Hazardous Substances Emergency Events Surveillance in Michigan 2005

September 2006

Division of Environmental and Occupational Epidemiology
Michigan Department of Community Health
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Michigan Department of Community Health

MDCH

Jennifer M. Granholm, Governor
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Hazardous Substances Emergency Events Surveillance in Michigan: 2005

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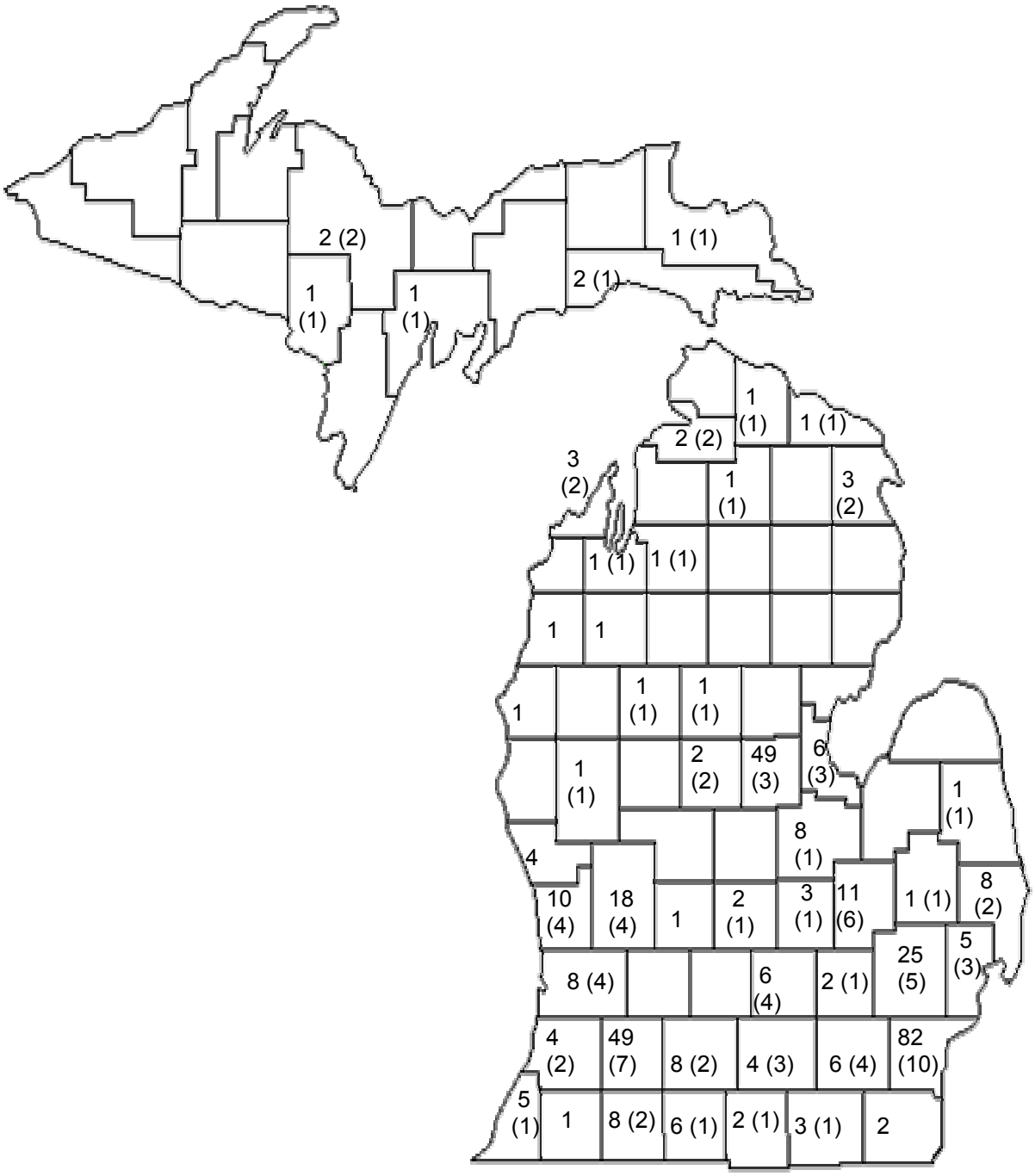


SUMMARY

This report summarizes the characteristics of hazardous substances emergency events reported to the Michigan Department of Community Health (MDCH) for 2005, the first full 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 15 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 383 reported events met HSEES criteria for inclusion in 2005 in Michigan. Sixty-seven percent of the events occurred at fixed facilities and the remainder were associated with transportation. More than one substance was released in 61 (15.9%) of these 383 events. The most commonly reported substances were carbon monoxide, ammonia, and sodium hydroxide. During this reporting period, 82 events (21.4% of all reported events) resulted in an injury, involving a total of 209 victims, three (1.4%) of whom died. The most frequently reported injuries were respiratory irritation, headache, and dizziness. Evacuations were ordered for 29 (7.6%) events. Decontaminations took place for 36 injured individuals and 251 uninjured, involving 17 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.

A number of activities are underway in Michigan to address public health issues identified by these data. These include the establishment of a system to alert local public health officials of significant releases in their jurisdictions, as part of the integration of Michigan HSEES into the State's public health emergency preparedness. Additionally, MDCH has initiated rulemaking to mandate reporting of chemical poisonings, which will improve identification of HSEES qualifying events. Finally, high risk business/employer groups are targeted for mailings of educational materials about reducing risks of chemical exposures.

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 fourteen other states.[1] This report summarizes data on hazardous substance releases in Michigan during 2005, the first full year of HSEES operation in the State.

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 2005 in Michigan. The highlights of the 2005 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.

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

METHODS

All 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, or, if not on the list, in an amount greater than or equal to 10 lbs or 1 gallon. Threatened releases of qualifying amounts will be included if the threat led to an action (e.g., evacuation) to protect the public health. The HSEES Mandatory Chemical Reporting List is in Appendix 1. Petroleum is excluded because the of the Petroleum Exclusion clause in the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), under which the HSEES program was being 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 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.

[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

- 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 data 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 2005 events was completed in May 2006. 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

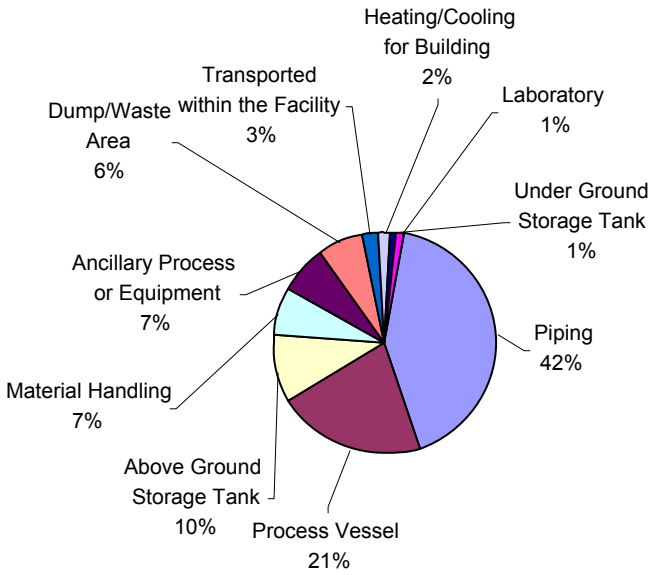
RESULTS

For 2005, 383 hazardous substance emergency events in Michigan were HSEES-eligible events and were included in the Michigan HSEES (MI-HSEES) program: three (1%) were threatened releases and seven (2%) had both an actual release and a threatened release. The counties with the most frequent number of events were Wayne with 82 (21.4%) events, Kalamazoo with 49 (12.8%) events and Midland with 49 (12.8%) events. A list of events by county is in Appendix 2.

Facility type

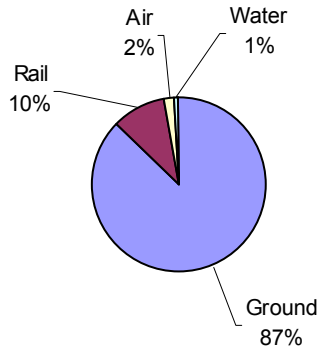
A total of 258 (67%) events occurred in fixed facilities. One hundred forty-six (56.6%) of the 258 fixed facility events did not identify an area in the facility where the release occurred. The main areas for the 112 events that did identify an area are as follows: piping-47 (42%), process vessel-24 (21.4%), above ground storage area-11 (9.8%), ancillary process/equipment-8 (7.1%), material handling-8 (7.1%), dump waste area-7 (6.3%), transported within the facility-3 (2.7%), heating/cooling for the building- 2 (1.8%), laboratory-1 (0.9%) and underground storage tank-1 (0.9%) (Figure 1).

