold for including mercury in HSEES from one gallon/ten pounds to any quantity.

One or two different types of releases could be reported for each substance. The most frequent release type of the 317 substances where only one type was reported was spills (liquid/solid) with 211 (66.6%), followed by air releases with 84 (26.5%), threatened release with 17 (5.4%) and fire with 5 (1.5%). There were 110 chemicals with two release types. Of events with two types of releases, the following combinations were reported: spill and air release with 100 (90.9%), spill and fire release- 1 (0.9%), spill and explosion release- 6 (5.5%) air release and fire- 2 (1.8%), and fire and explosion-1 (0.9%).

Time of release

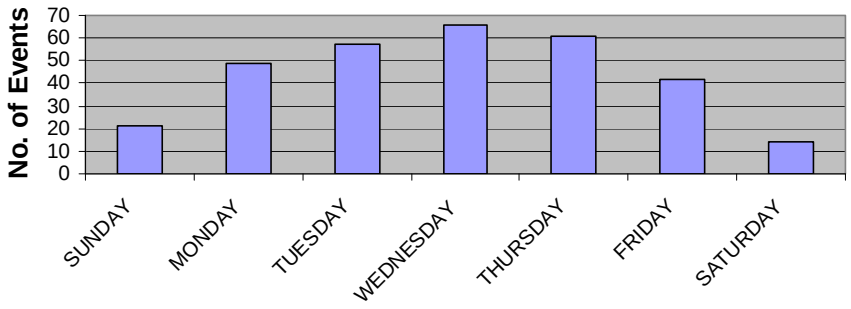
The number of events by month ranged from 19 (6.1%) in September to 33 (10.7%) in January. (Figure 3).

Figure 3.- Month distribution of events- Michigan Hazardous Substances Emergency Events Surveillance, 2007 (N=310)



Events were more likely to occur on weekdays than weekends (Figure 4). Of the 252 (81.3%) events for which a time category was reported, 36.9% occurred from 6 a.m. to 11:59 a.m., 32.5% from 12 p.m. to 5:59 p.m., 18.7%, from 6 p.m. to 11:59 pm and the remaining 11.9% from 12 a.m. to 5:59 a.m.

Figure 4.- Event day of the week distribution- Michigan Hazardous Substances Emergency Events Surveillance, 2007



Business/industry

Two hundred thirty-one (74.5%) of the 310 events were the responsibility of an industry or business and seventy-nine (25.5%) were not. The largest proportion of the business-associated events involved transportation and manufacturers of paper, chemical and petroleum industries with 87 (37.7%) and 44 (19.0%), respectively (Table 4). The distribution by industry is similar to that in 2006 and 2005. Selected industry subcategories with large numbers are also displayed on Table 4, including ground transportation- 80 (34.6%) and manufacturing of chemicals/pharmaceuticals- 38 (16.5%). Thirty (78.9%) of the 38 chemicals/pharmaceuticals manufacturing events occurred at one large chemical manufacturing facility.

Table 4.- Industries involved in events by 2-digit and selected 3-digit NAICS codes- Michigan Hazardous Substances Emergency Events Surveillance, 2007 (N=231*)

NAICS Code	Industry Category	No. Events	%
72	Accommodations/Food Services	3	1.3
56	Administrative Support/Waste Management and Remediation	4	1.7
11	Agriculture	8	3.5
71	Arts/Entertainment/Recreation	4	1.7
23	Construction	6	2.6
61	Education	17	7.4
62	Health Care	8	3.5
51	Information	2	0.9
31	Manufacturing- Food/Textiles/Apparel	9	3.9
33	Manufacturing- Metal/Transportation	10	4.3
32	Manufacturing- Paper/Petroleum/Chemicals/Plastics (N=44)		
325	*Manufacturing- Chemicals/Pharmaceuticals*	*38*	*16.5*
324	*Manufacturing- Petroleum/Coal*	*4*	*1.7*
322	*Manufacturing- Paper*	*1*	*0.4*
326	*Manufacturing- Plastics/Rubber*	1	0.4
81	Other Services (N=5)		
811	*Repair and Maintenance*	*5*	*2.2*
92	Public Administration	2	0.9
45	Retail Trade- Books/Music/Gifts	1	0.4
44	Retail Trade- Motor Vehicle/Building Materials/Gas Stations	5	2.2
48	Transportation- Ground/Air/Rail (N=87)		
484	*Transportation- Ground*	*80*	*34.6*
482	*Transportation- Rail*	*7*	*3.0*
49	Transportation- Storage Warehouse/Messenger	1	0.4
22	Utilities	8	3.5
42	Wholesale Trade	7	3.0
	Total	231	100
*79 events occurred in a non-industry setting.			

Response

All of the 310 events had information on the types of emergency personnel that responded to the event: 170 (54.8%) reported only one category of responders, 140 (45.2%) reported two categories of responders, 54 (17.4%) reported three and 34 (11.0%) reported four or more categories of responders. Company response teams, followed by third party clean-up contractors and fire departments were the most frequent categories of personnel to respond to an event.

Fifty-four events (17.4% of all events) resulted in a public health response. Two (3.7%) events involved a health investigation and environmental sampling, 50 (92.3%) had environmental sampling only, and 2 (3.7%) event had a health investigation only.

Victims, evacuations, sheltering in place, and decontaminations:

Ninety-four (30.3%) of the 310 events involved an injury, evacuation, shelter-in-place, or decontamination. A brief synopsis of the 94 events that included one or more of these public health impact measures is included in Appendix 3.

Victims

A total of 167 victims were reported in 67 events (21.6% of all events) (Table 5). Of the 67 events with victims, 43 (64.2%) involved only one victim and 12 (17.9%) involved two victims. Six events involved more than five victims, one of which had 29 victims. Of all victims, 157 (94%) were injured in fixed facility events (Table 5).The proportion of total events involving a victim was similar to previous years, but the total number of victims was less (207 in 2006 and 209 in 2005.

