

***IOWA DEPARTMENT OF
PUBLIC HEALTH
HAZARDOUS SUBSTANCES
EMERGENCY EVENTS
SURVEILLANCE SYSTEM***

***Calendar Year 1999
ANNUAL REPORT***

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HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE SYSTEM ANNUAL REPORT FOR CALENDAR YEAR 1999

Background

The Agency for Toxic Substances and Disease Registry (ATSDR) was created by Congress through Superfund legislation passed in 1980 and reauthorized in 1986. ATSDR, U.S. Department of Health and Human Services, has its main office in Atlanta, Georgia.

ATSDR's mission is to prevent exposure and adverse human health effects and diminished quality of life associated with exposure to hazardous substances from waste sites, unplanned releases, and other sources of pollution present in the environment.

Since 1990, 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 emergency release of hazardous substances and develop strategies to reduce and prevent these releases and their associated adverse health effects. The decision to begin the surveillance system was based on a 1988 study conducted by The Centers for Disease Control and Prevention. That survey assessed three national databases (the National Response Center, the U.S. Department of Transportation's Hazardous Material Information System, and the Acute Hazardous Events database) for their effectiveness in identifying acute hazardous substances releases.⁽¹⁾ These national databases, however, were of limited public health value.

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

Many events captured in state and local sources were not captured by the national databases. These data were further limited as a consequence of missing information, including demographic and other information about victims, the types of injuries received and the number of people affected when evacuations were necessary.

Five state health departments (Colorado, Iowa, Michigan, New Hampshire, and Wisconsin) participated in the pilot phase of the HSEES System and began collecting data January 1, 1990. By 1999, the number of participating states had increased to 15 and included Alabama, Colorado, Iowa, Minnesota, Mississippi, Missouri, New Jersey, New York, North Carolina, Oregon, Rhode Island, Texas, Utah, Washington, and Wisconsin. New Hampshire and Michigan are not currently participating.

The HSEES System is currently a web-based system, which is maintained by ATSDR. HSEES captures acute releases of hazardous substances into the environment and their adverse public health consequences. The system does not address chronic releases and the chronic effects on human health resulting from these releases. HSEES describes the morbidity and mortality experienced by responders, employees, and the general public that result from hazardous substances emergency events.

Goals

The surveillance system has four goals:

1. To describe the distribution and characteristics of hazardous substances emergencies;
2. To describe the morbidity and mortality experienced by employees, first responders, and the general public;
3. To identify and analyze risk factors associated with morbidity and mortality;
4. To identify strategies that might reduce future morbidity and mortality from the release of hazardous substances.

This report summarizes the characteristics of hazardous substances releases in Iowa and the associated public health consequences reported to the surveillance system during calendar year 1999.

Methods

Information for the HSEES System is collected on standardized data collection forms. The Iowa Department of Public Health (IDPH) receives information from various sources. The main sources are the Iowa Department of Natural Resources, Iowa Department of Public Health Sentinel Project Researching Agricultural Injuries Notification System, and the U. S. Coast Guard National Response Center. Upon receipt of these reports, an investigation is conducted to maximize the amount of information regarding these events.

Releases are eligible for inclusion if they are uncontrolled or illegal and require removal, cleanup, or neutralization according to federal, state, or local law. Threatened releases are also included in the system if they involve actions such as evacuations which are taken to protect the public health. Any substance is considered hazardous if it can be reasonably expected to cause injury or death to an exposed person. Releases occurring to air and water that could not be cleaned up are also included in the system if the amount released would have needed to be cleaned up if the spill had occurred on land. Events involving exclusively petroleum or substances such as manure, blood from slaughtering plants, chocolate or corn syrup are not included in the system.

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 category “other inorganic substances” comprises all inorganic substances except acids, bases, ammonia, and chlorine. The “other” category consists of chemicals that cannot be classified into any one of the other 10 chemical categories.

