

**Texas Hazardous Substances Emergency  
Events Surveillance (HSEES) System  
Executive Summary for 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 1993, the Texas Department of Health (TDH) has participated in this surveillance system. This report summarizes the characteristics of events reported to the surveillance system by the TDH 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, the National Response Center (NRC), the Texas Natural Resource Conservation Commission (TNRCC), U.S. Department of Transportation's Hazardous Materials Information System (HMIS) database, and local fire department hazardous materials units' run sheets. 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 TDH reported a total of 10,551 events for 1998 - 2001; 9,307 (88%) of the events occurred at fixed facilities, and 1,244 (12%) were transportation related. Equipment failure (5,410, 43%) was the contributing factor for the majority of the releases. In 10,385 (98%) of the events, only a single substance was released. The most commonly reported categories of substances were other inorganic substances; volatile organic compounds; mixtures involving more than one category; and a category designated "other substances", which included substances that could not be placed in one of the other 10 categories. During this reporting period, 239 (approximately 2% of all reported events) resulted in a total of 1,131 victims. The adverse health effects most frequently experienced by victims were respiratory irritation, eye irritation, skin irritation, and trauma. A total of 17 persons died as a result of all events, and 273 (3%) events required evacuations.

The findings regarding the distribution of the types of events, the numbers of events with victims and evacuations, and the numbers and types of injuries reported have, overall, been consistent since HSEES inception.

# **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. The Texas HSEES program (TxHSEES) has a size criterion that it imposes on all events meeting the case definition: The quantity must be greater than 10 pounds or 1 gallon (unless the CERCLA reportable quantity is 1 pound). 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, the National Response Center (NRC), the Texas Natural Resource Conservation Commission (TNRCC), U.S. Department of Transportation's Hazardous Materials Information System (HMIS) database, and local fire department hazardous materials units' run sheets. 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 TDH 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 TDH.

## **RESULTS**

A total of 10,551 hazardous substances emergency events were reported in 1998 - 2001 to the HSEES system by the TDH; about 45 (< 1%) of these events were threatened releases; 9,307 (88%) of the events occurred at fixed facilities; and 1,244 (12%) were transportation-related events (Table 1). Table 2 shows the number of events by county and type of event. The counties with the most frequent number of events were Harris 3,157 (30%) and Jefferson 1,415 (13%). These counties have a large number of industrial facilities.

The areas/locations most frequently involved in fixed-facility events included the process vessel 3,449 (35%) and the ancillary process equipment 3,397 (33%) (Figure 1). In transportation-related events, 74% occurred during ground transport (for example, truck, van, or tractor), and 16% 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). Up to two factors could be chosen for each event. Equipment failure was a contributing factor in 5410 (43%) of the events, 1,382 (11%) events were reported as involving human error, 1,307 (10%) involving process upset, and the remainder were attributable to other factors. (Information on factors contributing to transportation events was not collected until 2000.)

Ninety-eight percent of all events involved the release of only one substance. Two substances were released in 1% 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; 10,813 (98%) of the substances were actually released in 10,462 (99%) events; 63 (<1%) of the substances in 45 (<1%) of the events were threatened to be released; and 110 (1%) of the substances were involved in 44 (<1%) events that had both threatened and actual releases. The number of substances released was higher than the number of events. Most substances released were either spills 28% or air emissions 67%. Of the spills, 62% occurred in fixed-facility events. Of the air emissions, 99% occurred in fixed-facility events. The remaining releases resulted from fires (3%) or other types of releases (or combinations of types of releases) (1%). Ninety-nine (<1%) of the substances were threatened to be released.

Of the events with known time of occurrence, 34% occurred primarily from 06:00 AM through 11:59AM, and 29% from 12:00 noon through 17:59 (5:59 PM). Approximately 21% of events occurred on a Saturday or Sunday.

## **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 (33%), volatile organic compounds (24%), and mixtures (23%) (Table 4). In transportation-related events, other substances (28%), volatile organic compounds (20%), and acids (15%) were most frequently released. The 10 substances most frequently released in Texas for 1998 - 2001 are listed in Appendix A.

## **VICTIMS**

A total of 1,131 victims were involved in 239 events (2% of all events) (Table 5). Of the events with victims, 62% involved only one victim, and 77% involved either one or two victims. There were 143 (60%) fixed-facility events with victims and 96 (40%) transportation-related events with victims.

The substances released may not necessarily be the most likely to result in victims (Table 6). For example, other inorganic substances were released during 3,334 events; however, only 58 (approximately 2%) of these events resulted in adverse health effects.

Conversely, chlorine was released in only 52 events, and 10 (19%) of these events resulted in adverse health effects, indicating its greater potential for immediate harm.

The population groups most often adversely affected were employees (76%) and members of the general public (15%) (Figure 4). There were 56 first responder-victims in fixed-facility events. Of those, 68% were firefighters, 20% were responders of unknown type, 7% were police officers, and 5% were emergency medical technicians for fixed facilities (Figure 5). There were 10 first responder victims in transportation-related events. Of these, 50% were police officers, 40% were firefighters, and 10% were responders of unknown type in transportation-related events.

The types of adverse health effects sustained by victims are shown in Table 7 and Figure 6. The victims sustained a total of 1,910 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 (623, 36%) and eye irritation (272, 16%). In transportation-related events, trauma (85, 48%) and respiratory irritation (22, 12%) were reported most frequently. 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 99% of the victims was known; of these, 85% were male. The age of 94% of the victims was known; of these, the mean age was 36 years (range: <1 - 75 years). Most (37%) victims were transported to a hospital and treated on an outpatient basis, and 1.5% died (Figure 7).

Among victims, 22% of employees and 12% of first responders had not worn any form of PPE. There were no reports of student victims. The type of PPE worn by employee victims included eye protection (27%), hard hats (26%), steel-toed shoes (19%), and gloves (12%). Of the first responder victims, the most frequently worn PPE was fire fighter turnout gear (54%) followed by gloves (11%).

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 17 persons who died as a result of hazardous substances releases, 13 were employees and 4 were members of the general public. Thirteen died in transportation-related events and 4 in fixed-facility events. There were 16 men and 1 woman. They ranged in age from 23 – 75. Their injuries included trauma (13), thermal burns (5), chemical burns (2), and respiratory irritation (2).

## **EVACUATION**

Evacuations were ordered in 273 (3%) events. Of known evacuations, 163 (59%) were of a building or the affected part of a building, 93 (34%) were of an area besides an affected building, and 18 (7%) were reported as having no criteria. The median number of persons evacuated was 24 (range: 1 - 5000), and the median length of evacuation was 9 hours (range: 1 hour – 25 days). In 71 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 50 (70%) of these events.

## **CONTINGENCY PLANS**

The types of contingency or preparedness plans used during an event varied, with 79% involving the use of a company's operating procedures; 13% of events were reported as using an incident-specific *ad hoc* plan; and 7% involved the use of a hazardous materials (HAZMAT) or other response team's standard operating procedures.

