

Minnesota Department of Health

Hazardous Substances Emergency Events Surveillance

(HSEES)

Report for 2002 to 2003

Prepared under a Cooperative Agreement with
the Agency for Toxic Substances and Disease Registry



EXECUTIVE SUMMARY

The Hazardous Substances Emergency Events Surveillance (HSEES) system, maintained by the Agency for Toxic Substances and Disease Registry (ATSDR), actively collects information to describe the public health consequences of releases of hazardous substances in 15 states. This report summarizes the characteristics of events reported to the Minnesota Department of Health in 2002 and 2003. Information about acute events involving hazardous substances was collected, including the substance(s) released, number of victims, number and types of injuries, and number of evacuations. The data were computerized using an ATSDR-provided Web-based data entry system.

A total of 794 events were reported. In 736 (92.7%) events, only one substance was released. The most commonly reported categories of substances were other inorganic substances, pesticides, volatile organic compounds and ammonia. During this reporting period, 46 events (5.8% of all reported events) resulted in a total of 168 victims, of whom four (2.4%) died. The most frequently reported injuries were respiratory irritation, eye irritation, shortness of breath, and trauma. Evacuation reportedly was ordered for 59 (7.4 %) events.

The findings regarding the percentages of events with victims and events with evacuations and the distributions of the numbers and types of injuries reported have been fluctuating from year to year, but increasing overall.

HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE SYSTEM –

2002-2003 SUMMARY

INTRODUCTION

The Centers for Disease Control and Prevention defines surveillance as

“ongoing, 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”[1].

Since 1990, the Agency for Toxic Substances and Disease Registry (ATSDR) has maintained an active, state-based Hazardous Substances Emergency Events Surveillance (HSEES) system to describe the public health consequences of releases of hazardous substances. The decision to initiate a surveillance system of this type was based on a study published in 1989 about the reporting of hazardous substances releases to three national databases: the National Response Center Database, the Hazardous Material Information System (HMIS), and the Acute Hazardous Events Database [2]. A review of these databases indicated limitations. Many events were missed because of specific reporting requirements (for example, the HMIS did not record event involving intrastate carriers or fixed-facility events). Other important information was not recorded, such as the demographic characteristics of victims, the types of injuries sustained, and the number of persons evacuated. As a result of this review, ATSDR implemented the HSEES system to more fully describe the public health consequences of releases of hazardous substances.

HSEES has four goals:

- To describe the distribution and characteristics of acute hazardous substances releases;
- To describe morbidity and mortality among employees, responders, and the general public that resulted from hazardous substances releases;
- To identify risk factors associated with the morbidity and mortality; and
- To identify strategies that might reduce future morbidity and mortality resulting from the release of hazardous substances.

For a surveillance system to be useful, it must not only be a repository for data, but also useful to protect public health.

In the last few years, the fourth goal of the HSEES system has been emphasized; i.e., to develop strategies to reduce subsequent morbidity and mortality by having each participating state analyze its data and develop appropriate prevention outreach activities. These activities are intended to provide industry, responders, and the general public with information that can help prevent chemical releases and reduce morbidity and mortality if a release occurs.

This report provides an overview of HSEES for 2002-2003 in Minnesota, summarizes the characteristics of acute releases of hazardous substances and their associated public health consequences, and demonstrates how data from the system are translated into prevention activities to protect public health.

METHODS

Beginning in 2002, a newly updated data-collection form, approved by the Office of Management and Budget, went into effect. For each event, information was collected about the event, substance(s) released, victims, injuries, and evacuations.

Various data sources were used to obtain information about these events. These sources included, but were not limited to, the Minnesota Duty Officer, the National Response Center, the U. S. Department of Transportation Hazardous Materials Incident Reporting System, and the National Transportation Safety Board. Census data were used to estimate the number of residents in the vicinity of the events. All data were computerized using Web-based data entry system provided by ATSDR.

HSEES defines hazardous substances emergency events as uncontrolled or illegal releases or threatened releases of hazardous substances. Events involving releases of only petroleum are not included. Events are included if (1) the amount of substance released (or that might have been released) needed (or would have needed) to be removed, cleaned up, or neutralized according to federal, state, or local law; or (2) release of a substance was threatened, but the threat led to an action (for example, evacuation) that could have affected the health of employees, emergency responders, or members of the general public. HSEES defines victims as people who suffer at least one adverse health effect within 24 hours of the event or who die as a consequence of the event. Victims who receive more than one type of injury are counted once in each applicable injury type. Events are defined as transportation-related if they occur during surface, air, pipeline, or water transport of hazardous substances, or before being unloaded from a vehicle or vessel. All other events are considered fixed-facility events.

For the data analyses in this report, the substances released were categorized into 16 groups. The category “mixture” comprises substances from different categories that were mixed before the event, and the category “other inorganic substances” comprises all inorganic substances, except acids, bases, ammonia, and chlorine.

RESULTS

For 2002-2003, 794 hazardous substances emergency events were reported to Minnesota HSEES: 8 (1.0%) of these events were threatened releases. A total of 553 (69.6%) occurred in fixed facilities.

