Hazardous Substances Emergency Events Surveillance in Michigan 2006

November 2007

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

Hazardous Substances Emergency Events Surveillance in Michigan: 2006

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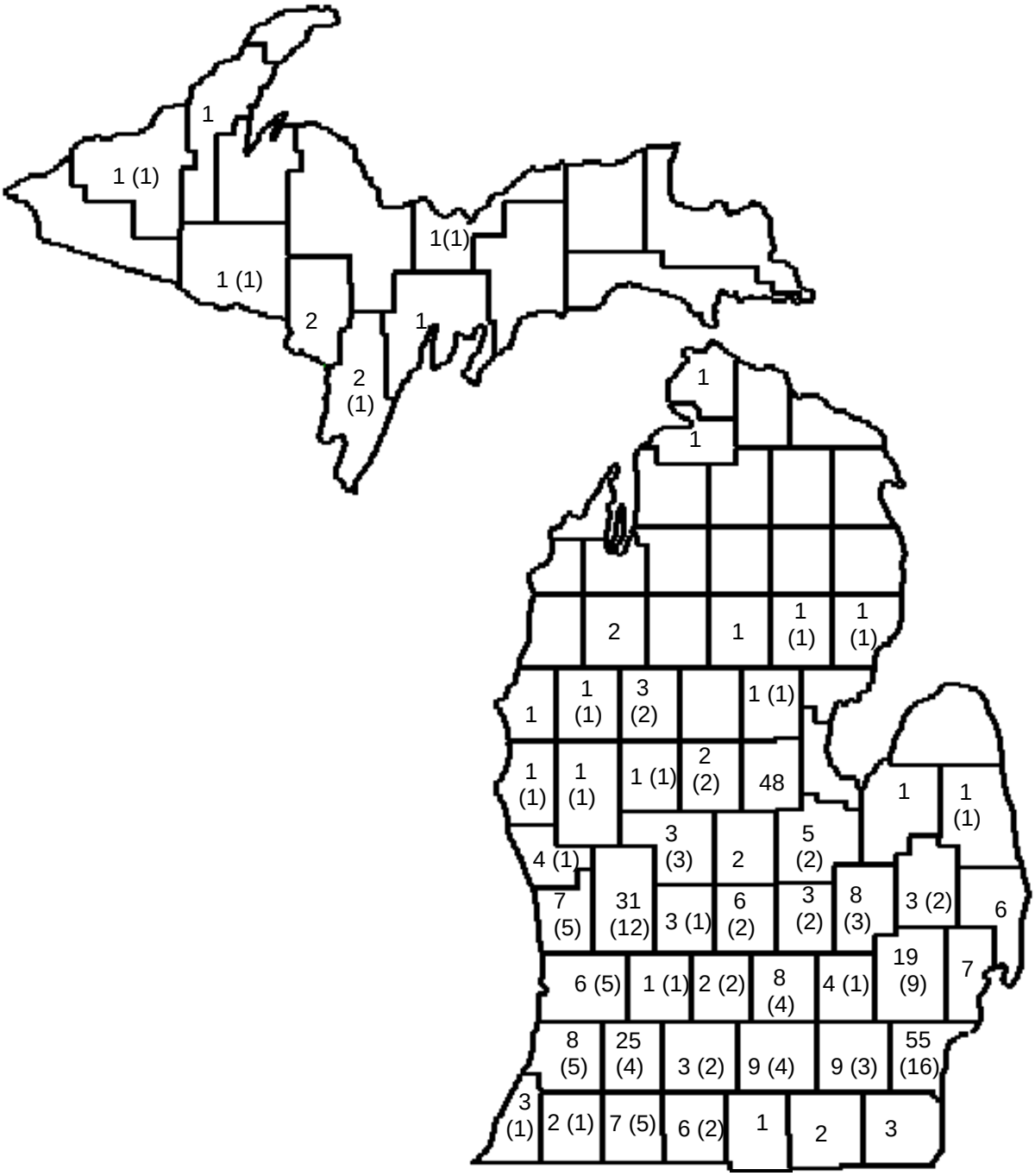


SUMMARY

This report summarizes the characteristics of hazardous substances emergency events reported to the Michigan Department of Community Health (MDCH) for 2006, the second year of this surveillance program in Michigan. The Hazardous Substances Emergency Events Surveillance (HSEES) system, maintained 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 about acute events involving hazardous substances is collected, including 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 338 reported events met HSEES criteria for inclusion in 2006 in Michigan. Two hundred thirty-nine of the events occurred at fixed facilities and the remainder were associated with transportation. More than one substance was released in 42 (12.4%) of these 338 events. The most commonly reported substances were carbon monoxide and ammonia. During this reporting period, 94 events (27.8% of all reported events) resulted in an injury, involving a total of 207 victims, 14 (6.8%) of whom died. The most frequently reported injuries were headache and dizziness. Evacuations were ordered for 50 (14.8%) events. Decontaminations took place for 17 injured individuals and 29 uninjured, involving seven events. The map on the opposite 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.

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 2006.

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.

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 2006 in Michigan. The highlights of the 2006 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 or evacuation. The 2005 annual report is available at
http://www.michigan.gov/documents/mdch/HSEESAnnual_Report_174705_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.

METHODS

All participating states follow the ATSDR HSEES protocol for collection and processing of information about releases.[2]

The ATSDR definition of a HSEES event is as follows: 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 (Appendix 1), 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 2006, 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. Petroleum is excluded because the of the Petroleum Exclusion clause in CERCLA, under which the HSEES program has been funded.

Various sources are used to identify and obtain information about HSEES-eligible events in Michigan. These include reports to the National Response Center (NRC)[3], the Federal Department of Transportation, the Michigan Department of Environmental Quality (DEQ), the Michigan Department of Agriculture, the Michigan State Police, the State Fire Marshal's office, the media, and others. Hospital discharge data are used to identify carbon monoxide releases.

Information collected on each 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 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

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

location is not available, nearby population groups were 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)[4].
- 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.

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 2006 events was completed in May 2007. A descriptive analysis of the data was conducted using SAS®[5].

[4] http://www.census.gov/epcd/www/naics.html
[5] Statistical Analysis Software (SAS®) version 9.1

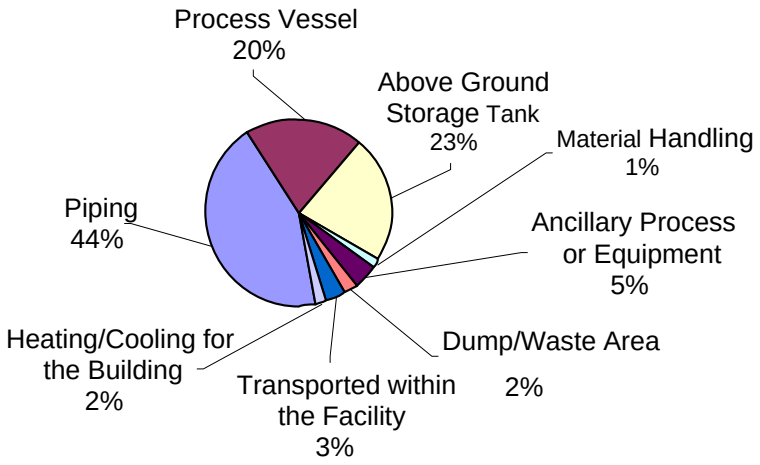
RESULTS

For 2006, 338 hazardous substance emergency events in Michigan were HSEES-eligible events and were included in the Michigan HSEES (MI-HSEES) program: 333 were actual releases, 4 (1.2%) were threatened releases and 1 (0.3%) had both an actual release and a threatened release. The counties with the most frequent number of events were Wayne with 55 (16.3%) events, Midland with 48 (14.2%) events and Kent with 31 (9.2%) events.

Facility type

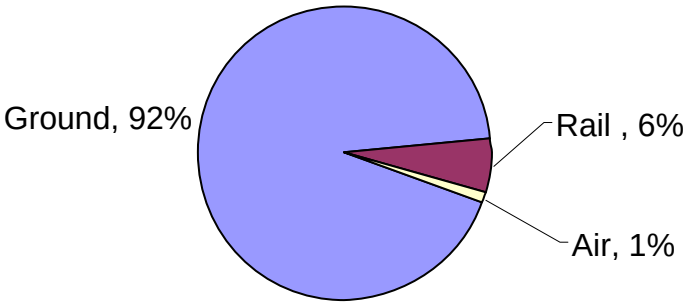
A total of 239 (70.7%) events occurred in fixed facilities. One hundred and fifty (62.8%) of the 239 fixed facility events did not identify an area in the facility where the release occurred. The main locations identified for the 89 events that included an area are as follows: piping- 39 (43.8%), process vessel- 18 (20.2%), above ground storage area- 20 (22.5%), ancillary process/equipment- 4 (4.5%), transported within the facility- 3 (3.4%), dump waste area-2 (2.2%), heating/cooling for the building- 2 (2.2%), and material handling- 1 (1.1%), (Figure 1).

Figure 1.- Areas of fixed facilities involved in events, Michigan Hazardous Substances Emergency Events Surveillance, 2006 (N=89)



Of the 99 transportation-related events, 92 (92.9%) occurred during ground transport, 6 (6.1%) involved transport by rail, and 1 (1%) involved air transportation (Figure 2). The largest proportion of transportation related events occurred during unloading from a vehicle, which had 39 (39.4%) events. Thirty (30.3%) events occurred while moving and were later discovered at a fixed facility.

Figure 2.- Distribution of transportation-related events, by type of transport- Michigan Hazardous Substances Emergency Events Surveillance System, 2006 (N=99)



Nearby populations

Information on populations within ¼ mile was available for 327 (96.7%) of the 338 events. Residences were within ¼ mile of 321 (98.2%) of 327 events. Businesses were within ¼ mile of 316 (98.1%) events; Schools- 39 (12.1%), daycare centers- 84 (26.1%), hospitals- 6 (1.9%) and nursing homes- 14 (4.3%). (Information on these five categories was not reported for 5 events.) Recreational areas were within ¼ mile of 32 (9.9%) events. (Information on this category was not reported in 3 events.)

Causes of events

Primary or root cause factors were reported in all but two of the 338 events. Secondary or immediate causal factors were identified in 131 (38.9%) of the 336 events where a primary factor was known. Of the reported primary factors in fixed facility events, human error and equipment failure accounted for most of the factors with 108 (45.6%) and 88 (37.1%) entries, respectively. Illicit drug production was the secondary cause of 28 (11.8%) fixed facility events. Out of the 99 transportation-related events, the majority (52.5%) were primarily due to human error, and improper filling/loading/packing was the leading secondary cause of 25 (25.3%) transportation-related events (Tables 1a and 1b).