## **TxHSEES SPECIFIC EVENTS**

The following is a description of some of the major events that occurred as a result of Tropical Storm Allison in 2001. This storm battered Texas from June 5-9, 2001, causing flood conditions that hadn't been seen in 500 years. Clean-up activities lasted for weeks afterwards. Twenty-eight counties (including the heavily industrialized Brazoria, Chambers, Galveston, and Harris counties) were declared disaster areas. According to the Environmental Protection Agency (EPA) Region VI's report, "Tropical Storm Allison formed relatively quickly in the northwest quadrant of the Gulf of Mexico starting early in the afternoon of June 5, 2001. The storm made landfall with sustained winds of 50 mph, with winds extending outward up to 90 miles from the center. The storm moved up to the Lufkin [East Texas] area and stalled. This . . . created days of continual rain in the entire southeastern Texas area, producing massive rainfall totals. This . . . resulted in severe flooding in 28 counties."

EPA Region VI worked closely with TNRCC, USCG, and local authorities to provide assistance. USCG assisted with loose containers found in the water. EPA assisted in removing loose containers left lying on land as the water receded. EPA officials also noted that local ship channel industries who were "collecting large volumes of oily and non-oiled floating debris that came to rest around their commercial docks" had requested federal assistance with the debris. During the recovery, Harris County Pollution Control handled citizen calls regarding household hazardous waste. TxHSEES followed up on all NRC and TNRCC reports that met TxHSEES case definition criteria.

The severe weather (rain, lightening, high winds) extinguished pilot lights on flares and caused power failures leading to equipment failures and plant shutdowns, in turn, causing air emissions. There were 14 such events releasing >200,000 pounds of mixtures of:

- Acetaldehyde
- Acetophenone
- Alcohol
- Benzene
- Butadiene
- Butene
- Carbon Monoxide
- Ethyl Benzene
- Ethylene
- 1-Hexene
- Hydrogen
- Hydrogen Sulfide
- Methanol
- Methyl Benzene
- NOx
- Propylene
- Propylene Oxide
- Sulfur Dioxide
- Toluene
- Xylene
- VOC NOS

One facility had one floating roof sink losing 707 pounds of VOC NOS to the air. Another facility had 6 floating roofs sink releasing 900 pounds of benzene, 280 pounds of fluoranthone, 51,900 pounds of toluene, 1,400 pounds of xylene, an unknown amount of gasoline, and an unknown amount of crude oil. A third incident involved a storm water pump for a storage tank floating roof which was overwhelmed by the large volume of rain water. This caused 3,438 pounds of a mixture of benzene, carbon monoxide, and VOC NOS to be released to the air.

There were 7 reports of heavy rains causing secondary containments to fail. Three releases occurred at the same facility. The first release occurred June 6, 2001 at 9:00 AM; 142 pounds of phosphoric acid leaked out of containment into the Houston Ship Channel. The second release occurred on June 9, 2001 at 12:01 AM; 15,000,000 gallons of phosphoric acid and water with PH of 0-2 were released to Bayou and Houston Ship Channel. This release was due to human error. The gypsum pile retaining wall, which had failed earlier in the year on January 11, 2001 had not been repaired before Tropical Storm Allison occurred. In the third release on June 9, 2001 at 10:45 AM, 850,000 gallons of sulfuric acid leaked through an above ground storage tank and ate through secondary containment. With the 36 inches of rain, there was total tank failure and the



material overflowed the secondary containment and contaminated large areas of the plant and entered the Houston Ship Channel.

On June 6 at 4:00 AM, another facility had an overflow of waste water from an outfall spilling 118 pounds of xylene. On June 8 at 9:30 PM heavy rains caused an overflow of 700 pounds of dicyclopentadiene at a third facility. On June 9 at 2:50 AM, a fourth facility experienced an overflow of secondary containment resulting in the release of 73 million gallons of storm water containing a mixture of:

- Aluminum
- Ammonia
- Acetone
- Barium
- Calcium
- Carbon
- Chromium
- cis-1,4-Dichlorobenzene
- Copper
- Iron
- Magnesium
- Potassium
- Sodium
- Vanadium
- Zinc

Later on June 9 at 4:30 PM, at a fifth facility, 120,000 gallons of storm water containing 300 ppm of ammonia (equivalent to 300 pounds of ammonia) overflowed from containment.

Flooding in Houston (at least 40 inches of water) caused a warehouse at a barge facility to flood and cover the dock with more than 1,000 tons of urea fertilizer. Flooding in Wharton county caused 3,600 gallons of ammonium nitrate fertilizer to wash from the loading/unloading areas of a chemical storage warehouse into ditches located in front of company property. One unusual and very tragic situation involved the flooding of a medical research laboratory located in the basement of a medical facility in downtown Houston. Many years of data and research efforts were lost. Less than 30 gallons of a mixture of alcohol, toluene, xylene, and non-halogenated solvents was spilled during the flood, as was less than 30 gallons of a mixture of carbon tetrachloride, chloroform, and halogenated solvents and 30 gallons of cooking oil. An unknown number of laboratory animals died in the flooding and an unknown quantity of biomedical waste was released. Fifteen employee-responders and 80 insurance assessor-responders were decontaminated. At the time of the flooding, which began on a Saturday, June 9, at 1:15 AM, ten people were evacuated from the affected lower floors of the medical facility. It took one week to pump out the flood water and clean up/decontaminate the area. Employees were not allowed to return to this part of the building for more than a month.

The only TxHSEES flood-related event having a victim involved a home owner's son-in-law who received chemical burns while trying to remove a drum that flood waters had carried and left in his mother-in-law's front yard. The drum contained "Corrosive Liquid NOS" and the injury occurred on June 12, 2001. The incident was reported to

Houston Fire Department's HAZMAT Unit. Unfortunately, additional information such as the man's age, whether or not he was decontaminated, or whether he received further medical treatment could not be obtained, even though the TxHSEES investigator made several attempts to do so.

Heavy rains may have contributed to a motor freight carrier accident in which the driver tried to make a sudden stop. The tote bin on his trailer ripped open causing 275 gallons of polymeric diphenyl methane diisocyanates to spill. Houston Fire Department's HAZMAT Unit responded to this incident. There were no victims.

Although it is not mentioned in some of the notifications and investigations, heavy rains and flooding may indirectly have contributed to several reports of equipment failure in piping and ancillary equipment. Some of the reported plant shutdowns in this region of the state from June 5 – 9, 2001 may have been due, in part, to the severe weather. Subsequent plant startups that occurred from June 10-12, 2001 also could have been related to the severe weather conditions and facility shutdowns that had occurred earlier in the week.

## **USES OF HSEES DATA**

TxHSEES uses the data it collects and analyzes to:

- make presentations to government, industry, and responder groups;
- produce and distribute booklets describing the distribution and impact of chemical emergencies within specific industries and groups; and
- assist individual companies by providing them analyses of their own data so they can use it to further define and improve their processes.