For each fixed-facility event, one or two types of area involved in the release can be selected. Of all 553 fixed-facility events, 486 (87.9%) had one type of area; 64 (11.6%), a combination of two area types, and 3 (0.5%), no type of area reported. Among events with one type of area reported, the main area was classified as follows: 138 (28.4%) ancillary processing equipment, 95 (19.5%) storage areas (i.e., tank, storage shed, and warehouse), 64 (13.2%) piping and 29 (6.0%) process vessel (a reaction chamber in which chemicals are processed). Of the 64 events with two areas,

seven (10.9%) involved ancillary processing equipments in combination with other types of area (Figure 1). Of the 241 transportation-related events, 214 (88.8%) occurred during ground transport (e.g., truck, van, or tractor), and 22 (9.1%) involved transport by rail (Figure 2). Fewer events involved water, air, and pipeline transportation modes. The largest proportion of transportation-related events occurred from a moving vehicle or vessel 102 (42.3%) and during unloading of a stationary vehicle or vessel 83 (34.4%).

Factors contributing to the events consisted of primary and secondary entries and were reported for 793 (99.9%) events (Figure 3). Of reported factors, more than half, 346 (62.6%), of fixed-facility events and 87 (36.1%) of transportation-related events involved equipment failure as the primary factor; 145 (26.2%) of fixed-facility and 147 (61.0%) of transportation-related events involved human error as the primary factor.

More than 92% of all events involved the release of only one substance. Two substances were released in 42 (5.3%) events, and approximately 2.0% involved the release of more than two substances (Table 1). Fixed-facility events were more likely than transportation events to have two or more substances involved in an event (9.2% vs. 2.9%).

A total of 875 substances were either released or threatened to be released during the 794 events. Two types of releases for each chemical (e.g., spill and air) could be reported. Of a total of 873 substances having type of release reported, only one type of release was associated with the following: spills (506, 58.0 %), air releases (275, 31.5%), fires (9, 1.0 %). Two types of releases were reported for the following combinations: spill and air releases (57, 6.5%), spills and fire (5, 0.6 %); the remainder involved other combinations of release types, or unknown release types.

The number of events by month ranged from 103 (13.0%) in June to 34 (4.3%) in January, with the largest proportions occurring from April to August. The proportion of events ranged from 16.2% to 17.1% during week days, and from 8.3% to 8.7% during weekend days. Of all 794 (100%) events for which time of day or time category was reported, 34.5% occurred from 6:00 a.m. to 11:59 a.m., 34.3% from 12:00 p.m. to 5:59 p.m., 19.4% from 6:00 p.m. to 11:59 p.m., and the remainder during the early hours of the day.

Industries

The largest proportions of HSEES events were associated with the manufacturing (36.5%) and the transportation (16.8%) industries (Table 2). However, the largest proportion of events with injuries occurred in the manufacturing industry (30.4%). The number of victims in the agriculture industry (11, 6.5%) followed the number of victims in the unspecified industries (24, 14.3%) and the manufacturing industry (97, 57.7%). Utilities services, particularly water supply, also resulted in a higher number of injuries (9, 5.4%).

Substances

A total of 875 substances were involved in all events, of which 15 (1.7%) were reported as threatened releases. The substances most frequently released were ammonia, sulfur dioxide, mercury, chlorine and heptane (Appendix A). These substances were grouped into 16 categories.

The categories most commonly involved in fixed-facility events were other inorganic substances (159, 25.4%), ammonia (91, 14.5%), and volatile organic compounds (90, 14.4%). In transportation-related events, the most common releases were pesticides (81, 32.7%), volatile organic compounds (35, 14.1%), and acids (32, 12.9%) (Table 3).

Victims

A total of 168 victims were involved in 46 events (5.8% of all events) (Table 4). Of the 46 events with victims, 25 (54.3 %) events involved only one victim, and 11 (23.9%) involved two victims. Of all victims, 150 (89.3%) were injured in fixed-facility events. Fixed-facility events were more likely to have more than one victim per event (54.5%) than were transportation events (23.1%).

To represent the magnitude of the effects of substances involved in injuries, the number of events in a specific substance category was compared with the number of events in the same category that had victims. Substances in events that involved one or more substances from the same substance category were counted once in that category. Substances in events that involved two or more substances from different categories were counted once in the multiple-substance categories. Substances released most often were not necessarily the most likely to result in victims (Table 5). For example, events involving the substance category “other inorganic substances” constituted 17.3% of all events. However, only 2.9% of these events resulted in injuries. Conversely, events involving multiple substance categories and chlorine exclusively comprised 3.3% and 5.4% of all events respectively, but 19.2% of these 26 events and 14.0% of 43 events resulted in injuries.

Employees (115, 68.5%) constituted the largest proportion of the population groups injured, followed by members of the general public (46, 27.4%) and responders (7, 4.2%) (Figure 4). Seven emergency response personnel were injured in fixed-facility events. Of those, three (42.9%) were police officers, one (14.3%) was a career firefighter, and one (14.3%) was a volunteer firefighter, one (14.3%) was an unspecified type of fire fighter, and one (14.3%) was an emergency medical responder (Figure 5). No emergency-responder victims were injured in transportation-related events.

Victims were reported to sustain a total of 227 injuries (Table 6). Some victims had more than one injury. Of all reported injuries, the most common injuries in fixed-facility events were respiratory irritation (123, 59.4%), eye irritation (21, 10.1%), shortness of breath (18, 8.7%), gastrointestinal symptoms (14, 6.8 %), other (9, 4.3%) and skin irritation (7, 3.4%). In transportation-related events, trauma (14, 70.0%), respiratory irritation (4, 20.0%), eye irritation (1, 5.0%) and chemical burns (1, 5.0%) were reported most frequently. In a large proportion of the instances, trauma might have resulted from a chain of events, such as a motor vehicle accident, leading to the release of a hazardous substance, and not necessarily by the exposure to the substance itself.