Table 1a.- Primary factors associated with events by event type- Michigan Hazardous Substances Emergency Events Surveillance, 2006

	Event Type					
	Fixed Facility*		Transportation		All Events	
Primary Factor	No. of Events	%	No. of Events	%	No. of Events	%
Human Error	108	45.6	52	52.5	160	47.6
Equipment Failure	88	37.1	45	45.5	133	39.6
Intentional	29	12.2	1	1.0	30	8.9
Illegal Act	8	3.4	1	1.0	9	2.7
Bad Weather	3	1.3	0	0.0	3	0.9
Other	1	0.4	0	0.0	1	0.3
Total	237	100	99	100	336	100

*Primary factor was unknown for 2 fixed facility events

Table 1b.- Secondary factors associated with events by event type- Michigan Hazardous Substances Emergency Events Surveillance, 2006

	Event Type					
	Fixed Facility		Transportation		All Events	
Secondary Factor	No. of Events	%	No. of Events	%	No. of Events	%
No Secondary Factor	164	69.2	41	41.4	205	61.0
Equipment Failure	14	5.9	4	4.0	18	5.4
Illicit Drug Production	28	11.8	1	1.0	29	8.6
Improper Fill/Load/Pack	2	0.8	25	25.3	27	8.0
System/Process upset	1	0.4	0	0.0	1	0.3
Forklift Puncture	2	0.8	6	6.1	8	2.4
Human Error	5	2.1	7	7.1	12	3.6
Unauthorized Dumping	5	2.1	1	1.0	6	1.8
Loadshift	1	0.4	12	12.1	13	3.9
Vehicle Roll Over	0	0.0	2	2.0	2	0.6
Improper Mixing	6	2.5	0	0.0	6	1.8
System Start/Shutdown	1	0.4	0	0.0	1	0.3
Overspray/Misapplication	1	0.4	0	0.0	1	0.3
Explosion	1	0.4	0	0.0	1	0.3
Performing Maintenance	3	1.3	0	0.0	3	0.9
Fire	1	0.4	0	0.0	1	0.3
Other	2	0.9	0	0.0	2	0.6
Total	237	100	99	100	336	100

Substances

A single substance was released in 296 (87.6%) of the 338 events. Two substances were released in 12 (3.6%) events and 30 (8.9%) 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 (99.0%) transportation events as well as 82.8% 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, 2006

	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	198	82.8	198	98	99.0	98	296	87.6	296
2	12	5.0	24	0	0.0	0	12	3.6	24
3	10	4.2	30	0	0.0	0	10	3.0	30
4	10	4.2	40	0	0.0	0	10	3.0	40
5	6	2.5	30	1	1.0	5	7	2.1	35
>5	3	1.3	53	0	0.0	0	3	0.9	53
Total	239	100	375	99	100	103	338	100	478

A total of 478 substances were associated with the 338 events, of which 10 (2.1%) 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, 2006

Substance	**# of times released**
Carbon Monoxide	75
Ammonia	28
Sodium Hydroxide	27
Hydrochloric Acid	21
Mercury	21
Sulfuric Acid	18
Chlorine	12
Acetone	8
Coleman® Fuel	8
Iodine	8

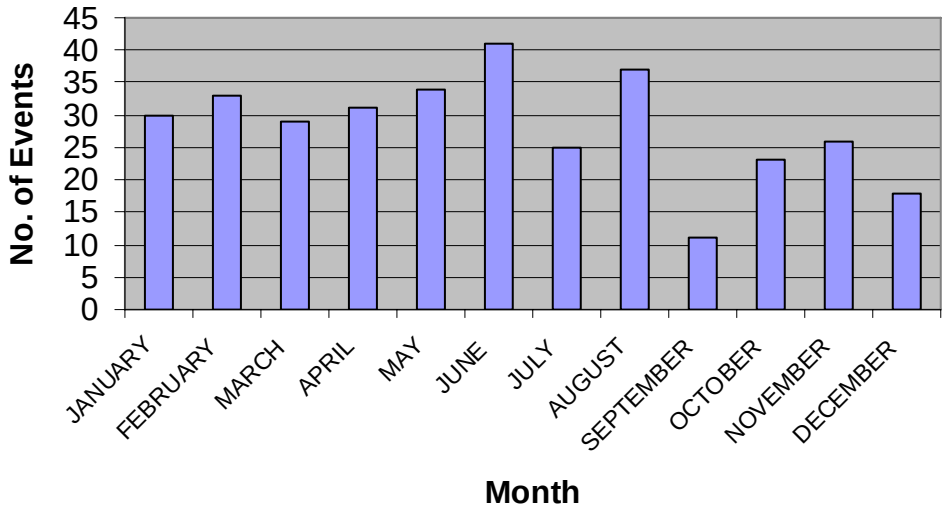
Carbon monoxide had the greatest number of releases (75) followed by ammonia and sodium hydroxide. Ammonia, sodium hydroxide, hydrochloric (muriatic) acid, acetone, Coleman® Fuel and iodine were frequently associated with methamphetamine laboratory seizures. A complete list of chemicals and the frequency of their releases is in Appendix 3.

One or two different types of releases could be reported for each substance. The most frequent release type of the 297 substances where one type was reported was spills (liquid/solid) with 152 (51.2%), followed by air releases with 135 (45.5%), and threatened releases with 10 (0.3%). There were 181 chemicals with two release types. Of events with two types of releases, the following combinations were reported: spill and air release with 126 (69.7%), spill and fire release- 49 (27.1%), air release and fire- 5 (2.8%), and spill and explosion- 1(0.6%).

Time of release

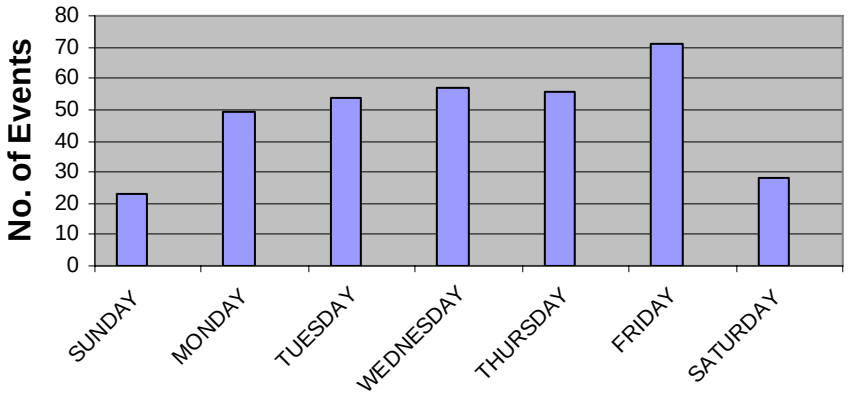
The number of events by month ranged from 11 (3.3%) in September to 41 (12.1%) in June, with the largest frequencies occurring in April to June (Figure 3).

Figure 3.- Month distribution of events- Michigan Hazardous Substances Emergency Events Surveillance, 2006 (N=338)



Events were more likely to occur on weekdays than weekends (Figure 4). The proportion of events occurring on weekdays ranged from 14.5% (Monday) to 21.1% (Friday), and the proportion occurring on the weekends ranged from 6.8% (Sunday) to 8.3% (Saturday). Of the 301 (89%) events for which a time category was reported, 33.8% occurred from 6 a.m. to 11:59 a.m., 25.4% from 12 p.m. to 5:59 p.m., 14.8%, from 6 p.m. to 11:59 pm and the remaining 15.1% from 12 a.m. to 5:59 a.m.

Figure 4.- Event day of the week distribution- Michigan Hazardous Substances Emergency Events Surveillance, 2006 (N=338)



Business/industry

Two hundred forty-nine (73.7%) of the 338 events were the responsibility of an industry or business and eighty-nine (26.3%) were not. The largest proportion of the business-associated events involved transportation and manufacturers of paper, chemical and petroleum industries with 96 (38.5%) and 58 (23.3%), respectively (Table 4). Selected industry subcategories with large numbers are also displayed on Table 4, including ground transportation- 93 (37.3%) and manufacturing of chemicals/pharmaceuticals- 54 (21.7%). Forty-seven (87%) of the 54 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, 2006 (N=249*)

NAICS Code	Industry Category	No. Events	%
72	Accommodations/Food Services	4	1.6
56	Administrative Support/Waste Management and Remediation (N=4)		
562	*Waste Management and Remediation*	*4*	*1.6*
11	Agriculture	4	1.6
71	Arts/Entertainment/Recreation	1	0.4
23	Construction	11	4.4
61	Education	14	5.6
62	Health Care	7	2.8
51	Information	2	0.8
31	Manufacturing- Food/Textiles/Apparel	5	2.0
33	Manufacturing- Metal/Transportation	21	8.4
32	Manufacturing- Paper/Petroleum/Chemicals/Plastics (N=58)		
325	*Manufacturing- Chemicals/Pharmaceuticals*	*54*	*21.7*
324	*Manufacturing- Petroleum/Coal*	*1*	*0.4*
322	*Manufacturing- Paper*	*1*	*0.4*
326	*Manufacturing- Plastics/Rubber*	2	0.8
21	Mining	1	0.4
81	Other Services (N=3)		
811	*Repair and Maintenance*	*3*	*1.2*
92	Public Administration	4	1.6
53	Real Estate- Rental and Leasing	1	0.4
45	Retail Trade- Books/Music/Gifts	1	0.4
44	Retail Trade- Motor Vehicle/Building Materials/Gas Stations	1	0.4
48	Transportation- Ground/Air/Rail (N=96)		
484	*Transportation- Ground*	*93*	*37.3*
482	*Transportation- Rail*	*3*	*1.2*
22	Utilities	9	3.6
42	Wholesale Trade	2	0.8
	Total	249	100

*89 events occurred in a non-industry setting.

Response

Of the 336 (99%) events with information on the types of emergency personnel that responded to the event, 143 (42.6%) reported only one category of responders, 112 (33.1%) reported categories of responders, 52 (15.4%) reported three and 29 (8.6%) reported four or more categories of responders. Company

response teams, followed by fire department and third party clean-up contractors were the most frequent categories of personnel to respond to an event.

Forty-seven events (13.9% of all events) resulted in a public health action. Two (4.3%) events had both a health investigation and environmental sampling, 44 (93.6%) had environmental sampling only, and 1 (2.1%) event had a health investigation only.

Methamphetamine

Twenty-seven (8.0%) MI-HSEES events involved clandestine methamphetamine (meth) laboratory seizures. This number is down from 48 cases included in 2005. This decrease may be due to a law passed that restricts the sale of ephedrine and pseudoephedrine-containing over-the-counter drugs.

Meth labs were included in MI-HSEES when they were found to be active within 72 hours of the seizure. This constituted 25% of the approximately 108 total meth laboratory seizures in Michigan in 2006. Most (77.8%) of the MI-HSEES lab seizures occurred in southwest Michigan (Allegan, Branch, Kalamazoo and St. Joseph Counties). Evacuations were ordered in 12 (44.4%) events. Five people in three events were injured.

Meth production involves a wide variety of chemicals to convert ephedrine or pseudoephedrine to methamphetamine. In the 27 MI-HSEES meth lab seizures, there were a total of 105 releases involving 25 different substances, with an average of 3.9 substances per release. The list to the right summarizes these chemicals by groups and gives examples.

In addition to methamphetamine lab seizures, there was one other methamphetamine-related event involving the attempted theft of anhydrous ammonia that resulted in the evacuation of a local trailer park for 6 hours and 10 injuries.

Chemicals Involved in Making Methamphetamine

Acids: hydrochloric acid and sulfuric acid
Anhydrous Ammonia/Ammonium Salts
Bases: caustic soda and sodium hydroxide
Fuels: Coleman® fuel and lighter fluid
Other Inorganic Substances: iodine, lithium, hydrogen peroxide and red phosphorus
Other: drain cleaners, methamphetamine oil/salt
Volatile Organic Compounds: acetone and solvents

Victims, evacuations, sheltering in place, and decontaminations:

One hundred fourteen (33.7%) of the 338 events involved an injury, evacuation or shelter-in-place. A brief synopsis of the 114 events that included one or more of these public health impact measures is included in Appendix 4.

Victims

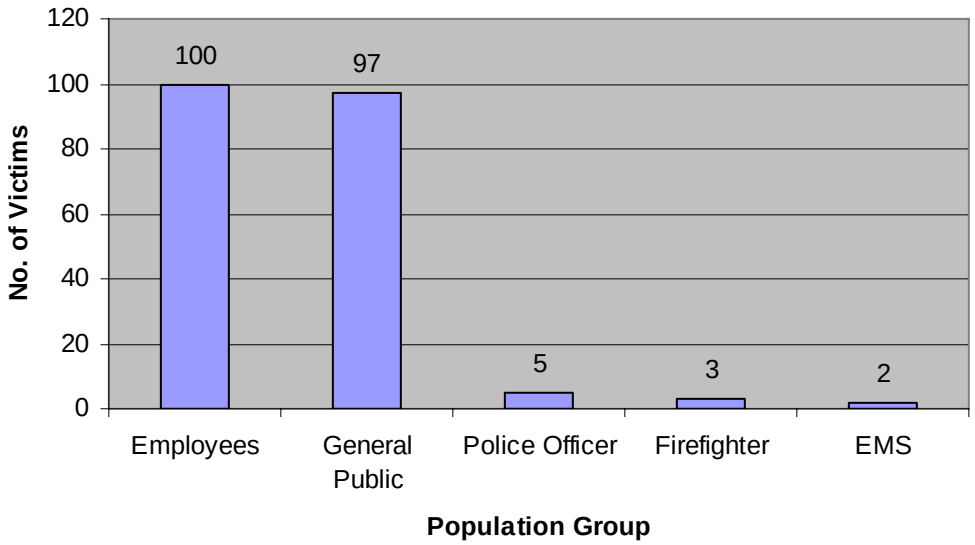
A total of 207 victims were reported in 94 events (27.8% of all events) (Table 5). Of the 94 events with victims, 57 (60.6%) involved only one victim and 18 (19.1%) involved two victims. Eight events involved more than five victims, one of which had 13 victims. Of all victims, 202 (97.6%) were injured in fixed facility events (Table 5).

