

**Minnesota Department of Health**

**Hazardous Substances Emergency Events Surveillance**

**(HSEES)**

**Report for 1998 to 2001**

## EXECUTIVE SUMMARY

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 associated with the release of hazardous substances. Since 1995, the Minnesota Department of Health has participated in this surveillance system. This report summarizes the characteristics of events reported to the surveillance system by the Minnesota Department of Health during 1998 to 2001.

Information on acute hazardous substances emergency events was collected. The types of data collected included general information on the event, substance(s) released, number of victims, number and types of adverse health effects experienced by the victims, and number of evacuations.

Several data sources were used to obtain the maximum amount of information about each event. These sources included, but were not limited to, Minnesota Duty Officer, various state agencies, local law enforcement and emergency responders, and responsible parties. Prior to January 2000, the data obtained were computerized using an ATSDR-provided data entry system and were sent to ATSDR quarterly. Beginning in January 2000, data were entered into a Web-based data entry system that allows for real-time data entry.

The Minnesota Department of Health reported a total of 1558 events for 1998 to 2001; 1312 (84.2%) of the events occurred at fixed facilities, and 246 (15.8%) were transportation related. Equipment failure, 597 (45.5%), was the contributing factor for the majority of fixed facility releases. In 95.8% of the events, only a single substance was released. The most commonly reported categories of substances were other inorganic substances; a category designated "other," which included substances that could not be placed in one of the other 10 categories; volatile organic compounds; mixtures involving substances from more than one category, i.e. that were mixed prior to the event; and pesticides. During this reporting period, 94 events (approximately 6.0% of all reported events) resulted in a total of 261 victims. The adverse health effects most frequently experienced by victims were respiratory problems (39.6%), gastrointestinal problems (11.7%), eye irritation (9.3%), and headache (7.5%). One person died as a result of all events, and 165 events required evacuations.

The Minnesota HSEES program has seen a doubling of events between 1995 and 2001. This increase in the annual number of events is primarily due to better reporting, that is more events are reported instead of an actual increase in the number of emergency releases.

# **HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE (HSEES)**

## **INTRODUCTION**

The surveillance system has four goals:

- To describe the distribution and characteristics of hazardous substances emergencies.
- To describe the morbidity and mortality experienced by employees, responders, and the general public as a result of hazardous substances releases.
- To identify risk factors associated with the morbidity and mortality.
- To identify strategies that might reduce future morbidity and mortality resulting from the release of hazardous substances.

This report summarizes the characteristics of hazardous substances releases and the associated public health consequences of events reported to the surveillance system during 1998 to 2001.

## **METHODS**

Releases are eligible for inclusion if they are uncontrolled or illegal and require removal, cleanup, or neutralization according to federal, state, or local law. Threatened releases are also included in the system if 1) they involve actions such as evacuations, which are taken to protect the public health, and 2) they would have required removal, cleanup, or neutralization according to federal, state, or local law. A substance is considered hazardous if it can be reasonably expected to cause injury or death to an exposed person. For inclusion in the Minnesota HSEES program, most releases must be at least 10 pounds or 1 gallon. Releases of extremely hazardous substances or undiluted pesticides are included regardless of quantity. Releases occurring to air and water that could not be cleaned up are also included in the system if the amount released would have needed to be cleaned up if the spill had occurred on land. Events involving only petroleum products are excluded.

Various data sources were used to obtain information about these events. These sources included, but were not limited to, Minnesota Duty Officer, various state agencies, local law enforcement and emergency responders, and responsible parties. Census data were used to estimate the number of residents living in the vicinity of the events. For each event, information was collected about the type of event (fixed-facility or transportation-related event); substance(s) released (identity, chemical form, type of release, and quantity released); victim(s) (population group, type of injury sustained, medical outcome, demographics, personnel protective equipment [PPE] worn, and

distance from the event); the type of area in which the event occurred; date and time of occurrence; numbers of persons potentially affected; use of environmental sampling; evacuations; response plans; and causal factors.

Emergency events captured by HSEES 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. Victims are defined as individuals with symptoms (including psychological stress) or injuries (including death) that result from the event. Victims who receive more than one type of injury are counted once in each applicable type of injury.

Substances are grouped into 11 categories: acids, ammonia, bases, chlorine, mixtures, paints and dyes, pesticides, polychlorinated biphenyls, volatile organic compounds (VOCs), other inorganic substances, and other substances. The “mixtures” category consists of chemicals from different categories that are mixed before release, and the “other” category consists of chemicals that cannot be classified into any one of the other 10 chemical categories. The category “other inorganic substances” comprises all inorganic substances except acids, bases, ammonia, and chlorine.

Prior to January 2000, data were computerized using a data entry system provided by ATSDR, and sent to ATSDR quarterly. Beginning in January 2000, data were entered into a Web-based data entry system. ATSDR performs data management, data analysis, and report generation of the entered data. ATSDR provides the Minnesota Department of Health with its own state-level data for analysis and report generation purposes. HSEES data are then used for prevention activities by ATSDR and by the Minnesota Department of Health.

## **RESULTS**

A total of 1558 hazardous substances emergency events were reported in 1998-2001 to the HSEES system by the Minnesota Department of Health; 22 (1.4%) of these events were threatened releases. 1312 (84.2%) of the events occurred at fixed facilities, and 246 (15.8%) were transportation-related events (Table 1). Table 2 shows the number of events by county and type of event.

Of the 1312 fixed facility events, 265 (20.2%) were in above ground storage, 248 (18.9%) were from piping systems, 166 (12.7%) were from process vessels, 146 (11.1%) occurred while handling materials, and 145 (11.1%) occurred in ancillary process equipment (Figure 1). In transportation-related events, 216 (87.8%) occurred during ground transport (for example, truck, van, or tractor), and 19 (7.7%) involved transport by rail (Figure 2). The remaining transportation-related events involved water, air, or pipeline transport.

Factors contributing to events were also reported for fixed facilities (Figure 3). Equipment failure was a contributing factor in 597 (45.5%) of the events. 343 (26.1%) events were reported as involving human error, 72 (5.5%) involving system/process upset, and the remainder were attributable to other factors. (Information on factors contributing to transportation events was not collected until 2000.)

95.8% of all events involved the release of only one substance. Two substances were released in approximately 2.8% of the events, and the remainder involved the release of more than two substances (Table 3).

