



ANNUAL REPORT 2004

U.S. DEPARTMENT OF HEALTH AND
HUMAN SERVICES
Agency for Toxic Substances and Disease Registry

Division of Health Studies
Surveillance and Registries Branch
Atlanta, Georgia

DISCLAIMER

Use of trade names and commercial sources is for identification only and does not imply endorsement by the Agency for Toxic Substances and Disease Registry or the U.S. Department of Health and Human Services.

Contents

	Page
Disclaimer	ii
List of Tables	iv
List of Figures	v
List of Appendices	v
Executive Summary	6
Introduction	6
Methods	8
Results	9
Industries	10
Substances	11
Victims	11
Nearby populations	13
Evacuations	14
Decontamination	14
Response	15
Reporting timeliness	15
Summary of Results, 1993–2004	15
Public Use Dataset	16
Prevention Activities	16
Uses of HSEES Data	17
References	18

List of Tables

Table 1.	Number of events meeting the surveillance definition, by state and type of event— Hazardous Substances Emergency Events Surveillance, 2004.....	25
Table 2.	Number of substances involved per event, by type of event—Hazardous Substances Emergency Events Surveillance, 2004.....	25
Table 3.	Industries involved in hazardous substance events, by category—Hazardous Substances Emergency Events Surveillance, 2004.....	26
Table 4.	Number of substances involved, by substance category and type of event— Hazardous Substances Emergency Events Surveillance, 2004.....	27
Table 5.	Number of victims per event, by type of event—Hazardous Substances Emergency Events Surveillance, 2004.....	27
Table 6.	Frequency of substance categories in all events and events with victims— Hazardous Substances Emergency Events Surveillance, 2004.....	28
Table 7.	Frequencies of injuries/symptoms, by type of event—Hazardous Substances Emergency Events Surveillance, 2004.....	29
Table 8.	Distribution of personnel who responded to the event—Hazardous Substances Emergency Events Surveillance, 2004.....	29
Table 9.	Cumulative data by year—Hazardous Substances Emergency Events Surveillance, 1993– 2004.....	30
Table 10.	Time period each state participated in Hazardous Substances Emergency Events Surveillance, 1993-2004.....	30

List of Figures

Figure 1.	Areas of fixed facilities involved in events—Hazardous Substances Emergency Events Surveillance, 2004.....	31
Figure 2.	Distribution of transportation-related events, by type of transport—Hazardous Substances Emergency Events Surveillance, 2004.....	32
Figure 3a.	Primary factors reported as contributing to events by type of event—Hazardous Substances Emergency Events Surveillance, 2004.....	33
Figure 3b.	Secondary factors reported as contributing to events—Hazardous Substances Emergency Events Surveillance, 2004.....	33
Figure 4.	Number of victims, by population group and type of event—Hazardous Substances Emergency Events Surveillance, 2004.....	34
Figure 5a.	Distribution of responders injured in fixed-facility events, by type of responder—Hazardous Substances Emergency Events Surveillance, 2004.....	35
Figure 5b.	Distribution of responders injured in transportation events—Hazardous Substances Emergency Events Surveillance, 2004.....	35
Figure 6.	Injury disposition—Hazardous Substances Emergency Events Surveillance, 2004.....	36
Figure 7.	Number of victims, by category and year—Hazardous Substances Emergency Events Surveillance, 1993–2004.....	37

List of Appendices

Appendix A.	The 96 substances most frequently involved in hazardous events—Hazardous Substances Emergency Events Surveillance, 2004.....	19
Appendix B.	Publications reference list.....	21

Executive Summary

The Hazardous Substances Emergency Events Surveillance (HSEES) system, maintained by the Agency for Toxic Substances and Disease Registry (ATSDR), actively collects information to describe the public health consequences of acute releases of hazardous substances in 15 states. This report summarizes the characteristics of events reported to ATSDR by all participating state health departments in 2004. Information about acute events involving hazardous substances was collected, including the substance(s) released, number of victims, number and types of injuries, and number of evacuations. The data were computerized using an ATSDR-provided Web-based data entry system.

A total of 7,744 events was reported. In 6,835 (88.3%) events, only one substance was released. The most commonly reported categories of substances were other inorganic substances (excluding chemicals in the categories of acids, bases, ammonia, and chlorine), volatile organic compounds, and mixtures involving substances from different categories that were mixed or formed from a reaction before release. During this reporting period, 620 events (8.0% of all reported events) resulted in a total of 1,838 victims, 41 of whom (2.4%) died. The most frequently reported injuries were respiratory irritation, headaches, and dizziness/central nervous system symptoms. Evacuations were ordered for 499 (6.4%) events.

Findings regarding the percentage of events involving victims and the distribution of types of injuries reported have been consistent in recent years. Topics targeted in 2004 included 1) disaster preparedness, 2) methamphetamine lab awareness activities, 3) outreach to specific groups using ammonia, chlorine, cleaning products, acids, and mercury, 4) outreach to targeted populations including children, responders, the transportation industry, and 5) special interest topics including carbon monoxide poisonings from underground utility fires and exposure to tearing agents from theft deterrent devices.

Introduction

The Centers for Disease Control and Prevention defines surveillance as the

“ongoing, systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the

timely dissemination of these data to those who need to know. The final link of the surveillance chain is the application of these data to prevention and control. A surveillance system includes a functional capacity for data collection, analysis, and dissemination linked to public health programs”^[1].

Since 1990, the Agency for Toxic Substances and Disease Registry (ATSDR) has maintained an active, state-based Hazardous Substances Emergency Events Surveillance (HSEES) system to describe the public health consequences of releases of hazardous substances. The decision to initiate a surveillance system of this type was based on a study published in 1989 about the reporting of hazardous substances releases to three national databases: the National Response Center Database, the Hazardous Material Information System (HMIS), and the Acute Hazardous Events Database^[2].

A review of these databases indicated limitations. Many events were missed because of specific reporting requirements (for example, the HMIS did not record events involving intrastate carriers or fixed-facility events). Other important information was not recorded, such as the demographic characteristics of victims, the types of injuries sustained, and the number of persons evacuated. As a result of this review, ATSDR implemented the HSEES system to more fully describe the public health consequences of releases of hazardous substances.

HSEES has several goals to:

- Describe the distribution and characteristics of acute hazardous substances releases;

- Describe morbidity and mortality among employees, responders, and the general public that resulted from hazardous substances releases;

- Develop strategies that might reduce future morbidity and mortality resulting from the release of hazardous substances.

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

In the past few years, the last goal of the HSEES system has been emphasized: to develop strategies that reduce subsequent morbidity and mortality by having each participating state analyze its data, develop appropriate prevention outreach activities, and develop ways to measure their effectiveness. These activities are intended to provide industry, responders, and

the general public with information that can help prevent chemical releases and can reduce morbidity and mortality if a release occurs.

This report provides an overview of HSEES for 2004 in all participating states, summarizes the characteristics of acute releases of hazardous substances and their associated public health consequences, and demonstrates how data from the system are translated into prevention activities to protect public health.

Methods

In 2004, 15 state health departments participated in HSEES: Alabama, Colorado, Iowa, Louisiana, Minnesota, Mississippi, Missouri, North Carolina, New Jersey, New York, Oregon, Texas, Utah, Washington, and Wisconsin. Alabama and Mississippi, however, did not collect a full year of data, so their data are excluded from this report. Information was collected about each event, including substance(s) released, victims, injuries (adverse health effects and symptoms), and evacuations.

Various data sources were used to obtain information about these events. These sources included records and oral reports of state environmental protection agencies, the U.S. Department of Transportation, the National Response Center, police and fire departments, and hospitals. U.S. Census Bureau data were used to estimate the number of residents in the vicinity of the events. All data were computerized using a Web-based data entry system provided by ATSDR.

HSEES defines hazardous substances emergency events as acute uncontrolled or illegal releases or threatened releases of hazardous substances. Events involving releases of only petroleum are excluded. Events are included if (a) 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 (b) the release of a substance was threatened, but the threat led to an action (for example, evacuation) that could have affected the health of employees, emergency responders, or members of the general public. HSEES defines victims as persons who experience at least one documented adverse health effect within 24 hours after the event or who die as a consequence of the event. Victims who receive more than one type of injury or symptom are counted once for each applicable injury type or symptom. Events are defined as transportation-related if they occur (a) during surface, air, pipeline, or

water transport of hazardous substances, or (b) before the substance is unloaded from a vehicle or vessel. All other events are considered fixed-facility events.

For data analyses, the substances released were categorized into 16 groups. The category “mixture” comprises substances from different categories that were mixed or formed from a reaction before the event; the category “other inorganic substances” comprises all inorganic substances except acids, bases, ammonia, and chlorine; and the category “other” comprises substances that could not be grouped into one of the existing categories.

