In 1980, Congress created the Agency for Toxic Substances and Disease Registry (ATSDR) to implement health-related sections of laws that protect the public from hazardous wastes and environmental spills of hazardous substances. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), commonly known as the "Superfund" Act, designated ATSDR as the lead agency within the Public Health Service to help prevent or reduce further exposure to hazardous substances and the adverse health effects that result from such exposures, and also to expand the knowledge base about such effects.

This publication reports the results and findings of a health study, registry, or other health-related activity supported by ATSDR in accordance with its legislative mandate described above.

Comments regarding this report are welcome. Please address to:

Agency for Toxic Substances and Disease Registry
Attn: Director, Division of Health Studies (E-31)
1600 Clifton Road, N.E.
Atlanta, Georgia 30333

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY
ATLANTA, GEORGIA

HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE (HSEES)

ANNUAL REPORT

1995

DIVISION OF HEALTH STUDIES
EPIDEMIOLOGY AND SURVEILLANCE BRANCH

DISCLAIMER

Mention of the name of any company or product does not constitute endorsement by the Agency for Toxic Substances and Disease Registry, the Public Health Service, or the U.S. Department of Health and Human Services.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

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. Five state health departments participated in the pilot phase of the surveillance system and began data collection on January 1, 1990. By 1995, the number of participating state health departments had increased to 14. This report summarizes the characteristics of events reported to the surveillance system from January 1, 1995, through December 31, 1995.

Information on acute hazardous substances emergency events was collected on data collection forms designed by ATSDR. The types of items collected included general information on the event, substance(s) released, victims, injuries, and evacuations. Estimates have been made of the number of people at risk of exposure to a particular event. In 1995, the HSEES data collection form was modified to allow the collection of additional information related to the event, substance(s) released, and victims. The major changes to the data collection form now allow information to be gathered on (1) whether individual substances involved in the event were actually released or threatened to be released, and (2) specific information on the types of responders involved in events. Participating state health departments began collecting data on the revised data collection form in July 1995.

Several data sources were used to obtain the maximum amount of information about these events. These sources included, but were not limited to, records or oral reports of state environmental protection agencies, police and fire departments,

and hospitals. The data obtained were computerized using an ATSDR-provided data entry system, and were sent to ATSDR quarterly.

The 14 states reported a total of 5,351 events for 1995; 80% of the events occurred at fixed facilities and 20% were transportation related. In 93% of the events only a single substance was released. The most commonly reported substances were "Volatile organic compounds", "Acids", "Other inorganic substances", and the category designated "Other," which included mixtures of substances and substances released so infrequently that they did not merit a separate category. During this reporting period, 402 events (approximately 8% of all events) resulted in a total of 1,689 victims. The most frequently reported injuries sustained by victims were respiratory irritation, nausea and vomiting, eye irritation, and headache. There were a total of 14 deaths in all events, and 557 events required evacuations.

On January 1, 1995, two states were added to the surveillance system, bringing the total of participating state health departments to 14. With less than one-third of all states participating in the HSEES system, the data might not be representative of events in the entire country. However, even though the number of participating states has increased from 5 to 14, the findings regarding the distribution of the types of events, the numbers of events with victims and evacuations, and the injuries reported have, overall, been consistent over the years.

HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE (HSEES)

INTRODUCTION

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. The decision to initiate a surveillance system of this type was based on a 1988 study on the reporting of hazardous substances releases to three national databases: the National Response Center Data Base, the Hazardous Materials Information System (HMIS), and the Acute Hazardous Events Data Base *(1)*. Review of the national databases indicated that they were limited because many events were missed through incomplete reporting (for example, HMIS does not include intrastate carrier or fixed-facility events). Other missing information included demographic information about victims, the types of injuries received, and the number of persons evacuated during events in which evacuations were ordered. As a result of this review, ATSDR implemented the HSEES system to describe the public health consequences associated with the release of hazardous substances. 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 reported to the surveillance system from January 1, 1995, through December 31, 1995.

METHODS

In 1995, 14 state health departments collected data for HSEES. Information was collected on standardized data collection forms. The types of information collected on data collection forms included information on the event, substance(s) released, victims, injuries, and evacuations. In 1995, the HSEES data collection form was modified to collect additional information related to the event, substance(s) released, and victims. The major changes to the data collection form now allow information to be gathered on (1) whether individual substances involved in the event were actually released or threatened to be released, and (2) specific information on the types of responders involved in events. Participating state health departments began collecting data on the revised data collection form in July 1995.