## **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. Since 1996, TxHSEES on average has completed approximately 2,600 cases/year. The largest number of cases (2,860) was investigated in 1998. The largest number of events with victims occurred in 1994 with 80 events injuring 1,012 victims. The second largest number of events with victims occurred in 1998, with 72 events injuring 418 victims (Table 8 and Figure 9). Since 1998, the number of employee victims has decreased (Figure 8 and Figure 9).

## APPENDICES

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

Number	Standardized Substance Name	Frequency
1.	Mixtures	3980
2.	Sulfur Dioxide	883
3.	Nitric Oxide/Nitrogen Dioxide/Oxides of Nitrogen NOS (NO <sub>x</sub> )	846
4.	Butadiene	339
5.	Benzene	320
6.	Ammonia	314
7.	Sulfuric Acid	185
8.	Sodium Hydroxide	162
9.	Ethylene	153
10.	Carbon Monoxide	133
Total		7315

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

Year	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
1998	2616	91.5	244	8.5	2860
1999	2336	86.8	355	13.2	2691
2000	2137	86.0	349	14.0	2486
2001	2218	88.2	296	11.8	2514
Total	9307	88.2	1244	11.8	10551

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

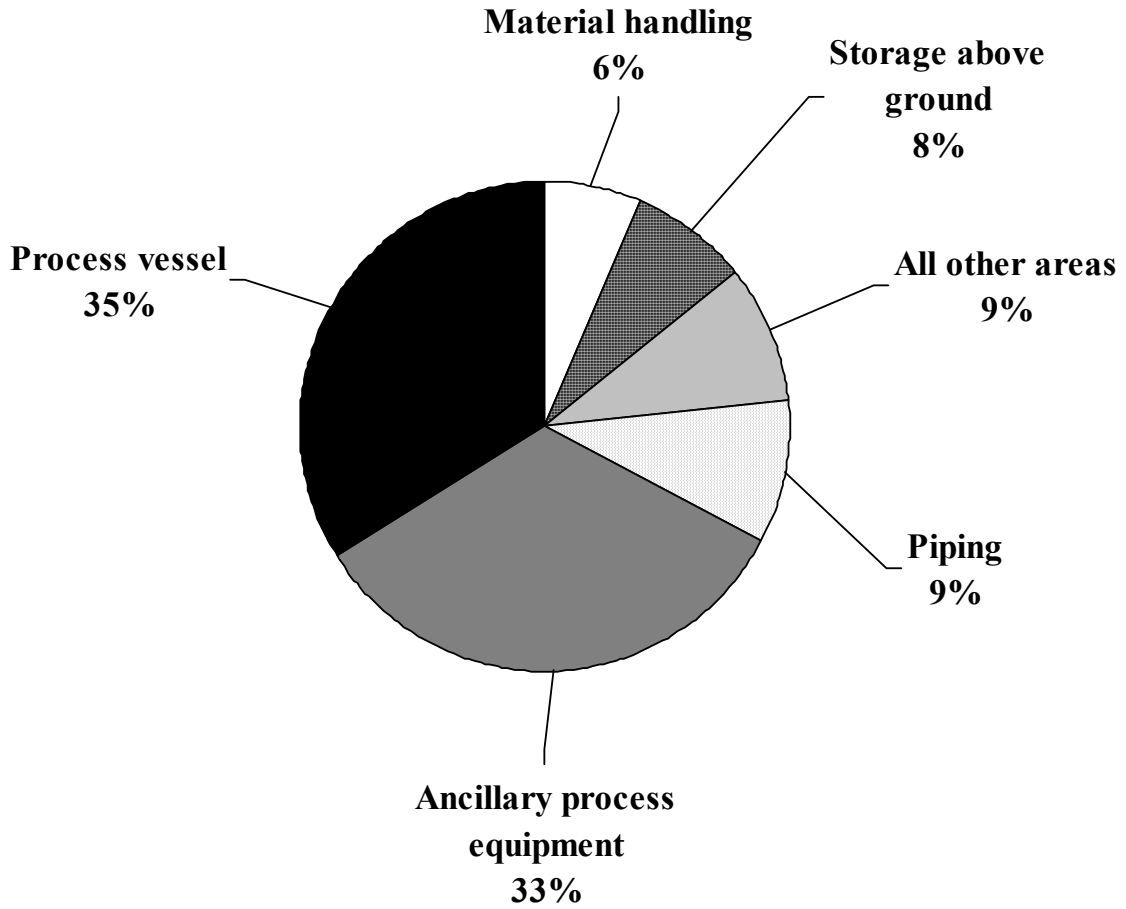
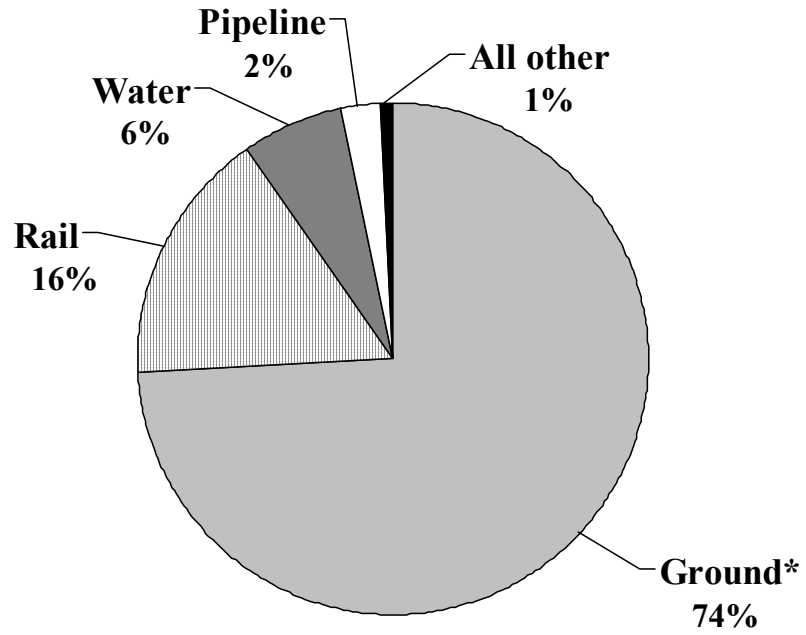
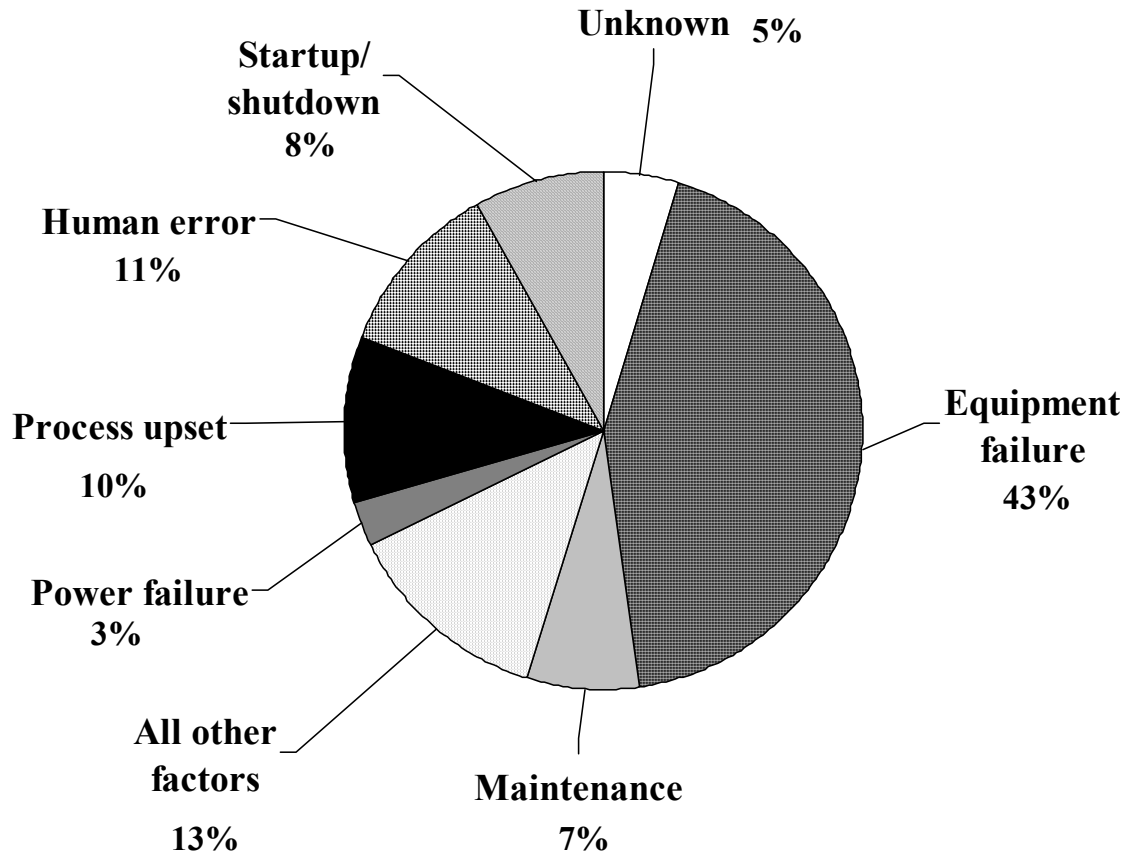