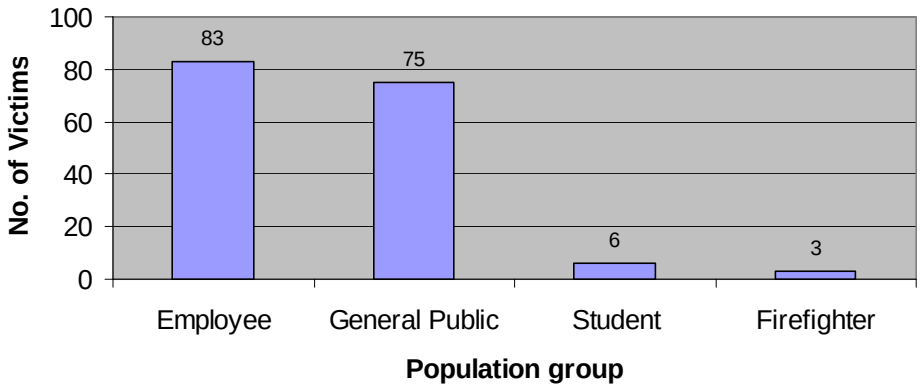
Table 5.- Number of victims per event, by type of event- Michigan Hazardous Substances Emergency Event Surveillance, 2007

	Type of Event								
	Fixed Facility			Transportation			All Events		
No. of Victims	No. of Events	%	Total Victims	No. of Events	%	Total Victims	No. of Events	%	Total Victims
1	39	63.9	39	4	66.7	4	43	64.2	43
2	11	18.1	22	1	16.7	2	12	17.9	24
3	3	4.9	9	0	0.0	0	3	4.4	9
4	1	1.6	4	1	16.7	4	2	3.0	8
5	1	1.6	5	0	0.0	0	1	1.5	5
>5	6	9.9	78	0	0.0	0	6	9.0	78
Total	61	100	157	6	100	10	67	100	167

Figure 5 shows the distribution of victims by population group. Employees constituted the largest part of the population groups injured with 83 (49.7%) of 167 persons injured, followed by the general public with 75 (44.9%) persons injured. Students accounted for 6 (3.6%) of the persons injured and firefighters accounted for the remaining 3 (1.8%).

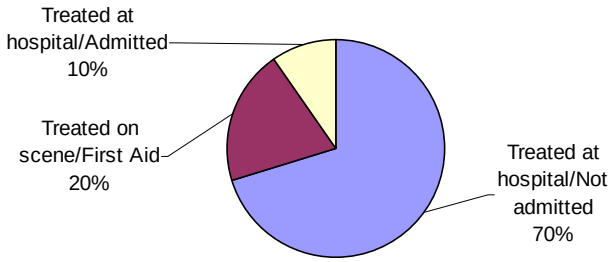
Employees and the general public have been the top two population groups with victims. In 2007, there was a decrease in responder injuries with only 3 firefighters. In 2005, there were 29 firefighters and three police officers and in 2006 there were five police officers, three firefighters and two EMS responders injured.

Figure 5.- Distribution of victims by population group- Michigan Hazardous Substances Emergency Surveillance, 2007 (N=167)



The age group was determined for 91 (54.5%) of the 167 victims: One (1.0%) was under one year old, two (2.2%) were one to four years old, 11 (12.1%) were five to 14 years old, 8 (8.8%) were 15-19 years old, 49 (53.8%) were 20-44 years old, 14 (15.4%) were 45-64 years old and 6 (6.6%) were older than 65 years. Sex was known for 110 (65.9%) of the 167 victims; of these, 79 (71.8%) were male. The proportion of male victims has remained constant over the three years of data collection. Severity of injuries was known for 165 (98.8%) of victims: 116 (70.3%) were treated and released from the hospital, 33 (20.0%) were treated on scene and 16 (9.7%) were admitted to the hospital (Figure 6).

Figure 6.- Injury outcome- Michigan Hazardous Substances Emergency Events Surveillance, 2007 (N=165)



The 167 victims were reported to have sustained a total of 310 injuries or symptoms (Table 6). Of all reported injuries/symptoms the most common in fixed facility events were headache with 63 (21.4%) events, followed by

gastrointestinal problems and respiratory irritation with 53 (18.0%) and 47 (15.9%) events, respectively. The top four injury types in fixed facilities have been constant over the three years of data collection.

Table 6.- Frequencies of injuries/symptoms, by type of event- Michigan Hazardous Substances Emergency Events Surveillance, 2007

	Type of Event					
	Fixed Facility		Transportation		All Events	
Injury/Symptom	No. of Injuries	%	No. of Injuries	%	No. of Injuries	%
Headache	63	21.4%	2	13.2%	65	21.0%
Gastrointestinal Problems	53	18.0%	1	6.7%	54	17.4%
Respiratory Irritation	47	15.9%	4	26.7%	51	16.5%
Dizziness/other CNS* symptoms	37	12.5%	0	0.0%	37	11.9%
Eye Irritation	37	12.5%	0	0.0%	37	11.9%
Skin Irritation	30	10.2%	4	26.7%	34	11.0%
Shortness of Breath	11	3.7%	0	0.0%	11	3.5%
Burns	10	3.4%	1	6.7%	11	3.5%
Trauma	4	1.4	2	13.3%	6	1.9%
Heart Problems	2	0.7%	1	6.7%	3	1.1%
Heat Stress	1	0.3%	0	0.0%	1	0.3%
Total	295	100.0%	15	100.0%	310	100.0%

*Central Nervous System

Evacuations and sheltering in place

Evacuations were ordered in 40 (12.9%) of the 310 events. Of these evacuations, 33 (82.5%) were of buildings or the affected parts of the building, six (15.0%) were of homes and businesses surrounding or downstream/downwind of the event, and one was not defined. The number of people evacuated was known for 32 (80.0%) of the 40 events. The number of people evacuated ranged from one to 3000 (Table 7). The length of evacuation, which was reported for 32 (64.0%) events, ranged from 30 minutes to 48 hours with a median of six hours. Six (1.8%) events involved sheltering in place orders in the surrounding communities. Four of the six shelter-in-place events also had evacuation orders.

The number of events with evacuations varied over the 3 years of data collection. There were evacuations in 7.6% and 14.8% of all events in 2005 and 2006, respectively. A majority (52.3%) of the events during this time period involved evacuation of 20 or fewer people.

Table 7.- Ranges of numbers of evacuated people by number of events, Michigan Hazardous Substances Emergency Events Surveillance, 2007*

# of people evacuated	# of events
<5	11
5-20	9
21-50	6
51-100	3
101-500	2
501-1000	0
>1000	1
Unknown	8
Total	40

*Number evacuated was unknown for 8 events.

Decontamination

Decontamination took place in one event (0.3% of all events). This event was a result of a mercury spill at a high school. A student brought a thermometer to school and intentionally dropped it and spread the mercury. This spill required 28 uninjured students to be decontaminated at the school.

Petroleum and Petroleum Products Releases

Although the 14 state/ATSDR protocol does not include capture of petroleum-related spills and releases, beginning in 2007, MI-HSEES began collecting basic information on petroleum and petroleum-related product spills that are greater than or equal to 25 gallons. (Propane releases which were reported in pounds were converted to gallons to determine if they met the 25-gallon inclusion criterion). No follow up was conducted on these cases and they were not reported to ATSDR.