Various data sources were used to obtain information about these events. These sources included, but were not limited to, records and oral reports of state environmental protection agencies, police and fire departments, and hospitals. Census data were used to estimate populations residing in the vicinity of the events. All of the data were computerized using an ATSDR-provided data entry system, and were sent to ATSDR quarterly.

Hazardous substances emergency events were defined as uncontrolled or illegal releases or threatened releases of hazardous substances or the hazardous by-products of substances. Not included were events involving petroleum products exclusively. Events were included when the amount of substance released, or that might have been released, needed (or would have needed) to be removed, cleaned up, or neutralized according to federal, state, or local law; or when there was only a threatened release of a substance, but this threat led to an action (for example, evacuation) that could have affected the health of employees, responders, or the general public. Victims were defined as those individuals who suffered at least one injury or died as a consequence of the event. In counting injuries, victims could have been counted more than once if they had more than one injury. Events were defined as transportation related when they occurred during surface, air, or water transport of hazardous substances. Fixed-facility events were defined as events occurring

at industrial sites, schools, farms, or any other type of facility. For the analyses, the substances released were categorized into 10 groups.

RESULTS

A total of 5,351 events were reported in 1995 to the HSEES system by the 14 participating state health departments. Eighty percent of the events occurred at fixed facilities and 20% were transportation related (Table 1). About 1% of all events were threatened releases.

Ninety-three percent of the events involved the release of only one substance. Two substances were released in another 5% of the events (Table 2).

Table 1.—Number of events meeting the surveillance definition, reported by state and type of event, Hazardous Substances Emergency Events Surveillance, January 1 - December 31, 1995.

STATE REPORTING EVENT	TYPE OF EVENT				TOTAL NUMBER OF EVENTS
	FIXED FACILITY		TRANSPORTATION		
	NUMBER OF EVENTS	(%)	NUMBER OF EVENTS	(%)	
Alabama	147	(79.0)	39	(21.0)	186
Colorado	220	(78.0)	62	(22.0)	282
Iowa	194	(60.2)	128	(39.8)	322
Minnesota	195	(84.4)	36	(15.6)	231
Mississippi	86	(74.8)	29	(25.2)	115
Missouri	172	(52.3)	157	(47.7)	329
New Hampshire	26	(81.2)	6	(18.8)	32

New York	307	(77.7)	88	(22.3)	395
North Carolina	186	(76.2)	58	(23.8)	244
Oregon	150	(78.5)	41	(21.5)	191
Rhode Island	48	(98.0)	1	(2.0)	49
Texas	1,948	(92.0)	170	(8.0)	2,118
Washington	347	(77.6)	100	(22.4)	447
Wisconsin	284	(69.3)	126	(30.7)	410
Total	4,310	(80.5)	1,041	(19.5)	5,351

Table 2.—Distribution of the number of substances released, by type of event, Hazardous Substances Emergency Events Surveillance, January 1 - December 31, 1995.

NUMBER OF SUB-STANCES RELEASED	TYPE OF EVENT						ALL EVENTS		
	FIXED FACILITY			TRANSPORTATION					
	NUMBER OF EVENTS	(%)	NUMBER OF SUB-STANCES	NUMBER OF EVENTS	(%)	NUMBER OF SUB-STANCES	NUMBER OF EVENTS	(%)	NUMBER OF SUB-STANCES
1	4,044	(93.8)	4,044	952	(91.5)	952	4,996	(93.4)	4,996
2	187	(4.3)	374	64	(6.1)	128	251	(4.7)	502
3	33	(0.8)	99	17	(1.6)	51	50	(0.9)	150
4	18	(0.4)	72	3	(0.3)	12	21	(0.4)	84
5	8	(0.2)	40	3	(0.3)	15	11	(0.2)	55
6 or more	20	(0.5)	362	2	(0.2)	17	22	(0.4)	379
Total	4,310	(100.0)	4,991	1,041	(100.0)	1,175	5,351	(100.0)	6,166

Most releases were either liquid spills (61%) or air emissions (30%). The remaining releases were the result of fires (6%) or other types of releases (3%).