Figure 1.- Areas of fixed facilities involved in events- Michigan Hazardous Substance Emergency Event Surveillance, 2005 (N=112)



Of the 125 transportation related events, 109 (87.2%) occurred during ground transport, 13 (10.4%) involved transport by rail, two (1.6%) involved air transportation and one (0.8%) involved transport by water (Figure 2). The largest proportion of transportation related events occurred from a moving vehicle, which had 53 (42.4%) events. Thirty-nine (31.2%) events occurred while unloading a vehicle.

Figure 2.- Distribution of transportation-related events, by type of transport- Michigan Hazardous Substances Emergency Events Surveillance System, 2005 (N=125)



Nearby populations

Information on populations within ¼ mile was available for 365 (95.3%) of the 383 events. Residences were within ¼ mile of 355 (97.2%) of 365 events. Businesses- 365 (100%) events; Schools- 50 (13.7%) and daycare centers-74 (20.2%) events. (Information on these two categories was not reported for 17 events.) Hospitals were within ¼ mile of five (1.4%), nursing homes-12 (3.3%) and recreational areas-30 (8.2%) events. (Information on these three categories was not reported in 18 events.)

Causes of events

Primary or root cause factors were reported in all but two of the 383 events, and secondary or immediate causal factors were identified in 253 (66.4%) of the 381 events where a primary factor was known. Of the reported primary factors in fixed facility events, equipment failure and human error accounted for most of the factors with 104 (40.6%) and 86 (33.6%) entries, respectively. Illicit drug

production was the secondary cause of 51 (19.8%) fixed facility events. The majority (56.8%) of transportation events were primarily due to human error, and improper filling/loading/packing was the leading secondary cause of 36 (28.8%) transportation-related events (Tables 1a and 1b).

Table 1a.- Primary factors associated with events by event type- Michigan Hazardous Substances Emergency Events Surveillance, 2005

	Event Type					
	Fixed Facility*		Transportation		All Events	
Primary Factor	No. of Events	%	No. of Events	%	No. of Events	%
Equipment Failure	104	40.6	53	42.4	157	41.2
Human Error	86	33.6	71	56.8	157	41.2
Intentional	52	20.3	0	0.0	52	13.6
Illegal Act	12	4.7	0	0.0	12	3.1
Bad Weather	0	0.0	1	0.8	1	0.3
Other	2	0.8	0	0.0	2	0.5
Total	256	100	125	100	381	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, 2005

	Event Type					
	Fixed Facility		Transportation		All Events	
Secondary Factor	No. of Events	%	No. of Events	%	No. of Events	%
No Secondary Factor	90	35.2	38	30.4	128	33.6
Equipment Failure	49	19.1	13	10.4	62	16.3
Illicit Drug Production	51	19.9	1	0.8	52	13.6
Improper Fill/Load/Pack	5	2.0	36	28.8	41	10.8
System/Process upset	20	7.8	0	0.0	20	5.2
Forklift Puncture	7	2.7	12	9.6	19	5.0
Human Error	6	2.3	8	6.4	14	3.7
Unauthorized Dumping	11	4.3	0	0.0	11	2.9
Loadshift	0	0.0	9	7.2	9	2.4
Vehicle Roll Over	1	0.4	6	4.8	7	1.8
Improper Mixing	6	2.3	0	0.0	6	1.6
System Start/Shutdown	3	1.2	0	0.0	3	0.8
Overspray/Misapplication	1	0.4	0	0.0	1	0.3
Explosion	1	0.4	0	0.0	1	0.3
Performing Maintenance	1	0.4	0	0.0	1	0.3
Vehicle Collision	1	0.4	2	1.6	3	0.8
Electrical Problems	1	0.4	0	0.0	1	0.3
Other	2	0.8	0	0.0	2	0.5
Total	256	100	125	100	381	100

Substances

A single substance was released in 322 (83.9%) of the 383 events. Two substances were released in 18 (4.7%) events and 43 (11.2%) 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 (97.6%) transportation events involved only one substance, compared to approximately three-quarters (77.5%) of events at fixed facilities.

Table 2.- Number of substances involved per event, by event type- Michigan Hazardous Substances Emergency Events Surveillance, 2005

	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	200	77.5	200	122	97.6	122	322	84.1	322
2	15	5.8	30	3	2.4	6	18	4.7	36
3	13	5.0	39	0	0.0	0	13	3.4	39
4	11	4.3	44	0	0.0	0	11	2.9	44
5	6	2.3	30	0	0.0	0	6	1.6	30
>5	13	5.0	95	0	0.0	0	13	3.4	95
Total	258	100	438	125	100	128	383	100	566

A total of 566 substances were associated with the 383 events, of which 29 (5.1%) 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, 2005

Substance	# of times released
Carbon Monoxide	52
Ammonia	40
Sodium Hydroxide	30
Hydrochloric Acid	29
Sulfuric Acid	16
Acetone	12
1,3- Butadiene	11
Mercury	11
Phosphorus	11
Ethyl Ether	10

Carbon monoxide had the greatest number of releases (52) followed by ammonia and sodium hydroxide. Ammonia, sodium hydroxide, hydrochloric (muriatic) acid and phosphorus were frequently associated with methamphetamine laboratory seizures. Four of the eleven mercury releases occurred in schools. A complete list of chemicals and their frequencies is in Appendix 3.

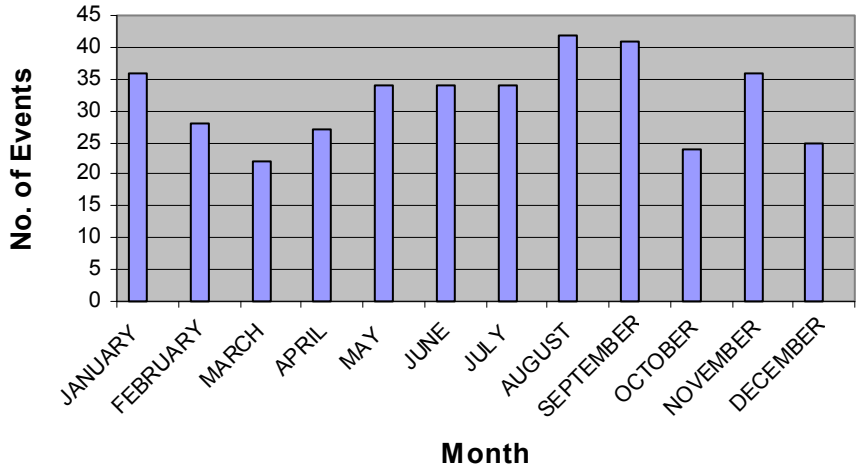
One or two different types of releases could be reported for each substance. The most frequent release type of the 416 substances where one type was reported was spills (liquid/solid) with 237 (57%), followed by air releases with 122 (29.3%), threatened releases with 29 (7%), fire with 27 (6.5%), and explosion with one

(0.2%). There were 150 chemicals with two release types. Of events with two types of releases, the following combinations were reported: spill and air release with 123 (82%), spill and fire release-15 (10%), spill and radiation-1(0.7%), air release and fire-7 (4.7%), fire and explosion-4 (2.6%).

Time of release

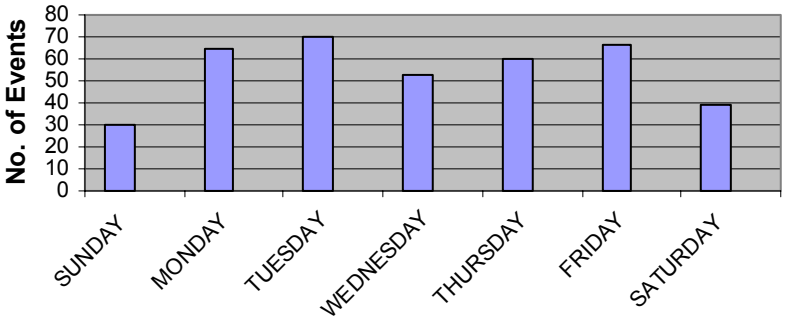
The number of events by month ranged from 24 (6.3%) in October to 42 (11%) in August, with the largest frequencies occurring in August and September (Figure 3).

Figure 3.- Month distribution of events- Michigan Hazardous Substances Emergency Events Surveillance, 2005 (N=383)



The proportion of events occurring on weekdays ranged from 13.8% (Wednesday) to 18.3% (Tuesday), and the proportion occurring on the weekends ranged from 7.8% (Sunday) to 10.1% (Saturday). Events were more likely to occur on weekdays than weekends (Figure 4). Of the 341 (89%) events for which a time category was reported, 39% occurred from 6 a.m. to 11:59 a.m., 27.6% from 12 p.m. to 5:59 p.m., 22.6%, from 6 p.m. to 11:59 pm and the remaining 10.8% from 12 a.m. to 5:59 a.m.