Results

For 2004, HSEES received reports of 7,744 acute hazardous substances events; 256 (3.3%) of these events were threatened releases; 48 (0.6%) were events in which substances were both threatened to be released and actually released. The number of events occurring in fixed facilities was 5,687 (73.4%) while 2,057 (26.6%) occurred during transportation. Two states, Texas and New York, reported 43.7% of all releases (Table 1).

For each fixed-facility event, reporters could select one or two types of area or equipment involved in the fixed facility where the event occurred. Of all 5,687 fixed-facility events, 4,922 (86.5%) reported one type of area and 735 (12.9%) reported a combination of two area types. Type of area was not reported for 30 (0.5%) events. The main areas were classified as follows: 1,825 (32.3%) ancillary processing equipment, 485 (8.6%) indoor, non-industrial, living areas, 470 (8.3%) piping, 460 (8.1%) storage above ground (Figure 1).

Of the 2,057 transportation-related events, 1,791 (87.1%) occurred during ground transport (e.g., truck, van, or tractor) and 160 (7.8%) involved transport by rail (Figure 2). Fewer events involved water, air, and pipeline transportation modes. Most ground transportation events (78.2%) involved trucks. The largest proportions of transportation-related events occurred during unloading of a stationary vehicle or vessel (688 [38.4%]) and from a moving vehicle or vessel (594 [28.9%]). Of the 2,057 transportation-related events, 450 (21.9%) involved releases en route that were later discovered at fixed facilities.

Factors consisted of primary (root) and secondary (contributing) causes. Primary factors were reported for 7,673 (99.1%) events (Figure 3a). Primary factors most reported for fixed-facility events, 3,152 (56.0%) involved equipment failure, and most reported for transportation-related

events 1,314 (64.4%) involved human error. Secondary factors were reported for 5,198 (67.1%) events ([Figure 3b](#)). Of the reported secondary factors, most fixed-facility events 780 (21.3%) involved system/process upset, and most transportation-related events 761 (49.8%) involved improper filling, loading, or packing.

More than 6,835 (88.3%) of all events involved the release of only one substance. Two substances were released in approximately 354 (4.6%) of the events, and more than two substances were released in approximately 555 (7.2%) (Table 2). Fixed-facility events were more likely to have two or more substances released in an event than transportation events (13.8% vs. 6.1%).

The number of events by month ranged from 574 (7.4%) in February to 760 (9.8%) in July, with the summer months having the highest number of events. The proportion of events ranged from 15.3% to 17.0% during weekdays, and from 8.8% to 9.7% during weekend days. Of all 7,580 (97.9%) events for which time of day or time category was reported, 35.5% occurred from 6:00 AM to 11:59 AM, 32.5% from 12:00 PM to 5:59 PM, 17.3% from 6:00 PM to 11:59 PM, and the remainder between midnight and 6:30 AM.

Industries

The largest number of HSEES events were associated with the manufacturing (2,969 [38.3%]) and transportation (1,854 [23.9%]) industries (Table 3). Within manufacturing, chemical and allied products manufacturing (1,506 [50.7%]) and petroleum and coal manufacturing (970 [32.7%]) accounted for most of the events. The largest number of events with victims occurred in the transportation industry (96 [15.5%]). The total number of victims was greatest in professional services (340 [18.5%]), followed by the manufacturing industry (338 [18.4%]) and transportation (319 [17.4%]). The subcategory food and kindred products manufacturing accounted for 26% of all victims in the manufacturing industry. Although the manufacturing industry resulted in a large proportion of events with victims and a large number of victims, only 2.6% of all manufacturing events involved victims. Conversely, 34.0% of all events in private vehicles or property involved victims, however they constituted only a small proportion (5.6%) of events with victims.

Substances

The number of substances were released in all events was 10,323, of which 814 (7.9%) substances were reported as threatened to be released. The substances most frequently released were sulfur dioxide, carbon monoxide, ammonia, and nitrogen oxide (NOX) (Appendix A). Substances were grouped into 16 categories. The substance categories most commonly released in fixed-facility events were other inorganic substances (2,044 [25.5%]), volatile organic compounds (1,544 [19.3%]), and mixtures (1,181 [14.7%]) (Table 4). In transportation-related events, the most common substance categories released were volatile organic compounds (377 [16.5%]), acids (313 [13.7%]), and pesticides (245 [10.7%]).

Two types of releases (e.g., spill and air) could be reported for each substance. Single releases were associated with air releases (4,850 [47.0%]), spills (4,179 [40.5%]), threatened releases (815 [7.9%]), fire (425 [4.1%]), explosion (32 [0.3%]), and radiation (19 [0.2%]). Of events with two types of releases, the following combinations were reported: spill and air releases (389 [72.7%]), spill and fire (61 [11.4%]), air releases and fire (43 [8%]), fire and explosion (19 [3.6%]), spill and explosion (11 [2.1%]), air releases and explosion (11 [2.1%]), and the remaining 1 (0.2%) involved other combinations of release types. The release type was missing for 3 substances.

Victims

The number of victims involved was 1,838 in 620 events (8.0% of all events) (Table 5). Of the 620 events with victims, 376 (60.7%) involved only one victim, and 87 (14.0%) involved two victims. Of all victims, 1,452 (79.0%) were injured in fixed-facility events. Fixed-facility events were more likely to have three or more victims per event (28.7%) than were transportation-related events (15.3%). An additional 453 persons in 158 events (2.1% of all events) were observed at a hospital or medical facility but did not have symptoms resulting from the event and were not, therefore, counted as victims.

To represent the magnitude of the effects of substances involved in injuries, the number of events in a specific substance category was compared with the number of events in the same substance category that involved victims. In events that involved one or more substances from a specific substance category, substances were counted once in that category. In events that

involved two or more substances from different categories, substances were counted once in the multiple substance categories. Substances released most often were not necessarily the most likely to involve victims (Table 6). For example, events categorized as other inorganic substances constituted 19.5% of all events; however, only 4.8% of these events resulted in injuries. Conversely, events involving chlorine exclusively accounted for 2.2% and those involving ammonia exclusively 5.2% of all events, but 23.0% of the chlorine events and 12.3% of ammonia events involved injuries.

Employees (837 [45.5%]) constituted the largest proportion of the population groups injured, followed by members of the general public (640 [34.8%]) (Figure 4). In fixed-facility events, 166 emergency response personnel were injured. Of those, 92 (55.4%) were police officers, 46 (27.7%) were career firefighters, and 11 (6.6%) were volunteer firefighters (Figure 5a, 5b). In transportation-related events, 53 responders were injured; most these (37 [69.8%]) were police officers, 8 (15.1%) were career firefighters, and 5 (9.4%) were responders of unknown type. Police officers were injured more frequently in transportation related events (69.8%) than in fixed-facility events (55.4%).

Victims were reported to sustain a total of 2,977 injuries or symptoms (Table 7). Some victims had more than one injury or symptom. Of all reported injuries or symptoms, the most common injuries or symptoms in fixed-facility events were respiratory irritation (755 [31.2%]), headaches (372 [15.4%]), and dizziness or central nervous system symptoms (352 [14.6%]). In transportation-related events, trauma (111 [19.8%]), respiratory irritation (100 [17.9%]), headaches (81 [14.5%]), and eye irritation (81 [14.5%]) were reported most frequently. Most (98.2%) of the trauma injuries in transportation-related events were not substance-related; these injuries resulted from a chain of events, such as a motor vehicle accident leading to the release of a hazardous substance, and not from exposure to the substance itself.

The median age of the 834 (45.4%) victims for whom exact age was reported was 32 years (range: 0–87 years). For the 1,355 (73.7%) injured persons for whom an age category was reported, 37 (2.7%) were < 5 years of age, 149 (11%) were 5–14 years of age, 111 (8.2%) were 15–19 years of age, 768 (56.7%) were 20–44 years of age, 254 (18.8%) were 45–64 years of age, and 36 (2.7%) were ≥65 years of age. Of the 1,004 injured persons for whom age was not reported, 642 (63.9%) were presumably adults (because their population group was reported as

responders or employees), and 362 (36.1%) could have been adults or children (because their population group was reported as members of the general public).

Sex was known for 1,538 (83.7%) of the victims; of these, 1,011 (65.7%) were males. Of all employees and responders for whom sex was reported, 72.8% were males.

Of the 1,838 victims, 1,039 (56.5%) were treated at hospitals without admission, and 262 (14.3%) were treated at the scene; 41 (2.2%) deaths were reported (Figure 6). Severity was unknown for 24 (1.3%) victims. Whether personal protective equipment (PPE) was used was reported for 784 (93.7%) employee-victims and for 207 (94.5%) responder-victims. Most of the employee-victims (94.5%) and 36.2% of the responder-victims had not worn any form of PPE. Employee-victims who wore PPE most often used eye protection (10 [23.3%]) and gloves (18 [41.86%]). Among injured emergency responders who wore PPE, 30 (22.7%) wore firefighter turnout gear with respiratory protection, 41 (31.1%) wore gloves, and 34 (25.8%) wore firefighter turnout gear without respiratory protection. Firefighter turnout gear is protective clothing usually worn by firefighters during structural firefighting operations and is similar to Level "D" protection. The Occupational Safety and Health Administration defines Level "D" protection as coveralls, boots/shoes (chemical-resistant leather, steel toe and shank), safety glasses or chemical splash goggles, and hard hats. Level "D" provides limited protection against chemical hazards.