Events occurred primarily on weekdays, from 6:00 AM through 11:59 AM (36%) and from 12:00 noon through 5:59 PM (34%). Approximately 18% of events occurred at some time during the weekend period.

Of the 10 categories into which HSEES substances were grouped, "Volatile organic compounds" (VOCs) (17%), "Other inorganic substances" (23%), "Acids" (9%), and "Other" substances (28%) were most commonly released in fixed-facility events (Table 3). The category "Other" consisted of mixtures of substances, as well as substances that were not mixtures but could not be placed in one of the other nine substance categories. The category "Other inorganic substances" comprised all inorganic substances except for acids, bases, ammonia, and chlorine. In transportation-related events, "Pesticides" (17%), "Other inorganic substances" (16%), "Volatile organic compounds" (11%), "Acids" (13%), and "Other" substances (28%) were most frequently reported.

Table 4 shows the distribution of the number of victims by the type of event. A total of 1,689 victims were involved in 402 events (approximately 8% of all events). Approximately one-half of the events with victims involved only one victim; about 68% of the events involved one or two victims. Fixed-facility events accounted for the majority (83%) of victims.

The substance categories with the most events did not necessarily have the most victims (Table 5). For instance, 975 events involved VOCs, but only 67 (7%) of these events involved victims. Although chlorine accounted for only 149 (2%) events, 32% of chlorine events resulted in victims, indicating its greater potential for harm.

The population subgroups most often injured were employees (57%) and the general public (30%) (Table 6). A higher proportion of responders and the general public were injured in transportation events than in fixed-facility events.

The types of injuries sustained by victims are shown in Table 7. The victims sustained a total of 2,825 injuries. Some victims experienced more than one injury. The most commonly reported injuries in fixed-facility events were respiratory irritation (42%),

nausea or vomiting (15%), headache (13%), and eye irritation (12%). In transportation-related events, respiratory irritation (28%), nausea or vomiting (17%), trauma (13%), and eye irritation (13%) were most frequently reported. Trauma was more often reported in transportation-related events than in fixed facility events. 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 was known for 86% of victims; 68% were male and 32% were female. Among the population subgroups, more of the responders (88%) and employees (72%) were male. The mean age of the victims was about 23 years, with a range from 1 to 86 years. Most victims (64%) were reported to have been transported to and treated at a hospital, but not admitted. Ten percent were treated at the scene with first aid; 12% were transported to a hospital, but not treated; 9% were admitted to a hospital; and 5% went to their private physician.

Among victims, 73% of employees and 39% of responders did not wear any personal protective equipment. Those employees who did wear personal protective equipment most frequently wore level "D" protection (7%) and gloves (5%). The personal protective equipment most frequently worn by first responders was firefighter turnout gear (35%), level "B" (13%) and level "D" (5%) protection.

Table 3.—Distribution of the number of substances released, by substance category and type of event, Hazardous Substances Emergency Events Surveillance, January 1 - December 31, 1995.

SUBSTANCE CATEGORY	TYPE OF EVENT				ALL EVENTS	
	FIXED FACILITY		TRANSPORTATION			
	NUMBER OF SUBSTANCES	(%)	NUMBER OF SUBSTANCES	(%)	NUMBER OF SUBSTANCES	(%)
Acids	432	(8.6)	152	(12.9)	584	(9.5)
Ammonia	337	(6.7)	42	(3.6)	379	(6.2)
Bases	178	(3.6)	75	(6.4)	253	(4.1)
Chlorine	142	(2.8)	7	(0.6)	149	(2.4)
Other inorganic substances	1,162	(23.3)	185	(15.7)	1,347	(21.8)

Table 3.—Continued.

SUBSTANCE CATEGORY	TYPE OF EVENT				ALL EVENTS	
	FIXED FACILITY		TRANSPORTATION			
	NUMBER OF SUBSTANCES	(%)	NUMBER OF SUBSTANCES	(%)	NUMBER OF SUBSTANCES	(%)
Paints and dyes	93	(1.9)	41	(3.5)	134	(2.2)
Pesticides	254	(5.1)	204	(17.4)	458	(7.4)
Polychlorinated biphenyls	173	(3.5)	12	(1.0)	185	(3.0)
Volatile organic compounds	843	(16.9)	132	(11.2)	975	(15.8)
Other	1,377	(27.6)	325	(27.7)	1,702	(27.6)
Total	4,991	(100.0)	1,175	(100.0)	6,166	(100.0)

Table 4.—Distribution of the number of victims by type of event, Hazardous Substances Emergency Events Surveillance, January 1 - December 31, 1995.

