Public Health Reports

Tree-Related Injuries Associated With Response and Recovery From Hurricane Sandy, New Jersey, 2011-2014

Public Health Reports
2018, Vol. 133(3) 266-273

DOI: 10.1177/0033354918766871
journals.sagepub.com/home/phr

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Abstract

Objectives: Extreme weather events require extensive tree removal and disposal, tasks associated with severe injury risks among workers and residents. To help understand the risks of such activities, we evaluated the impact of a large and destructive storm (Hurricane Sandy in 2012) on the incidence of tree-related injuries.

Methods: We searched chief-complaint text fields for patients aged 18-65 from 2011-2014 emergency department visit records submitted by New Jersey hospitals through the state-based syndromic surveillance system. Tree-related keywords (eg, saw, branch, wood chip, woodchip, tree) identified possible injuries that we then reviewed to exclude unrelated cases and classify mechanisms of tree-related injury. We used Poisson regression analysis to evaluate changes in the rates of probable tree-related injuries, adjusting for total emergency department visits and seasonal variation.

Results: We identified 698 probable tree-related injuries from 2011-2014 among patients aged 18-65, including 104 (14.9%) falls, 241 (34.5%) machine-related injuries, 311 (44.6%) struck-by injuries, and 42 (6.0%) other tree-related injuries. Tree-related injuries increased significantly in the quarter immediately after Hurricane Sandy (November 2012–January 2013) compared with the same quarter the year before (rate ratio [RR] = 1.67; 95% confidence interval [CI], 1.13-2.47) and the year after (RR = 2.47; 95% CI, 1.62-3.78) Hurricane Sandy, especially for struck-by injuries compared with the year before (RR = 2.74; 95% CI, 1.47-5.12) and the year after (RR = 4.17; 95% CI, 2.09-8.32) Hurricane Sandy. More than one-third of the injuries (33.4%) involved chainsaws.

Conclusions: A major hurricane was associated with an increase in tree-related injuries in emergency departments, especially for mechanisms consistent with handling downed and damaged trees. Further research should confirm these findings and evaluate opportunities for preventing tree-related injuries.

Keywords

occupational injuries, epidemiology, trees, population surveillance, injuries

Extreme weather, including hurricanes, heavy rain, snow, flooding, or ice, causes extensive damage to buildings, transportation networks, and electrical lines. Numerous hazards are associated with response and recovery, from drowning to construction falls, but removing fallen and broken trees is particularly hazardous and is often performed under acute time pressure. Limited research and surveillance show that a substantial background injury risk and high rate of work-related fatalities[1-3] are associated with tree care, tree trimming, and tree removal. Tree workers sustain severe injuries through tree care and related operations,[4] and large numbers of emergency department (ED) visits are related to chainsaws (primarily used for cutting trees and branches).[5] After extreme weather events such as ice storms and hurricanes, downed trees must be trimmed or removed quickly from roads, buildings, and power lines to restore function and electricity, and these activities are associated with worker and homeowner injuries.[6,7] Furthermore, the occurrence of tree-related injuries might rise because of the increasing

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frequency of extreme weather events associated with climate change.[8]

Hurricane Sandy made landfall in New Jersey on October 29, 2012, affecting a wide and heavily populated region. The storm generated a massive response and recovery effort, when more than 8 million people lost electrical power and flooding upended transportation and housing.[6] New Jersey's largest electrical utility company estimated that 48 000 trees were trimmed or removed in the process of restoring power in their service area.[9] Of the 7 work-related fatalities in New Jersey immediately associated with Hurricane Sandy, 3 were tree-care workers (unpublished data, New Jersey Department of Health, Occupational Health Surveillance Unit, fatal occupational injuries surveillance, 2012). Some residents handling trees themselves also died of injuries.[10] Similarly, tree cleanup after Hurricane Matthew in 2016 resulted in deaths among workers[11] and residents.[12]

The research and surveillance data needed to quantify tree-related injuries and develop prevention plans are scant, especially for nonfatal injuries and changes over time. One reason for this lack of data is that tree-care tasks are performed by people in various industries, occupations, and consumer activities; thus, injuries associated with trees are difficult to enumerate in total or by type of company or job title. State-based health care data, such as hospitalization and ED billing data, may have diagnostic information on injuries, but available coding usually cannot identify detailed causes of injury.[13]

For natural disasters, it is especially important to evaluate surveillance data sources. This study adds to efforts to use syndromic surveillance systems as a tool for surveillance and prevention planning during and after extreme weather conditions. Syndromic surveillance was originally designed to quickly monitor emerging infectious diseases through records of ED visits. However, syndromic surveillance methods have evolved to evaluate other events, such as chemical exposures, heat-related illnesses, and occupational injuries.[14-17] We used chief-complaint text from ED visit records collected in New Jersey to assess the occurrence of tree-related injuries over time, with a particular focus on changes before, during, and after Hurricane Sandy.