Figure 2. —Distribution of transportation-related events, by type of transport, Hazardous Substances Emergency Events Surveillance, Texas, 1998 - 2001.



\*Transport in a truck, van, or tractor.

Figure 3. . —Contributing factors, Hazardous Substances Emergency Events Surveillance, Texas, 1998 – 2001\*.



\*Information on factors contributing to transportation events was not collected until 2000.



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

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
Anderson	5	83.3	1	16.7	6
Andrews	2	66.7	1	33.3	3
Angelina	69	92.0	6	8.0	75
Aransas	2	100.0	0	0.0	2
Archer	4	80.0	1	20.0	5
Armstrong	0	0.0	1	100.0	1
Atascosa	0	0.0	1	100.0	1
Austin	2	100.0	0	0.0	2
Bailey	0	0.0	0	0.0	0
Bandera	0	0.0	1	100.0	1
Bastrop	1	50.0	1	50.0	2
Baylor	0	0.0	0	0.0	0
Bee	2	100.0	0	0.0	2
Bell	4	40.0	6	60.0	10
Bexar	49	70.0	21	30.0	70
Blanco	0	0.0	0	0.0	0
Borden	1	100.0	0	0.0	1
Bosque	0	0.0	0	0.0	0
Bowie	10	76.9	3	23.1	13
Brazoria	767	96.4	29	3.6	796
Brazos	4	50.0	4	50.0	8
Brewster	1	100.0	0	0.0	1
Briscoe	0	0.0	0	0.0	0
Brooks	0	0.0	1	100.0	1
Brown	0	0.0	1	100.0	1
Burleson	3	42.9	4	57.1	7
Burnet	0	0.0	1	100.0	1
Caldwell	1	100.0	0	0.0	1
Calhoun	286	99.3	2	0.7	288
Callahan	0	0.0	1	100.0	1
Cameron	17	58.6	12	41.4	29
Camp	2	100.0	0	0.0	2
Carson	1	20.0	4	80.0	5
Cass	0	0.0	2	100.0	2
Castro	3	100.0	0	0.0	3

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

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
Chambers	95	93.1	7	6.9	102
Cherokee	1	33.3	2	66.7	3
Childress	0	0.0	0	0.0	0
Clay	0	0.0	0	0.0	0
Cochran	0	0.0	1	100.0	1
Coke	0	0.0	0	0.0	0
Coleman	0	0.0	2	100.0	2
Collin	10	71.4	4	28.6	14
Collingsworth	0	0.0	0	0.0	0
Colorado	1	33.3	2	66.7	3
Comal	25	96.1	1	3.9	26
Comanche	1	50.0	1	50.0	2
Concho	0	0.0	0	0.0	0
Cooke	1	25.0	3	75.0	4
Coryell	1	100.0	0	0.0	1
Cottle	0	0.0	0	0.0	0
Crane	113	100.0	0	0.0	113
Crockett	1	50.0	1	50.0	2
Crosby	0	0.0	0	0.0	0
Culberson	0	0.0	2	100.0	2
Dallam	2	50.0	2	50.0	4
Dallas	179	42.6	241	57.4	420
Dawson	0	0.0	0	0.0	0
Deaf Smith	0	0.0	0	0.0	0
Delta	0	0.0	1	100.0	1
Denton	14	58.3	10	41.7	24
DeWitt	0	0.0	0	0.0	0
Dickens	0	0.0	0	0.0	0
Dimmit	0	0.0	0	0.0	0
Donley	0	0.0	1	100.0	1
Duval	1	25.0	3	75.0	4
Eastland	0	0.0	0	0.0	0
Ector	230	96.2	9	3.8	239
Edwards	0	0.0	0	0.0	0

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

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
Ellis	19	82.6	4	17.4	23
El Paso	139	66.5	70	33.5	209
Erath	1	100.0	0	0.0	1
Falls	2	100.0	0	0.0	2
Fannin	2	66.7	1	33.3	3
Fayette	1	25.0	3	75.0	4
Fisher	1	50.0	1	50.0	2
Floyd	2	100.0	0	0.0	2
Foard	0	0.0	0	0.0	0
Fort Bend	16	80.0	4	20.0	20
Franklin	1	50.0	1	50.0	2
Freestone	5	55.6	4	44.4	9
Frio	0	0.0	0	0.0	0
Gaines	4	80.0	1	20.0	5
Galveston	575	97.0	18	3.0	593
Garza	1	100.0	0	0.0	1
Gillespie	1	100.0	0	0.0	1
Glasscock	0	0.0	0	0.0	0
Goliad	0	0.0	0	0.0	0
Gonzales	2	100.0	0	0.0	2
Gray	39	100.0	0	0.0	39
Grayson	19	73.1	7	26.9	26
Gregg	173	95.0	9	5.0	182
Grimes	0	0.0	1	100.0	1
Guadalupe	7	88.4	1	12.0	8
Hale	3	75.0	1	25.0	4
Hall	1	100.0	0	0.0	1
Hamilton	1	100.0	0	0.0	1
Hansford	2	100.0	0	0.0	2
Hardeman	0	0.0	1	100.0	1
Hardin	11	84.6	2	15.4	13
Harris	2791	88.4	366	11.6	3157
Harrison	25	89.3	3	10.7	28
Hartley	2	66.7	1	33.3	3

