

North Carolina's National Toxic Substance Incidents Program (NTSIP)

2016 Summary Report



Executive Summary

In 2016, there were a total of 341 chemical release incidents. Twenty-two releases (6%) resulted in one or more injury and 43 releases (12%) led to an official evacuation. 208 releases (61%) were transportation related.

There were 133 people injured due to chemical release incidents in 2016. Carbon monoxide injured 133 people, trichloroisocyanuric acid injured 18 people, and chlorine injured 12 people. More than half of the people injured were treated at a hospital but not admitted (60%).

Sodium hydroxide was the most commonly released chemical (65 releases). Natural gas had 19 releases and the most associated evacuations (16 evacuations). Carbon monoxide had 12 releases, 11 evacuations, and the highest victim count. One release of trichloroisocyanuric acid injured 18 people.

Introduction

To help monitor and prevent unintentional releases of toxic substances, North Carolina participates in the Agency for Toxic Substances and Disease Registry's (ATSDR) National Toxic Substance Incidents Program (NTSIP). North Carolina has participated in NTSIP since its inception in 2010 and previously participated in a similar program called the Hazardous Substances Emergency Events Surveillance Program. For the purpose of this report, a toxic substance release is defined as an unintentional, acute emergency release (lasting 72 hours or less) of a toxic substance that meets NTSIP's eligibility criteria. These criteria are based on the toxicity of the chemical and the amount released. (For specific NTSIP reporting criteria, refer to the 2010 NTSIP final report available on the ATSDR NTSIP webpage; the link is available in the first reference on page 6.) This report summarizes surveillance findings for 2016. During 2016, NTSIP captured information on 341 toxic substance releases meeting NTSIP's eligibility criteria.

Data Source

Toxic substance releases are identified through reports from the National Response Center, the North Carolina Office of Emergency Management, the U.S. Department of Transportation (Hazardous Materials Incidents), local health departments, the media and on-call notifications from the N.C. Public Health Preparedness and Response and Communicable Disease Branches. All toxic substance releases that occur in North Carolina and come to the attention of North Carolina NTSIP staff are evaluated to determine whether they meet NTSIP eligibility criteria. All events meeting the criteria are promptly entered into the online NTSIP database.

If toxic substance releases involve injured persons, the North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) may be used to determine a variety of victim information including type and severity of injury. NC DETECT contains data from emergency departments, the Carolinas Poison Center, and the Pre-hospital Medical Information System (PreMIS).

Findings

From January 1, 2016 through December 31, 2016, North Carolina's NTSIP database captured 341 chemical release incidents, of which 22 (6%) resulted in one or more injuries and 43 (12%) led to an official evacuation (Table 1). Primary notification sources included the Department of Transportation (n=228, 67%), emergency government services (n=69, 20%), and the media (n=21, 6%). Fifteen (4%) of the spills involved chemical mixtures and three (1%) of the spills resulted in a chemical reaction. Chemical mixtures did not result in any injuries, however, two chemical reactions resulted in one or more injury (Table 5). Mecklenburg County had the most releases (n=74, 22%) followed by Guilford (n=66, 19%) and Forsyth (n=41, 12%).

Toxic substance releases can occur when hazardous materials are transported or can occur at a fixed-facility (i.e. if an event is not transportation-related). For 2016, 208 (61%) of the total number of spills involved transportation, while the number of spills involving a fixed facility were 133 spills (39%). Of the 208 spills involving transportation, the majority were ground transportation (n=195, 94%), followed by pipeline transport (n=9, 4%) and railway transport (n=3, 1%). Ninety-one (44%) of the transportation spills occurred during unloading, 89 (43%) occurred en-route and were later discovered at fixed facilities, 11 (5%) occurred from a moving vehicle or vessel, 9 (4%) were classified as pipelines, 5 (2%) occurred from a stationary vehicle or vessel (e.g. staged at transfer), and 3 (1%) were unknown (Figure 1).

Of the 133 spills involving fixed facilities, 52 (39%) occurred in a material handling area, 17 (13%) occurred in piping, 16 (12%) occurred in an above ground storage area, 10 (8%) were classified as other (5 of which were meth labs), 11 (8%) occurred in a process vessel, 9 (7%) occurred as part of heating and cooling systems, 6 (5%) involved ancillary process equipment, 4 (3%) were transport within a fixed facility, 2 (1.5%) occurred in a dump/waste area, 1 (0.8%) occurred in a laboratory, and 5 (4%) were unknown (Figure 1).