Methods

We used EpiCenter,[18] a syndromic surveillance system developed and maintained by Health Monitoring Systems, Inc, for monitoring by health departments in the United States. Under the direction of the New Jersey Department of Health, EpiCenter is a secure online system that receives real-time ED data from 98% of acute-care hospitals and satellite EDs in New Jersey. The system accepts chief-complaint text generated from each step in the ED's triage process, along with limited information about the patients.

To characterize a major source of injury, we developed classifiers for tree-related injuries. Classifiers are keywords that specify certain events or outcomes and can be searched for in the chief-complaint field.[16] To finalize the classifiers, New Jersey Department of Health staff members with expertise in injury, occupational health, and surveillance proposed keywords and phrases specific to tree-related injuries (eg, saw, branch, wood chip, woodchip, tree) by reviewing a year of data of ED injury chief complaints. We consulted other resources (eg, tree-care experts) as needed to clarify inclusions and exclusions. We then proposed and applied possible keywords to the free-text chief-complaint field for all ED visits and generated additional exclusions through this process. Common word combinations that were not truly tree-related injuries were excluded, such as saw pmd, saw nurse, branchial, allerg, branch ave, branch ct, bundle, distree, extreme, peds, respiratory, saw blood, saw doc, saw dr, saw ped, spots, street, table saw, tablesaw, tree dr, and tree lane.

For this analysis, we reviewed data on ED visits from January 1, 2011, through December 31, 2014, by using specific keywords to identify 1324 possible tree-related injuries from chief-complaint fields. Variables provided by EpiCenter included date of visit to the ED, chief-complaint text, age, and sex. Project staff members who were familiar with tree-care operations and medical records reviewed the text for each potential case. We excluded 285 cases in which no injury was associated with trees or a tree-related activity. For example, unrelated chief complaints might include such phrases as "Cherry Tree Estates" or "branchial." We also excluded 12 injuries that coincidentally included a tree (eg, when a motor vehicle left the roadway and hit a tree), 4 duplicate cases, 41 cases with inadequate details for classification, and cases that were related to saws not used in tree work (eg, laceration to arm with jigsaw, $n = 67$) or involved an unknown type of saw ($n = 217$). We presumed that injuries resulting from machinery and tools primarily used in tree operations (eg, chainsaws, chippers) were tree related. We did not include data on patients aged <18 or >65 because those injuries were likely recreational or incidental interactions with trees.

Three staff members then classified the remaining 698 probable tree-related injuries by the injury mechanism, based primarily on the Bureau of Labor Statistics method of classifying fatal occupational injuries[19] according to 4 mechanisms: (1) machine related (typically lacerations or other injuries caused by chainsaws and other equipment), (2) falls (primarily injuries resulting from a fall from a tree or truck while cutting trees), (3) struck by (resulting from being struck by a falling or flying tree or branch), and (4) other (small number that did not fit into the first 3 categories). For a case of discordant classification, the reviewers evaluated the case and came to a consensus decision.

We used descriptive analyses to evaluate the characteristics of cases and occurrence over time by month, with a focus on Hurricane Sandy. To assess the effects of Hurricane Sandy on tree-related injuries, we considered the month beginning November 1, 2012, to be the first post–Hurricane Sandy month. (Sandy made landfall on October 29, 2012.) We computed monthly and yearly proportions of tree-related

Table 1. Characteristics of emergency department visits classified as tree-related injuries, New Jersey, January 2011 through December 2014[a]

