

Louisiana Hazardous Substances Emergency Events Surveillance (HSEES) System

2002: A Summary Report

**Louisiana Department of Health and Hospitals
Office of Public Health
Section of Environmental Epidemiology & Toxicology**



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EXECUTIVE SUMMARY

Since 1990, the Agency for Toxic Substances and Disease Registry (ATSDR) of the U.S. Department of Health and Human Services has maintained an active, state-based Hazardous Substances Emergency Events Surveillance (HSEES) system to describe the public health consequences associated with the release of hazardous substances. Since 2001, the Louisiana Department of Health and Hospitals (LDHH) has participated in this surveillance system. This report summarizes the characteristics of events reported to the surveillance system by the LDHH from January 1st through December 31st, 2002.

Information on acute hazardous substances emergency events was collected. The types of data collected included general information on the event, substance(s) released, number of victims, number and types of adverse health effects experienced by the victims, and number of evacuations.

Several data sources were used to obtain the maximum amount of information about each event. These sources included, but were not limited to, the Louisiana State Police (LSP), the National Response Center (NRC), and the Louisiana Department of Environmental Quality (LDEQ). Data were entered into a Web-based data entry system that allows for real-time entry.

The LDHH screened over 8,000 events, and of those events, 1,669 events were investigated to determine if the events met the HSEES criteria. Out of 1,669 events, 752 of them met the criteria for the Louisiana HSEES database for 2002. Among the 752 events, 630 (83.8%) of the events occurred at fixed facilities and 122 (16.2%) were transportation related. Equipment failure was reported as a primary factor in 530 events, and it was also reported as a secondary factor in 161 events. In 504 (67.0%) events, only a single substance was released. The most commonly reported categories of substances were "Other inorganic substances", "Volatile organic compounds", and "Oxy-Organics". During this reporting period, 20 events resulted in a total of 30 victims (2.7% of all events). The most frequently experienced adverse health effects were "Burns". One person died and 9 events required evacuations.

HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE (HSEES)

INTRODUCTION

The HSEES system has four goals:

- To describe the distribution and characteristics of acute hazardous substances releases.
- To describe the morbidity and mortality experienced by employees, responders, and the general public as a result of hazardous substances releases.
- To identify risk factors associated with morbidity and mortality.
- To identify strategies that may reduce future morbidity and mortality resulting from the release of hazardous substances.

This report summarizes the characteristics of hazardous substances releases and the associated public health consequences of events reported in Louisiana to the surveillance system during 2002.

METHODS

Hazardous substances releases are eligible for inclusion in the surveillance system if they are uncontrolled or illegal and require removal, cleanup, or neutralization according to federal, state, or local law. Threatened releases are also included in the system if 1) they involve actions, such as evacuations, which are taken to protect the public health, and 2) they would have required removal, cleanup, or neutralization according to federal, state, or local law if the release had actually occurred. A substance is considered hazardous if it can be reasonably expected to cause injury or death to an exposed person. Releases to air and water that could not be cleaned up are also included in the system if the amount released would have required clean up if the spill had occurred on land. Events involving only petroleum are excluded.

Various data sources were used to obtain information about these events. These sources included, but were not limited to, the Louisiana State Police, the National Response Center, and the Louisiana Department of Environmental Quality. Census data were used to estimate the number of residents living in the vicinity of the events. For each event, information was collected about the type of event (fixed-facility or transportation-related event); substance(s) released (identity, chemical form, type of release, and quantity released); victim(s) (population group, type of injury sustained, medical outcome, demographics, personnel protective equipment (PPE) worn, and distance from the event); the type of area in which the event occurred; date and time of occurrence; numbers of

persons potentially affected; use of environmental sampling; evacuations; causal factors; and other variables related to public health

Acute chemical releases 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 ground, air, or water.

Victims are defined as individuals with symptoms or injuries (including death) that result from the event. Victims who receive more than one type of injury are counted once in each applicable type of injury.

Substances are grouped into 16 categories: acids, ammonia, bases, chlorine, mixtures, paints and dyes, pesticides, polychlorinated biphenyls, volatile organic compounds, other inorganic substances, hetero-organics, hydrocarbons, oxy-organics, polymers, formulations, and other substances. The "Mixtures" category consists of chemicals from different categories that are mixed before release, and the "Other" category consists of chemicals that cannot be classified into any one of the other 15 chemical categories.

