Surveillance of Hazardous Substances Emergency Events in North Carolina

Cumulative Report 1998 – 2001

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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 1991, the North Carolina Division of Public Health has participated in this surveillance system. This report summarizes the characteristics of events reported to the surveillance system by the N.C. Division of Public Health, Occupational and Environmental Branch, N.C. HSEES Program during 1998-2001.

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, Division of Emergency Management (DEM), Department of Crime Control and Public Safety; the National Response Center (NRC), U.S. Coast Guard; the Hazardous Materials Information System (HMIS), U.S. Department of Transportation; and the media. Secondary notification sources are the Division of Water Quality, Department of Environmental and Natural Resources and the Department of Agriculture—Food and Drug Protection Division, Structured Pesticide Control Division and Plant and Industrial Division. 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 N.C. HSEES program reported a total of 1,087 events for 1998-2001. Approximately 372 (34.2%) of the events occurred at fixed facilities, and 715 (65.8%) were transportation-related. Human error 487 (40.7%) was the contributing factor for the majority of the releases. In 1041 (95.8%) of the events, only a single substance was released. The most commonly reported categories of substances were other (287, 24.2%), volatile organic compounds (228, 19.2%), acids (169, 14.2%) and other inorganic compounds (155, 13.0%). During this reporting period, 106 events (approximately 9.7% of all reported events) resulted in a total of 417 victims. The adverse health effects most frequently experienced by victims were respiratory irritation (264, 37.1%), eye irritation (100, 14.0%), gastrointestinal problems (68, 9.6%) and trauma (42, 5.9%). A total of four persons died as a result of all events, and 138 (12.7%) events required evacuations.

The findings regarding the distribution of the types of events, numbers of events with victims and evacuations, and the injuries reported have changed in several areas since the inception of the HSEES program. The number of transportation events has increased due to additional reporting sources. The percentage of events with victims, as well as the number of evacuations, is declining. Respiratory irritation continues to be the most frequently reported adverse health effect experienced by victims.

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 1998-2001.

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. Reportable quantities are at least ten pounds or one gallon of the substance that is released or threatened to be released, with the exception of extremely hazardous substances, which are reported in any amount. 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, Division of Emergency Management (DEM), Department of Crime Control and Public Safety; the National Response Center (NRC), U.S. Coast Guard; the Hazardous Materials Information System (HMIS), U.S. Department of Transportation; and the media. Secondary notification sources are the Division of Water Quality, Department of Environmental and Natural Resources and the Department of Agriculture—Food and Drug Protection Division, Structured Pesticide Control Division and Plant and Industrial Division. 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 N.C. Division of Public Health, Occupational and Environmental Epidemiology Branch 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 N.C. Division of Public Health, Occupational and Environmental Epidemiology Branch.

RESULTS

A total of 1,087 hazardous substances emergency events were reported in 1998-2001 to the HSEES system by the N.C. Division of Public Health, Occupational and Environmental Epidemiology Branch, N.C. HSEES Program; about 23 (2.1%) of these events were threatened releases. Three hundred seventy-two (34.2%) of the events occurred at fixed facilities, and 715 (68.8%) were transportation-related events (Table 1). Table 2 shows the number of events by county and type of event. Map 1 shows the distribution of events by county.

Fixed-facility events occur in various areas of the facilities; 27.3% occurred in above-ground storage areas, 22.0% in piping, 13.4% in material handling, and 10.0% in

process vessels (Figure 1). In transportation-related events, 92.1% occurred during ground transport (for example, truck, van, or tractor), and 6.8% involved transport by rail (Figure 2). The remaining transportation-related events involved water, air, or pipeline transport.

Factors contributing to events were also reported (Figure 3). Human error was a contributing factor in 487 (40.7%) of the events, 269 (22.5%) events were reported as involving equipment failure, 190 (15.9%) involving improper filling or loading, and the remaining events were attributable to other factors. (Information on factors contributing to transportation events was not collected until 2000.)

Nearly 96% of all events involved the release of only one substance. Two substances were released in approximately 2.3% of the events, and the remainder involved the release of more than two substances (Table 3).

Chemicals were either released or threatened to be released in the events; 1,138 (94.8%) of the substances were actually released, and 63 (5.2%) of the substances were threatened to be released. The number of substances released was higher than the number of events, because some events had more than one chemical released. There were 1,041 (95.8%) events where one chemical was released and 46 (4.2%) events with two or more substances released (Table 3). Most substances released were either spills (78.5%) or air emissions (12.6%). Of the spills, 26.4% occurred in fixed-facility events. Air emissions (88.1%) were most frequent in fixed-facility events. In transportation events, 92.9% of releases were spills. The remaining releases resulted from fires or other types of releases (or combinations of types of releases).

Of the events with known time of occurrence, 37.4% occurred primarily from 6:00 AM to 12 noon, and 31.5% from 12 noon to 6:00 PM. Approximately 12.9% of events occurred on a Saturday or Sunday. From 1998 through 2001, nearly 60% of the events occurred between April and September; 40% occurred during the other six months.

SUBSTANCES

Of the 11 categories into which HSEES substances were grouped, the categories of substances most commonly released in fixed-facility events were volatile organic compounds (87, 19.6%), other (80, 18.0%) and other inorganic compounds (74, 16.7%) (Table 4). In transportation-related events, other compounds (207, 27.8%), volatile organic compounds (141, 19.0%), and acids (123, 16.5%) and were most frequently released. The 10 substances most frequently released in N.C. for 1998-2001 are listed in Appendix A.

VICTIMS

A total of 417 victims were involved in 106 events (9.8% of all events) (Table 5). Of the events with victims, 52.8% involved only one victim, and 71.7% involved either

one or two victims. Of the 417 total victims, 253 (60.7%) were injured in fixed-facility events.