Characteristics	2011	2012	2013	2014	Total
Total no. of visits	2 988 786	3 123 215	3 034 055	3 112 676	12 258 732
No. of visits for probable tree-related injuries	115	207	194	182	698
No. of participating facilities[b]	62	66	76	78	78
Age, y, no. (%)					
18-30	22 (19.1)	38 (18.4)	53 (27.3)	50 (27.5)	163 (23.4)
31-50	56 (48.7)	105 (50.7)	94 (48.5)	79 (43.4)	334 (47.9)
51-65	37 (32.2)	64 (30.9)	47 (24.2)	53 (29.1)	201 (28.8)[c]
Sex, no. (%)					
Female	18 (15.7)	15 (7.2)	11 (5.7)	28 (15.4)	72 (10.3)
Male	97 (84.3)	192 (92.8)	183 (94.3)	154 (84.6)	626 (89.7)
Mechanism or cause, no. (%)					
Fall	21 (18.3)	33 (15.9)	23 (11.9)	27 (14.8)	104 (14.9)
Machine related	33 (28.7)	63 (30.4)	74 (38.1)	71 (39.0)	241 (34.5)
Struck by	53 (46.1)	98 (47.3)	88 (45.4)	72 (39.6)	311 (44.6)
Other	8 (7.0)	13 (6.3)	9 (4.6)	12 (6.6)	42 (6.0)
Month, no. (%)					
January	1 (0.9)	5 (2.4)	14 (7.2)	6 (3.3)	26 (3.7)
February	1 (0.9)	5 (2.4)	6 (3.1)	3 (1.6)	15 (2.1)
March	2 (1.7)	12 (5.8)	17 (8.8)	10 (5.5)	41 (5.9)
April	4 (3.5)	16 (7.7)	23 (11.9)	34 (18.7)	77 (11.0)
May	4 (3.5)	13 (6.3)	15 (7.7)	17 (9.3)	49 (7.0)
June	8 (7.0)	20 (9.7)	26 (13.4)	19 (10.4)	73 (10.5)
July	8 (7.0)	19 (9.2)	16 (8.2)	21 (11.5)	64 (9.2)
August	22 (19.1)	12 (5.8)	13 (6.7)	17 (9.3)	64 (9.2)
September	5 (4.3)	19 (9.2)	17 (8.8)	15 (8.2)	56 (8.0)
October	27 (23.5)	27 (13.0)	23 (11.9)	15 (8.2)	92 (13.2)
November	25 (21.7)	41 (19.8)	17 (8.8)	16 (8.8)	99 (14.2)
December	8 (7.0)	18 (8.7)	7 (3.6)	9 (4.9)	42 (6.0)

[a]Tree-related injuries were determined by using text from chief-complaint fields from emergency department (ED) visit records submitted to EpiCenter,[18] an online system that receives real-time ED data from acute-care hospitals and satellite EDs in New Jersey.
[b]The total number of eligible EDs was 80.
[c]Not all percentages total to 100.0 because of rounding.

injuries by using the total number of ED visits reported to EpiCenter monthly from 2011 through 2014 to account for small increases in reporting volume as facilities joined the system. The number and proportion of facilities (of all 80 acute-care facilities) in New Jersey reporting to EpiCenter changed over time, from 62 (78%) in 2011 to 78 (98%) in 2014; however, the overall volume changed by less than 5%. To evaluate the short-term impact of Hurricane Sandy, we calculated and compared the monthly rate of tree-related injuries during November 2012 with each monthly rate 2 months before and 2 months after Hurricane Sandy (ie, September 2012–October 2012 and December 2012–January 2013). To assess the longer-term impact of Hurricane Sandy, we divided the hurricane study period into quarters (November-January, February-April, May-July, and August-October) for each 12-month period from November 2011 through October 2014. We compared the incidence of tree-related injuries during each quarter of the 12 months after Hurricane Sandy made landfall (defined as November 2012 through October 2013) with that of the same quarter the 12 months before and the 12 months after Hurricane Sandy. Comparing rates using the same time of year helped to control for the substantial seasonal variation in tree-related injuries.

We performed descriptive and Poisson regression analyses to assess the effects of the month of ED visit, age, sex, and mechanism/cause on the risk of injury. We calculated and compared rate ratios (RRs) of tree-related injuries using linear contrasts in Poisson regression analysis, with monthly incidence and quarterly incidence as the dependent variables. The volume of total ED visits reported to EpiCenter under logarithm transformation in the Poisson regression models served as an offset term to account for differences in reporting volume over time. In the short-term impact analysis, we included months, years, and months-by-years interaction as the independent variables. In the long-term impact analysis, we included quarters, years, and quarters-by-years interaction as the independent variables. We performed all statistical analyses using the GENMOD procedure in SAS version 9.4.[20]