Beginning in January 2001, data were entered into the Agency for Toxic Substances and Disease Registry's (ATSDR) Web-based data entry system. ATSDR and the Louisiana Department of Health and Hospitals (LDHH) perform data management and data analysis and report the entered data. Louisiana HSEES data will be used for prevention activities by ATSDR and LDHH.

RESULTS

In 2002, a total of 752 hazardous substances emergency events in the state of Louisiana were eligible for inclusion in the HSEES system. Of those 752 events, 750 (99.7%) were in the category "Substances all actually released into environment" and 2 (0.3%) were in the category "Substances all threatened to be released into environment". Out of 752 events, 630 (83.8%) events occurred at fixed facilities, and 122 (16.2%) events were transportation-related events. Table 1 shows the number of events by parish and type of event.

Table 1 — Number of events meeting the surveillance definition, by parish and type of event, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002

Parish	Type of event				Total number of events
	Fixed Facility		Transportation		
	Number of events	%	Number of events	%	
Ascension	85	90.4	9	9.6	94
Avoyelles	0	0.0	1	100.0	1
Beauregard	0	0.0	2	100.0	2
Bienville	0	0.0	1	100.0	1
Bossier	0	0.0	1	100.0	1
Caddo	8	36.4	14	63.6	22
Calcasieu	140	94.0	9	6.0	149
Cameron	2	66.7	1	33.3	3
Catahoula	0	0.0	1	100.0	1
De Soto	1	100.0	0	0.0	1
E. Baton Rouge	62	87.3	9	12.7	71
E. Carroll	0	0.0	1	100.0	1
Iberia	0	0.0	2	100.0	2
Iberville	47	88.7	6	11.3	53
Jefferson	11	52.4	10	47.6	21
Jefferson Davis	1	100.0	0	0.0	1
Lafayette	1	20.0	4	80.0	5
Lafourche	3	50.0	3	50.0	6
Livingston	0	0.0	1	100.0	1
Orleans	3	20.0	12	80.0	15
Ouachita	35	97.2	1	2.8	36
Plaquemines	16	94.1	1	5.9	17
Rapides	0	0.0	2	100.0	2
Richland	0	0.0	2	100.0	2
St. Bernard	44	93.6	3	6.4	47
St. Charles	85	97.7	2	2.3	87
St. James	45	88.2	6	11.8	51
St. John the Baptist	7	70.0	3	30.0	10
St. Landry	5	100.0	0	0.0	5
St. Mary	5	71.4	2	28.6	7
St. Tammany	1	50.0	1	50.0	2
Tangipahoa	2	33.3	4	66.7	6
Terrebonne	2	66.7	1	33.3	3
Union	1	33.3	2	66.7	3
Vermilion	5	100.0	0	0.0	5
Vernon	1	100.0	0	0.0	1
W. Baton Rouge	7	70.0	3	30.0	10
Washington	1	100.0	0	0.0	1
Webster	2	66.7	1	33.3	3
Total*	628	83.8	121	16.2	749

*Parish was missing for 3 events (2 fixed-facility, 1 transportation)

Process vessel (n=303, 47.6%) and ancillary processing equipment (n=157, 24.7%) were the most common areas where fixed-facility releases occurred (Figure 1). Of the 122 transportation-related events, 71 (58.2%) occurred during trucking, and 42 (34.4%) involved transport by rail (Figure 2).

Figure 1 — Areas of fixed facilities involved in events, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002