During 1999 Iowa entered data into a computerized database and sent it quarterly to ATSDR where it was loaded into a SAS database. Personal or company identifiers are not transmitted to ATSDR to protect the confidentiality of program participants. The information collected includes the following items:

1. The location of the event (including whether the event took place at a fixed facility or during transportation of the substance);
2. The cause of the event (e.g. part of the facility where the event occurred, primary cause for the event);
3. The time the event occurred (date, time of day, day of week);
4. The substance(s) name and the quantity released;
5. Possible exposure, such as proximity to residential areas, the primary use of nearby land (e.g., industrial, commercial, rural/agricultural, or residential), the number of people living or working within a quarter, a half, and a one mile radius of the event, and how many of those people were actually home when the event took place;
6. Victim information such as the type of victim (*i.e.*, first responder, employee, general public), victim's gender and age, the severity and type of injury (e.g., skin irritation, chemical burn, etc.); and
7. Evacuations and in-place sheltering, including length of action and number of people affected.

Definitions

Hazardous substances - Any chemical, radiological, medical or biological substance. Petroleum, other fuels, alkanes, fats and oils are not included in ATSDR's case definition of a hazardous substance. Also, spills involving such things as manure, blood from slaughtering plants, milk, corn syrup, etc., are not included in the surveillance system.

Fixed facility events - These events include releases occurring within or outside the confines of a facility. Examples of fixed facilities are fertilizer manufacturers, industrial plants, farms, and schools.

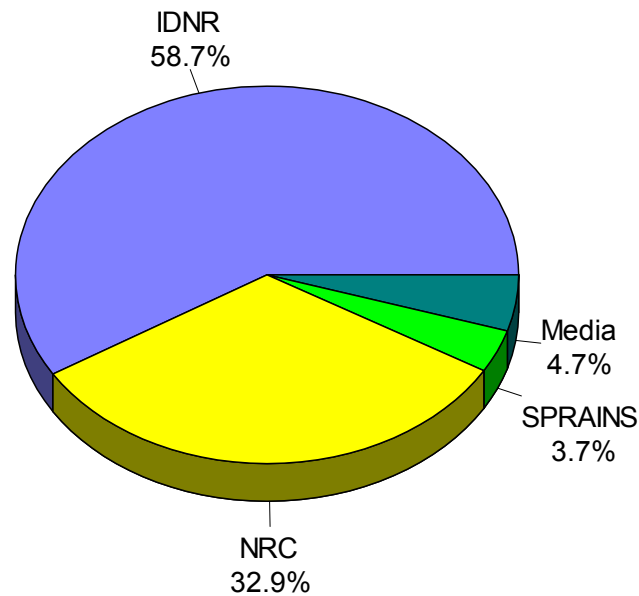
Transportation events - These events involve ground/roadway (*e.g.*, truck, car, tractor), rail, water, air, or pipeline transportation and occur outside the boundaries of fixed facilities.

Victims - Those individuals sustaining adverse health effects (injuries/symptoms including death) as a result of the event. These individuals sought some type of medical attention. Victims who receive more than one type of injury are counted once for each applicable type of injury.

Results and Findings of 1999 Data

In 1999, 288 hazardous substances emergency events were reported to IDPH. Most emergency event reports were received from the Iowa Department of Natural Resources and the U. S. Coast Guard National Response Center. Other reporting sources included the IDPH's Sentinel Project Researching Agricultural Injuries Notification System (SPRAINS) and the media (Figure 1). Of the 288 events, 283 had chemicals released into the environment; 2 of the events were threatened releases; and 3 were events involving chemicals that were partly released and partly threatened to be released.