Sex was known for 164 (97.6%) of the victims; of these 110 (67.1%) were males. Males constituted 68.6 % of all employees and responders for whom sex was reported. The median age of the 127 (77.4%) victims for whom age was reported was 31 years (range: 3-77). Of these, four were children aged <10 years, and 11 were children aged 10-18 years. For the 41 (24.4%) injured

persons for whom the age was not reported, 36 (87.8%) were presumably adults (first responders and employees) and 5 (12.2 %) could have been adults or children (members of the general public or the category of victims was not known). The largest proportion of victims 113 (67.3%) were treated at a hospital, but not admitted; 18 (10.7%) were treated at a hospital and admitted, and four (2.4 %) died (Figure 6).

The status of personal protective equipment (PPE) use was reported for 113 (98.3%) employees and for seven (100%) first-responder victims. Most of these employees (60, 53.1%) and four first responders had not worn any form of PPE. Employees who wore PPE most often used eye protection (52, 98.1%) and gloves (49, 92.5%). Among first responders who wore PPE, two (66.7%) wore fire fighter turn-out gear; and one (33.3%) wore Level A protection.^a

Four events involved more than ten injured people per event. The events are as follows:

In 2002, five youths sprayed pepper spray throughout a grocery store. The county's hazardous materials responders were called to the scene, along with law enforcement, fire department, emergency medical services, and the American Red Cross. Twenty-one people sustained respiratory irritation, including thirteen members of the general public, seven employees, and one emergency medical responder. The store was evacuated for five hours.

In 2002, chlorine dioxide was released from piping in a meat processing plant. Thirty-six employees were treated at a hospital, though none were admitted, and eight were treated on site. Some employees went to the hospital for evaluation only. Symptoms included respiratory irritation, eye irritation, gastrointestinal problems, headache, and dizziness. A hazardous materials team, the company's response team, law enforcement, fire departments, emergency medical services, and hospital personnel responded to the scene.

In 2003, ammonia was released from a refrigeration system at a meat packing plant. Twenty employees were treated at a hospital for respiratory irritation. One employee was admitted to the hospital. About 150 employees were evacuated from the plant for three hours.

In 2003, about four ounces of hydrofluoric acid was released from a pump during maintenance at an oil refinery, causing 13 workers to require treatment at a hospital for respiratory irritation. Two of the workers were admitted to the hospital. Responders included the company's response team, law enforcement, and emergency medical services. The immediate area in the building was evacuated for about one hour and a half hour.

EVACUATIONS

Evacuations were ordered in 59 (7.5%) events where evacuation status was reported. Of these evacuations, 41 (69.5%) were of a building or the affected part of a building; 11 (18.6%) were of a downwind or downstream area and the remainder were of a defined circular area surrounding the event locations, of a circular and downwind or downstream area, of no criteria, or not known. The number of people evacuated was known for 56 events and ranged from zero to 350 people, with a median of 14. However, five ordered evacuations were reported as having no evacuees. The median length of evacuation was two hours. In 93.2 % of events for which evacuation was

^a Note: Firefighter turn-out gear is protective clothing normally worn by firefighters during structural fire-fighting operations and is similar to level "D" protection. Level "D" as defined by the Occupational Safety and Health Administration is coveralls, boots/shoes (leather or chemical resistant, steel toe and shank), safety glasses or chemical splash goggles, and hard hat. Level "D" provides limited protection against chemical hazards.

ordered, access to the area was restricted. Five events had in-place sheltering ordered by an official.

RESPONSE

States could report up to 10 categories of “who responded” to the event. At least one response category was reported for 717 (90.3%) of events. Of these events, 22.6% had two or more categories reported, 11.2% had three or more categories reported, 5.4% had four or more categories reported, 1.8% had five or more categories reported, four events had six categories reported, one event had seven categories reported.

The distribution of the 10 response categories are as follows^{*†}:

Company’s response team	80.6%
Fire Department	20.5%
Law enforcement agency	15.2%
Certified HazMat team	8.8%
EMT	7.0%
‘Other’	5.7%
Environmental agency	2.9%
Health Department	1.0%
Hospital personnel	0.1%
EPA response team	0.0%

* Percentages sum to greater than 100% because an event can report multiple categories.

† Based on 717 events for which at least one response category was reported.

PREVENTION ACTIVITIES

During 2002-2003 the Minnesota HSEES program performed various prevention activities. These activities included:

- Presenting overview information about the HSEES system and summary data at the National Environmental Health Association conference in Minneapolis, July 2002.
- Producing a five-page fact sheet concerning accidental chlorine releases. The fact sheet was distributed to organizations that regularly handle chlorine.
- Presenting information about acute hazardous substances releases to local Community Awareness and Emergency Response groups.
- Compiling 2002 preliminary HSEES data by county for the Minnesota County Health Tables, produced by Minnesota Department of Health. This information was loaded on the web, and receives over 2000 site visits per year.
- Organizing a one-day conference called “Plans into Action: Clandestine Drug Lab Response.” This conference was geared toward local governmental and private industry representatives with a goal of reducing injuries and public health problems associated with meth labs. There were 148 registered attendees at the conference, representing 46 of Minnesota’s 87 counties.