Four fixed-facility events account for 35% (148) of the total number of victims reported. These events affected 75 employees, 51 students and 22 general public members. None of the victims were wearing PPE. Victims in these four events account for more than 47% of the total number of adverse health effects reported. Most victims sustained multiple adverse health effects. The most frequently reported adverse health effect was respiratory irritation (36.1%) followed by dizziness/central nervous system symptoms (22.9%) and eye irritation (12.3%). Most victims (75.7%) were treated and released from the hospital. The chemical categories associated with the most number of victims were other inorganic compounds (238 victims), volatile organic compounds (148 victims) and chlorine (50 victims).

The population groups most often adversely affected were employees (65.9%) and general public (16.8%) (Figure 4). There were 17 first-responder victims in fixed-facility events. Of those, 47.1% were police officers, 35.3% were firefighters, 11.8% were members of employee responder teams and the remaining 5.9% were responders of unknown type. (Figure 5). There were 3 first-responder victims in transportation-related events. All three were volunteer firefighters.

The types of adverse health effects sustained by victims are shown in Table 7 and Figure 6. The victims sustained a total of 703 adverse health effects, and some victims had more than one adverse health effect. The most commonly reported adverse health effects in fixed-facility events were respiratory irritation (252, 39.6%), eye irritation (96, 15.1%), and dizziness/central nervous system symptoms (78, 12.3%). In transportation-related events, trauma (38, 56.7%), respiratory irritation (12, 17.9%) and gastrointestinal problems (9, 13.4%) were reported most frequently. Trauma was reported more frequently in transportation-related events (90.5%) than in fixed-facility events (9.5%). 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 gender of 63.5% of the victims was known; of these, 59.6% were male. Among the population groups, more of the emergency responders (100%) and employees (74.3%) were male when gender was known. Nearly 83% of student victims were female. The age of 28.8% of the victims was known; of these, the mean age was 27.2 years (range: 5-72 years). The majority of victims were treated at the hospital and did not require admittance (279, (66.9%). Eighty-six (20.6%) victims were treated on scene with first aid and another 32 (7.7%) were transported to the hospital and admitted (Figure 7).

Among victims, 77.5% of employees, 45.0% of first responders, and 98.1% of students were not wearing any form of PPE. For employee victims reported as wearing PPE, 24.6% wore eye protection and 9.2% wore a hard hat. Of the first responder victims, the most frequently worn was PPE firefighter turnout gear (38.5%) and level "A" protection (30.8%).

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 hard hat. 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.

Of the four persons who died as a result of hazardous substances releases, all were male employees of unknown age who were not using any form of PPE. Two men died as a result of trauma in transportation events. The other two men died as a result of trauma and chemical burns related to a tank explosion at a plastic resin manufacturing facility.

EVACUATION

Evacuations were ordered in 138 (12.7%) events, and the evacuation status of one (0.1%) event was unknown. Of known evacuations, 83 (61.0%) were of a building or the affected part of a building, 51 (37.5%) were of an area besides an affected building, and two (1.5%) were reported as having no criteria. The median number of persons evacuated was 182 (range: 1-5000), and the median length of evacuation was 8.4 hours (range: 0.1-72.0). In 15 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 13 (86.7%) of these events.

CONTINGENCY PLANS

The types of contingency or preparedness plans used during an event varied, with 62.3% involving the use of a company's operating procedures. Other plans reported were hazardous materials response team's standard operating procedures (29.1%), incident specific ad hoc plan (7.5%), and the remainder were natural disaster plans, other, or unknown.

NORTH CAROLINA TRANSPORTATION EVENTS

Additional analyses were conducted of transportation events to determine their association with the adverse public health consequences of personal injuries. The majority of these events were trucking-related. A total of 597 (83.5% of transportation

events) trucking events were reported. Thirty-six (6.0%) of these events were associated with a total of 50 victims. Nearly 98% of these events involved only one chemical.

Trauma was the most frequently reported injury (60%). Sixteen percent of victims reported gastrointestinal problems, 15% reported respiratory irritation and the remaining nine percent of victims reported eye irritation or chemical burns. Most victims were treated and released from a hospital (42.0%). Thirty-four percent were admitted to the hospital. Two people died as a result of their injuries. None of the victims were using any type of PPE.

Evacuations were ordered in 18 (3.0%) of the trucking services events. A total of 6,830 people were evacuated (range: 5-5,000 people). The length of evacuation, available for 89% of events, ranged from 1 to 24 hours.

An information sheet with transportation-related HSEES data was distributed to trucking terminals throughout the state in late 2001. Additional analyses will be conducted in the near future to determine if this intervention method was successful.

USES OF HSEES DATA

There are multiple uses for N.C. HSEES data regarding risk factors related to the occurrence of emergency events and the associated morbidity and mortality. Results of data analysis are used for multiple prevention outreach activities. Fact sheets about the chemical releases associated with the most injuries are written and distributed to industries that use the potentially dangerous substances, county emergency management directors and fire marshals. Data presentations are made to local emergency planning committees (LEPCs) in counties where the majority of HSEES events are reported. These counties request follow-up presentations to determine if their county is making progress in reducing the number of releases and/or injuries associated with releases. N.C. HSEES data is also distributed to firefighters throughout the state via articles in the "North Carolina Fire Rescue Journal" published quarterly by the Office of the State Fire Marshal.

SUMMARY OF RESULTS, 1993–2001

The number of events, substances released, events with victims, and deaths for the years 1993 through 2001 are shown in Table 8. The number of substances released gradually declined until 1999. In 1999 the number of substances released began to increase, surpassing the initial amount reported in 1993. Table 8 also illustrates a fluctuation in the number of victims per year; however, the percentage of events with victims is gradually declining. Figure 8 shows that, consistently from 1993 through 2001, employees are the most frequently injured victim group. There are several spikes in the number of student victims, which relate to various school-related events during those years. The increased number of transportation events, as mentioned previously, is most likely due to additional reporting sources rather than a true increase in the number of events. Most changes in the data seem to be gradual.