Table 5.- Number of victims per event, by type of event- Michigan Hazardous Substances Emergency Event Surveillance, 2006

	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	52	58.4	52	5	100.0	5	52	55.3	57
2	18	20.2	36	0	0.0	0	12	12.8	36
3	6	6.7	18	0	0.0	0	4	4.3	18
4	1	1.1	4	0	0.0	0	4	4.3	4
5	4	4.5	20	0	0.0	0	2	2.1	20
>5	8	9.0	72	0	0.0	0	8	8.5	72
Total	89	100	202	5	100	5	94	100	207

Figure 5 shows the distribution of victims by population group. Employees constituted the largest part of the population groups injured with 100 (48.3%) of 207 persons injured, followed by the general public with 97 (46.9%) persons injured. Responders, including firefighters, police officers and EMS, comprised the remaining 10 (4.8%) of all injured persons. All but 5 (4 members of the general public and 1 employee) injuries occurred at fixed facilities.

Figure 5.- Distribution of victims by population group- Michigan Hazardous Substances Emergency Events Surveillance, 2006 (N=207)

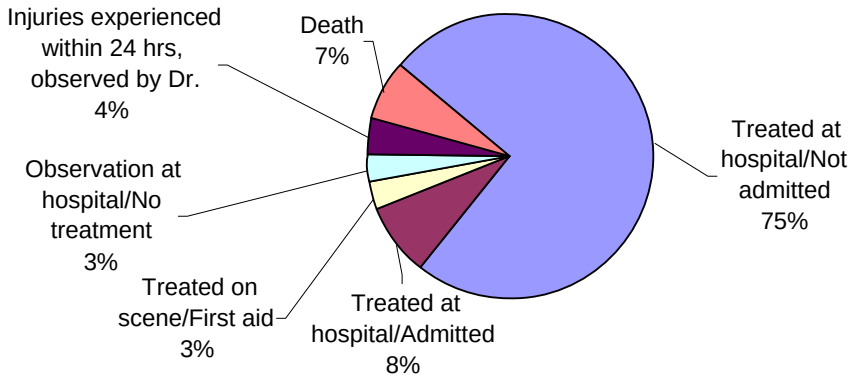


The age range was determined for 167 (80.7%) of the 207 victims: None were under one year old, three (1.8%) were one to four years old, seven (4.2%) were five to 14 years old, 13 (7.8%) were 15-19 years old, 81 (48.5%) were 20-44 years old, 52 (31.1%) were 45-64 years old and 11 (6.6%) were older than 65 years.

Sex was known for 178 (86.0%) of the 207 victims; of these, 111 (62.4%) were male.

Severity of injuries was known for 204 (98.6%) of victims: 152 (74.5%) were treated and released from the hospital and 17 (8.3%) were admitted to the hospital. All of the 14 (6.9%) deaths reported were associated with carbon monoxide exposure (Figure 6).

Figure 6.- Injury outcome- Michigan Hazardous Substances Emergency Event Surveillance, 2006 (N=204)



The 207 victims were reported to have sustained a total of 371 injuries or symptoms (Table 6). Of all reported injuries/symptoms the most common in fixed facility events were headache with 86 (24.4%) events, followed by dizziness and gastrointestinal problems with 70 (19.8%) and 69 (19.5%) events, respectively.

Table 6.- Frequencies of injuries/symptoms, by type of event -Michigan Hazardous Substances Emergency Events Surveillance, 2006

	Type of Event					
	Fixed Facility		Transportation		All Events	
Injury/Symptom	No. of Injuries	%	No. of Injuries	%	No. of Injuries	%
Headache	86	24.4%	5	27.8%	91	24.5%
Dizziness/other CNS* symptoms	70	19.8%	6	33.3%	76	20.5%
Gastrointestinal Problems	69	19.5%	0	0.0%	69	18.6%
Respiratory Irritation	62	17.6%	6	33.3%	68	18.3%
Shortness of Breath	19	5.4%	0	0.0%	19	5.1%
Eye Irritation	16	4.5%	0	0.0%	16	4.3%
Trauma	9	2.6%	0	0.0%	9	2.4%
Skin Irritation	6	1.7%	0	0.0%	6	1.6%
Heart Problems	2	0.6%	0	0.0%	2	0.5%
Other	4	1.1%	0	0.0%	4	1.1%
Total	353	100.0%	18	100.0%	371	100.0%

*Central Nervous System

Evacuations and sheltering in place

Evacuations were ordered in 50 (14.8%) of the 338 events. Of these evacuations, 40 (80.0%) were of buildings or the affected parts of the building, nine (18%) were of homes and businesses surrounding or downstream/downwind of the event, and one (2.0%) was not defined. The number of people evacuated was known for 39 (78.0%) of the 50 events. The number of people evacuated ranged from one to 1500 (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.

Table 7.- Ranges of numbers of evacuated people by number of events, Michigan Hazardous Substances Emergency Events Surveillance, 2006*

# of people evacuated	# of events
<5	8
5-20	16
21-50	8
51-100	2
101-500	4
501-1000	0
>1000	1
Total	39

*Number evacuated was unknown for 11 events.

Decontamination

Decontamination took place in seven events (2.1% of all events), including five events in which 17 injured people were decontaminated and two events in which 29 uninjured people were decontaminated. Ten of the 17 injured decontaminated individuals were decontaminated at a medical facility, three were decontaminated on scene and four were decontaminated both on scene and at a medical facility.

Of the 29 uninjured decontaminated individuals, 13 (44.8%) were firefighters who were exposed during one event to waterproofing chemicals in an enclosed area and 15 (51.7%) were hospital employees who were exposed to ethylene oxide and decontaminated in the emergency department.

Michigan Department of Community Health

Carbon Monoxide

Poisoning Prevention

Carbon monoxide (CO) was the most frequently reported substance in the MI-HSEES surveillance program in 2005 and 2006, with 52 and 75 events respectively. There were 14 deaths associated with MI-HSEES CO exposure events in 2006. Using generators and power-washers in poorly ventilated areas were the leading sources of exposure. Thirty-six percent of the CO releases were work-related and 64% occurred at a residence.

CO release events are included in MI-HSEES if they happen at a place of work, or if they happen in a home and there is an outside response (i.e. 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 2006, hospital discharge data identified a total of 619 people having unintentional carbon monoxide poisoning, most of whom were exposed from faulty furnaces or from car and truck exhaust.

In response to these findings, MI-HSEES has developed some educational interventions to prevent carbon monoxide. The first is the development of a press release that is issued when power outages are anticipated or have occurred from severe weather on the hazards of CO exposure from improperly installed generators. 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.

The MDCH site for information about carbon monoxide poisoning prevention can be found at www.michigan.gov/carbonmonoxide

DISCUSSION

These data on 338 chemical releases in 2006 in Michigan comprise the second full year of MI-HSEES operation. Twenty-one percent of these releases resulted in injury to 207 individuals, including 14 fatalities, and evacuations were mandated in approximately 15% of the events. Mercury and carbon monoxide releases were associated with a considerable number of the reported evacuations and injuries.

MDCH has been concerned about reports of mercury spills resulting in school evacuations and school closures for several years, in spite of a Michigan law that mandated that schools be mercury-free by December 2004. Because of this concern, in 2006 MI-HSEES sent letters to approximately 4730 school principals and their district superintendents asking about the status of their compliance with the law and providing some guidance in how to come into compliance. MDCH and the Michigan Department of Environmental Quality provided consultation to a number of schools that requested assistance, and, as the schools came into compliance, their names were added to the list of districts and schools that responded that they were mercury free. All 1778 schools that responded to the survey are now mercury free. The list is posted at: http://www.michigan.gov/mdch/0,1607,7-132-2945_5105-110654--,00.html. MI-HSEES is following up with survey non-respondents and will be issuing a final report in 2008.

The 75 carbon monoxide events resulted in 101 non-fatal injuries and 14 deaths. In response to this finding, MDCH has initiated a carbon monoxide poison prevention educational program (see sidebar on facing page).

MI-HSEES is collaborating with other programs at MDCH to expand tracking of chemical poisoning events, like carbon monoxide, by promulgating rules to mandate health care provider reporting of all chemical poisoning events. These rules went into effect September 18, 2007.

These data show that the MI-HSEES system is useful for characterizing the variety of hazardous substances releases in Michigan and identifying useful 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. When it became

evident that local health departments wanted MI-HSEES information about releases in their communities as promptly as possible, MI-HSEES established a set of procedures for immediately alerting local health departments. This went into effect in early 2006. In 2006 MI-HSEES alerted local public health departments to 13 incidents and provided assistance in 15 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.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
1,1-Dimethyl hydrazine	Any quantity
1,2-Dibromo-3-chloropropane	CERCLA RQ 1 lb
1,2-Dibromoethane	CERCLA RQ 1lb
1,2-Ethanediamine	Any quantity
1,3 Butadiene	Any quantity
1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene	CERCLA RQ 1lb
1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-(1.alpha.,4.alpha.,4a.beta.,5.alpha.,8.alpha.,8a.beta.)-	Any quantity
1,4-Dichloro-2-butene	CERCLA RQ 1lb
2,2'-Bioxirane	Any quantity
2,2-Dimethyl-1,3-benzodioxol-4-ol methylcarbamate	CERCLA RQ 1lb
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	CERCLA RQ 1lb
2,4-Dithiobiuret	Any quantity
2-Acetylaminofluorene	CERCLA RQ 1lb
2-Butenal	Any quantity
2-Butenal, (e)-	Any quantity
2-Butene, 1,4-dichloro-	CERCLA RQ 1lb
2-Chloro-N-(2-chloroethyl)-N-methylethanamine	Any quantity
2-Methyllactonitrile	Any quantity
2-Propen-1-amine	Any quantity
2-Propen-1-ol	Any quantity
2-Propenal	Any quantity
2-Propenenitrile	Any quantity
2-Propenenitrile, 2-methyl-	Any quantity
2-Propenoyl chloride	Any quantity
3,3'-Dichlorobenzidine	CERCLA RQ 1lb
3-Chloropropionitrile	Any quantity
4,6-Dinitro-o-cresol	Any quantity
4,7-Methanoindan, 1,2,3,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-	Any quantity
4-Aminobiphenyl	CERCLA RQ 1lb
4-Aminopyridine	Any quantity
5-(Aminomethyl)-3-isoxazolol	Any quantity
5-Fluorouracil	Any quantity
7,12-Dimethylbenz[a]anthracene	CERCLA RQ 1lb
Acetaldehyde (HSEES)	Any quantity
Acetic acid (HSEES)	Any quantity
Acetic acid ethenyl ester	Any quantity
Acetone (HSEES)	Any quantity
Acetone cyanohydrin	Any quantity
Acetone thiosemicarbazide	Any quantity
Acrolein (HSEES)	Any quantity