Figure 4.- Event day of the week distribution- Michigan Hazardous Substances Emergency Events Surveillance, 2005 (N=383)



Business/industry

Two hundred ninety-five (77.2%) of the 383 events were the responsibility of an industry or business. Eighty seven (22.7%) were not associated with a business/industry, and responsibility could not be determined for one event. The largest proportion of the business-associated events involved transportation and manufacturers of paper, chemical and petroleum industries with 120 (40.7%) and 89 (30.2%), respectively (Table 4). Selected industry subcategories with large numbers are also displayed on Table 4, including ground transportation-110 (28.7%) and manufacturing of chemicals/pharmaceuticals-67 (17.5%) Forty-six (71.8%) of the 67 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, 2005 *

NAICS Code	Industry Category	No. Events	%
72	Accommodations/Food Services	4	1.4
56	Administrative Support/Waste Management and Remediation (N=13)		
562	*Waste Management and Remediation*	*13*	*4.4*
11	Agriculture	7	2.4
71	Arts/Entertainment/Recreation	3	1.0
23	Construction	5	1.7
61	Education	13	4.4
62	Health Care	1	0.3
31	Manufacturing- Food/Textiles/Apparel	7	2.4
33	Manufacturing- Metal/Transportation	17	5.8
32	Manufacturing- Paper/Petroleum/Chemicals/Plastics (N=89)		
325	*Manufacturing- Chemicals/Pharmaceuticals*	*67*	*22.7*
324	*Manufacturing- Petroleum/Coal*	*14*	*4.8*
322	*Manufacturing- Paper*	*8*	*2.7*
45	Retail Trade- Books/Music/Gifts	1	0.3
44	Retail Trade- Motor Vehicle/Building Materials/Gas Stations	3	1.0
48	Transportation- Ground/Air/Rail (N=120)		
484	*Transportation- Ground*	*110*	*37.3*
482	*Transportation- Rail*	*7*	*2.4*
481	*Transportation- Air*	*3*	*1*
49	Transportation- Storage/Warehouse/Messengers	3	1.0
22	Utilities	8	2.7
42	Wholesale Trade	1	0.3
	Total	295	100

*87 events occurred in a non-industry setting and for 1 event the industry was not specified.

Response

Of the 376 (98%) events with information on the types of emergency personnel that responded to the event, 107 (27.9%) reported two or more categories of personnel who responded, 44 (11.5%) reported three or more categories and 21 (5%) reported four or more categories of responders. Company response teams, followed by law enforcement and third party clean-up contractors were the most frequent categories of personnel to respond to an event.

Thirty-two events (8.4% of all events) resulted in a public health action. Two (6%) events had both a health investigation and environmental sampling, 25 (78%) had environmental sampling only, two (6%) had a health investigation only, two

(6%) resulted in structural changes to prevent further releases, and one (4%) had a health advisory.

Victims, evacuations, sheltering in place, and decontaminations:

A brief synopsis of the 102 events that included one or more of these public health impact measures is included in Appendix 4, sorted by county.

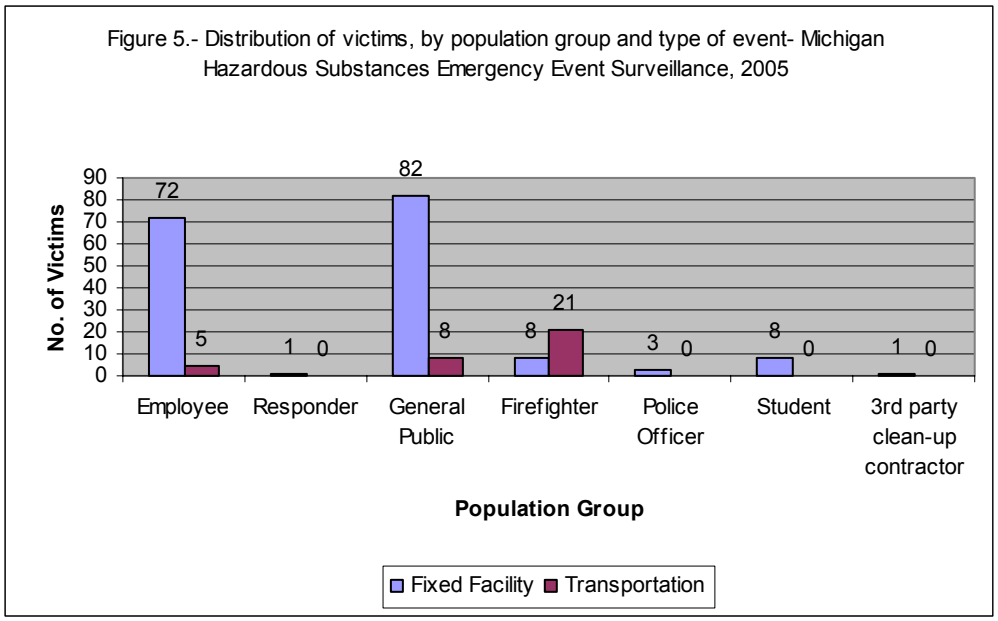
Victims

A total of 209 victims were reported in 82 events (21.4% of all events) (Table 5). Of the 82 events with victims, 52 (63.4%) involved only one victim and 12 (14.6%) involved two victims. Of all victims, 175 (83.7%) 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, 2005

	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	45	62.5	45	7	70.0	7	52	63.4	52
2	11	15.3	22	1	10.0	2	12	14.6	24
3	3	4.2	9	1	10.0	3	4	4.9	12
4	4	5.6	16	0	0.0	0	4	4.9	16
5	2	2.8	10	0	0.0	0	2	2.4	10
>5	7	9.7	73	1	10.0	22	8	9.8	95
Total	72	100	175	10	100	34	82	100	209

Figure 5 shows the distribution of victims by population group. The general public constituted the largest part of the population groups injured with 90 (43.1%) persons injured, followed by employees with 77 (36.8%) persons injured. Responders, including firefighters, police officers and other responders, comprised 33 (15.8%) of all injured persons (Figure 6). One transportation event caused the injury of 21 fire fighters. (See Appendix 4: Mackinac County case, MI20050242 for a description of this event.)

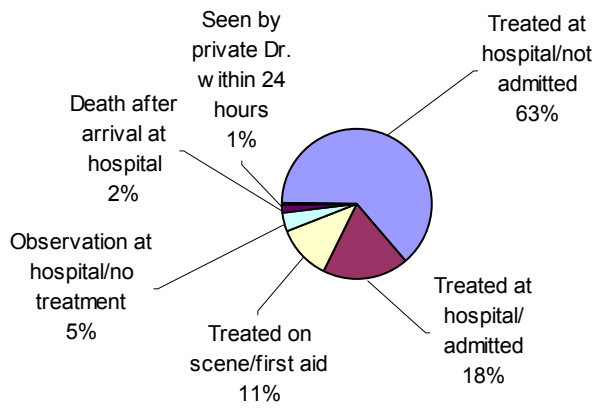


The age range was determined for 123 (58.9%) of the 209 victims: None were under one year old, four (3.3%) were one to four years old, 11 (8.9%) were five to 14 years old, eight (6.5%) were 15-19 years old, 64 (52%) were 20-44 years old, 29 (23.6%) were 45-64 years old and seven (5.7%) were older than 65 years.

Sex was known for 155 (74%) of the 209 victims; of these, 109 (70%) were male.

Severity of injuries was known for 200 (95.7%) of victims: 127 (63.5%) were treated and released from the hospital and 37 (18.5%) were admitted to the hospital. Three (1.5%) deaths were reported (Figure 6). Two of the deaths were associated with carbon monoxide exposure and one associated with a traffic accident involving hazardous ink (See Appendix 4: Allegan County, case MI20050282; Otsego County, case MI20050480 and Mackinac County, case MI20050242.)

Figure 6.- Injury outcome- Michigan Hazardous Substances Emergency Events Surveillance, 2005 (N=200)



The 209 victims were reported to have sustained a total of 367 injuries or symptoms (Table 6). Of all reported injuries/symptoms the most common in fixed facility events were respiratory irritation with 72 (23.7%) events, followed by headache and dizziness each with (22.7%) and 47 (15.5%) events, respectively.