In this first year of collecting these petroleum-only related events, there were 206 events. Event location was known for 195 events- 98 (50.3%) of these were in fixed facilities and the other 97 (49.7%) were transportation related. These events occurred in 54 (61.5%) of the 83 counties, with the greatest number of events occurring in the highly populated metro Detroit area [Wayne County: 48 (23.3%), Oakland: 16 (7.8%) and Macomb: 11 (5.3%)].

A primary cause was known for 157 (76.2%) of these events. Of the known primary causes, human error and equipment failure were the most frequent with 73 (46.5%) and 65 (41.4%) respectively. Bad weather accounted for 10 (6.4%) events. A secondary cause was known for 138 (67.0%) of these events; the most frequent secondary cause was vehicle collision with 56 (40.6%).

A total of 30,600 pounds of propane and 184,364 gallons of petroleum and petroleum-related products were spilled. There were 212 spills in the 206 events.

The most spilled petroleum product was diesel fuel with 108 (50.9%) spills. Table 8 lists all of the petroleum and petroleum-related products.

**Table 8.- List of petroleum and petroleum-related products spilled-
Michigan Hazardous Substances Emergency Event Surveillance, 2007**

Name	Frequency	Percent
Antifreeze	1	0.5%
Auto body Repair Waste	1	0.5%
Crude oil	1	0.5%
Diesel	108	50.9%
Fuel	2	0.9%
Fuel Oil	4	1.9%
Gasoline	23	10.8%
Heating Oil	1	0.5%
Hydraulic Fluid	1	0.5%
Hydraulic Oil	8	3.8%
Hydrocarbon	1	0.5%
Jet Fuel	2	0.9%
Kerosene	2	0.9%
Lube Oil	1	0.5%
Mix: Coolant/ Oil	1	0.5%
Mix: Diesel/ Hydraulic Oil	1	0.5%
Mix: Diesel/ Kerosene	1	0.5%
Mix: Fuel/ Oil	1	0.5%
Mix: Hydraulic Oil/ Mineral Spirits/ Oil	1	0.5%
Mix: Oil/ Water	1	0.5%
Mineral Oil	3	1.4%
Motor Oil	7	3.3%
Oil	21	9.9%
Petroleum Distillates	1	0.5%
Propane	3	1.4%
Transformer Oil	13	6.1%
Transmission Fluid	1	0.5%
Waste Oil	1	0.5%
Total	212	100.0%

Are Michigan K-12 schools now mercury free? Evaluation of school compliance with MCL380.1274b

Michigan passed an amendment to the Revised School Code (Act 451 as amended) mandating that K-12 schools remove all elemental mercury or mercury-containing instruments by December 31, 2004. Mercury is a potent neurotoxin that is especially hazardous to children. This law was passed to protect children from accidental exposure resulting from spills of mercury in the laboratory and breakage of mercury-containing instruments. In 2003 schools were informed of the requirements of the law and were offered technical assistance in identifying and disposing of mercury sources in a letter from the Michigan Department of Environmental Quality (DEQ) and the Michigan Department of Education (MDE). The Michigan Department of Community Health (MDCH) became concerned about compliance with the law when its Hazardous Substance Emergency Events Surveillance system (HSEES) project received reports of mercury spills in schools after the December 2004 compliance deadline.

MDCH HSEES developed a two-part strategy to assess the magnitude of non-compliance and to provide assistance to non-compliant schools, in collaboration with DEQ and the MDE. The first phase included the development and mailing of a four-page booklet to provide guidance to schools on how to identify and dispose of mercury, accompanied by a survey asking about the status of their mercury removal process. These materials, which were mailed out under a cover letter signed by the MDCH Director, took a public health rather than a regulatory approach. The second part of the strategy was to have schools respond to a compliance question on a survey all public schools are required to complete every year to facilitate school districts' compliance with the federal *No Child Left Behind Act of 2001* and the MDE's accreditation requirements.

The MDCH booklet, survey, and cover letter were mailed in July 2006 to 4,712 school principals, and the 685 district school superintendents that oversee these schools. Thirty-eight percent of the schools returned completed surveys to MDCH. Most reported that the mercury removal process was complete. About 25 schools indicated on the survey that they had not completed the process and/or called MDCH to request assistance with the mercury removal process. The DEQ Environmental Assistance hotline also received calls requesting assistance.

The mercury compliance question was then placed in the spring 2007 MDE survey. Results of the survey were given to MDCH in September 2007. The names of schools in the MDE survey were matched to the list in the MDCH survey. Schools were contacted that gave discrepant information (13 schools), had not responded to either survey (55 schools), or indicated that they were not in compliance (15 schools). MDCH HSEES provided assistance to the schools that indicated that they were still not mercury free.

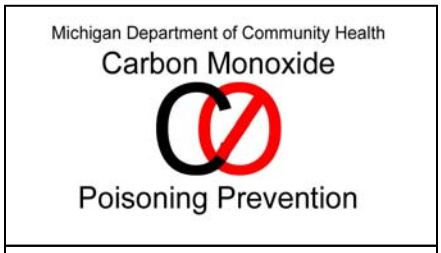
The results of this project suggest that the goal of this legislation – protecting children from exposure to mercury in school-was accomplished for the most part. However, there were three additional spills reported in 2007, and this may mean that some school administrators answering the survey questions were not aware of the continued presence of mercury in their schools. A multi-phased assessment and technical assistance process was useful in achieving and documenting results, a process that was made possible by funding and resources provided by the Agency for Toxic Substances and Disease Registry's (ATSDR) HSEES program.

DISCUSSION

These data on 310 non-petroleum chemical releases in 2007 in Michigan comprise the third full year of MI-HSEES operation. Twenty-one percent of these releases resulted in injury to 167 individuals, and evacuations were ordered in approximately 13% of the events. Several notably large events included a carbon monoxide release from malfunctioning forklifts causing CO poisoning in 23 employees of a food processing plant, a hydrochloric acid release from a plating company causing an evacuation of 3,000 in the surrounding community, and an evacuation of 65 employees because of a rusted tank leaking chlorine gas.

Carbon monoxide continued to be the most frequently reported release event this year, although there were fewer numbers of CO-related events than previous years (52 in 2005, 75 in 2006 and 39 in 2007). Most of these events were identified from hospital discharge data (hospitals are required to report all CO-related poisoning hospitalizations). The absolute number of hospital discharges for CO was actually larger in 2007 than 2006, but the number qualifying for MI-HSEES was less, which may have been due to the lack of details in many of the discharge summaries.