NUMBER OF VICTIMS	TYPE OF EVENT						ALL EVENTS		
	FIXED FACILITY			TRANSPORTATION					
	NUMBER OF EVENTS	(%)	NUMBER OF VICTIMS	NUMBER OF EVENTS	(%)	NUMBER OF VICTIMS	NUMBER OF EVENTS	(%)	NUMBER OF VICTIMS
1	146	(45.8)	146	52	(62.7)	52	198	(49.2)	198
2	61	(19.1)	122	12	(14.5)	24	73	(18.2)	146
3	29	(9.1)	87	1	(1.2)	3	30	(7.5)	90

Table 4.—Continued.

NUMBER OF VICTIMS	TYPE OF EVENT						ALL EVENTS		
	FIXED FACILITY			TRANSPORTATION					
	NUMBER OF EVENTS	(%)	NUMBER OF VICTIMS	NUMBER OF EVENTS	(%)	NUMBER OF VICTIMS	NUMBER OF EVENTS	(%)	NUMBER OF VICTIMS
4	17	(5.3)	68	8	(9.6)	32	25	(6.2)	100
5	12	(3.8)	60	3	(3.6)	15	15	(3.7)	75
6 or more	54	(16.9)	924	7	(8.4)	156	61	(15.2)	1,080
Total	319	(100.0)	1,407	83	(100.0)	282	402	(100.0)	1,689

Table 5.—Number of substances released in all events and events with victims, by substance category, Hazardous Substances Emergency Events Surveillance, January 1 - December 31, 1995.

SUBSTANCE CATEGORY	TOTAL NUMBER OF RELEASES	(%)	NUMBER OF RELEASES WITH VICTIMS	(%)	PERCENT OF RELEASES WITH VICTIMS*
Acids	584	(9.5)	83	(12.5)	14.2
Ammonia	379	(6.2)	43	(6.5)	11.3
Bases	253	(4.1)	29	(4.4)	11.5
Chlorine	149	(2.4)	48	(7.3)	32.2
Other inorganic substances	1,347	(21.8)	126	(19.0)	9.4

Table 5.—Continued.

SUBSTANCE CATEGORY	TOTAL NUMBER OF RELEASES	(%)	NUMBER OF RELEASES WITH VICTIMS	(%)	PERCENT OF RELEASES WITH VICTIMS*
Paints and dyes	134	(2.2)	11	(1.7)	8.2
Pesticides	458	(7.4)	49	(7.4)	10.7
Polychlorinated biphenyls	185	(3.0)	4	(0.6)	2.2
Volatile organic compounds	975	(15.8)	67	(10.1)	6.9
Other	1,702	(27.6)	202	(30.5)	11.9

*Percent of releases that resulted in personal injury within the substance category calculated by: Percent of releases with victims = 100 × (Number of releases with victims) / (Total number of releases)

Table 6.—Distribution of victims by population group and type of event, Hazardous Substances Emergency Events Surveillance, January 1 - December 31, 1995.

POPULATION GROUP	TYPE OF EVENT				ALL EVENTS	
	FIXED FACILITY		TRANSPORTATION			
	NUMBER OF VICTIMS	(%)	NUMBER OF VICTIMS	(%)	NUMBER OF VICTIMS	(%)
Employee	881	(62.6)	85	(30.2)	966	(57.2)
Responder	167	(11.9)	50	(17.7)	217	(12.8)
General public	359	(25.5)	147	(52.1)	506	(30.0)
Total	1,407	(100.0)	282	(100.0)	1,689	(100.0)

A total of 14 persons died as the result of events; 4 died in 1 event, 2 in 1 event; and 1 in each of 8 separate events. Seven of the 14 deaths occurred in fixed-facility events and 7 occurred in transportation-related events. Of those who died, 12 were male; 4 were responders, 6 were employees, and 4 were members of the general public. Twelve sustained traumatic injuries, of which six occurred as a result of transportation events and six of fixed-facility events. All responders who died wore level " B" personal protective equipment. No form of personal protective equipment was reported to have been used by the other victims who subsequently died.

