

**Tennessee's National Toxic Substance Incidents Program (NTSIP)**

**2010 Summary Report**

**Tennessee Department of Health**

**Communicable and Environmental Diseases and Emergency Preparedness**

**Environmental Epidemiology Program**



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## **Executive Summary**

Tennessee is one of seven states to be awarded a grant from the Agency of Toxic Substances and Disease Registry (ATSDR) to begin the National Toxic Substance Incidents Program (NTSIP). Through this program, health department staff collects information on uncontrolled or illegal acute (lasting less than 72 hours) releases of toxic substances and work towards preventing the public from coming into contact with them. A substance is considered toxic if it can reasonably be expected to cause an adverse human health effect. These materials include chemicals, radiation, and naturally occurring matter. The goals of the program are to: (1) describe what has occurred, (2) locate at-risk communities, and (3) identify, develop, and promote activities to prevent the public from coming into contact with harmful materials. 2010 is the first year Tennessee has participated in this surveillance program. This report summarizes the characteristics of events reported to the Tennessee Department of Health in 2010. Information about acute events involving toxic substances was collected, including the substance(s) released, the number of victims involved in a release, the type of injuries sustained by victims, and the number of evacuations. These data were computerized using a web-based database provided by ATSDR.

In 2010, 348 events met the NTSIP case definition. In 345 (99.1%) events, only one substance was released. The most commonly reported categories of substances were sodium hydroxide, ammonia, and methamphetamine. During this reporting period, 48 events (13.8% of all reported events) resulted in a total of 107 victims. The most frequently reported injuries were respiratory system problems, burns, and dizziness. Evacuations were ordered in 40 (11.5%) events.

Prevention outreach efforts for 2010 focused on coordination among federal, state, and local agencies involved in toxic substance activities and data collection of acute toxic substance releases.

## **Introduction**

The Centers for Disease Control and Prevention (CDC) defines surveillance as the “ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know. The final link of the surveillance chain is the application of these data to prevention and control. A surveillance system includes a functional capacity for data collection, analysis, and dissemination linked to public health programs.”<sup>1</sup>

Since 1990, the Agency for Toxic Substances and Disease Registry (ATSDR) has maintained an active, state-based Hazardous Substances Emergency Events Surveillance (HSEES) system to describe the public health consequences of releases of hazardous substances. HSEES was replaced by the National Toxic Substance Incidents Program (NTSIP) in 2010 to include a national approach to chemical surveillance.<sup>2</sup> The decision to initiate a surveillance system of this type was based on a study published in 1989 about the hazardous substance releases to three national databases: the National Response Center (NRC) Database, the Department of Transportation (DOT) Hazardous Material Information System (HMIS), and the Acute Hazardous Events Database.<sup>3</sup> Limitations are revealed after review of these databases. Many events were missed because of specific reporting requirements (for example, the HMIS did not record events involving intrastate carriers or fixed facilities) and other important information was not recorded (such as the demographic characteristics of victims, the types of injuries sustained, and the number of person evacuated).

As a result of this review, ATSDR implemented the HSEES system from 1990 to 2009, followed by NTSIP in 2010, to more fully describe the public health consequences of toxic substance releases. The goal of NTSIP is to reduce the morbidity and mortality from toxic substance incidents. To do this, NTSIP employs three components: a national database, state surveillance partners, and response teams.

A national database is built through the collaboration of other agencies interested in reducing harm from chemical spills. These agencies include U.S. DOT, NRC, state health departments, and the media. Combining data from several sources provides a clearer picture of toxic substance releases throughout the United States.<sup>4</sup>

The state surveillance partners currently consist of seven states that contribute data to NTSIP: Louisiana, New York, North Carolina, Oregon, Tennessee, Utah, and Wisconsin. If a toxic spill occurs within one of these states, the health department collects information on the spill. Such information includes the chemical that is spilled, the location, and cause of the spill, and whether or not people are harmed by the spill. This information can then be used by federal agencies and their partners to learn more about reducing harm caused by toxic substances and safer ways to manage them.<sup>5</sup>

Response teams are available at the request of local and state health departments when responding to large-scale toxic spills. ATSDR can provide response teams through its Assessment of Chemical Exposures (ACE) Program. ACE scientists can quickly report to a site and help interview people exposed to the toxic substance in order to get detailed information on their health effects and needs. ACE scientist can also collect and test samples that will measure the level of the toxic substance in people and the environment.<sup>6</sup>

For a surveillance system to be useful, it must not only be a repository for data, the data must also be used to protect public health. For the first year of NTSIP in Tennessee, initial efforts are

focused on increasing personnel, establishing effective partnerships with key state emergency response agencies, and negotiating agreement with relevant federal, state, local, and private agencies so that information on acute toxic spills can be collected in an accurate and timely manner. With this information, strategies to reduce subsequent morbidity and mortality can be developed by having each participating state analyze their data and initiate appropriate prevention outreach activities. These activities are intended to provide industry, responders, and the public with information that can help prevent chemical releases and reduce morbidity and mortality.

This report provides an overview of NTSIP for 2010 in Tennessee, summarizes the characteristics of acute toxic substance releases and their associated public health consequences, and demonstrates how data from the system are translated into prevention activities to protect public health.

## **Methods**

In 2010, information such as the chemical released, the number of victims, injuries, and evacuations caused by the release, and factors contributing to the release were collected on every uncontrolled or illegal acute release of toxic substances. An acute release was considered a release lasting less than 72 hours. A substance was considered toxic if it can reasonably be expected to cause an adverse human health effect due to its properties or as documented in literature. Events were included (1) if the substance released was on the NTSIP mandatory reporting list, which consists of the Environmental Protection Agency's (EPA) Extremely Hazardous Substances List and the Department of Homeland Security (DHS) Chemical Facilities Anti-Terrorism Standard (CFATS) Appendix A or (2) if not on the NTSIP mandatory reporting list, the released amount was greater than or equal to 10 pounds or 1 gallon with the exception of the following:

- Paint and coatings - included if the amount released was 100 pounds or more
- Polychlorinated biphenyls (PCBs) with a concentration greater than 50 parts per million (ppm) - included if the amount released was 10 gallons or more
- Propylene glycol or ethylene glycol – included if the amount released was 50 gallons or more
- Freons – included if the amount released was 100 gallons or more

Petroleum only incidents, as well as stack or flare incidents, were included only when there was a public health action, such as an evacuation, health advisory, or environmental sampling, or when there was an injury caused by the released chemical. Petroleum used as a fuel in a vehicle at the time of the incident was not included.