Only one event involved more than 50 injured persons; 57 employees were injured due to improper mixing of a chemical that caused a hydrochloride/phenol volatilization in a physicians' clinic. All the victims reported dizziness or central nervous system symptoms; 37 employee-victims and 18 general public-victims were treated with first aid on the scene; 57 persons were self-evacuated from the building for 22 hours, and access to the building was restricted. A fire department and certified HazMat team responded to this event.

Nearby populations

The proximity of an event location to selected populations was determined using geographic information systems (GIS) or health department records. Reported residences were within ¼ mile of 4,693 (61.8%) events, schools within ¼ mile of 926 (12.3%) events, hospitals within ¼ mile of 99 (1.3%) events, nursing homes within ¼ mile of 261 (3.5%) events, licensed daycare centers within ¼ mile of 901 (12.2%) events, industries or other businesses within ¼ mile of

5,832 (79.2%) events, and recreational areas within ¼ mile of 895 (11.9%) events. Information for proximity of the event location to selected populations was missing for 153-385 events.

The number of events at which persons were at risk of exposure was determined primarily using GIS. There were 5,246 (70.1%) events with persons living within ¼ mile of the event; 6,182 (82.7%) events with persons living within ½ mile; and 6,608 (88.4%) events with persons living within 1 mile. Information was missing on the number of persons living within ¼ mile for 264 events, ½ mile for 265 events, and 1 mile for 267 events.

Evacuations

Evacuations were ordered in 499 (6.5%) of 7,683 events for which where evacuation status was reported. Of these evacuations, 76.7% were of buildings or affected parts of buildings; 13% were of defined circular areas surrounding the event locations; 3.5% were of areas downwind or downstream of the event; and 3.9% were of circular and downwind or downstream areas. The number of persons evacuated was known for 424 (85.0%) events and ranged from 1 to 3,000 persons, with a median of 20. However, one ordered evacuation was reported as having no evacuees. The median length of evacuation was 2 hours (range: 12 minutes to 85 days). Evacuation length was missing for 43 (8.6%) events, and one event reported 0 hours. Of all 7,744 events, 1,820 (23.5%) had access to the area restricted; 97 (1.3%) events had in-place sheltering ordered by an official.

Decontamination

Of the 1,766 (96.0%) victims for whom decontamination status was known, 1,483 (84.0%) were not decontaminated, 157 (8.9%) were decontaminated at the scenes, 101 (5.7%) were decontaminated at medical facilities, and 25 (1.4%) were decontaminated at both the scenes and medical facilities.

For events in which uninjured persons were decontaminated, the median number of uninjured decontaminated individuals was 3 persons per event (range: 1–100 persons). Decontamination was done at medical facilities for 4 uninjured employees, 3 uninjured responders, and 20 uninjured members of the general public. Decontamination was done at the scenes for 144 uninjured employees, 451 uninjured responders, 140 uninjured members of the general public, and 72 uninjured students.

Response

Of the 7,706 events with information on response to the event, 790 (10.3%) events reported no response. Reported for 1,694 (22.0%) events, were multiple responders, 807 (11.7%) events reported 2 categories of responders, 482 (7.0%) events reported 3 categories, 241 (3.5%) events reported 4 categories, and 405 (5.9%) events reported 5 or more categories. Of the 10,140 responder counts, the most frequent response team was from the company where the release occurred 5,212 (51.4%), followed by fire departments 1,299 (12.8%), law enforcement agencies 1,213 (12.0%), and certified HazMat teams 881 (8.7%) (Table 8).

Reporting timeliness

Of the 5,687 events that occurred in fixed facilities, 3,502 (61.6%) were reported within 48 hours of occurrence while 649 (31.6%) of the 2,057 transportation events were reported within 48 hours. Of 7,744 events reported in 2004, the incident information for 4,151 (53.6%) events was entered into HSEES system in 48 hours, 1,173 (15.2%) were reported in less than 7 days, and 1,743 (22.5%) were reported more than one month after incidents happened. Because obtaining information about road-related releases from federal or states departments of transportation was not timely, 1,090 of 2,057 (53%) transportation events were reported more than one month after occurrence.

Summary of Results, 1993–2004

During 1993–2004, the largest proportion of events occurred in fixed facilities (Table 9). However, in recent years, the number of reported transportation-related events has increased partially due to the 1999 addition of the U.S. Department of Transportation's Hazardous Materials Information System as a primary notification source for transportation events.

The number of substances released has also increased. The percentage of events with victims was highest in 1993 (12.1%) and lowest in 1997 (6.7%).

Respiratory irritation has consistently been the most frequently reported injury.

Employees continue to be the most commonly reported victims of acute chemical releases. However, in 2004 the percentage of employee victims was 45.5%, which is the second lowest year in the last 12 years (1994, 45.4%). Members of the general public constitute a large proportion of the victims as well (Figure 7). The number of injured responders has increased recently, and this increase likely results from police officers who are injured when responding to events involving the manufacture of methamphetamine.

The number of deaths associated with acute hazardous substances events has increased in recent years. Many of these deaths were attributed to nonchemical circumstances surrounding the events (e.g., a crash resulting from high-speed travel of a truck pulling an ammonia tank).

Public Use Dataset

ATSDR has created a public-use HSEES dataset to enable public health professionals and other interested parties to perform their own analyses. A data dictionary provides users with detailed instructions for working with the dataset. This dataset is available for download from the ATSDR Web site. Data contained in the file are related to events that occurred in the 17 participating HSEES states from 1996 to 2001. The public use dataset contains 39,764 records and 71 variables. A second public use dataset covering the years 2002-2004 will be available sometime in 2006.

Prevention Activities

In 2004, prevention outreach was very productive. ATSDR staff and state health department staff presented HSEES data in many venues including the annual conferences of the International Society for Environmental Epidemiology, American Public Health Association, National Disaster Medical System, Council of State and Territorial Epidemiologists, Mary Kay O'Connor Process Safety Center at Texas A & M University and many state specialized conferences. In addition, many peer reviewed articles were published (Appendix B). HSEES websites hosted on the participating state health department and ATSDR websites continue to be very useful tools to disseminate products and data as well as to increase visibility of the program. States continued to work with event reporting sources in their states to improve timeliness. Activities to foster enhanced collaboration included hosting stakeholder meetings, providing articles for stakeholder newsletters, contacting key stakeholders directly, and

presenting at stakeholders meetings. Several states have developed electronic distribution systems, including their health alert networks to disseminate their information in a timely and cost-efficient manner.

Topics targeted in 2004 included 1) disaster preparedness, 2) methamphetamine lab awareness activities, 3) outreach to specific groups using ammonia, chlorine, cleaning products, acids, and mercury, 4) outreach to targeted populations including children, responders, and the transportation industry, and 5) special interest topics including carbon monoxide poisonings from underground utility fires and exposure to tearing agents from theft deterrent devices.

Specifically providing data to groups with problems, such as the hotel association with chlorine releases or state departments of transportation with methamphetamine labs dumped at rest areas provides for collaboration and the potential to measure decreases in events post-intervention.

Uses of HSEES Data

During 2004, ATSDR continued to respond to requests for HSEES information from local, state, and federal agencies and organizations.

The ATSDR HSEES Internet Web site page is available at <http://www.atsdr.cdc.gov/HS/HSEES/>. At this site, annual reports and other information can be downloaded. Internet links to other relevant Web sites and the public use dataset are also available.

HSEES-related activities in 2004 included collaboration with other agencies and organizations that are involved with response to chemical terrorism, emergency response, hazardous substances, and public health (e.g., the U.S. Environmental Protection Agency). HSEES collaborated with international partners to pilot test the system in India and Poland. In India, HSEES is partnering with the National Institute of Occupational Health (NIOSH) and in Poland, HSEES is partnering with the Nofer Institute for Occupational Health.

An important contribution of HSEES data is its help in building capacity within each participating state health department to target prevention activities related to acute spills and their associated public health consequences. Because HSEES is funded in part through the Centers for Disease

Control and Prevention (CDC), Coordinating Center for Terrorism Preparedness and Emergency Response, the HSEES system is also building capacity to alert the authorities when a public health action needs to be implemented immediately. Activities are conducted by state HSEES coordinators, often in collaboration with other local and state agencies. The program has been working over the years with several CDC Public Health Prevention Specialists to build capacity within the program to develop sound prevention activities that can be evaluated for their effectiveness.

References

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

Appendix A.

The 96 substances most frequently involved in hazardous events, Hazardous Substances Emergency Events Surveillance, 2004.