Evacuations were ordered in 557 events. Sixty-four percent of the evacuations were of a building or the affected part of a building. Fourteen percent were based on a defined circular area around an event, 10% were based on actual or anticipated downwind dispersion, and 9% were reported as having been ordered without criteria for evacuation. The median number of persons evacuated was 20, with a range of from 0 to 3,500 evacuated persons. In 43 events, in-place sheltering was ordered; instructions regarding precautions to take during the in-place sheltering were provided in 28 of these events.

AMMONIA

Additional analyses were conducted on ammonia releases to determine their association with the adverse public health consequences of personal injuries and evacuations. Only events with releases from a single chemical category were used in the analyses. The quantity released, available for 89% of the ammonia releases, was reported in pounds for 67% of these releases. The amounts ranged from 1 to more than 99,000 pounds, with a median of 200 pounds.

Table 7.—Distribution of type of injury by type of event, Hazardous Substances Emergency Events Surveillance, January 1 - December 31, 1995.

TYPE OF INJURY	TYPE OF EVENT				ALL EVENTS	
	FIXED FACILITY		TRANSPORTATION			
	NUMBER OF INJURIES	(%)	NUMBER OF INJURIES	(%)	NUMBER OF INJURIES	(%)
Chemical burns	81	(3.5)	9	(1.8)	90	(3.2)
Dizziness or other CNS*	155	(6.6)	43	(8.7)	198	(7.0)
Eye irritation	279	(12.0)	62	(12.6)	341	(12.1)
Headache	302	(13.0)	37	(7.5)	339	(12.0)
Heat stress	3	(0.1)	0	(0.0)	3	(0.1)
Nausea or vomiting	341	(14.6)	85	(17.3)	426	(15.1)
Respiratory irritation	984	(42.2)	140	(28.4)	1,124	(39.8)

Table 7.—Continued.

TYPE OF INJURY	TYPE OF EVENT				ALL EVENTS	
	FIXED FACILITY		TRANSPORTATION			
	NUMBER OF INJURIES	(%)	NUMBER OF INJURIES	(%)	NUMBER OF INJURIES	(%)
Skin irritation	86	(3.7)	17	(3.4)	103	(3.6)
Thermal burns	28	(1.2)	5	(1.0)	33	(1.2)
Trauma	19	(0.8)	63	(12.8)	82	(2.9)
Other	54	(2.3)	32	(6.5)	86	(3.0)
Total	2,332	(100.0)	493	(100.0)	2,825	(100.0)

The number of injuries is greater than the number of victims, because a victim can have more than one injury.
* Central nervous system symptoms or signs.

There were 355 events that involved only the release or threatened release of ammonia. Ammonia releases were 1.85 times more likely to result in events with victims than all other releases (95% confidence interval: 1.31-2.61). The victims of ammonia releases were most frequently employees (63%) and members of the general public (24%). Thirteen percent of victims were responders. Most victims were male (73%). The mean age, known for 79%, was 33 years (range 6 to 60 years).

The main health effects reported for ammonia releases were respiratory irritation (41%) and eye irritation (21%). Nausea or vomiting (9%), chemical burns (9%), thermal burns (5%), trauma (4%), headache (4%), skin irritation (3%), and dizziness or other central nervous system symptoms (2%) were also reported. Most victims (74%) were transported to a hospital for treatment, but were not admitted; 10% were treated on the scene, and 4% were admitted to a hospital. There were 4 deaths as a result of ammonia events. All four victims were responders to a single event who died from trauma and thermal burns. The 355 actual or threatened ammonia releases were also nearly three times as likely to have resulted in evacuations as all other single chemical category releases (OR = 2.85; 95% CI: 2.17-3.74).

USE OF HSEES DATA

ATSDR continues to respond to requests for HSEES information from local, state, and federal agencies and organizations. In fall 1995, ATSDR published a pamphlet for local emergency planning committees (LEPC) and first responders describing the HSEES system and brief results of data collection *(2)*. The pamphlet was distributed to approximately 5,000 LEPCs nationwide, as well as to other federal, state, and local agencies; manufacturing industries; private organizations; and individuals involved in emergency response or simply interested in HSEES surveillance activities. The pamphlet was designed with a tear-off form that was to be mailed back to ATSDR in order to receive a copy of the 1994 annual report. Data from the HSEES was also used in presentations at scientific meetings and to write and publish several articles about the results of data collection *(3-5)*. In addition, ATSDR received several requests from researchers from other countries and territories for the HSEES protocol and data collection form to help develop similar surveillance systems

in their countries.