In 2016, 133 persons were injured as a result of toxic substance release incidents in North Carolina (Table 2), with 21 events having one or more injury. Headache was the most common type of injury reported followed by respiratory system problems and dizziness or other central nervous system (CNS) symptoms. Respiratory system problems were defined as breathing problems or difficulties, pneumonitis, cough, wheezing, sore throat, throat irritation, and shortness of breath. Fifteen people were admitted to a hospital, and 80 people were treated at a hospital and not admitted (Table 2). Six people suffered trauma injuries in events that involved NTSIP-eligible chemical releases. However, in five of the cases, the trauma was not chemical related and these cases are therefore not included in aggregate victim data. There were four reported fatalities. Two fatalities were due to non-chemical related trauma, one was a chemical suicide, and the other fatality was due to a chemical release that resulted from a motor vehicle accident. The two fatalities that were non-chemical related will be excluded from the victim data.

Of the 133 injured persons, 76 (57%) were members of the general public, 45 (34%) were employees, 5 (4%) were EMT personnel, 4 (3%) were unspecified responders, 2 (1.5%) were career firefighters, and 1 (0.8%) was a police officer (Figure 2). In 2016, slightly more males

(n=67) were injured than females (n=45) (21 victims' sex was unknown). Twenty-two of the injured persons were children under the age of 18, 51 were young adults ages 18-34, 40 injured people were ages 35-64, and two people were 65 years or older. Eighteen victims' ages are unknown (Figure 2).

Human error was the primary factor in 226 (66%) of the chemical releases and equipment failure was the primary factor in 103 (30%) spills. Seventy-eight of the primary factors were specified as due to a loose closure, component, or device; 75 were due to improper filling, loading, or packing; and 63 were due to dropping a package in handling (Table 3). Seven chemical releases were due to illegal acts. Specifically, six were illicit drug production related and one was due to unauthorized dumping. Three releases were due to bad weather conditions, one was an intentional act, and one event had an unknown primary factor. Most chemical releases (n=278) did not have a secondary factor listed, however, 34 releases listed equipment failure as a secondary factor, and 12 listed human error.

Human error was the primary factor for 14 events that resulted in one or more injury, while equipment failure was the primary factor for 6 events that resulted in one or more injury. Eleven spills were non-industry related, occurring at or in a private vehicle or residence, while the majority of spills (n=330, 97%) were industry-related. The number of injuries was significantly higher (n=110) for fixed facilities than the number of injuries that occurred during transportation (n=23), even though there were fewer fixed facility spills (n=133) than transportation spills (n=208). Twenty-two chemical releases resulted in one or more injury. In fixed facilities, 16 spills resulted in one or more injury, and for releases involving transportation, 6 spills resulted in one or more injury. Also of interest, while only 11 releases were non-industry related, 25 people were injured due to non-industry related releases. Almost half of non-industry related chemical spills (n=5) resulted in one or more injury (Figure 3).

Evacuations were ordered for 43 (12%) of the NTSIP-eligible releases. Of the 43 evacuations, 35 evacuations reported the length of time the evacuation was in effect. Twenty-eight evacuations lasted five hours or fewer, and one evacuation lasted for seventy-two hours. Of the 43 evacuations ordered, 32 reported the number of people evacuated. Twenty-four evacuations involved 50 people or fewer, and three involved more than 500 people (Figure 4). Out of the 43 evacuations, 28 evacuations had no injuries associated with the event and 15 events that had evacuations also had one or more injury. For seven NTSIP-eligible releases, there were injuries associated with the release, and there was no evacuation. However, in all seven cases, there were two or fewer injuries.

There were 334 NTSIP-eligible incidents with responders. There was no response in three releases and four releases are unknown. Of the 334 incidents with responders, company response teams had the highest number of responses (n=241) followed by fire departments (n=63), law enforcement (n=46), and third party clean-up contractors (n=37). Certified hazmat teams and local emergency management both responded to 35 events, EMTs responded to 24 events, and public works responded to 18 events (Table 4). Twelve responders were injured. Three of the unspecified responders were treated at the hospital but not admitted, and one was admitted to the hospital. The two firefighters, one police officer, and five EMTs were treated at the hospital but not admitted.