Table 6.-Frequencies of injuries/symptoms, by type of event, Michigan Hazardous Substances Emergency Events Surveillance, 2005

	Type of Event					
	Fixed Facility		Transportation		All Events	
Injury/Symptom	No. of Injuries	%	No. of Injuries	%	No. of Injuries	%
Respiratory Irritation	72	23.7%	23	36.5%	95	25.9%
Headache	69	22.7%	3	4.8%	72	19.6%
Dizziness/other CNS symptoms	47	15.5%	4	6.3%	51	13.9%
Gastrointestinal Problems	37	12.2%	2	3.2%	39	10.6%
Skin Irritation	21	6.9%	0	0.0%	21	5.7%
Eye Irritation	20	6.6%	2	3.2%	22	6.0%
Shortness of Breath	16	5.3%	21	33.3%	37	10.1%
Trauma	7	2.3%	4	6.3%	11	3.0%
Burns	7	2.3%	3	4.8%	10	2.7%
Heat Stress	6	2.0%	0	0.0%	6	1.6%
Heart Problems	2	0.7%	0	0.0%	2	0.5%
Other	0	0.0%	1	1.6%	1	0.3%
Total	304	100.0%	63	100.0%	367	100.0%

Evacuations and sheltering in place

Evacuations were ordered in 29 (7.6%) of the 383 events. Of these evacuations, 25 (86.2%) were of buildings or the affected parts of the building, two (6.9%) were of homes and businesses surrounding or downstream/downwind of the event, and 2 (6.9%) were not defined. The number of people evacuated was known for 28 (97%) of the 29 events. The number of people evacuated ranged from two to 1000 (Table 7). The length of evacuation, which was reported for 16 (51.7%) events, ranged 1.5 to 336 hours (14 days) with a median of five hours. One event involved the evacuation of more than 1000 individuals for 3 days. (See Appendix 4: Wayne County, case MI20050349.) Four (1.1%) events involved sheltering in place orders in the surrounding communities. Two of the shelter in place events also had evacuation orders and two of them did not.

Table 7.- Ranges of numbers of evacuated people by number of events, Michigan Hazardous Substances Emergency Events Surveillance, 2005*

# of people evacuated	# of events
<5	7
5-20	5
21-50	2
51-100	3
101-500	4
501-1000	6
>1000	1
Total	28

*Number evacuated was unknown for one event.

Fire at a Hazardous Waste Recycling Facility

In August 2005, a hazardous waste tank at a company that provides industrial waste management and recycling services exploded and burned, setting off a chain reaction of fires in surrounding chemical storage tanks. Local officials ordered an evacuation of over 900 houses within a half mile radius of the facility. State and local public health, the Environmental Protection Agency, and ATSDR provided support to the team of first responders, including extensive environmental sampling. Volatile Organic Compounds (VOCs), Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs), and metals in the air and soot debris deposited in the community were of concern, but sampling results indicated that there were no acute health risks from these potential exposures.
(See Appendix 4- Wayne County MI20050349)

Decontamination

Decontamination took place in 17 events, including nine events in which 36 injured people were decontaminated and eight events in which 242 uninjured people were decontaminated. Thirty-one of the 36 injured decontaminated individuals were decontaminated at a medical facility, and five were decontaminated on scene.

Of the 242 uninjured decontaminated individuals, 207 (85.5%) were students in three events related to mercury spills in the schools (see Appendix 4:Calhoun County, case MI20050152, Kent County, case MI20050153 and Hillsdale County, case MI20050179). Eleven uninjured responders were decontaminated at a medical facility, three employees in two events were decontaminated on scene, ten responders were decontaminated on scene, and 11 members of the general public in two events were decontaminated on scene.

Methamphetamine

Forty-eight (12.5%) MI-HSEES events involved clandestine methamphetamine (meth) laboratory seizures. Meth labs were included in MI-HSEES when they were found to be active within 72 hours of the seizure. This constituted 20% of the approximately 250 total meth laboratory seizures in Michigan in 2005. Most (78.2%) of the lab seizures occurred in southwest Michigan. Evacuations were ordered in eight (17.4%) events. Four people in four events were injured.

Meth production involves a wide variety of chemicals to convert ephedrine or pseudoephedrine to methamphetamine. In the 48 MI-HSEES meth lab seizures, there were a total of 172 releases involving 27 substances, with an average of four substances per release. The list to the right summarizes these chemicals by groups: Acids include hydrochloric acid and sulfuric acid; bases include caustic soda and sodium hydroxide; fuels include Coleman® fuel and lighter fluid; other inorganic substances include iodine, lithium, hydrogen peroxide and red phosphorus; other includes drain cleaners methamphetamine oil/salt; and Volatile Organic Compounds (VOCs) include acetone and solvents.

In addition to methamphetamine lab seizures, there were five methamphetamine-related events involving attempted thefts, usually of anhydrous ammonia, that resulted in a release. Of these five events, three of them resulted in the injury of six people, and one involved the death of approximately 50 cows.

Michigan has passed two laws recently to address this problem. The first restricts the sale of ephedrine and pseudoephedrine containing over-the-counter drugs. The second requires MDCH to develop guidance and rules for clean-up of meth labs.

Chemicals Involved in Making Methamphetamine

Acids
Anhydrous Ammonia/Ammonium Salts
Bases
Fuels
Other Inorganic Substances
Other
VOC's

DISCUSSION

These data on 383 chemical releases in 2005 in Michigan comprise the first full year of MI-HSEES operation. Twenty-one percent of these releases resulted in injury to 209 individuals, including three fatalities, and evacuations were mandated in approximately seven percent of the events.

Notable in this first year of data were the large number of carbon monoxide events (52), which resulted in 88 non-fatal injuries and two deaths, and the number of active methamphetamine-related lab seizures (46; 40% of the 114 events that did not occur at a business or industry and 12% of all MI-HSEES events). A third area of interest were the mercury spills in schools (four of the 10 mercury releases), resulting in school evacuations and school closures, in spite of a Michigan law that mandated that schools be mercury-free by December 2004.

MDCH is responding to these findings with several actions:

- 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.
- MI-HSEES staff is working with other staff in MDCH, who have mandated responsibilities for addressing clean-up concerns at meth sites, to assist in data collection for all meth lab seizures.
- The MI-HSEES program is collaborating with the Michigan Departments of Education and Environmental Quality in conducting a survey and providing technical advice to schools so that they can come into compliance with the law requiring them to be mercury–free.

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 for a number of reasons. First, the MI-HSEES network of reporting sources was not fully established until later in 2005. The program undertook a wide variety of activities throughout the year to bring awareness of MI-HSEES to agencies that receive reports and to have them agree to provide data, but some of these agencies did not begin reporting until later in 2005. Second, a number of these 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. 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

1,3 Butadiene
Acetaldehyde
Acetic Acid
Acrolein
Acrylonitrile
Ammonia
Arsenic Trioxide
Arsine
Benzene
Bis(Chloromethyl)Ether
Boron Trichloride
Boron TriFluoride
Bromine
Carbon Disulfide
Carbon Monoxide
Chlorine
Chlorine Dioxide
Chloroform
Chloromethyl ether
Crotonaldehyde
Cyanogen Chloride
Diborane
Dimethylamine
Dimethyldichlorosaline
Epichlorohydrin
Ethylene Dibromide
Ethylene Oxide
Ethyleneimine
Fluorine
Formaldehyde
Hydrazine
Hydrochloric acid
Hydrogen fluoride
Hydrogen Bromide
Hydrogen Cyanide
Hydrogen sulfide
Hydrogren selenide
Isobutylnitrile
Methyl Chloride
Methyl Hydrazine
Methyl Isocyanate
Methyltrichlorosilane
Nickel Carbonyl
Nitric Acid
Nitrogen Dixoide
Perfluoroisobutylene
Phenol
Phosgene
Phosphine
Phosphorous Trichloride
Potassium Cyanide
Propylene Oxide
Sarin
Sodium Cyanide
Sodium Hydroxide
Stibine
Styrene
Sulfur Trioxide
Sulfuric Acid
Tetrafluroethylene
Thionyl Chloride
Titanium Tetrachloride
Toluene Diisocyanate
Trichlorlorsilane
Trimethylamine
Trimethylchlorosilane
Uranium Hexafluoride
Vinyl Acetate
Vinyl Chloride