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

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
Haskell	2	100.0	0	0.0	2
Hays	1	100.0	0	0.0	1
Hemphill	2	66.7	1	33.3	3
Henderson	5	71.4	2	28.6	7
Hidalgo	11	68.8	5	31.2	16
Hill	5	71.4	2	28.6	7
Hockley	4	80.0	1	20.0	5
Hood	1	50.0	1	50.0	2
Hopkins	2	33.3	4	66.7	6
Houston	0	0.0	0	0.0	0
Howard	122	98.4	2	1.6	124
Hudspeth	0	0.0	1	100.0	1
Hunt	1	100.0	0	0.0	1
Hutchinson	279	98.6	4	1.4	283
Irion	0	0.0	0	0.0	0
Jack	1	50.0	1	50.0	2
Jackson	0	0.0	1	100.0	1
Jasper	3	75.0	1	25.0	4
Jeff Davis	0	0.0	0	0.0	0
Jefferson	1390	98.2	25	1.8	1415
Jim Hogg	0	0.0	1	100.0	1
Jim Wells	1	100.0	0	0.0	1
Johnson	10	71.4	4	28.6	14
Jones	3	60.0	2	40.0	5
Karnes	1	50.0	1	50.0	2
Kaufman	6	66.7	3	33.3	9
Kendall	0	0.0	0	0.0	0
Kenedy	1	100.0	0	0.0	1
Kent	24	100.0	0	0.0	24
Kerr	1	100.0	0	0.0	1
Kimble	0	0.0	0	0.0	0
King	0	0.0	0	0.0	0
Kinney	0	0.0	0	0.0	0
Kleberg	1	50.0	1	50.0	2

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

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
Knox	0	0.0	0	0.0	0
Lamar	0	0.0	2	100.0	2
Lamb	2	66.7	1	33.3	3
Lampasas	0	0.0	0	0.0	0
LaSalle	0	0.0	0	0.0	0
Lavaca	0	0.0	0	0.0	0
Lee	0	0.0	0	0.0	0
Leon	1	100.0	0	0.0	1
Liberty	6	50.0	6	50.0	12
Limestone	3	75.0	1	25.0	4
Lipscomb	0	0.0	0	0.0	0
Live Oak	37	100.0	0	0.0	37
Llano	0	0.0	0	0.0	0
Loving	0	0.0	0	0.0	0
Lubbock	20	62.5	12	37.5	32
Lynn	0	0.0	0	0.0	0
Madison	2	66.7	1	33.3	3
Marion	0	0.0	1	100.0	1
Martin	0	0.0	0	0.0	0
Mason	0	0.0	0	0.0	0
Matagorda	32	100.0	0	0.0	32
Maverick	0	0.0	1	100.0	1
McCulloch	0	0.0	0	0.0	0
McLennon	13	56.5	10	43.5	23
McMullen	0	0.0	0	0.0	0
Medina	1	50.0	1	50.0	2
Menard	0	0.0	0	0.0	0
Midland	5	41.7	7	58.3	12
Milam	10	100.0	0	0.0	10
Mills	0	0.0	1	100.0	1
Mitchell	0	0.0	0	0.0	0
Montague	0	0.0	1	100.0	1
Montgomery	39	76.5	12	23.5	51
Moore	75	98.7	1	1.3	76

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

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
Morris	1	100.0	0	0.0	1
Motley	0	0.0	0	0.0	0
Nacogdoches	2	33.3	4	66.7	6
Navarro	2	33.3	4	66.7	6
Newton	0	0.0	0	0.0	0
Nolan	0	0.0	2	100.0	2
Nueces	603	97.7	14	2.3	617
Ochiltree	1	33.0	2	66.7	3
Oldham	0	0.0	0	0.0	0
Orange	218	99.1	2	0.9	220
Palo Pinto	0	0.0	0	0.0	0
Panola	1	50.0	1	50.0	2
Parker	4	100.0	0	0.0	4
Parmer	1	33.3	2	66.7	3
Pecos	2	66.7	1	33.3	3
Polk	0	0.0	3	100.0	3
Potter	14	48.3	15	51.7	29
Presidio	1	100.0	0	0.0	1
Rains	0	0.0	0	0.0	0
Randall	0	0.0	0	0.0	0
Reagan	0	0.0	0	0.0	0
Real	0	0.0	0	0.0	0
Red River	1	100.0	0	0.0	1
Reeves	0	0.0	1	100.0	1
Refugio	0	0.0	2	100.0	2
Roberts	0	0.0	0	0.0	0
Robertson	0	0.0	3	100.0	3
Rockwall	0	0.0	0	0.0	0
Runnels	1	100.0	0	0.0	1
Rusk	2	100.0	0	0.0	2
Sabine	0	0.0	0	0.0	0
San Augustine	2	100.0	0	0.0	2
San Jacinto	0	0.0	0	0.0	0
San Patricio	15	83.3	3	16.7	18

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

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
San Saba	1	100.0	0	0.0	1
Schleicher	1	100.0	0	0.0	1
Scurry	1	100.0	0	0.0	1
Shackelford	0	0.0	0	0.0	0
Shelby	2	66.7	1	33.3	3
Sherman	3	75.0	1	25.0	4
Smith	90	89.1	11	10.9	101
Somervell	2	100.0	0	0.0	2
Starr	0	0.0	0	0.0	0
Stephens	1	100.0	0	0.0	1
Sterling	2	100.0	0	0.0	2
Stonewall	0	0.0	0	0.0	0
Sutton	1	25.0	3	75.0	4
Swisher	0	0.0	0	0.0	0
Tarrant	92	62.6	55	37.4	147
Taylor	1	11.1	8	88.9	9
Terrell	0	0.0	0	0.0	0
Terry	1	33.3	2	66.7	3
Throckmorton	0	0.0	0	0.0	0
Titus	4	100.0	0	0.0	4
Tom Green	7	77.8	2	22.2	9
Travis	54	58.7	38	41.3	92
Trinity	0	0.0	0	0.0	0
Tyler	0	0.0	0	0.0	0
Upshur	2	40.0	3	60.0	5
Upton	3	100.0	0	0.0	3
Uvalde	0	0.0	0	0.0	0
Val Verde	1	33.3	2	66.7	3
Van Zandt	1	33.3	2	66.7	3
Victoria	223	99.1	2	0.9	225
Walker	3	75.0	1	25.0	4
Waller	8	72.7	3	27.3	11
Ward	2	100.0	0	0.0	2
Washington	2	66.7	1	33.3	3