The mere existence of methamphetamine labs did not qualify them as an incident. There must be

an acute chemical release lasting no longer than 72 hours before detection. If responders suffered injuries while entering the premises, even though there was no evidence of a release, it should be reported.

Several data sources were used to obtain information about these events. Sources include NRC, DOT's HMIS, the Tennessee Highway Patrol, the Tennessee Poison Center (TPC), the Tennessee Emergency Management Agency (TEMA), the Tennessee Department of Environment and Conservation (TDEC), Google Alerts (a web content monitoring service), the Homeland Security Infrastructure Program (HSIP), local health agencies, media (newspaper, radio, and television), and industry. Census data were used to estimate the number of residents in the vicinity of the events. All data were computerized using a web-based data entry system provided by ATSDR.

NTSIP defines victims as people who had at least one documented adverse health effect within 24 hours of an event for symptoms or injuries possibly associated with the event. The exception to the 24-hour stipulation was to count all victims who died because of the event as deaths, even if the death occurred much longer than 24 hours after the event, to the extent this information can be obtained. Victims who received more than one type of injury or symptom were counted once in each applicable injury or symptom category.

Events were defined as transportation-related if they occur (1) during ground, air, pipeline, or water transport of toxic substances or (2) before being completely unloaded from a vehicle or vessel. All other events were considered fixed facility events.

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

## **Results**

In 2010, Tennessee NTSIP captured 348 acute hazardous substance events. Of these events, 148 (42.5%) occurred in fixed facilities and 200 (57.5%) occurred during transportation. Shelby and Davidson counties had the greatest number of events with 108 (31.0%) and 80 (23.0%), respectively (Table 1).

**Table 1:** Number of events meeting the surveillance definition, by county and type of event

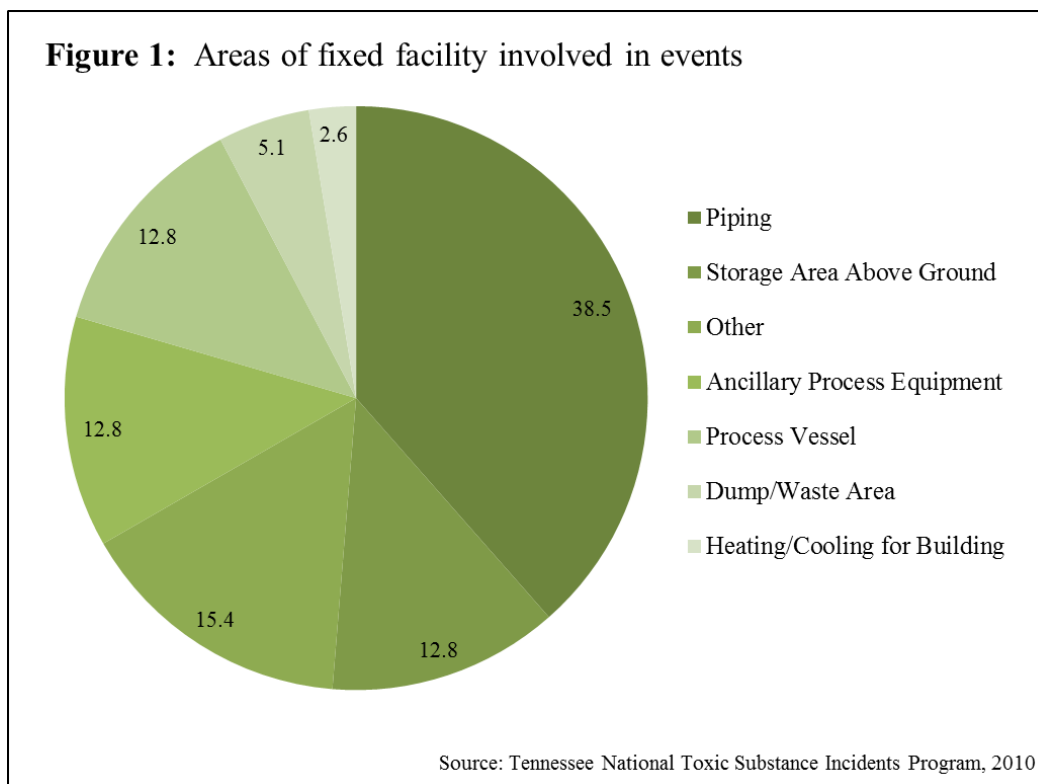
County	Type of Event				All Events	
	Fixed Facility		Transportation			
	No. Events	%*	No. Events	%*	No. Events	%
Anderson	0	0	1	100	1	0.3
Blount	2	66.7	1	33.3	3	0.9
Bradley	2	66.7	1	33.3	3	0.9
Campbell	0	0.0	1	100.0	1	0.3
Carter	1	100.0	0	0.0	1	0.3
Chester	1	100.0	0	0.0	1	0.3
Claiborne	0	0.0	1	100.0	1	0.3
Cocke	0	0.0	1	100.0	1	0.3
Coffee	6	100.0	0	0.0	6	1.7
Davidson	17	21.3	63	78.8	80	23.0
Dickson	1	100.0	0	0.0	1	0.3
Dyer	1	100.0	0	0.0	1	0.3
Fayette	0	0.0	1	100.0	1	0.3
Fentress	1	100.0	0	0.0	1	0.3
Gibson	1	50.0	1	50.0	2	0.6
Hamblen	1	50.0	1	50.0	2	0.6
Hamilton	9	40.9	13	59.1	22	6.3
Hardeman	1	100.0	0	0.0	1	0.3
Hawkins	4	80.0	1	20.0	5	1.4
Haywood	1	100.0	0	0.0	1	0.3
Humphreys	1	50.0	1	50.0	2	0.6
Jefferson	2	66.7	1	33.3	3	0.9
Johnson	1	100.0	0	0.0	1	0.3
Knox	9	36.0	16	64.0	25	7.2
Loudon	0	0.0	1	100.0	1	0.3
Madison	5	83.3	1	16.7	6	1.7
Marshall	2	66.7	1	33.3	3	0.9
Maury	1	100.0	0	0.0	1	0.3
McMinn	2	50.0	2	50.0	4	1.1
Monroe	1	33.3	2	66.7	3	0.9
Montgomery	2	100.0	0	0.0	2	0.6
Obion	1	50.0	1	50.0	2	0.6
Perry	1	100.0	0	0.0	1	0.3
Polk	1	50.0	1	50.0	2	0.6
Putnam	1	100.0	0	0.0	1	0.3
Roane	1	100.0	0	0.0	1	0.3
Robertson	1	100.0	0	0.0	1	0.3
Rutherford	8	57.1	6	42.9	14	4.0
Sequatchie	1	100.0	0	0.0	1	0.3
Sevier	2	100.0	0	0.0	2	0.6
Shelby	46	42.6	62	57.4	108	31.0
Smith	0	0.0	1	100.0	1	0.3
Stewart	1	100.0	0	0.0	1	0.3
Sullivan	4	33.3	8	66.7	12	3.4
Tipton	2	66.7	1	33.3	3	0.9
Unicoi	1	33.3	2	66.7	3	0.9
Weakley	0	0.0	2	100.0	2	0.6
White	1	100.0	0	0.0	1	0.3
Williamson	1	20.0	4	80.0	5	1.4
Wilson	0	0.0	1	100.0	1	0.3
<b>Total</b>	<b>148</b>		<b>200</b>		<b>348</b>	<b>100.0</b>

Source: Tennessee National Toxic Substance Incidents Program, 2010.