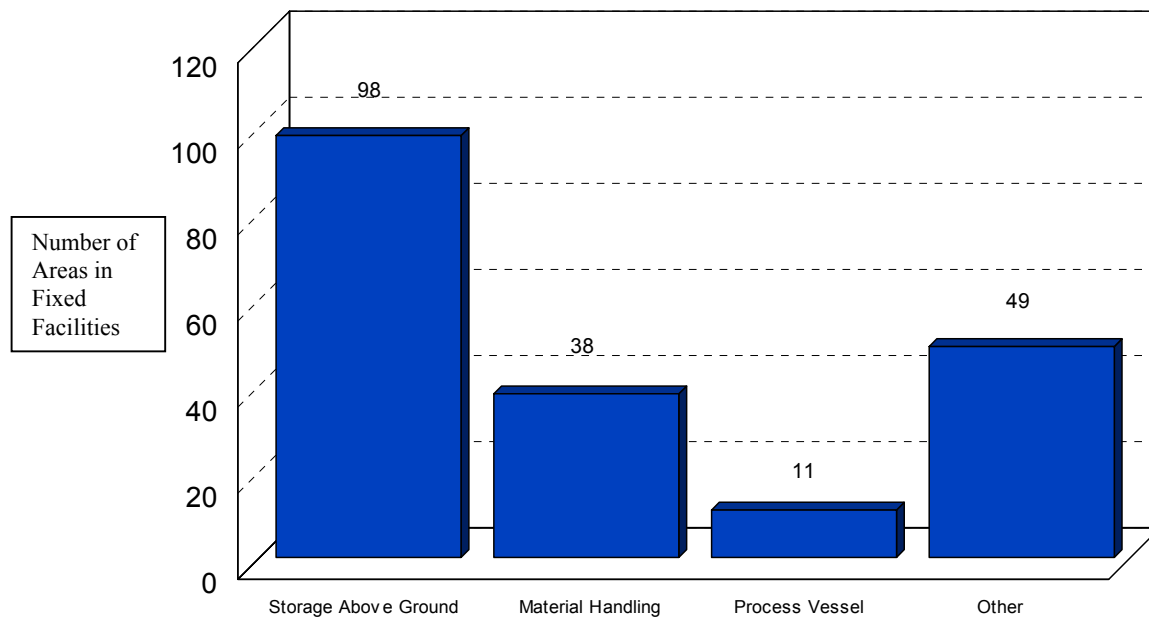
Figure 1
Sources for Reporting of Emergency Chemical Releases
Calendar Year 1999



There were 196 hazardous substances events that occurred at fixed facilities and 92 that occurred while a substance was being transported. Ninety-eight (50%) of the fixed facility events were reported as involving above ground storage, 38 (19.4%) involved material handling, and 11 (5.6%) involved a process vessel. The remaining fixed facility events involved ancillary process equipment, piping, transportation within the confines of a fixed

facility, transformer/capacitor, or “other” such as, storage below ground, dump/waste area, heating/cooling system, or meth lab (Figure 2).

Figure 2
Areas of Fixed Facilities Involved in Events
Calendar Year 1999



Primary factors contributing to fixed facility events are displayed in Table 1.

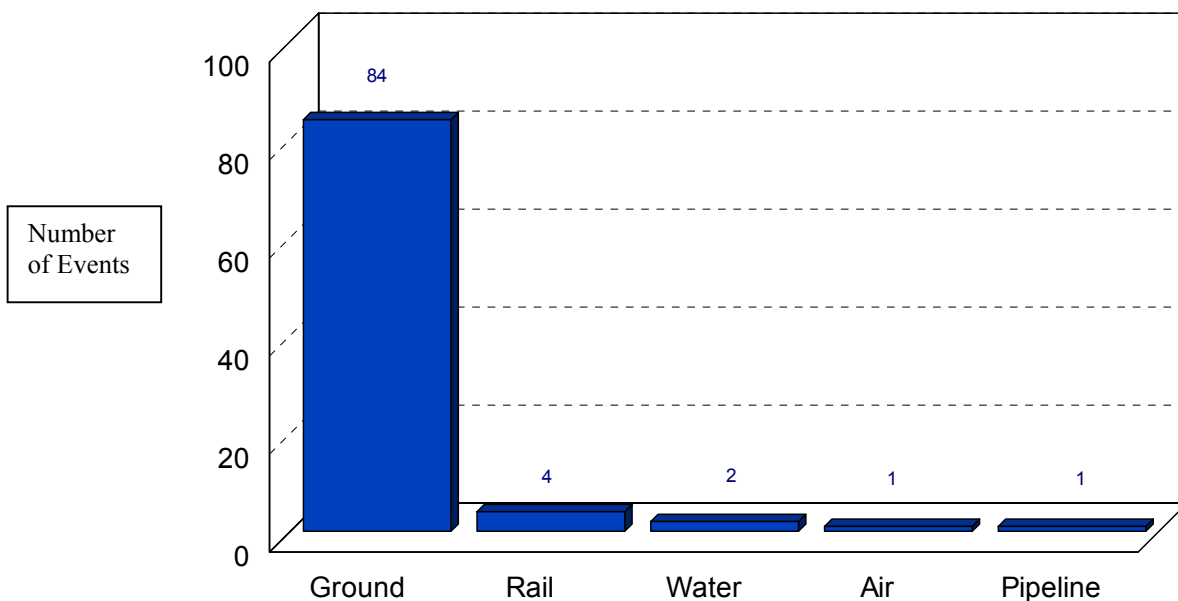
Table 1
Primary Factors Contributing to Fixed Facility Events
Calendar Year 1999