CO release events are included in MI-HSEES if they occur at a place of work, or if they happen in a home, excluding releases from faulty furnaces, and there is an outside response, e.g. EMS or fire department is called to the home. The events included in MI-HSEES represented only a small proportion of the total number of CO releases in the state. In 2007, hospital discharge data identified a total of 858 people having unintentional carbon monoxide poisoning, most of whom were exposed from faulty furnaces or from car and truck exhaust.



The MDCH web site for information about carbon monoxide poisoning prevention is at: www.michigan.gov/carbonmonoxide

In response to these findings, MI-HSEES developed some educational interventions to prevent carbon monoxide exposure. The first was the development of a press release on the hazards of CO exposure from improperly installed generators, which is issued when power outages are anticipated or have occurred from severe weather. The press release was used 2 times in the latter part of 2007. The second is a new web page on the MDCH web site with messages about prevention of CO poisoning in the home, at work, on boats, and other circumstances.

Mercury spills in schools have been identified since the beginning of the program in 2005, and this has been of concern because all Michigan schools had been required by law to dispose of elemental mercury and mercury-containing instruments by 2004. In response, as noted first in the 2006 annual report, the

MI-HSEES program began a project to assess the scope of non-compliance with that law and offer technical assistance to schools to comply. That project was completed in 2007 and is described in the sidebar on p. 21.

Methamphetamine-related release events also continued to be reported frequently, with about the same number reported in 2005 as 2007. There were fewer reports in 2006 than in 2005 and 2007, which may have been a result of a new law restricting the sale of ephedrine and pseudoephedrine-containing over-the-counter drugs. The increase in 2007 could be a result of methamphetamine manufacturers finding ways around the law.

Overall, there were fewer HSEES-qualifying events in 2007 than 2006. The overall lesser number can be attributed mostly to the lesser number of MI-HSEES-qualifying reports of carbon monoxide in 2007 than 2006.

The data from 2007 on petroleum-related releases show that petroleum is the largest category of chemical releases in the state (over 200 in 2007). These events appear to be less likely than MI-HSEES events to result in human injury, but data collection is very limited because of lack of resources to the program. Additional resources would make it possible to have more complete information collected on these events, including information on injuries, making the data more useful for epidemiologic analysis and for a more complete picture of hazardous substance releases in Michigan.

The MI-HSEES data continue to be useful in characterizing the variety of hazardous substances releases in Michigan and identifying appropriate follow-up public health actions. Nevertheless, it should be noted that these data are probably an undercount of all hazardous substances emergency release events in Michigan. A number of cooperating State agencies have indicated that they believe that responsible parties are not always reporting release events that are required under various laws; MI-HSEES cannot identify such events unless they are identified in an alternate source such as the press.

The MI-HSEES project is part of a larger program in the MDCH that addresses chemical terrorism and chemical emergency events preparedness and response. That program has been supporting local health departments in the development of plans and exercises related to chemical emergency events. MI-HSEES established a set of procedures for immediately alerting local health departments of MI-HSEES events in their communities in early 2006. In 2007, MI-HSEES alerted local public health departments to 17 incidents and provided assistance in 18 others. MI-HSEES will continue alerting and providing data in various formats to promote planning for and responding to chemical emergency events locally and statewide.

Appendix 1.- Events by county- Michigan Hazardous Substances Emergency Surveillance, 2007						
County	Event Type				Total	
	Fixed Facility		Transportation		All Events	
	No.	%	No.	%	No.	%
Allegan	4	1.3	2	0.7	6	1.9
Barry	1	0.3	0	0.0	1	0.3
Bay	2	0.7	1	0.3	3	1.0
Berrien	6	1.9	2	0.7	8	2.6
Branch	6	1.9	3	1.0	9	2.9
Calhoun	2	0.7	4	1.3	6	1.9
Cass	5	1.6	0	0.0	5	1.6
Chippewa	1	0.3	0	0.0	1	0.3
Clare	1	0.3	0	0.0	1	0.3
Clinton	1	0.3	0	0.0	1	0.3
Delta	0	0.0	1	0.3	1	0.3
Dickinson	0	0.0	1	0.3	1	0.3
Eaton	3	1.0	0	0.0	3	1.0
Genesee	9	2.9	0	0.0	9	2.9
Grand Traverse	2	0.7	0	0.0	2	0.7
Gratiot	1	0.3	0	0.0	1	0.3
Hillsdale	1	0.3	1	0.3	2	0.7
Ingham	4	1.3	1	0.3	5	1.6
Ionia	2	0.7	0	0.0	2	0.7
Isabella	1	0.3	0	0.0	1	0.3
Jackson	4	1.3	2	0.7	6	1.9
Kalamazoo	12	3.9	10	3.2	22	7.1
Kent	15	4.8	10	3.2	25	8.1
Leelanau	0	0.0	1	0.3	1	0.3
Lenawee	2	0.7	1	0.3	3	1.0
Livingston	2	0.7	1	0.3	3	1.0
Macomb	4	1.3	4	1.3	8	2.6
Marquette	2	0.7	0	0.0	2	0.7
Mason	1	0.3	0	0.0	1	0.3
Menominee	0	0.0	1	0.3	1	0.3
Midland	28	9.0	3	1.0	31	10.0

Appendix 1.- Events by county- Michigan Hazardous Substances Emergency Surveillance, 2007						
County	Event Type				Total	
	Fixed Facility		Transportation		All Events	
Missaukee	1	0.3	0	0.0	1	0.3
Monroe	0	0.0	1	0.3	1	0.3
Montcalm	1	0.3	0	0.0	1	0.3
Muskegon	2	0.7	0	0.0	2	0.7
Newaygo	1	0.3	1	0.3	2	0.7
Oakland	20	6.5	8	2.6	28	9.0
Osceola	2	0.7	0	0.0	2	0.7
Otsego	1	0.3	0	0.0	1	0.3
Ottawa	13	4.2	2	0.7	15	4.8
Roscommon	1	0.3	1	0.3	2	0.7
Saginaw	4	1.3	2	0.7	6	1.9
Shiawassee	1	0.3	0	0.0	1	0.3
St. Clair	3	1.0	1	0.3	4	1.3
St. Joseph	6	1.9	0	0.0	6	1.9
Tuscola	2	0.7	0	0.0	2	0.7
Van Buren	7	2.3	0	0.0	7	2.3
Washtenaw	3	1.0	3	1.0	6	1.9
Wayne	34	11.0	16	5.1	50	16.1
Wexford	0	0.0	2	0.7	2	0.7
Total	224	72.3	86	27.7	310	100.0