1741 chemicals were either released or threatened to be released in the events. 1702 (97.8%) of the substances were actually released, and 8 (2.2%) of the substances were threatened to be released, and 1 was unknown. The number of substances released was higher than the number of events, because some events had multiple substances released (see Table 3). Most substances released were either spills 1020 (58.6%) or air emissions 468 (26.9%). Of the spills, 798 (78.2%) occurred in fixed-facility events. Of the air emissions, 456 (97.4%) occurred in fixed-facility events. The remaining releases resulted from fires (5.8%) or other types of releases (or combinations of types of releases) (8.7%).

Of the events with known time of occurrence, 37.9% occurred primarily from 6:00 AM to 12 noon, and 35.8% from 12 noon to 6:00 PM. Approximately 16.9% of events occurred on a Saturday or Sunday. During 1998 to 2001, the spring planting season (April, May, and June) had over twice as many events (542) (34.8%) as the first 3 months of the year (266) (17.1%). Late summer (July, August, and September) had 422 (28.4%) events and fall (October, November, and December) had 308 (19.8%) events.

## **SUBSTANCES**

Of the 11 categories into which HSEES substances were grouped, the categories of substances most commonly released in fixed-facility events were other inorganic substances (18.4%), other substances not otherwise specified (17.6%), and volatile organic compounds (14.6%) (Table 4). In transportation-related events, pesticides (25.5%), other substances not otherwise specified (21.9%), and other inorganic substances (10.6%) were most frequently released. The 10 substances most frequently released in Minnesota for 1998-2001 are listed in Appendix A.

## **VICTIMS**

A total of 261 victims were involved in 94 events (6.0% of all events) (Table 5). Of the events with victims, 58.5% involved only one victim, and 75.5% involved either one or two victims. Events with victims are a smaller percent (5.5%) of fixed facility events than they are of transportation events (8.9%).

The substances released may not necessarily be the most likely to result in victims (Table 6). For example, other inorganic substances and other substances not otherwise specified were released 617 times (35.4% of all chemicals released); however, only 36 (5.8%) of these releases resulted in adverse health effects. Conversely, pesticides were released only 191 (11.0% of all chemicals released), and 37 (19.4%) of these releases resulted in adverse health effects, indicating greater potential for immediate harm.

The population groups most often adversely affected were employees (67.8%) and general public (21.5%) (Figure 4). There were 26 first responder victims in fixed-facility events. Of those, 46.2% were volunteer fire fighters, 30.8 % were police officers, 11.5% were EMTs, 7.7% were professional fire fighters, and 3.8% were unknown type of responder (Figure 5). There were 2 first responder victims in transportation-related events. Of these, 1 was a police officer and 1 was an unknown type of responder.

The types of adverse health effects sustained by victims are shown in Table 7 and Figure 6. The victims sustained a total of 454 adverse health effects (injury/symptom), and some victims had more than one adverse health effect. The most commonly reported adverse health effects in fixed-facility events were respiratory problems (41.1%), gastrointestinal problems (12.4%), and eye irritation (9.4%). In transportation-related events, trauma (64.3%), respiratory problems (17.9%), and eye irritation (7.1%) were reported most frequently. Trauma was reported more frequently in transportation-related events (64.3%) than in fixed-facility events (1.2%). The trauma might have been caused by the sequence of events (for example, a motor vehicle accident) leading to the release of a hazardous substance, and not necessarily by exposure to the hazardous substance itself.

The sex of 88.9% of the victims was known; of these, 66.8% were male. For the 19 emergency responders with known sex, 18 were male and 1 was female. Employee victims, with known sex (168), were 31.0% female and 69.0% male. General public victims, with known sex (45), were nearly evenly split between females (53.3%) and males (46.7%). The age of 60.5% of the victims was known; of these, the mean age was 32 years (range: 1-76 years). The majority of victims (55.9%) were treated at a hospital and released; an additional 16.9% were treated at a hospital and admitted, while 13.4% were treated at the scene (Figure 7).

Among victims, 74.0% of employees and 46.4% ( 42.9% None and 3.6% Unknown) of first responders had not worn any form of PPE. For employee victims reported as wearing PPE, 80.4% wore gloves, 78.3% wore eye protection, and 52.2% wore steel-toed shoes. Of the first responder victims, the most frequently worn PPE was Firefighter turn out gear (67.7%) and Level B (26.7%).

Level "A" protection is worn when the highest level of respiratory, skin, and eye protection is needed. It includes a supplied-air respirator, approved by the Mine Safety and Health Administration (MSHA), U.S. Department of Labor, and the National Institute for Occupational Safety and Health (NIOSH); pressure-demand, self-contained breathing apparatus; fully encapsulating chemical-resistant suit; coveralls; long cotton

underwear; chemical resistant gloves (inner); boots, chemical-resistant, steel toe and shank; hard hat; disposable gloves and boot covers; cooling unit; and 2-way radio communications. Level "D" is worn as a work uniform and is not recommended for sites with respiratory or skin hazards. Level "D" includes coveralls, gloves, boots/shoes (leather or chemical-resistant, steel toe and shank), safety glasses or chemical splash goggles, and hardhat. Level "D" provides no protection against chemical hazards. Firefighter turnout gear is protective clothing normally worn by firefighters during structural fire-fighting operations, and is similar to level "D" protection.

One person died in a of a hazardous substances release. This person was a male employee, about 35 years old, who died due to trauma when the truck he was driving went off the road.

## **EVACUATION**

Evacuations were ordered in 165 (10.6%) events and the evacuation status of 2 (0.1%) events was unknown. Of known evacuations, 128 (77.6%) were of a building or the affected part of a building, 36 (21.8%) were of an area besides an affected building, and 1 (0.6%) were reported as having no criteria. The median number of persons evacuated was 19 (range: 1-1500), and the median length of evacuation was 2 hours (range: 1-264). In 10 events, in-place sheltering was ordered by an official, and instructions regarding precautions to take during in-place sheltering were provided by an official in 9 (90%) of these events.

## **CONTINGENCY PLANS**

A contingency or preparedness plan was used for 1383 (88.8%) of the events. The types of contingency or preparedness plans used during an event varied, company's operating procedures were used for 940 (68.0%), HazMat/response team standard operating procedures were used for 387 (28.0%), other plans were used for the remaining 56 (4.0%) events.