Most NTSIP-eligible releases occurred between 6:00am and 11:59pm. This is unsurprising as most releases were industry related. Specifically, 111 spills occurred during the hours of 6:00am-11:59am, 84 spills occurred during the hours of 12:00pm-5:59pm. Ninety spills occurred between the hours of 6:00pm and 11:59pm. Most releases also occurred during the work week, with the most occurring Wednesday, Thursday, and Friday. Most spills occurred between April and October; each of these months had over thirty spills, except for May, which had twenty-one spills (Figure 5).

For 2016, sodium hydroxide was involved in the greatest number of NTSIP-eligible releases (n=65) (Table 5). The second most commonly released substances were hydrogen peroxide and sulfuric acid, both with 20 releases. The chemical with the highest victim count was carbon monoxide (n=83). In 2016, out of twelve total carbon monoxide releases, eight releases resulted in one or more injury. Sulfuric Acid and Hydrogen Peroxide each had two releases that resulted in one or more injury. However, one release of Trichloroisocyanuric Acid injured 18 people and one release of chlorine injured 12 people (Table 6).

Public Health Significance

Toxic substance releases are a public health concern in North Carolina. Sodium hydroxide contributed to the greatest number of releases in the state for 2016. However, carbon monoxide releases resulted in the highest victim count. Natural gas was the fourth most commonly released chemical in 2016, however, it was the most commonly released chemical for 2013, 2014, and 2015. Toxic substance release incidents often result in evacuations, injuries and even in fatalities.

To provide guidance for local health departments when responding to chemical releases, the Chemical Release Investigation Kit & Template, also known as CRIKT, was initiated in 2013. A CRIKT is developed for each chemical of concern and is comprised of three distinct parts: 1) a step-by-step response guide; 2) a one-page chemical fact sheet; and 3) a line listing template. Each toolkit will ensure local health departments have easily accessible chemical information, guidance on how to respond, and information on who to contact to strengthen public health response in the event of a chemical release. As of February 2017, CRIKTs have been developed for 35 chemicals, including all 7 of the chemicals that contributed to the greatest number of releases in 2015. For more information about CRIKT, please visit <http://epi.publichealth.nc.gov/oe/chemrad/chemkit.html>.

Limitations

The toxic substance releases captured in North Carolina's database are limited to those meeting NTSIP eligibility criteria. NTSIP has developed a list of substances that must be reported at any quantity when released, as well as a list of substances that must be reported when at least 1 pound is released. Other toxic substances are only entered into NTSIP if at least 10 pounds or 1 gallon was released. For certain commonly released substances that are less toxic, such as paint, releases are only entered if the quantity released is above a certain threshold, and releases of petroleum fuels are only entered if an injury or public health action (such as an evacuation)

occurred. Releases that occur at a private residence are only entered if a public health action occurred.

It should also be noted that North Carolina NTSIP program staff stopped receiving methamphetamine laboratory incident reports from the State Bureau of Investigation (SBI) in 2011, so NTSIP staff has relied on media reports in their place. Since media reports do not include the same level of detail as SBI reports, many of these incidents may not be captured in NTSIP after 2010.

References

National Toxic Substance Incidents Program (NTSIP) Annual Report 2010. U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. Available from http://www.atsdr.cdc.gov/ntsip/docs/ATSDR_Annual%20Report_031413_FINAL.pdf.

Toxic Substance Releases in North Carolina—National Toxic Substance Incidents Program, 2013–2014. Department of Health and Human Services, Department of Public Health, Occupational and Environmental and Epidemiology Branch. Available from http://epi.publichealth.nc.gov/oeo/docs/ToxicSubstanceReleasesFullReport_2013_2014.pdf.

North Carolina's National Toxic Substance Incidents Program (NTSIP), 2015 Summary Report. Department of Health and Human Services, Department of Public Health, Occupational and Environmental and Epidemiology Branch. Available from http://epi.publichealth.nc.gov/oeo/docs/ToxicSubstanceReleasesFullReport_2015.pdf.