Primary Factor	Number of Events	Percent
Equipment Failure	87	44.4
Operator Error	46	23.5
Deliberate Damage	8	4.1
Improper Mixing	5	2.6
Improper Filling/Overfill	3	1.5
Factors Beyond Human Control	3	1.5
System Startup/Shutdown	2	1
Maintenance	1	0.5
Unauthorized/Improper Dumping	1	0.5
Other*	27	13.8
Unknown	13	6.6
Total	196	100

* The "Other" category includes clandestine drug labs.

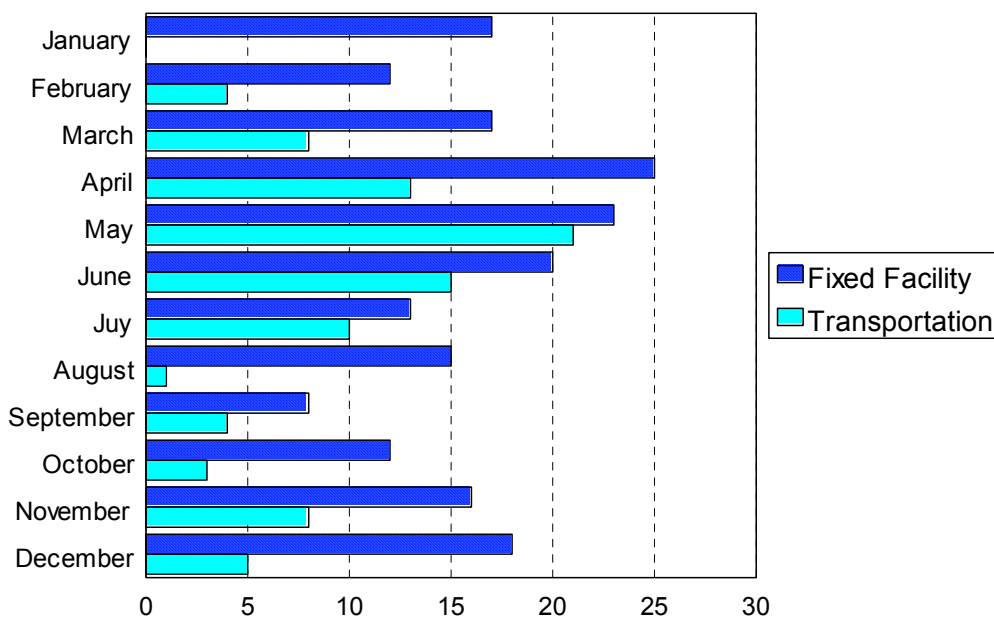
The distribution of transportation related events is displayed in Figure 3.

Figure 3
Distribution of Transportation-Related Events
Calendar Year 1999



Of the 288 hazardous substances events, 117 (40.6%) took place in the span of three months (April, May, and June). Figure 4 shows a breakdown (by month) for fixed facility and transportation related events.

Figure 4
Releases by month for Fixed Facility and Transportation Events
Calendar Year 1999



During 1999, releases continued to be higher during the typical workweek of Monday through Friday.

Table 2
Distribution of Events by Day of Week
Calendar Year 1999

Day of Week	Fixed Facility Events	Transportation Events	Total Events
Sunday	17	6	23
Monday	32	16	48
Tuesday	38	16	54
Wednesday	40	21	61
Thursday	30	15	45
Friday	24	12	36
Saturday	15	6	21

Of all reported times for events, 102 (35.4%) occurred between the hours of noon and 6 p.m. followed by 94 (32.6%) events occurring between the hours of 6:01 a.m. and 11:59 a.m. There were 92 (32%) events that occurred between 6:01 p.m. and 6 a.m.

There were 318 chemicals released (or threatened to be released) in the 288 hazardous emergency events reported in 1999. Of these, 270 (93.7%) were released in events with a single chemical and the number of chemicals released in the remainder of events ranged from 2 to 5.

Table 3 describes the distribution of the number of substances released by substance category and type of event. In 1999, ammonia was the most commonly released chemical in Iowa followed by pesticides. Although many of the ammonia and pesticide releases involve the agricultural industry, some are attributed to refrigeration ammonia and the lawn maintenance industry.