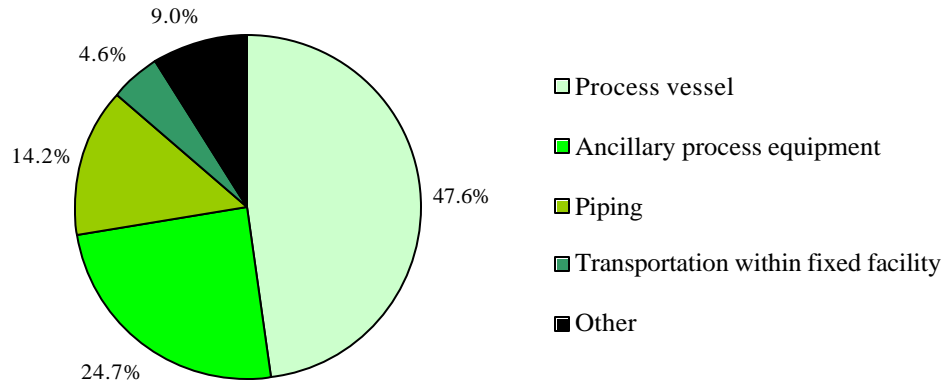
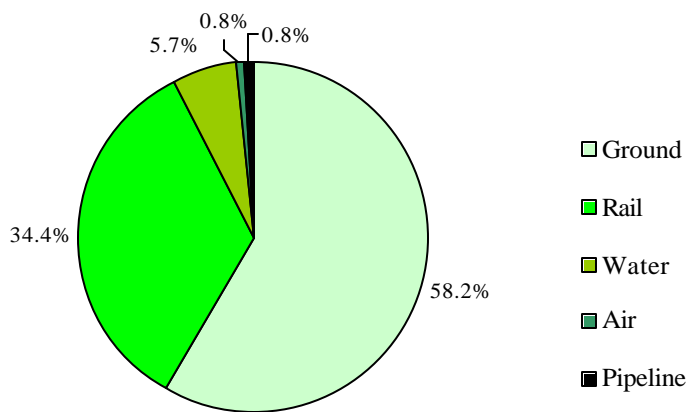


Figure 2 — Distribution of transportation-related events, by type of transport, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002



Primary and secondary factors contributing to fixed-facility events were also reported. Equipment failure was the primary contributing factor in 461 (73.2%) fixed-facility events, followed by 109 (17.3%) events involving an intentional or illegal act (Figure 3). System start up and shut down was reported as a secondary contributing factor in 159 (25.2%) fixed-facility events, followed by 136 (21.6%) events involving equipment failure (Figure 4).

Figure 3 — Primary factors reported as contributing to the occurrence of fixed-facility events, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002

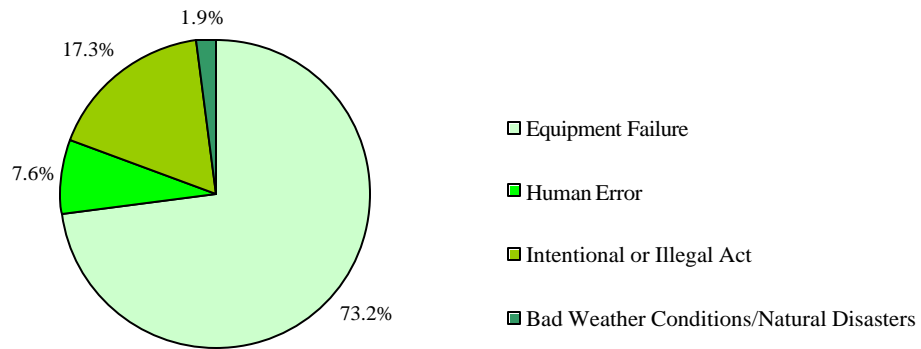
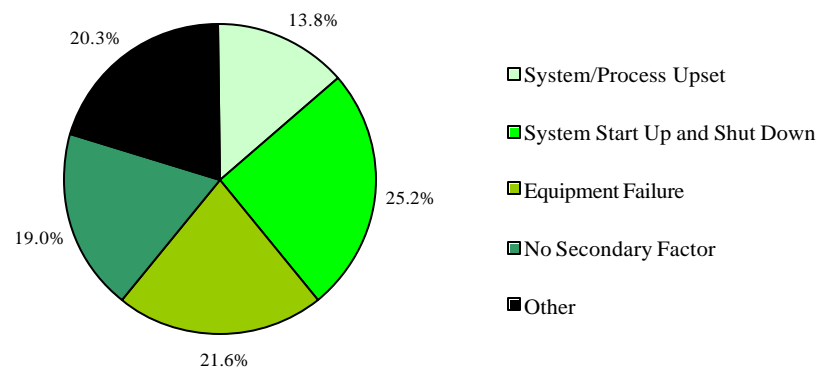


Figure 4 — Secondary factors reported as contributing to the occurrence of fixed-facility events, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002



Primary and secondary factors contributing to transportation events were also reported. Equipment failure was the primary contributing factor in 69 (56.6%) transportation events, followed by 50 (41.0%) events involving human error (Figure 5). Improper filling/loading/packing was reported as a secondary contributing factor in 39 (32.0%) transportation events, followed by 25 (20.5%) events involving equipment failure (Figure 6).

