HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE (HSEES)

Five-Year Cumulative Report
1998–2001
Division of Health Studies
Epidemiology and Surveillance Branch

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Atlanta, Georgia

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 send your comments to the following address

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

Agency for Toxic Substances and Disease Registry..... …….Julie L. Gerberding, MD, MPH, Administrator

Henry Falk, MD, MPH, Assistant Administrator

Division of Health Studies……..… G. David Williamson, PhD, Director

Sharon Campolucci, MSN, Deputy Director

Kim Blindauer, DVM, MPH, Assistant Director for Science

Epidemiology and Surveillance Branch,
Hazardous Substances Emergency Events Surveillance Staff…….....Wendy E. Kaye, PhD, Chief

Zahava Berkowitz, MSc
Maureen Orr, MS
Casetta R. Simmons
Perri Zeitz Ruckart, MPH
Kevin Horton, MSPH
Shannon Rossiter, MPH
Wendy Wattigney, MStat

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DISCLAIMER

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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. The purpose of HSEES is to describe the public health consequences associated with the release of hazardous substances and develop strategies to reduce and prevent releases and their associated adverse health effects. Five state health departments participated in the pilot phase of the surveillance system and began data collection on January 1, 1990. Thirteen states participated in HSEES for the entire 4-year period of 1998–2001: Alabama, Colorado, Iowa, Minnesota, Mississippi, Missouri, New York, North Carolina, Oregon, Rhode Island, Texas, Washington, and Wisconsin. Three states participated during portions of the period: Louisiana (2001), New Jersey (2000–2001), and Utah (2000–2001). Currently, 15 states participate in HSEES. All states who participated in HSEES at any time during 1998–2001 are shown in Figure 1.

The HSEES system is a computerized database used to monitor the acute public health consequences of hazardous substances releases into the environment. The system does not study chronic human health effects or the impact on the environment from these releases. The system documents all reportable acute hazardous substances releases except for those involving only petroleum (for example, natural gas, propane, jet fuel, and gasoline). HSEES events can occur at fixed facilities or during transportation.

The HSEES system has four objectives:

- To describe the distribution of hazardous substances emergency events within participating states
- To describe morbidity and mortality among employees, responders, and the general public that result from acute releases of hazardous substances
- To analyze and describe risk factors associated with morbidity and mortality
- To develop strategies to reduce morbidity and mortality

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 also are included in the system if they 1) involve actions, such as evacuations, taken to protect the public health and 2) would have required removal, cleanup, or neutralization according to federal, state, or local law. A substance is considered hazardous if it can reasonably be expected to cause injury or death to an exposed person. Threatened releases occurring to air and water that could not be cleaned up also are included in the system if the amount released would have needed to be cleaned up if the spill had occurred on land.

Data from several sources are used to obtain information about the events. These sources include records and oral reports of state environmental protection agencies, police and fire

departments, hospitals, corporations, the media, and others. Data collected on each event include 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, personal protective equipment 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 within 24 hours after the event. Victims who receive more than one type of injury are counted once for each applicable type of injury.

Substances are grouped into 11 categories: acids, ammonia, bases, chlorine, mixtures, paints and dyes, pesticides, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), other inorganic substances, and “other” substances. The “mixtures” category consists of chemicals from different categories that are mixed before release; 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.

Participating states enter data into a Web-based data entry system. ATSDR manages and analyzes the data and generates a report of the entered data. ATSDR provides each participating state with its own state-level data for analysis and report-generation purposes. ATSDR and the participating states then use the HSEES data for prevention activities.

This cumulative report summarizes the characteristics of hazardous substances releases and the associated public health consequences of events reported during the 4-year period 1998 through 2001. Data are presented first for the system as a whole, then individually by state. A contact name is provided after each state summary as a source for further information.

RESULTS

Distribution of Events, by Year, State, and Type

A total of 28,571 events were reported to HSEES for 1998–2001 (Table 1). Texas reported 37% of all events (n=10,551); Rhode Island reported the smallest percentage, less than 1% (n=209). Fixed-facility events represented 75% (n=21,453) of all reported events. Only 25% (n=7,118) of all events were transportation-related. During 1998–2001, the percentage of

fixed-facility events differed considerably by state. New Jersey had the largest percentage (93%) and North Carolina the smallest (34%).

Temporal Patterns of Events

The number of events increased each year from 1998 through 2001 (Figure 2) primarily because of increases in the number of participating states and the number of reporting sources. However, even when states that did not participate for the full period were excluded, the number of events per year still increased from 5,785 in 1998 to 7,105 during 2001. The frequency of both transportation-related and fixed-facility events during 1998–2001 was highest during April through August, peaking in June for fixed-facility events and in May for transportation-related events (Figure 3). These peaks coincide with the agricultural planting season when demand for agricultural chemicals is high. Both fixed-facility and transportation-related events occurred more frequently on weekdays (Monday through Friday), than on Saturdays and Sundays (Figure 4); events were more likely to occur on Wednesdays. Most events (67% [n=13,757] of fixed-facility and 69% [4,127] of transportation-related events) occurred between the hours of 6 AM and 6 PM (Figure 5). Fixed-facility events peaked at 10 AM and transportation-related events peaked at 9:00 AM (Figure 6).

Chemicals

Of the 11 categories into which HSEES substances were grouped, the categories of chemicals most commonly released were other inorganic substances (24%, n=8,123), volatile organic substances (20%, n=6,806), and “other” (19%, n=6,409) (Table 2). The 10 most frequently released chemicals were ammonia (5%, n=1,705), sulfur dioxide (5%, n=1,521), sulfuric acid (2%, n=761), hydrochloric acid (2%, n=666), carbon monoxide (2%, n=665), sodium hydroxide (2%, n=654), nitric oxide (2%, n=641), mercury (2%, n=593), paint or coating not otherwise specified (2%, n=584), and ethylene glycol (1%, n=470).

Fixed-Facility Events

The largest percentage (46%, n=9,809) of fixed-facility industry-related events involved releases from processing equipment used at industrial facilities. Other prime locations for events were above-ground storage areas (14%, n=3,038), piping (13%, n=2,746), and material loading and unloading sites (10%, n=2,133). The most frequent primary factors contributing to fixed-facility releases were equipment failure (46%, n=9,869) and human error (21%, n=4,444). The most frequent secondary factors in fixed-facility releases were system/process upset (22%, n=882), system startup and shutdown (16%, n=652), and equipment failure (13%, n=530). The most frequently released substances in fixed-facility events were other inorganic substances (34%, n=7,269), VOCs (26%, n=5,583), and “other” (19%, n=4,019). Fixed-facility events occurred in residential (27%, n=5,719), rural/agricultural (13%, n=2,704), and industrial/commercial (82%, n=17,589) areas. Events can have more than one area descriptor.

Transportation-Related Events

Eighty-five percent (n=6,046) of transportation-related events occurred during ground transport; 9% (n=658) during rail transport, and 6% (n=414) combined for air, pipeline, water, or other type of transport. The most frequently released substances during transportation-related events were in “other” (34%, n=2,390), VOCs (17%, n=1,223), acids (15%, n=1,057), and other inorganic substances (12%, n=854). Transportation-related events occurred in residential (26%, n=1,829), rural/agricultural (18%, n=1,295), and industrial/commercial (74%, n=5,262) areas.

Victims

Fixed-facility events resulted in 7,002 victims and transportation-related events resulted in 1,100 victims. For all events, employees (54%, n=4,397) were most often injured followed by the general public (22%, n=1,788), students (12%, n=997) and first responders (10%, n=805). The category of victim was not known for 30 persons. Of the first-responder group, police, career firefighters, and volunteer firefighters were the most frequent victims of both fixed-facility and transportation-related events.

Approximately 95% of all events reported to HSEES involved the release, or threatened release, of only one hazardous substance, 4% involved two or three substances, and 1% involved four or more substances. Again, multisubstance events more frequently resulted in victims than did single-substance events (59% [n=1,385] vs. 25% [n=6,430]). Chlorine was the substance category most likely to be involved in events with victims (27%, n=117) than was ammonia (18%, n=323), acids (16%, n=432), pesticides (15%, n=203), and “other” (10%, n=672). PCBs were least likely to be involved in events with victims (1%, n=3).

Respiratory irritation (52%, n=4,188) was the most frequently reported injury for all events. Other frequent injuries were headache (19%, n=1,548), eye irritation (19%, n=1,525), dizziness and other central nervous system effects (17%, n=1,374), gastrointestinal irritation and vomiting (17%, n=1,337), skin irritation (9%, n=723), and trauma or physical injury (9%, n=706). Of the trauma injuries, 57% (n=403) were reported in transportation-related events because collision-related injuries were not excluded.