APPENDICES

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

Number	Standardized Substance Name	Frequency
1.	Sodium hydroxide	68
2.	Ammonia	55
3.	Hydrochloric acid	44
4.	Mixtures	39
5.	Phosphoric acid	38
6.	Potassium hydroxide	38
7.	Chlorine	29
8.	Resin solution	29
9.	Sulfuric acid	28
10.	Xylene	28
Total		399

Appendix B

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

Year	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
1998	88	56.1	69	43.9	157
1999	108	34.0	210	66.0	318
2000	87	28.9	214	71.1	301
2001	89	28.6	222	71.4	311
Total	372	34.2	715	65.8	1087

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

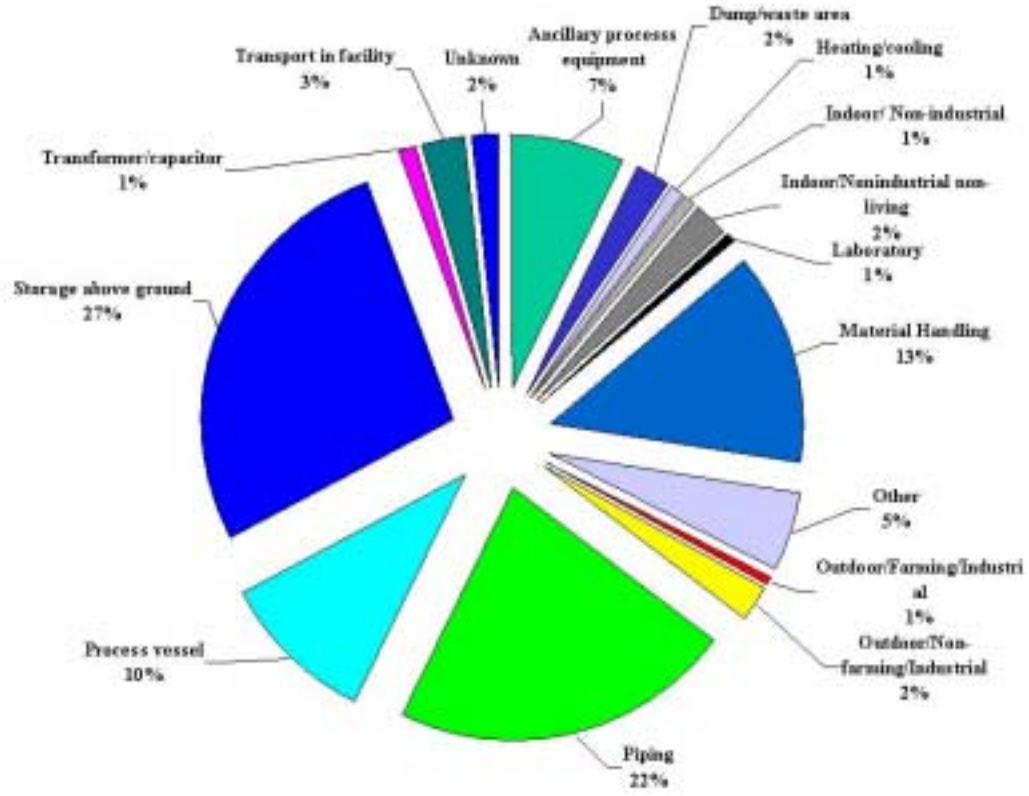


Figure 2. —Distribution of transportation-related events, by type of transport, Hazardous Substances Emergency Events Surveillance, North Carolina, 1998-2001.

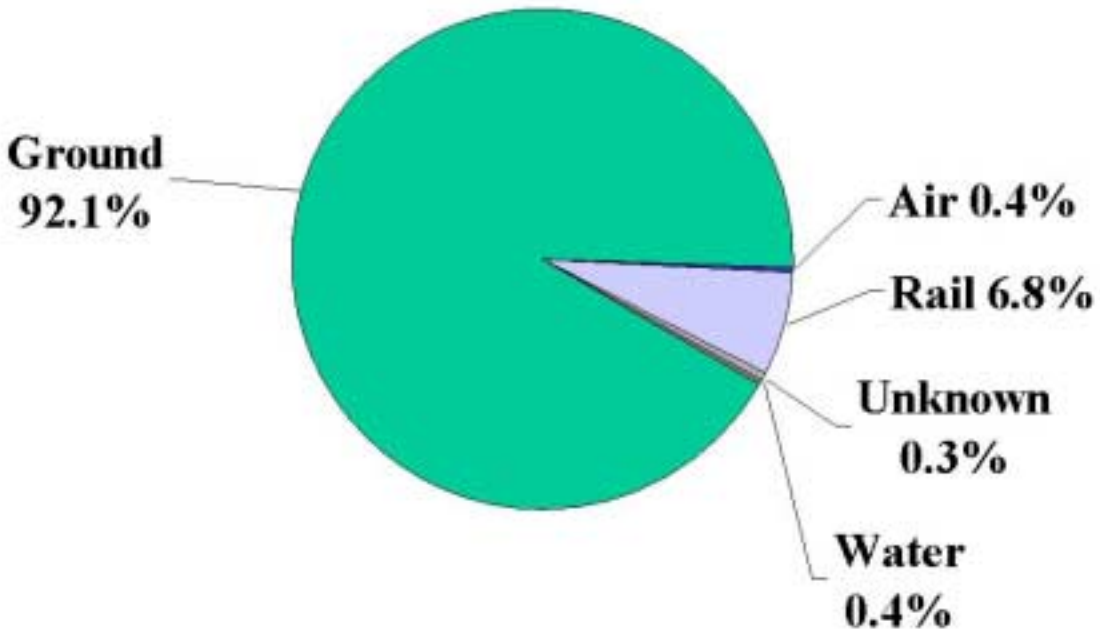


Figure 3. —Factors reported as contributing to the occurrence of fixed-facility events, Hazardous Substances Emergency Events Surveillance, North Carolina, 1998-2001.