Appendix: Tables and Figures

Table 1. NTSIP-eligible toxic substance releases information for North Carolina, 2016

NTSIP-eligible releases	Toxic substance incident releases total	341
	Releases resulting in one or more injuries	22 (6%)
	Releases that led to an official evacuation	43 (12%)
Type of release	Fixed-facility releases	133 (39%)
	Transportation releases	208 (61%)
Chemical-related fatalities	Chemical suicide	1
	Chemical release due to motor vehicle accident	1
Primary notification source	Department of Transportation	228 (67%)
	Emergency Government Services	69 (20%)
	Media	21 (6%)
	National Response Center	16 (5%)
	Other Government Services	7 (2%)

Table 2. Number, type, and severity of injuries that resulted from NTSIP-eligible toxic substance releases, North Carolina, 2016

Injury type ^a		Severity of injury ^a	
Respiratory system problems	42 (32%)	Death on scene or on arrival at hospital	2 (1.5%)
Headache	44 (33%)	Treated at hospital (admitted)	15 (11%)
Gastrointestinal problems	36 (27%)	Treated at hospital (not admitted)	80 (60%)
Dizziness or other CNS symptoms	41 (31%)	Treated on scene (first aid)	7 (5%)
Trauma (chemical related)	1 (0.8%)	Refused care (not treated)	29 (22%)
Heart problems	8 (6%)	Number of injuries sustained by each victim^a	
Eye irritation	4 (3%)	One injury	83 (62%)
Shortness of breath (unknown cause)	1 (0.8%)	Two injuries	39 (29%)
Skin irritation	1 (0.8%)	Three injuries	11 (8%)
Chemical Burns	9 (7%)	Total injuries: 194	
Other (injury not specified)	7 (5%)	Total injured persons: 133	

^aNon-chemical related injuries were not included; percentages are out of total injured persons (n=133)

Table 4. Types and number of responses to chemical releases, North Carolina 2016		
Type of Response	Number of Responses ^a	Responder injuries
Company's response teams	241 (71%)	
Fire department	63 (18%)	2
Law enforcement	46 (13%)	1
Third party clean-up contractor	37 (11%)	
Certified hazmat teams	35 (10%)	
Emergency management	35 (10%)	
EMTs	24 (7%)	5
Dept. of works, utilities, transportation (includes Coast Guard)	18 (5%)	
Other	6 (2%)	
Environmental agency or EPA	3 (1%)	
Health department or agency	3 (1%)	
Specialized multi-agency team	3 (1%)	
Total	514	
No Response	3 (1%)	
Unknown	4	4 ^b
Total incidences	341	

^a Percentages are out of total number of chemical releases (n=341) ^b unspecified responder

Table 3. Specified primary factors for Human Error and Equipment failure, 2016 ^a		
	Human Error	Equipment Failure
Improper loading, filling, or packing	70 (21%)	5 (1.5%)
Loose closure, component or device	21 (6%)	57 (17%)
Forklift puncture	23 (7%)	0 (0%)
Ruptured pipeline	16 (5%)	5 (1.5%)
Other	68 (20%)	0 (0%)
Dropped package	63 (18%)	0
Improper ventilation	4 (1%)	0
Improper instillation	1 (0.3%)	0
Valve failure	0	10 (3%)
System or process upset	2 (0.6%)	6 (2%)
Aging machinery	1 (0.3%)	10 (3%)
Impact with sharp or protruding object	5 (1.5%)	1 (0.3%)
Vehicle or vessel collision	7 (2%)	0
Vehicle derailment, rollover or capsize	3 (0.9%)	1 (0.3%)
Performing maintenance	3 (0.9%)	1 (0.3%)
Load shift	0	1 (0.3%)
Improper mixing	3 (0.9%)	0
Power failure or electrical problem	0	1 (0.3%)
Unauthorized or improper dumping	1 (0.3%)	0
System start up and shutdown	1 (0.3%)	0
Explosion or fire	1 (0.3%)	1 (0.3%)
Unknown	1 (0.3%)	4 (1%)
Total	226 (66%)	103 (30%)

^a Percentages are out of total number of chemical releases (n=341)

Table 5. Chemicals that contributed to ≥ 10 NTSIP-eligible toxic substance releases, North Carolina, 2016

Chemical ¹	Releases	Treated at hospital (admitted)	Treated at hospital (not admitted)	Treated on scene	Refused care	Total victims
Sodium hydroxide	65	0	0	0	0	0
Hydrogen peroxide	20	1	1	0	0	2
Sulfuric acid	20	1	0	1	0	2
Natural gas	19	0	0	1	0	1
Ammonia	12	0	0	0	0	0
Carbon monoxide	12	10	53	0	20	83
Corrosive liquids, NOS	10	0	0	0	0	0

¹ Chemicals that were released as a mixture or reaction are also included as part of this table

Table 6. NTSIP-eligible chemical releases contributing to injuries and corresponding number of evacuations in 2016