\*Percentage = (number of events by type of event per county ÷ total number of events in that county) × 100

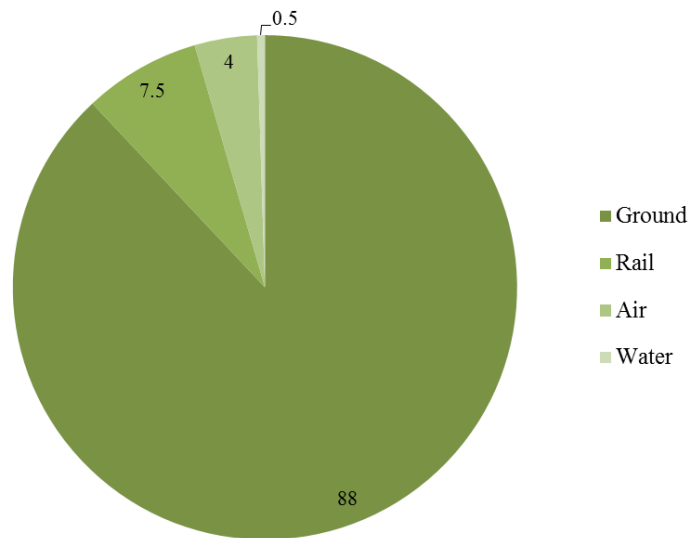


For each fixed facility event in which the North American Industry Classification System (NAICS) begins with 21 for mining, 22 for utilities, 23 for construction, or 31 – 33 for manufacturing, one or two choices can be selected to specify the type of area where the event occurred or the equipment involved in the event. Of 148 fixed facility events, 39 (26.4%) reported one type of area or equipment and 3 (2.0%) reported a combination of two types of areas or equipment. Among events with one type of area or equipment reported, the main areas or equipment were classified as follows: 15 (38.5%) piping, 6 (15.4%) other, 5 (12.8%) process vessel, and 5 (12.8%) storage area above ground (Figure 1).



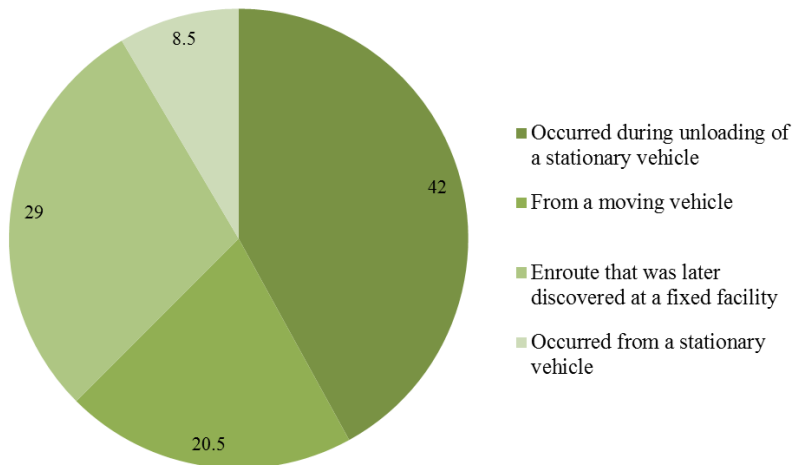
Of the 200 transportation-related events, 176 (88.0%) occurred during ground transport (e.g., tanker truck, non-tanker truck, bus, van, or automobile), and 15 (7.5%) involved transport by rail (Figure 2a). Fewer events involved water, air, and pipeline modes of transportation. The largest proportions of transportation-related events occurred during unloading of a stationary vehicle or vessel [84 (42%)] or en route but were not discovered until the vehicle reached a fixed facility destination [58 (29%)] or from a stationary vehicle or vessel [17 (8.5%)]. Of the 200 transportation-related events, 41 (20.5%) involved a release from a moving vehicle or vessel. (Figure 2b).