Appendix 2.- Events by county- Michigan Hazardous Substances Emergency Events Surveillance, 2005						
	Event Type					
County	Fixed Facility		Transportation		All Events	
	No.	%	No.	%	No.	%
Allegan	5	1.31	3	0.78	8	2.09
Alpena	2	0.52	1	0.26	3	0.78
Barry	5	1.31	0	0.00	5	1.31
Bay	5	1.31	1	0.26	6	1.57
Berrien	2	0.52	3	0.78	5	1.31
Branch	2	0.52	4	1.04	6	1.57
Calhoun	3	0.78	5	1.31	8	2.09
Cass	1	0.26	0	0.00	1	0.26
Charlevoix	1	0.26	1	0.26	2	0.52
Cheboygan	1	0.26	0	0.00	1	0.26
Chippewa	1	0.26	0	0.00	1	0.26
Clare	1	0.26	0	0.00	1	0.26
Clinton	0	0.00	2	0.52	2	0.52
Crawford	1	0.26	0	0.00	1	0.26
Delta	1	0.26	0	0.00	1	0.26
Dickinson	0	0.00	1	0.26	1	0.26
Genesee	8	2.09	3	0.78	11	2.87
Grand Traverse	1	0.26	0	0.00	1	0.26

Appendix 2.- Events by county- Michigan Hazardous Substances Emergency Events Surveillance, 2005						
	Event Type					
County	Fixed Facility		Transportation		All Events	
	No.	%	No.	%	No.	%
Gratiot	2	0.52	0	0.00	2	0.52
Hillsdale	2	0.52	0	0.00	2	0.52
Ingham	5	1.31	1	0.26	6	1.57
Ionia	1	0.26	0	0.00	1	0.26
Isabella	2	0.52	0	0.00	2	0.52
Jackson	4	1.04	0	0.00	4	1.04
Kalamazoo	31	8.09	18	4.70	49	12.79
Kalkaska	1	0.26	0	0.00	1	0.26
Kent	6	1.57	12	3.13	18	4.70
Lapeer	1	0.26	0	0.00	1	0.26
Leelanau	2	0.52	0	0.00	2	0.52
Lenawee	3	0.78	0	0.00	3	0.78
Livingston	1	0.26	1	0.26	2	0.52
Mackinac	0	0.00	2	0.52	2	0.52
Macomb	5	1.31	0	0.00	5	1.31
Manistee	1	0.26	0	0.00	1	0.26
Marquette	2	0.52	0	0.00	2	0.52
Mason	0	0.00	1	0.26	1	0.26
Mecosta	1	0.26	0	0.00	1	0.26

Appendix 2.- Events by county- Michigan Hazardous Substances Emergency Events Surveillance, 2005						
	Event Type					
County	Fixed Facility		Transportation		All Events	
	No.	%	No.	%	No.	%
Midland	45	11.75	4	1.04	49	12.79
Monroe	1	0.26	1	0.26	2	0.52
Muskegon	3	0.78	1	0.26	4	1.04
Newaygo	0	0.00	1	0.26	1	0.26
Oakland	11	2.87	14	3.66	25	6.53
Otsego	1	0.26	0	0.00	1	0.26
Ottawa	8	2.09	2	0.52	10	2.61
Presque Isle	1	0.26	0	0.00	1	0.26
Saginaw	5	1.31	3	0.78	8	2.09
Sanilac	1	0.26	0	0.00	1	0.26
Shiawassee	2	0.52	1	0.26	3	0.78
St. Clair	6	1.57	2	0.52	8	2.09
St. Joseph	7	1.83	1	0.26	8	2.09
Van Buren	4	1.04	0	0.00	4	1.04
Washtenaw	6	1.57	0	0.00	6	1.57
Wayne	47	12.27	35	9.14	82	21.41
Wexford	0	0.00	1	0.26	1	0.26
Total	258	67.36	125	32.64	383	100.00

Appendix 3.- Complete list of substances released and frequencies- Michigan Hazardous Substances Emergency Events Surveillance, 2005

Name	Frequency	Percent
1, 2 dichloroethane	1	0.18
1-chloro-1,2,2,2,-tetraflouroethane	1	0.18
2,4-D	2	0.35
2-4 dichlorophenol	1	0.18
2-dimethylaminoethanol	1	0.18
Absorbit	1	0.18
Acetic Acid	1	0.18
Acetone	12	2.12
Acid NOS	3	0.53
Acidic Wastewater	1	0.18
Acrylonitrile	2	0.35
Adhesive NOS	2	0.35
Alcohol NOS	4	0.71
Aluminum Sulfate	1	0.18
Ammonia	40	7.07
Ammonium Nitrate	6	1.06
Ammonium Phosphate	1	0.18
Ammonium Sulfate	2	0.35
Barium Sulfate	1	0.18
Benzene	2	0.35
Beryllium	1	0.18
Bismuth Subcarbonate	1	0.18
Bismuth Subyallate	1	0.18
Butadiene	11	1.94
C-2191	2	0.35
Calcined Alumina	1	0.18
Cutrine Plus	1	0.18
Calcium Lactate	1	0.18
Calcium Phosphate	1	0.18
Cannabis	1	0.18
Carbon Monoxide	52	9.19
Carboxylated Styrene Butadiene	1	0.18
Caustic Soda	3	0.53
Charcoal	1	0.18
Chlorine	5	0.88
Chlorine Dioxide	1	0.18
Chlorite	1	0.18
Chloroacetyl Chloride	1	0.18
Chloroform	4	0.71
Chloromethyl methyl ether	2	0.35

Name	Frequency	Percent
Chromic Acid	2	0.35
Chromium VI	1	0.18
Cleaning Agent NOS	1	0.18
Coleman Fuel	1	0.18
Combustible Liquid NOS	2	0.35
Coolant NOS	1	0.18
Corrosive Liquid Acidic Inorganic NOS	2	0.35
Corrosive NOS	5	0.88
Corrosive liquid acidic organic NOS	2	0.35
Corrosive liquid basic inorganic NOS	3	0.53
Diesel Fuel	1	0.18
Diethylbenzene	1	0.18
Dimethyl Sulfide	1	0.18
Disodium Oxide	1	0.18
Divinyl Benzene	1	0.18
Drain Cleaner NOS	4	0.71
EPA D001: Ignitable Waste	1	0.18
Epoxy NOS	1	0.18
Ether NOS	1	0.18
Ethyl Benzene NOS	1	0.18
Ethyl Chloride	1	0.18
Ethyl Ether	10	1.77
Ethylbenzene	1	0.18
Ethylene Glycol	3	0.53
Ethylene Oxide	1	0.18
Ethylvinylbenzene	1	0.18
Ferric Chloride	2	0.35
Flammable Liquid NOS	2	0.35
Flammable Organic Solvent	1	0.18
Freon	1	0.18
Fuel NOS	6	1.42
Glycol NOS	1	0.18
Hexadiene	1	0.18
Hexamethylenediamine	1	0.18
Hydraulic Fluid	1	0.18
Hydrobromic acid	1	0.18
Hydrochloric Acid	29	5.12
Hydrogen Peroxide	6	1.06

Appendix 3.- Complete list of substances released and frequencies- Michigan Hazardous Substances Emergency Events Surveillance, 2005

Name	Frequency	Percent
Hydrogen Sulfide	2	0.35
Isopropanol Phosphorus	1	0.18
Ink NOS	2	0.35
Iodine	9	1.59
Isophorone Diisocyanate	1	0.18
Isopropanol NOS	7	1.24
Isopropyl Alcohol	1	0.18
Kerosene	1	0.18
Light Oil - Benzene containing biproduct	1	0.18
Lighter Fluid NOS	11	1.94
Lithium	2	0.35
Lithium Chloride	1	0.18
Meth Oil	4	0.71
MIX: 1,2,3,4-tetrahydro-5-(1-phenylethyl)-napthalene/1,2,3,4-tetrahydro-6-1-(1-phenylethyl)-napathalene/ Biphenyl/ Phenyl Ether/ Toluene/ Ammonia	1	0.18
MIX: Acetone/ Ethylbenzene/ Isopropyl Alcohol/ Methyl Alchohol /Methyl Ethyl Ketone/ Methyl Isobutyl Ketone/ N-Butyl Acetate/ SC 100/ Toluene/ Xylene/ Propylene Glycol	3	0.53
MIX: Acetone/ Isopropyl Alcohol/ Methyl Alcohol/ Methyl Isobutyl Ketone/ N-Butyl Acetate SC 100/SC 150/VM&P Naptha/ Xylene	1	0.18
MIX: Acrylonitrile/ Nitrogen	1	0.18
MIX: Banner Maxx/ Mancozeb	1	0.18
MIX: Bleach/ Explosives NOS/ Hydrochloric Acid	1	0.18
MIX: Calcium Carbonate/ Titanium Dioxide	1	0.18
MIX: Calcium Carbonate/ Tronox	1	0.18
MIX: Chloromethyl methyl ether/ Hydrochloric acid	1	0.18
MIX: Ethyl Alcohol/ Ethyl Silicate	1	0.18
MIX: Ethylbenzene/ Isopropyl Alcohol/Methyl Isobutyl Ketone/ N-Butyl Acetate/ Xylene	1	0.18
MIX: F002 Waste Solvent/ F003 Waste Solvent/F005 Waste Solvent	1	0.18
MIX: Hydrogen Peroxide/ Peroxyacetic acid	1	0.18
MIX: Hydrogen Sulfide/ Sulfur Dioxide	1	0.18
MIX: Iodine /METH OIL	1	0.18
MIX: Kaolin Titanium Dioxide	1	0.18
MIX: Lead /Sulfuric Acid	1	0.18
MIX: Methyl Chloride/ Methyl Ether	1	0.18
MIX: Paint Additives/ Paint NOS/ Paint Solvent	1	0.18
MIX: Sodium Hypochlorite/ Water	1	0.18
MIX: Vinyl Chloride/Vinylidene Chloride	1	0.18
Magnesium Carbonate	1	0.18
Malathion	1	0.18
Mercury	11	1.94
Methamphetamine	6	1.06
Methamphetamine Chemicals NOS	14	2.47
Methanesulfonic Acid	1	0.18
Methyl Alcohol	5	0.88
Milorginite	1	0.18
Monocarbamide Dihydrogen Sulfate	1	0.18
Monolite Blue bxe hd paste	1	0.18
Motor Oil	2	0.35
Mustard Gas	1	0.18
Nalco 39M	1	0.18
Nitric Acid	5	0.88
Nutralene (nitrogen)	1	0.18
Organic Peroxide NOS	1	0.18
Paint NOS	19	3.36
Perchloroethylene	2	0.35
Phosgene	1	0.18