No	Substance	No. Events
1	Sulfur dioxide	502
2	Carbon monoxide	480
3	Ammonia	464
4	Nitrogen oxide (nox)	454
5	Volatile organic compounds nos*	273
6	Hydrochloric acid	252
7	Sulfuric acid	184
8	Mercury	179
9	Methamphetamine chemicals nos*	179
10	Sodium hydroxide	173
11	Paint nos*	140
12	Ethylene glycol	135
13	Resin nos*	119
14	Nitric oxide	112
15	Benzene	111
16	Acetone	99
17	Chlorine	95
18	Polychlorinated biphenyls	90
19	Nitrous oxide	78
20	Ethylene	75
21	Hydrogen sulfide	65
22	Toluene	64
23	Mix: carbon monoxide/hydrogen sulfide/nitrogen oxide (nox)/sulfur dioxide/volatile organic compounds	63
24	Hydrogen peroxide	62
25	Acid nos*	61
26	Iodine	60
27	Butadiene	59
28	Adhesive nos*	56
29	Mix: carbon monoxide/nitrogen oxide (nox)/volatile organic compounds nos*	56
30	Phosphorus	56
31	Ethyl ether	51
32	Nitrogen dioxide	51
33	Freon	49
34	Solvent nos*	48
35	Sodium hypochlorite	47
36	Mix: carbon monoxide/nitrogen oxide (nox)/sulfur dioxide/volatile organic compounds nos*	45
37	Paint or coating nos*	45
38	Asbestos	44
39	Flammable liquid nos*	44
40	Lithium	44
41	Phosphoric acid	43
42	Potassium hydroxide	43
43	Diesel fuel	42
44	Propylene	41
45	Antifreeze	39
46	Fluorocarbon 22	39
47	Hydraulic oil	38
48	Nitrogen tetroxide	38

49	Propane	38
50	Ethyl alcohol	37
51	Nitric acid	36
52	Paint thinner nos*	34
53	Isopropyl alcohol	33
54	Mix: carbon monoxide/ethylene/nitrogen oxide (nox)	33
55	Mix: hydrogen sulfide/sulfur dioxide	33
56	Ethylene oxide	32
57	Methyl alcohol	31
58	Xylene	31
59	Mix: carbon monoxide/nitrogen oxide (nox)	27
60	Pesticide nos*	27
61	Ink nos*	24
62	Mix: carbon monoxide/nitrogen oxide (nox)/propylene	24
63	Alcohol nos*	23
64	Chloroform	23
65	Methanol nos*	23
66	Methyl ethyl ketone	23
67	Formaldehyde	22
68	Base nos*	21
69	Corrosive nos*	21
70	Fertilizer nos*	21
71	Methylene chloride	21
72	Mix: carbon monoxide/nitrogen dioxide/nitrogen oxide (nox)/sulfur dioxide	21
73	Mix: carbon monoxide/nitrogen oxide (nox)/sulfur dioxide	21
74	Tetrachloroethylene	21
75	Vinyl chloride	21
76	Ammonium nitrate	20
77	Hexane	20
78	Nitrogen fertilizer	20
79	Urea ammonium nitrate	20
80	Coleman fuel	18
81	Corrosive liquid acidic inorganic nos*	18
82	Ethylene dichloride	18
83	Styrene	18
84	Hydrochloric (muriatic) acid	17
85	Sulfuric (battery) acid	17
86	Bleach	16
87	Nitrogen	16
88	Sulfur	16
89	Mix: carbon monoxide/hydrogen sulfide/nitrogen oxide (nox)/sulfur dioxide	15
90	Mix: carbon monoxide/nitric oxide/nitrogen dioxide	15
91	Mix: carbon monoxide/oxides of nitrogen nos*	15
92	Caustic soda	14
93	Hydraulic fluid	14
94	Isopropanol nos*	14
95	Mix: ammonia/oxides of nitrogen nos*	14
96	Sodium chloride	14

* NOS = not otherwise specified

Appendix B.

Publications reference list

2005

Ernst KP, Wattigney WA, Kaye WE. Releases from improper chemical mixing, Hazardous Substances Emergency Events Surveillance system, 1996–2001. *J Occup Environ Med* 2005; 47:287–93.

Centers for Disease Control and Prevention (CDC). Public health consequences from hazardous substances acutely released during rail transit—South Carolina, 2005; selected states, 1999–2004. *MMWR* 2005;53:64–7.

Horton DK, Burgess P, Rossiter S, Kaye WE. Secondary contamination of emergency department personnel from o-chlorobenzylidene malononitrile exposure, 2002. *Am J Emerg Med* 45(6):655-658.

Horton DK, Berkowitz Z, Kaye WE. Morbidity and mortality from hazardous materials events in the personal services industry, 1993–2001: A follow-Up report from the Hazardous Substances Emergency Events Surveillance (HSEES) system. *Am J Ind Med* 47:419-427.

Kaye WE, Orr MF, Wattigney WA. Surveillance of Hazardous Substances Emergency Events: identifying areas for public health prevention. *Int J Hyg Environ Health* 208(2005):37-44.

2004

Berkowitz Z, Horton DK, Kaye WE. Hazardous substances releases causing fatalities and/or people transported to hospitals: rural/agricultural vs. other areas. *Prehospital Disaster Med* 2004;19(3):213–20.

Centers for Disease Control and Prevention (CDC). Brief report: exposure to tear gas from a theft-deterrent device on a safe—Wisconsin, December 2003. *MMWR* 2004;53:176–7.

Horton DK, Berkowitz Z, Kaye WE. Hydrofluoric acid releases in 17 states and the acute health effects associated, 1993-2001. *J Occup Environ Med* 2004;46:501–8.

Centers for Disease Control and Prevention (CDC). Brief report: Injuries associated with homemade fireworks—selected states, 1993–2004. *MMWR*. 2004;53(25):562–3.

Horton DK, Berkowitz Z, Kaye WE. Surveillance of hazardous materials events in 17 states, 1993-2001: a report from the Hazardous Substances Emergency Events Surveillance (HSEES) system. *Am J Ind Med* 2004;45:539–48.

Centers for Disease Control and Prevention (CDC). Carbon monoxide releases and poisonings attributed to underground utility cable fires—New York, January 2000–December 2003. *MMWR* 2004;53:920–2.

Ruckart PZ, Borders J, Villanacci J, Harris R, Samples-Ruiz M. The role of adverse weather conditions in acute releases of hazardous substances, Texas, 2000–2001. *J Hazard Mater* 2004;115:27–31.

Ruckart PZ, Wattigney W, Kaye WE. Risk factors for acute chemical releases with public health consequences: Hazardous Substances Emergency Events Surveillance in the U.S., 1996–2001. *Environ Health* 2004;3(1):10.

Ruckart PZ, Orr MF, Kaye WE. Hazardous chemical releases in the home. *J Environ Health* 2004;67(5):14–9.

2003

Berkowitz Z, Barnhart HX, Kaye WE. Factors associated with severity of injury resulting from acute releases of hazardous substances in the manufacturing industry. *J Occup Environ Med* 2003;45:734–42.

Centers for Disease Control and Prevention (CDC). Homemade chemical bomb events and resulting injuries—selected states, January 1996-March 2003. *MMWR* 2003;52:662–4.

Horton DK, Berkowitz Z, Kaye WE. The acute consequences to children exposed to hazardous substances used in illicit methamphetamine production, 1996 to 2001. *J Child Health* 2003;1:99–108.

Horton DK, Berkowitz Z, Kaye WE. Secondary contamination of ED personnel from hazardous materials events, 1995-2001. *Am J Emerg Med* 2003;21:199–204.

Horton DK, Berkowitz Z, Haugh GS, Orr MF, Kaye WE. Acute public health consequences associated with hazardous substances released during transit, 1993–2000. *J Hazard Mater* 2003;B98:161–75.

Manassaram DM, Orr MF, Kaye WE. Hazardous substances events associated with the manufacturing of chemicals and allied products. *J Hazard Mater* 2003;104:123–35.

Manassaram DM, Orr MF, Kaye WE. Counterterrorism planning using the hazardous substances events surveillance system. *Disaster Manag Response* 2003;1:35–40.

Weisskopf MG, Drew JM, Hanrahan LP, Anderson HA, Haugh GS. Hazardous ammonia releases: public health consequences and risk factors for evacuation and injury, United States, 1993-1998. *J Occup Environ Med* 2003;45(2):197–204.

2002

Berkowitz Z, Haugh GS, Orr MF, Kaye WE. Releases of hazardous substances in schools: data from Hazardous Substances Emergency Events Surveillance system, 1993-1998. *J Environ Health* 2002;65:20–7.

Berkowitz Z, Orr MF, Kaye WE, Haugh GS. Adverse public health effects associated with releases of hazardous substances in the agricultural industry and related services in four mid-Western states. *J Occup Environ Med* 2002;44:714–23.