**Figure 2a:** Distribution of transportation-related events by type of transport



Source: Tennessee National Toxic Substance Incidents Program, 2010

**Figure 2b:** Distribution of different phases of transportation-related events

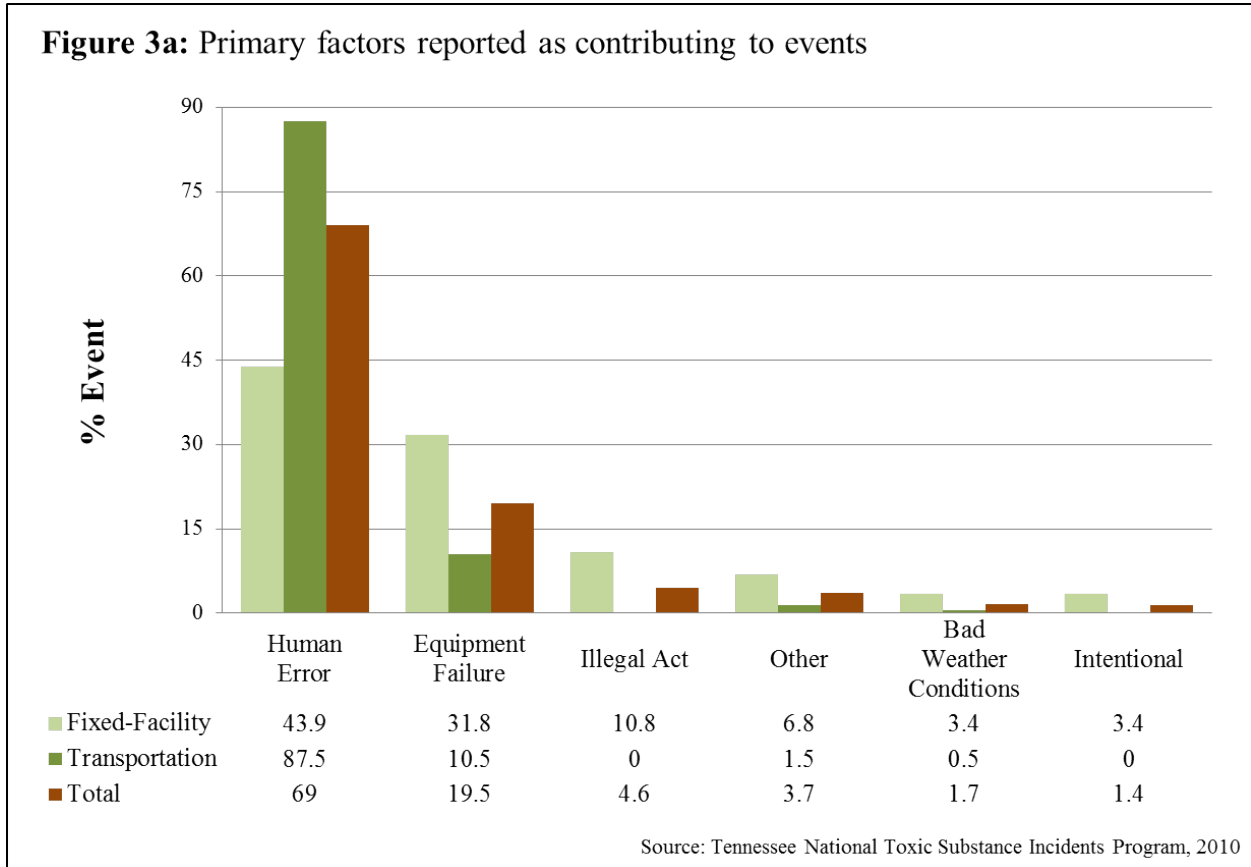


Source: Tennessee National Toxic Substance Incidents Program, 2010

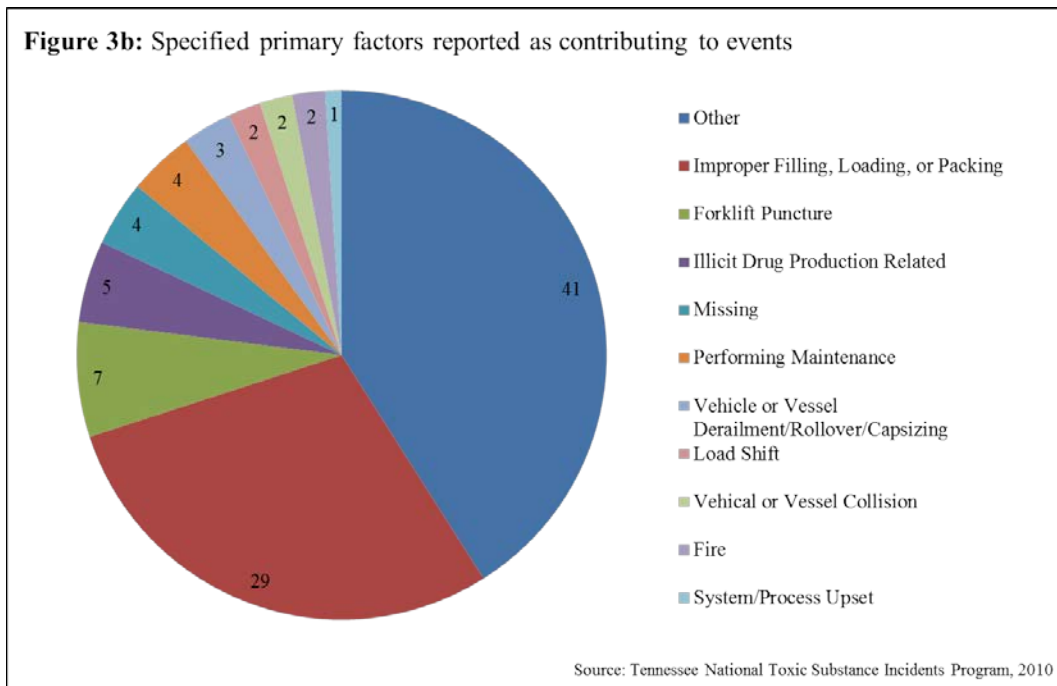
Primary and secondary factors contributing to the events were reported. Human error was reported as primary factors in 69 % of events (Figure 3a). Most (43.9%) fixed-facility events reported human error as the primary factor and most (87.5%) transportation-related events also reported human error as the primary factor. Of the reported specified primary factors, 29%

events involved improper filling, loading, or packing and 41% events were reported for other factors (Figure 3b).

**Figure 3a:** Primary factors reported as contributing to events



**Figure 3b:** Specified primary factors reported as contributing to events



99.1% of all events involved the release of only one substance. Two substances were released in approximately 0.9% of the events and no events involved the release of more than two substances (Table 2). Fixed-facility events were more likely than transportation-related events to have two or more substances released (2.0% vs. 0.0%, respectively).

**Table 2:** Number of substances involved per event, by type of event

No. Substances	Type of Event						All Events		
	Fixed Facility			Transportation			No. Events	%	Total Substances
	No. Events	%	Total Substances	No. Events	%	Total Substances			
1	145	98	145	200	100	200	345	99.1	348
2	3	2	6	0	0	0	3	0.9	6
<b>Total</b>	<b>148</b>	<b>100</b>	<b>151</b>	<b>200</b>	<b>100</b>	<b>200</b>	<b>348</b>	<b>100</b>	<b>354</b>

Source: Tennessee National Toxic Substance Incidents Program, 2010.

NTSIP events were more likely to occur when there was industrial, commercial or agricultural activity, e.g., in the 6 hours before noon (25.9%) and the 6 hours after and including noon (30.2%), compared with the 6 hours before midnight (25.6%) and the 6 hours after and including midnight (18.4%). 14 events did not have a time specified. Additionally, 84.8% of events occurred on weekdays compared to 15.2% occurring on weekends (Tables 3a and 3b). May through October had 31.9% of the events and the remaining 6 months of the year had 68.1% events.

**Table 3a:** Frequencies of events, by time range

Time Range	No. of Events	%
0-5:59AM	90	25.9
6:00-11:59AM	105	30.2
12:00-5:59PM	89	25.6
6:00-11:59PM	64	18.4
<b>Total</b>	<b>348</b>	<b>100.0</b>

**Table 3b:** Frequencies of events, by day

Event Day	No. of Events	%
Monday	38	10.9
Tuesday	63	18.1
Wednesday	63	18.1
Thursday	65	18.7
Friday	66	19.0
Saturday	32	9.2
Sunday	21	6.0
<b>Total</b>	<b>348</b>	<b>100.0</b>

Source: Tennessee National Toxic Substance Incidents Program, 2010.