Appendix 3.- Complete list of substances released and frequencies- Michigan Hazardous Substances Emergency Events Surveillance, 2005

Name	Frequency	Percent
Phosphoric Acid	5	0.88
Phosphorus	11	1.94
Polyamine NOS	1	0.18
Polychlorinated Biphenyls	1	0.18
Polymer NOS	1	0.18
Polyurethane	1	0.18
Pontamine Yellow-GXG- Stilbene dyestuff	1	0.18
Potassium Chlorate	1	0.18
Potassium Chloride	1	0.18
Potassium Hydroxide	2	0.35
Potassium Nitrate	1	0.18
Propylene Glycol	3	0.53
Resin NOS	6	1.06
Sodium Chloride	2	0.35
Sodium Hydroxide	30	5.3
Sodium Hypochlorite	1	0.18
Solvent NOS	13	2.3
Starter Fluid	1	0.18
Strontium Chloride	1	0.18
Styrene	3	0.53
Styrene Monomer	2	0.35
Sulfate of Potash	1	0.18

Name	Frequency	Percent
Sulfur	1	0.18
Sulfur Dioxide	8	1.41
Sulfuric Acid	16	2.83
Thorium NOS	1	0.18
Tannic Acid	1	0.18
Tetrachloroethylene	1	0.18
The Works Toilet Bowl Cleaner	1	0.18
Therminol	1	0.18
Toluene	8	1.41
Toxic Solid, organic	1	0.18
Trasar 23261	1	0.18
Trichlorosilane	1	0.18
Triethylamine	1	0.18
UFlex (nitrogen)	1	0.18
Uranium	1	0.18
Urea	1	0.18
Urethane	1	0.18
Vinyl Chloride	2	0.35
Vinylidene Chloride	2	0.35
Wastewater NOS	1	0.18
Xylene	3	0.53
Zipity Strip	1	0.18

Appendix 4- Events resulting in an evacuation, injury or decontamination by county, Michigan Hazardous Substances Emergency Events Surveillance, 2005

Allegan County
MI20050005- Two men were injured and hospitalized after suffering severe chemical burns to their skin and lungs when a fire extinguisher carrying anhydrous ammonia exploded inside their car. They had stolen the chemical to make methamphetamine.

MI20050282- A pool fan malfunctioned causing a release of carbon monoxide in a home, killing a woman and injuring a man while they slept.

NI20050440- Heat transfer oil was released from a hot oil system due to an onsite reservoir overfill. When it sprayed out of the vent it 'rained' onto a truck delivery man. He was taken to the hospital with respiratory effects, was treated, released and seen the next day.

MI20050618- Use of construction equipment in an enclosed area at a turkey farm caused the release of carbon monoxide. One employee was found unconcious. EMS responded and took him to the hospital where he was admitted for treatment.

Alpena County
MI20050620- A family of four used a gas generator to heat their cabin causing a release of carbon monoxide. There was no ventilation. The two adults experienced headaches and dizziness and the two children experienced vomiting. The mother was taken to the hospital by EMS where she was admitted. The father and two children followed behind the ambulance and were treated and released.

MI20050621- There was a release of carbon monoxide due to the use of a propane heater in a pickup truck. EMS responded when a man was found to be dizzy and unsure of his surroundings. He was taken to the hospital and admitted for treatment.

Barry County
MI20050322- Police seized a methamphetamine lab containing anhydrous ammonia, solvents and acids. Seven adults and three children were in the house at the time of this active cook. All were evacuated and decontaminated on the scene.

MI20050636- Use of a gas-powered log splitter caused a release of carbon monoxide. One person was injured; he passed out after using the equipment. EMS responded and took him to the hospital where he received hyperbaric treatment.

Appendix 4- Events resulting in an evacuation, injury or decontamination by county, Michigan Hazardous Substances Emergency Events Surveillance, 2005

Bay County
MI20050453- A chemical fire involving trichlorosilane at a machine manufacturing plant caused the evacuation of all 200 employees while the fire was contained and cleaned up.

MI20050134- A high school senior was mixing chemicals from a chemistry set in his basement when they exploded. He suffered chemical burns and was taken to the local hospital's burn unit. His left hand was blown off in the explosion. All four people in the home were evacuated. The home was completely destroyed.

MI20050543- A 19-year-old male (the same teen from MI20050134) was overcome by ether fumes in his apartment. He was improperly mixing chemicals. He called EMS/ Fire Department for help. They found numerous unknown chemicals along with some suspected radioactive materials. This prompted an evacuation of the apartment complex while Hazmat was there cleaning up the apartment. The teen was taken to the hospital and admitted for chemical trauma. Later it was determined that there were no radioactive materials.

Berrien County
MI20050436- Sodium hydroxide was released from its tote in a traffic accident on a highway. One person was injured due to the release and was treated on the scene.

Branch County
MI20050359- Police seized a methamphetamine lab containing anhydrous ammonia, Coleman® fuel, drain cleaner and other chemicals used to make meth. Two children were evacuated from the home.

Calhoun County
MI20050152- A middle school was evacuated after a student brought mercury to school. The mercury was dropped on the floor and kicked up and down the hallways. The school was closed for two weeks while it was decontaminated. A dozen staff and students were decontaminated on the scene.

MI20050625- Use of a power washer in the basement of a home caused a release of carbon monoxide. One person, who experienced dizziness and headache, was taken by EMS to the hospital where he was admitted.

Charlevoix County
MI20050606- Use of a power washer in an enclosed area of a home caused a release of carbon monoxide. EMS transported one person to the hospital who experienced headache and nausea.

MI20050609- Carbon monoxide was released when a personal boat was enclosed due to rain and running for more than seven hours. The three people

aboard the boat experienced headache. EMS and the fire department responded to the dock and took them to the local hospital for treatment.

Cheboygan County
MI20050622- Use of a gas-powered generator in a garage at a home caused a release of carbon monoxide. Two people were taken to the hospital by EMS after they were found to be dizzy with headaches and nausea.

Chippewa County
MI20050611- A man was using a propane gas stove with the flue blocked in a log cabin. This caused a release of carbon monoxide. The man passed out. EMS responded and took him to the hospital where he received hyperbaric treatment.

Clare County
MI20050508- Police seized a methamphetamine lab containing acetone, anhydrous ammonia, solvents and sulfuric acid. One adult and three children were evacuated. Officers estimated that his lab was producing about ten grams of meth per week.

Delta County
MI20050212- A valve on a storage tank failed at a paper manufacturing facility releasing 4500 gallons of chlorine dioxide. Residents located within one-half mile of the plant were evacuated until the leak was contained.

Dickinson County
MI20050644- A valve was blown off a pipeline during the transfer of cooling liquid causing it to foam out. The valve hit an employee in the face. He was treated and released from the local hospital.

Genesee County
MI20050487- A student brought mercury to his high school. It was released in the cafeteria and tracked through the hallways. Local public health did not find out about this until one week after the incident. At that time, the school was evacuated for 72 hours while a clean-up contractor cleaned up the spill.