Figure 5 — Primary factors reported as contributing to the occurrence of transportation events, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002

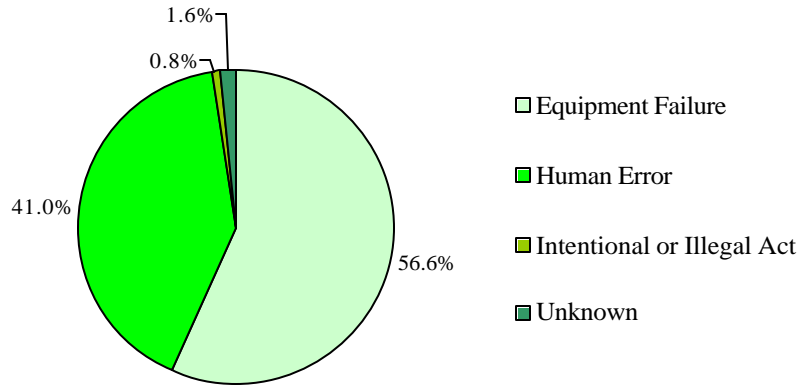
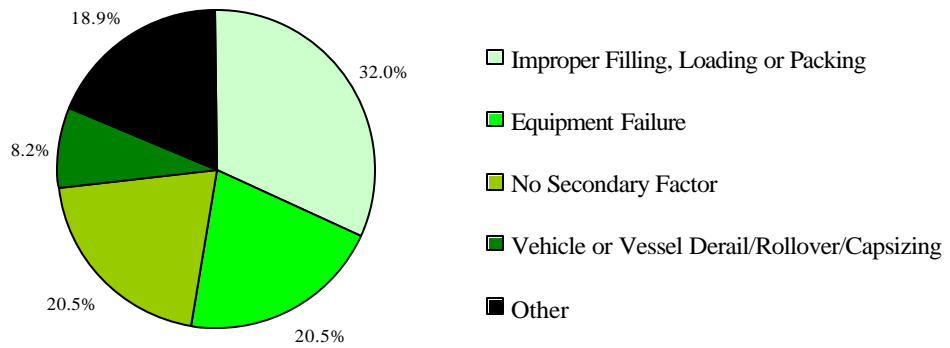
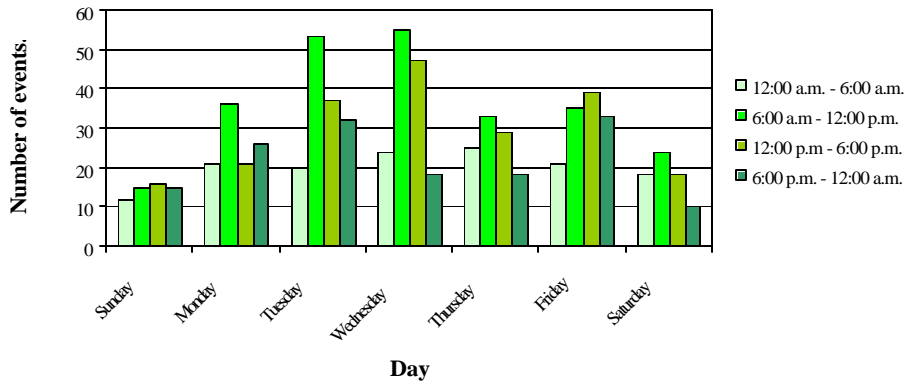


Figure 6 — Secondary factors reported as contributing to the occurrence of transportation events, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002



Of the events with known time of occurrence, 33.4% occurred from 6:00 AM to 12:00 PM, and 27.5% from 12:00 PM. to 6:00 PM (Figure 7). Approximately 38% of events occurred on a Tuesday or Wednesday.

Figure 7 — Distribution of events by day and time, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002



* The time was unknown for one event which occurred on a Thursday.