SUMMARY OF RESULTS, 1990 - 1995

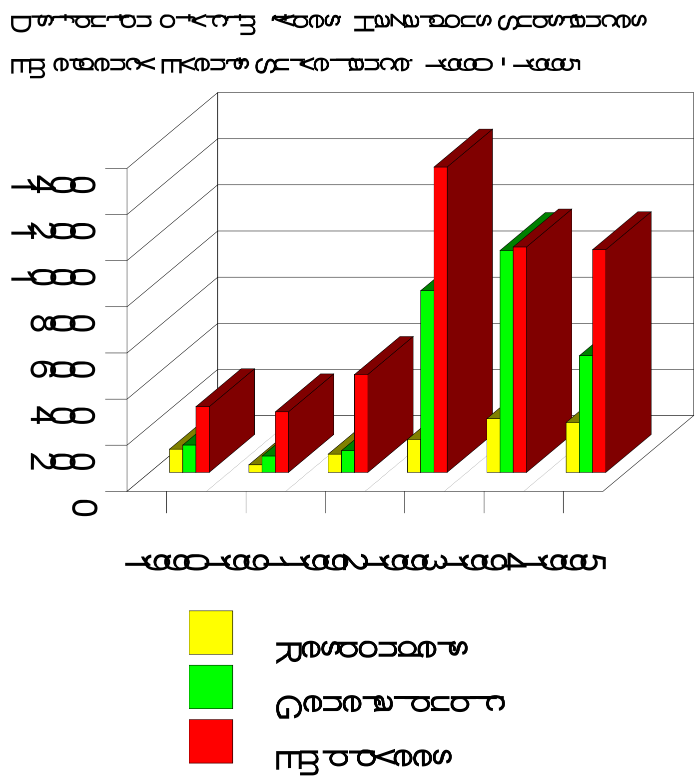
The number of events, substances released, events with victims, and deaths for the years 1990 through 1995 are shown in Table 8. In the 6 years of data collection, the majority of events have involved a single substance and most events have occurred at fixed facilities. Respiratory irritation has consistently been reported as the most common injury experienced by victims. In 1995, however, respiratory irritation and nausea or vomiting were reported more often than was eye irritation. Although the number of participating state health departments increased from 5 to 14 over the years of data collection, the percentage of events with victims decreased from 19% in 1990 to only 8% in 1995, suggesting that either the system might be receiving better reporting of events without injuries or that, perhaps, the surveillance system might have affected the types of hazardous substances releases but not necessarily the number of releases.

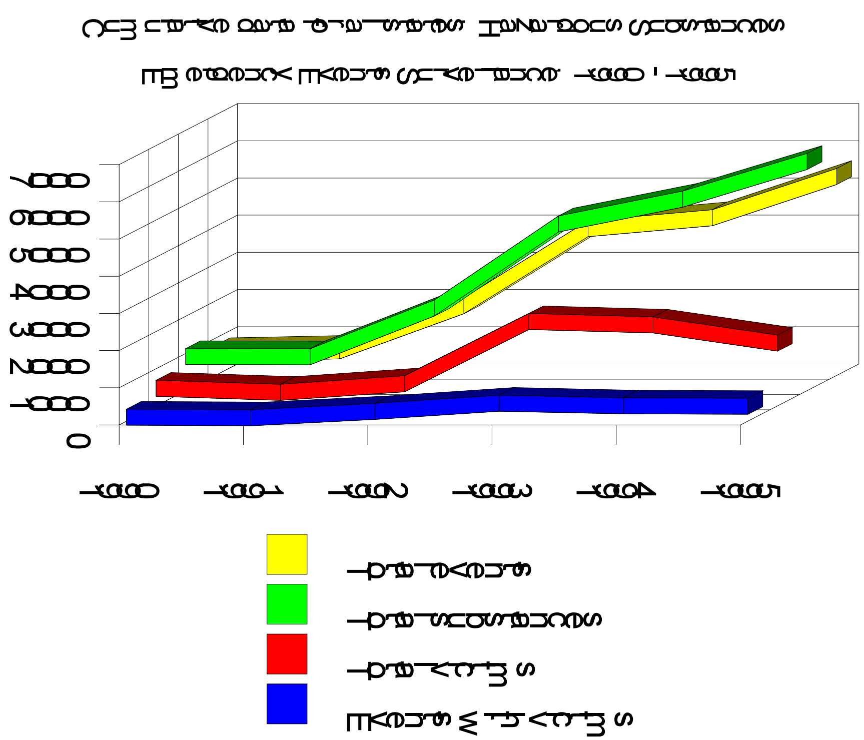
Figure 1 shows the distribution of victims for the years 1990 through 1995. Employees continue to be the most commonly reported victims of emergency events. Cumulative data on the number of events, substances, victims, and events involving victims are displayed in Figure 2. In operation for only 6 years, HSEES remains a relatively new surveillance system. The data reported to the system has, overall, remained stable. Continuation of this pattern of stability should allow for the identification of risk factors related to the occurrence of emergency events and the associated morbidity and mortality. Findings from HSEES data collection efforts can be used in training efforts and health education programs for first responders, including firefighters, hazardous materials teams, and hospital personnel, as well as for manufacturers and transporters of hazardous materials.