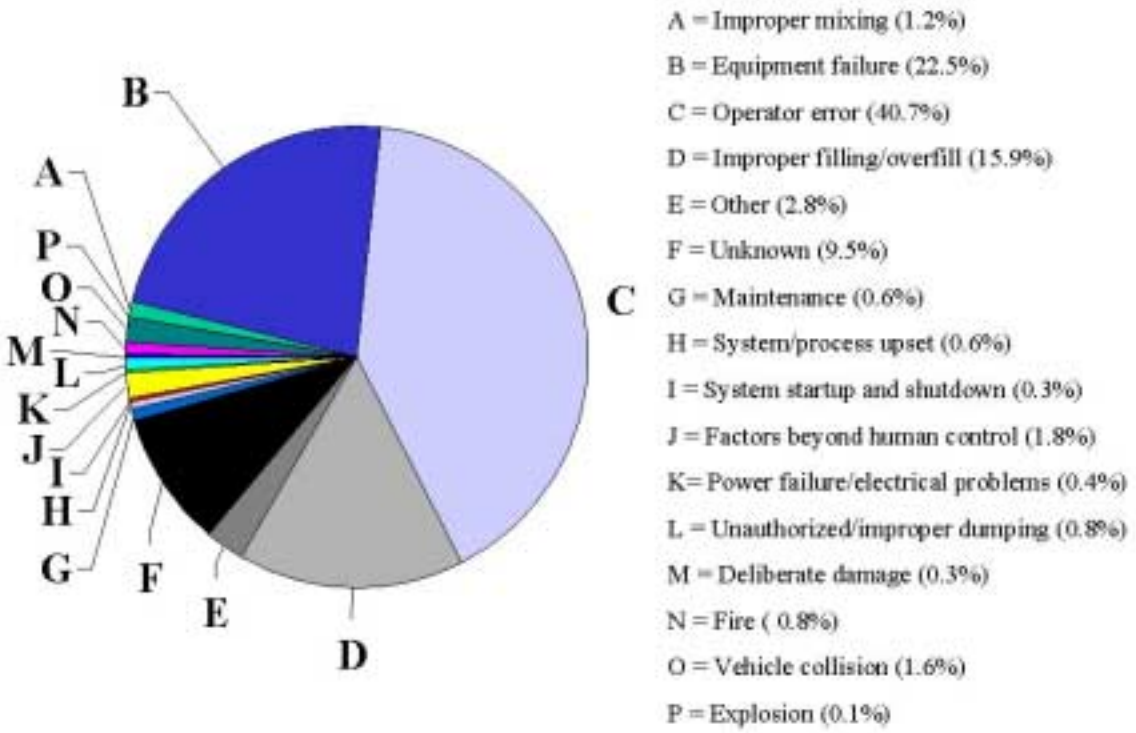


Table 2. —Number of events meeting the surveillance definition, by county and type of event, Hazardous Substances Emergency Events Surveillance, North Carolina, 1998-2001.

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
Alamance	13	61.9	8	38.1	21
Alexander	2	66.7	1	33.3	3
Anson	0	0.0	1	100.0	1
Ashe	1	100.0	0	0.0	1
Avery	1	100.0	0	0.0	1
Beaufort	6	50.0	6	50.0	12
Bertie	1	100.0	0	0.0	1
Bladen	6	85.7	1	14.3	7
Brunswick	9	64.3	5	35.7	14
Buncombe	8	44.4	10	55.6	18
Burke	1	25.0	3	75.0	4
Cabarrus	3	13.6	19	86.4	22
Caldwell	9	90.0	1	10.0	10
Carteret	1	50.0	1	50.0	2
Caswell	0	0.0	2	100.0	2
Catawba	10	38.5	16	61.5	26
Chatham	7	87.5	1	12.5	8
Chowan	0	0.0	1	100.0	1
Cleveland	1	16.7	5	83.3	6
Columbus	8	72.7	3	27.3	11
Craven	4	50.0	1	20.0	5
Cumberland	17	44.7	21	55.3	38
Currituck	0	0.0	1	100.0	1
Dare	1	100.0	0	0.0	1
Davidson	6	30.0	14	70.0	20
Davie	1	100.0	0	0.0	1
Duplin	4	80.0	1	20.0	5
Durham	9	31.0	20	69.0	29
Edgecombe	3	42.9	4	57.1	7
Forsyth	25	32.5	52	67.5	77
Franklin	0	0.0	1	100.0	1
Gaston	5	62.5	3	37.5	8
Granville	0	0.0	8	100.0	8
Greene	0	0.0	1	100.0	1
Guilford	28	29.8	66	702	94
Halifax	1	20.0	4	80.0	5
Harnett	3	60.0	2	40.0	5

Table 2 continued

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
Haywood	3	42.9	4	57.1	7
Henderson	4	33.3	8	66.7	12
Hertford	0	0.0	2	100.0	2
Hoke	0	0.0	2	100.0	2
Iredell	1	33.3	2	66.7	3
Jackson	2	100.0	0	0.0	2
Johnston	2	25.0	6	75.0	8
Jones	0	0.0	3	100.0	3
Lee	3	50.0	3	50.0	6
Lenoir	4	66.7	2	33.3	6
Lincoln	1	100.0	0	0.0	1
Macon	4	66.7	2	33.3	6
Madison	1	33.3	2	66.7	3
Martin	4	44.4	5	55.6	9
McDowell	2	66.7	1	33.3	3
Mecklenburg	21	7.6	254	92.4	275
Mitchell	2	100.0	0	0.0	2
Montgomery	2	100.0	0	0.0	2
Moore	4	80.0	1	20.0	5
Nash	3	30.0	7	70.0	10
New Hanover	17	51.5	16	48.5	33
Northampton	0	0.0	4	100.0	4
Onslow	3	60.0	2	40.0	5
Orange	4	57.1	3	42.9	7
Pamlico	0	0.0	1	100.0	1
Pasquotank	2	50.0	2	50.0	4
Pender	0	0.0	1	100.0	1
Perquimans	0	0.0	5	100.0	5
Person	5	71.4	2	28.6	7
Pitt	5	50.0	5	50.0	10
Polk	0	0.0	1	100.0	1
Randolph	0	0.0	2	100.0	2
Richmond	2	15.4	11	84.6	13
Robeson	4	50.0	4	50.0	8
Rockingham	1	50.0	1	50.0	2
Rowan	6	75.0	2	25.0	8
Rutherford	3	60.0	2	40.0	5
Sampson	4	66.7	2	33.3	6