SUBSTANCES

Of all events, 67.0% involved the release of only one substance. Two substances were released in 20.1% of the events, and the remainder involved the release of more than two substances (Table 2).

Table 2 — Distribution of the number of substances released, by type of event, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002

Number of subs. released	Type of Event						All Events		
	Fixed Facility			Transportation			Number of events	%	Number of subs.
	Number of events	%	Number of subs.	Number of events	%	Number of subs.			
1	391	62.1	391	113	92.6	113	504	67.0	504
2	145	23.0	290	6	4.9	12	151	20.1	302
3	54	8.6	162	3	2.5	9	57	7.6	171
4	15	2.4	60	0	0.0	0	15	2.0	60
≥ 5	25	4.0	168	0	0.0	0	25	3.3	168
Total *	630	100.1	1071	122	100.0	134	752	100.0	1205

* Total may not equal 100% due to rounding.
subs. = substances

In the 752 events, there were 1,205 chemicals either released or threatened to be released. Air releases were involved in 986 (81.7%) releases, followed by 199 (16.5%) spills, 8 (0.7%) fires, 7 (0.6%) threatened releases, and 2 (0.2%) radiation releases; 5 were unknown. More than one type of release was reported in two events (e.g., spill and air).

Of the air emissions, 97.3% were from fixed-facility events. All of the fires resulted from fixed-facility events.

Of the 16 categories into which HSEES substances were grouped, the categories of substances most commonly released in fixed-facility events were “Other inorganic substances” (46.2%) and “VOCs” (28.2%) (Table 3). In transportation-related events, “VOCs” (25.4%), “Acids” (12.7%) and “Other inorganic substances” (9.7%) were most frequently released (Table 3). The 10 substances most frequently released in Louisiana for 2002 are listed in the Appendix.

Table 3 — Distribution of the number of substances released, by substance category and type of event, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002

Substance Category	Type of event				Total number of releases	
	Fixed Facility		Transportation		Number of substances	%
	Number of substances	%	Number of substances	%		
Other Inorganics	495	46.2	13	9.7	508	42.2
Volatile organic compounds	302	28.2	34	25.4	336	27.9
Oxy-Organics	43	4.0	12	9.0	55	4.6
Polymers	38	3.5	10	7.5	48	4.0
Acids	30	2.8	17	12.7	47	3.9
Pesticides	28	2.6	8	6.0	36	3.0
Ammonia	29	2.7	4	3.0	33	2.7
Chlorine	28	2.6	2	1.5	30	2.5
Hydrocarbons	24	2.2	1	0.7	25	2.1
Other	18	1.7	6	4.5	24	2.0
Bases	13	1.2	9	6.7	22	1.8
Paints & Dyes	8	0.7	11	8.2	19	1.6
Hetero-Organics	7	0.7	4	3.0	11	0.9
Mixture (across categories)*	7	0.7	2	1.5	9	0.7
Indeterminate	1	0.1	1	0.7	2	0.2
Formulations	0	0.0	0	0.0	0	0.0
Polychlorinated biphenyls	0	0.0	0	0.0	0	0.0
Total**	1071	100.0	134	100.1	1205	100.1

*Mixtures of substances from different categories

**Total may not equal 100% due to rounding.

VICTIMS

Of 752 events, there were a total of 30 victims (Table 4) in 20 events (2.7% of all releases). Of the events with victims, 65% involved only one victim, and 95% involved either one or two victims. Of the transportation events, 8.2% involved victims, while only 1.6% of the fixed-facility events involved victims.

Table 4 — Distribution of the number of victims, by type of event, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002

Number of victims	Type of event						All events		
	Fixed facility			Transportation					
	Number of events	%	Number of victims	Number of events	%	Number of victims	Number of events	%	Number of victims
1	5	50.0	5	8	80.0	8	13	65.0	13
2	4	40.0	8	2	20.0	4	6	30.0	12
3	0	0.0	0	0	0.0	0	0	0.0	0
4	0	0.0	0	0	0.0	0	0	0.0	0
5	1	10.0	5	0	0.0	0	1	5.0	5
Total	10	100.0	18	10	100.0	12	20	100.0	30

The number of total releases compared with releases resulting in victims by substance category is presented in Table 5. The most frequently released substances were not necessarily the most likely to result in injury. Though the substance categories for “Chlorine” and “Acids” have the same number of releases resulting in victims, there are less chlorine releases than acid releases for the entire year. Acids were released 47 times with 4 (8.5%) of those releases resulting in injury. Conversely, chlorine was released in 30 events, 4 (13.3%) of which resulted in injury, the highest percentage of injuries from a substance category.