Appendix 2.- Complete list of substances released and frequencies- Michigan Hazardous Substances Emergency Events Surveillance, 2007

NAME	Frequency	Percent
2,5-dimethyl-2,5-ditert butylperoxyhexane-3	1	0.2
2-Chloroacetophenone	1	0.2
3,4-dichlorobenzonitrile	1	0.2
4,4'-Methylenebis(2-chloroaniline)	1	0.2
Acetone	10	2.3
Acetonitrile	1	0.2
Acid NOS	2	0.5
Acrylonitrile	3	0.7
Adhesive NOS	1	0.2
Aluminum Oxide	1	0.2
Amines, (corrosive liquid)	1	0.2
Ammonia	29	6.8
Ammonium Nitrate	5	1.2
Ammonium Sulfate	3	0.7
Barium Oxide	1	0.2
Bleach	1	0.2
Butadiene	5	1.2
Carbon Monoxide	39	9.1
Chlorine	6	1.4
Chloroform	1	0.2
Chloromethyl methyl ether	4	0.9
Coleman Fuel	10	2.3
Cyanogas	1	0.2
Diethylene Glycol Monohxyl Ether	2	0.5
Dimethyl Ether	1	0.2
Divinyl-tetramethyl-disiloxane	1	0.2
Drain Cleaner NOS	1	0.2
Ephedrine	1	0.2
Ethanol NOS	3	0.7
Ethanolamine NOS	1	0.2
Ether NOS	2	0.5
Ethyl Ether	7	1.6
Ethylene Glycol	3	0.7
Ethylene Oxide	1	0.2
Explosives NOS	2	0.5
Ferric Oxide	1	0.2
Formaldehyde	1	0.2
Formic Acid	1	0.2
Fuel NOS	4	0.9
Herbicide NOS	1	0.2
Hexamethyldisilazane	1	0.2
Hexane	1	0.2
Hexchrome	1	0.2
Hydrazine	1	0.2
Hydrochloric Acid	19	4.5
Hydrogen Peroxide	3	0.7
Hydrogen Sulfide	3	0.7
Ink NOS	1	0.2
Iodine	7	1.6
Isooctane	1	0.2
Isopropanol NOS	4	0.9
Isopropyl Alcohol	2	0.5
Lighter Fluid NOS	1	0.2
Lithium	2	0.5
Lithium Fluoride	1	0.2
Lithium Oxide NOS	1	0.2
Lumax	1	0.2
Meth Oil	2	0.5
MIX: Ammonia/Bleach	1	0.2
MIX: Ammonium Bifluoride/Nitric Acid/Sulfuric Acid	1	0.2
MIX: Butadiene/Styrene	1	0.2
MIX: Calcium Chloride/Citric Acid/Sodium Bisulfite/Sulfur/brine s	1	0.2
MIX: Chromium Sulfate/Flurozirconic acid	1	0.2
MIX: Copper Sulfate/Sodium Hydroxide	1	0.2
MIX: Ethanol NOS/Nitric Acid	1	0.2
MIX: Fertilizer NOS/Prodiamine/Tri-Power	1	0.2
MIX: Heptane/Isopropanol NOS	1	0.2
MIX: Isopropanol NOS/Toluene	1	0.2
MIX: Magnesium Chloride Anhydrous/brine salt	1	0.2
MIX: Nitric Acid/Phosphoric Acid	1	0.2
MIX: Sodium Hydroxide/Sodium Hypochlorite/Swimming Pool Chemical	1	0.2

Appendix 2.- Complete list of substances released and frequencies- Michigan Hazardous Substances Emergency Events Surveillance, 2007

NAME	Frequency	Percent
Magnesium	1	0.2
Marvcide	1	0.2
Mercury	33	7.7
Metam-Sodium	1	0.2
Methamphetamine	4	0.9
Methamphetamine Chemicals NOS	18	4.2
Methanol NOS	3	0.7
Methyl Alcohol	2	0.5
Methyl Chloride	1	0.2
Methyl tert-Butyl Ether	1	0.2
Nitric Acid	4	0.9
Nitrogen	1	0.2
Nitrogen Fertilizer	1	0.2
Nitrous Oxide	1	0.2
Paint NOS	21	4.9
Perchloroethylene	3	0.7
Pesticide NOS	1	0.2
Phosgene	1	0.2
Phosphoric Acid	2	0.5
Phosphorus	5	1.2
Picric Acid	1	0.2
Polyester Resin	1	0.2
Polyurethane	1	0.2
Polyvinyl Acetate NOS	1	0.2
Potassium Chloride	1	0.2
Potassium Hydroxide	3	0.7
Potassium Sulfate	1	0.2
Propane	1	0.2
Quaternary Amine NOS	1	0.2
Raid	1	0.2
Red Devil Lye	1	0.2
Resin NOS	2	0.5
Selenium	1	0.2
Silicate NOS	1	0.2
Sodium Hydride	1	0.2
Sodium Hydrosulfide	1	0.2
Sodium Hydroxide	15	3.5
Sodium Hypochlorite	6	1.4
Sodium Nitrate	1	0.2
Sodium Oxide	1	0.2
Sodium Thiosulfate	1	0.2
Solvent NOS	22	5.2
Sulfur Dioxide	1	0.2
Sulfuric Acid	14	3.3
TACC adhesive	1	0.2
Titanium Dioxide	1	0.2
Toluene	2	0.5
Toluenediamine	1	0.2
Triethanolamine	1	0.2
Triethylene Glycol	1	0.2
Vinyl Chloride	4	0.9
Vinylidene Chloride	1	0.2
Xylene	3	0.7
Zinc Sulfate NOS	1	0.2
Total	427	100.0

Appendix 3.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2007

MI20070001- Mercury was spilled in a science lab in a high school. The school was evacuated while the health department and the Department of Environmental Quality ensured proper clean up.

MI20070004- A vial of mercury was in a storage closet in a school. The stopper on the vial was needed for another project. When someone pulled the stopper out, the vial fell causing a release of mercury. The room was evacuated and the local health department responded and cleaned up that day.

MI20070005- A student brought a necklace from Mexico into a high school. The necklace broke and mercury was released; students played with it in the hall before contacting a teacher. Five students were taken to a local emergency department as a precaution.

MI20070013- Police seized an active methamphetamine lab containing sulfuric acid, sodium nitrate, fuel and other chemicals involved in the manufacturing process. One child was evacuated from the area.