Most victims were treated at a hospital for their injuries and released (51%, n=4,157) or treated on the scene (25%, n=1,981). Few victims sought care from a private physician (5%, n=432), were admitted to a hospital (8%, n=635), were transported to a hospital for observation but not treated (3%, n=269), or died from their injuries (2%, n=130). The severity of injury to 19 (<1%) of reported victims is unknown.

Deaths

A total of 130 deaths were reported to HSEES during 1998–2001 from 97 events. Seventy victims were involved in transportation-related events. In sixteen events, more than one person died. The greatest number of fatalities for one event was 10 from a transportation event. The second largest number of fatalities for one event was a fixed-facility event with six fatalities. Forty-five (64%) victims in transportation-related events experienced only trauma-related injuries at events where no explosion was reported. Vehicle-related trauma, rather than hazardous substances, probably caused these and one other death for which we have limited information. The remaining 84 deaths, considered to be related to the release of hazardous substances, were evaluated further. Events in which explosions were reported were responsible for 31% (n=26) of the 84 deaths. The 84 deaths resulted from 59 fixed-facility events and 25 transportation-related events. Of the 84 deaths, 46 were employees, 34 were members of the general public, and four were first responders.

Evacuation Orders

Eight percent (n=2,336) of events involved an official evacuation order. The number of persons evacuated ranged from one to 11,000. Fifty percent of the evacuations involved 20 or fewer persons, 75% involved 65 or fewer persons, and 5% involved 500 or more persons.

Decontamination

A total of 7,715 people were decontaminated at HSEES events. Of the 2,301 employees decontaminated, 1,400 were decontaminated on the scene and 901 were decontaminated at a medical facility. Of the 1,445 members of the general public decontaminated, 576 were decontaminated on the scene and 869 were decontaminated at a medical facility. Of the 3,969 first responders decontaminated, 3,100 were decontaminated on the scene and 869 were decontaminated at a medical facility. Some persons might have been decontaminated at both locations.

DISCUSSION

HSEES has recorded data on a large number of events for 1998–2001. The majority of events occurred at fixed facilities and during normal business hours (6 AM to 6 PM). Because human error and equipment failure contributed substantially to the releases, workers need to be trained to safely handle hazardous substances and employers need to be conscious of the ramifications of inadequate equipment maintenance.

Handlers and users of substances (e.g., acids, ammonia, chlorine, and pesticides) that frequently cause injury when released should be targeted for prevention messages. Because respiratory irritation is the most commonly reported injury, employees and responders should be trained to use appropriate personal protective equipment, particularly respiratory protection.

Firefighters frequently are injured at fixed-facility events. Firefighters usually wear turnout gear, which is designed for fighting structural fires; however, it is not chemically resistant and does not require respiratory protection. Police officers, who also frequently are injured at transportation-related events, may not be routinely provided with protective equipment or with hazardous substance training.

Events reported to HSEES follow a seasonal pattern. Events increase when agricultural activities (e.g., planting, fertilizing, and applying pesticides) are being performed. Agricultural workers frequently use hazardous chemicals, namely ammonia and pesticides. States with a large agriculture industry probably would benefit from continued and possibly enhanced safety training for agricultural and agricultural chemical transport workers. In addition, state health departments should work with their state agricultural departments to enforce regulations.

During 1998–2001, many victims were decontaminated and treated at hospital emergency facilities. This emphasizes the need to raise awareness among emergency department personnel about the potential risk for secondary contamination from incoming victims associated with hazardous materials releases. If contaminated patients are not properly identified or treated, the results can be significant, possibly causing loss of life or a temporary closing of an emergency department.

Tables and Figures

Table 1. Number of events meeting the surveillance definition, by state and type of event—Hazardous Substances Emergency Events Surveillance (HSEES) system.*

State	Years included	Type of event				All events	
		Fixed facility		Transportation related			
		No.	(%)	No.	(%)	No.	(%)
Alabama	1998–2001	405	(53.9)	346	(46.1)	751	(2.6)
Colorado	1998–2001	83	(51.4)	457	(48.6)	940	(3.3)
Iowa	1998–2001	844	(70.9)	346	(29.1)	1,190	(4.1)
Louisiana	2001	684	(83.9)	131	(16.1)	815	(2.8)
Minnesota	1998–2001	1,312	(84.2)	246	(15.8)	1,558	(5.4)
Mississippi	1998–2001	397	(50.2)	394	(49.8)	791	(2.7)
Missouri	1998–2001	655	(56.8)	498	(43.2)	1,153	(4.0)
New Jersey	2000–2001	956	(92.7)	75	(7.3)	1,031	(3.6)
New York	1998–2001	2,717	(80.8)	644	(19.2)	3,361	(11.7)
North Carolina	1998–2001	372	(34.2)	715	(65.8)	1,087	(3.8)
Oregon	1998–2001	571	(71.6)	226	(28.4)	797	(2.8)
Rhode Island	1998–2001	168	(80.4)	41	(19.6)	209	(0.7)
Texas	1998–2001	9,307	(88.2)	1,244	(11.8)	10,551	(36.7)
Utah	2000–2001	548	(65.5)	289	(34.5)	837	(2.9)
Washington	1998–2001	1,302	(73.2)	478	(26.9)	1,780	(6.2)
Wisconsin	1998–2001	877	(45.8)	1,039	(54.2)	1,916	(6.7)
Total	**-------**	**21,598**	**(75.1)**	**7,169**	**(24.9)**	**28,767**	**(100)**

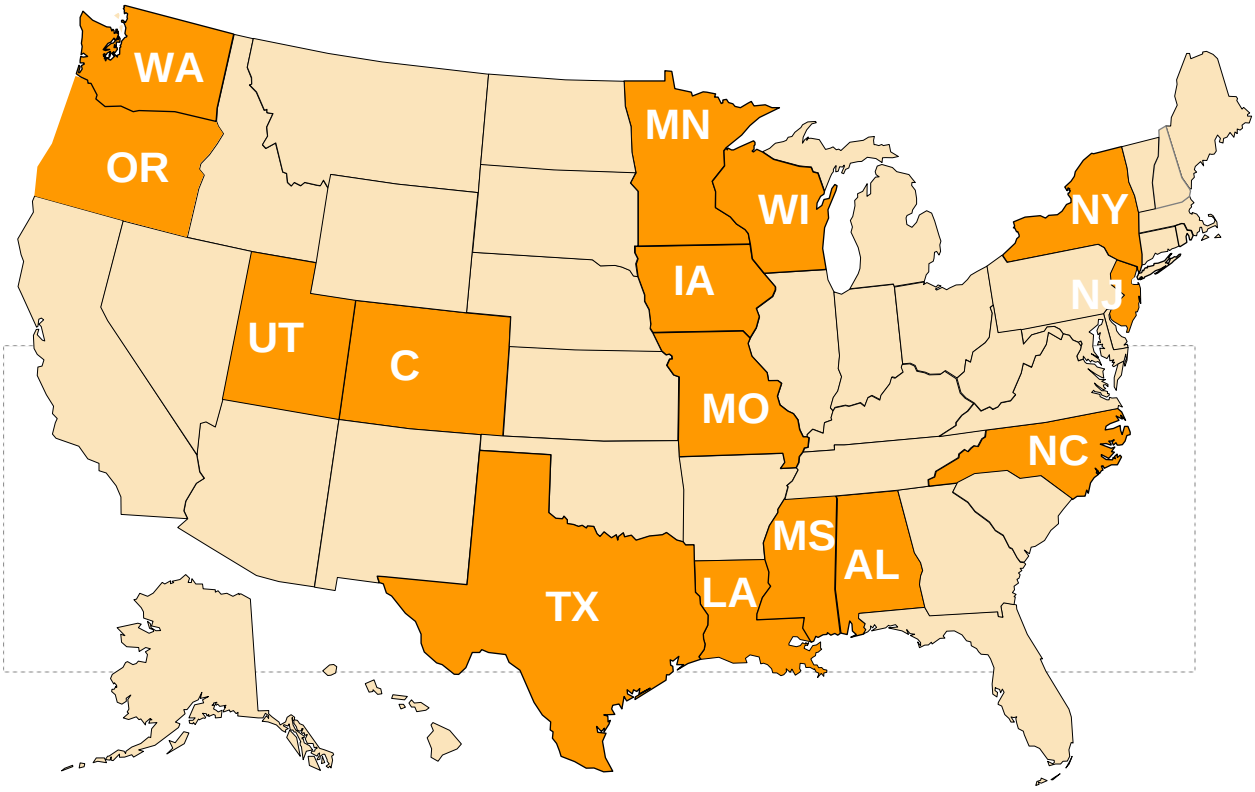
* Numbers may differ slightly from those reported by individual states because of adjustments made by the states after submission of the data to ATSDR.