Appendix 1.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
Acrylamide	Any quantity
Acrylonitrile (HSEES)	Any quantity
Acrylyl chloride	Any quantity
Adiponitrile	Any quantity
Aldicarb	Any quantity
Aldicarb sulfone	CERCLA RQ 1lb
Aldrin	Any quantity
Allyl alcohol	Any quantity
Allylamine	Any quantity
alpha - Endosulfan	CERCLA RQ 1lb
Aluminum phosphide	Any quantity
Aminopterin	Any quantity
Amiton	Any quantity
Amiton oxalate	Any quantity
Ammonia (anhydrous)	Any quantity
Ammonia (HSEES)	Any quantity
Amphetamine	Any quantity
Aniline	Any quantity
Aniline, 2,4,6-trimethyl-	Any quantity
Antimony pentafluoride	Any quantity
Antimycin A	Any quantity
ANTU	Any quantity
Aroclor 1016	CERCLA RQ 1lb
Aroclor 1221	CERCLA RQ 1lb
Aroclor 1232	CERCLA RQ 1lb
Aroclor 1242	CERCLA RQ 1lb
Aroclor 1248	CERCLA RQ 1lb
Aroclor 1254	CERCLA RQ 1lb
Aroclor 1260	CERCLA RQ 1lb
Arsenic	CERCLA RQ 1lb
Arsenic acid	CERCLA RQ 1lb
Arsenic acid	CERCLA RQ 1lb
Arsenic disulfide	CERCLA RQ 1lb
Arsenic pentoxide	Any quantity
Arsenic trioxide (HSEES)	Any quantity
Arsenic trisulfide	CERCLA RQ 1lb
Arsenous oxide	Any quantity
Arsenous trichloride	Any quantity
Arsine (HSEES)	Any quantity
Asbestos (friable)	CERCLA RQ 1lb
Azaserine	CERCLA RQ 1lb
Azinphos-ethyl	Any quantity
Azinphos-methyl	Any quantity
Aziridine	Any quantity
Aziridine, 2-methyl	Any quantity
Barban	CERCLA RQ 1lb
Bendiocarb	CERCLA RQ 1lb
Bendiocarb phenol	CERCLA RQ 1lb
Benomyl	CERCLA RQ 1lb
Benzal chloride	Any quantity
Benzenamine, 3-(trifluoromethyl)-	Any quantity

Appendix 1.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
Benzene (HSEES)	Any quantity
Benzene, 1-(chloromethyl)-4-nitro-	Any quantity
Benzene, 1,1'-(2,2,2-trichloroethylidene)bis [4-methoxy-	CERCLA RQ 1lb
Benzene, 1,3-diisocyanato-2-methyl-	Any quantity
Benzene, 2,4-diisocyanato-1-methyl-	Any quantity
Benzenearsonic acid	Any quantity
Benzenethiol	Any quantity
Benzidine	CERCLA RQ 1lb
Benzimidazole, 4,5-dichloro-2-(trifluoromethyl)-	Any quantity
Benzo[a]pyrene	CERCLA RQ 1lb
Benzo[b]fluoranthene	CERCLA RQ 1lb
Benzoic trichloride	Any quantity
Benzotrichloride	Any quantity
Benzyl chloride	Any quantity
Benzyl cyanide	Any quantity
Beryllium chloride	CERCLA RQ 1lb
Beryllium fluoride	CERCLA RQ 1lb
Beryllium nitrate	CERCLA RQ 1lb
Beryllium nitrate	CERCLA RQ 1lb
beta - Endosulfan	CERCLA RQ 1lb
beta-BHC	CERCLA RQ 1lb
beta-Propiolactone	Any quantity
Bicyclo[2.2.1]heptane-2-carbonitrile, 5-chloro-6-((((methylamino)carbonyl)oxy)imino)-,(1-alpha,2-beta,4-alpha,5-alpha,6E))-	Any quantity
Bis(2-chloroethyl) ether (HSEES)	Any quantity
Bis(chloromethyl) ether	Any quantity
Bis(chloromethyl) ketone	Any quantity
Bitoscanate	Any quantity
Borane, trichloro-	Any quantity
Borane, trifluoro-	Any quantity
Boron trichloride (HSEES)	Any quantity
Boron trifluoride (HSEES)	Any quantity
Boron trifluoride compound with methyl ether (1:1)	Any quantity
Boron, trifluoro[oxybis[methane]]-, (T-4)-	Any quantity
Bromadiolone	Any quantity
Bromine (HSEES)	Any quantity
Bromomethane	Any quantity
Butadiene (HSEES)	Any quantity
Cacodylic acid	CERCLA RQ 1lb
Cadmium oxide	Any quantity
Cadmium stearate	Any quantity
Calcium arsenate	Any quantity
Calcium arsenite	CERCLA RQ 1lb
Camphechlor	Any quantity
Camphene, octachloro-	Any quantity
Cantharidin	Any quantity

Appendix 1.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
Carbachol chloride	Any quantity
Carbamic acid, methyl-, O-(((2,4-dimethyl-1,3-dithiolan-2-yl)methylene)amino)-	Any quantity
Carbamothioic acid, dipropyl-, S-(phenylmethyl) ester	CERCLA RQ 1lb
Carbendazim	CERCLA RQ 1lb
Carbofuran	Any quantity
Carbofuran phenol	CERCLA RQ 1lb
Carbon disulfide (HSEES)	Any quantity
Carbon monoxide (above 50ppm) (HSEES)	Any quantity
Carbonic dichloride	Any quantity
Carbonochloridic acid, 1-methylethyl ester	Any quantity
Carbonochloridic acid, methylester	Any quantity
Carbonochloridic acid, propylester	Any quantity
Carbophenothion	Any quantity
Carbosulfan	CERCLA RQ 1lb
Chlordane	Any quantity
Chlorfenvinfos	Any quantity
Chlorine (HSEES)	Any quantity
Chlorine dioxide (HSEES)	Any quantity
Chlormephos	Any quantity
Chlormequat chloride	Any quantity
Chloroacetic acid	Any quantity
Chloroethanol	Any quantity
Chloroethyl chloroformate	Any quantity
Chloroform (HSEES)	Any quantity
Chloromethyl ether (HSEES)	Any quantity
Chloromethyl methyl ether	Any quantity
Chlorophacinone	Any quantity
Chloroxuron	Any quantity
Chlorpyrifos	CERCLA RQ 1lb
Chlorthiophos	Any quantity
Chromic chloride	Any quantity
Cobalt carbonyl	Any quantity
Cobalt, ((2,2'-(1,2-ethanediylbis(nitrilomethylidyne))bis(6-fluorophenylato))(2-)-N,N',O,O')-	Any quantity
Coke Oven Emissions	CERCLA RQ 1lb
Colchicine	Any quantity
Coumaphos	Any quantity
Coumatetralyl	Any quantity
Creosote	CERCLA RQ 1lb
Crimidine	Any quantity
Crotonaldehyde (HSEES)	Any quantity
Crotonaldehyde, (E)-	Any quantity
Cupric acetoarsenite	Any quantity
Cyanogen bromide	Any quantity
Cyanogen chloride (HSEES)	Any quantity
Cyanogen iodide	Any quantity

Appendix 1.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
Cyanophos	Any quantity
Cyanuric fluoride	Any quantity
Cyclohexanamine	Any quantity
Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1.alpha.,2.alpha.,3.beta.,4.alpha.,5.alpha.,6.beta.)-	Any quantity
Cycloheximide	Any quantity
Cyclohexylamine	Any quantity
DBCP	CERCLA RQ 1lb
DDD	CERCLA RQ 1lb
DDE	CERCLA RQ 1lb
DDT	CERCLA RQ 1lb
Decaborane(14)	Any quantity
delta-BHC	CERCLA RQ 1lb
Demeton	Any quantity
Demeton-S-methyl	Any quantity
Dialifor	Any quantity
Diazinon	CERCLA RQ 1lb
Dibenz[a,h]anthracene	CERCLA RQ 1lb
Diborane (HSEES)	Any quantity
Diborane(6)	Any quantity
Dichlone	CERCLA RQ 1lb
Dichloroethyl ether	Any quantity
Dichloromethyl ether	Any quantity
Dichloromethylphenylsilane	Any quantity
Dichlorophenylarsine	Any quantity
Dichlorvos	Any quantity
Dicrotophos	Any quantity
Dieldrin	CERCLA RQ 1lb
Diepoxybutane	Any quantity
Diethyl chlorophosphate	Any quantity
Diethylarsine	CERCLA RQ 1lb
Diethylstilbestrol	CERCLA RQ 1lb
Digitoxin	Any quantity
Diglycidyl ether	Any quantity
Digoxin	Any quantity
Diisopropylfluorophosphate	Any quantity
Dimefox	Any quantity
Dimethoate	Any quantity
Dimethyl chlorothiophosphate	Any quantity
Dimethyl phosphorochloridothioate	Any quantity
Dimethyl sulfate	Any quantity
Dimethylamine (HSEES)	Any quantity
Dimethylcarbamyl chloride	CERCLA RQ 1lb
Dimethyldichlorosilane (HSEES)	Any quantity
Dimethylhydrazine	Any quantity
Dimethyl-p-phenylenediamine	Any quantity
Dimetilan	Any quantity
Dinitrobutyl phenol	Any quantity
Dinitrocresol	Any quantity
Dinoseb	Any quantity
Dinoterb	Any quantity

Appendix 1.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
Dioxathion	Any quantity
Diphacinone	Any quantity
Diphosphoramide, octamethyl-	Any quantity
Disulfoton	Any quantity
Dithiazanine iodide	Any quantity
Dithiobiuret	Any quantity
Emetine, dihydrochloride	Any quantity
Endosulfan	Any quantity
Endosulfan sulfate	CERCLA RQ 1lb
Endothion	Any quantity
Endrin	Any quantity
Endrin aldehyde	CERCLA RQ 1lb
Epichlorohydrin (HSEES)	Any quantity
EPN	Any quantity
Ergocalciferol	Any quantity
Ergotamine tartrate	Any quantity
Ethane, 1,1'-thiobis[2-chloro-	Any quantity
Ethaneperoxoic acid	Any quantity
Ethanesulfonyl chloride, 2-chloro-	Any quantity
Ethanimidothioic acid, 2-(dimethylamino)-N-hydroxy-2-oxo-, methyl ester	CERCLA RQ 1lb
Ethanimidothioic acid, N-[[methylamino)carbonyl]	Any quantity
Ethanol, 1,2-dichloro-, acetate	Any quantity
Ethanol, 2,2'-oxybis-, dicarbamate	CERCLA RQ 1lb
Ethene, chloro-	CERCLA RQ 1lb
Ethion	Any quantity
Ethoprop	Any quantity
Ethoprophos	Any quantity
Ethyl cyanide	Any quantity
Ethyl methanesulfonate	CERCLA RQ 1lb
Ethylbis(2-chloroethyl)amine	Any quantity
Ethylene dibromide	CERCLA RQ 1lb
Ethylene dibromide (HSEES)	Any quantity
Ethylene fluorohydrin	Any quantity
Ethylene oxide (HSEES)	Any quantity
Ethylenediamine	Any quantity
Ethyleneimine (HSEES)	Any quantity
Ethylthiocyanate	Any quantity
Fenamiphos	Any quantity
Fensulfothion	Any quantity
Fluenetil	Any quantity
Fluorine (HSEES)	Any quantity
Fluoroacetamide	Any quantity
Fluoroacetic acid	Any quantity
Fluoroacetic acid, sodium salt	Any quantity
Fluoroacetyl chloride	Any quantity
Fluorouracil	Any quantity
Fonofos	Any quantity
Formaldehyde (HSEES)	Any quantity
Formaldehyde (solution)	Any quantity