MI20070038- A small bottle of dried picric acid was found in a laboratory. The building was evacuated and closed while fire department's hazmat team stabilized and disposed of the material.

MI20070042- A construction worker was using a welding torch in a parking ramp. Buildup of carbon monoxide developed and went into the vent systems of a nearby building housing an investment company and 5 floors of condominiums. Firefighters evacuated about 30 people from building, and then they ventilated the building.

MI20070044- A propane heater was used to thaw frozen outdoor pipes at a daycare center. Somehow, the heater was unplugged, allowing carbon monoxide to leak into the building. The carbon monoxide detector alarm sounded. Fifteen people were taken to the hospital with 5 of them having symptoms of nausea, headache and eye irritation.

MI20070052- Police seized a medium sized active methamphetamine lab containing acetone, solvents and other chemicals involved in manufacturing. Two people were evacuated at the time of the seizure.

MI20070053- Employees at a publishing company opened a package and a suspicious brown substance was released. It was later determined to be a silicate. This caused immediate respiratory distress in two employees, with a third employee falling ill later. One of the first two was transported to the hospital. The building was evacuated.

MI20070057- Two employees at a metal coating company were unloading acidic soap when it fell and splashed them. They went to the hospital with skin irritation.

Appendix 3.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2007

MI20070058- A gas powered generator was used in the garage of a home as a source for heat and electricity because the utilities were not turned on in the home. The family, two adults and four children, were overcome by carbon monoxide and all were taken to the emergency department.

MI20070063- Police seized a methamphetamine lab containing fuel, ammonium nitrate, sodium hydroxide and other chemicals used for manufacturing the drug. Two adults and three children were evacuated.

MI20070087- Police seized a methamphetamine lab containing iodine, Coleman Fuel® and other chemicals used in the manufacturing process. Three people were evacuated. The man was later taken to jail. The mother took the child to the emergency department at the request of Child Protective Services (CPS) as a precaution.

MI20070068- Five staff members working in a laundry room at a nursing home were using undiluted bleach solution. The solution was poured down the drain causing lingering fumes in the air. The employees were exposed to the fumes for about 15 minutes. Hazmat and EMS responded and the laundry room was evacuated. One female with a history of asthma experienced an asthma attack and lost consciousness and was brought into the emergency department, was intubated and sent to ICU. She died three days later. One other staff member presented with wheezing and shortness of breath. The other three employees were transported to the hospital as a precaution.

MI20070140- A methamphetamine lab caught on fire in trailer. The fire began in the center of the trailer and quickly engulfed the rest of it. One of the “cooks” experienced both chemical and thermal burns and was admitted to the hospital.

MI20070141- A methamphetamine lab caught on fire in an apartment building. The building was evacuated while the fire was extinguished and the lab was dismantled. One of the cooks experienced burns on his hand and was taken to the emergency department for treatment.

MI20070160-A student brought a thermometer to school and intentionally dropped it on the floor in front of the cafeteria, a high traffic area. He was hoping for a day off. All 1600 students were checked for mercury contamination; 28 tested positive and were decontaminated, two of which were found to have elevated levels and were taken to area hospital as a precaution. Everyone was sheltered in place until they were checked. The school was open the following day.

MI20070190- A mercury-containing candy thermometer was dropped in a high school. MDCH arranged for the county to borrow the MDCH Lumex for testing and aided in finding a proper clean-up contractor. Approximately 40 students were quarantined for two hours while officials cleaned up.

Appendix 3.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2007

MI20070208- During the filling of an ammonia tank at a fertilizer co-op company the truck drove away from the hose before it was properly disconnected exposing four employees to anhydrous ammonia. All went to the hospital with breathing problems. One of the employees was admitted because of a rash he developed.

MI20070209- A chemical manufacturing company has granulated chlorine stored on site. A janitor had swept up some and put it in a cardboard box. Over the weekend there was a lot of rain, some of which got into the facility and reacted with the contents that were in the box. The box caught fire and also released a cloud of chlorine gas. Three nearby houses in this rural area were evacuated as a precaution. The cloud stayed mainly inside of the building once the air system was shut down.

MI20070228- Sixty-five employees were evacuated from an automotive components manufacturing plant after a chlorine release from a tank that had rusted out. The tank remained on site from a process that had not been used in at least 15 years. The gas was released outside about eight feet from the open door to the plant. The vents from the plant sucked the chlorine gas into the plant. Two employees went to find the source and experienced shortness of breath and respiratory problems. They went to the emergency department and were soon released. By the time the source of chlorine was found, the release had stopped. The plant was vented before employees came back to work.

MI20070229- A thermometer in a box broke and leaked onto a desk in a classroom. Students had to evacuate the classroom while it was secured and the spill could be cleaned up. The room remained closed for one day to ensure proper clean-up.

MI20070230- Two employees at a welding repair facility were burned when the nitrogen tank they were filling exploded because they overfilled it. The event happened at 2 am and there were only three people on site.

MI20070284- Gas powered forklifts malfunctioned and caused the release of carbon monoxide in a fruit processing plant. Twenty three employees experienced headache and nausea. All went to the hospital and were treated with oxygen. One employee was kept overnight, the rest were released the same day. The plant was closed for 24 hours while the fire department monitored the air. The company immediately switched to electric forklifts.

MI20070293- There was an anhydrous ammonia release from a freezer at a food processing facility. The fire department sprayed down the area to suppress any lingering vapors. Eighty employees were evacuated for 12 hours while it was cleaned up. Three employees went to the emergency department and three were treated on scene for respiratory distress.

Appendix 3.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2007

MI20070296- Police seized an active methamphetamine lab containing Coleman Fuel®, solvents and other chemicals involved in manufacturing the drug. One person was evacuated until the hazardous substances were removed.

MI20070307- Two teens released some pepper/mace spray in a library. It spread to a nearby grocery store. Approximately 30 people were evacuated from the buildings for two and a half hours while they were vented. Five people went to the hospital where they were treated for nausea, burning skin and eyes and respiratory troubles. About 24 others were treated on scene for burning eyes and skin.

MI20070308- Improper mixing at a chemical plant caused a cloud of nitric acid and phosphoric acid to be released into the air. The plant was evacuated for three hours while a hazmat team and the fire department ventilated the area.

MI20070310- A family called the MDCH Division of Environmental Health to report an odd illness. The MDCH toxicologist advised the family install a carbon monoxide detector, based on the symptoms. The family had just installed a new stove; and experienced the most severe symptoms when the house was closed up. The son went to the emergency department with headache, nausea and dizziness. The family determined the carbon monoxide source was the new stove. They had it fixed.