Table 2. Distribution of the number of substances released, by substance category and type of event, for the 16 states that participated in HSEES during 1998–2001.

Substance category	Type of event				All events	
	Fixed facility		Transportation related			
	No. of substances	(%)	No. of substances	(%)	No. of substances	(%)
Acids	1,661	(6.4)	1,066	(13.8)	2,727	(8.1)
Ammonia	1,607	(6.2)	216	(2.8)	1,823	(5.4)
Bases	560	(2.2)	602	(7.8)	1,162	(3.5)
Chlorine	420	(1.6)	19	(0.2)	439	(1.3)
Mixtures*	3,014	(11.7)	331	(4.3)	3,345	(10.0)
Other inorganic substances	7,299	(28.4)	864	(10.6)	8,163	(24.4)
Other substances	4,039	(15.7)	2,408	(31.1)	6,447	(19.3)
Paints and dyes	431	(1.7)	411	(5.3)	842	(2.5)
Pesticides	799	(3.1)	570	(7.4)	1,369	(4.1)
Polychlorinated biphenyls	315	(1.2)	28	(0.4)	343	(1.0)
Volatile organic compounds	5,602	(21.8)	1,227	(18.0)	6,829	(20.4)
Total	**25.747**	**(100.0)**	**7,742**	**(100.0)**	**33,489**†	**(100.0)**

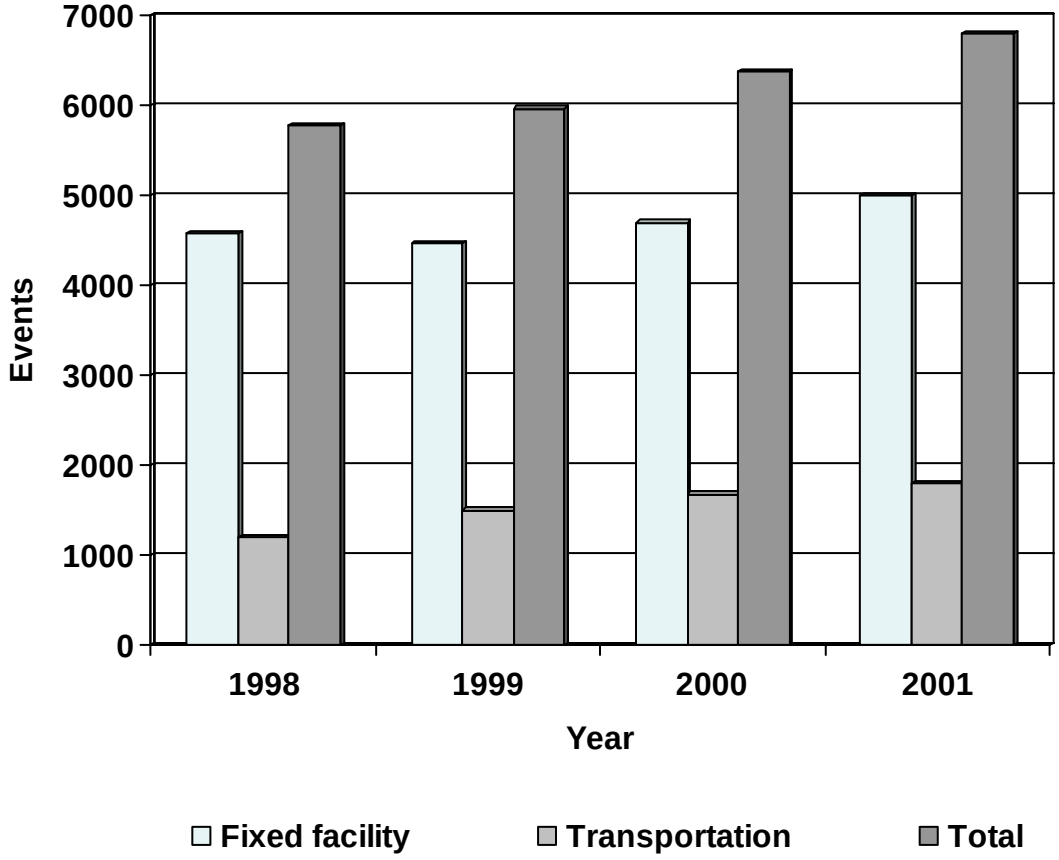
* Mixtures of substances from other categories.
† The number of substances does not equal the number of events because some events release multiple substances.

Figure 1. States participating in the Hazardous Substances Emergency Events Surveillance (HSEES) system*



* 13 states participated in HSEES during 1998–2001: Alabama, Colorado, Iowa, Minnesota, Mississippi, Missouri, New York, North Carolina, Oregon, Rhode Island, Texas, Washington, and Wisconsin. Three states participated during portions of the period: Louisiana (2001), New Jersey (2000–2001), and Utah (2000–2001).

Figure 2. Distribution of events reported to the Hazardous Substances Emergency Events Surveillance (HSEES) system, by year, for the 13 states that participated during 1998–2001.



* The 13 states that participated in HSEES during 1998–2001 included Alabama, Colorado, Iowa, Minnesota, Mississippi, Missouri, New York, North Carolina, Oregon, Rhode Island, Texas, Washington, and Wisconsin.

Figure 3. Events reported to the Hazardous Substances Emergency Events Surveillance (HSEES) system, by month and type of event, for the 16 states that participated during 1998–2001.

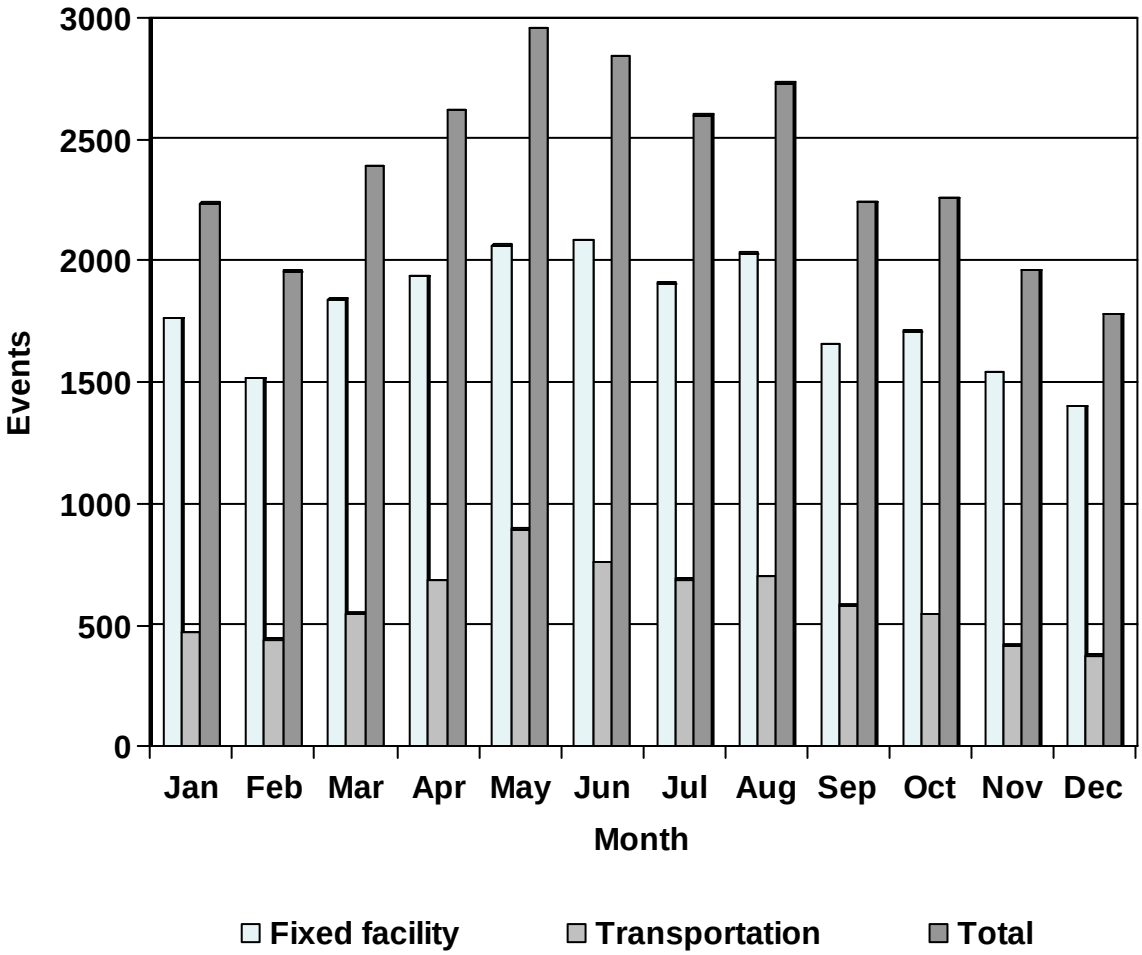


Figure 4. Events reported to the Hazardous Substances Emergency Events Surveillance (HSEES) system, by day of the week and type of event, for the 16 states that participated during 1998–2001.