Appendix 1.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
Formaldehyde cyanohydrin	Any quantity
Formetanate hydrochloride	Any quantity
Formothion	Any quantity
Formparanate	Any quantity
Fosthietan	Any quantity
Fuberidazole	Any quantity
Furan	Any quantity
Gallium trichloride	Any quantity
Guthion	Any quantity
Heptachlor	CERCLA RQ 1lb
Heptachlor epoxide	CERCLA RQ 1lb
Hexachloro-1,3-butadiene	CERCLA RQ 1lb
Hexachlorobutadiene	CERCLA RQ 1lb
Hexachlorocyclohexane (gamma isomer)	Any quantity
Hexachlorocyclopentadiene	Any quantity
Hexamethylenediamine, N,N'-dibutyl-	Any quantity
Hexamethylphosphoramide	CERCLA RQ 1lb
Hydrazine (HSEES)	Any quantity
Hydrazine, 1,1-dimethyl-	Any quantity
Hydrazine, 1,2-dimethyl-	CERCLA RQ 1lb
Hydrazine, methyl-	Any quantity
Hydrochloric acid (HSEES)	Any quantity
Hydrocyanic acid	Any quantity
Hydrofluoric acid	Any quantity
Hydrofluoric acid (conc. 50% or greater)	Any quantity
Hydrogen bromide (HSEES)	Any quantity
Hydrogen chloride (anhydrous)	Any quantity
Hydrogen chloride (gas only)	Any quantity
Hydrogen cyanide (HSEES)	Any quantity
Hydrogen fluoride (anhydrous)	Any quantity
Hydrogen fluoride (HSEES)	Any quantity
Hydrogen peroxide (Conc.> 52%)	Any quantity
Hydrogen selenide (HSEES)	Any quantity
Hydrogen sulfide (HSEES)	Any quantity
Hydroquinone	Any quantity
Iron carbonyl (Fe(CO)5), (TB-5-11)-	Any quantity
Iron, pentacarbonyl-	Any quantity
Isobenzan	Any quantity
Isobutylnitrile (HSEES)	Any quantity
Isobutyronitrile	Any quantity
Isocyanic acid, 3,4-dichlorophenyl ester	Any quantity
Isodrin	Any quantity
Isofluorphate	Any quantity
Isophorone diisocyanate	Any quantity
Isopropyl chloroformate	Any quantity
Isopropylmethylpyrazolyl dimethylcarbamate	Any quantity
Isothiocyanatomethane	Any quantity
Kepone	CERCLA RQ 1lb
Lactonitrile	Any quantity

Appendix 1.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
Lead arsenate	CERCLA RQ 1lb
Lead arsenate	CERCLA RQ 1lb
Lead arsenate	CERCLA RQ 1lb
Leptophos	Any quantity
Lewisite	Any quantity
Lindane	Any quantity
Lithium hydride	Any quantity
Malononitrile	Any quantity
Manganese, bis(dimethylcarbamodithioato-S,S')-	CERCLA RQ 1lb
Manganese, tricarbonyl methylcyclopentadienyl	Any quantity
Mechlorethamine	Any quantity
Melphalan	CERCLA RQ 1lb
Mephosfolan	Any quantity
Mercaptodimethur	Any quantity
Mercuric acetate	Any quantity
Mercuric chloride	Any quantity
Mercuric cyanide	CERCLA RQ 1lb
Mercuric oxide	Any quantity
Mercury (HSEES)	Any quantity
Methacrolein diacetate	Any quantity
Methacrylic anhydride	Any quantity
Methacrylonitrile	Any quantity
Methacryloyl chloride	Any quantity
Methacryloyloxyethyl isocyanate	Any quantity
Methamidophos	Any quantity
Methanamine, N-methyl-N-nitroso-	Any quantity
Methane, chloromethoxy-	Any quantity
Methane, isocyanato-	Any quantity
Methane, oxybis[chloro-	Any quantity
Methane, tetranitro-	Any quantity
Methane, trichloro-	Any quantity
Methanesulfenyl chloride, trichloro-	Any quantity
Methanesulfonyl fluoride	Any quantity
Methanethiol	Any quantity
Methidathion	Any quantity
Methiocarb	Any quantity
Methomyl	Any quantity
Methoxychlor	CERCLA RQ 1lb
Methoxyethylmercuric acetate	Any quantity
Methyl 2-chloroacrylate	Any quantity
Methyl bromide	Any quantity
Methyl chloride (HSEES)	Any quantity
Methyl chlorocarbonate	Any quantity
Methyl chloroformate	Any quantity
Methyl parathion	Any quantity
Methyl phenkapton	Any quantity
Methyl phosphonic dichloride	Any quantity
Methyl thiocyanate	Any quantity
Methyl vinyl ketone	Any quantity
Methylmercuric dicyanamide	Any quantity

Appendix 1.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
Methyl hydrazine (HSEES)	Any quantity
Methyl isocyanate (HSEES)	Any quantity
Methyl isothiocyanate	Any quantity
Methyl mercaptan	Any quantity
Methyltrichlorosilane (HSEES)	Any quantity
Metolcarb	Any quantity
Mevinphos	Any quantity
Mexacarbate	Any quantity
Mitomycin C	Any quantity
Monocrotophos	Any quantity
Muscimol	Any quantity
Mustard gas	Any quantity
Nickel carbonyl (HSEES)	Any quantity
Nicotine	Any quantity
Nicotine sulfate	Any quantity
Nitric acid (conc 80% or greater)	Any quantity
Nitric acid (HSEES)	Any quantity
Nitric oxide	Any quantity
Nitrobenzene	Any quantity
Nitrocyclohexane	Any quantity
Nitrogen dioxide (HSEES)	Any quantity
Nitrogen mustard	Any quantity
Nitrogen oxide (NO)	Any quantity
Nitrosodimethylamine	Any quantity
N-Nitrosodiethanolamine	CERCLA RQ 1lb
N-Nitrosodiethylamine	CERCLA RQ 1lb
N-Nitrosodimethylamine	Any quantity
N-Nitrosomorpholine	CERCLA RQ 1lb
N-Nitroso-N-ethylurea	CERCLA RQ 1lb
N-Nitroso-N-methylurea	CERCLA RQ 1lb
N-Nitroso-N-methylurethane	CERCLA RQ 1lb
N-Nitrosopyrrolidine	CERCLA RQ 1lb
Norbormide	Any quantity
O,O-Diethyl O-pyrazinyl phosphorothioate	Any quantity
o-Cresol	Any quantity
Organorhodium Complex (PMN-82-147)	Any quantity
Ouabain	Any quantity
Oxamyl	Any quantity
Oxetane, 3,3-bis(chloromethyl)-	Any quantity
Oxirane	Any quantity
Oxirane, (chloromethyl)-	Any quantity
Oxirane, methyl-	Any quantity
Oxydisulfoton	Any quantity
Ozone	Any quantity
Paraquat dichloride	Any quantity
Paraquat methosulfate	Any quantity
Parathion	Any quantity
Parathion-methyl	Any quantity
Paris green	Any quantity
PCBs	CERCLA RQ 1lb

Appendix 1.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
Pentaborane	Any quantity
Pentadecylamine	Any quantity
Peracetic acid	Any quantity
Perchloromethyl mercaptan	Any quantity
Perfluoroisobutylene (HSEES)	Any quantity
Phenol (HSEES)	Any quantity
Phenol, 2,2'-thiobis[4-chloro-6-methyl-	Any quantity
Phenol, 3-(1-methylethyl)-, methylcarbamate	Any quantity
Phenoxarsine, 10,10'-oxydi-	Any quantity
Phenyl dichloroarsine	Any quantity
Phenylhydrazine hydrochloride	Any quantity
Phenylmercuric acetate	Any quantity
Phenylmercury acetate	Any quantity
Phenylsilatrane	Any quantity
Phenylthiourea	Any quantity
Phorate	Any quantity
Phosacetim	Any quantity
Phosfolan	Any quantity
Phosgene (HSEES)	Any quantity
Phosphamidon	Any quantity
Phosphine (HSEES)	Any quantity
Phosphonothioic acid, methyl-, O-(4-nitrophenyl) O-phenyl ester	Any quantity
Phosphonothioic acid, methyl-, O-ethyl O-(4-(methylthio)phenyl) ester	Any quantity
Phosphonothioic acid, methyl-, S-(2-(bis(1-methylethyl)amino)ethyl) O-ethyl ester	Any quantity
Phosphoric acid, 2-dichloroethenyl dimethyl ester	Any quantity
Phosphoric acid, dimethyl 4-(methylthio) phenyl ester	Any quantity
Phosphorodithioic acid O-ethyl S,S-dipropyl ester	Any quantity
Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester	Any quantity
Phosphorothioic acid, O,O-dimethyl-5-(2-(methylthio)ethyl)ester	Any quantity
Phosphorous trichloride (HSEES)	Any quantity
Phosphorus	Any quantity
Phosphorus (yellow or white)	Any quantity
Phosphorus oxychloride	Any quantity
Phosphorus pentachloride	Any quantity
Phosphorus trichloride	Any quantity
Phosphoryl chloride	Any quantity
Physostigmine	Any quantity
Physostigmine, salicylate (1:1)	Any quantity
Picrotoxin	Any quantity
Piperidine	Any quantity
Pirimifos-ethyl	Any quantity
Plumbane, tetramethyl-	Any quantity

Appendix 1.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
Polychlorinated biphenyls	CERCLA RQ 1lb
Potassium arsenate	CERCLA RQ 1lb
Potassium arsenite	Any quantity
Potassium cyanide (HSEES)	Any quantity
Potassium silver cyanide	Any quantity
Promecarb	Any quantity
Propanenitrile	Any quantity
Propanenitrile, 2-methyl-	Any quantity
Propargyl bromide	Any quantity
Propham	CERCLA RQ 1lb
Propionitrile	Any quantity
Propionitrile, 3-chloro-	Any quantity
Propiophenone, 4'-amino	Any quantity
Propyl chloroformate	Any quantity
Propylene oxide (HSEES)	Any quantity
Propyleneimine	Any quantity
Prothoate	Any quantity
Pyrene	Any quantity
Pyrethrins	CERCLA RQ 1lb
Pyrethrins	CERCLA RQ 1lb
Pyrethrins	CERCLA RQ 1lb
Pyridine, 2-methyl-5-vinyl-	Any quantity
Pyridine, 3-(1-methyl-2-pyrrolidinyl)-,(S)-	Any quantity
Pyridine, 4-amino-	Any quantity
Pyridine, 4-nitro-, 1-oxide	Any quantity
Pyriminil	Any quantity
Salcomine	Any quantity
Sarin (HSEES)	Any quantity
Selenious acid	Any quantity
Selenium oxychloride	Any quantity
Semicarbazide hydrochloride	Any quantity
Silane, (4-aminobutyl)diethoxymethyl-	Any quantity
Silane, chlorotrimethyl-	Any quantity
Silane, dichlorodimethyl-	Any quantity
Silane, trichloromethyl-	Any quantity
Silver cyanide	CERCLA RQ 1lb
Silver nitrate	CERCLA RQ 1lb
Sodium arsenate	Any quantity
Sodium arsenite	Any quantity
Sodium azide (Na(N3))	Any quantity
Sodium cacodylate	Any quantity
Sodium cyanide (Na(CN)) (HSEES)	Any quantity
Sodium fluoroacetate	Any quantity
Sodium hydroxide (HSEES)	Any quantity
Sodium selenate	Any quantity
Sodium selenite	Any quantity
Sodium tellurite	Any quantity
Stannane, acetoxytriphenyl-	Any quantity
Stibine (HSEES)	Any quantity
Streptozotocin	CERCLA RQ 1lb