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

County	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
Webb	14	51.9	13	48.1	27
Wharton	3	60.0	2	40.0	5
Wheeler	0	0.0	0	0.0	0
Wichita	5	50.0	5	50.0	10
Wilbarger	1	50.0	1	50.0	2
Willacy	0	0.0	1	100.0	1
Williamson	8	53.3	7	46.7	15
Wilson	0	0.0	0	0.0	0
Winkler	1	100.0	0	0.0	1
Wise	6	100.0	0	0.0	6
Wood	2	100.0	0	0.0	2
Yoakum	3	75.0	1	25.0	4
Young	0	0.0	0	0.0	0
Zapata	1	100.0	0	0.0	1
Zavala	0	0.0	0	0.0	0
Unidentified	0	0.0	1	100.0	1
Total	9307	88.2	1244	11.8	10551



Table 3.—Distribution of the number of substances released, by type of event, Hazardous Substances Emergency Events Surveillance, Texas, 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	9216	99.0	9216	1169	93.9	1169	10385	98.4	10385
2	53	0.6	106	49	4.0	98	102	1.0	204
3	15	0.2	45	15	1.2	45	30	0.3	90
4	6	0.1	24	3	0.2	12	9	0.1	36
≥ 5	17	0.1	230	8	0.7	41	25	0.2	271
Total	9307	100.0	9621	1244	100.0	1365	10551	100.0	10986

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

Substance category	Type of event				All events	
	Fixed facility		Transportation			
	No. of substances	%	No. of substances	%	No. of substances	%
Acids	334	3.5	211	15.5	545	5.0
Ammonia	315	3.3	12	0.9	327	3.0
Bases	149	1.5	93	6.8	242	2.2
Chlorine	49	0.5	3	0.2	52	0.5
Mixtures*	2203	22.9	108	7.9	2311	21.0
Other inorganic substances	3198	33.2	136	10.0	3334	30.3
Other substances	878	9.1	384	28.1	1262	11.5
Paints and dyes	53	0.6	90	6.6	143	1.3
Pesticides	148	1.5	56	4.1	204	1.9
Polychlorinated biphenyls	20	0.2	3	0.2	23	0.2
Volatile organic compounds	2271	23.6	267	19.6	2538	23.1
Indeterminate	3	<0.1	2	<0.1	5	<0.1
Total**	9621	100.0	1365	100.0	10986	100.1

\* Mixtures of substances from different categories.

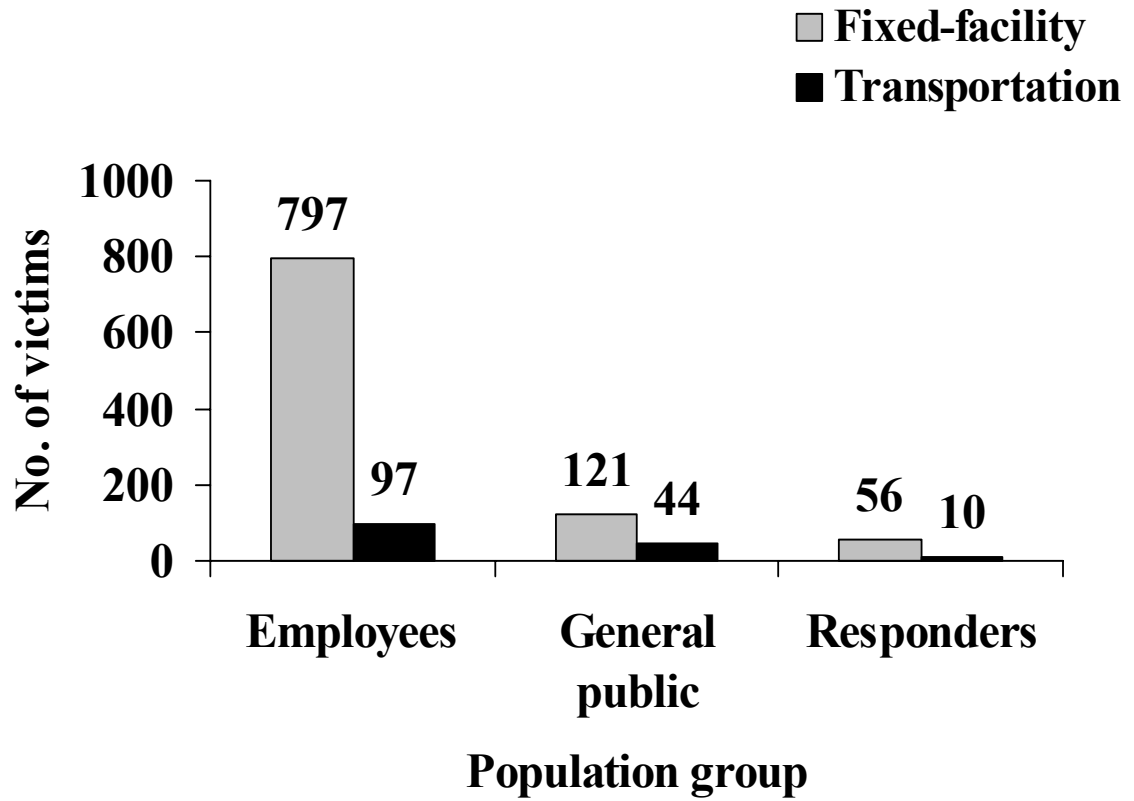
\*\* Percentages may not add to 100% due to rounding.

Table 5.—Distribution of the number of victims, by type of event, Hazardous Substances Emergency Events Surveillance, Texas, 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	74	51.7	74	73	76.0	73	147	61.5	147
2	22	15.4	44	14	14.6	28	36	15.1	72
3	9	6.3	27	2	2.1	6	11	4.6	33
4	10	7.0	40	4	4.2	16	14	5.9	56
5	5	3.5	25	0	0.0	0	5	2.1	25
≥6	23	16.0	770	3	3.1	28	26	10.9	798
Total*	143	99.9	980	96	100.0	151	239	100.1	1131

\* Percentages may not add to 100% due to rounding.

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



\*There were 6 victims involved in fixed-facility events for whom population group was unknown. No victims were identified as students.