## Industries

The largest proportions of NTSIP events were associated with the manufacturing (59 [17.0%]) and transportation (175 [50.3%]) industries (Table 4). Within manufacturing, chemical manufacturing (32 [54.2%]), food manufacturing (8 [13.6%]) and petroleum manufacturing (5 [8.5%]) accounted for most of the events. The largest number of events with victims occurred in the transportation industry (12 [25.0%]). The total number of victims was greatest in the transportation industry (21 [19.6%]) followed by the number of victims in manufacturing industry (14 [13.1%]) and educational services (12 [11.2%]). The subcategory chemical manufacturing accounted for 42.9% of all victims in the manufacturing industry. Although the manufacturing industry resulted in a large proportion of events with victims and a large number of victims, only 10.4% of all 59 events resulted in victims.

**Table 4:** Industries involved in hazardous substance events and events with victims by category

Industry Category	Total Events		Events with Victims		Percentage of Events with Victims	Total No. of Victims
	No.	%	No.	%		
Accommodation and Food Services	2	0.6	1	2.1	50	2
Administrative and Support Services	6	1.7	4	8.3	66.7	11
Agriculture, Forestry, Fishing and Hunting	1	0.3	0	0.0	0.0	0
Construction	8	2.3	1	2.1	12.5	1
Educational Services	3	0.9	1	2.1	33.3	12
Health Care and Social Assistance	2	0.6	0	0.0	0.0	0
Information	1	0.3	0	0.0	0.0	0
Manufacturing	59	17.0	5	10.4	8.5	14
Mining, Quarrying, and Oil and Gas Extraction	3	0.9	1	2.1	33.3	1
Not an Industry	33	9.5	19	39.6	57.6	35
Other Services	5	1.4	0	0.0	0.0	0
Professional, Scientific, and Technical Services	4	1.1	0	0.0	0.0	0
Public Administration	7	2.0	1	2.1	14.3	2
Real Estate, Rental, and Leasing	1	0.3	1	2.1	100.0	1
Retail Trade	3	0.9	1	2.1	33.3	6
Transportation and Warehousing	175	50.3	12	25.0	6.9	21
Utilities	1	0.3	0	0.0	0.0	0
Wholesale Trade	34	9.8	1	2.1	2.9	1
<b>Total</b>	<b>348</b>	<b>100.0</b>	<b>48</b>	<b>100.0</b>		<b>107</b>

Source: Tennessee National Toxic Substance Incidents Program, 2010.

## Substances

A total of 351 substances were released in all events. The individual substances most frequently released were sodium hydroxide, ammonia, and methamphetamine (Appendix). Substances were grouped into 15 categories. The substance categories most commonly released in fixed- facility

events were volatile organic compounds (22 [14.6%]), ammonia (17 [11.3%]), other inorganic substances (13 [8.6%]) and acids (13 [8.6%]). In transportation-related events, the most commonly released substance categories were bases (52 [26.0%]), acids (39 [19.5%]), volatile organic compounds (36 [18.0%]), and other inorganic substances (24 [12.0%]) (Table 5).

Two types of releases for each substance (e.g., spill and volatilization) could be reported. Only one type of release was associated with the event as follows: spill (264 [75.2%]), volatilization (72 [20.5%]), fire (10 [2.8%]), and explosion (5 [1.4%]). Of events with two types of releases, the following combinations were reported: spill and volatilization (11 [50.0%]), volatilization and explosion (5 [22.7%]), and the 4 (18.2%) involved a fire and explosion.

**Table 5: Number of substances involved, by substance category and type of event**

Substance Category	Type of event				All Events	
	Fixed Facility		Transportation			
	No. Substances	%	No. Substances	%	No. Substances	%
Acids	13	8.6	39	19.5	52	14.8
Ammonia	17	11.3	4	2	21	6
Bases	9	6	52	26	61	17.4
Chlorine	7	4.6	2	1	9	2.6
Formulations	0	0	1	0.5	1	0.3
Hetero-Organics	0	0	1	0.5	1	0.3
Hydrocarbons	1	0.7	3	1.5	4	1.1
Indeterminate	0	0	1	0.5	1	0.3
Mixtures*	10	6.6	6	3	16	4.6
Other†	44	29.1	17	8.5	61	17.4
Other Inorganic Substances‡	13	8.6	24	12	37	10.5
Oxy-Organics	6	4	3	1.5	9	2.6
Paints and Dyes	0	0	2	1	2	0.6
Pesticides/Agricultural	7	4.6	3	1.5	10	2.8
Polymers	2	1.3	6	3	8	2.3
Volatile Organic Compounds (VOCs)	22	14.6	36	18	58	16.5
<b>Total§</b>	<b>151</b>	<b>100</b>	<b>200</b>	<b>100</b>	<b>351</b>	<b>100.1</b>

Source: Tennessee National Toxic Substance Incidents Program, 2010.

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

† Not belonging to one of the existing categories.

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

§ Percentage does not total 100% due to rounding.

## Victims

A total of 107 victims were involved in 48 events (13.8% of all events) (Table 6). Of the 48 events with victims, 26 (54.2%) events involved only one victim, and 10 (20.8%) involved two victims. Of all victims, 87 (81.3%) were injured in fixed- facility events. Persons who were

**Table 6:** Number of victims per event, by type of event

No. Victims	Type of event						All Events		
	Fixed Facility			Transportation					
	No. Events	%	Total Victims	No. Events	%	Total Victims	No. Events	%	Total Victims
1	20	55.6	20	6	50	6	26	54.2	26
2	6	16.7	12	4	33.3	8	10	20.8	20
3	2	5.6	6	2	16.7	6	4	8.3	12
4	2	5.6	8	0	0	0	2	4.2	8
5	2	5.6	10	0	0	0	2	4.2	10
6	2	5.6	12	0	0	0	2	4.2	12
7	1	2.8	7	0	0	0	1	2.1	7
12	1	2.8	12	0	0	0	1	2.1	12
<b>Total</b>	<b>36</b>	<b>100.0</b>	<b>87</b>	<b>12</b>	<b>100</b>	<b>20</b>	<b>48</b>	<b>100.0</b>	<b>107</b>

Source: Tennessee National Toxic Substance Incidents Program, 2010.

observed at a hospital or medical facility but did not have symptoms resulting from the event were not counted as victims.