## **USES OF HSEES DATA**

### **Outreach and education activities**

The HSEES coordinator provides information from the HSEES database for training and educational purposes. Information on emergency releases provided to the State Fire Marshall's Office was used for planning the location, training, and equipment needs for Chemical Assessment Teams and Hazardous Materials Response Teams. The HSEES information was also used in training of Public Health Nurses to increase awareness of their role in emergency response, and to encourage them to be actively involved with County Emergency Managers in developing Emergency Response Plans. This training occurred as part of the Eighth Annual Public Health Nursing Practices Workshop held by the Local Public Health Association of Minnesota in October of 1998.

Analyses of HSEES data resulted in several activities and publications for the years 2000 and 2001.

1. Analysis of ammonia releases culminated in the writing of “A Description of Agricultural Releases of Anhydrous Ammonia in Minnesota.” This report was published in the November/December issue of the Journal of Chemical Health & Safety in 2000.
2. An article entitled “April Showers Bring May Ammonia Releases” was written using information developed for the publication in (1). This second article was published in the March/April issue of the Minnesota State Fire Chiefs’ Magazine in 2000.
3. In April of 2000, the MN HSEES coordinator presented information on mercury releases in schools at the Minnesota Science Teachers Association Spring Conference in Rochester, MN. The presentation, along with John Gilkenson’s (MN Office of Environmental Assistance) presentation, was aimed at convincing teachers to remove mercury from their schools. The material from the presentation was displayed for both days of the conference.
4. Data on location of hazardous chemical spills and types of material released were used by the MDH Wellhead Protection Program to identify events in wellhead protection areas within the State using a geographic information system.
5. The “Hazardous Substances Emergency Events Surveillance 3-Year Cumulative Report for Minnesota” was posted on the MDH web site. Notice of the posting, with a copy of the executive summary, was mailed to 111 county emergency managers, environmental officers at major companies, and state agencies. This mailing was aimed at generating awareness among these groups of people on the availability of information related to acute releases of hazardous substances in the HSEES database. It also served to inform HSEES contacts in industries that their participation in the HSEES program has produced tangible results.
6. Pesticide applicators must attend annual training to renew their license with the MN Department of Agriculture. The MN Pesticide & Education Organization conducts the training as part of their annual conferences. The MN HSEES program provided six scenarios to a private trainer, Thomas O. Murdock, Ph.D. Dr. Murdock conducted training using these scenarios at the annual conferences. The topic of his presentation was “Pesticide Emergency Response Plans and Spill Mitigation Strategies.”
7. A proposed expansion of the Dakota, Minnesota and Eastern Railroad (DM&E) could result in up to 40 extra trains per day traveling through cities along the railway. Copies of “Public Health Risks of Railroad Hazardous Substances Emergency Events” (2001) (J Occup Environ Med., 43(2):94-100) were provided to local government agencies and public organizations concerned about the proposed expansion of the DM&E. This report describes the increased risks associated with railroad events compared with other events. These groups cited the article when they proposed upgraded crossings, bypasses, and large setbacks in areas near the proposed rail line. The Surface Transportation Board has not issued a determination in DM&E’s proposal.



8. HSEES data was used by John Gilkenson's (MN Office of Environmental Assistance) to generate support for legislation banning the sale of mercury thermometers in Minnesota. The MDH Commissioner wrote a letter of support for this legislation based in part on the recommendation of the HSEES program. The legislation was passed banning the sale of mercury thermometers in Minnesota, with certain exemptions.
9. Hazardous substances emergency events surveillance data were summarized by county, and the summary reports for 1995, 1997, and 1999 were provided to the 87 counties in Minnesota.

### **Collaborative efforts**

The cooperation between HSEES and the Minnesota Clandestine Drug Labs Program continues to be strengthened. HSEES expertise in emergency event response planning informs the activities of the clandestine drug labs staff, while the clandestine drug labs staff can be used to enhance the policy/planning activities and outreach activities of the HSEES program. During 1997, the Minnesota HSEES program received its first reports of clandestine drug labs that occur in Minnesota. In response to these notifications, the Site Assessment and Consultation Unit (which administers the HSEES program) developed a fact sheet, "Potential Environmental Hazards at Illegal Drug Lab Sites: An Advisory Note to Law Enforcement Officials". This fact sheet was mailed, with an accompanying letter, to local law enforcement and public health officials who have jurisdiction over locations where clandestine drug labs were discovered. Local officials, alerted to the environmental health risks by the fact sheet, soon began asking MDH for guidance in cleanup of clandestine drug labs. A staff member began to research clandestine drug labs response in other states, and started to create a MDH clandestine drug labs' guidance in 1998.

The number of clandestine drug labs reported to MDH continued to rise in 1999, and the MDH continued to see a sharp increase in the number of requests for assistance and guidance regarding clandestine drug lab cleanup, staff safety, and child protection issues. These calls came from state and local agencies, as well as private citizens involved in some aspect of a clandestine drug lab incident. This led the Division of Environmental Health to hold strategy sessions in early 2000 to determine how MDH should respond to the growing demand for information and advise related to clandestine drug labs. As a result of these sessions, a request for a new departmental clandestine drug labs program was approved by the governor and submitted to the state legislature. This request was approved during the 2001 legislative session and MDH received appropriations to fund this program beginning in fiscal year 2002. Staff was assigned to the program beginning in July 2001. The Minnesota Clandestine Drug Labs Program has a major focus on methamphetamine laboratories, with new and growing attention to methcathinone.

Two documents on health, safety, remediation issues, and cleanup guidelines for clandestine drug labs in Minnesota have been revised. Another document, 'State and Local Environmental Health (EH) Staff Roles and Responsibilities in a Clandestine Lab

Situation' is being developed and will be sent to all state and local environmental health staff working in Minnesota. This will also be followed with training. The 'Minnesota Clandestine Drug Lab Manual' has been sent to Minnesota Community Health Service (CHS) Administrators, County Attorneys, Environmental Health Directors, County Emergency Managers, local law enforcement, Tribal health Directors, and others in 87 Minnesota Counties. Training sessions will correspond with materials offered in this manual and topics include lab awareness, child evaluation and treatment, MDH cleanup guidelines, staff safety, cleanup assessment, notification and follow-up, and ordinance mechanism. The information in the manual will help people to build capacity to respond in a variety of situations involving chemical emergency releases.

The clandestine drug labs staff plan to collaborate with major Minnesota retailers in creating a program to increase awareness of clandestine drug lab activity and knowledge of ingredients purchased in retail establishments, and to limit sales of precursor products at the cash register. There are also plans to disseminate information developed by this program through other forms of media, such as television and radio spots available in other organizations and states. A clandestine drug labs database is being built within this program at MDH. The purpose of this database is to document lab activity, help to focus resources in areas where they are needed, and provide a place where the public can find record of residential labs and cleanup status. Again, these activities will have relevance for developing the capacity to prevent or respond to other kinds of criminal or terrorist activities involving purchases of chemicals.