Appendix 1.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
Strychnine	Any quantity
Strychnine, sulfate	Any quantity
Styrene (HSEES)	Any quantity
Sulfotep	Any quantity
Sulfoxide, 3-chloropropyl octyl	Any quantity
Sulfur dioxide	Any quantity
Sulfur dioxide (anhydrous)	Any quantity
Sulfur fluoride (SF4), (T-4)-	Any quantity
Sulfur tetrafluoride	Any quantity
Sulfur trioxide (HSEES)	Any quantity
Sulfuric acid (aerosol forms only)	Any quantity
Sulfuric acid (HSEES)	Any quantity
Tabun	Any quantity
Tellurium hexafluoride	Any quantity
TEPP	Any quantity
Terbufos	Any quantity
Tetraethyl lead	Any quantity
Tetraethyl pyrophosphate	Any quantity
Tetraethyldithiopyrophosphate	Any quantity
Tetraethyltin	Any quantity
Tetrafluoroethylene (HSEES)	Any quantity
Tetramethyllead	Any quantity
Tetranitromethane	Any quantity
Thallium chloride TlCl	Any quantity
Thallium sulfate	Any quantity
Thallium(I) carbonate	Any quantity
Thallium(I) sulfate	Any quantity
Thallous carbonate	Any quantity
Thallous chloride	Any quantity
Thallous malonate	Any quantity
Thallous sulfate	Any quantity
Thiocarbazide	Any quantity
Thiocyanic acid, methyl ester	Any quantity
Thiodicarb	CERCLA RQ 1lb
Thiofanox	Any quantity
Thiomethanol	Any quantity
Thionazin	Any quantity
Thionyl chloride (HSEES)	Any quantity
Thiophanate-methyl	CERCLA RQ 1lb
Thiophenol	Any quantity
Thiosemicarbazide	Any quantity
Thiourea, (2-chlorophenyl)-	Any quantity
Thiourea, (2-methylphenyl)-	Any quantity
Thiourea, 1-naphthalenyl-	Any quantity
Titanium chloride (TiCl4) (T-4)-	Any quantity
Titanium tetrachloride (HSEES)	Any quantity
Toluene-2,4-diisocyanate (HSEES)	Any quantity
Toluene-2,6-diisocyanate (HSEES)	Any quantity
Toxaphene	Any quantity
trans-1,4-Dichloro-2-butene	Any quantity
trans-1,4-Dichlorobutene	Any quantity
Triallate	CERCLA RQ 1lb

Appendix 1.- Hazardous Substances Emergency Events Surveillance Mandatory Chemical Reporting List

Name	Threshold
Triamiphos	Any quantity
Triazofos	Any quantity
Trichloro(chloromethyl)silane	Any quantity
Trichloro(dichlorophenyl)silane	Any quantity
Trichloroacetyl chloride	Any quantity
Trichloroethylsilane	Any quantity
Trichloromethanesulfenyl chloride	Any quantity
Trichloronate	Any quantity
Trichlorophenylsilane	Any quantity
Trichlorosilane (HSEES)	Any quantity
Triethoxysilane	Any quantity
Trimethylamine (HSEES)	Any quantity
Trimethylchlorosilane (HSEES)	Any quantity
Trimethylolpropane phosphite	Any quantity
Trimethyltin chloride	Any quantity
Triphenyltin chloride	Any quantity
Tris(2-chloroethyl)amine	Any quantity
Uranium hexafluoride (HSEES)	Any quantity
Valinomycin	Any quantity
Vanadium pentoxide	Any quantity
Vinyl acetate (HSEES)	Any quantity
Vinyl acetate monomer	Any quantity
Vinyl chloride	CERCLA RQ 1lb
Vinyl chloride (HSEES)	Any quantity
Warfarin	Any quantity
Warfarin sodium	Any quantity
Xylylene dichloride	Any quantity
Zinc phosphide	Any quantity
Zinc phosphide (conc. <= 10%)	Any quantity
Zinc phosphide (conc. > 10%)	Any quantity
Zinc, dichloro(4,4-dimethyl-5((((methylamino)carbonyl)oxy)imino)pentanenitrile)-, (T-4)-	Any quantity
Ziram	CERCLA RQ 1lb

Appendix 2.- Events by county- Michigan Hazardous Substances Emergency Events Surveillance, 2006						
County	Event Type				Total	
	Fixed Facility		Transportation		All Events	
	No.	%	No.	%	No.	%
Alger	1	0.3	0	0.0	1	0.3
Allegan	6	1.8	0	0.0	6	1.8
Barry	1	0.3	0	0.0	1	0.3
Berrien	2	0.6	1	0.3	3	0.9
Branch	4	1.2	2	0.6	6	1.8
Calhoun	1	0.3	2	0.6	3	0.9
Cass	1	0.3	1	0.3	2	0.6
Charlevoix	0	0.0	1	0.3	1	0.3
Clinton	4	1.2	2	0.6	6	1.8
Delta	1	0.3	0	0.0	1	0.3
Dickinson	1	0.3	1	0.3	2	0.6
Eaton	1	0.3	1	0.3	2	0.6
Emmet	1	0.3	0	0.0	1	0.3
Genesee	4	1.2	4	1.2	8	2.4
Gladwin	1	0.3	0	0.0	1	0.3
Gratiot	2	0.6	0	0.0	2	0.6
Hillsdale	1	0.3	0	0.0	1	0.3
Houghton	1	0.3	0	0.0	1	0.3
Ingham	6	1.8	2	0.6	8	2.4

Appendix 2.- Events by county- Michigan Hazardous Substances Emergency Events Surveillance, 2006						
County	Event Type				Total	
	Fixed Facility		Transportation		All Events	
	No.	%	No.	%	No.	%
Ionia	3	0.9	0	0.0	3	0.9
Iosco	1	0.3	0	0.0	1	0.3
Iron	1	0.3	0	0.0	1	0.3
Isabella	2	0.6	0	0.0	2	0.6
Jackson	7	2.1	2	0.6	9	2.7
Kalamazoo	16	4.7	9	2.7	25	7.4
Kent	13	3.9	18	5.3	31	9.2
Lake	1	0.3	0	0.0	1	0.3
Lapeer	2	0.6	1	0.3	3	0.9
Lenawee	2	0.6	0	0.0	2	0.6
Livingston	3	0.9	1	0.3	4	1.2
Macomb	4	1.2	3	0.9	7	2.1
Mason	1	0.3	0	0.0	1	0.3
Mecosta	1	0.3	0	0.0	1	0.3
Menominee	2	0.6	0	0.0	2	0.6
Midland	45	13.3	3	0.9	48	14.2
Monroe	3	0.9	0	0.0	3	0.9
Montcalm	3	0.9	0	0.0	3	0.9
Muskegon	3	0.9	1	0.3	4	1.2

Appendix 2.- Events by county- Michigan Hazardous Substances Emergency Events Surveillance, 2006						
County	Event Type				Total	
	Fixed Facility		Transportation		All Events	
	No.	%	No.	%	No.	%
Newaygo	1	0.3	0	0.0	1	0.3
Oakland	15	4.4	4	1.2	19	5.6
Oceana	1	0.3	0	0.0	1	0.3
Ogemaw	1	0.3	0	0.0	1	0.3
Ontonagon	1	0.3	0	0.0	1	0.3
Osceola	2	0.6	1	0.3	3	0.9
Ottawa	6	1.8	1	0.3	7	2.1
Roscommon	0	0.0	1	0.3	1	0.3
Saginaw	3	0.9	2	0.6	5	1.5
Sanilac	1	0.3	0	0.0	1	0.3
Shiawassee	2	0.6	1	0.3	3	0.9
St. Clair	2	0.6	4	1.2	6	1.8
St. Joseph	7	2.1	0	0.0	7	2.1
Tuscola	1	0.3	0	0.0	1	0.3
Van Buren	7	2.1	1	0.3	8	2.4
Washtenaw	7	2.1	2	0.6	9	2.7
Wayne	28	8.3	27	8.0	55	16.3
Wexford	2	0.6	0	0.0	2	0.6
Total	239	70.7	99	29.3	338	100.0

Appendix 3.- Complete list of substances released and frequencies- Michigan Hazardous Substances Emergency Events Surveillance, 2006

Name	Frequency	Percent
1.3- Butadiene	7	1.5
1,1,1-Trichloroethane	1	0.2
2-n-Octyl-4-isothiazolin-3-one	1	0.2
ALUMIN-R	1	0.2
Acetic Acid	1	0.2
Acetone	8	1.7
Acid NOS	5	1.1
Acrylonitrile	3	0.6
Alcohol NOS	4	0.8
Aluminum Sulfate	1	0.2
Amine NOS	1	0.2
Ammonia	28	5.9
Ammonium Nitrate	2	0.4
Ammonium Sulfate	1	0.2
Argon	1	0.2
Benzene	1	0.2
Betadine	1	0.2
Butane	1	0.2
Butylated hydroxytoluene	1	0.2
Caustic NOS	1	0.2
Cadmium	1	0.2
Calcium Chloride	3	0.6
Carbon Monoxide	75	15.7
Caustic Soda	1	0.2
Chlorine	12	2.5
Chlorine Dioxide	1	0.2
Chloroacetyl Chloride	1	0.2
Chloroform	1	0.2
Chloromethyl Methyl Ether	3	0.6
Chlorosilane	1	0.2
Coleman Fuel	8	1.7
Combustible Liquid NOS	1	0.2
Copper Sulfate	2	0.4
Cyanide NOS	1	0.2
Cyclohexylamine	1	0.2
Dibutyl Dilaurate	1	0.2
DOT 2810: Toxic Liquid, Organic, N.O.S.	1	0.2
Decahydronaphthalene	1	0.2
Decalin	1	0.2
Diborane	1	0.2
Diethylene Glycol	1	0.2
Diethyltoluamide	1	0.2
Dimethyl Ether	1	0.2

Name	Frequency	Percent
Diphenylmethane	2	0.4
EPA D001: Ignitable Waste	1	0.2
Ester NOS	1	0.2
Ethyl Ether	5	1.1
Ethylbenzene	1	0.2
Ethylene Glycol	4	0.8
Ethylene Oxide	3	0.6
Explosives NOS	2	0.4
Ferric Chloride	1	0.2
Fertilizer NOS	1	0.2
Formaldehyde	1	0.2
Fuel NOS	2	0.4
Furfural	1	0.2
Glyphosate Isopropylammonium salt	1	0.2
Hexane	1	0.2
Hydrochloric Acid	21	4.4
Hydrogen Peroxide	5	1.1
Hydrogen Sulfide	1	0.2
Indeterminate Substance	2	0.4
Imidan	1	0.2
Inorganic Acid NOS	1	0.2
Iodine	8	1.7
Isopropanol NOS	5	1.1
Isopropyl Alcohol	1	0.2
Lead	1	0.2
Lighter Fluid NOS	2	0.4
Lithium	2	0.4
MIXTURE	21	4.4
Mercury	21	4.4
Methamphetamine	1	0.2
Methamphetamine Chemicals NOS	8	1.7
Methanol NOS	7	1.5
Methyl Chloride	5	1.1
Methyl Mercaptan	1	0.2
Methylene Chloride	3	0.6
Nitric Acid	3	0.6
Nitric dioxide mixed with nitric oxide	1	0.2
Oxidizer NOS	1	0.2
Paint NOS	27	5.6
Paint Thinner NOS	2	0.4
Paint Waste NOS	2	0.4
Paraformaldehyde	1	0.2

Appendix 3.- Complete list of substances released and frequencies- Michigan Hazardous Substances Emergency Events Surveillance, 2006

Name	Frequency	Percent
Parco Cleaner 319	1	0.2
Phosgene	1	0.2
Phosphoric Acid	1	0.2
Phosphorus	5	1.1
Polyamine NOS	1	0.2
Polychlorinated Biphenyls	1	0.2
Polyphosphoric Acid	1	0.2
Potash	2	0.4
Potassium Hydroxide	4	0.8
Potassium Permanganate	1	0.2
Propylene Oxide	2	0.4
Resin NOS	2	0.4
Rub-R-Wall + Waterproofing	1	0.2
Silicon Dioxide NOS	1	0.2
Soda Ash	1	0.2
Sodium Chloride	1	0.2
Sodium Chromate (VI)	1	0.2
Sodium Hydroxide	27	5.7
Sodium Hypochlorite	5	1.1
Solvent NOS	11	2.3
Styrene	4	0.8
Sulfur Dioxide	2	0.4
Sulfuric Acid	18	3.8
Sulfuryl Chloride	1	0.2
Tetrachloroethylene	2	0.4
Toluene	1	0.2
Toxic Solid Inorganic N.O.S.	1	0.2
Toxic liquids, organic, n.o.s.	1	0.2
Triethylamine	2	0.4
Trimethylamine	1	0.2
Vinyl Chloride	1	0.2
Vinylidene Chloride	1	0.2
Xylene	2	0.4

Appendix 4.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2006

MI20060009- Equipment failure was to blame for the release of carbon monoxide in a home causing all five people there to experience headache and nausea. All 5 were treated with oxygen and released from the hospital. The fire department and EMS responded to this incident.