Horton DK, Berkowitz Z, Kaye WE. The public health consequences from acute chlorine releases, 1993-2000. *J Occup Environ Med* 2002;44:906–13.

Zeitz P, Orr MF, Kaye WE. Public health consequences of mercury spills: Hazardous Substances Emergency Events Surveillance System: 1993-1998. *Environ Health Perspect* 2002;110:129–32.

2001

Burgess JL, Kovalchick DF, Harter L, Kyes KB, Lymp JF, Brodtkin CA. Hazardous materials events: evaluation of transport to health care facility and evacuation decisions. *Am J Emerg Med* 2001;19:99–105.

Orr MF, Kaye WE, Zeitz P, Powers ME, Rosenthal L. Public health risks of railroad hazardous substance emergency events. *J Occup Environ Med* 2001;43:94–100.

Orr MF, Haugh GS, Kaye WE. Hazardous Substances Emergency Events Surveillance (HSEES), 1993 to 1997. *Chemical Health and Safety* 2001;35–41.

Welles WL, Wilburn RE. Hazardous Substances Emergency Events Surveillance (HSEES) in New York State, 1993 to 1997. *Chemical Health and Safety* 2001;42–52.

2000

Burgess JL, Kovalchick DF, Harter L, Kyes KB, Thompson JN. Hazardous materials events: an industrial comparison. *J Occup Environ Med* 2000;42:546–53.

Centers for Disease Control and Prevention (CDC). Public health consequences among first responders to emergency events associated with illicit methamphetamine laboratories—selected states, 1996-1999. *MMWR* 2000;49:1021–4.

Souther L, Small-Johnson J, Messing RB. A description of agricultural releases of anhydrous ammonia in Minnesota. *Chemical Health and Safety* 2000;16–22.

Weisskopf MG, Drew JM, Hanrahan LP, Anderson HA. Hazardous ammonia releases in Wisconsin: trends and risk factors for evacuation and injury. *Wisc Med J* 2000;30–46.

Zeit P, Berkowitz Z, Orr MF, Haugh GS, Kaye WE. Frequency and type of injuries in responders of hazardous substances emergency events, 1996 to 1998. *J Occup Environ Med* 2000;42:1115–20.

1996

Hall HI, Dhara VR, Kaye WE, Price-Green PA. Public health consequences of hazardous substance releases. *Toxicol Ind Health* 1996;12:289–93.

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;86:855–7.

Wendt RD, Hall HI, Price-Green PA, Dhara VR, Kaye WE. Evaluating the sensitivity of hazardous substances emergency events surveillance: a comparison of three surveillance systems. *J Environ Health* 1996;58:13–7.

1995

Agency for Toxic Substances and Disease Registry. ATSDR update: Hazardous Substances Emergency Events Surveillance (HSEES) system: 1993 data. *Health and Environment Digest* 1995;8:83–4.

Hall HI, Price-Green PA, Dhara VR, Kaye WE. Health effects related to releases of hazardous substances on the Superfund priority list. *Chemosphere* 1995;31:2455–61.

1994

Hall HI, Dhara VR, Price-Green PA, Kaye WE. Surveillance for emergency events involving hazardous substances—United States, 1990-1992. *MMWR* 1994;43(No. SS-2):1–6.

Hall HI, Dhara VR, Kaye WE, Price-Green PA. Surveillance of hazardous substance releases and related health effects. *Arch Environ Health* 1994;49:45–8.

Table 1. Number of events meeting the surveillance definition, by state and type of event—Hazardous Substances Emergency Events Surveillance, 2004.

State	Type of event				Total No. events (%)
	Fixed facility		Transportation		
	No. events	% *	No. events	% *	
Colorado	54	30.2	125	69.8	179 (2.3)
Iowa	244	69.9	105	30.1	349 (4.5)
Louisiana	474	84.0	90	16.0	564 (7.3)
Minnesota	325	69.4	143	30.6	468 (6.0)
Missouri	148	49.3	152	50.7	300 (3.9)
North Carolina	201	52.6	181	47.4	382 (4.9)
New Jersey	444	76.4	137	23.6	581 (7.5)
New York	820	75.5	266	24.5	1086 (14.0)
Oregon	161	70.0	69	30.0	230 (3.0)
Texas	1959	85.2	339	14.8	2298 (29.7)
Utah	397	78.8	107	21.2	504 (6.5)
Washington	261	69.6	114	30.4	375 (4.8)
Wisconsin	199	46.5	229	53.5	428 (5.5)
Total	5687	73.4	2057	26.6	7744 (100.0)

* Percentage = (number of events by type of event per state/total number of events in that state) x 100

Table 2. Number of substances involved per event, by type of event—Hazardous Substances Emergency Events Surveillance, 2004

No. substances	Type of event						All events		
	Fixed facility			Transportation			No. events	%	Total substances
	No. events	%	Total substances	No. events	%	Total substances			
1	4904	86.2	4904	1931	93.9	1931	6835	88.3	6835
2	277	4.9	554	77	3.7	154	354	4.6	708
3	110	1.9	330	31	1.5	93	141	1.8	423
4	276	4.9	1104	9	0.4	36	285	3.7	1140
≥ 5	120	2.1	1135	9	0.4	82	129	1.7	1217
Total	5687	100.0	8027	2057	100.0	2296	7744	100.0	10323

Table 3. Industries involved in hazardous substance events, by category—Hazardous Substances Emergency Events Surveillance, 2004

Industry Category	Total events		Event with victims		Percentage of events with victims	Total no. victims Number (maximum)*
	No.	%	No.	%		
Agriculture	197	2.5	22	3.5	11.2	38 (8)
Mining	180	2.3	5	0.8	2.8	6 (2)
Construction	112	1.4	21	3.4	18.8	48 (7)
Manufacturing	2969	38.3	78	12.6	2.6	338 (36)
Transportation	1854	23.9	96	15.5	5.2	319 (50)
Communications	5	0.1	0	0.0	0.0	0 (0)
Utilities	502	6.5	33	5.3	6.6	65 (9)
Wholesale trade	346	4.5	15	2.4	4.3	54 (40)
Retail trade	149	1.9	31	5.0	20.8	118 (22)
Finance and real estate	53	0.7	14	2.3	26.4	51 (12)
Business and repair services	56	0.7	12	1.9	21.4	17 (3)
Personal services	192	2.5	53	8.5	27.6	102 (28)
Entertainment	39	0.5	10	1.6	25.6	32 (9)
Professional services	210	2.7	55	8.9	26.2	340 (57)
Public administration	71	0.9	16	2.6	22.5	56 (11)
Abandoned facilities	159	2.1	5	0.8	3.1	14 (5)
Private vehicle or property	103	1.3	35	5.6	34.0	42 (4)
Illegal activity (non-illicit drug related)	87	1.1	17	2.7	19.5	41 (7)
Illegal activity (illicit drug related)	414	5.3	90	14.5	21.7	139 (5)
Unspecified and unknown	46	0.6	12	1.9	26.1	18 (4)
Total†	7744	100.0	620	100.0	8.0	1838 (57)

* Minimum number of victims per event = 1.

† Includes chemical dumped on highway or other property and currently nonoperating former businesses

Table 4. Number of substances involved, by substance category and type of event—Hazardous Substances Emergency Events Surveillance, 2004

Substance category	Type of Event				All Events	
	Fixed facility		Transportation			
	No. substances	%	No. substances	%	No. substances	%
Acids	517	6.4	313	13.7	830	8.1
Ammonia	391	4.9	80	3.5	471	4.6
Bases	209	2.6	201	8.8	410	4.0
Chlorine	162	2.0	34	1.5	196	1.9
Formulations	12	0.1	2	0.1	14	0.1
Hetero-organics	98	1.2	28	1.2	126	1.2
Hydrocarbons	102	1.3	64	2.8	166	1.6
Mixture across chemical category*	1181	14.7	80	3.5	1261	12.2
Other †	480	6.0	195	8.5	675	6.5
Other inorganic substances ‡	2044	25.5	201	8.8	2245	21.8
Oxy-organics	734	9.2	190	8.3	924	9.0
Paints & dyes	123	1.5	143	6.2	266	2.6
PCB's	85	1.1	9	0.4	94	0.9
Pesticides	249	3.1	245	10.7	494	4.8
Polymers	85	1.1	130	5.7	215	2.1
Volatile organic compounds	1544	19.3	377	16.4	1921	18.6
Total ¶	8016	100.0	2292	100.0	10308	100.0

* substances from different categories that were mixed or formed from a reaction before the event.

† Not belonging to one of the existing categories.

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

¶ Of 10,323 total substances, 15 were excluded because they were not assigned a substance category.