To represent the magnitude of the effects of substances involved in injuries, the number of events in a specific substance category was compared with the number of events in the same category that resulted in victims. In events that involved one or more substances from the same substance category, substances were counted once in that category. In events that involved two or more substances from different categories, substances were counted once in the multiple substance categories. Substances released most often were not necessarily the most likely to result in victims (Table 7). For example, events categorized as bases constituted 17.4% of all events; however, only 1.6% of these events resulted in injuries. Conversely, events involving pesticide accounted for 2.8% of all events respectively, but 30.0% of the events resulted in injuries.

**Table 7: Frequency of substance categories in all events and events with victims¶**

Substance Category	All Events		Events with victims		
	No.	%	No.	Percentage of all releases with victims	Percentage of events with victims in substance category
Acids	52	14.8	2	4.1	3.8
Ammonia	21	6.0	0	0.0	0.0
Bases	61	17.4	1	2.0	1.6
Chlorine	9	2.6	1	2.0	11.1
Formulations	1	0.3	0	0.0	0.0
Hetero-Organics	1	0.3	0	0.0	0.0
Hydrocarbons	4	1.1	1	2.0	25.0
Indeterminate	1	0.3	0	0.0	0.0
Mixtures*	16	4.6	3	6.1	18.8
Other†	61	17.4	23	46.9	37.7
Other Inorganic Substances‡	37	10.5	5	10.2	13.5
Oxy-Organics	9	2.6	2	4.1	22.2
Paints and Dyes	2	0.6	0	0.0	0.0
Pesticides/Agricultural	10	2.8	3	6.1	30.0
Polymers	8	2.3	1	2.0	12.5
Volatile Organic Compounds (VOCs)	58	16.5	7	14.3	12.1
<b>Total</b>	<b>351</b>	<b>100</b>	<b>49</b>	<b>100.0</b>	

Source: Tennessee National Toxic Substance Incidents Program, 2010.

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

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

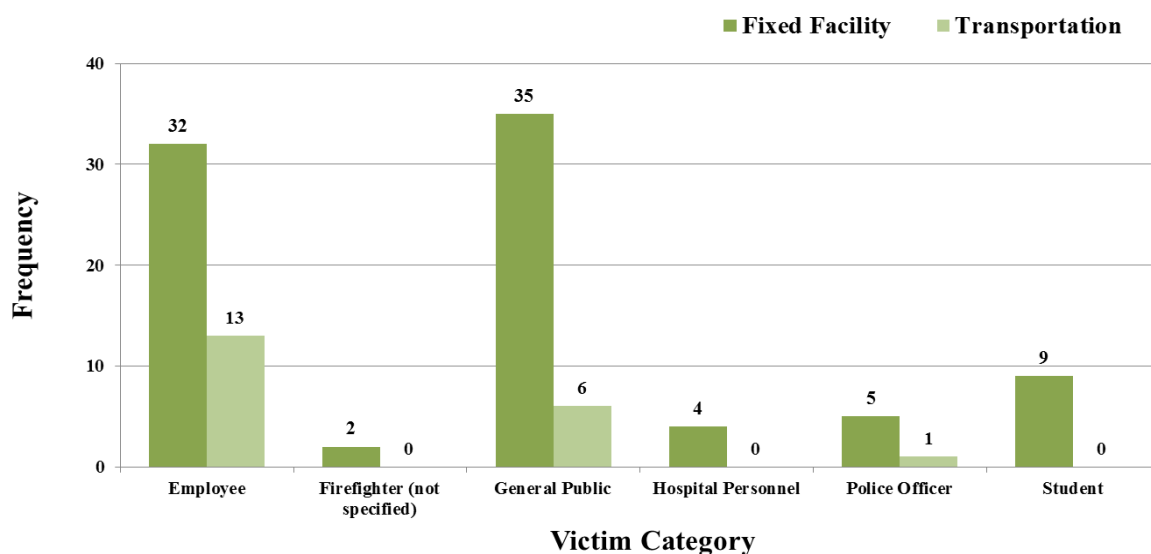
† Not belonging to one of the existing categories.

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

Employees (45 [42.1%]) constituted the largest proportion of the population groups injured followed by general public (41 [38.3%]) (Figure 4). In fixed-facility events, 7 emergency response personnel were injured. Two (2.3%) of those were firefighters and five (5.7%) were police officers. Four hospital personnel were injured in fixed-facility events. One responder (police officer) was injured in transportation-related events.



**Figure 4:** Distribution of victims, by population group and type of event



Source: Tennessee National Toxic Substance Incidents Program, 2010

Victims were reported to sustain a total of 159 injuries or symptoms (Table 8). Some victims had more than one injury or symptom. Of all reported injuries/symptoms, the most common injuries/symptoms in fixed-facility events were respiratory irritation (42 [29.8%]) and burns (24 [17.0%]). In transportation-related events, non-chemical related trauma (10 [45.5%]), and respiratory irritation (2 [9.1%]) were reported most frequently. Not all of the trauma injuries in transportation-related events were substance-related; these injuries resulted from a chain of events, such as a motor vehicle accident leading to the release of a hazardous substance, and not from exposure to the substance itself.