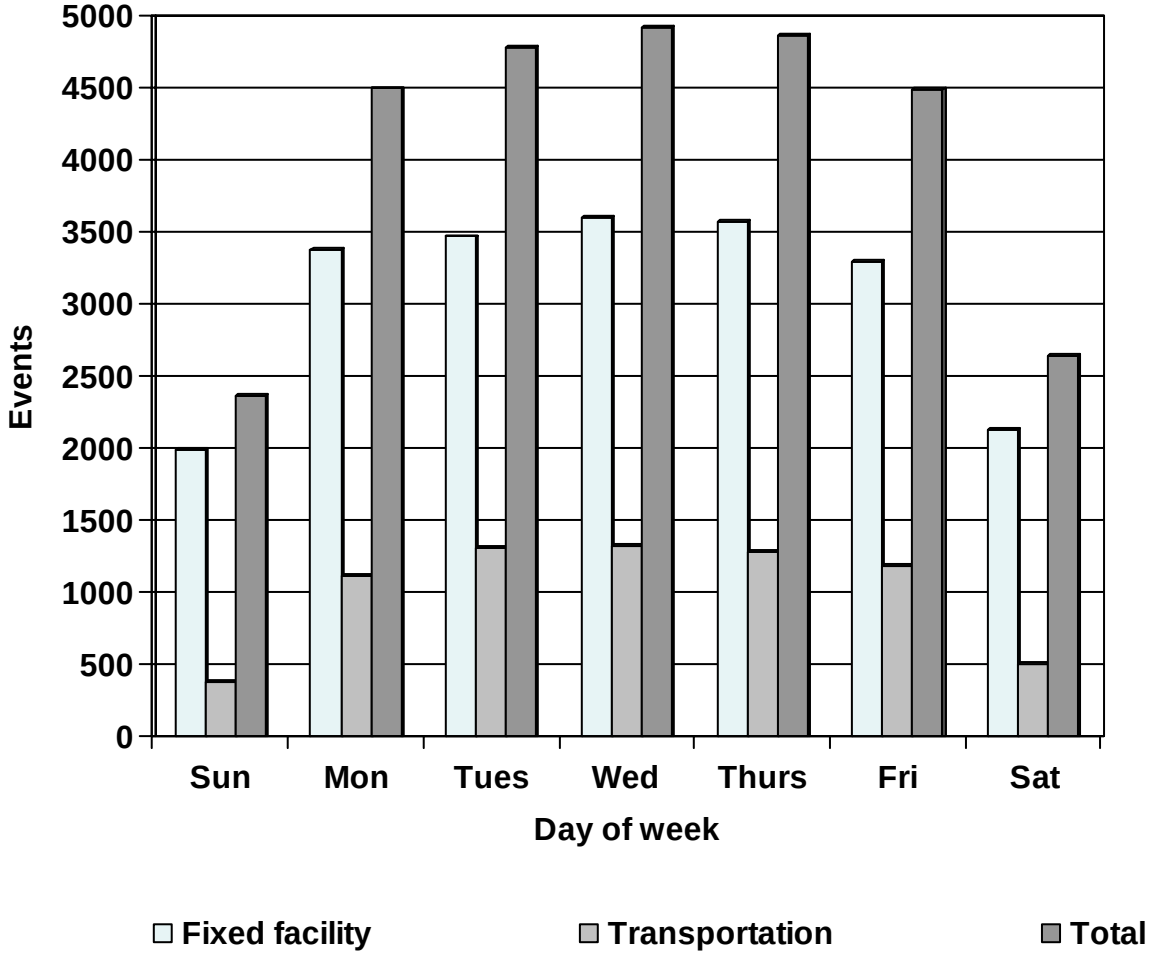


Figure 5. Fixed facility events reported to the Hazardous Substances Emergency Events Surveillance (HSEES) system, by time of day, for the 16 states that participated during 1998–2001.

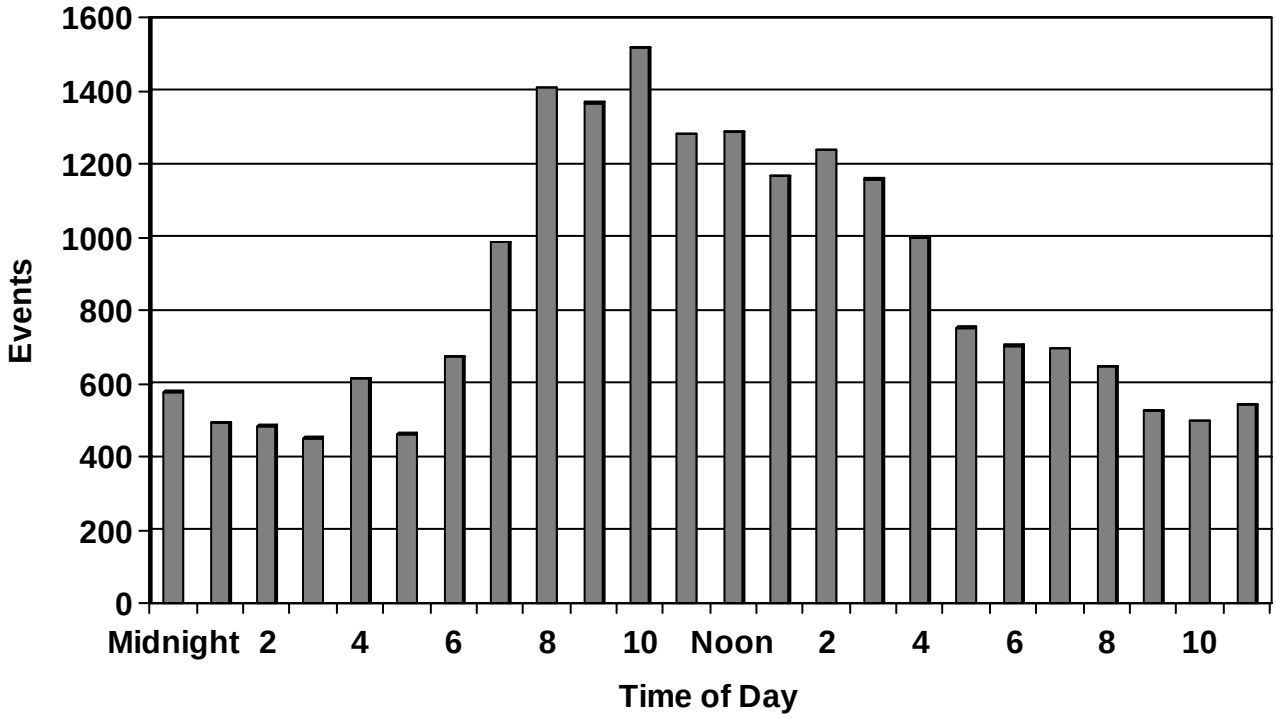
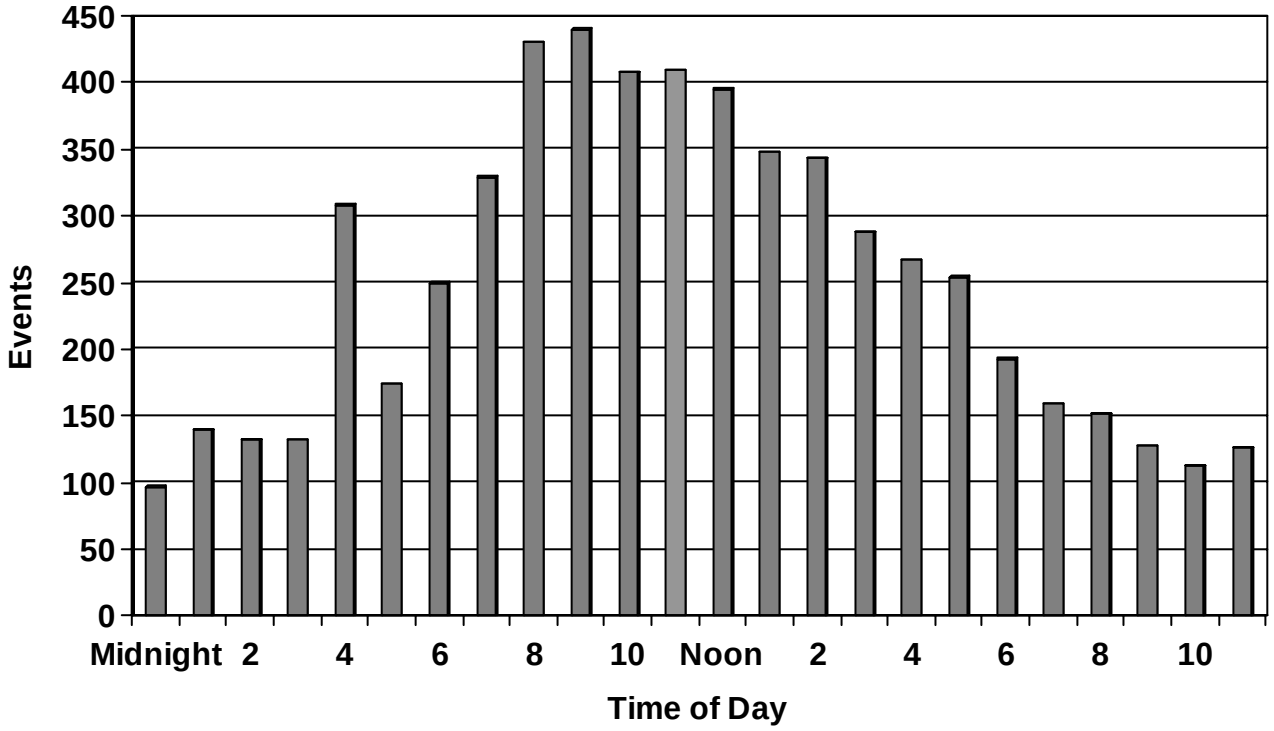