Chemical	Total number of releases	Releases with one or more victim	Total number of victims	Evacuations
Sulfuric acid	20	2	2	1
Hydrogen peroxide	20	2	2	0
Natural gas	19	1	1	16
Carbon monoxide	12	8	83	11
Hydrochloric acid	3	1	1	0
Chlorine	2	1	12	1
Reaction ¹	1	1	2	1
Reaction ²	1	1	7	1
Bleach	1	1	2	1
Trichloroisocyanuric acid	1	1	18	1
Diesel fuel	1	1	1	0
Hydrogen cyanide	1	1	1	0
Isopentane	1	1	1	1

¹ Reaction: Phosphoric acid
² Reaction: Chlorine/hydrochloric acid/nonylphenol polyethylene glycol ether/phosphoric acid/sodium hypochlorite/sodium sulfonate

Figure 1. Phases of transportation and areas involved in NTSIP eligible releases in 2015

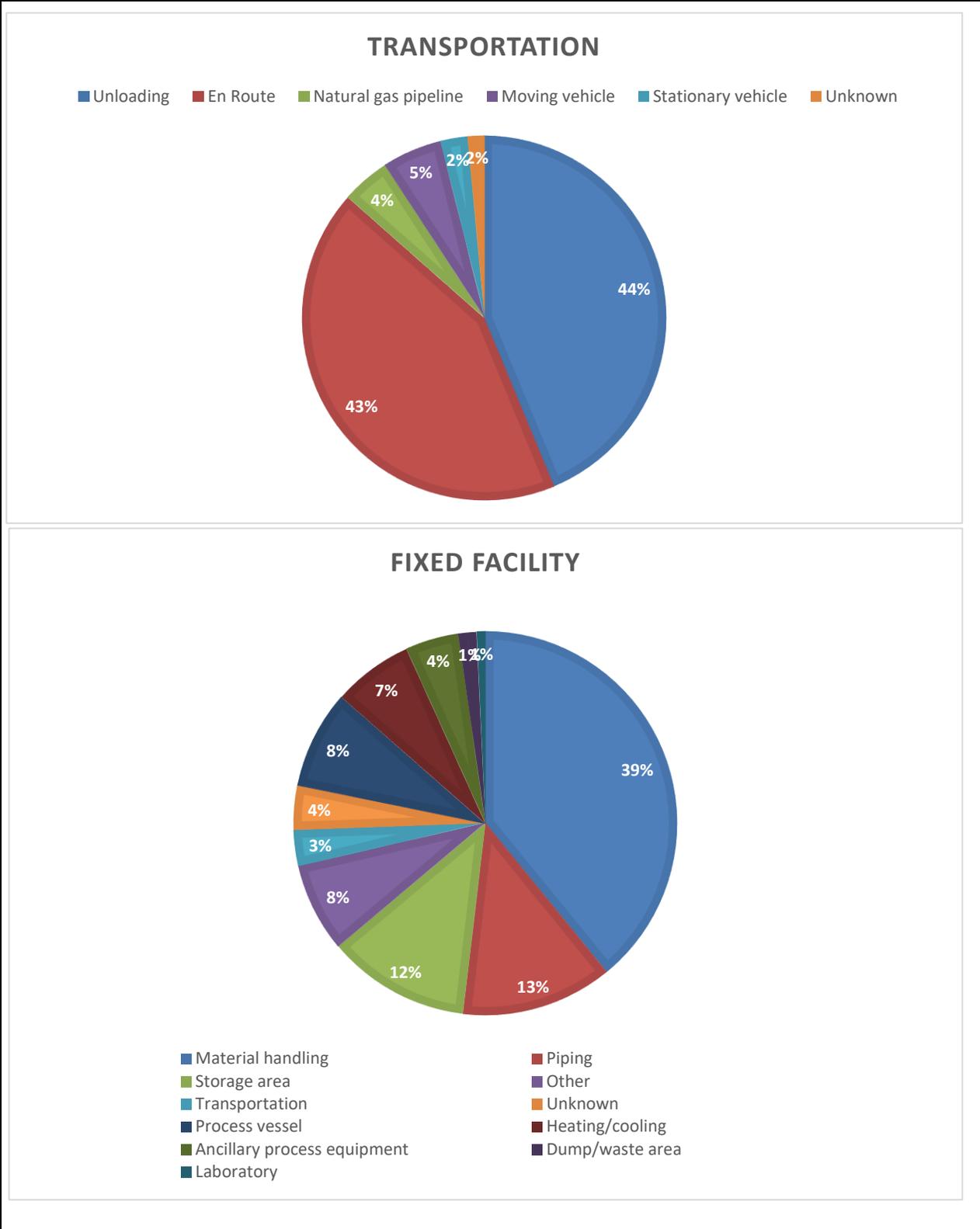
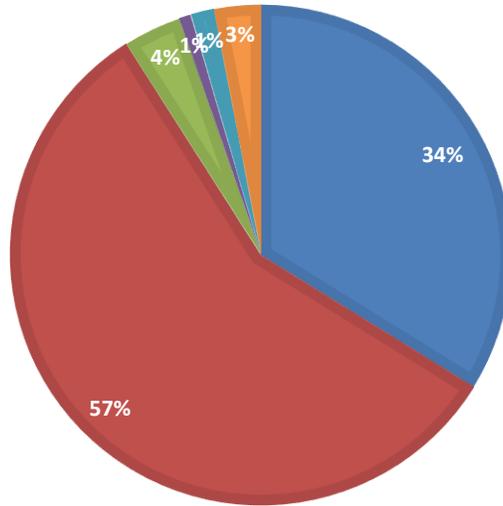