Table 5 — Number of substances released in all events and events with victims, by substance category, Hazardous Substances Emergency Surveillance Events, Louisiana, 2002

Substance Category	Total Releases		Releases with Victims		
	Number	Percentage	Number	Percentage	Percentage by substance category
Acids	47	3.9	4	20.0	8.5
Ammonia	33	2.7	2	10.0	6.1
Bases	22	1.8	2	10.0	9.1
Chlorine	30	2.5	4	20.0	13.3
Other Inorganic Substances	508	42.2	3	15.0	0.6
Paints & Dyes	19	1.6	0	0.0	0.0
Pesticides	36	3.0	2	10.0	5.6
Volatile organic compounds	336	27.9	1	5.0	0.3
Other	24	2.0	1	5.0	4.2
Mixture (across categories)	9	0.7	0	0.0	0.0
Hetero-Organics	11	0.9	0	0.0	0.0
Hydrocarbons	25	2.1	0	0.0	0.0
Oxy-Organics	55	4.6	1	5.0	1.8
Polymers	48	4.0	0	0.0	0.0
Indeterminate	2	0.2	0	0.0	0.0
Total	1205	100.1	20	100.0	

*Total may not equal 100% due to rounding.

The types of adverse health effects sustained by victims are shown in Table 6. The most commonly reported adverse health effects in fixed-facility events were chemical-related burns (38.9%). Trauma (33.3%) was reported as the most common adverse health effect in transportation events. In some instances, trauma may have been caused by the sequence of events (for example, a motor vehicle accident) leading to the release of a hazardous substance and not by exposure to the hazardous substance itself.

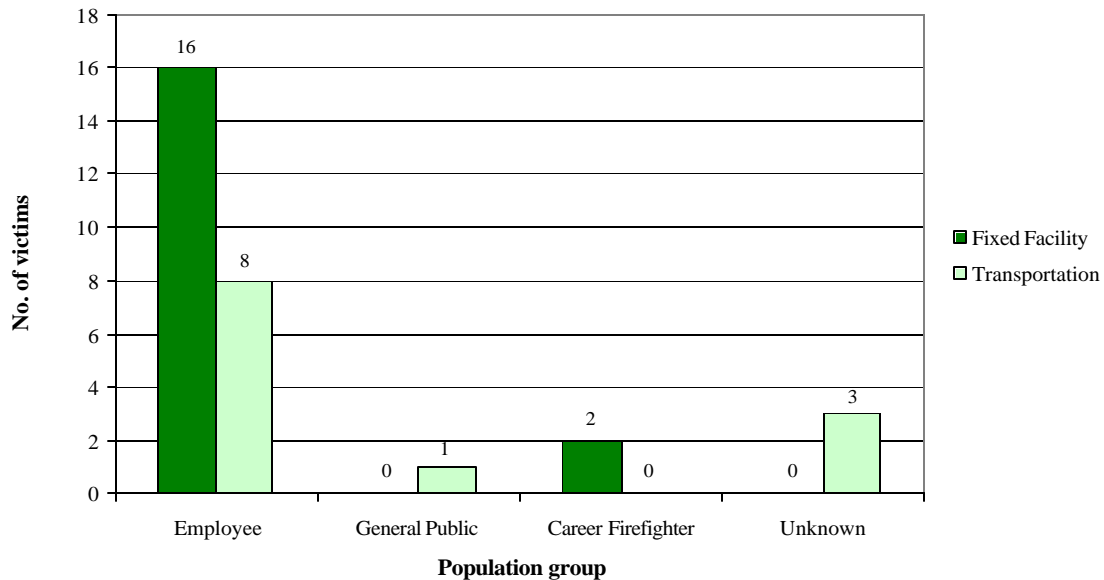
Table 6 — Distribution of type of injury, by type of events, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002