Table 2 continued

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
Scotland	1	50.0	1	50.0	2
Stanly	4	50.0	4	50.0	8
Surry	5	55.6	4	44.4	9
Transylvania	4	80.0	1	20.0	5
Tyrell	1	50.0	1	50.0	2
Union	11	52.4	10	47.6	21
Vance	3	50.0	3	50.0	6
Wake	23	45.2	23	54.8	42
Washington	1	0.0	1	100.0	1
Watauga	1	50.0	1	50.0	2
Wayne	5	28.6	5	71.4	7
Wilkes	2	50.0	2	50.0	4
Wilson	4	60.0	4	40.0	10
Yadkin	1	50.0	1	50.0	2
Total	375	34.4	716	65.6	1087

Table 3. —Distribution of the number of substances released, by type of event, Hazardous Substances Emergency Events Surveillance, North Carolina, 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	348	93.5	348	693	96.9	693	1041	95.8	1041
2	9	2.4	18	16	2.2	32	25	2.3	50
3	6	1.6	18	3	0.4	9	9	0.8	27
4	1	0.3	4	1	0.1	4	2	0.2	8
≥ 5	8	22	66	2	0.3	10	10	0.9	76
Total	372	100.0	454	715	100.0	748	1087	100.0	1202

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

Substance category	Type of event				All events	
	Fixed facility		Transportation			
	No. of substances	(%)	No. of substances	(%)	No. of substances	(%)
Acids	46	(10.1)	123	(16.4)	169	(14.1)
Ammonia	50	(11.0)	8	(1.1)	58	(4.8)
Bases	23	(5.1)	100	(13.4)	123	(10.2)
Chlorine	28	(6.2)	1	(0.1)	29	(2.4)
Mixtures*	19	(4.2)	2	(1.7)	32	(2.7)
Other inorganic substances	74	(16.3)	81	(10.8)	155	(12.9)
Other substances	90	(19.8)	211	(28.2)	301	(25.0)
Paints and dyes	11	(2.4)	35	(4.7)	46	(3.8)
Pesticides	21	(4.6)	33	(4.4)	54	(4.5)
Polychlorinated biphenyls	5	(1.1)	2	(0.3)	7	(0.6)
Volatile organic compounds	87	(19.2)	141	(18.9)	228	(19.0)
Total	454	(100.0)	748	(100.0)	1202	(100.0)

* Mixtures of substances from different categories.

Table 5. —Distribution of the number of victims, by type of event, Hazardous Substances Emergency Events Surveillance, North Carolina, 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	21	(47.7)	21	35	(56.5)	35	56	(52.8)	56
2	15	(34.1)	30	5	(8.1)	10	20	(18.9)	40
3	5	(11.4)	15	3	(4.8)	9	8	(7.5)	24
4	4	(9.1)	16	0	(0.0)	0	4	(3.8)	16
5	4	(9.1)	20	0	(0.0)	0	4	(3.8)	20
≥6	13	(29.5)	253	1	(1.6)	8	14	(13.2)	261
Total	44	(100.0)	355	62	(100.0)	62	106	(100.0)	417

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

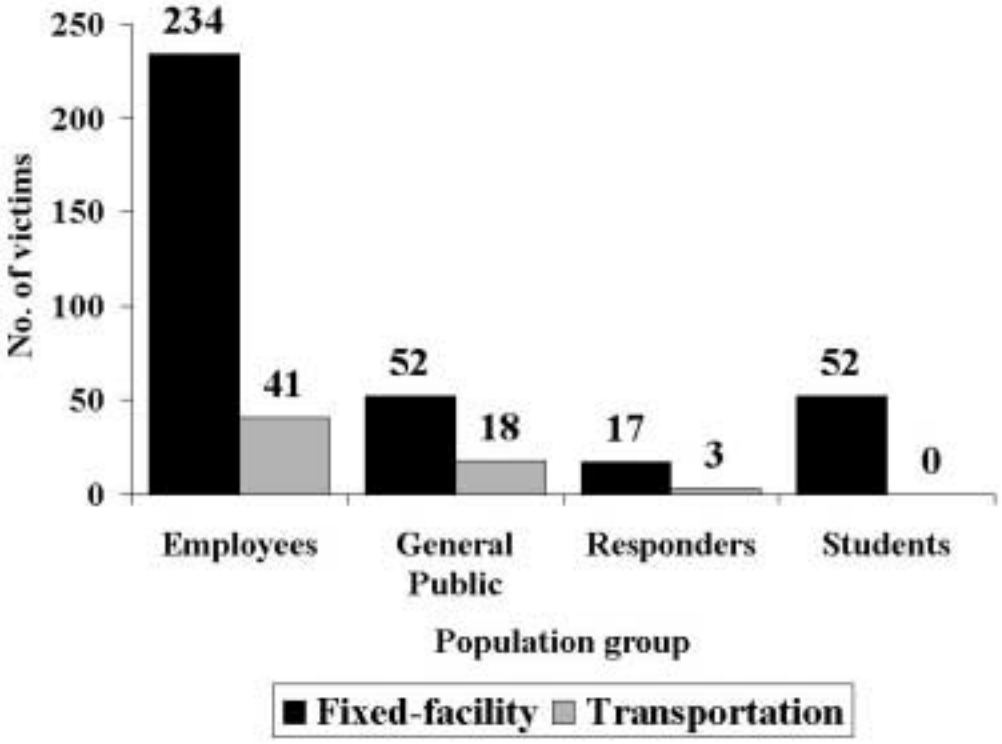
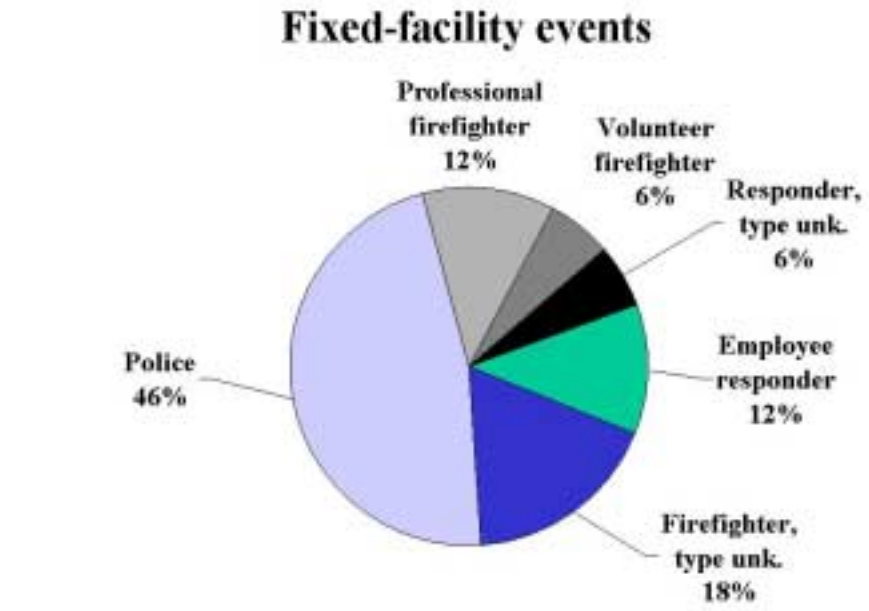