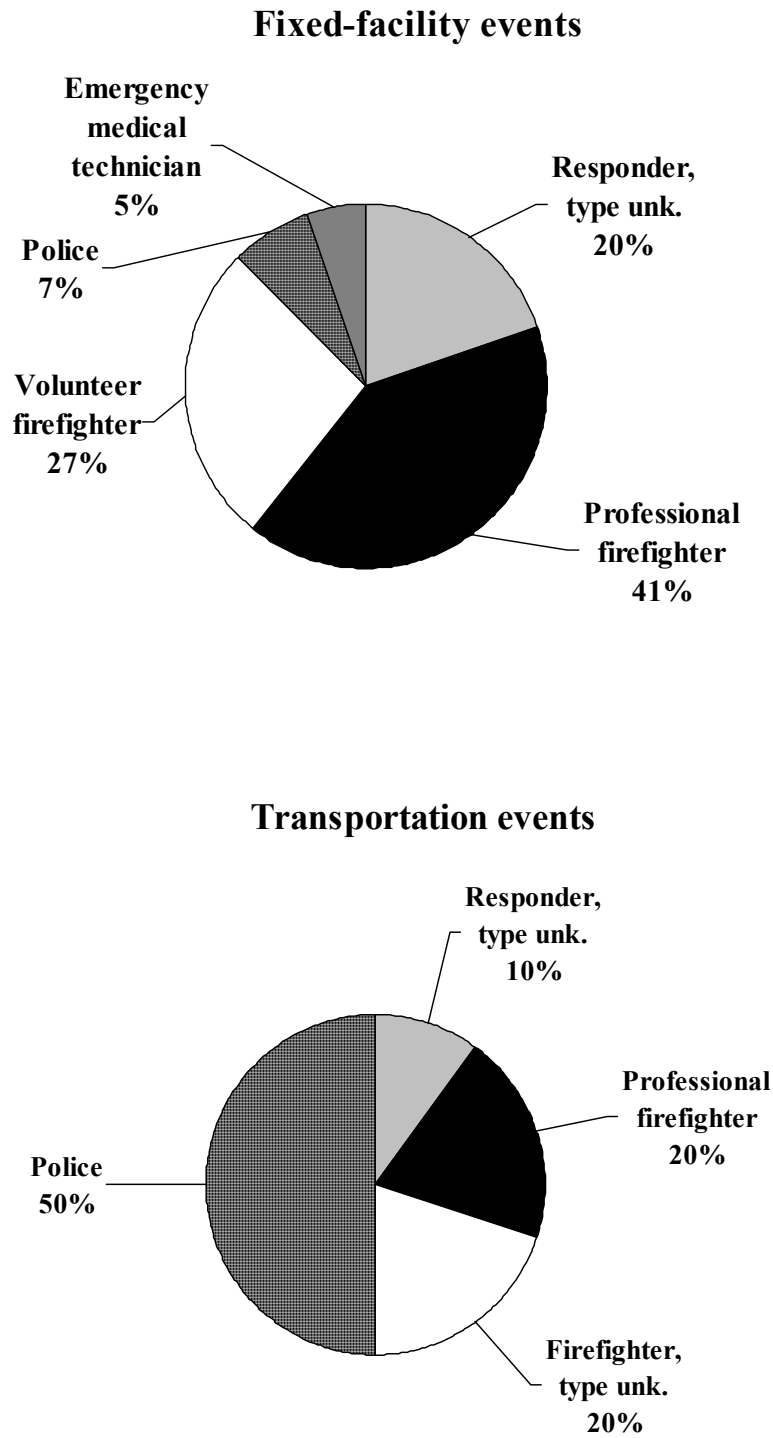
Table 6.—Number of substances released in all events and events with victims, by substance category, Hazardous Substances Emergency Events Surveillance, Texas, 1998 - 2001.

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	545	5.0	47	13.5	8.6
Ammonia	327	3.0	16	4.6	4.9
Bases	242	2.2	14	4.0	5.8
Chlorine	52	0.5	10	2.9	19.2
Mixtures	2311	21.0	53	15.3	2.3
Other inorganic substances	3334	30.3	58	16.7	1.7
Other, not otherwise specified	1262	11.5	77	22.2	6.1
Paints and dyes	143	1.3	5	1.4	3.5
Pesticides	204	1.9	16	4.6	7.8
Polychlorinated biphenyls	23	0.2	0	0.0	0.0
Volatile organic compounds	2538	23.1	50	14.4	2.0
Indeterminate	5	<0.1	1	0.3	20.0
Total*†	10986	100.0	347	99.9	3.2

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

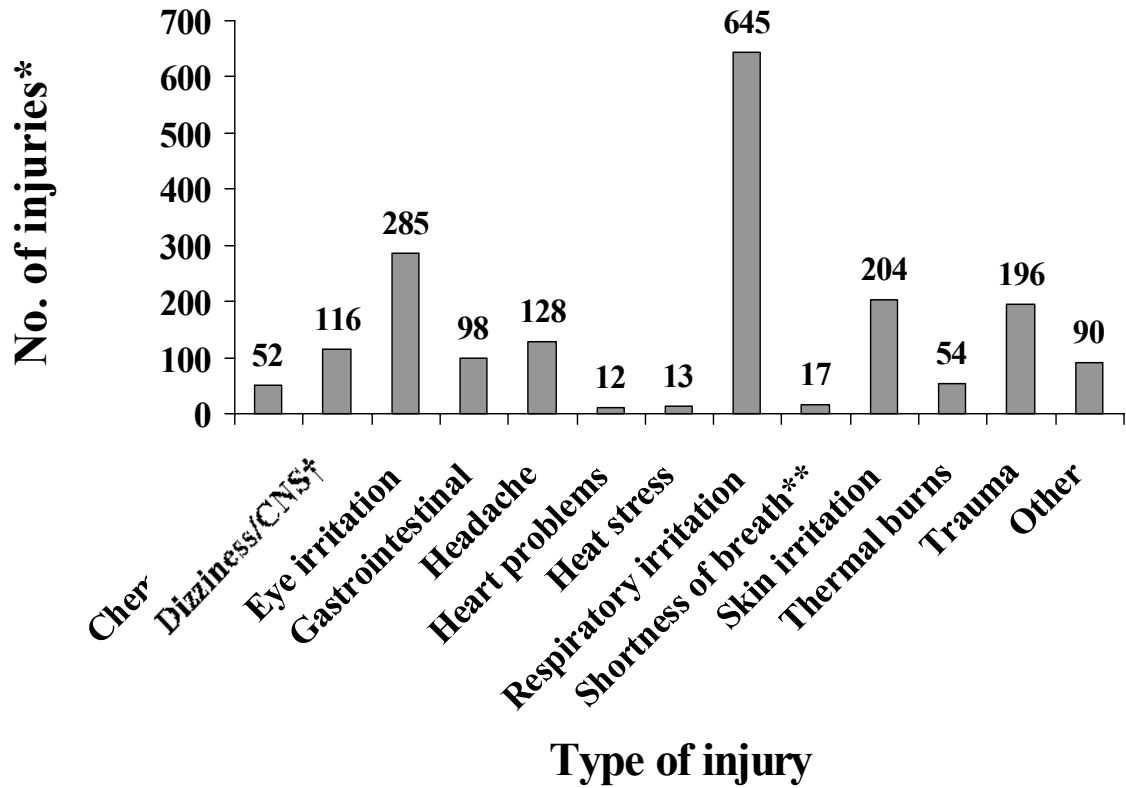
†Percentages may not add to 100% due to rounding.

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



\*There were 66 responder victims reported to Texas in 1998 - 2001.