Table 5. Number of victims per event, by type of event—Hazardous Substances Emergency Events Surveillance, 2004

No. victims	Type of event						All events		
	Fixed facility			Transportation					
	No. events	%	Total victims	No. events	%	Total victims	No. events	%	Total victims
1	268	57.9	268	108	68.8	108	376	60.6	376
2	62	13.4	124	25	15.9	50	87	14.0	174
3	32	6.9	96	7	4.5	21	39	6.3	117
4	29	6.3	116	8	5.1	32	37	6.0	148
5	15	3.2	75	1	0.6	5	16	2.6	80
≥6	57	12.3	773	8	5.1	170	65	10.5	943
Total	463	100.0	1452	157	100.0	386	620	100.0	1838

Table 6. Frequency of substance categories in all events and events with victims—Hazardous Substances Emergency Events Surveillance System, 2004*

Substance category	All events		Events with victim		
	No.	%	No.	Percentage of all releases with victims	Percentage of events with victims in substance category
Acids	556	7.2	53	8.6	9.5
Ammonia	407	5.3	43	6.9	10.6
Bases	310	4.0	31	5.0	10.0
Chlorine	185	2.4	42	6.8	22.7
Formulations	11	0.1	0	0.0	0.0
Hetero-organics	56	0.7	2	0.3	3.6
Hydrocarbons	101	1.3	4	0.6	4.0
Mixture across chemical category†	596	7.7	57	9.2	9.6
Multi-chemical category	1085	14.0	69	11.1	6.4
Other‡	1237	16.0	61	9.9	4.9
Other inorganic substances§	1227	15.9	43	6.9	3.5
Oxy-organics	603	7.8	86	13.9	14.3
Paints & dyes	233	3.0	6	1.0	2.6
PCB's	91	1.2	0	0.0	0.0
Pesticides	371	4.8	36	5.8	9.7
Polymers	201	2.6	17	2.7	8.5
Volatile organic compounds	466	6.0	69	11.1	14.8
Total¶	7736	100.0	619	100.0	8.0

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

† Substances from different categories that were mixed or formed from a reaction before the event.

‡ Not classified.

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

¶ Of 7,744 total events, 8 were excluded because they were not assigned a substance category. These 8 involved one substance each. One of the excluded events had victims.

Table 7. Frequencies of injuries/symptoms, by type of event*—Hazardous Substances
Emergency Events Surveillance, 2004

Injury/symptom	Fixed facility		Transportation		All events	
	No. injuries	%	No. injuries	%	Total no. injury	%
Burns§	143	5.9	22	3.9	165	5.5
Dizziness/central nervous system symptoms	352	14.6	60	10.7	412	13.8
Eye irritation	281	11.6	81	14.5	362	12.2
Gastrointestinal system problems	284	11.8	64	11.4	348	11.7
Headache	372	15.4	81	14.5	453	15.2
Heart problems	7	0.3	6	1.1	13	0.4
Heat stress	9	0.4	2	0.4	11	0.4
Other	18	0.7	1	0.2	19	0.6
Respiratory irritation	755	31.2	100	17.9	855	28.7
Shortness of breath	66	2.7	12	2.1	78	2.6
Skin irritation	76	3.1	20	3.6	96	3.2
Trauma†	54	2.2	111	19.8	165	5.5
Total	2417	100.0	560	100.0	2977	100.0

* The number of injuries is greater than the number of victims (1,838) because a victim could have had more than one injury.

† Of the 165 trauma injuries, 23 were chemical-related, 141 were not chemical-related, 1 was both chemical and non-chemical related, and the type of trauma was missing for 13 injuries.

§ Of the 165 burns injuries, 89 were chemical-related, 55 were thermal, 21 were both.

Table 8. Distribution of personnel who responded to events—Hazardous
Substances Emergency Events Surveillance, 2004

Responder category	No. responders	% of events
Certified HazMat team	881	11.4
Company's response team	5212	67.6
Emergency medical technicians	419	5.4
Environmental agency	628	8.1
EPA† response team	30	0.4
Fire department	1299	16.9
Health department/health agency	146	1.9
Hospital personnel	6	0.1
Law enforcement agency	1213	15.7
Other	306	4.0
No response	790	10.3
Total	10930*	

* Of 7744 total events, response information were missing for 38 events. Total (10930) greater than total number of events (7706) because multiple responder categories could be reported per event.

† Environmental Protection Agency

Table 9.— Cumulative data by year—Hazardous Substances Emergency Events Surveillance, 1993-2004*

Year	No. Participating States	Type of event			No. substances released	No. victim	No. deaths	Events with victims	
		Fixed facility	Transportation	Total				No.	%†
1993	11	3,199	634	3,833	4,361	2,230	16	464	12.1
1994	12	3,321	912	4,233	5,072	2,181	21	414	9.8
1995	14	4,273	1,037	5,310	6,027	1,688	14	402	7.6
1996	14	4,327	1,159	5,486	5,861	1,622	33	390	7.1
1997	13	4,385	1,128	5,513	6,089	1,896	28	372	6.7
1998	13	4,729	1,252	5,981	6,486	1,533	36	405	6.8
1999	13	4,634	1,626	6,260	6,974	1,912	30	504	8.0
2000	15	5,499	2,049	7,548	8,342	2,513	44	752	10.0
2001	16	6,736	2,242	8,978	11,764	2,168	22	710	7.9
2002	15	6,493	2,520	9,013‡	11,009	2,150	47	739	8.2
2003	15	6,782	2,323	9,105	12,018	1,835	51	720	7.9
2004	13	5,687	2,057	7,744	10,323	1,838	41	620	8.0
Total		60,065	18,939	69,991	94,326	23,566	383	6,492	8.3

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

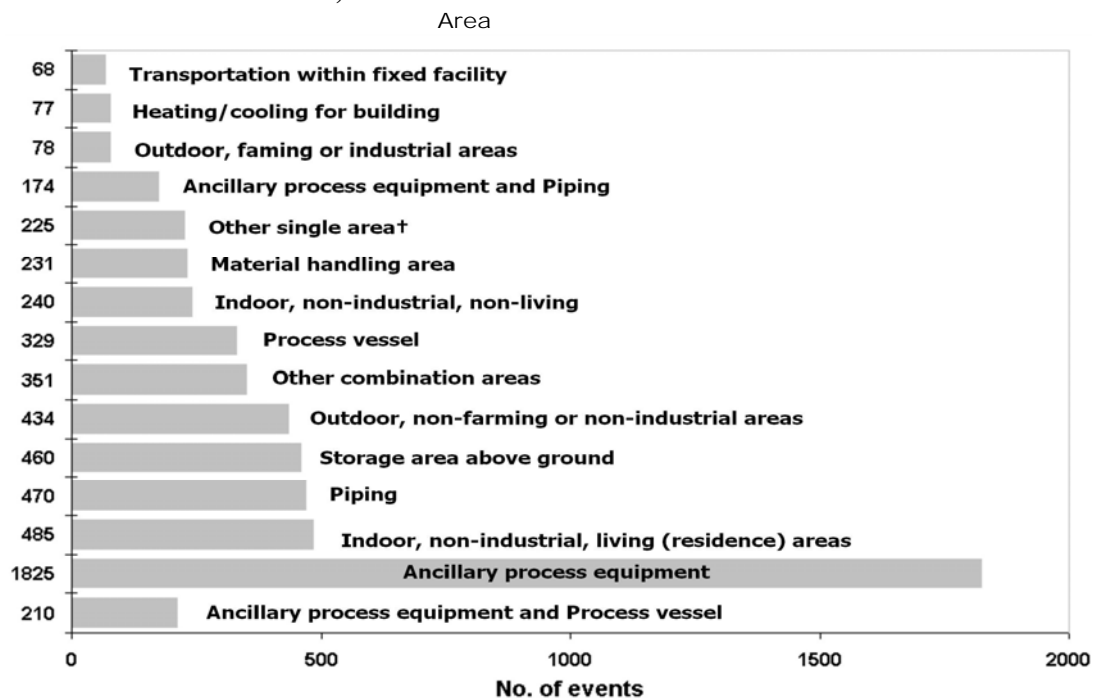
† Percentage of events with victims.

‡The total number of events does not include one event occurring in 2002 because the type of event was not known.

Table 10. Time period each state participated in Hazardous Substances Emergency Events Surveillance, 1993-2004

State	Years Participated
Alabama	1993-2003
Colorado	1993-2004
Iowa	1993-2004
Louisiana	2001-2004
Minnesota	1995-2004
Mississippi	1995-2003
Missouri	1994-2004
New Hampshire	1993-1996
New Jersey	2000-2004
New York	1993-2004
North Carolina	1993-2004
Oregon	1993-2004
Rhode Island	1993-2001
Texas	1993-2004
Utah	2000-2004
Washington	1993-2004
Wisconsin	1993-2004

Figure 1. Areas of fixed facilities involved in events—Hazardous Substances Emergency Events Surveillance, 2004*



* Of all 5,687 fixed-facility events, 4,922 had one type of area reported, 735 had a combination of two area types, and 30 had type of area missing.