Injury	Type of event				All events	
	Fixed facility		Transportation			
	No. of injuries	%	No. of injuries	%	No. of injuries	%
Burns	7	38.9	2	16.7	9	30.0
Respiratory Irritation	5	27.8	1	8.3	6	20.0
Skin Irritation	1	5.6	1	8.3	2	6.7
Trauma	1	5.6	4	33.3	5	16.7
Other	4	22.2	2	16.7	6	20.0
Symptoms not specified	0	0	2	16.7	2	6.7
Total*	18	100.1	12	100.0	30	100.1

*Total may not equal 100.0% due to rounding

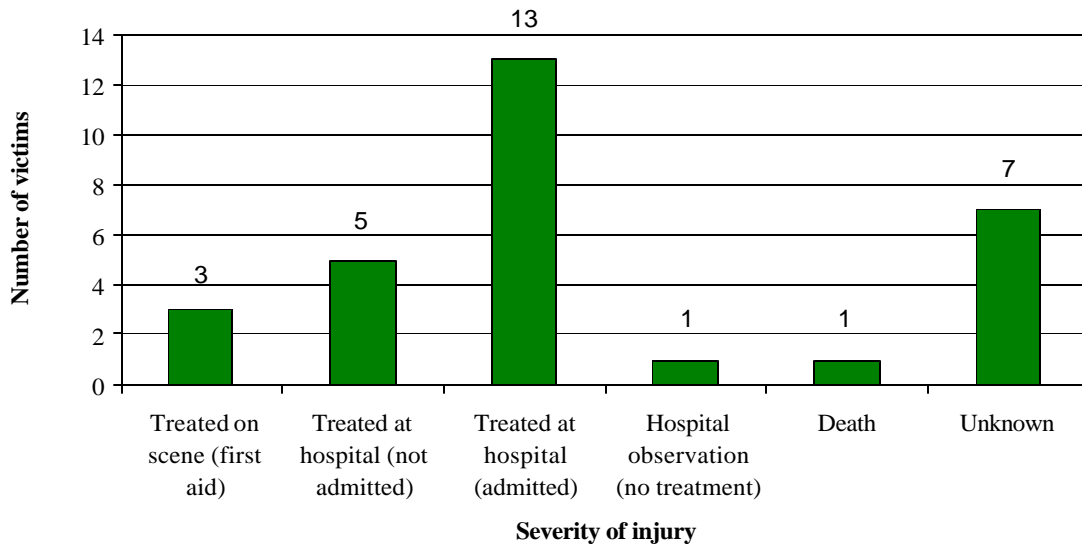
Among the 30 victims, 24 (80.0%) were employees, 2 (6.7%) were career firefighters, one (3.3%) was a member of the general public, and the category of 3 (10.0%) victims was unknown (Figure 8). Of the 30 victims, 16 (53.3%) were male, one (3.3%) was female, and the sex of the other 13 (43.3%) was unknown. Age was unknown for all but 2 victims; however, all but 4 victims can be determined to be adults given their victim category of employees.

Figure 8 — Distribution of victims by population group and type of event, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002



The medical outcomes of the 30 victims are shown in Figure 9. Most victims for which severity was known were treated at a hospital; 13 (43.3%) were admitted and 5 (16.7%) were treated and released. The one fatality involved an accident between a car and an insecticide truck. The truck overturned into a ditch, spilling its contents and fatally injuring the driver. The fatality resulted from the accident, not the insecticide.

Figure 9 — Medical outcome, Hazardous Substances Emergency Events Surveillance, Louisiana, 2002



Of the 24 employees, 16 (66.7%) were reported as not wearing any PPE, 5 (20.8%) were wearing hard hats, and the type of PPE worn was unknown for 3 (12.5%) employees. Chemical-related burns were reported as an adverse health effect for 4 (25.0%) of the employees not wearing any PPE and all 5 (100.0%) employees wearing hard hats. One career firefighter experienced trauma, which was not chemical-related during a fixed-facility event, and was wearing firefighter turn-out gear with respiratory protection. The second career firefighter experienced respiratory symptoms resulting from a fixed-facility event during which ammonia was released; he was wearing firefighter turn-out gear without respiratory protection. Firefighter turnout gear is worn by firefighters during a structural fire-fighting operation, and is similar to level “D” protection. Level “D” as defined by the Occupational Safety and Health Administration includes coveralls, gloves, boots/shoes (leather or chemical-resistant, steel toe and shank), safety glasses or chemical splash goggles, and hard hat. Level “D” PPE provides limited protection against chemical hazards.