Figure 2. Victim Role and Age Distribution

VICTIM OCCUPATION

Employee General public EMT personnel Police officer Firefighter Unspecified responder



VICTIM AGES

Under 18 age 18-34 age 35-64 65+ Unknown

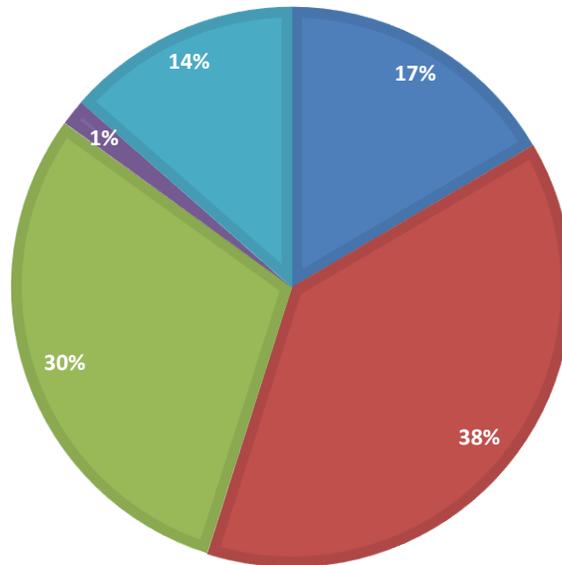


Figure 3. Event and injury totals comparing transportation and fixed facilities events and industry related releases versus private vehicle or residence