Figure 6. Transportation-related events reported to the Hazardous Substances Emergency Events Surveillance (HSEES) system, by time of day, for the 16 states that participated during 1998–2001.



ALABAMA

Since 1993, the Alabama Department of Public Health (ADPH) has participated in the HSEES system. The ADPH reported a total of 751 events for 1998–2001; 405 (53.9%) occurred at fixed facilities, and 346 (46.1%) were transportation related. Equipment failure (n=275, 36.6%) contributed to the majority of releases. In 715 (95.2%) of the events, one substance was released. The most commonly reported categories of substances besides "other" and other inorganic substances were volatile organic compounds, acids, bases and pesticides. During this reporting period, 67 events (approximately 9% of all reported events) resulted in a total of 161 victims. Adverse health effects most frequently experienced by victims were respiratory problems, trauma, eye irritation, and dizziness. A total of 12 persons died as a result of all events, and 65 (8.7%) events required evacuations. Of the 12 deaths, four occurred in fixed facilities and eight occurred during transportation. Additionally, seven deaths were among employees, four were members of the general public, and one was a first responder.

The years 1998–2001 were fairly typical with one major exception; the number of deaths. Of the 16 deaths identified by the Alabama HSEES program, all 12 occurred during 1998 and 1999.

Data sources included the National Response Center, Alabama Department of Environmental Management, U.S. Department of Transportation, state and local emergency management agencies, as well as self-reporting from industry.

Contact person:

Neil Sass, PhD
Alabama Department of Public Health
Division of Epidemiology
P.O. Box 303017
Montgomery, AL 36130-3017

Phone: 334-206-5941
Fax: 334-206-2012
Email: nsass@adph.state.al.us
Website: http://www.adph.org/RISK/default.asp?TemplateNbr=0&DeptID=145&TemplateId=1310

COLORADO

Since 1990, the Colorado Department of Public Health and Environment (CDPHE) has participated in the HSEES system. CDPHE reported a total of 940 events for 4 years; approximately 483 (51.4%) occurred at fixed facilities, and 457 (48.6%) were transportation related. Human error (431 events, 49.5%) contributed to the majority of the releases. In 912 (97.0%) of the events, one substance was released. The most commonly reported categories of substances were "other", volatile organics, other inorganic substances, and acids. During this reporting period, 42 events (approximately 4.5% of all reported events) resulted in a total of 183 victims. Adverse health effects most frequently experienced by victims were respiratory system irritation, eye irritation, dizziness or other central nervous system symptoms, and headache. One person died and 64 (6.8%) 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 been consistent overall since HSEES's inception.

Data sources used included local fire/police and hazardous materials units, local and county health departments, poison control centers, state highway patrol, and the state department of transportation.

Contact person:

Chrystine Kelley, HSEES Coordinator
Colorado Department of Public Health and Environment
HMWMD-B2
4300 Cherry Creek Drive South
Denver, CO 80246-1530

Phone: 303-692-3300 or toll-free 888-569-1831
Fax: 303-759-5355
Email: comments.hmwmd@state.co.us
Website: http://www.cdphe.state.co.us/hm/hsees.asp

IOWA

Since 1990, the Iowa Department of Public Health (IDPH) has participated in the HSEES system. IDPH reported a total of 1,190 events for 1998–2001; 844 (71%) occurred at fixed facilities, and 346 (29%) were transportation-related. At fixed facilities, equipment failure (385 events , 45.6%) was the most likely contributing factor to the releases. In 1,086 (91%) events, one substance was involved. The most commonly reported categories of substances were "other" substances, ammonia, volatile organic compounds, and pesticides. During this reporting period, 128 events (approximately 11% of all reported events) resulted in a total of 236 victims. Adverse health effects most frequently experienced by victims were respiratory problems and chemical burns. A total of 10 people died and 121 (10%) events required evacuations. Of the 10 deaths, three occurred in fixed facilities and seven occurred during transportation. Additionally, six deaths occurred among employees and four were members of the general public.

In the past 12 years of data collection (data for 1990–1992 are considered pilot data), certain aspects of emergency events appear to be consistent. Although two major interstates (Interstate 35 and Interstate 80) run through Iowa, most events occured in fixed facilities. The most common types of releases were agricultural chemicals, with a high proportion of events occurring during the agricultural planting season (April, May, and June). The majority of events involved one chemical, and most events with victims involved one victim (74%). Employees were injured most often (49%). The general public comprised 35% of the victims. Large proportions of people who received injuries were transferred to the hospital (76%) and approximately 12% of those were admitted.

Data sources included the Iowa Department of Natural Resources, Iowa Department of Public Health Sentinel Project Researching Agricultural Injuries Notification System, U.S. Coast Guard National Response Center, Iowa Department of Public Safety Narcotics Enforcement Division, and the media.

Contact person:

Debbi Cooper
Iowa Department of Public Health
Division of Environmental Health
Lucas State Office Building
321 East 12th Street
Des Moines, IA 50319-0075

Phone: 515-242-6337
Fax: 515-281-4529
Email: dcooper@idph.state.ia.us
Website: http://www.idph.state.ia.us/hpevh/hseess_content/program_information.htm

LOUISIANA

Since 2001, the Louisiana Department of Health and Hospitals (LDHH) has participated in the HSEES system. LDHH reported a total of 815 events for 2001; 684 (83.9%) occurred at fixed facilities, and 131 (16.1%) were transportation related. Equipment failure was reported as a primary factor in 357 events and as a secondary factor in 40 events. In 605 (74.2%) events, one substance was released. The most commonly reported categories of substances were other inorganic substances, volatile organic compounds, and "other". During this reporting period, 20 events resulted in a total of 63 victims (2.5% of all events). Adverse health effects most frequently experienced by victims were respiratory system problems and burns. A total of two (2.7%) people died as a result of work-related events, and 22 events required evacuations.

Data sources included the Louisiana State Police, National Response Center, and Louisiana Department of Environmental Quality.