## **SUMMARY OF RESULTS, 1993–2001**

The number of events, substances released, events with victims, and deaths for the years 1995 through 2001 are shown in Table 8. The number of transportation events remains relatively constant. The number of fixed facility events continues to grow, probably due to better reporting. Since most events have a single chemical released (95.8%, Table 3), the number of chemicals has grown along with the number of events (see Figure 9). The majority of victims continue to be employees (Figure 8). Due to a few events with large numbers of victims, the categories in Figure 8 are fairly sporadic.

Both anecdotal and quantitative information from the Minnesota HSEES data provide useful knowledge. Some uses of this knowledge are described above in the USES OF HSEES DATA section. Additional collection and evaluation of HSEES data should produce additional benefits.

## APPENDICES

Appendix A—The 10 Most Frequently Released Substances, Hazardous Substances  
Emergency Events Surveillance, Minnesota, 1998-2001.

Number	Standardized Substance Name	Frequency
1.	Ammonia	163
2.	Ethylene Glycol	52
3.	Sulfuric Acid	51
4.	Mercury	47
5.	Sodium Hydroxide	46
6.	Sulfur Dioxide	45
7.	Ethanol	44
8.	MIX: Dimethyl Disulfide/Dimethyl Sulfide/Hydrogen Sulfide/Methyl Mercaptan	44
9.	Black Liquor (a byproduct of wood processing, consisting mostly of sodium hydroxide)	35
10.	Hydrochloric Acid	33
Total	(32.2%, 560 of 1741 chemicals released)	560

Table 1. —Number of events meeting the surveillance definition, by year and type of event, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

Year	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
1998	341	(90.5)	36	(9.5)	377
1999	287	(82.5)	61	(17.5)	348
2000	346	(82.6)	73	(17.4)	419
2001	338	(81.6)	76	(18.4)	414
Total	1312	(84.2)	246	(15.8)	1558

Figure 1. —Areas of fixed facilities involved in events, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

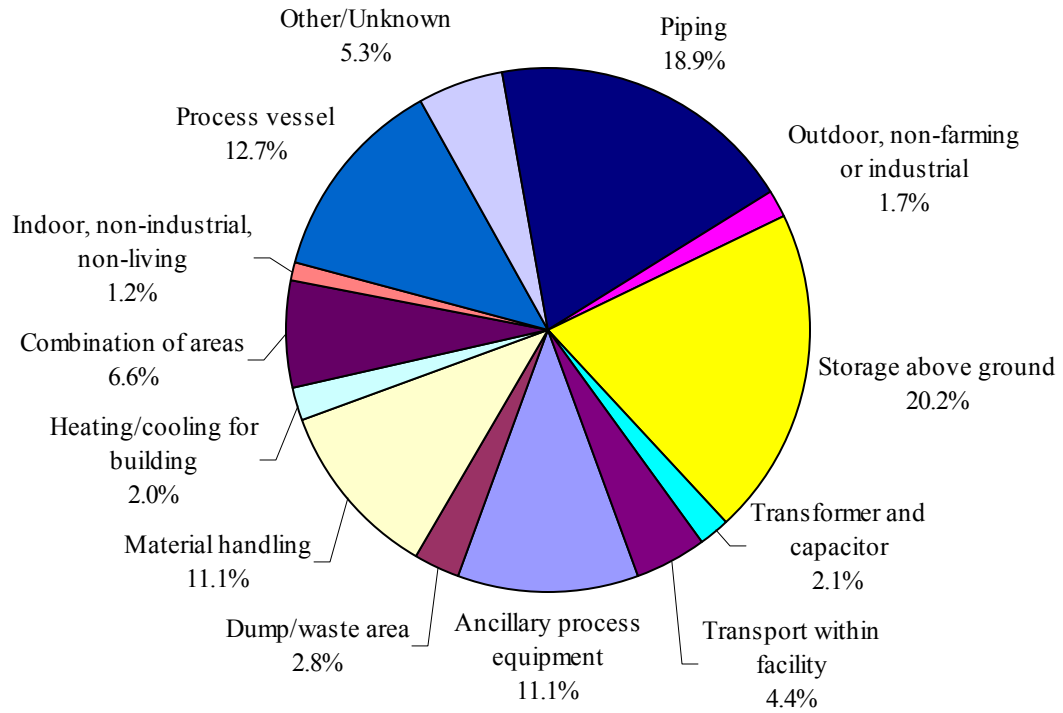


Figure 2. —Distribution of transportation-related events, by type of transport, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

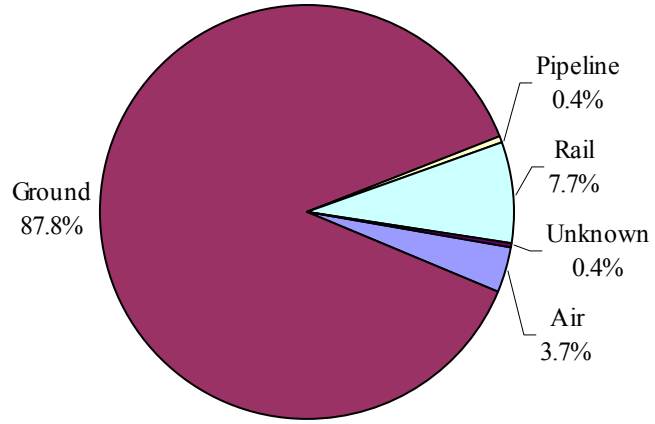


Figure 3. . —Factors reported as contributing to the occurrence of fixed-facility events, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