Table 6. —Number of substances released in all events and events with victims, by substance category, Hazardous Substances Emergency Events Surveillance, North Carolina, 1998-2001.

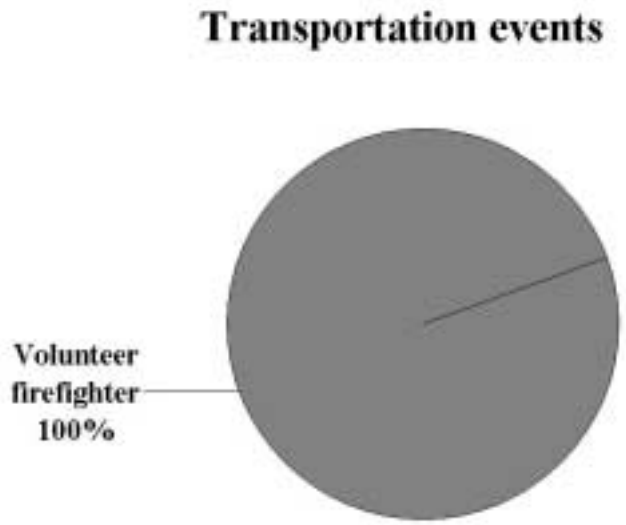
Substance category	Total releases		Releases with victims		
	No.	Percentage of total releases	No.	Percentage of all releases with victims	Percentage of releases in substance category
Acids	169	14.2%	15	10.9%	8.9%
Ammonia	58	4.9%	6	4.3%	10.3%
Bases	123	10.4%	3	2.2%	2.4%
Chlorine	29	2.4%	9	6.5%	31.0%
Mixtures	32	2.7%	4	2.9%	12.5%
Other inorganic substances	155	13.0%	35	25.4%	22.6%
Other, not otherwise specified	287	24.2%	36	26.1%	12.5%
Paints and dyes	46	3.9%	5	3.6%	10.9%
Pesticides	54	4.5%	7	5.1%	13.0%
Polychlorinated biphenyls	7	0.6%	0	0.0%	0.0%
Volatile organic compounds	228	19.2%	18	13.0%	7.9%
Total*	1188	100.0%	138	100.0%	11.6%

*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, North Carolina, 1998-2001.

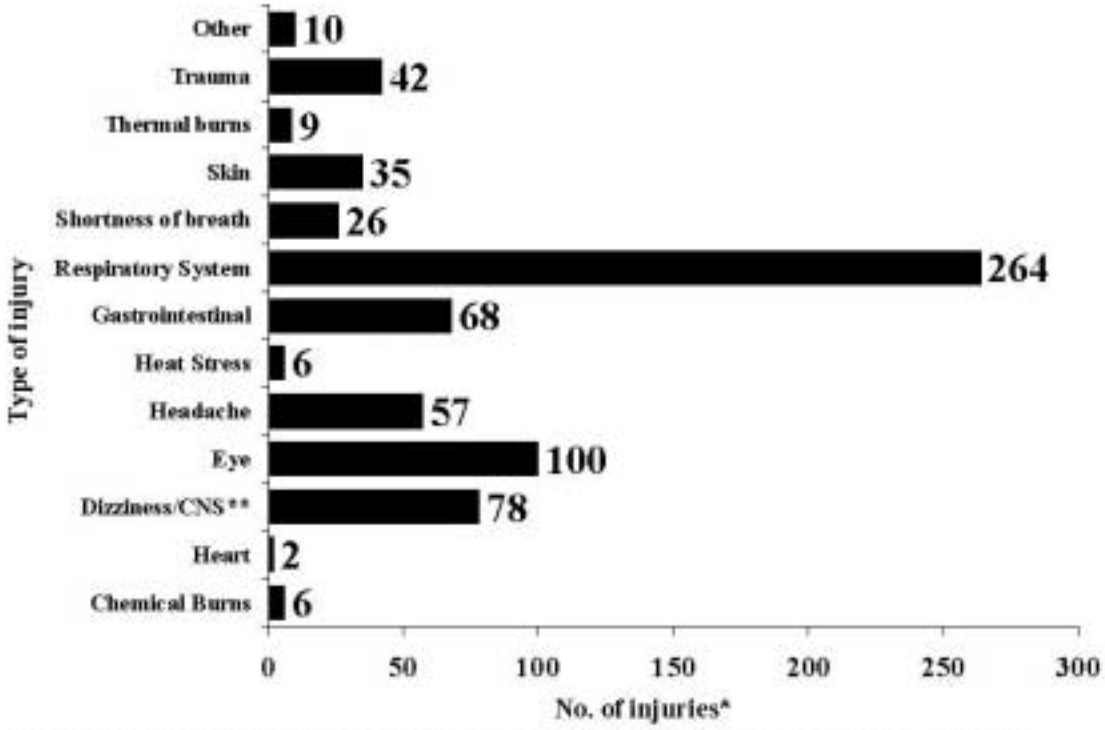


Unk. = specific type unknown



* There were 20 responder victims reported to the North Carolina HSEES system in 1998-2001.