Contact person:

Dianne Dugas, MPH, MSW
Louisiana Department of Health and Hospitals
Office of Public Health
Section of Environmental Epidemiology and Toxicology
325 Loyola Avenue, Ste. 210
New Orleans, LA 70112

Phone: 504-568-3539
Fax: 504-568-4359
Email: ddugas@dhh.state.la.us

MINNESOTA

Since 1995, the Minnesota Department of Health (MDH) has participated in the HSEES system. MDH reported a total of 1,558 events during 1998–2001; 1,312 (84.2%) occurred at fixed facilities, and 246 (15.8%) were transportation related. Equipment failure contributed to the majority of fixed-facility releases (597 events, 45.5%). In 95.8% of events one substance was released. The most commonly reported categories of substances released were other inorganic substances, "other", volatile organic compounds; mixtures involving substances from more than one category, and pesticides. During this reporting period, 94 events (approximately 6.0% of all reported events) resulted in a total of 261 victims. Adverse health effects most frequently experienced by victims were respiratory problems (39.6%), gastrointestinal problems (11.7%), eye irritation (9.3%), and headache (7.5%). One person died and 165 events required evacuations.

Events reported annually to the Minnesota HSEES program doubled from1998 to 2001, primarily because of better reporting; that is, more events are being reported rather than because of actual increases in the number of emergency releases.

Data sources included the Minnesota Duty Officer, various state agencies, local law enforcement and emergency responders, and responsible parties.

Contact person:

Nancy Rice, MPH
Minnesota Department of Health
Site Assessment and Consultation
P.O. Box 64975
St. Paul, MN 55164-0975

Phone: 651-215-0918
Fax: 651-215-0975
Email: Nancy.Rice@health.state.mn.us
Website: http://www.health.state.mn.us/divs/eh/hazardous/hsees.html

MISSISSIPPI

Since 1995, the Mississippi State Department of Health (MSDH) has participated in the HSEES system. MSDH reported a total of 791 events for 1998–2001; 397 (50.2%) occurred at fixed facilities, and 394 (49.8%) were transportation related. Equipment failure contributed to a majority of releases. In 727 (91.9%) events one substance was released. The most commonly reported substance categories were other inorganic chemicals (17.2%), volatile organic compounds (14.3%), and "other" 28.0%. During this reporting period, 61 events (7.7% of all reported events) resulted in a total of 175 victims. Adverse health effects most frequently experienced by victims were respiratory system problems (33.3%), eye irritation (13.1%), and gastrointestinal problems (9.2%). Two persons died as a result of chemical exposure, and 78 (9.9%) events required evacuations.

Since 1995, 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 been fairly consistent.

Sources of event information included the Mississippi Department of Environmental Quality—Emergency Services Division; Mississippi Emergency Management Agency; U.S. Department of Transportation's Hazardous Materials Information System; local fire and police departments; civil defense/emergency planning agencies; and newspaper, radio, and television reports.

Contact person:

Robert Mozingo
Office of Emergency Planning and Response
Mississippi State Department of Health
P.O. Box 1700
Jackson, MS 39215-1700
570 Woodrow Wilson Boulevard, Suite 431

Phone: 601-576-8121
Fax: 601-576-7373
Email: Robert.Mozingo@msdh.state.ms.us
Website: http://www.msdh.state.ms.us/Surveillance/index.htm

MISSOURI

Since 1993, the Missouri Department of Health and Senior Services (DHSS) has participated in the HSEES system. DHSS reported 957 events for calendar years 1999–2001. For this section, data from 1998 were not included because they were included in ATSDR's last cumulative report; however, Missouri data for 1998–2001 are included in the tables and figures in the back of this report. Of the 957 events during 1999–2001, 510 (53.3%) occurred at fixed facilities and 447 (46.7%) were transportation related. Human error was the primary contributor to the majority of the releases (394 events, 41.2%). In 842 (88%) of the events, one substance was released. Excluding the categories of "other" and other inorganic substances, the most commonly reported categories of substances released were volatile organic compounds, acids, and ammonia. During this reporting period, 205 events (approximately 21.4% of all reported events) resulted in a total of 425 victims. Adverse health effects most frequently experienced by victims were respiratory system irritation, headache, and trauma. A total of 20 persons died, and 71 events required evacuations. Of the 20 deaths, four occurred in fixed facilities, and 16 occurred during transportation. Additionally, six deaths were among employees, and 14 were members of the general public.

Data sources included the National Response Center, Missouri Department of Natural Resources, Missouri State Highway Patrol, facility personnel, and responding agencies. Since 1999, DHSS has actively recruited additional primary reporting sources, which has significantly increased the number of events reported over previous years. Because of the number of people experiencing adverse health effects as a result of methamphetamine-related events, particularly law enforcement and fire personnel, additional data prompted DHSS to develop prevention strategies targeted to this population group to increase awareness of the risks of injury when responding to methamphetamine-related events, and to recommend precautions to for entering environments with known or suspected methamphetamine-related activities.

Contact person:

Carla Henry
Missouri Department of Health & Senior Services
Office of Surveillance
HSEES Program
P.O. Box 570
Jefferson City, MO 65102-0570

Phone: 573-526-1686
Fax: 573-751-9071
Email: henryc@dhss.mo.gov
Website: http://www.dhss.state.mo.us/hsees/

NEW YORK

Since 1992, the New York State Department of Health (NYSDOH) has participated in the HSEES system. NYSDOH reported a total of 3,361 events for 1998–2001; 2,717 (81%) occurred at fixed facilities, and 644 (19%) were transportation related. Human error (1,303 events, 39%) contributed to the majority of the releases. In 3,156 (94%) events, one substance was released. The most commonly reported categories of substances were volatile organic compounds (1,297, 25.7%), "other"(1,281, 25.4%), other inorganic substances (1,127, 22.4%), acids (444, 9%), and pesticides (208, 4%). During this reporting period, 423 events (approximately 13% of all reported events) resulted in a total of 2,011 victims. Adverse health effects most frequently experienced by victims were respiratory irritation (808, 40.2%); headache (597, 29.7%); nausea and vomiting (502, 25.0%); and dizziness and other central nervous system symptoms (466, 23.2%). A total of 19 persons died, and 412 (12%) events required evacuations. Of the19 deaths, 12 occurred in fixed facilities, five occurred during transportation, and two were unknown. Additionally, 11 deaths occurred among employees, three were members of the general public, three were first responders, and two were unknown.

During 1998–2001, the New York HSEES project flourished. Through improved procedures implemented by staff, increased numbers of spill sources, and greater cooperation with contacts, the number of events captured increased each year so that the annual number almost tripled from about 450 in 1998 to 1,256 in 2001.

Data sources included the New York State Department of Environmental Conservation, New York City Department of Environmental Protection, New York State Office of Fire Prevention and Control, U.S. Department of Transportation's Hazardous Materials Information System, and the media.

Contact person:

Wanda Lizak Welles, PhD
Chief, Hazardous Substances Events
Surveillance Section
New York State Department of Health
Bureau of Toxic Substance Assessment
Flanigan Square, Room 330
547 River Street
Troy, NY 12180

Phone: 518-402-7810
Fax: 518-402-7819
Email: w1w02@health.state.ny.us
Website: http://www.health.state.ny.us/nysdoh/environ/hsees/hsees.htm

NORTH CAROLINA

Since 1991, the North Carolina Division of Public Health has participated in the HSEES system. The North Caroline HSEES program reported a total of 1,087 events for 1998–2001; approximately 372 (34.2%) occurred at fixed facilities, and 715 (65.8%) were transportation related. Human error 487 (40.7%) contributed to the majority of the releases. In 1,041 (95.8%) of the events, one substance was released. The most commonly reported categories of substances were "other" (287 events, 24.2%), volatile organic compounds (228, 19.2%), acids (169, 14.2%), and other inorganic substances (155, 13.0%). During this reporting period, 106 events (approximately 9.7% of all reported events) resulted in a total of 417 victims. Adverse health effects most frequently experienced by victims were respiratory irritation (264, 37.1%), eye irritation (100, 14.0%), gastrointestinal problems (68, 9.6%), and trauma (42, 5.9%). A total of 4 persons died, and 138 (12.7%) events required evacuations.

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

Data sources included the Division of Emergency Management, Department of Crime Control and Public Safety; the National Response Center, U.S. Department of Transportation's Hazardous Materials Information System, and the media. Secondary notification sources are the Division of Water Quality, Department of Environmental and Natural Resources, and the Department of Agriculture—Food and Drug Protection Division, Structured Pesticide Control Division, and Plant and Industrial Division.