EVACUATIONS AND IN-PLACE SHELTERING

Information was collected on evacuations and the areas affected by evacuations. Evacuations were ordered in 9 (1.2%) events. Among the 9 evacuations, 5 (55.6%) were of a building or the affected part of a building, 2 (22.2%) were reported as having no criteria, one (11.1%) was of an affected circle or radius, and one (11.1%) was a circle radius and downwind/downstream. The median number of people evacuated was 22 (range: 15 to 1000). The median length of evacuation was 2.5 hours (average: 17 hours, 33 minutes and range: 20 minutes to 96 hours). An official ordered in-place sheltering in an additional 8 events. During an order to “shelter-in-place,” officials request people within a specific distance of an event to remain indoors and discontinue air intake through mechanisms such as air conditioning to prevent exposure to harmful levels of hazardous substances.

CHLORINE

Additional analyses were conducted involving chlorine releases to determine their association with the adverse public health consequences of injuries and evacuations. Of the 30 chlorine releases, 27 (90.0%) involved the release of only chlorine. Twenty-eight (93.3%) chlorine releases occurred at fixed facilities, while the remaining 2 (6.7%) releases were transportation related. The amount of chlorine released ranged from less than one pound to 410 pounds. The amount released was unknown for 11 (36.7%) events.

Four (14.8%) of the 27 events that only involved chlorine resulted in a total of 6 victims; all of which were employees. Four of the six injuries resulting from these events were reported as “Respiratory Irritation”. No deaths were associated with chlorine releases. Two (33.3%) victims were treated at a hospital but not admitted, one (16.7%) victim was treated on the scene with first aid, one (16.7%) victim was treated at a hospital and admitted, and the medical outcome of 2 (33.3%) victims was unknown.

Evacuations were ordered in 6 (22.2%) of the 27 events involving only chlorine. Fifteen people each were evacuated for 2 events, 28 evacuated in another event and the number of people evacuated was unknown for the other 3 events. The length of evacuation ranged from 20 minutes to 3 hours (evacuation time unknown for 3 events).

USES OF HSEES DATA

Data generated by Louisiana’s HSEES system have been presented at annual meetings, where government and private-industry stakeholders are updated on current information pertaining to fixed-facility and transportation-related events. Louisiana’s HSEES system will also use data in presentations to appropriate audiences on reducing future morbidity (injuries) and mortality (deaths) associated with hazardous substances emergencies and conduct outreach activities for employees and manufacturers to increase awareness about the health effects of acute exposures to hazardous chemicals.

SUMMARY OF RESULTS, Louisiana 2001-2002

The numbers of hazardous substance events, events with victims, and deaths for 2001-2002 in Louisiana are shown in Table 7. From 2001 through 2002, there were a total of 1567 eligible events for HSEES surveillance. Among them, 1314 were fixed-facility events and 253 were associated with transportation. There were 2369 substances released, and the most frequent releases involved sulfur dioxide (305 releases or 12.9%). There were a total of 93 victims resulting from 40 events; these victims included 3 (3.2%) fatalities (Table 7).

Table 7 — Cumulative data, Hazardous Substances Emergency Events Surveillance, Louisiana, 2001-2002

Year	Type of event		Total number of events	Number of subs. released	Number of deaths	Number of victims	Events with victims	
	Fixed facility	Transportation					No.	%
2002	630	122	752	1205	1	30	20	2.7
Total	1314	253	1567	2369	3	93	40	2.6

subs = substances

APPENDIX

The 10 Most Frequently Released Substances,
Hazardous Substances Emergency Events Surveillance,
Louisiana, 2002

Number	Standardized Substance Name	Frequency
1.	Sulfur Dioxide	156
2.	NOX	108
3.	Nitric Oxide	77
4.	Hydrogen Sulfide	62
5.	Benzene	59
6.	Nitrogen Dioxide	45
7.	Vinyl Chloride	37
8.	Butadiene	34
9.	Carbon Monoxide	34
10.	Ammonia	33
Total		645