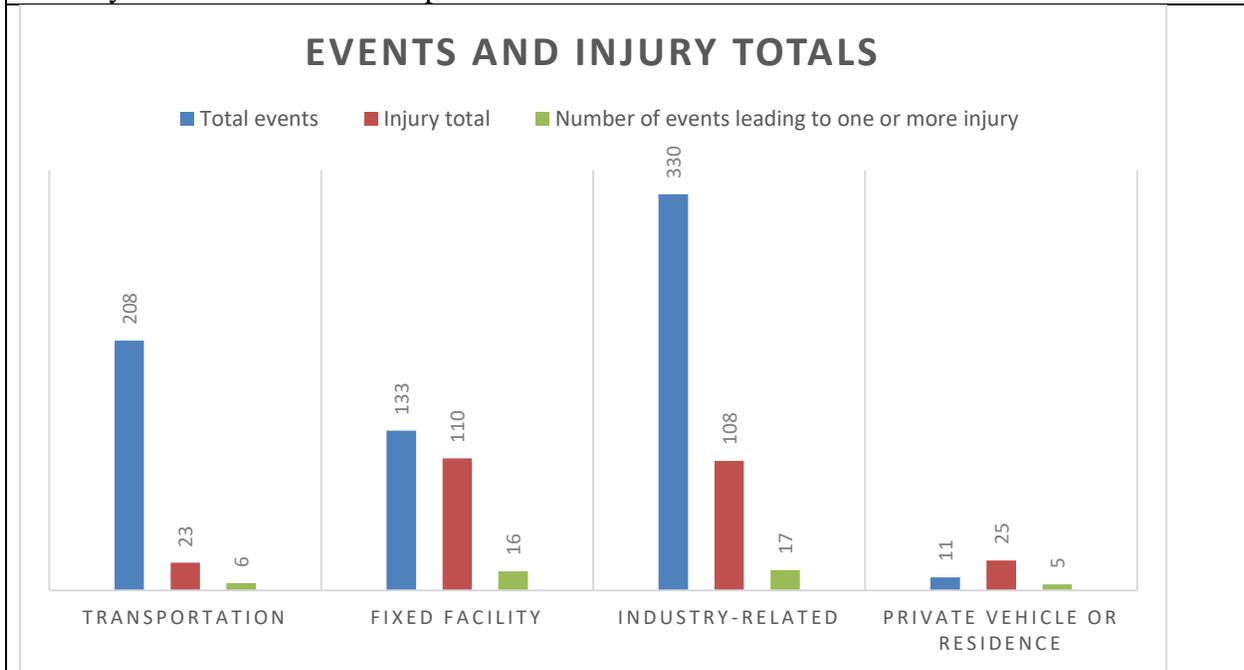


Figure 4. Evacuations after NTSIP-eligible toxic substance releases, North Carolina, 2016

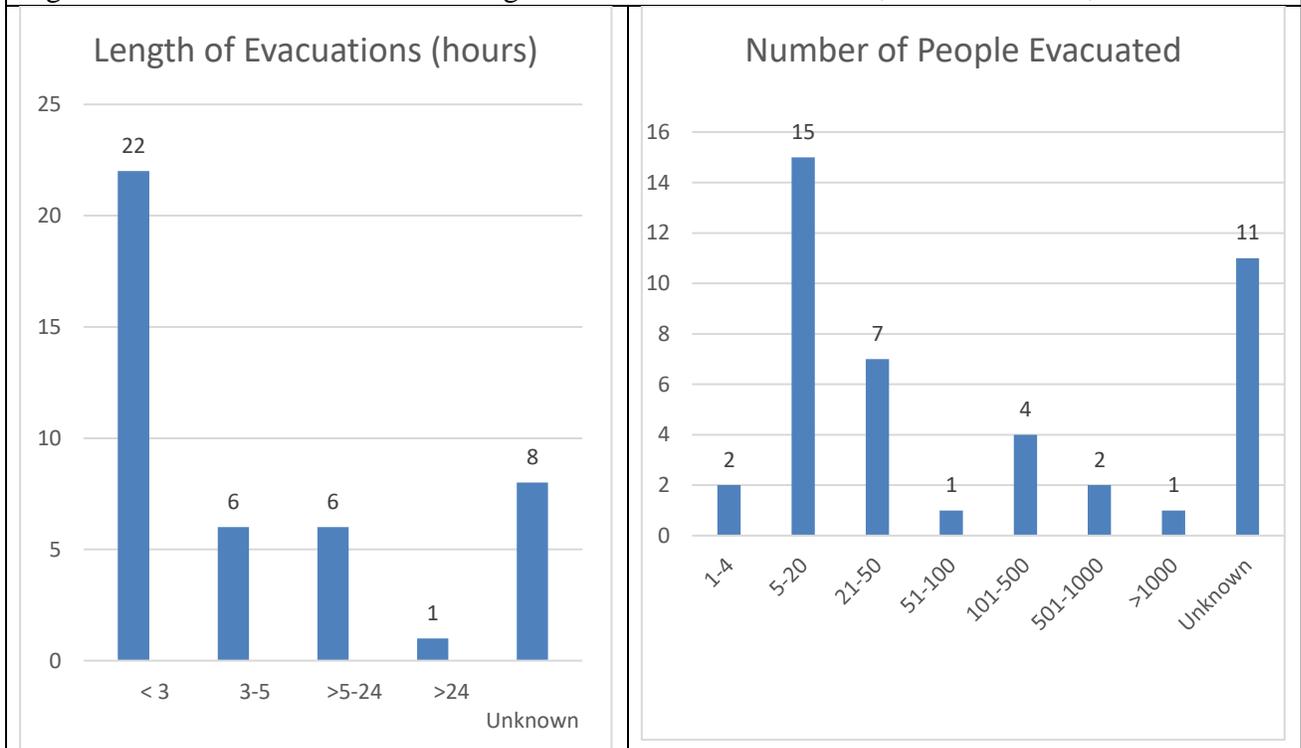


Figure 5. NTSIP-eligible events by month, day, and time of occurrence