Contact person:

Sherry Giles, MPH
Occupational & Environmental Epidemiology Branch
DHHS, Division of Public Health
1912 Mail Service Center
Raleigh, NC 27699-1912

Phone: 919-733-1145
Fax: 919-733-9555
Email: sherry.giles@ncmail.net
Website: http://www.schs.state.nc.us/epi/oii/hsees.cfm

NEW JERSEY

Since 2000, the New Jersey Department of Health and Senior Services (NJDHSS) has participated in the HSEES system. NJDHSS reported a total of 1,031 events for 2000–2001; 956 (92.7%) of the events occurred at fixed facilities, and 75 (7.3%) were transportation related. Equipment failure was the primary factor for the majority of the releases (299 events, 29.0%). In 963 events (93.4%) one substance was released. The most commonly reported categories of substances were other organic substances and volatile organic compounds. During this reporting period, 73 events (7.1%) resulted in a total of 144 victims. Adverse health effects most frequently experienced by victims were respiratory problems, eye irritation, and dizziness/central nervous system symptoms. No one died as a result of any of these events, although 172 (16.7%) events required ordered evacuations.

The number of events, the number of evacuations, and the number of victims per event were consistent during 2000 and 2001. The proportion of transportation events was lower in 2001 than 2000.

Data sources included the New Jersey Department of Environmental Protection Communication Center and the National Response Center.

Contact person:

Jonathan Savrin
New Jersey Department of Health and Senior Services
Consumer and Environmental Health Services
P.O. Box 369
Trenton, NJ 08625

Phone: (609) 588-3120
Fax: (609) 588-7599
Email: jonathan.savrin@doh.state.nj.us

OREGON

Since 1992, the Oregon Department of Human Services/Health Services (OHS) has participated in the HSEES system. OHS reported a total of 797 events for 1998–2001; 571 (72%) occurred at fixed facilities, and 226 (28%) were transportation related. Equipment failure was the most frequent contributing factor (243 events, 25%) and human error was the second most frequent contributing factor (186, 19%). Deliberate damage/illegal activity was a factor in 103 (11%) of incidents. In 684 (86%) of the events one substance was released. The most commonly reported substance category was volatile organic compounds. The most commonly reported substances were methamphetamine drug lab chemicals. During this reporting period, 114 events (14%) resulted in a total of 334 victims. Adverse health effects most frequently experienced by victims were respiratory irritation (184 victims), headache (83 victims), and gastrointestinal disturbances (58 victims). A total of seven persons died, and 119 (15%) events required evacuations.

The findings regarding the distribution of events in transportation and at fixed facilities, the numbers of events with victims or evacuations, and the types of injuries most frequently reported have been consistent since 1993 in Oregon. However, the rising prevalence of methamphetamine drug labs has significantly impacted the most commonly reported substances or substance categories released.

Data sources included, but were not limited to, the Oregon Emergency Response System, Office of State Fire Marshal, and National Response Center, interviews of responders, business representatives, other OHS program staff, and media accounts.

Contact person:

Theodora Tsongas PhD, MS
Environmental and Occupational Epidemiology
Office of Disease Prevention and Epidemiology
Oregon Public Health Services
Department of Human Services
800 N.E. Oregon Street, #827
Portland, OR 97232-2162

Phone: (503) 731-4202
Fax: (503) 872-5398
Email: theodora.a.tsongas@state.or.us
Website: www.healthoregon.org/hsees/index.cfm

RHODE ISLAND

Since 1992, the Rhode Island Department of Health (RIDH) has participated in the HSEES system. RIDH reported a total of 209 events for 1998–2001; 168 (80.4%) occurred at fixed facilities, and 41 (19.6%) were transportation related. Human error (39.5%) was the contributing factor for the majority of the releases. In 194 (92.8%) of the events, one substance was released. The most commonly reported categories of substances were other inorganic substances (31.3%), "other" substances (21.3%), and volatile organic compounds (12.1%). During this reporting period, 21 events (approximately 10% of all reported events) resulted in a total of 154 victims. Adverse health effects most frequently experienced by victims were dizziness and other central nervous system symptoms and gastrointestinal problems. A total of two people died, and 40 (19.0%) events required evacuations.

Data sources included records or oral reports of the Rhode Island Department of Environmental Management, the National Response Center, local police and fire departments, companies and institutions involved, and hospitals.

Since January 1, 2002, the RIDH has not participated in the HSEES system. For Rhode Island HSEES data before 2002, please contact:

Rhode Island Department of Health,
Office of Environmental Health Risk Assessment
Three Capitol Hill, Room 201
Providence, RI 02908-5097

Phone: (401) 222-3424
Website: http://www.healthri.org/environment/risk/hsees/hsees.htm

TEXAS

Since 1993, the Texas Department of Health (TDH) has participated in the HSEES system. TDH reported a total of 10,551 events for 1998–2001; 9,307 (88%) occurred at fixed facilities, and 1,244 (12%) were transportation related. Equipment failure (5,410, 43%) contributed to the majority of the releases. In 10,385 (98%) of the events, one substance was released. The most commonly reported categories of substances were other inorganic substances, volatile organic compounds, mixtures, and "other" substances. During this reporting period, 239 (approximately 2% of all reported events) resulted in a total of 1,131 victims. Adverse health effects most frequently experienced by victims were respiratory irritation, eye irritation, skin irritation, and trauma. A total of 17 persons died, and 273 (3%) events required evacuations. Of the17 deaths, four occurred in fixed facilities and 13 occurred during transportation. Additionally, 13 deaths occurred among employees, and four were members of the general public.

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

Data sources included the National Response Center, the Texas Natural Resource Conservation Commission, U.S. Department of Transportation's Hazardous Materials Information System, and local fire department hazardous materials units' run sheets.

Contact person:

Richard Harris
Texas Department of Health
Bureau of Epidemiology (T-702)
1100 West 49th Street
Austin, TX 78756-3199

Phone: 512-458-7220
Fax: 512-458-7776
Email: richard.harris@tdh.state.tx.us
Website: http://www.tdh.state.tx.us/epitox/hsees.htm

UTAH

Since calendar year 2000, the Utah State Department of Health (UDH) has participated in the HSEES system. UDH reported a total of 837 events for calendar years 2000 and 2001; approximately 548 (65.5%) occurred at fixed facilities, and 289 (34.5%) were transportation related. Equipment failure (324 events, 38.7%), and human error (323, 38.6%) contributed to the majority of the releases. In 598 (71%) of the events, one substance was released. The most commonly reported categories of substances were other inorganic substances (778 substances, 53%) and "other" (269, 18%). During this reporting period, 24 events (approximately 3% of all reported events) resulted in a total of 140 victims. Adverse health effects most frequently experienced by victims were respiratory irritation (56 victims, 40.0%), dizziness or other central nervous system symptoms/headache (34, 24.3%), and trauma (26, 18.6%). One person died in one event, and 24 (3.6 %) required evacuations.

For calendar years 2000 and 2001, the distribution of the types of events, number of events with victims and evacuations, and numbers and types of injuries were consistent.

Data included the Utah Division of Environmental Response & Remediation, Utah Highway Patrol, National Response Center, Utah Poison Control, U.S. Department of Transportation's Hazardous Materials Information System, media (newspaper, radio, television), local health agencies, and industry.

Contact person:

Wayne Ball, PhD
Utah Department of Health
Bureau of Epidemiology
P.O. Box 142104
Salt Lake City, Utah 84114-2104

Phone: 801-538-6191
Fax: 801-538-6564
Email: wball@utah.gov
Website: www.health.utah.gov/els/epidemiology

WASHINGTON

Since 1991, the Washington State Department of Health (WSDOH) has participated in the HSEES system. WSDOH reported a total of 1,780 events for 1998–2001; 1,302 (73%) occurred at fixed facilities, and 478 (27%) were transportation related. Equipment failure contributed most commonly to releases (620 events, 35%). In 1,616 (91%) events, one substance was released. The most commonly reported categories of substances were "other" substances (24%), other inorganic substances (19%), volatile organic compounds (14%), acids (11%), and ammonia (9%). During this reporting period, 616 events (approximately 35% of all reported events) resulted in a total of 1,653 victims. Adverse health effects most frequently experienced by victims were respiratory irritation, eye irritation, dizziness and other central nervous system symptoms, gastrointestinal problems, and headache. A total of 28 (1.7%) persons died, and 356 (20.0%) events required evacuations. Of the 28 deaths, 18 occurred in fixed facilities and 10 occurred during transportation. Thirteen deaths occurred among employees, and 15 were members of the general public.