MI20060015- There was an attempted theft of anhydrous ammonia at a steel treating company. The thieves left the tank open and it leaked into a residential area. A local trailer park was evacuated for 6 hours. Five first responders (2 police and 3 firemen) experienced chemical burns and were taken to the hospital. Five residents also experienced respiratory difficulties and went to the hospital. Environmental samples were taken to ensure safe levels before residents were allowed to return.

MI20060023- A valve on a fitting at a spring manufacturing plant broke causing a leak of 288 pounds of anhydrous ammonia. This resulted in an evacuation of 150 people from the area. The ammonia was removed from the venting vessel and the broken valve was fixed.

MI20060034- A release of diborane from a non-tanker truck caused the evacuation of two nearby buildings as a precaution. One person without symptoms was transported to the hospital for observation.

MI20060051- A high school custodian improperly mixed pool chemicals causing toxic fumes. He experienced eye and skin irritation and was transported by the fire department to the hospital where he was treated and released. Twenty students in a nearby part of the school were evacuated until the clean-up was complete.

MI20060060- At a seizure of a methamphetamine lab, anhydrous ammonia, solvents and other chemicals used in methamphetamine production were found. Eight adults and four children were evacuated while the clean-up was completed.

MI20060080- A student brought a mercury thermometer to school. It broke in the student’s purse, and she did not realize it until she had carried it all over the school. The school was evacuated for 24 hours while clean up occurred.

MI20060085- An employee at an auto manufacturing plant improperly mixed some acids and alcohols. Two employees were injured and admitted to the hospital, and three others were taken to the emergency department for observation. The plant was evacuated for two hours while the clean up and investigation took place.

MI20060090- A methamphetamine lab fire involving anhydrous ammonia, solvents and acids in an apartment building caused the evacuation of 18 people.

Appendix 4.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2006

MI20060093- A student dropped a mercury-containing instrument in a physics lab in a high school. All 20 students were evacuated from the lab for the remainder of the day. Clean-up was completed after school and sampling was done the following morning to ensure no mercury remained.

MI20060094- Hydrogen sulfide was released from an underground gas well due to equipment failure. Three employees were exposed. All three were taken to the hospital for treatment.

MI20060097- A person spilled one cup of mercury in a science lab at a university. All five people in the lab were evacuated while the clean-up took place.

MI20060121- A mixture containing formaldehyde and methane was being transported via truck. When the package arrived at the facility, employees noticed that it was damaged in transport. When the bad odor was detected, the area was evacuated while a clean-up contractor responded.

MI20060127- An active methamphetamine lab was seized containing solvents, ammonia, ether and other methamphetamine chemicals. Two adults and two children were evacuated. The two children were taken to an area hospital for treatment for chemical exposure.

MI20060130- An employee at a pizza restaurant mixed three cleaners together in a drain. This created a toxic gas. All 29 consumers and six employees were evacuated for eight hours so the store could be ventilated. Three employees and three consumers were taken by EMS to the hospital for treatment and released. Two consumers were treated on scene and two later went to the hospital for observation.

MI20060131- A chemical explosion occurred after a student improperly mixed solvents in a chemistry lab at a university. Hazmat and the fire department contained the spill and applied absorbents. A contractor was hired to ensure proper clean-up. The building (about 50 people) was evacuated for 12 hours while clean-up was completed.

MI20060134- A methamphetamine lab was seized containing hydrochloric acid, alcohol, hydrogen peroxide and other methamphetamine chemicals. Four adults in the home were evacuated overnight while cleanup was completed.

MI20060137- A roofing company was sealing a rooftop of a commercial strip mall. One of the stores did not shut its air intake, and fumes got into the building causing eightt employees and one employee of another store to experience nausea, vomiting, headache and shortness of breath. A public health investigation and environmental sampling were done to make sure the problem was solved.

MI20060139- The pressure relief valve at a food manufacturing plant opened and released 1308 pounds anhydrous ammonia. The 40 employees in the affected part of the plant were evacuated while clean-up took place.

MI20060142- Release of nitric oxide and nitrogen dioxide occurred during the yellow pigment manufacturing process at a chemical manufacturing plant. A shelter-in-place was established for 1/2 mile around plant for two hours. The plant was evacuated during this time while it was ventilated. Wind helped disperse gas from the area so clean-up time was minimal.

MI20060143- A man put a pipe bomb on a 1000 gallon propane tank. The bomb squad responded, determined it was a 'live bomb' and evacuated a radius of 1000 ft around the area while a robot detonated the device.

MI20060144- Tank overflow caused material to be released from a vent pipe on a molding machine at a manufacturing facility. The material was released into sand. Thirty employees working at the time were evacuated for one hour.

MI20060150- The pressure relief valve on a high vapor line at a beverage manufacturing facility opened up and released 200 pounds of ammonia. The 150 employees at the plant were evacuated for 30 minutes while the vapors dissipated.

MI20060154- A worker spraying waterproofing chemicals in a hole at a construction site basement fell ill. EMS arrived, and two paramedics went into the hole where he was working and rescued him. The worker and the 2 paramedics then went to the hospital where they were treated for respiratory symptoms and skin irritation. The worker was admitted overnight. Thirteen responding firefighters were also decontaminated at the hospital as a precaution. The firefighters drove themselves to the hospital and did not experience any symptoms.

MI20060176- A tank at a metal heat-treating company had a leak of anhydrous ammonia from a storage tank. Three employees were evacuated from the area for an hour and a half while the leak was fixed and the area was ventilated.

MI20060184- Someone entered a retail store and intentionally mixed pool chemicals together resulting in a release of chlorine gas. All 22 employees and two customers were evacuated for 36 hours while the store was ventilated. Eight employees experienced eye irritation and shortness of breath. All were taken to the hospital; one was admitted.

MI20060188- An active methamphetamine lab containing acids, ammonium nitrate and sodium hydroxide was seized. Four adults and two children were evacuated from the house while clean-up occurred.

Appendix 4.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2006

MI20060193- Police seized a recently active methamphetamine production lab containing acetone, anhydrous ammonia, ether and sodium hydroxide. The “cook”, the only person at the house, was injured from the chemicals.

MI20060210- Four people were evacuated for 12 hours when police seized a methamphetamine lab that had just finished cooking. Child Protective Services were called about the three children involved.

MI20060212- An employee in a science lab dropped a tray of chemicals containing hydrochloric acid and sulfuric acid while cleaning up the lab. The employee was decontaminated on scene and taken to hospital for treatment for a possible splash on the foot. The building was evacuated for two hours while the spill was cleaned up.

MI20060213- Ethylene oxide was spilled in an operating room at a hospital. The alarm went off causing all 15 employees to be evacuated from the area. Fifteen employees went to the emergency department; six were treated and released for nausea and nine were asymptomatic and were there for observation. The area where the spill occurred was evacuated for 18 hours while it was ventilated and cleaned.

MI20060234- Chemical explosions from a chemical waste center caused a large fire that led to the evacuation of about 50 people in the local neighborhoods near the facility. The residents were allowed back to their homes after three hours. Three employees experienced first and second degree burns and were taken to the hospital for treatment; two were discharged the same day and one was admitted.

MI20060246- Forty farm workers were picking blueberries in a field when a neighboring berry grower began spraying a pesticide on a field that was just west and across the street. The product drifted and caused the workers to leave the field. Eight workers went to the hospital emergency department including one who was admitted after experiencing nausea, muscle weakness, respiratory irritation and shortness of breath. Five others were identified as having these symptoms but did not receive medical treatment.

MI20060247- Police seized an active methamphetamine lab. Four adults and three children were evacuated from the house while clean-up occurred. The children were placed with Child Protective Services because of the condition of the house.

MI20060248- An apparel manufacturing plant caught fire. Sulfuric acid and tetrachloroethelene were on site and were potentially released. Thirty people in local hotels were evacuated for 12 hours while the fire was contained and clean-up occurred. Local residents were asked to shelter-in-place during this time.

Appendix 4.- Events resulting in an evacuation, injury or decontamination-Michigan Hazardous Substances Emergency Events Surveillance, 2006

MI20060257- Five people experienced minor breathing problems after an ammonia leak at a vegetable processing plant. Four of people were taken to the hospital and 1 refused treatment. The release was caused by a faulty valve. The fumes leaked into the building. The building was evacuated while it was ventilated. Samples were taken to ensure that the air was safe before employees were allowed back to work.

MI20060262- Three students found some mercury in a drawer in a wood shop storage room at a high school, and it spilled on the floor of the room. The students and teacher were evacuated and the area was secured. MDCH, EPA, the local health department and a clean-up contractor responded and cleaned the area. The area was restricted until the vapor levels dissipated.

MI20060267- Homeowners purchased the contents of a storage unit at an auction. When they arrived home with the contents they discovered there were about eight pounds of C-10 commercial grade explosives with 23 blasting caps. The area was immediately secured and nine people were evacuated until the bomb squad arrived and safely removed the explosives. The area near the storage unit facility was also restricted while the bomb squad ensured the area was explosive-free.

MI20060272- Police seized an active methamphetamine lab containing iodine, solvents, muriatic acid and betadine. The “cook” was taken into custody. The “cook’s” 14-year-old daughter arrived home from school and was evacuated and taken to Child Protective Services.

MI20060276- Three men using two generators in a furniture resale shop died from carbon monoxide poisoning. They did not ventilate the store during the generator use.

MI20060283- Loose caps on 55-gallon drums caused a release of Diethylenetriamine (DETA) at a Department of Corrections facility. One employee was injured and 16 prisoners on scene were checked by medical personnel as a precaution.

MI20060284- A spill of mercury at a high school caused the school to be evacuated for the afternoon while clean-up contractors ensured the spill had been cleaned properly. The teacher who attempted to clean up the spill was taken to a local hospital as a precaution, he was not injured.

MI20060290- A spill of 100 gallons of nitric acid in a plating plant caused a shelter-in-place and an evacuation of about 50 homes and 200 residents. The spill was due to equipment malfunction. People were allowed back to their homes six hours after the spill.

Appendix 4.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2006

MI20060297- A shelf at a daycare facility containing bleach, hand soap and other cleaning materials fell over causing the bleach and soap to spill. This created a strong odor in the facility. The fire department responded and evacuated two employees for two hours while the facility was ventilated. The spill happened early in the morning before any children had arrived.

MI20060300- A release of carbon monoxide from a propane generator used in a small hunting trailer caused the death of one man. He died while asleep.

MI20060301- Police seized an active methamphetamine lab containing Coleman® Fuel, ammonium nitrate, sodium hydroxide and other chemicals used in making methamphetamine. Four children and their mother were evacuated at the time. The children were later placed with Child Protective Services and their mother was arrested.

MI20060307- Three adults and six children were taken from their home to the hospital for carbon monoxide poisoning. The fire department and EMS responded and found the carbon monoxide readings to be near 1000 ppm.

MI20060308- A construction worker died after using a portable gas generator to heat the duplex he was building. He was found dead the next morning from carbon monoxide poisoning.

MI20060329- A basement of a hospital was evacuated after a release of ethylene oxide. Two employees went to the emergency department as a precaution.

MI20060334- A truck driver was delivering sodium hypochlorite to a holding tank. The valve was stripped and caused the chemical to spray out all over his legs. He suffered first and second degree burns and missed work for one month.

MI20060335- Silicon dioxide dust was spread for flying ants and then the area was vacuumed, causing an aerosol release of silicon dioxide into the indoor air at an automobile manufacturing facility. Five employees were given oxygen and taken by ambulance to the hospital for treatment.

MI20060351- Police seized an active methamphetamine lab containing acetone, solvents and other chemicals used in making methamphetamine. Five adults were evacuated at the time.