The Minnesota HSEES Internet website page is available at <http://www.health.state.mn.us/divs/eh/hazardous/surv/index.html>. At this site, annual reports and other information can be downloaded.

Use of HSEES data

Over the past two years, the Minnesota HSEES program experienced an increase in the number of requests for HSEES data. Many of the requests are from county government emergency planners or private industry emergency planners, who are finding it useful to review data about hazardous substances releases that have occurred within their jurisdiction or in nearby areas. In addition, emergency responder trainers are using the data as examples of actual emergencies that have occurred in particular areas. Data provided can include a general time frame of the event, description of the type of industry or organization involved, type of chemical released, and number of injuries.

The HSEES data are also being used in assessment of the overall health of a county's population. Number of releases, evacuations, and victims per year, by county, are being used as one additional measure of the safety of population within the county's limits.

As emergency preparedness continues to be a priority, HSEES data will likely continue to be a resource for preparing for future emergencies.

SUMMARY OF RESULTS, 1995 -2003

During 1995—2003, the largest proportion of events occurred in fixed facilities (Table 7). However, the number of reported transportation-related events is increasing. The increase is partially due to the utilization of the U.S. Department of Transportation's Hazardous Materials Information System as a primary notification source for transportation events. In addition, the total number of events continued to increase over time, (Figure 7). The increase in the number of events may have been due, at least in part, to the expansion of reporting sources.

In events involving victims, respiratory symptoms consistently have been most frequently reported. The number of deaths associated with events continues to suggest the need to evaluate, not only the danger posed by exposure to hazardous substances, but also the circumstances surrounding the events (e.g., a crash resulting from high-speed travel of a truck pulling an ammonia tank). Employees continue to be the most commonly reported victims of emergency events. However, members of the general public and responders constitute a large proportion as well (Figure 8).

The findings from the HSEES data analyses regarding the proportions of the number of events with victims and events with evacuations and the distributions of the numbers and types of injuries reported have been consistent over time.

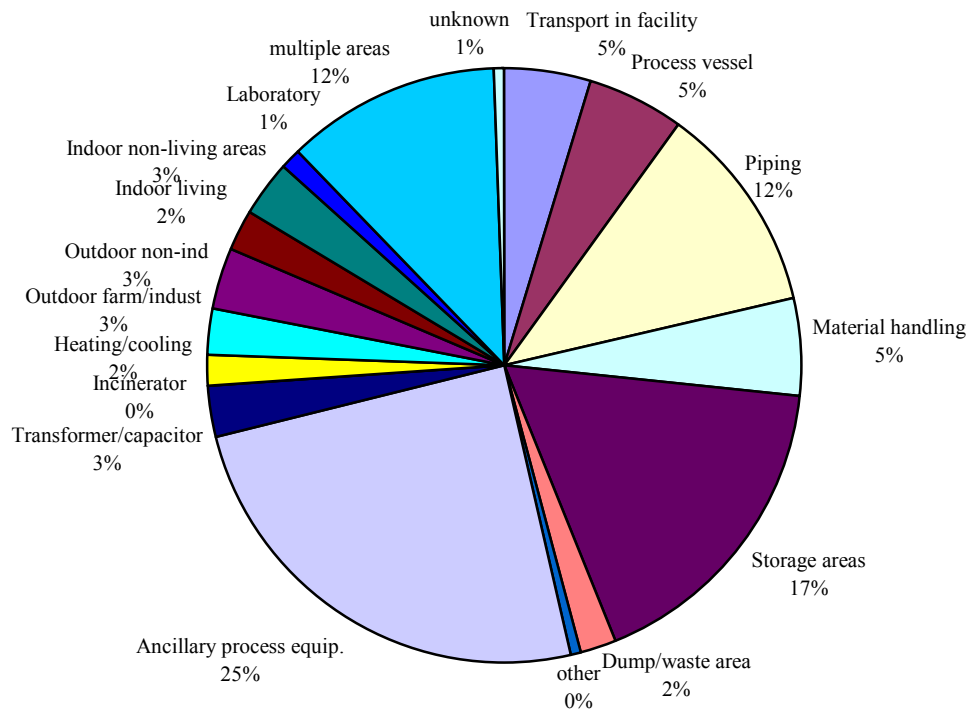
REFERENCES

1. Centers for Disease Control and Prevention: Comprehensive plan for epidemiologic surveillance. Atlanta: US Department of Health and Human Services; (1986)
2. Binder S. Death, injuries, and evacuations from acute hazardous materials releases. Am J Public Health 1989; 70:1042-4.

Appendix A. — The 10 most frequent substances involved in events, Minnesota Hazardous Substances Emergency Events Surveillance, 2002-2003

Number	Standardized Substance Name	No. of releases
1	Ammonia	100
2	Sulfur Dioxide	57
3	Mercury	32
4	Chlorine	27
5	Heptane	26
6	Ethyl Alcohol	20
7	Polychlorinated Biphenyls	16
8	Sulfuric Acid	14
9	Sodium Hydroxide	14
10	Sodium Hypochlorite	14

Figure 1. –Areas of fixed facilities involved in events, Minnesota Hazardous Substances Emergency Events Surveillance, 2002-2003



Indoor living = a place that is a residence

Indoor non-living = inside at a place that is not a residence (e.g., farm, industry, commercial business, and school)

Outdoor nonind - outside at a place that is nonindustrial, or nonfarming (e.g., driveways, yards, roofs at residences, and schools).