MI20070330- Authorities were called to an ice making facility due to an ammonia leak which was due to maintenance on the tank. There were three employees present at the time; one of them was taken to the hospital for treatment of minor chemical burns. The plant was evacuated for two hours. Hazmat responded and turned off the leaking valve. A clean-up contractor assisted in the clean up.

MI20070354- Operator error caused a release of nitric acid from a holding tank at a chemical manufacturing facility. About 7000 gallons were released into a secondary containment area, throughout the building, into the adjacent parking lot and into a nearby sanitary sewer. The plant (~200 employees) was evacuated and two employees, who experienced minor chemical burns, went to the emergency department.

MI20070361- Police seized an active methamphetamine lab containing sodium hydroxide, Coleman® Fuel and other chemicals involved in the manufacturing process. The one person who was evacuated was extracting ammonia from cold packs at the time of the seizure.

MI20070370- A man was attempting to protect his home with a home made bomb. He accidentally set it off and it exploded in his face. He lost his arm. Local homes were evacuated until the bomb squad determined the area was safe.

Appendix 3.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2007

MI20070371- A fire from a leaking container at a wire company caused the release of sulfuric acid from a storage tank. About 9000 gallons of sulfuric acid were released in the fire. Two employees were working at the time and were able to get out without injury. Three firemen were injured; one broke his leg when he fell off the truck, one had dehydration and the other experienced chest weakness. The spill was contained, diluted and neutralized.

MI20070376- Police seized an active methamphetamine lab containing anhydrous ammonia, drain cleaner, ether, and other chemicals involved in manufacturing the drug. Five people were evacuated from the home until clean-up was completed.

MI20070390- Police seized a recently active methamphetamine lab containing ammonium sulfate, solvents and other chemicals involved in manufacturing methamphetamine. Four individuals were present at the time; one was arrested and the other three were evacuated while clean-up occurred.

MI20070396- An active methamphetamine lab was seized by police. The "cook" forgot to off-gas the lab and it exploded in his face. He was taken to the hospital for burn treatment. His wife and stepson were evacuated while clean-up occurred.

MI20070410- A recently active methamphetamine lab was seized by police. Three adults and three children were evacuated until clean-up was complete.

MI20070412- There was a release of hydrochloric acid from a containment area on the roof of a plating company. 3000 people including three schools and a senior center were evacuated, due to the threat of rain that could cause a toxic cloud. A man went to the hospital for treatment for throat irritation. The leak was vacuumed into a tank and the residue was neutralized with soda ash. The leaking tank was then filled with water to dilute any remaining acid and was run through the facility's treatment system.

MI20070417- A man trying to unclog his drain mixed sodium hydroxide and copper sulfate together. The mixture exploded in his face and caused him and his wife to go to the hospital for treatment of chemical burns. Poison control center was consulted.

MI20070431- A faulty valve on a tanker released approximately 300 gallons of metam-sodium onto a gravel roadway. The driver was taken to the hospital for decontamination and treatment for the chemical trauma he experienced. Twenty local residents were evacuated until sand was applied on the spill. This was the proper protocol for clean up. HSEES staff notified the local health department and assisted them with concerns local residents were having about the spill.

Appendix 3.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2007

MI20070434- A recently active methamphetamine lab was seized by police. It contained Coleman Fuel®, ammonium sulfate and other chemicals used in the manufacturing process. Five people were evacuated until clean-up was complete.

MI20070444- Contractors at a food processing plant were applying TACC adhesive to Formica counter tops. They were found passed out. They regained consciousness on their way to the hospital.

MI20070450- A tanker was leaking ethanolamine while traveling down the highway and later at a rest stop. Hazmat responded and the rest stop was evacuated for seven hours. The spill was monitored and contained. Contents of the tank were transferred to another truck.

MI20070451- The driver of a tanker truck slammed on the brakes to avoid a collision, causing totes to rupture and release 300 gallons of sodium hypochlorite. Two buildings were evacuated and area roads were closed. Sandbags were applied to contain the material. Contractors were called for clean-up.

MI20070452- An employee at a casino improperly mixed cleaning chemicals causing a release of chloramine. He was taken to the emergency department and was treated and released for respiratory distress.

MI20070454- Police seized an active methamphetamine lab containing ether, ammonia and other chemicals involved in manufacturing the drug. Four adults and one child were evacuated at the time of the seizure.

MI20070458- A 16-year-old boy and his friend made a homemade bomb. They lit it and could not extinguish it. The bomb exploded in the living room of the house. It blew off the boy's hand. The other 5 people in the home self evacuated. The area was restricted until the bomb squad said it was safe to return.

MI20070470- A woman set off a Raid® Fogger in her home and did not leave. She called the fire department. She was treated and released from the hospital for coughing and shortness of breath.

MI20070471- Police seized an active methamphetamine lab containing anhydrous ammonia and solvents. Five people were evacuated from the home until clean-up was completed.

MI20070484- Equipment failure from a pump on a tanker at a plastics manufacturer caused a release of 550 gallons of a mixture of acids. Some of the spill went into storm sewers. Sewers were neutralized with soda ash. Some soil was excavated and the streets were swept. Businesses were evacuated and local roads were closed while it was cleaned up.

Appendix 3.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2007

MI20070486- While at work an employee at a restaurant splashed a cleaner containing quaternary ammonium into his eye and called the Poison Control Center.

MI20070490- Police seized a recently active methamphetamine lab containing anhydrous ammonia, solvents, ether and other chemicals involved in manufacturing the drug. Three people were evacuated at the time of the seizure.

MI20070495- A man in his mid-20's suffered severe burns from a methamphetamine lab explosion; a 20 oz pop bottle exploded in his face and he caught on fire. His friend tried to extinguish the flames by putting chemical extinguisher on him. He was airlifted to a hospital where he was kept in an induced coma for two months. According to police "his hands and face were burned off".

MI20070485- While at work, a hair stylist spilled disinfectant in her eye. She called the Poison Control Center.

MI20070497- A tanker truck rollover caused a small leak of gaseous methanol. Nearby buildings were evacuated as a precaution. The driver of the truck was experiencing some trauma and heart troubles and was taken to the hospital. The spill was cleaned up by a contractor.

MI20070501- A YMCA released all of the pool chemicals for the day in a short period of time. There was a sixty-nine year old man swimming at the time and he experienced respiratory distress. The Poison Control Center was called when he was en route to the hospital.

MI20070502- An employee at an unknown facility improperly mixed bleach and ammonia. He was overcome by chloramine fumes and treated on scene. Poison Control Center was consulted.