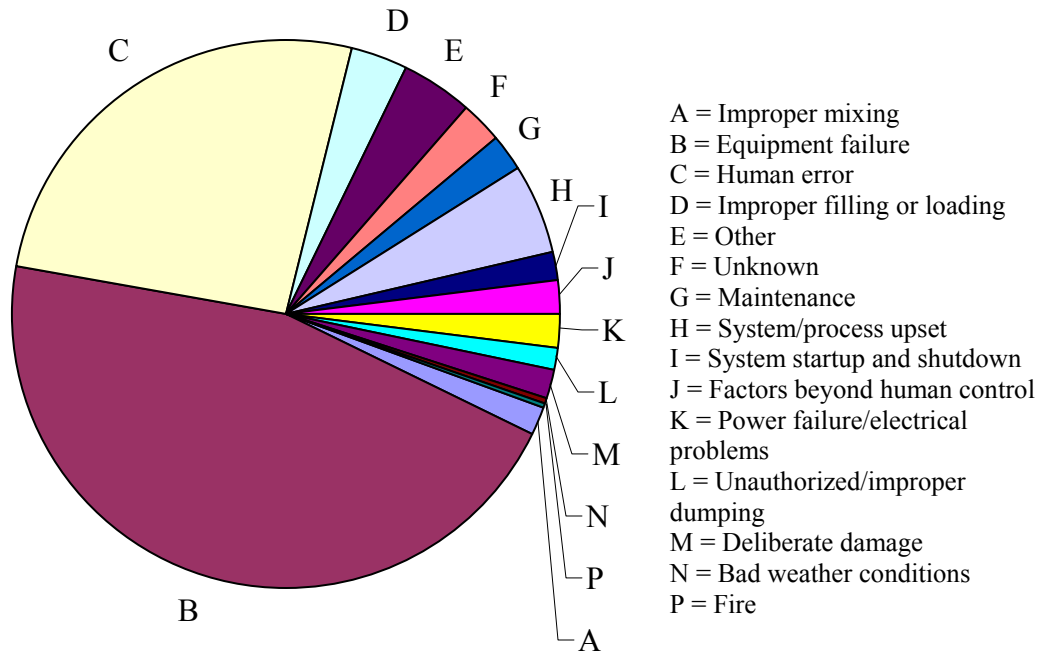




Table 2. —Number of events meeting the surveillance definition, by county and type of event, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
AITKIN	1	(50.0)	1	(50.0)	2
ANOKA	34	(85.0)	6	(15.0)	40
BECKER	5	(71.4)	2	(28.6)	7
BELTRAMI	3	(100.0)	0	(0.0)	3
BENTON	3	(75.0)	1	(25.0)	4
BIG STONE	1	(50.0)	1	(50.0)	2
BLUE EARTH	19	(79.2)	5	(20.8)	24
BROWN	4	(57.1)	3	(42.9)	7
CARLTON	129	(97.0)	4	(3.0)	133
CARVER	13	(81.3)	3	(18.8)	16
CASS	2	(100.0)	0	(0.0)	2
CHIPPEWA	3	(75.0)	1	(25.0)	4
CHISAGO	4	(80.0)	1	(20.0)	5
CLAY	5	(62.5)	3	(37.5)	8
CLEAR-WATER	1	(100.0)	0	(0.0)	1
COOK	0	(0.0)	0	(0.0)	0
COTTON-WOOD	8	(88.9)	1	(11.1)	9
CROW WING	9	(75.0)	3	(25.0)	12
DAKOTA	180	(91.8)	16	(8.2)	196
DODGE	3	(75.0)	1	(25.0)	4
DOUGLAS	1	(33.3)	2	(66.7)	3
FARIBAULT	15	(68.2)	7	(31.8)	22
FILLMORE	9	(81.8)	2	(18.2)	11
FREEBORN	17	(89.5)	2	(10.5)	19
GOODHUE	7	(53.8)	6	(46.2)	13
GRANT	2	(50.0)	2	(50.0)	4
HENNEPIN	231	(84.9)	41	(15.1)	272
HOUSTON	3	(75.0)	1	(25.0)	4
HUBBARD	4	(100.0)	0	(0.0)	4
ISANTI	1	(20.0)	4	(80.0)	5
ITASCA	43	(97.7)	1	(2.3)	44
JACKSON	3	(75.0)	1	(25.0)	4
KANABEC	0	(0.0)	0	(0.0)	0
KANDIYOHI	7	(77.8)	2	(22.2)	9

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
KITTSON	7	(87.5)	1	(12.5)	8
KOOCHI-CHING	27	(96.4)	1	(3.6)	28
LAC QUI PARLE	1	(25.0)	3	(75.0)	4
LAKE	1	(100.0)	0	(0.0)	1
LAKE OF THE WOODS	4	(100.0)	0	(0.0)	4
LE SUEUR	3	(100.0)	0	(0.0)	3
LINCOLN	1	(100.0)	0	(0.0)	1
LYON	41	(91.1)	4	(8.9)	45
MAHNOMEN	0	(0.0)	1	(100.0)	1
MARSHALL	2	(50.0)	2	(50.0)	4
MARTIN	7	(63.6)	4	(36.4)	11
MCLEOD	15	(83.3)	3	(16.7)	18
MEEKER	5	(62.5)	3	(37.5)	8
MILLE LACS	2	(100.0)	0	(0.0)	2
MORRISON	16	(94.1)	1	(5.9)	17
MOWER	7	(70.0)	3	(30.0)	10
MURRAY	3	(60.0)	2	(40.0)	5
NICOLLET	4	(100.0)	0	(0.0)	4
NOBLES	6	(85.7)	1	(14.3)	7
NORMAN	0	(0.0)	1	(100.0)	1
OLMSTED	17	(81.0)	4	(19.0)	21
OTTER TAIL	7	(53.8)	6	(46.2)	13
PENNINGTON	1	(33.3)	2	(66.7)	3
PINE	1	(100.0)	0	(0.0)	1
PIPESTONE	4	(57.1)	3	(42.9)	7
POLK	7	(87.5)	1	(12.5)	8
POPE	2	(50.0)	2	(50.0)	4
RAMSEY	101	(89.4)	12	(10.6)	113
RED LAKE	2	(100.0)	0	(0.0)	2
REDWOOD	4	(66.7)	2	(33.3)	6
RENVILLE	18	(78.3)	5	(21.7)	23
RICE	10	(83.3)	2	(16.7)	12
ROCK	2	(50.0)	2	(50.0)	4
ROSEAU	3	(100.0)	0	(0.0)	3
SCOTT	9	(81.8)	2	(18.2)	11