MI20050032- A homeowner called the EPA to report that he had “mustard gas”[*] and several other unknown chemicals in his house. His father was a former employee of a chemical company. The FBI responded and the chemical company agreed to clean up the site. When the homeowner touched some of the unknown chemicals, they burned his skin.

[*] Mustard gas, or sulfur mustard, is a vesicant that was manufactured for use as a chemical warfare agent. The chemical company involved in this incident used to have a contract with the federal government to make mustard gas.

Appendix 4- Events resulting in an evacuation, injury or decontamination by county, Michigan Hazardous Substances Emergency Events Surveillance, 2005

MI20050594- Improper use of a gas generator in an enclosed area caused an employee at a roofing company to become dizzy and nauseous. He was treated and released from the local emergency department for carbon monoxide poisoning.

MI20050596- Improper use of a gas generator at a bottling facility caused a release of carbon monoxide. Four employees suffered headache and vomiting; one of which was treated and released from the emergency department.

MI20050608- A car left running in a closed garage for more than six hours caused the release of carbon monoxide. One person experienced headache and dizziness and was transported by EMS to the local hospital.

MI20050640- Improper use of a lawn mower caused a release of carbon monoxide. A man thought that if he turned the lawn mower on and left it on overnight in his garage the carbon monoxide would kill the mice that were living in there. He went in and checked on the mower during the night. He passed out. His niece found him the following morning. EMS responded and took him to the hospital where he was admitted.

Gratiot County

MI20050598- Release of carbon monoxide from the use of a forklift in an enclosed area caused an employee to have headache and nausea. He was treated and released from the hospital.

Hillsdale County

MI20050179- An elementary school was evacuated after a student brought mercury to school. The mercury spilled on the bus and then it was carried into the school. The school was evacuated. All 200 students were decontaminated at the school; their parents had to bring new clothes before they were allowed to leave the school. The school was closed over the weekend for cleanup and reopened Monday.

Ingham County

MI20050300- Police seized a methamphetamine lab containing anhydrous ammonia, ether and acids. Three people were evacuated from the home.

MI20050057- Employees at an athletic facility improperly mixed pool cleaning chemicals causing a dangerous chemical reaction releasing hydrochloric acid. A total of 340 people had to be evacuated for six hours. Four people suffered respiratory symptoms and burning eyes. They were treated and released at a local hospital.

Appendix 4- Events resulting in an evacuation, injury or decontamination by county, Michigan Hazardous Substances Emergency Events Surveillance, 2005

MI20050459- A man attempted to steal anhydrous ammonia (used to make meth) from a farm. The attempt resulted in the man giving himself severe chemical burns to the face.

MI20050626- Use of a generator inside of a home caused a release of carbon monoxide. One person, who experienced headache and nausea, was taken by EMS to a hospital where he was treated and released.

Isabella County

MI20050395- Three men stole anhydrous ammonia from an industrial site. The ammonia leaked causing respiratory injuries in two of the men and two police officers. They remained at the hospital overnight for observation.

MI20050599- Release of carbon monoxide from the use of a space heater in an enclosed area caused two employees at a hospital to have headaches. The employees were treated and released at the hospital.

Jackson County

MI20050372- Police seized a methamphetamine lab containing acetone, red phosphorus and other solvents. Three adults and four children were evacuated.

MI20050600- A car was left running in a garage at a home causing a release of carbon monoxide. The homeowner suffered a headache and called EMS to take her to the hospital.

MI20050601- Carbon monoxide was released when an employee at a construction site used a saw in an enclosed area. He was treated for nausea at a local hospital.

Kalamazoo County

MI20050497- Police seized a methamphetamine lab containing acids, red phosphorous and other chemicals involved in meth production. Two adults and four children were evacuated. The “cook” admitted to dumping chemicals down the drains in the home.

MI20050309- A thirteen-year-old boy was left in charge of an active meth lab when a fire broke out. The fire department responded. The boy spent the night in the hospital for observation.

MI20050421- Police seized a methamphetamine lab that was on fire. The lab contained anhydrous ammonia, Freon, sulfuric acid, drain cleaner and lithium. The “cook” was treated for superficial burns at the local hospital.

MI20050475- An anhydrous ammonia meth lab caught fire burning the “cook.” He was sent to the hospital with chemical burns.

Appendix 4- Events resulting in an evacuation, injury or decontamination by county, Michigan Hazardous Substances Emergency Events Surveillance, 2005

MI20050619- A faulty exhaust system on a school bus caused the release of carbon monoxide. The bus driver experienced nausea and diziness. EMS responded and took her to the hospital for treatment.

MI20050623- Use of gas-powered engines in a garage at a home caused the release of carbon monoxide. EMS responded and took one person who experienced shortness of breath and nausea for treatment at the hospital.

MI20060628- A gas dryer malfunctioned at a hotel causing a release of carbon monoxide. Two employees spent about one hour in this room and experienced headaches and nausea. EMS responded and took them to the hospital where they were treated and released.

Kalkaska County
MI20050605- Carbon monoxide was released when a man was working on a tractor in the garage at his home. The man experienced shortness of breath and was taken to the local hospital by EMS.

Kent County
MI20050313- Three employees at a transportation company were evacuated for three hours after a forklift damaged some cargo containing toxic organic solids.

MI20050153- A high school was evacuated after a student brought mercury to school. The mercury contamination was confined to one hallway wing and one classroom. The school was closed for three weeks while it was decontaminated. Seven students were decontaminated on the scene by taking showers and disposing of their clothes.

MI20050638- A faulty stove caused a release of carbon monoxide. One person was cooking at the time and experienced headache and nausea. EMS responded and transported her to the hospital.

MI20050639- Use of a power washer in an enclosed area caused a release of carbon monoxide. One person experienced headache and dizziness. EMS responded and transported him to the hospital.

Lapeer County
MI20050602- Use of a power sprayer in an enclosed area in a home resulted in a release of carbon monoxide. Two people in the home experienced headaches and nausea. EMS responded and they were treated and released from the local hospital.

Appendix 4- Events resulting in an evacuation, injury or decontamination by county, Michigan Hazardous Substances Emergency Events Surveillance, 2005

Leelanau County
MI20050338- An employee at a fruit packing facility closed and subsequently neglected to re-open a valve to the ammonia tank/piping system. This caused pressure to build up within the tank. The relief valve on the tank activated, as designed, resulting in a leak of ammonia into the outside air. Two people were injured. The plant was evacuated while the problem was resolved.

MI20050614- Use of a forklift in an enclosed area of a fruit processing plant caused a release of carbon monoxide. Six employees experienced symptoms ranging from headaches to nausea and vomiting. EMS responded and transported them to the local hospital for treatment.

Lenawee County
MI20050213- A 55-gallon drum of ethyl acetate/ethyl alcohol was spilled when an employee at a manufacturing company punctured the drum with a forklift. One person went to a medical facility as a precaution and was decontaminated there.

Livingston County
MI20050241- Two people illegally dumped 40 pounds of copper sulfate, an algaecide, into a local lake. This was 30 times the label rate for a lake of this size. Three children suffered skin irritation and respiratory effects after swimming in the lake.

Mackinac County
MI20050242- A traffic accident involving a semi truck carrying dry ink and a pick up truck occurred on a two-lane highway. The semi truck caught fire, burning all of the ink in the load. The driver of the pickup truck was taken to the hospital where he later died. Twenty-one fire fighters were taken to a local hospital after the fumes from the fire caused them to suffer shortness of breath and other respiratory effects.

Macomb County
MI20050441- Employees were evacuated from their machine manufacturing plant after flammable organic solvents were released during a gasket change on the tank.

MI20050348- A truck delivery man dropped a box containing glass bottles of malathion. The driver was treated for shortness of breath on the scene by the responding fire department.

MI20050593- A construction worker was injured after using a gas-powered generator in an enclosed area for six hours. He was treated and released from the local emergency department for carbon monoxide poisoning. Environmental samples were taken to ensure proper ventilation had taken place prior to employee return.

Appendix 4- Events resulting in an evacuation, injury or decontamination by county, Michigan Hazardous Substances Emergency Events Surveillance, 2005

Marquette County
MI20050610- A hunter used a propane heater in his hunting blind. Poor ventilation yielded a release of carbon monoxide. EMS responded and took him to the hospital where he was admitted for five days and received hyperbaric treatment.

MI20050612- Use of equipment in an enclosed area at a university caused a release of carbon monoxide. The local fire department and EMS responded. Two employees experienced headaches and nausea and were taken to the hospital. Eight other employees were transported as a precaution.