**Table 8:** Frequencies of injuries/symptoms, by type of event\*

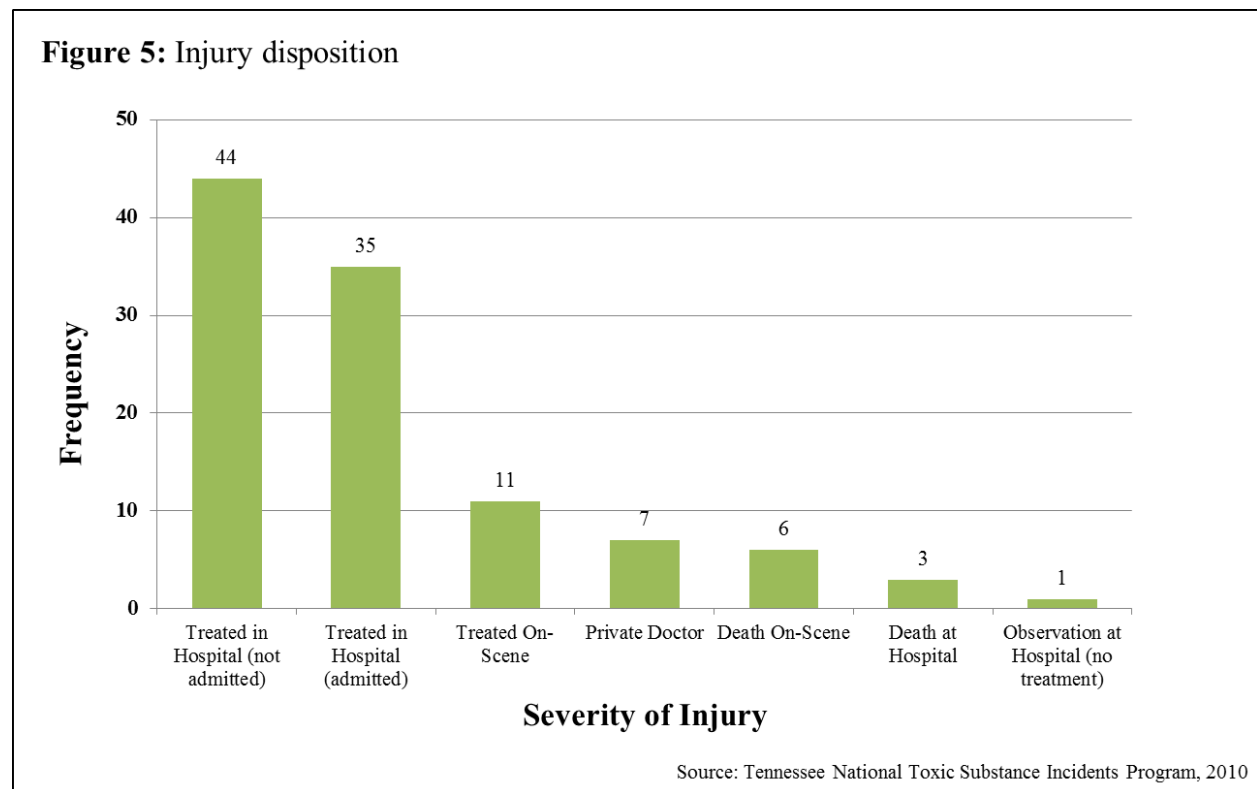
Injury/Symptom	Fixed facility		Transportation		All Events	
	No. Injuries	%	No. Injuries	%	Total no. injuries	%
Chemical Burns	3	2.1	2	9.1	5	3.1
Chemical and Thermal Burns	2	1.4	0	0.0	2	1.3
Dizziness/CNS Symptoms	24	17.0	0	0.0	24	15.1
Eye Irritation	8	5.7	1	4.5	9	5.7
Gastrointestinal	14	9.9	0	0.0	14	8.8
Headache	14	9.9	0	0.0	14	8.8
Heart Problems	1	0.7	0	0.0	1	0.6
Non-Chemical Related Trauma	5	3.5	10	45.5	15	9.4
Respiratory	42	29.8	2	9.1	44	27.7
Shortness of Breath	8	5.7	1	4.5	9	5.7
Skin Irritation	1	0.7	0	0.0	1	0.6
Thermal Burns	19	13.5	2	9.1	21	13.2
<b>Total</b>	<b>141</b>	<b>100.0</b>	<b>18</b>	<b>81.8</b>	<b>159</b>	<b>100.0</b>

Source: Tennessee National Toxic Substance Incidents Program, 2010.

\*The number of injuries is greater than the number of victims (107) because a victim could have had more than one injury

Exact age was reported for 26 (24.3%) of the victims. The median age of the victims was 33 years (range: 2 – 62 years). For the 105 (98.1%) injured persons for whom an age category was reported, 4 (3.8%) were child under 18 years of age, 101 (96.2%) was 18 years old or greater. Of the 81 injured persons for whom age was not reported, 51 (63%) were presumably adults (because their population group was reported as responders or employees) and 30 (37%) could have been adults or children (because their population group was reported as members of the public or student).

Sex was known for 86 (80.4%) of the victims. Of these, 57 (66.3%) were males. Of the 107 victims, 44 (41.1%) were treated at a hospital and not admitted and 35 (32.7%) were treated at hospital and admitted. 9 (8.4%) fatalities were reported (Figure 5).



The status of personal protective equipment (PPE) use was reported for 45 (42.1%) employee-victims. Most of the employee-victims (97.8%) had not worn any form of PPE. One employee-victim reported wearing Level D personal protective equipment.

Two events involved 19 injured people. These events resulted in 12 victims and 7 victims, respectively. In the event involving 12 victims, carbon monoxide was released in a state community college area on Thursday. A tall ladder in the boiler room was moved in such a way as to knock the PVC exhaust pipe loose from the boiler’s engine, separating it from a connecting rubber boot. This resulting in carbon monoxide to be dispersed throughout the building and an

order to evacuate the affected part of the facility was given. Classes were suspended for the rest of the day and all day on Friday.

In the event resulting in seven victims, metam sodium, which is a common soil fumigant, was released in a residential area. The primary contributing factor in this event was overspray/misapplication of that pesticide. In addition, a hose break on the irrigation equipment was responsible for the increased odor. All the seven victims were general public that experienced eye irritations, dizziness, and respiratory symptoms.

### **Nearby populations**

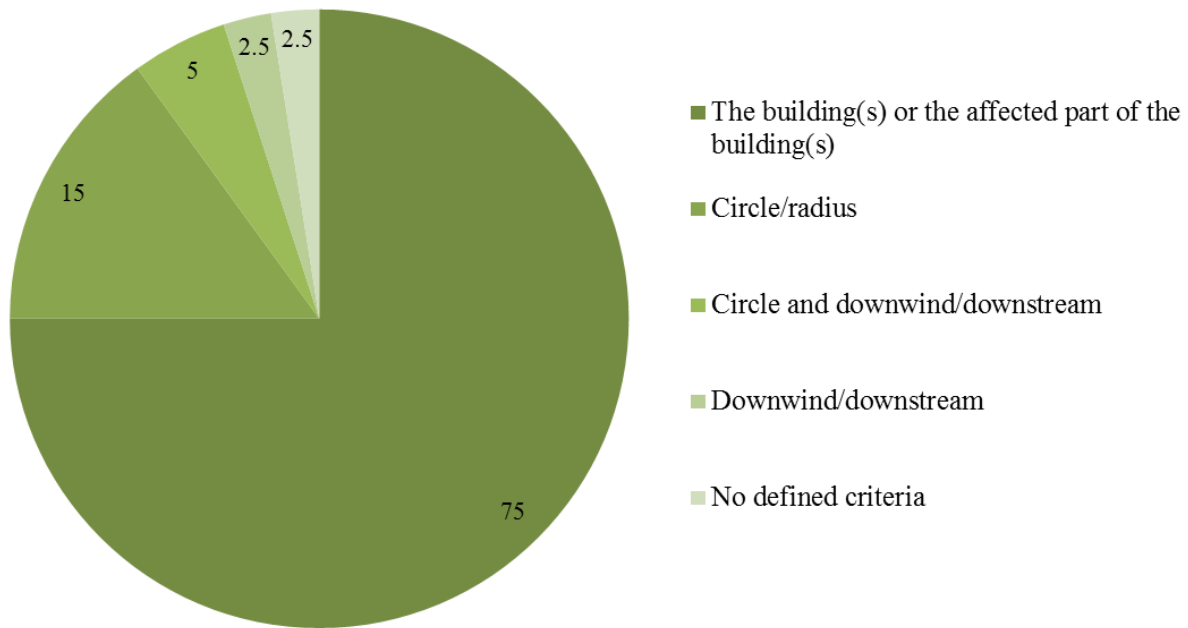
The proximity of the event location in relation to selected populations was determined using geographic information systems (GIS). Residences were within ¼ mile of 299 (85.9%) events, schools were within ¼ mile of 2 (0.6%) events, hospitals were within ¼ mile of 2 (0.6%) events, nursing homes were within ¼ mile of 2 (0.6%) events, licensed daycares were within ¼ mile of 24 (6.9%) events, industries or other businesses were within ¼ mile of 283 (81.3%) events, and recreational areas were within ¼ mile of 16 (4.6%) events.