Outside ind = outside at an industry or farming area

Figure 2. –Distribution of transportation-related events, by type of transport, Minnesota Hazardous Substances Emergency Events Surveillance, 2002-2003

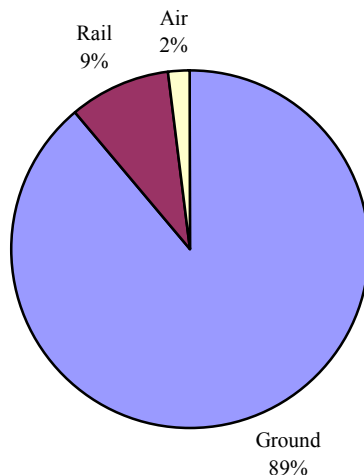


Figure 3. –Factors contributing to events, Minnesota Hazardous Substances Emergency Events Surveillance, 2002-2003

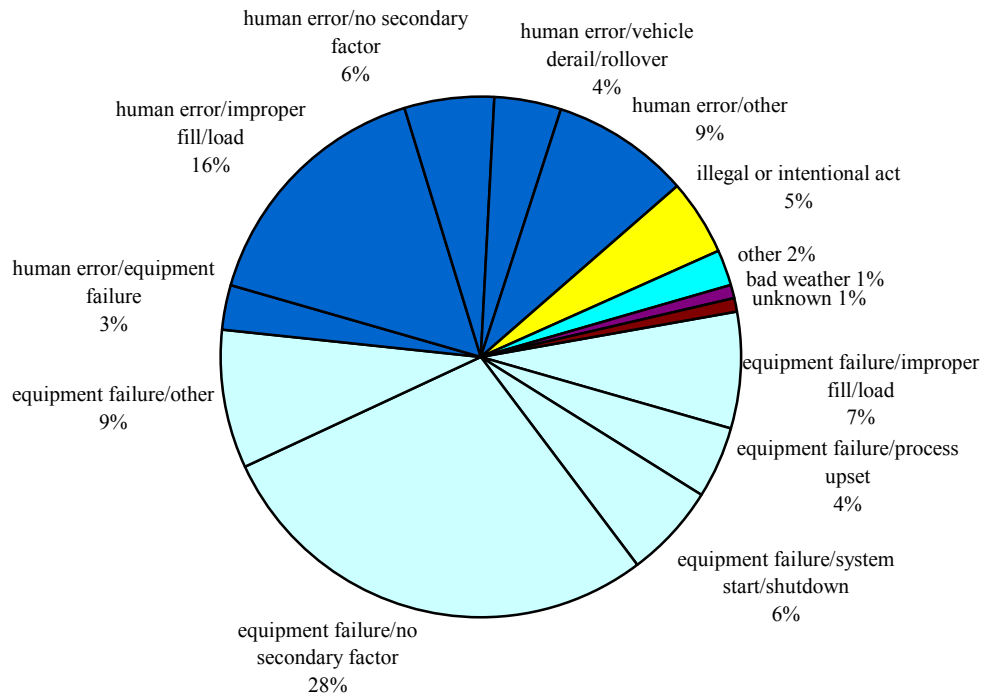


Figure 4. –Distribution of victims, by population group and type of event, Minnesota Hazardous Substances Emergency Events Surveillance, 2002-2003

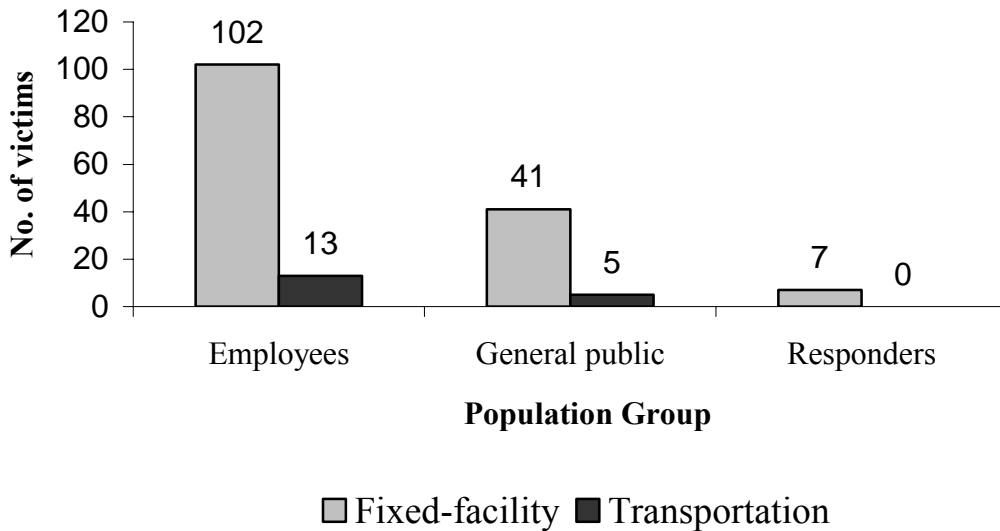


Figure 5. –Number of responders injured by population group, Minnesota Hazardous Substances Emergency Events Surveillance, 2002-2003