Figure 6. —Distribution of type of injury for all events, Hazardous Substances Emergency Events Surveillance, Texas, 1998 – 2001.

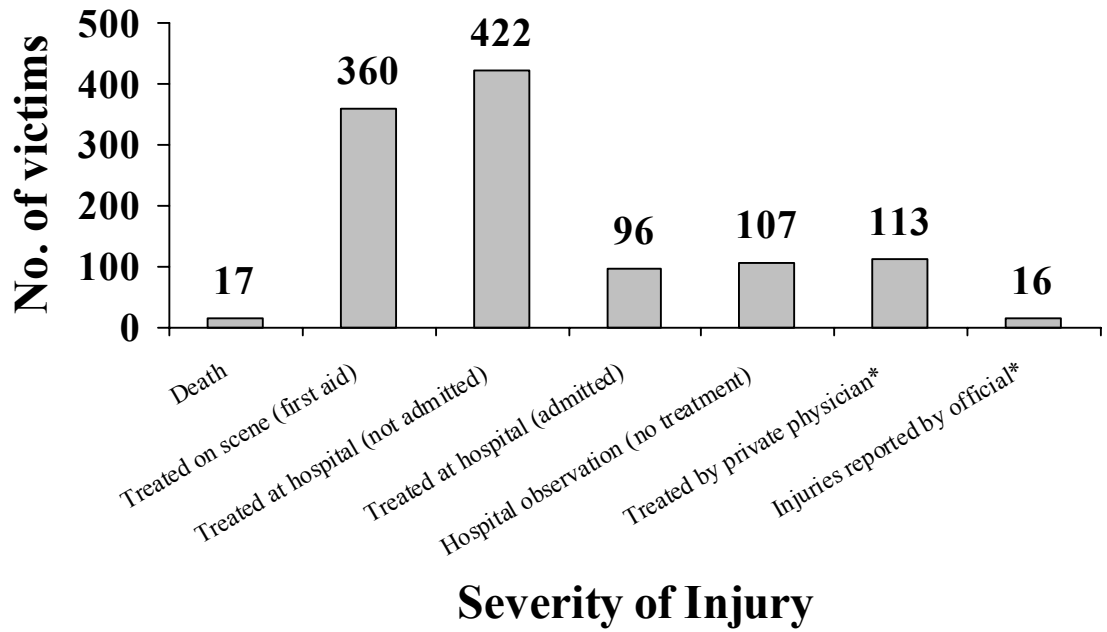


\*A total of 1910 injuries was reported. The number of injuries was greater than the number of victims, because some victims had more than one injury.

†Central nervous system symptoms.

\*\*Shortness of breath due to unknown cause.

Figure 7. —Injury outcome, Hazardous Substances Emergency Events Surveillance, Texas, 1998 – 2001.



\*Within 24 hours.



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

Type of adverse health effect	Type of event				All events	
	Fixed facility		Transportation			
	No.	%	No.	%	No.	%
Chemical burns	44	2.5	8	4.5	52	2.7
Heart problems	12	0.7	0	0.0	12	0.6
Dizziness/CNS <sup>†</sup>	111	6.4	5	2.8	116	6.0
Eye irritation	272	15.7	13	7.3	285	14.9
Headache	109	6.3	19	10.7	128	6.7
Heat stress	12	0.7	1	0.6	13	0.7
Gastrointestinal problems	87	5.0	11	6.2	98	5.1
Respiratory irritation	623	36.0	22	12.4	645	33.8
Shortness of breath‡	17	1.0	0	0.0	17	0.9
Skin irritation	198	11.4	6	3.4	204	10.7
Thermal burns	48	2.8	6	3.4	54	2.8
Trauma	111	6.4	85	47.8	196	10.3
Other	88	5.1	2	1.1	90	4.7
Total**	1732	99.9	178	100.2	1910	99.9

\* 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.

‡ Shortness of breath due to unknown cause.

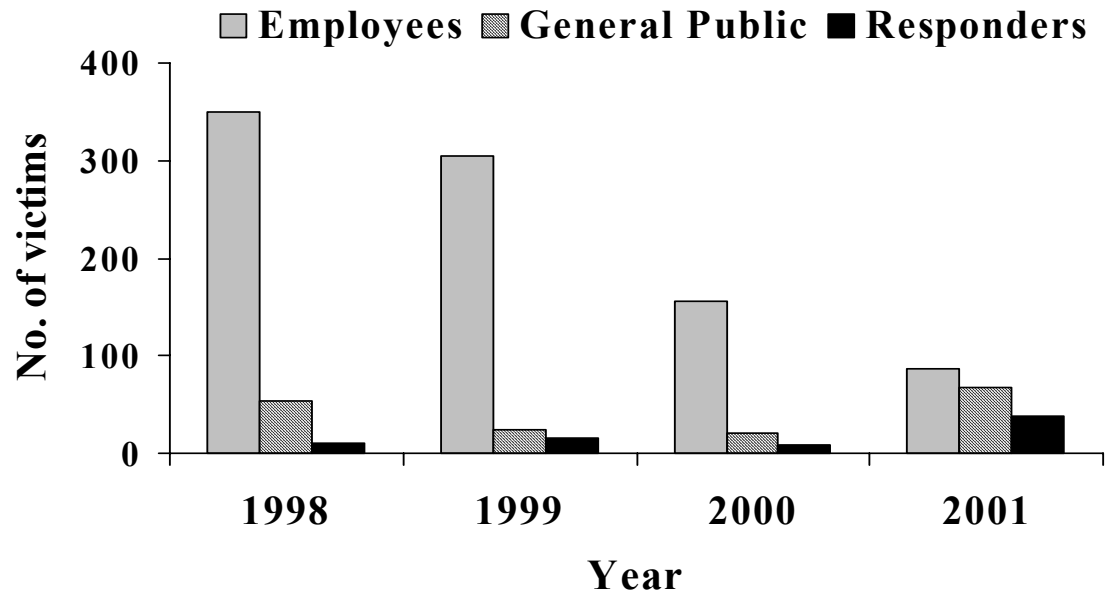
\*\* Percentages may not add to 100% due to rounding

Table 8.— Cumulative data, Hazardous Substances Emergency Events Surveillance, Texas, 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	1145	106	1251	1543	6	702	60	4.8
1994	1099	155	1254	1668	7	1012	80	6.4
1995	1945	170	2115	2289	0	254	52	2.5
1996	2265	223	2488	2543	19	249	65	2.6
1997	2455	254	2709	2833	11	290	55	2.0
1998	2616	244	2860	2925	6	418	72	2.5
1999	2336	355	2691	2791	2	344	49	1.8
2000	2137	349	2486	2582	8	178	53	2.1
2001	2218	296	2514	2688	1	191	65	2.6
Total	18215	2152	20368	21862	60	3638	551	2.7

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

Figure 8. — Distribution of victims, Hazardous Substances Emergency Events Surveillance, Texas, 1998 - 2001.



\*No students were identified during this time period. There were 6 unknown victims in 1998.

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