† Of all 225 other single areas, 14 were storage areas below ground, 60 were dump/waste area, 26 were other, 65 were transformer or capacitor, 22 were incinerator, and 38 were laboratory.

**Figure 2. Distribution of transportation-related events, by type of transport—
Hazardous Substances Emergency Events Surveillance, 2004**

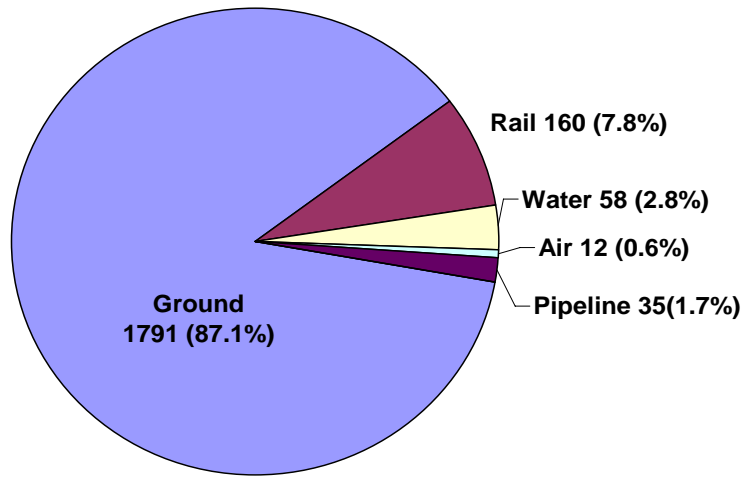


Figure 3a. Primary factors reported as contributing to events, by type of events— Hazardous Substances Emergency Events Surveillance, 2004

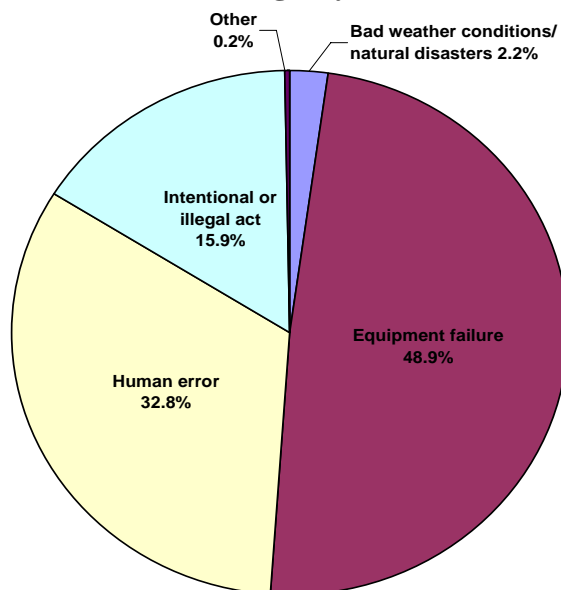
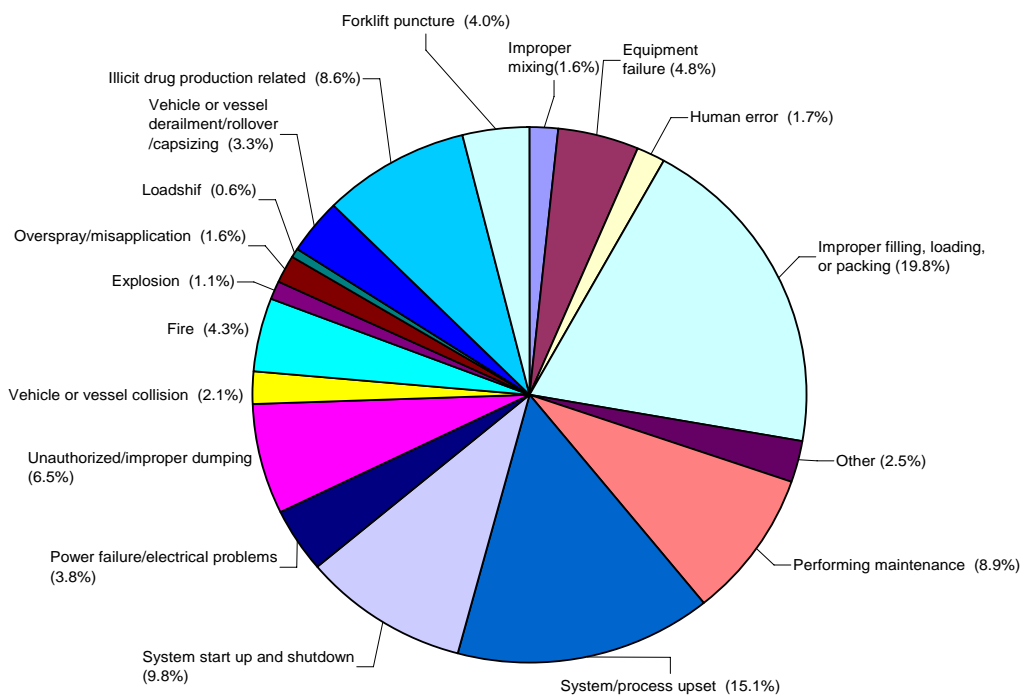
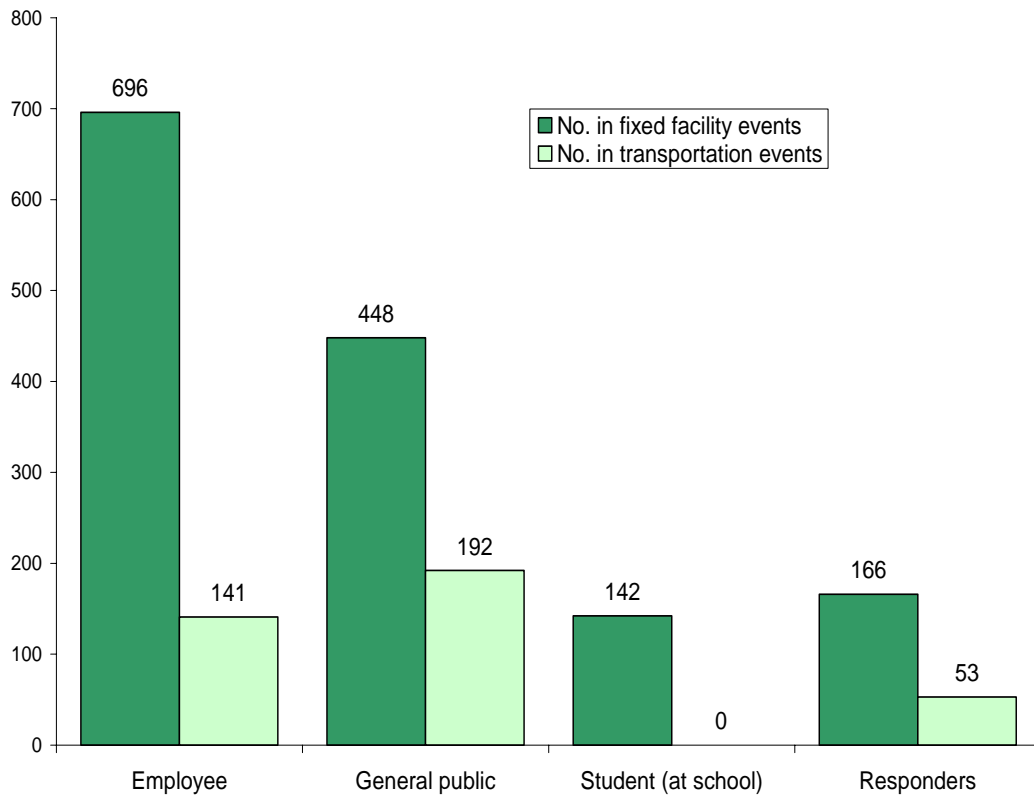


Figure 3b. Secondary factors reported as contributing to events— Hazardous Substances Emergency Events Surveillance, 2004

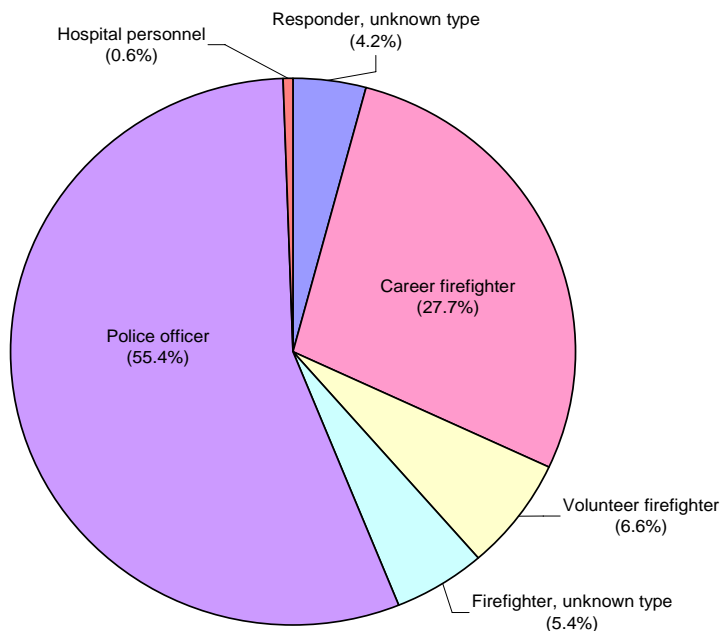


* Of 7744 total events, 2511 have no secondary factor, and 35 have secondary factor missing.