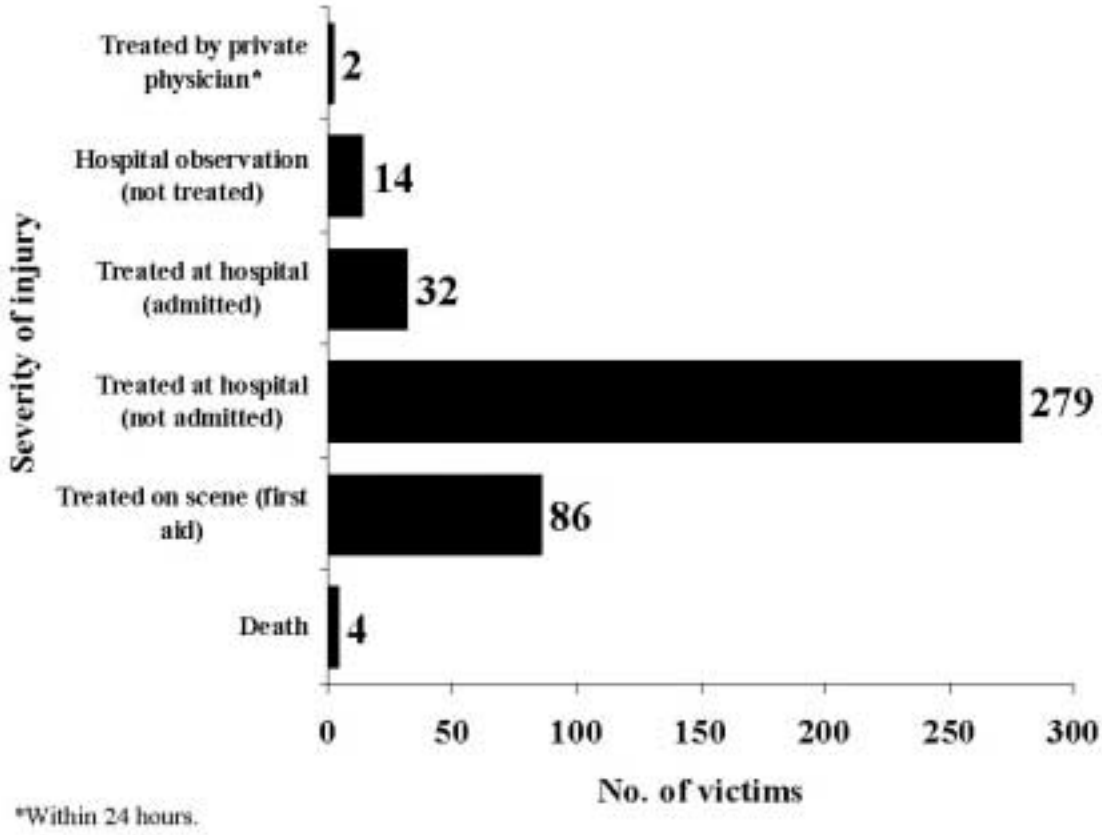
Figure 6. —Distribution of type of injury for all events, Hazardous Substances Emergency Events Surveillance, North Carolina, 1998-2001.



*A total of 703 injuries was reported. The number of injuries was greater than the number of victims because some victims had more than one injury.

**Central nervous system symptoms.

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



*Within 24 hours.

Table 7. —Distribution of type of adverse health effect, by type of event*, Hazardous Substances Emergency Events Surveillance, North Carolina, 1998-2001.

Type of adverse health effect	Type of events				All events	
	Fixed facility		Transportation			
	No.	%	No.	%	No.	%
Chemical burns	5	0.8	1	1.5	6	0.9
Heart problems	2	0.3	0	0.0	2	0.3
Dizziness/CNS†	78	12.3	0	0.0	78	11.1
Eye irritation	96	15.1	4	60.	100	14.2
Headache	57	9.0	0	0.0	57	8.1
Heat stress	3	0.5	3	4.5	6	0.9
Gastrointestinal problems	59	9.3	9	13.4	68	9.7
Respiratory problems	252	39.6	12	17.9	264	37.6
Shortness of breath	26	4.1	0	0.0	26	3.7
Skin irritation	35	5.5	0	0.0	35	5.0
Thermal burns	9	1.4	0	0.0	9	1.3
Trauma	4	0.6	38	56.7	42	6.0
Other	10	1.6	0	0.0	10	1.4
Total	636	100.0	67	100.0	703	100.0