Mecosta County
MI20050635- Construction equipment left running in a garage caused a release of carbon monoxide. One employee passed out from exposure. EMS responded and took him to the hospital where he was admitted.

Midland County
MI20050219- A reactor at a chemical manufacturing facility pressured up resulting in the release of diethyl benzene, ethylvinylbenzene and divinylbenzene to the air. Two employees and one member of the general public went to the plant's medical facilities as a result of the odors and received treatment.

MI20050355- Butadiene was released into the atmosphere after the valve on the tank failed at a chemical plant. One person was injured. After he was decontaminated in the shower, he was seen at the company's medical facility.

MI20050597- Improper use of the pump generator from a large truck resulted in a release of carbon monoxide. There was a malfunction in the exhaust system. One person was treated and released from the hospital for headache and dizziness.

Newaygo County
MI20050637- A running van in a garage caused a release of carbon monoxide. A man was sleeping in the van for about eight hours. He was found unconscious. EMS and police responded.

Oakland County
MI20050058- Birds nesting in a ventilation system at a school caused a carbon monoxide release. At least 50 people were evacuated. Three people suffered injuries (nausea, vomiting, headaches and episodes of fainting) and were seen by a health care provider. An additional 12 saw a health care provider just as a precaution.

Appendix 4- Events resulting in an evacuation, injury or decontamination by county, Michigan Hazardous Substances Emergency Events Surveillance, 2005

MI20050595- Improper use of a gas generator in an enclosed garage at a home caused the resident to have headache, cough and nausea. He was taken to the hospital by ambulance for treatment for carbon monoxide poisoning.

MI20050615- Use of a gas-powered power washer in a basement without ventilation caused a release of carbon monoxide. The man using the power washer was found unconcious by his wife. EMS responded and transported him to the hospital for treatment.

MI20050624- Use of a sander in a poorly ventilated factory caused a release of carbon monoxide. One employee, who experienced dizziness and nausea, was taken by EMS to the hosptial for hyperbaric treatment.

MII20050633- Use of a generator in a home caused a release of carbon monoxide. EMS responded and took one person, who experienced headache and dizziness, to the hospital for treatment.

Otsego County
MI20050480- A hunter died of carbon monoxide poisoning in his hunting shanty after using a gas generator indoors.

Ottawa County
MI20050099- Fifty employees at a chemical manufacturing facility were evacuated when the pressure regulator on the supply line of the anhydrous ammonia storage tank into the distributions system was found to be leaking.

MI20050616- Use of faulty equipment in the building of a nature center caused the release of carbon monoxide. The fire department and EMS responded. Five employees experienced headache, diziness and nausea. EMS took the employees to the hospital for treatment.

MI20050617- Use of a hi/lo and power washer in an enclosed area at a transportation facility caused the release of carbon monoxide. An employee experienced headache, nausea and heart irregularities. EMS responded and took him to the hospital for treatment.

MI20050634- Use of a power washer in an enclosed area caused a release of carbon monoxide. Two employees experienced dizziness, headache and nausea. EMS responded and took them to the hospital where they were admitted for treatment.

Presque Isle County
MI20050613- A man was working on a tractor in an enclosed garage. This caused a release of carbon monoxide. He experienced nausea and dizziness. EMS was called, and he was transported to the hospital.

Appendix 4- Events resulting in an evacuation, injury or decontamination by county, Michigan Hazardous Substances Emergency Events Surveillance, 2005

Saginaw County
MI20050603- Improper use of gas-powered machinery on a farm led to the release of carbon monoxide. Two employees experienced headaches and dizziness. EMS responded and the employees were treated and released from the local hospital.

Sanilac County
MI20050627- Use of a pneumatic propane lift in an enclosed area at a door manufacturing company caused a release of carbon monoxide. One employee, who experienced nausea and dizziness, was transported by EMS to the hospital where he was treated and released.

St. Clair County
MI20050344- An employee at a hardware store poured sulfuric acid into the drain system. Due to the fumes created, ten consumers and three employees in the card store next door had to be evacuated.

MI20050455- A group of students mixed a pop bottle bomb containing "The Works" and aluminum foil. It went off in front of their high school. The school was evacuated for three hours while the incident was investigated.

St. Joseph County
MI20050157- Coleman® fuel, used to cook methamphetamine, caused a fire in an apartment building. The "cook" had burns and blisters on his index finger from the fire. He was treated on the scene before he was arrested.

MI20050089- An officer spent two days in the hospital after he was involved in a methamphetamine lab bust. He was exposed the hydrochloric acid fumes and was wearing a mask at the time of exposure.

Shiawassee County
MI20050629- Use of a propane heater to heat a home caused a release of carbon monoxide. Eight people in the home experienced headache, nausea and vomiting. EMS responded and took them to the hospital where they were treated and released.

Van Buren County
MI20050519- Police seized a methamphetamine lab in a trailer containing Coleman fuel, anhydrous ammonia, bleach and ether. Six adults and one child were evacuated.

MI20050538- Police seized a methamphetamine lab in an apartment containing acetone, solvents, sodium hydroxide, toluene and ammonium nitrate. Three adults were evacuated from the apartment.

Appendix 4- Events resulting in an evacuation, injury or decontamination by county, Michigan Hazardous Substances Emergency Events Surveillance, 2005

Washtenaw County

MI20050393- A public middle school added a biocide to the coolant in the building's air conditioning system. This was too close to an open air intake causing ten people respiratory distress. All were treated on scene. All 600 people in the school were evacuated while it was aired out. The school rebuilt the fresh air intake so this exposure would not occur in the future.

MI20050422- A public middle school (the same as MI20050393, only this happened 1 week earlier than MI20050393) added a biocide to the coolant in the building's air conditioning system. This was too close to an open air intake causing six people respiratory distress. All were treated on scene. The school was evacuated for five hours while it was aired out. The school rebuilt the fresh air intake so this exposure would not occur in the future.

MI20050010- A cleaning crew at a retail store improperly mixed chemicals, including hydrochloric acid. This mixture created a toxic cloud causing six employees to be overcome by fumes. They were treated at a local hospital and released.

MI20050014- Three employees at an ink company tried to lift a 55-gallon drum of a chemical which is a varnish-like finish used to make magazine covers shine. The drum tipped over covering one of the employee's chest and face. Safety goggles and a quick reaction to get under the shower limited his exposure.

Wayne County

MI20050142- A pipe ruptured in the cold mill building at a steel manufacturing plant causing a spill of hydrochloric acid. Three employees in this area of the building were evacuated for four hours while the spill was cleaned up and the pipe was repaired.

MI20050230- A faulty valve fitting caused a leak of anhydrous ammonia from a compressor at a chemical manufacturing facility. The building was evacuated while repairs were made and clean up occurred.

MI20050327- A tote at an environmental waste company that had hydrogen sulfide contained in between layers of 275 gallons of waste was emptied into a below ground processing chamber. Bacterial decomposition of the organic waste caused the release of hydrogen sulfide gas. Seven people were sent to the emergency department for observation and one of them stayed overnight. All were decontaminated at the medical facility.

MI20050349- Chemical explosions from a hazardous waste recycling center caused a large fire that led to the evacuation of over 1000 people in the local neighborhoods in a quarter-mile radius around the facility. The residents were allowed back to their homes after 72 hours. About 30 people (some fire fighters)

were treated at local hospitals for minor complaints such as difficulty breathing and shortness of breath. Eleven people were decontaminated at local hospitals.

MI20050118- A homeowner knocked over a jar of mercury in the abandoned house he was restoring. He went to the hospital and was treated for mercury contamination.

MI20050429- While unloading a freight truck, three bottles of nitric acid spilled. The driver of the truck was injured.

MI20050604- Improper use of an auto/spray painter in an enclosed area at an automobile manufacturing company caused a release of carbon monoxide. One employee experienced a headache and was taken to the hospital by EMS, and was treated and released.

MI20050607- Use of a grill to heat a garage caused a release of carbon monoxide. EMS transported two people to the hospital who experienced headache and dizziness.

MI20050631- Use of a generator to heat a home caused a release of carbon monoxide. A family member found a mother and daughter, who lost consciousness, inside the home. They were transported via EMS to the hospital. The daughter was admitted and received hyperbaric treatment. The mother was treated and released.

MI20050632- A plumber in a home used a propane torch and kerosene heater in a non-ventilated home while working. He experienced headache and dizziness. He was transported to the hospital via EMS.

Unknown- Southeast Michigan

MI20050630- A faulty press at an auto manufacturing company caused the release of carbon monoxide. Four employees experienced headaches and were transported via EMS to the hospital where they were treated and released.