Table 3
Number of Substances Released by Category and Type of Event
Calendar Year 1999

Chemical Category	Event Type				All Events	
	Fixed Facility		Transportation		Number	Percent
	Number	Percent	Number	Percent		
Acids	15	6.8	5	5.1	20	6.3
Ammonia	64	29.2	13	13.1	77	24.2
Bases	4	1.8	1	1.0	5	1.6
Chlorine	4	1.8	0	0.0	4	1.3
Other Inorganic Substances	19	8.7	9	9.1	28	8.8
Paints and Dyes	1	0.5	2	2.0	3	0.9
Pesticides	25	11.4	30	30.3	55	17.3
PCBs	8	3.7	0	0.0	8	2.5
VOCs	18	8.2	3	3.0	21	6.6
Mixture Across Chemical Category	15	6.8	11	11.1	26	8.2
Other	46	21.0	25	25.3	71	22.3
Total	219	100.0	99	100.0	318	100.0

Evacuations were ordered in 34 events. Twenty of the evacuations were of a building or the affected part of a building. Two were based on a defined circular area around the event. Nine were based on actual or anticipated downwind dispersion. A defined circular area and downwind plume dispersion determined one, and two had no criteria. The number of people evacuated ranged from 1 to 364, with a median of 40.

Forty-seven events resulted in 93 victims. Thirty-eight of these events occurred at a fixed facility and nine occurred during transport. Table 4 describes the distribution of the number of victims by type of event.

Table 4
Distribution and Number of Victims by Type of Event
Calendar Year 1999

Number of Victims	Type of Event				All Events & Victims	
	Fixed Facility		Transportation			
	Number of Events	Total Number of Victims	Number of Events	Total Number of Victims	Number of Events	Total Number of Victims
1 (one)	23	23	6	6	29	29
2 (two)	3	6	1	2	4	8
3 (three)	5	15	2	6	7	21
4 (four)	2	8	0	0	2	8
5 (five)	3	15	0	0	3	15
6 (six)	2	12	0	0	2	12
Total	38	79	9	14	47	93

In 1999 employees had the greatest risk of being injured by an emergency chemical release (Figure 5).

Figure 5
Number of Victims by Victim Category
Calendar Year 1999

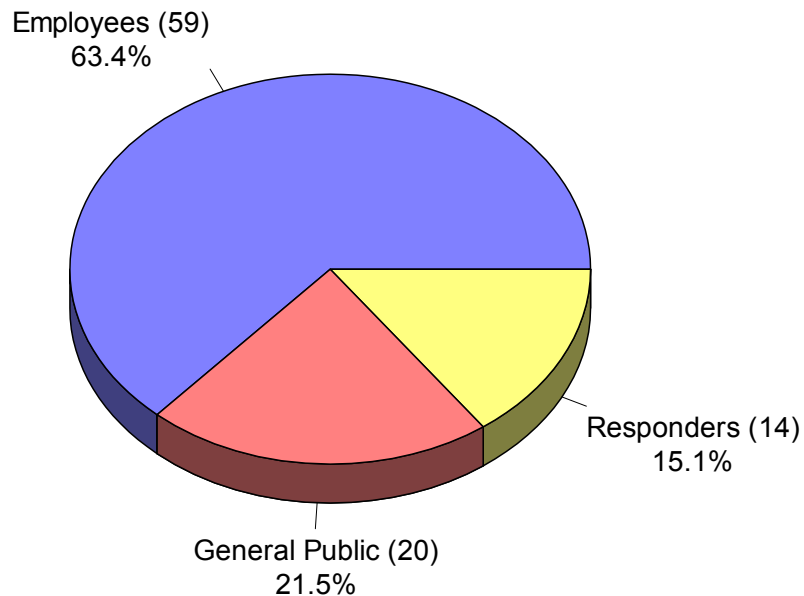


Table 5 describes the number of victims and the chemicals they were exposed to.