Table 8.—Cumulative data for all states, Hazardous Substances Emergency Events Surveillance, 1990 - 1995.

YEAR	NUMBER OF STATES REPORT-ING	TYPE OF EVENT			NUMBER OF SUB-STANCES RELEASED	NUMBER OF DEATHS	NUMBER OF VICTIMS	NUMBER OF EVENTS WITH VICTIMS (%)*
		FIXED FACILITY NUMBER OF EVENTS	TRANS-PORTATION NUMBER OF EVENTS	TOTAL NUMBER OF EVENTS				
1990	5	441	147	588	918	5	476	110 (19)
1991	5	461	200	661	911	2	370	94 (14)
1992	9	1,500	376	1,876	2,221	4	600	263 (14)
1993†	11	3,303	642	3,945	4,485	16	2,269	486 (12)
1994†	12	3,333	911	4,244	5,153	20	2,178	414 (10)
1995†	14	4,310	1,041	5,351	6,166	14	1,689	402 (8)
TOTAL		13,348	3,317	16,665	19,854	61	7,582	1,769 (11)

* Percent of events with victims.
† Reportable event definition expanded to include ALL hazardous substances except petroleum and petroleum by-products.


Distribution of Victim Types, Hazardous Substances
Emergency Events Surveillance, 1990 - 1995
0
200
400
600
800
1000
1200
1400
1990
1991
1992
1993
1994
1995
Responders
General public
Employees



Hazardous Substances
Emergency Events Surveillance 1990 - 1995
7000
6000
5000
4000
3000
2000
1000
0
1990
1991
1992
1993
1994
1995
Total events
Total substances
Total victims
Events with victims

REFERENCES

1. Binder S. Death, injuries, and evacuations from acute hazardous materials releases. Am J Public Health 1989;79:1042-4.

2. ATSDR. Hazardous Substances Emergency Events Surveillance System: Information for Local Emergency Planning Committees and First Responders. Atlanta: US Department of Health and Human Services, Public Health Service, 1995.

3. Hall HI, Price-Green PA, Dhara VR, Kaye WE. Health effects related to releases of hazardous substances on the Superfund Priority list. Chemosphere 1995;31(1):2455-61.

4. Agency for Toxic Substances and Disease Registry. ATSDR update: hazardous substances emergency events surveillance (HSEES) system: 1993 data. Health and Environment Digest 1995;8(10):83-4.

5. Hall HI, Haugh GS, Price-Green PA, Dhara VR, Kaye WE. Risk factors for hazardous substance releases that result in injuries and evacuations: Data from 9 states. Am J Public Health 1996;86(6):855-7.

Figure 1.—Distribution of victims, Hazardous Substances Emergency Events Surveillance, 1990 - 1995.

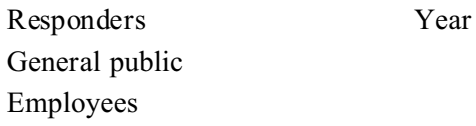
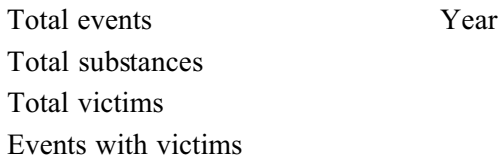


Figure 2.—Cumulative data for all states, Hazardous Substances Emergency Events Surveillance, 1990 - 1995.



Number of victims