The number of events has increased, primarily at fixed facilities, in the past 4 years over 1993–1997. Numbers of victims in hazardous substance emergency events were lower in 1998–2001 than in 1993–1997.

Data sources included the U.S. Department of Transportation, Washington State Department of Ecology, Washington State Emergency Management, Washington State Department of Labor and Industries, Washington State Patrol, local fire departments, and local news media.

Contact person:

Wayne Clifford
Manager, Site Assessment Section
Washington State Department of Health
PO Box 47846
Olympia WA 98504-7846
Phone 360-236-3371
FAX 360-236-3383
Email: Wayne.Clifford@doh.wa.gov
Website: http://www.doh.wa.gov/ehp/ts/hsees.htm

WISCONSIN

Since 1992, the Wisconsin Department of Health and Family Services/Division of Public Health (WDPH) has participated in the HSEES system. During 1998–2001, WDPH reported a total of 1,916 events; 877 (45.8%) occurred at fixed facilities, and 1,039 (54.2%) were transportation related. Equipment failure was the factor reported most frequently, contributed to 317 (36.2%) of the fixed-facility events. Human error contributed to 280 (31.9%) of fixed facility events. In all 1,916 events one substance was released. Among all events (fixed and transportation), the most commonly reported substance-release categories were "other" (31.9%), acids (12.2%), other inorganic (11.7%), volatile organic compounds (9.1%), and ammonia (7.7%). A total of 121 events (6.3%) resulted in a total of 614 victims. Adverse health effects most frequently experienced by victims were respiratory irritation (36.0%), skin irritation (16.7%), eye irritation (13.4%), shortness of breath (9.0%), and headache (8.4%). A total of four persons died, and 216 events (11.3%) required evacuations.

Data sources included the Wisconsin Department of Natural Resources; Wisconsin Emergency Management ; Wisconsin Department of Agriculture, Trade and Consumer Protection; Wisconsin Division of Narcotics Enforcement; National Response Center; U.S. Department of Transportation's Hazardous Materials Information System; and local organizations including fire departments and law enforcement.

Contact person:

James Drew
Wisconsin Department of Health and Family Services
Bureau of Environmental Health
WI HSEES Program, Room 150
One West Wilson St.
Madison, WI 53701

Phone: 608-266-2663
Fax: 608-267-4853
Email: drewjm@dhfs.state.wi.us

Summary of Prevention Outreach Activities

States participating in HSEES are asked to develop at least four strategies annually to reduce injuries and deaths associated with hazardous substances emergencies. Each state-specific activity needs to 1) be supported by data from the cumulative analyses, 2) involve a mix of target groups and primary and secondary prevention, and 3) raise HSEES awareness among the various target groups. Additionally, states are encouraged to collaborate with other local, state, and/or federal agencies. A number of journal articles have resulted from analysis of the cumulative data as well. This section summarizes some of the common prevention outreach activities, grouped by major activity categories, undertaken for 2001.

Chemical-Specific

Ammonia

Ammonia releases are most prevalent in the agricultural sector. However, releases also occur in other areas such as from refrigeration systems in the manufacturing industry. During 2001, three states conducted activities related to ammonia.

- One state created an ammonia fact sheet that addresses the health effects and hazards associated with anhydrous ammonia exposure and the appropriate personal protective equipment for employees and first responders.

- One state created a prevention brochure targeting agricultural ammonia facilities, focusing on the appropriate personal protective equipment and the regulatory requirements regarding ammonia tanks.

- One state surveyed each party responsible for an ammonia release in the state to determine the precise cause of the release.

Chlorine

Of all substances reported to the HSEES system, chlorine release events represent the highest proportion of events causing injury. Four states conducted chlorine release activities during 2001.

- Two states distributed fact sheets to chlorine producers and businesses that operate swimming pools and spas.
- One state presented data on chlorine releases to state and local agencies that regulate the chlorine industries.
- One state presented data on chlorine releases to personnel in public and private schools containing swimming pools.

Mercury

Mercury is one of the most common substances released among HSEES system states. Four states conducted mercury release activities during 2001.

- Three states created mercury fact sheets to distribute at meetings and presentations, and on state health department websites. The fact sheets also were distributed to school administrators.
- One state provided data on mercury releases to help scientifically support a bill to ban the sale of mercury thermometers in the state.

County-Specific Presentations

Five states conducted county-specific outreach activities to increase awareness about the potential risks for hazardous substance releases in the county area. HSEES states conducted these county-specific outreach activities at the request of counties experiencing large volumes of releases. All five of these states conducted outreach activities by presenting county-specific data to local emergency planning committees, industry, fire departments, county fire marshals, and other hazardous materials responder units.

HSEES System Overview

All 16 states presented a general overview of the HSEES system. This overview included background information about HSEES, reports, brochures, newsletters, and journal articles. This information was presented at conferences and hazardous materials training sessions and on state websites.

Most and Least Effective Prevention Outreach Activities

Activities summarized below are those the states feel were most and least effective in the short term; these were evaluated on the basis of feedback from target audiences and the ability to solve problems that occurred.

<u>Most effective</u>

States viewed as most effective the activities that targeted large audiences (such as distributing cumulative reports, industry booklets, and fact sheets) or posting of new information on their website. States mention that oral presentations are an opportunity to educate attendees on the existence of the HSEES system, which will help improve the data collection process. Additionally, attendance at presentations where the data are audience-specific (i.e., county-, industry-, and responder-specific presentations) is high. Finally, attending conferences and

workshops provides networking opportunities for HSEES coordinators (i.e., linking government, academia, and industry).

Least effective

Activities viewed by states as least effective often resulted from difficulty in scheduling presentations or a lack of interest and cooperation from target audiences. Similarly difficult was getting targeted audiences to complete evaluations, suggesting that better evaluation measures need to be explored. Also viewed as least effective were activities that did not allow for feedback from the target audience. Industry, including manufacturers and users of hazardous substances, were difficult to reach. More innovative activities targeted toward industry, such as providing a company-specific analysis and giving oral presentations, need to be implemented. However, as one state found, legislation concerning privacy needs to be explored before any analysis is planned.

Future Activities

The HSEES system will continue efforts to develop new prevention activities and document their efficacy. In addition to the 1998–2001 cumulative report, HSEES annual reports, fact sheets, and brochures also are available. The public-access HSEES Web site will be available in 2005 for people to download these products. The HSEES program will continue to submit journal articles and present at national conferences.

HSEES will continue to foster its relationships with government and private organizations including the U.S. Environmental Protection Agency, U.S. Department of Transportation, U.S. Chemical Safety and Hazard Investigation Board, Chemical Manufacturers Association, Chlorine Institute, International Institute of Ammonia Refrigeration, and Mary Kay O'Connor Process Safety Center.

Plans to enhance the Web-deployed data entry system, including mapping capabilities, are under way.

APPENDIX A

Publications

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.

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.

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

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

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, 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.

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.

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.

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. *American Journal of Industrial Medicine*. 2004;45:538-548.

Horton DK, Berkowitz Z, Kaye WE. Hydrofluoric acid releases in 17 states and the acute health effects associated, 1993-2001. *Journal of Occupational and Environmental Medicine*. 2004;46:501-508.

Horton DK, Drew J, Nehls-Lowe H, Otto W, Kaye WE. Public health dispatch: acute tearing agent toxicity after exposure to a theft-deterrent device on a safe—Wisconsin, December 2003. MMWR 2004;53:176-7.

Horton DK, Ernst K, Kaye WE. 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.

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

Horton DK, Haugh GS, Kaye WE. Public health consequences among first responders to emergency events associated with illicit methamphetamine laboratories— selected states, 1996–1999. MMWR 2000;49:1021-4.

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 Management and Response 2003;1:35-40.

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, Kaye WE, Zeitz P, Powers ME, Rosenthal L. Letter to editor: Public health risks of railroad hazardous substance emergency events. J Occup Environ Med 2001;43:738-40.

Orr MF, Haugh GS, Kaye WE. Hazardous Substances Emergency Events Surveillance, 1993 to 1997. Chemical Health and Safety. 2001; Jan/Feb:35-41.

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

Weisskopf MG, Drew JM, Hanrahan LP, Anderson HA. Hazardous ammonia releases in Wisconsin: trends and risk factors for evacuation and injury. Wisconsin Medical Journal. 2000; Nov:30-46.

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

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

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.

Zeitz 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.

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