Table 5
Distribution of Number of Victims by Chemical Name
Calendar Year 1999

Chemical Name	Number of Victims
Ammonia	40
Chlorine	6
Ammonia/Bleach/Chloramine	6
Acid NOS	5
Ether	5
Chlorine & Phosphoric Acid	4
Ammonia & Ether	4
Oxidizer NOS, Vinegar, Drain Cleaner, & Sodium Hydroxide/Sodium Hypochlorite/Sodium Silicate	4
Hydrochloric Acid	3
Aluminum Phosphide	3
Nitrogen	2
Ethyl Alcohol, Hexane, & Carbon Black	2
Hydrazine	1
Imazepyr	1
Sulfur	1
Ammonium Sulfate	1
Sodium Hydroxide	1
Malathion	1
3,6-Dichloropicolinic Acid/Aceto-chlor/Flumetsulam/Nitrogen	1
Oxidizer NOS/Hydrochloric Acid	1
2-(2-aminoethoxyl) Ethanol, Diesel Fuel,& Chlorimuron-Ethyl/Metribuzine	1
Total	93

Some victims may have experienced more than one injury. Iowa's 93 victims experienced a total of 111 injuries. The most common symptoms expressed were respiratory irritation and chemical burns. Table 6 lists types of injury for fixed facility and transportation events.

Table 6
Injury Type for Fixed Facility and Transportation Events
Calendar Year 1999

Injury Type	Fixed Facility	Transportation	Total
Trauma	7	5	12
Respiratory Irritation	51	7	58
Eye Irritation	8	0	8
Nausea or Vomiting	2	0	2
Chemical Burns	17	2	19
Thermal Burns	2	0	2
Skin Irritation	3	0	3
Dizziness/CNS Symptoms	3	0	3
Headache	3	0	3
Shortness of Breath	1	0	1
Total	97	14	111

Summary of Results, 1990 - 1999

The number of events, types of releases, number of victims, and deaths for the years 1990 through 1999 are shown in Table 7.

Table 7
Cumulative Data for Hazardous Substances Emergency Events in Iowa
1990-1999

Calendar Year	Fixed Facility Events	Transportation Events	Total Events	Total Victims	Total Deaths
1990	245	138	383	102	2
1991	221	159	380	56	1
1992	257	127	384	55	0
1993	218	88	306	57	1
1994	208	79	287	103	6
1995	194	128	322	62	0
1996	202	95	297	74	1
1997	184	121	305	106	1
1998	190	94	284	41	0
1999	196	92	288	93	5
Total	2,115	1,121	3,236	749	17

In the last seven years of data collection (1990 through 1992 data are considered as pilot data), certain aspects of emergency events appear to be consistent:

1. The majority of events involve a single chemical release;

2. A high proportion of events occur during the agricultural planting season (April, May, June);
3. Emergency releases are more likely to happen Monday through Friday between the hours of 6:01 a.m. and 6:00 p.m.;
4. The most common types of releases occurring in Iowa are agricultural chemicals;
5. Most events occur at fixed facilities;
6. The majority of events with victims involve a single victim;
7. Employees are the group that is injured most often.
8. Respiratory irritation is the most commonly encountered injury.

Use of HSEES Data

This information serves to identify the risk factors that are related to the occurrence of emergency events and the associated morbidity and mortality. This information can be used in health education programs for manufacturers and transporters of hazardous substances, firefighters, law enforcement personnel, emergency medical services personnel, and hazardous material team members. Additionally, these data can be used to better prepare for emergency chemical releases that occur in communities and rural areas of the state.

ATSDR has responded to numerous inquiries for information about HSEES. Requests for reprints of articles published in scientific literature have been received from people within the United States and from many other countries as well. Researchers from other countries have requested the HSEES protocol and data collection form to help them develop their own systems. Other requests have been received for data analyses. For example, the U.S. Environmental Protection Agency has asked for listings of the most frequently released substances to help determine priority substances for regulatory purposes. The substance name standardization project will allow greater opportunity to perform analyses on specific substances reported to the database.

IDPH has provided information to local emergency planning committees and hospital emergency room personnel to assist them in establishing emergency preparedness plans. Iowa data have also been used when individuals are attempting to justify the need for a hazmat team.

Iowa's HSEES System is supported by funds from a cooperative agreement with the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services.

This surveillance system is the only method used to collect data regarding the public health impact of hazardous substances emergency events in Iowa. IDPH is interested in sharing HSEES data via oral presentations at professional/governmental meetings and with other interested public or private groups. Comments and suggestions are encouraged regarding the usefulness of HSEES information, format of this report, and how it may be improved for the future.

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