Results

Of the 698 probable tree-related injuries identified during 2011-2014, we found the fewest cases (n = 115) and the

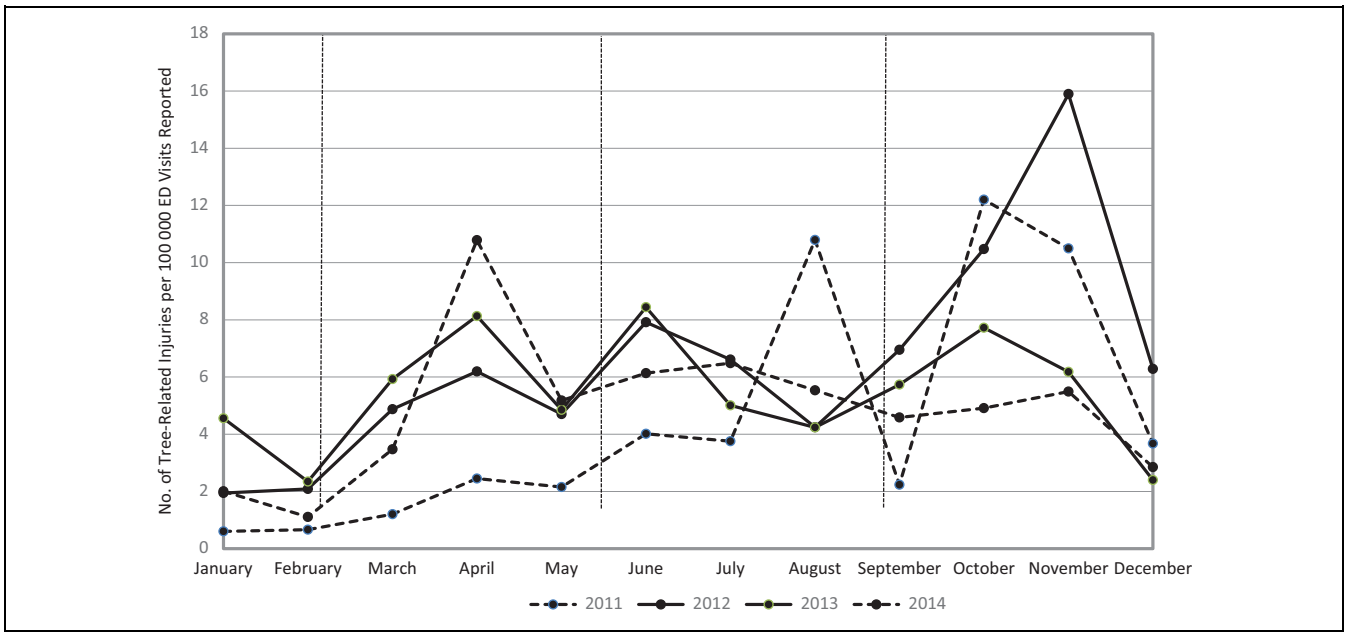

Figure. Monthly rate of probable tree-related injuries at emergency departments (EDs) before, during, and after Hurricane Sandy (n = 698), New Jersey, January 2011 through December 2014. Hurricane Sandy made landfall on October 29, 2012; Hurricane Irene made landfall on August 28, 2011; a major early snowstorm, "Snowtober," occurred on October 29, 2011. Tree-related injuries (n = 698) were identified by using the text from the chief-complaint field from ED visit records submitted to EpiCenter,[18] an online system that receives real-time ED data from acute-care hospitals and satellite EDs in New Jersey. Vertical lines indicate seasonal quarters (November-January, February-April, May-July, and August-October), beginning with November 1.

fewest participating hospitals (n = 62) in 2011 compared with other years (Table 1). Most injuries occurred among men (n = 626, 89.7%) and people aged 31-50 (n = 334, 47.9%). The most common mechanism or cause of tree-related injuries was struck by (n = 311, 44.6%) followed by machine related (n = 241, 34.5%). By season, fewer injuries occurred in the winter (December-February) than in other seasons. In addition to the peak rate of tree-related injuries (15.9 per 100 000 reported ED visits) in November 2012, several other estimated increases followed known extreme weather events. For example, the rate of injuries per 100 000 reported ED visits appeared to increase after Hurricane Irene arrived on August 28, 2011 (12.2) and after a major early snowstorm, "Snowtober," occurred on October 29, 2011 (10.5) (Figure).