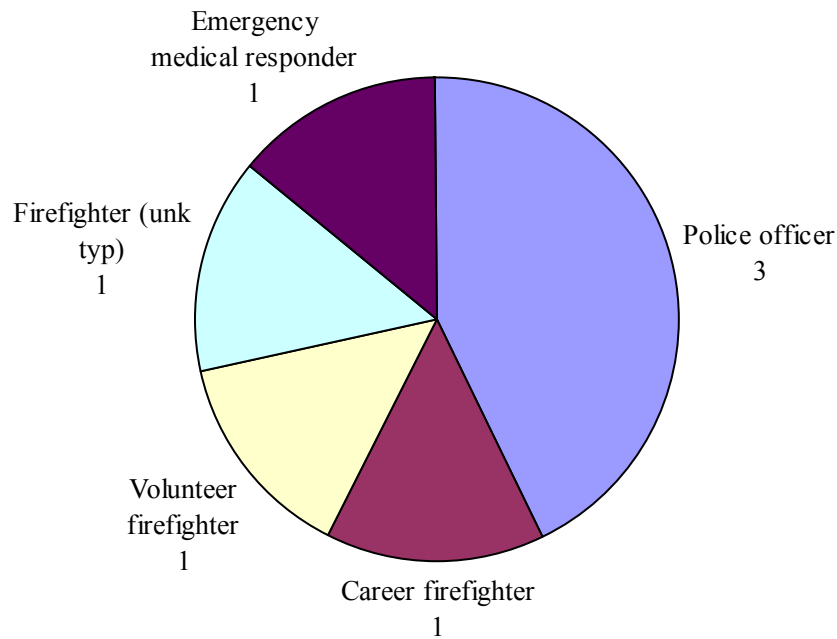


Figure 6. –Injury outcome, Minnesota Hazardous Substance Emergency Events Surveillance, 2002-2003

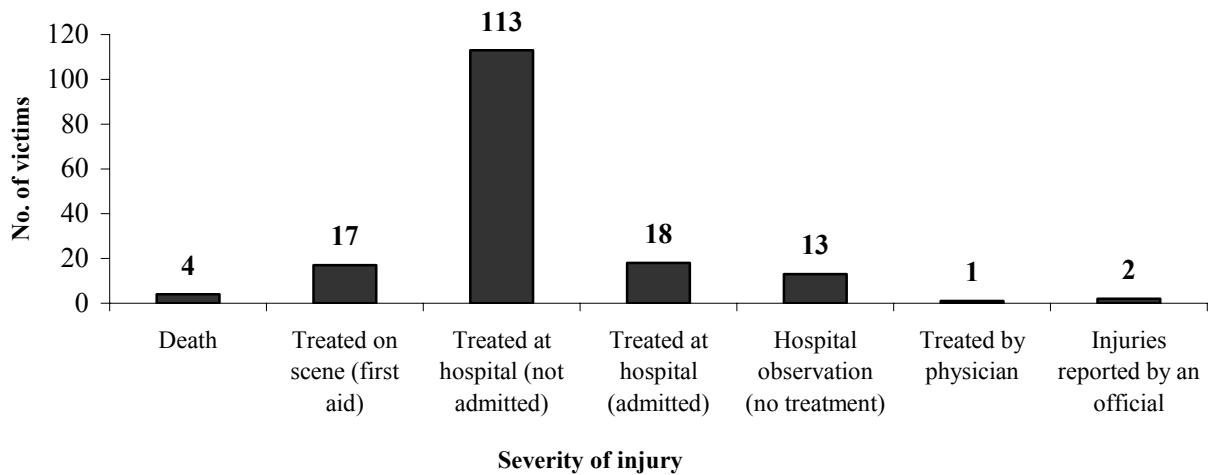


Figure 7. –Minnesota Hazardous Substances Emergency Events Surveillance Events, 1995-2003