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
SHERBURNE	21	(95.5)	1	(4.5)	22
SIBLEY	5	(83.3)	1	(16.7)	6
ST. LOUIS	22	(84.6)	4	(15.4)	26
STEARNS	22	(62.9)	13	(37.1)	35
STEELE	15	(57.7)	11	(42.3)	26
STEVENS	3	(75.0)	1	(25.0)	4
SWIFT	3	(60.0)	2	(40.0)	5
TODD	4	(80.0)	1	(20.0)	5
TRAVERSE	1	(100.0)	0	(0.0)	1
WABASHA	3	(100.0)	0	(0.0)	3
WADENA	2	(66.7)	1	(33.3)	3
WASECA	3	(42.9)	4	(57.1)	7
WASHINGTON	75	(94.9)	4	(5.1)	79
WATONWAN	6	(66.7)	3	(33.3)	9
WILKIN	0	(0.0)	0	(0.0)	0
WINONA	8	(88.9)	1	(11.1)	9
WRIGHT	6	(85.7)	1	(14.3)	7
YELLOW MEDICINE	3	(60.0)	2	(40.0)	5
Total	1312	(84.2)	246	(15.8)	1558

Table 3. —Distribution of the number of substances released, by type of event, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

No. of substances released	Type of event						All events		
	Fixed facility			Transportation					
	No. events	%	No. of substances	No. events	%	No. of substances	No. events	%	No. of substances
1	1262	(96.2)	1262	230	(93.5)	230	1492	(95.8)	1492
2	31	(2.4)	62	12	(4.9)	24	43	(2.8)	86
3	5	(0.4)	15	3	(1.2)	9	8	(0.5)	24
4	5	(0.4)	20	0	(0.0)	0	5	(0.3)	20
≥ 5	9	(0.7)	108	1	(0.4)	11	10	(0.6)	119
Total	1312	(100.0)	1467	246	(100.0)	274	1558	(100.0)	1741

Table 4. —Distribution of the number of substances released, by substance category and type of event, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

Substance category	Type of event				All events	
	Fixed facility		Transportation			
	No. of substances	(%)	No. of substances	(%)	No. of substances	(%)
Acids	115	(7.8)	19	(6.9)	134	(7.7)
Ammonia	148	(10.1)	20	(7.3)	168	(9.6)
Bases	63	(4.3)	9	(3.3)	72	(4.1)
Chlorine	32	(2.2)	0	(0.0)	32	(1.8)
Mixtures*	199	(13.6)	26	(9.5)	225	(12.9)
Other inorganic substances	270	(18.4)	29	(10.6)	299	(17.2)
Other substances, NOS	258	(17.6)	60	(21.9)	318	(18.3)
Paints and dyes	18	(1.2)	15	(5.5)	33	(1.9)
Pesticides	121	(8.2)	70	(25.5)	191	(11.0)
Polychlorinated biphenyls	29	(2.0)	1	(0.4)	30	(1.7)
Volatile organic compounds	214	(14.6)	25	(9.1)	239	(13.7)
Total	1467	(100.0)	274	(100.0)	1741	(100.0)

\* Mixtures of substances from different categories which were mixed prior to the event.

Table 5. —Distribution of the number of victims, by type of event, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

No. of victims	Type of event						All events		
	Fixed facility			Transportation					
	No. of events	(%)	No. of victims	No. of events	(%)	No. of victims	No. of events	(%)	No. of victims
1	35	(48.6)	35	20	(90.9)	20	55	(58.5)	55
2	15	(20.8)	30	1	(4.5)	2	16	(17.0)	32
3	5	(6.9)	15	1	(4.5)	3	6	(6.4)	18
4	3	(4.2)	12	0	(0.0)	0	3	(3.2)	12
5	4	(5.6)	20	0	(0.0)	0	4	(4.3)	20
≥6	10	(13.9)	124	0	(0.0)	0	10	(10.6)	124
Total	72	(100.0)	236	22	(100.0)	25	94	(100.0)	261

Figure 4. —Distribution of victims by population group\* and type of event, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