MI20060352- A 70-year-old man, working in a church as a self employed construction worker, was using a propane/kerosene generator without any ventilation. He was found dead from carbon monoxide poisoning.

MI20060353- An employee at a farm was working with a forklift in an enclosed area with poor ventilation for eight hours. EMS responded and took him to the emergency department for treatment for carbon monoxide poisoning.

MI20060354- A couple used a generator in their basement. There was no ventilation and carbon monoxide built up in the home. The man was found dead and the woman was found semi-conscious. EMS responded and took her to the hospital for treatment.

MI20060355- A man was riding a four-wheeler and got stuck in a swamp. The four-wheeler and a car were running and idling while he tried to get them loose. The area was filled with smoke. EMS responded and took the rider to the emergency department for treatment for carbon monoxide poisoning.

MI20060356- A man used a gas-powered concrete cutter in an enclosed area in his home. EMS took him to the emergency department for treatment for carbon monoxide poisoning.

MI20060357- Use of a forklift in an enclosed area at a trucking company caused buildup and release of carbon monoxide sending one employee to the emergency department for treatment.

MI20060358- A woman using a propane space heater in her home experienced headache and nausea. She called EMS, and was taken to the emergency department and treated for carbon monoxide poisoning.

MI20060359- A man was working behind a wrecker truck for several hours with it running while trying to get the front end of a car lifted up. There was little or no ventilation in the area. He experienced headache and burning chest. EMS responded and took him to the emergency department where he was treated for carbon monoxide poisoning.

MI20060360- A twenty-year-old man was working as a carpet installer in a home. He had a generator running in an enclosed area with no ventilation. He experienced headache and nausea. EMS responded and took him to the emergency department for treatment for carbon monoxide poisoning.

MI20060361- Two employees at an automobile manufacturing facility worked nine hours in an enclosed area with machines. The next day they were sent to the emergency department because they were experiencing symptoms. The plant was sampled, and it had elevated levels of carbon monoxide in the work area.

MI20060362- A female employee at a hospital was exposed to carbon monoxide due to unknown causes. She was taken to the emergency department and treated for carbon monoxide poisoning and released.

MI20060363- A man was competing seasonal maintenance on his lawnmower and had the engine running in an enclosed area. He felt ill and had his wife call

EMS. He was taken to the emergency department and treated for carbon monoxide poisoning.

MI20060364- A woman was at home using her fireplace. It had poor ventilation. The fire department responded and told her there was carbon monoxide in her home and that she should go to the emergency department since she was dizzy and had a headache.

MI20060365- A woman woke up experiencing dizziness and nausea but went to work despite feeling ill. She came home to find that her husband had died. The pilot light on the gas fireplace had gone out but the gas was still on, thus causing a release of carbon monoxide.

MI20060366- Poor fireplace ventilation caused carbon monoxide to build up in a home. The fire department and EMS responded. Two people were taken to the emergency department for treatment for carbon monoxide poisoning.

MI20060367- An employee at a machine tool shop was at work in a pole-barn using a forklift. There was no ventilation in the area. He was found unconscious from the buildup of carbon monoxide. EMS responded and took him to the emergency department for treatment.

MI20060368- A man was at work at a sheet metal fabrication shop using a power washer. The carbon monoxide alarm went off and the company response team responded. He was sent to the emergency department for treatment for carbon monoxide poisoning because he was experiencing headache and nausea.

MI20060369- A man was at home in his garage with the door nearly closed. He was using a kerosene heater and a generator. He was found disoriented and dizzy. EMS responded, and he was admitted to the hospital with carbon monoxide poisoning.

MI20060370- A woman was using a wood burning stove to heat her house because the electricity had been turned off. EMS came to the house and took her to the hospital, where she was admitted for treatment for carbon monoxide poisoning.

MI20060371- A woman was using a power washer in the basement of her home. She began experiencing dizziness, headache and nausea. She called EMS, who took her to the emergency department for treatment for carbon monoxide poisoning.

MI2000373- A man was working in an enclosed garage with a propane heater. He passed out from carbon monoxide poisoning. His daughter found him and called EMS, who responded and took him to the emergency department for treatment.

MI20060374- Two men working at a construction site in an enclosed area with gas-powered equipment experienced nausea, shortness of breath and headache. They were sent to the emergency department for treatment for carbon monoxide poisoning.

MI20060375- A man was working in a garage with a generator running. EMS responded to the home, and he was taken to the emergency department for treatment for carbon monoxide poisoning.

MI20060376- A woman, living alone, had a power outage and used 3 kerosene heaters in the living room. EMS was called and she was admitted to the hospital and treated for carbon monoxide poisoning.

MI20060377- An elderly man was using a generator in his basement and it caused the carbon monoxide alarm to go off. He called the fire department to the scene. EMS also arrived and took him to the emergency department for treatment for carbon monoxide poisoning.

MI20060378-There was a power outage in the area. The generator that was powering the house was located in the garage. A teen was working on his car in the garage at the same time. He experienced nausea and headache, and his mother passed out. The father called EMS. Even though the father did not experience any symptoms, he along with his wife and son went to the emergency department for treatment for carbon monoxide poisoning.

MI20060379- There was a power outage. Two people used a propane heater and generator in their home. The wife passed out and the husband had a headache. The fire department responded first and checked the house, and found there to be high levels of carbon monoxide. EMS took them to emergency department for treatment.

MI20060380- There was a power outage in the area. A man was using a propane torch in his home to keep the pipes from freezing. He experienced severe headache and nausea and then passed out. EMS was called and he was taken to the emergency department for treatment for carbon monoxide poisoning.

MI20060381- Use of a wood-burning stove in a house caused a carbon monoxide release. One person in the home experienced headache and dizziness. The fire department was called and confirmed the release. The fire department referred the person to the emergency department for treatment.

MI20060382- Two employees at a tool and die shop were exposed to carbon monoxide for eight hours. The onset of symptoms (headache and nausea) caused them to stop working. The company suggested that they go to the emergency department for treatment.

MI20060383- An air compressor in an enclosed area at a sunroof manufacturing company caused a buildup of carbon monoxide. One employee experienced headache and nausea. The fire department evacuated other employees and sent them home; those employees did not seek treatment.

MI20060384- Car exhaust from a bus garage at a State Police facility triggered the carbon monoxide alarm and one employee was sent to emergency department.

MI20060385- A man was using a propane welder in an unventilated room while working at an educational technology services center. This caused a release of carbon monoxide. The carbon monoxide alarm sounded and the company sent two to the emergency department; one was experiencing headache and nausea and the other went as a precaution.

MI20060386- Use of a generator in a home caused a release of carbon monoxide. The woman woke up in the morning feeling ill and called EMS. She was taken to the emergency department. Her husband was asymptomatic and was transported as a precaution.

MI20060387- A man was operating a gas powered concrete saw in his basement. This caused a release of carbon monoxide. He felt ill, so he exited the basement and felt better, but then went back to finish the job. He experienced chest pain and headache. EMS took him to the emergency department.

MI20060388- A man was using a gas generator to pump out his flooded basement. This caused a release of carbon monoxide. The fire department came to check the carbon monoxide levels and suggested he go to emergency department because he was experiencing headache and nausea.

MI20060389- A man and his caretaker in a nursing home were in a room using a propane space heater. There was poor ventilation, and carbon monoxide was released. They were found unconscious and unresponsive. EMS took them to the hospital.

MI20060390- A man was working in his garage with gas-powered equipment with the door closed. He was found unconscious. EMS took him to the emergency department for treatment for carbon monoxide poisoning.

MI20060391- An employee at a concrete company was working with a gas heater in an enclosed space. The carbon monoxide alarm went off and the company sent him to the emergency department for treatment.

MI20060392- An employee was working in the basement of a construction home and had to use a generator to pump the water out so they could pour the

concrete. There was poor ventilation, causing a release of carbon monoxide. He passed out. EMS came and took him to the emergency department.

MI20060393- A man was using a propane heater in his home. The carbon monoxide alarm went off, and the fire department came and inspected the situation. EMS responded and took him to the emergency department.

MI20060394- A man used a kerosene heater in his home without proper ventilation. This caused a release of carbon monoxide. He called EMS and was taken to the emergency department.

MI20060395- A family of three was using a wood burning stove in their home. The fire department responded to the home and told them that they had high levels of carbon monoxide in their home. They self-evacuated and went to the emergency department. One person was treated for carbon monoxide poisoning. The other two were asymptomatic.

MI20060396- A man was working on a running truck in an enclosed garage for about three hours. He experienced dizziness and confusion. EMS responded and took him to the emergency department for treatment for carbon monoxide poisoning.

MI20060397- A man was in a garage for two hours with a kerosene heater. This caused a release of carbon monoxide. He left the garage and passed out. EMS responded and took him to the emergency department.

MI20060398- Employees were performing maintenance in a tunnel at a water company. High levels of carbon monoxide were detected. Seven people experienced symptoms and were sent to the emergency department for treatment. Two others were transported as a precaution.

MI20060399- A faulty water heater at a fast food restaurant caused the release of carbon monoxide. The fire department responded and sent two employees to the emergency department for treatment for carbon monoxide poisoning.

MI20060400- A faulty vehicle exhaust system caused a carbon monoxide release inside a vehicle. The man felt very dizzy and called EMS. He was taken to the emergency department for treatment.

MI20060401- A man was using two generators in his home. He called EMS when he felt dizzy and had a headache. He went to the emergency department for treatment for carbon monoxide poisoning.

MI20060402- Use of a generator in a home caused a release of carbon monoxide. Two people experienced vomiting, headache and dizziness. EMS brought them to hospital where they were admitted for one day.

MI20060403- An employee of an electrical contracting company was at work in a poorly ventilated room with a gas generator. He felt sick and his employer sent him to the emergency department for treatment for carbon monoxide poisoning.

MI20060404- A woman was using a gas stove and space heater to heat her home. This caused a release of carbon monoxide. EMS responded to the home and took her to the emergency department.

MI20060405- There was a power outage for two days. A man used a generator in his basement for power. A release of carbon monoxide occurred. EMS responded to the home and took him to the emergency department

MI20060406- A man was welding inside a home. Carbon monoxide was released and the carbon monoxide detector went off. The fire department responded and sent one woman to the emergency department.

MI20060407- A man was using a cement-cutting gas-powered saw in his basement. His wife found him unconscious. EMS came and took him to emergency department for treatment of carbon monoxide.

MI20060408- There was a Motocross event going on in a recreational area. There were trailers set up near where the bikes were running. There was a lot of exhaust outside from the bikes in the area and the windows were open in a trailer causing high levels of carbon monoxide. EMS responded and took two people to the emergency department.

MI20060409- A faulty water heater in a home caused a carbon monoxide release. The fire department came and recommended that the family of five go to the emergency department for treatment. Three family members experienced symptoms and two went as a precaution.

MI20060410- An employee at a YMCA used a power washer inside without proper ventilation. This caused a release of carbon monoxide. The employee passed out four times. EMS responded and took her to the emergency department.

MI20060411- A pregnant woman was working in a warehouse with propane heaters, when the carbon monoxide alarms sounded. She experienced a headache. The company sent her to the emergency department for evaluation.

MI20060413- A man was using a charcoal grill to heat the barn in which he was working. There was no ventilation. His wife found him unconscious and called EMS, who took him to the emergency department for treatment of carbon monoxide poisoning.

Appendix 4.- Events resulting in an evacuation, injury or decontamination- Michigan Hazardous Substances Emergency Events Surveillance, 2006

MI20060414- A stove was left on in an empty apartment causing a release of carbon monoxide. The tenant in the apartment above the empty apartment experienced dizziness and headache. She called the fire department; they came to check the levels and recommended she go to the emergency department.

MI20060415- A manufacturing company had a forklift and other gas powered tools running in the warehouse. There was little ventilation. The fire department and EMS responded after the carbon monoxide alarms went off. The fire department evacuated the building until it could be properly ventilated. One employee was taken by EMS to the emergency department.