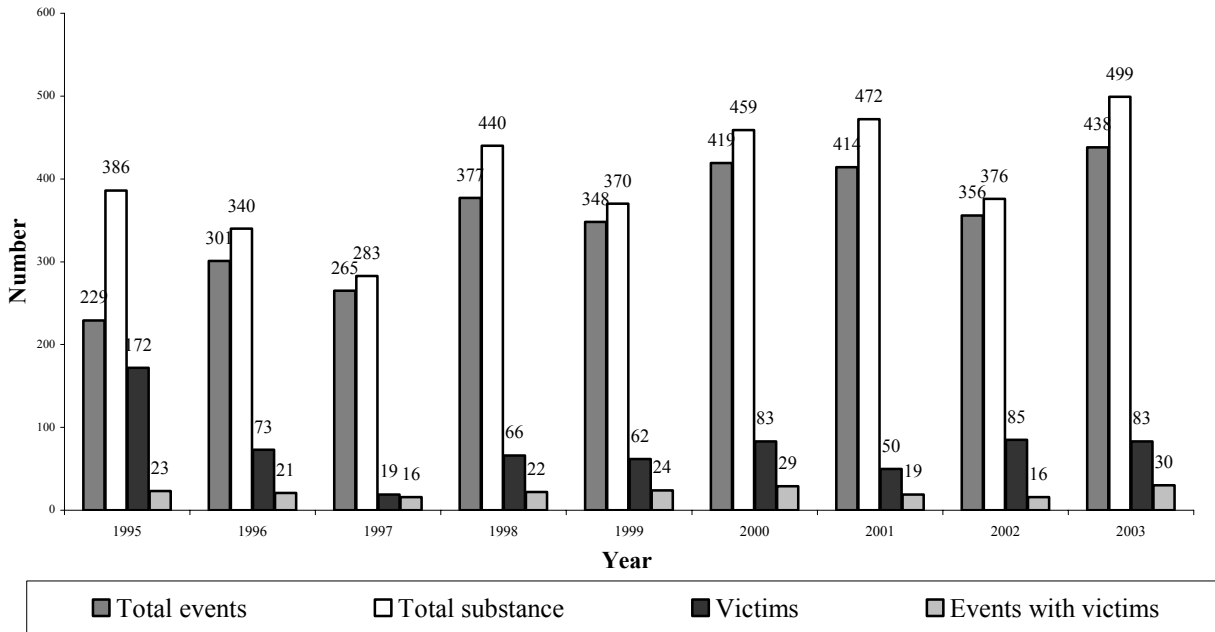


Figure 8. –Distribution of victims, Minnesota Hazardous Substances Emergency Events Surveillance, 1995-2003

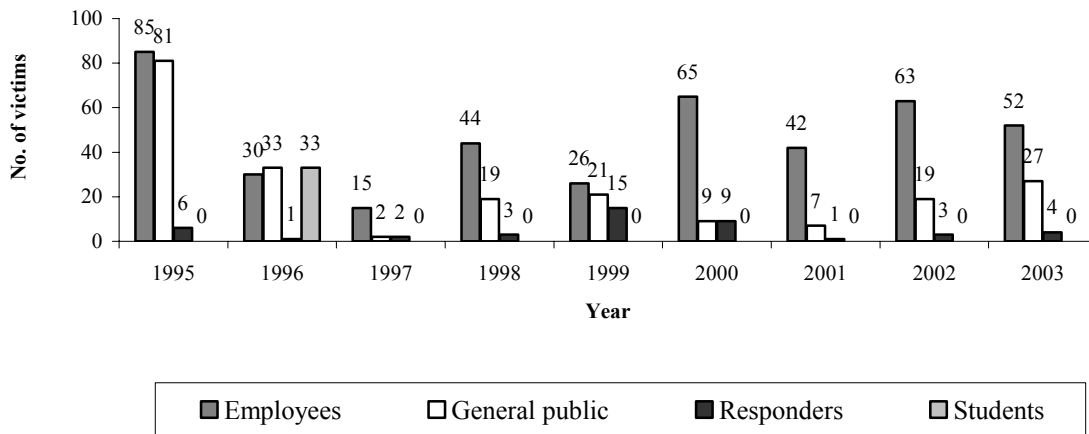


Table 1. – Number of substances involved per event, by type of event, Minnesota Hazardous Substances Emergency Events Surveillance, 2002-2003

No. substances	Type of event						All events		
	Fixed facility			Transportation					
	No. events	%	Total substances	No. events	%	Total substances	No. events	%	Total substances
1	502	90.8	502	234	97.1	234	736	92.7	736
2	35	6.3	70	7	2.9	14	42	5.3	84
3	9	1.6	27	0	0	0	9	1.1	27
4	7	1.3	28	0	0	0	7	0.9	28
≥ 5	0	0	0	0	0	0	0	0	0
Total	553	100	627	241	100	248	794	100	875

Table 2. –Industries involved in hazardous substances events, by category, Minnesota Hazardous Substances Emergency Events Surveillance, 2002-2003.

Industry category	Total events		Events with victims		Percentage all events with victims	Total no. victims # (range)*
	No.	%	No.	%		
Agriculture	114	14.4	8	17.4	7.0	11 (1-4)
Mining	3	0.4	0	0	0	0 (0)
Construction	5	0.6	1	2.2	20	1 (1)
Manufacturing	290	36.5	14	30.4	4.8	97 (1-44)
Transportation	133	16.8	3	6.5	2.3	4 (1-2)
Communications	0	0	0	0	0	0 (0)
Utilities	67	8.4	4	8.7	6.0	9 (1-4)
Wholesale trade	66	8.3	5	10.9	7.6	5 (1)
Retail trade	16	2	0	0	0	0 (0)
Finance	1	0.1	0	0	0	0 (0)
Business and repair services	6	0.8	1	2.2	16.7	1 (1)
Personal services	25	3.1	1	2.2	4	5 (5)
Entertainment	10	1.3	2	4.3	20	4 (1-3)
Professional services	30	3.8	3	6.5	10	6 (1-3)
Public administration	7	0.9	1	2.2	14.3	1 (1)
Unspecified/not applicable	21	2.6	3	6.5	14.3	24 (1-21)
Total	794	100.0	46	100.0		168

*Range of number of victims per event with victims.

Table 3. –Number of substances involved, by substance category and type of event, Minnesota Hazardous Substances Emergency Events Surveillance, 2002-2003

Substance category	Type of event				All events	
	Fixed facility		Transportation			
	No. substances	%	No. substances	%	No. substances	%
Acids	32	5.1	32	12.9	64	7.3
Other*	31	4.9	9	3.6	40	4.6
Mixture†	16	2.6	16	6.5	32	3.7
Ammonia	91	14.5	14	5.6	105	12.0
Bases	22	3.5	17	6.9	39	4.5
Chlorine	42	6.7	3	1.2	45	5.1
Other inorganic substances‡	159	25.4	19	7.7	178	20.3
Paints & dyes	10	1.6	5	2.0	15	1.7
Pesticides	50	8.0	81	32.7	131	15.0
Polychlorinated biphenyls	15	2.4	1	0.4	16	1.8
Volatile organic compounds	90	14.4	35	14.1	125	14.3
Formulations	6	1.0	0	0	6	0.7
Hetero-Organics	9	1.4	0	0	9	1.0
Hydrocarbons	5	0.8	2	0.8	7	0.8
Oxy-Organics	42	6.7	5	2.0	47	5.4
Polymers	7	1.1	9	3.6	16	1.8
Total§	627	100.1	248	100	875	100

* Not classified.