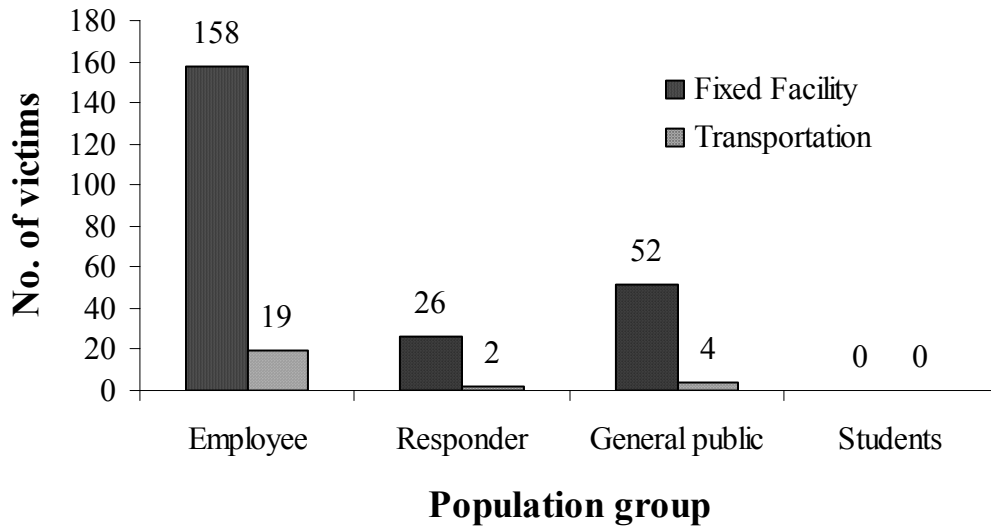


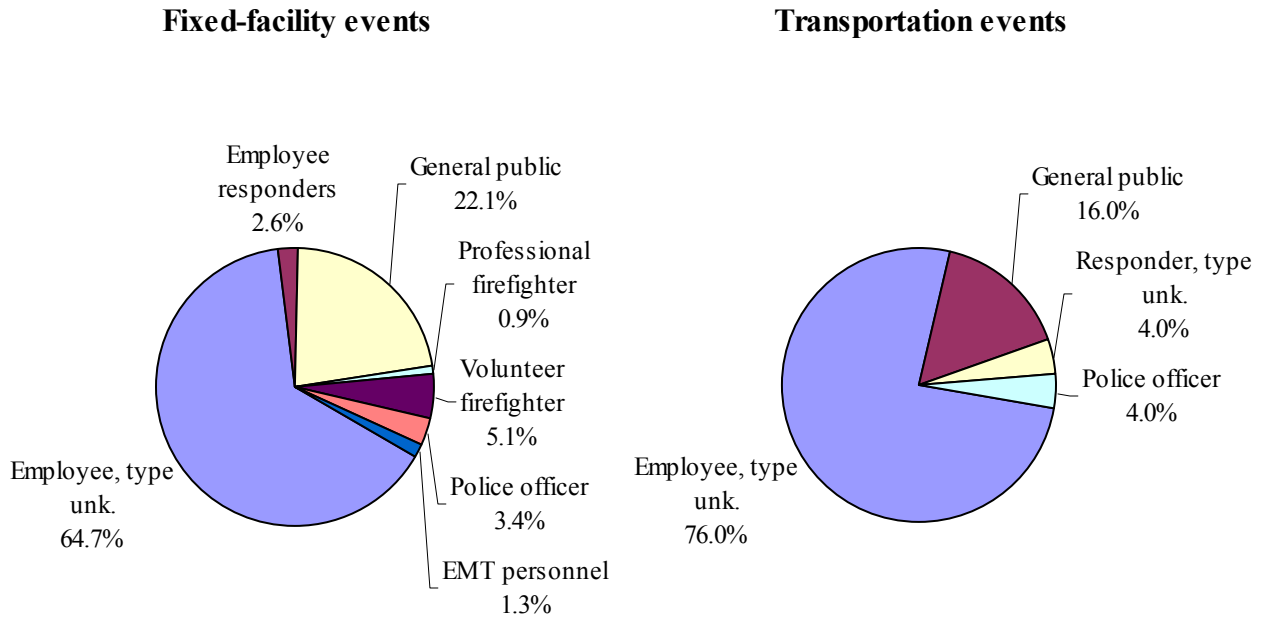
Table 6. —Number of substances released in all events and events with victims, by substance category, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

Substance category	Total releases		Releases with victims		
	No.	Percentage of total releases	No.	Percentage of all releases with victims	Percentage of releases in substance category
Acids	134	(7.7)	12	(7.8)	(9.0)
Ammonia	168	(9.6)	17	(11.0)	(10.1)
Bases	72	(4.1)	6	(3.9)	(8.3)
Chlorine	32	(1.8)	8	(5.2)	(25.0)
Mixtures	225	(12.9)	18	(11.7)	(8.0)
Other inorganic substances	299	(17.2)	13	(8.4)	(4.3)
Other, not otherwise specified	318	(18.3)	23	(14.9)	(7.2)
Paints and dyes	33	(1.9)	2	(1.3)	(6.1)
Pesticides	191	(11.0)	37	(24.0)	(19.4)
Polychlorinated biphenyls	30	(1.7)	0	(0.0)	(0.0)
Volatile organic compounds	239	(13.7)	18	(11.7)	(7.5)
Total*	1741	(100.0)	154	(100.0)	(8.8)

\*Total exceeds total number of events because events at which more than one substance was released were counted more than once.



Figure 5. —Distribution of responder victims, \* by population group and type of event, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.



\* There were 28 responder victims reported to the Minnesota Department of Health in 1998 - 2001.

Figure 6. —Distribution of type of injury/symptom for all events, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