The number of events at which persons were at risk of exposure was determined primarily using GIS. There were 302 (86.8%) events with persons living within ¼ mile of the event; 331 (95.1%) events with persons living within ½ mile; and 346 (99.4%) events with persons living within 1 mile.

### **Evacuations**

Evacuations were ordered in 40 (11.5%) events. Of these evacuations, 75.0% were of buildings or affected parts of buildings; 15.0% were of defined circular areas surrounding the event locations; and 2.5% were of no defined criteria (Figure 6). The number of people evacuated was known for 1,433 (11.5%) events and ranged from 2 to 500 people. The median length of evacuation was 4 hours (range: less than one hour to 48 hours). Of all 40 events, 39 (97.5%) had access to the area restricted.

**Figure 6: Area of evacuation criteria**



Source: Tennessee National Toxic Substance Incidents Program, 2010

### Decontamination

Of the 107 (100%) victims for whom decontamination status was known, 88 (82.2%) were not decontaminated and 9 (8.4%) were decontaminated at the scene.

### Response

Three hundred forty-five (99.1%) events had information on who responded to the event; 24.6% reported 2 categories of personnel who responded, 16.8% reported 3 categories, and 10.4% reported 4 categories. Company response teams (45.4%) responded most frequently to events followed by fire department (12.1%), law enforcement agencies (9.4%), and third party clean-up contractor (7.1%) (Table 9). No one responded in 3 (0.5%) events.

**Table 9:** Distribution of personnel who responded to the event

<b>Responder Category</b>	<b>No.</b>	<b>%</b>
Company's Response Team	255	45.4
Fire Department	68	12.1
Law Enforcement Agency	53	9.4
Third Party Clean-Up Contractor	40	7.1
Certified HazMat Team	37	6.6
EMS	34	6.0
State, County, or Local Emergency Managers/Coordinators/Planning Committees)	29	5.2
Other	15	2.7
Department of Works/Utilities/Transportation (includes Coast Guard)	17	3.0
Environmental Agency/EPA* Response Team	7	1.2
No Response	3	0.5
Health Department/Health Agency	2	0.4
Specialized Multiagency Team	1	0.2
Hospital	1	0.2

Source: Tennessee National Toxic Substance Incidents Program, 2010.

\*Environmental Protection Agency

### **Prevention Activities**

During 2010, the Tennessee NTSIP focused their efforts on collaborating with and collecting data from key federal, state, and local agencies involved in toxic substance activities. Such agencies include the Tennessee Department of Environment and Conservation (TDEC), Tennessee Department of Transportation (TDOT), Tennessee Emergency Management Agency (TEMA), Local Emergency Planning Committees (LEPCs), and Agency of Toxic Substances and Disease Registry (ATSDR). Through the addition of qualified personnel devoting their time to surveillance, data collection, data entry, and data management, TDH has been able to sufficiently coordinate with other agencies and accomplish the goals and sustainability requirements of the program.

While continuing to collaborate with and collect data from key federal, state, and local agencies involved in toxic substance activities, year 2011 will be spent analyzing and mapping the collected data. Through analyzing and mapping data gathered, TDH will be able to gain a better understanding of the causes of acute hazardous substance emergency releases as they occur throughout Tennessee. TDH will then be able to identify vulnerabilities in industry, transportation, and communities in order to effectively develop and promote methods that could prevent future releases and mitigate the consequences when a release does occur. Information gathered and lessons learned will then be disseminated to the public, collaborating agencies, and key organizations in summary reports, educational presentations, and fact sheets. All reports, presentations, and fact sheets will be made available on the TDH website. Additionally, TDH

will develop a program fact sheet containing data on chemicals of interest tailored for individual hospitals within Tennessee. The program fact sheet will be based on a template provided by ATSDR.

### **Summary of Results**

During 2010, the largest proportion of events occurred in transportation facilities (Table 1). The most common primary factor contributing to the event was human error (Figure 3a). The largest proportions of NTSIP events were associated with the manufacturing and transportation industries (Table 4). The individual substances most frequently released were sodium hydroxide, ammonia, and methamphetamine (Appendix A).

There were total of 107 victims of which most of them were associated with fixed facility (Table 6). Employees constituted the largest proportion of the population groups injured followed by public (Figure 4). Some victims had more than one injury or symptom. Of all reported injuries/symptoms, the most common injuries/symptoms in fixed-facility events were respiratory irritation and burns. In transportation-related events, non-chemical related trauma, and respiratory irritation were reported most frequently (Table 8).

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## Appendix

The 10 substances most frequently involved in events

Number	Chemical Substance	Total Substance Releases	
		No.	%
1	Sodium Hydroxide	38	10.8
2	Ammonia	20	5.7
3	Methamphetamine Chemicals NOS	17	4.8
4	Natural Gas	13	3.7
5	Acetone	11	3.1
6	Sulfuric Acid	11	3.1
7	Hydrochloric Acid	7	2.0
8	Propane	7	2.0
9	Corrosive NOS	6	1.7
10	Resin NOS	6	1.7

Note: Sodium hydroxide includes both sodium hydroxide and sodium hydroxide NOS  
Methamphetamine includes both methamphetamine and methamphetamine NOS.