† Substances from different categories that were mixed prior to the event.

‡ All inorganic substances except for acids, bases, ammonia and chlorine.

§ Total may not equal 100.0% due to rounding.

Table 4. –Frequency of the number of victims by type of event, Minnesota Hazardous Substances Emergency Events Surveillance, 2002-2003

No. victims	Type of event						All events		
	Fixed facility			Transportation					
	No. of events	%	Total victims	No. events	%	Total victims	No. events	%	Total victims
1	15	45.5	15	10	76.9	10	25	54.3	25
2	9	27.3	18	2	15.4	4	11	23.9	22
3	2	6.1	6	0	0	0	2	4.3	6
4	2	6.1	8	1	7.7	4	3	6.5	12
5	1	3.0	5	0	0	0	1	2.2	5
≥ 6	4	12.1	98	0	0	0	4	8.7	98
Total*	33	100.1	150	13	100	18	46	99.9	168

* Total may not equal 100.0% due to rounding.

Table 5. –Frequency of substance categories in all events and events with victims, Minnesota Hazardous Substances Emergency Events Surveillance System, 2002-2003.*

Substance category	All events		Events with victims		
	No.	%	No.	Percentage of all releases with victims	Percentage of events with victims in substance category
Acids	58	7.3	4	8.7	6.9
Other†	36	4.5	1	2.2	2.8
Mixture‡	30	3.8	3	6.5	10.0
Ammonia	105	13.2	10	21.7	9.5
Bases	38	4.8	1	2.2	2.6
Chlorine	43	5.4	6	13.0	14.0
Other inorganic substances¶	137	17.3	4	8.7	2.9
Paints & dyes	15	1.9	1	2.2	6.7
Pesticides	119	15.0	6	13.0	5.0
Polychlorinated biphenyls	15	1.9	0	0.0	0
Volatile organic compounds	102	12.8	3	6.5	2.9
Multiple substance categories	26	3.3	5	10.9	19.2
Formulations	6	0.8	0	0.0	0
Hetero organics	1	0.1	0	0.0	0
Hydrocarbons	3	0.4	0	0.0	0
Oxy-organics	44	5.5	2	4.3	4.5
Polymers	16	2.0	0	0.0	0
Total€	794	100	46	99.9	

*Substances in events that involved multiple substances were counted only once in a substance category when all the substances were associated with the same category. If events that involved multiple substances from different substance categories they were counted only once in the multiple substance categories.

†Not classified.

‡Substances from different categories that were mixed prior to the event.

¶All inorganic substances except for acids, bases, ammonia, and chlorine.

€ Total may not equal 100.0% due to rounding.

Table 6. –Frequencies of injuries/symptoms, by type of event, * Minnesota Hazardous Substances Emergency Events Surveillance, 2002-2003

Injury/symptom	Fixed facility		Transportation		All events	
	No. injuries	%	No. injuries	%	Total no.	%
Trauma	1	0.5	14	70.0	15	6.6
Respiratory	123	59.4	4	20.0	127	55.9
Eye	21	10.1	1	5.0	22	9.7
Gastrointestinal system	14	6.8	0	0.0	14	6.2
Heat stress	0	0.0	0	0.0	0	0.0
Chemical burns	2	1.0	1	5.0	3	1.3
Other	9	4.3	0	0.0	9	4.0
Skin	7	3.4	0	0.0	7	3.1
Dizziness or other central nervous system	6	2.9	0	0.0	6	2.6
Headache	6	2.9	0	0.0	6	2.6
Heart problems	0	0.0	0	0.0	0	0.0
Shortness of breath	18	8.7	0	0.0	18	7.9
Total†	207	100.0	20	100.0	227	99.9

*The number of injuries is greater than the number of victims (168) because a victim could have had more than one injury.

†Total may not equal 100.0% due to rounding.

Table 7.— Cumulative data by year, Minnesota Hazardous Substances Emergency Events Surveillance, 1993-2003.*

Year	Type of event			No. substances Involved	No. victims	No. deaths	Events with victims	
	Fixed facility	Transportation	Total				No.	%†
1995	193	36	229	386	172	0	23	11.5
1996	224	77	301	340	73	0	21	10.5
1997	194	71	265	283	19	1	16	8.0
1998	341	36	377	440	66	0	22	11.0
1999	287	61	348	370	62	0	24	12.0
2000	346	73	419	459	83	1	29	14.5
2001	338	76	414	472	50	0	19	9.5
2002	230	126	356	376	85	1	16	8.0
2003	323	115	438	499	83	3	30	15.0
Total	2476	671	3147	3625	693	6	200	

* Numbers in the table may differ from those reported in previous years because of adjustments in HSEES qualification requirements for events.

† Percentage of events with victims