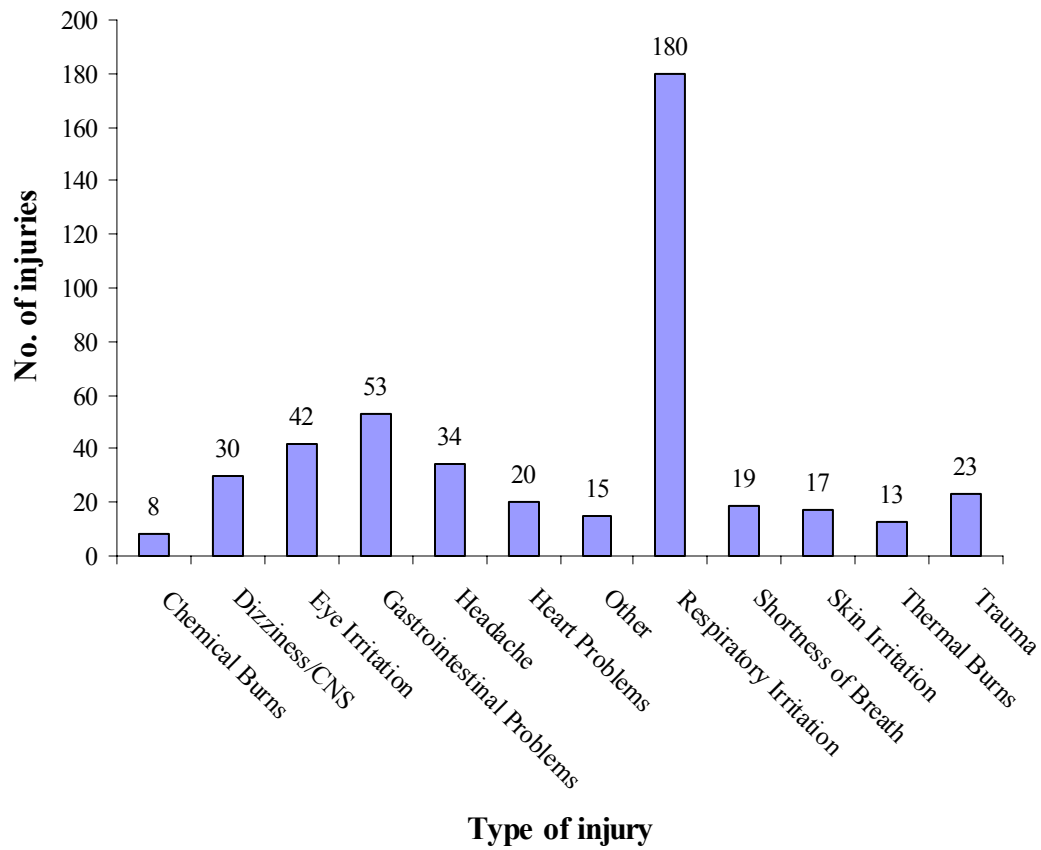


Figure 7. —Injury outcome, Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

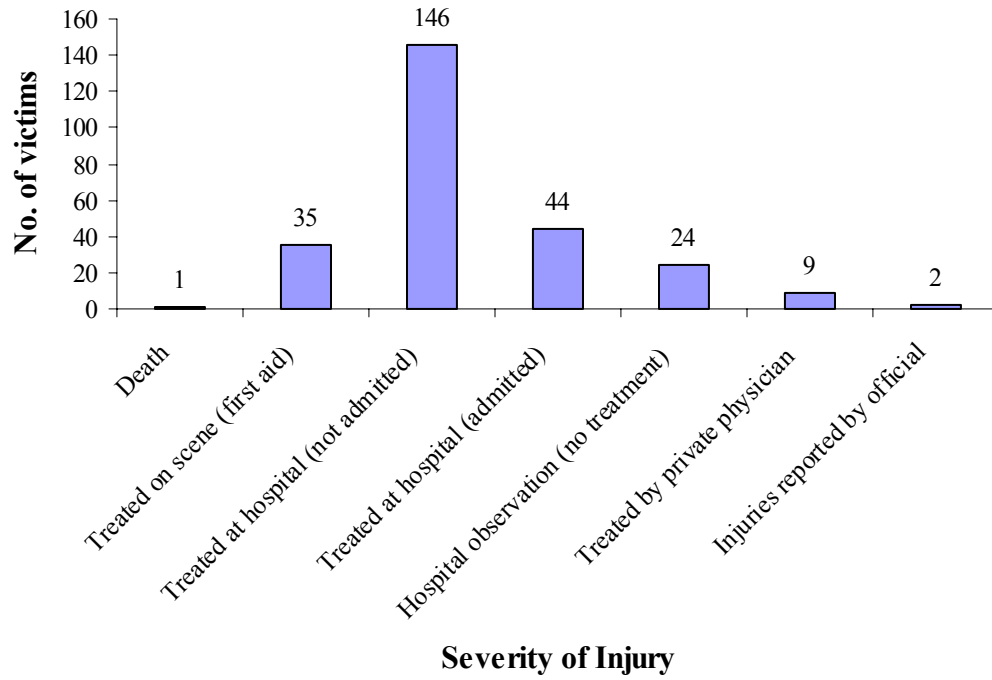


Table 7. —Distribution of type of injury/symptom, by type of event, \* Hazardous Substances Emergency Events Surveillance, Minnesota, 1998-2001.

Type of injury/ symptom	Type of events					
	Fixed facility		Transportation		All events	
	No.	%	No.	%	No.	%
Chemical burns	7	(1.6)	1	(3.6)	8	(1.8)
Heart problems	20	(4.7)	0	(0.0)	20	(4.4)
Dizziness/ CNS <sup>†</sup>	30	(7.0)	0	(0.0)	30	(6.6)
Eye irritation	40	(9.4)	2	(7.1)	42	(9.3)
Headache	33	(7.7)	1	(3.6)	34	(7.5)
Heat stress	0	(0.0)	0	(0.0)	0	(0.0)
Gastrointestinal problems	53	(12.4)	0	(0.0)	53	(11.7)
Respiratory problems	175	(41.1)	5	(17.9)	180	(39.6)
Shortness of breath	18	(4.2)	1	(3.6)	19	(4.2)
Skin irritation	17	(4.0)	0	(0.0)	17	(3.7)
Thermal burns	13	(3.1)	0	(0.0)	13	(2.9)
Trauma	5	(1.2)	18	(64.3)	23	(5.1)
Other	15	(3.5)	0	(0.0)	15	(3.3)
Total	426	(100.0)	28	(100.0)	454	(100.0)

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

<sup>†</sup> Central nervous system symptoms.

Table 8. —Cumulative data, Hazardous Substances Emergency Events Surveillance, Minnesota, 1995-2001.

Year*	Type of event			No. of substances released	No. of deaths	No. of victims	Events with victims	
	Fixed facility	Transport	Total				No.	%
1995	193	36	229	386	0	172	23	(10.0)
1996	224	77	301	340	0	73	21	(7.0)
1997	194	71	265	283	1	19	16	(6.0)
1998	341	36	377	440	0	66	22	(5.8)
1999	287	61	348	370	0	62	24	(6.9)
2000	346	73	419	459	1	83	29	(6.9)
2001	338	76	414	472	0	50	19	(4.6)
Total	1923	430	2353	2750	2	525	154	(6.5)

\*Minnesota started the HSEES program in 1995; therefore there is no data for 1993 and 1994.

Figure 8. —Distribution of victims, Hazardous Substances Emergency Events Surveillance, Minnesota, 1995-2001.

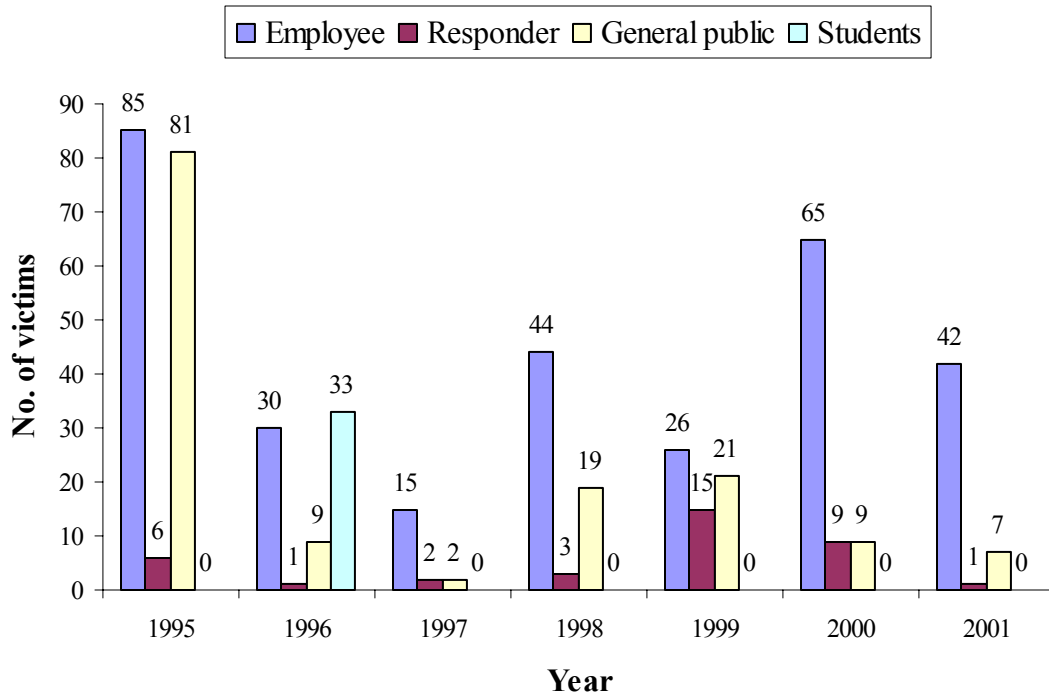


Figure 9. —Cumulative data for Minnesota, Hazardous Substances Emergency Events Surveillance, 1995-2001.