MI20070508- An employee at a group home spilled bleach, which splashed on her leg. She experienced a red and itchy rash. Poison Control Center was called for consulting.

MI20070515- Police seized an active methamphetamine lab containing solvents and other chemicals involved in manufacturing. Four people were evacuated from the home until clean-up was completed.

MI20070540- An employee was using a power washer in an enclosed area at a large retail store. He experienced headache, dizziness and nausea and was told to go to the emergency department for treatment due to carbon monoxide poisoning.

Appendix 3.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2007

MI20070541- An employee working in a basement with lots of machines and no ventilation experienced headache and dizziness. He was sent to the emergency department for treatment due to carbon monoxide poisoning.

MI20070542- A man was working in his garage with the door closed and was found almost passed out. EMS was called and he was taken to the emergency department for treatment due carbon monoxide poisoning.

MI20070543- A man working at a construction job was working in the garage with a power trowel. He felt ill with headache and nausea. He was instructed to go to the emergency department and was treated for carbon monoxide poisoning.

MI20070544- A farmer was working in a milking parlor with a power washer. He experienced headache and nausea. He went to the emergency department for treatment of carbon monoxide poisoning.

MI20070545- A family of two was using a kerosene heater for two days as a heating source. One person fell ill; the fire department and EMS responded and took her to the hospital where she was admitted and treated for carbon monoxide poisoning.

MI20070546- Forklifts were running in a warehouse without ventilation and caused a build up of carbon monoxide. Seven employees were sent to the emergency department for treatment for symptoms of carbon monoxide poisoning.

MI20070547- A family cooked on a charcoal grill inside a house causing a build-up of carbon monoxide in the house. The fire department and EMS responded and transported two people to the emergency department for treatment.

MI20070548- A contractor was at work hanging drywall and using power tools in a poorly ventilated area. He was found passed out. EMS came and took him to the emergency department where he was treated for carbon monoxide poisoning.

MI20070549- A man was working on a tractor in his basement garage. Carbon monoxide filled the home. Both the man and his wife experienced dizziness and headaches and called EMS. They were taken to the emergency department and treated for carbon monoxide poisoning.

MI20070550- An employee at an automotive parts warehouse was working in a warehouse with propane powered forklifts when another employee closed the doors, stopping all ventilation. The employee experienced headache and nausea and was sent to the emergency department for treatment due to carbon monoxide poisoning.

Appendix 3.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2007

MI20070551- A man was washing his basement with a gas-powered power washer and passed out once he was upstairs. EMS came to the house and took him to the emergency department, where he was treated for carbon monoxide poisoning.

MI20070552- An employee working in a basement with lots of machines and no ventilation experienced headache and dizziness. He was sent to the emergency department for treatment due to carbon monoxide poisoning.

MI20070553- Two men were working in a basement of an apartment building with a running commercial water pump; one of the men was overcome by the build-up of carbon monoxide. EMS came and transported him to the emergency department.

MI20070554- A man was working in a truck accessory store with a gas pressure washer. He passed out and EMS was called. He was transported to the emergency department where he was treated for carbon monoxide poisoning.

MI20070555- A man was at home working on his car in the garage with a wood burning stove. He passed out. EMS was called and he was transported to the emergency department where he was treated for carbon monoxide poisoning.

MI20070556- A man was working on his car in the garage with the door closed. He was discovered passed out. EMS came and transported him to the emergency department where he was treated for carbon monoxide poisoning.

MI20070557- An employee was discovered passed out in a warehouse. He was working with a generator and running cars in an enclosed space. EMS responded and he was taken to the hospital where he was admitted and treated for carbon monoxide poisoning.

MI20070558- Two employees were working in the garage at a hotel with running cars and a concrete cutting machine; they experienced shortness of breath, headache and nausea and were sent to emergency department for treatment due to carbon monoxide poisoning.

MI20070559- An employee was working in a barn with forklifts running at an apple farm. The employee experienced headache, dizziness and nausea. The fire department and EMS came and confirmed carbon monoxide presence and took the employee to the emergency department for treatment due to carbon monoxide poisoning.

MI20070560- An employee working on a propane engine was inside without ventilation. He passed out. The company called EMS. He was transported to the emergency department and treated for carbon monoxide poisoning.

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MI20070561- Contractors were working in a garage with a generator and kerosene heaters. One employee experienced headache and dizziness. Management sent them to the emergency department for treatment of carbon monoxide poisoning.

MI20070562- A man was working on his tractor inside his garage. His neighbors found him disoriented and weak. EMS came and transported him to the emergency department where he was treated for carbon monoxide poisoning.

MI20070563- A man was using a space heater to heat his home and was found unresponsive. EMS came and transported him to the hospital where he was admitted and treated for carbon monoxide poisoning.

MI20070565- Elevated carbon monoxide levels were found in a steel plant. One employee tried to go back into the area. He experienced dizziness and was sent to emergency department where he was treated for carbon monoxide poisoning.

MI20070566- A faulty gas stove caused a release of carbon monoxide in a home. Five people felt ill and were taken by EMS to the emergency department for treatment due to carbon monoxide poisoning

MI20070567- A faulty water heater caused a carbon monoxide release. Two residents experienced shortness of breath and headache. They called the fire department and were taken to the emergency department for treatment.

MI20070568- A college student used a space heater in her home. She felt ill and called the fire department. They came and found high levels of carbon monoxide and sent her to the emergency department for treatment.

MI20070569- A family of two was using a charcoal grill as a heater. They experienced headaches, nausea and vomiting. EMS came and transported them to the emergency department where they were treated for carbon monoxide poisoning

MI20070570- A generator was running overnight in a mobile home. Two people experienced dizziness, headaches and shortness of breath. EMS responded and transported them to the emergency department for treatment of carbon monoxide poisoning.

MI20070571- A municipal truck had an exhaust leak. The driver drove it for about eight hours; then he felt ill and was sent to the emergency department for treatment of carbon monoxide poisoning.

MI20070572- A man was working in his basement with a gas-powered saw and no ventilation. He was dizzy and had a headache. EMS came and transported

him to the emergency department where he was treated for carbon monoxide poisoning.

MI20070573- Use of a kerosene heater inside of a home with no ventilation caused a carbon monoxide build-up. A family of four called EMS and they were taken to the emergency department for treatment due to carbon monoxide poisoning.

MI20070574- An employee at a bus garage was working with a running car. He experienced headache, nausea and shortness of breath. EMS was called and he was transported to the emergency department where he was treated for carbon monoxide poisoning.