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

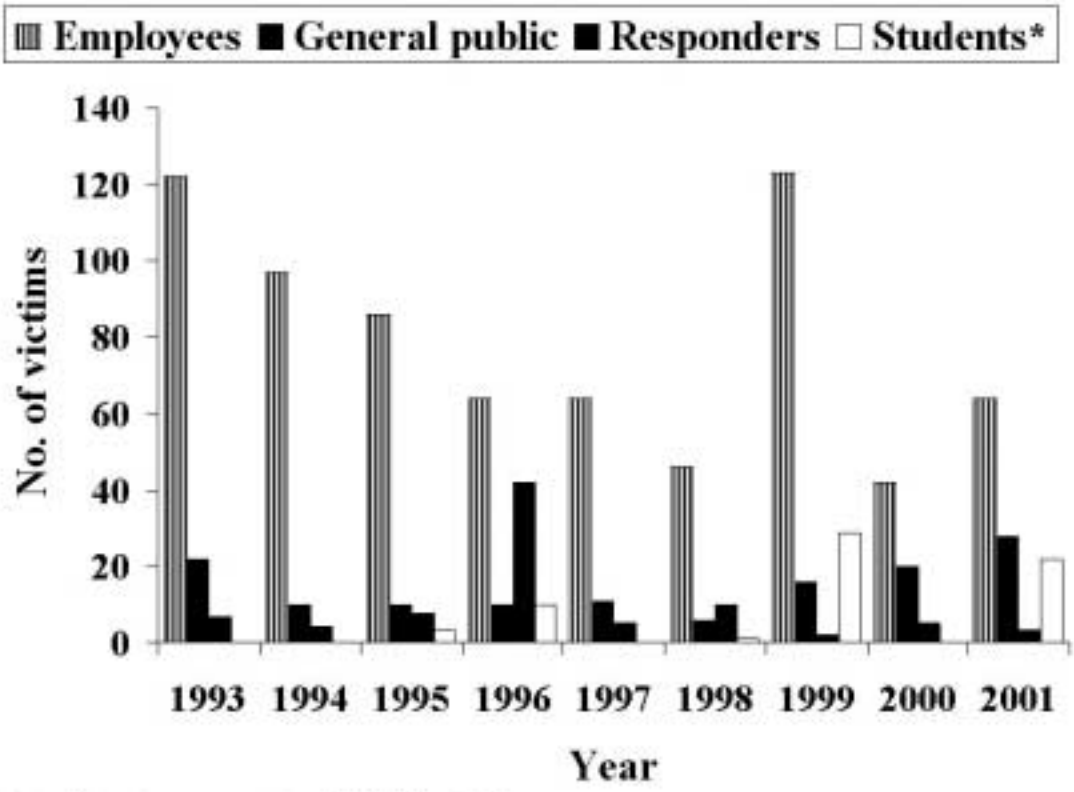
† Central nervous system symptoms.

Table 8. —Cumulative data, Hazardous Substances Emergency Events Surveillance, North Carolina, 1993-2001.*

Year	Type of event			No. of substances released	No. of deaths	No. of victims	Events with victims	
	Fixed facility	Transport	Total				No.	%
1993	184	77	261	306	2	151	58	22.2
1994	191	54	245	273	1	111	36	14.7
1995	186	58	244	285	0	107	30	12.3
1996	128	45	173	185	1	126	32	18.5
1997	116	42	158	172	4	80	26	16.5
1998	88	69	157	183	1	63	23	14.6
1999	108	210	318	349	2	170	32	10.1
2000	87	214	301	314	0	67	26	8.6
2001	90	221	311	360	1	117	25	8.0
Total	1178	990	2168	2427	12	992	288	13.3

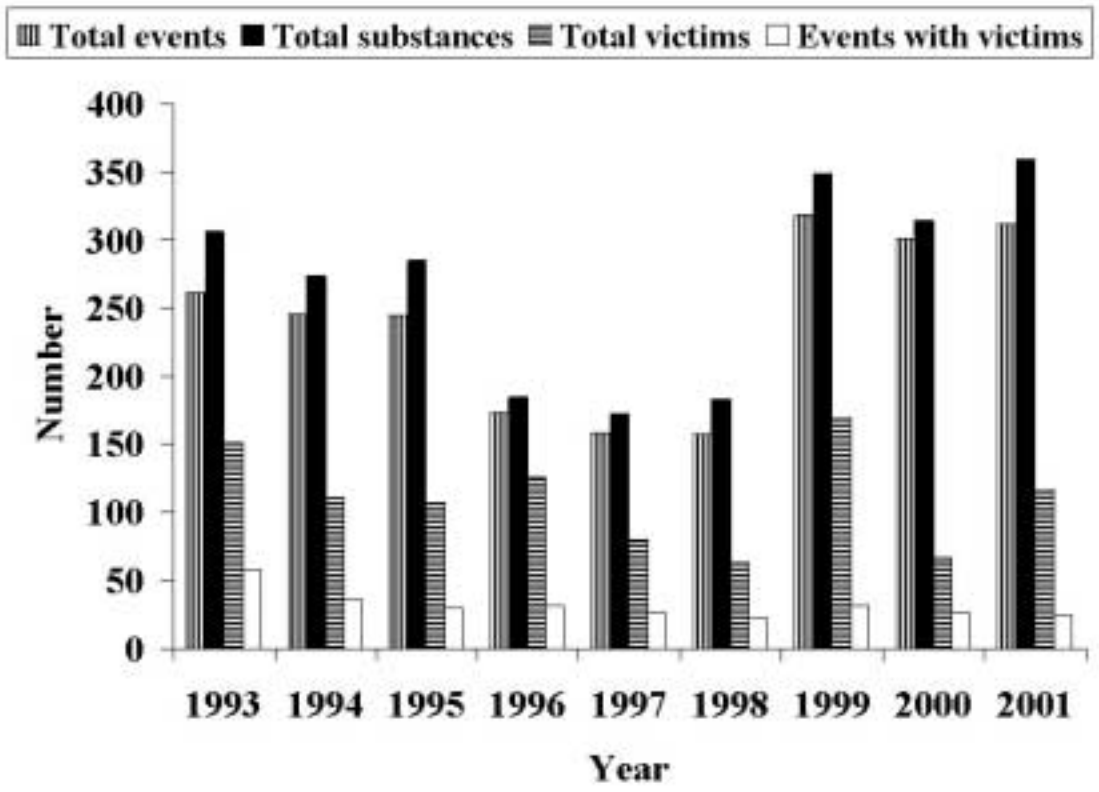
*Numbers in the table may differ from those reported in previous years because of adjustments in the HSEES qualification requirements for events.

Figure 8. —Distribution of victims, Hazardous Substances Emergency Events Surveillance, North Carolina, 1993-2001.



*The student category was not available before 1995.

Figure 9. —Cumulative data for North Carolina, Hazardous Substances Emergency Events Surveillance, 1993-2001.



Map 1. —Event Distribution by county for North Carolina, Hazardous Substances Emergency Events Surveillance, 1998-2001.