Figure 4. Number of victims, by population group and type of event—Hazardous Substances Emergency Events Surveillance, 2004



**Figure 5a. Distribution of responders injured in fixed facility events, by type of responder
—Hazardous Substances Emergency Events Surveillance, 2004**



**Figure 5b. Distribution of responders injured in transportation events, by type of responder
—Hazardous Substances Emergency Events Surveillance, 2004**

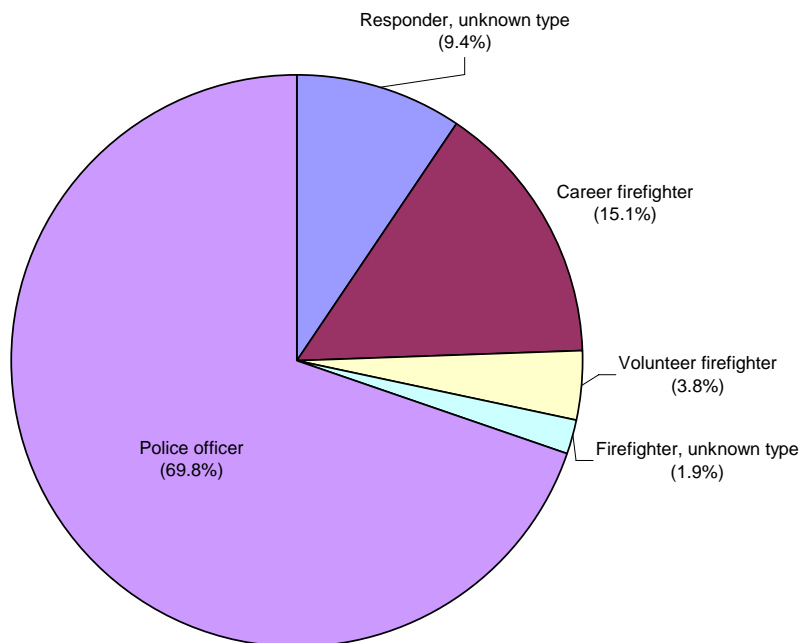


Figure 6. Injury disposition—Hazardous Substances Emergency Events Surveillance, 2004

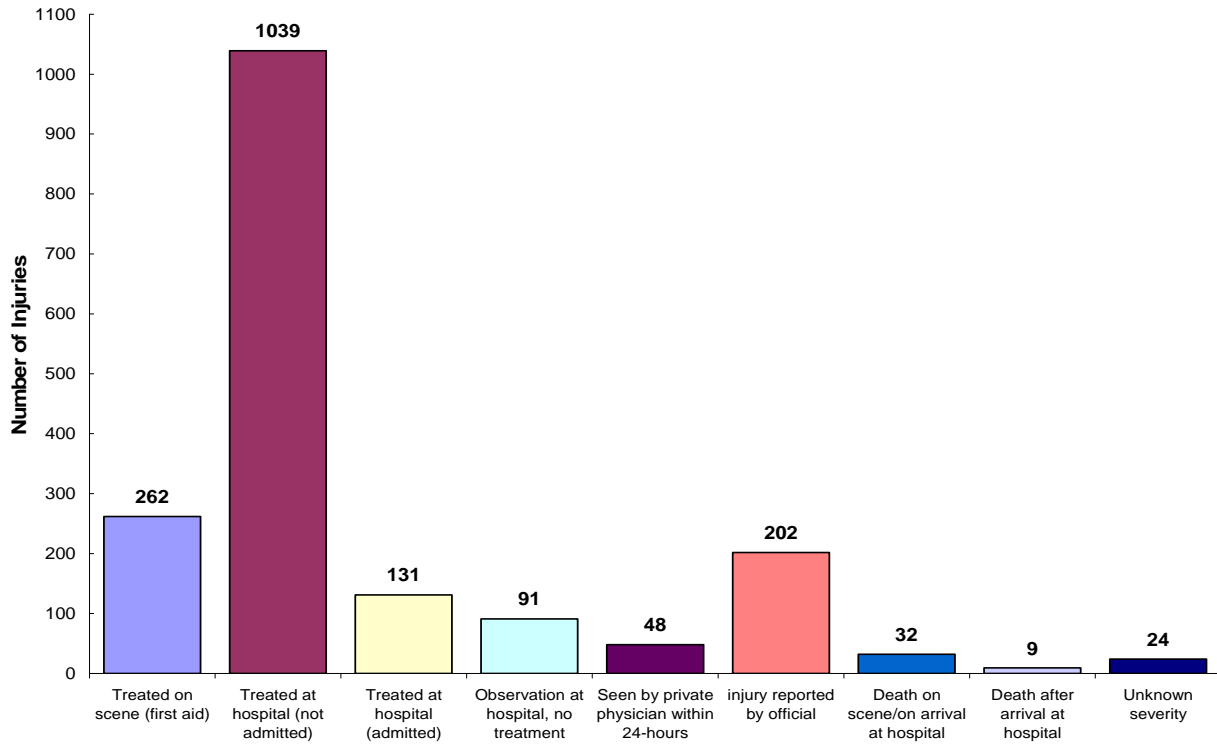
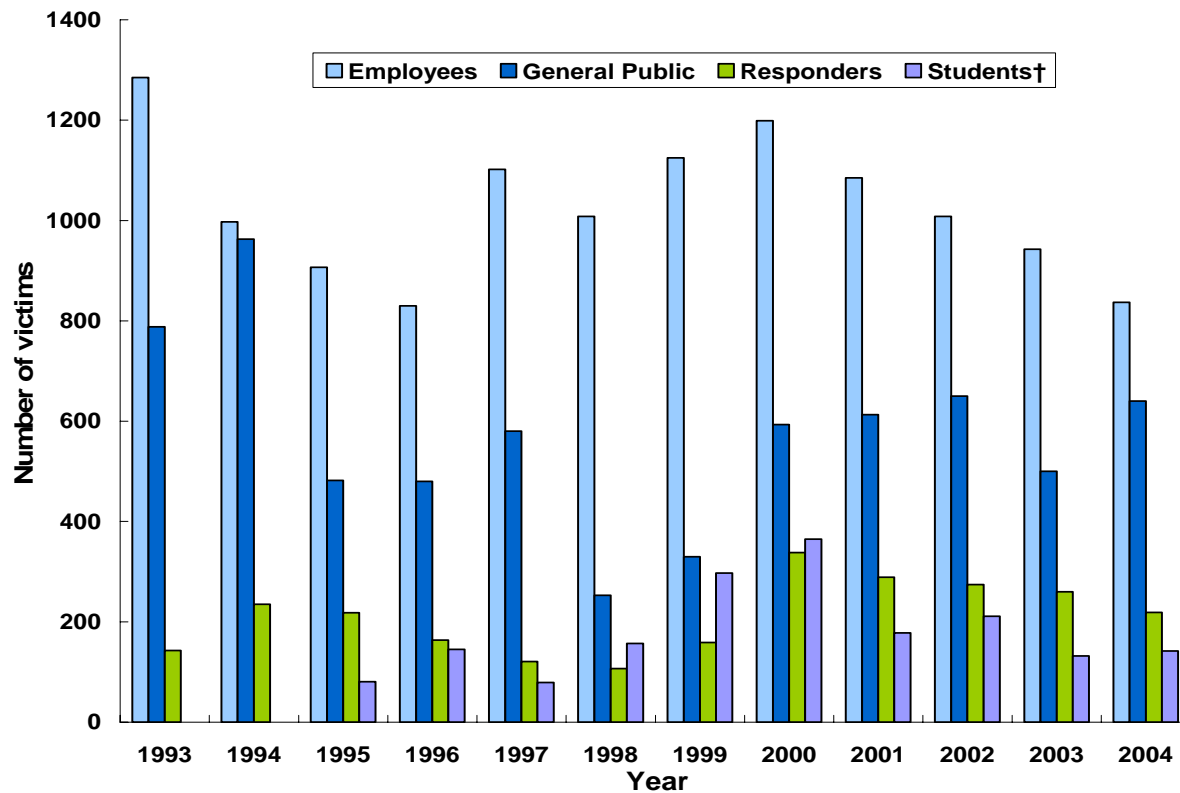


Figure 7. Number of victims, by category and year—Hazardous Substances Emergency Events Surveillance, 2004*



* The population category was unknown or missing for 72 victims in 2003.

† The student category was not available before 1995. Before 1995, students were included in the general public category.