A significant increase in all tree-related injuries occurred in the quarter immediately after Hurricane Sandy (November 2012–January 2013) compared with the corresponding quarters during the 12 months before (RR = 1.67; 95% CI, 1.13-2.47) and after (RR = 2.47; 95% CI, 1.62-3.78) Hurricane Sandy (Table 2). The increased number of tree-related injuries was caused by a substantial increase in the risk of struck-by injuries compared with the corresponding quarter in the 12 months before (RR = 2.74; 95% CI, 1.47-5.12) and the corresponding quarter in the 12 months after (RR = 4.17; 95% CI, 2.09-8.32) Hurricane Sandy. This increase in struck-by injuries was mostly confined to the first quarter after Hurricane Sandy, with nonsignificant increases after that, primarily in the second quarter after Hurricane Sandy (February 2013–April 2013). Nonsignificant increases in the risk of falls and machine-related injuries also occurred in the quarter after Hurricane Sandy compared with both the previous and subsequent time frames. For example, the immediate (1-month) effect of Hurricane Sandy resulted in similar RRs to those found for a quarterly (3-month) effect, based on fewer cases. The number of struck-by tree-related injuries increased significantly in November 2012 compared with November 2011 (RR = 1.93; 95% CI, 0.92-4.05) and November 2013 (RR = 5.61; 95% CI, 1.94-16.21).

The process of reviewing potential tree-related injuries revealed other helpful information. Many chief complaints included text identifying the type of injury (eg, laceration), the location of the injury (eg, hand or head), or the mechanism of injury (eg, fell out of tree, laceration to hand while cutting branch). For example, 91 of the 698 (13.0%) probable tree-related chief complaints reported injuries to the eye from a moving object. The chief-complaint text indicated that chainsaws caused at least 235 of the 698 (33.7%) tree-related injuries. Many chief complaints included the word "saw" as a mechanism, but the type of saw was not identified in 217 cases. Chainsaw-related injuries increased from 33 to 70 yearly cases from 2011 to 2014 and involved many parts of the body (based on chief-complaint text), including thigh, foot, arm, finger, face, knee, abdomen, and shoulder. Hurricane Sandy made landfall in New Jersey late on October 29; as such, tree-related injuries related to Sandy might have occurred on a few days in October. In October 2012, a total of 27 injuries occurred for the entire month,

Table 2. Number, mechanism, and rate ratios of quarterly tree-related injuries in the years before, during, and after Hurricane Sandy, New Jersey, 2011-2014[a]

Type of Tree-Related Injury	Year Before Hurricane Sandy, No.[b]	Hurricane Sandy Year, No.[b]	Year After Hurricane Sandy, No.[b]	Hurricane Sandy Year vs Year Before Hurricane Sandy, Rate Ratio[c] (95% CI)	Hurricane Sandy Year vs Year After Hurricane Sandy, Rate Ratio[c] (95% CI)
Quarter 1 (November-January)					
All tree-related injuries	38	73	30	1.67 (1.13-2.47)[d]	2.47 (1.62-3.78)[d]
Fall	6	8	6	1.16 (0.40-3.34)	1.36 (0.47-3.91)
Machine related	15	18	14	1.04 (0.53-2.07)	1.31 (0.65-2.63)
Struck by	13	41	10	2.74 (1.47-5.12)[d]	4.17 (2.09-8.32)[d]
Other	4	6	0	—[e]	—[e]
Quarter 2 (February-April)					
All tree-related injuries	33	46	47	1.29 (0.83-2.02)	1.07 (0.71-1.61)
Fall	5	4	6	0.74 (0.19-2.76)	0.73 (0.21-2.58)
Machine related	12	20	20	1.54 (0.75-3.16)	1.09 (0.59-2.03)
Struck by	15	22	16	1.36 (0.71-2.62)	1.50 (0.79-2.86)
Other	1	0	5	—[e]	—[e]
Quarter 3 (May-July)					
All tree-related injuries	52	57	57	0.97 (0.67-1.41)	1.04 (0.72-1.51)
Fall	9	3	7	0.29 (0.08-1.09)	0.45 (0.12-1.73)
Machine related	18	20	24	0.98 (0.52-1.86)	0.87 (0.48-1.57)
Struck by	20	29	24	1.28 (0.73-2.27)	1.26 (0.73-2.17)
Other	5	5	2	—[e]	—[e]
Quarter 4 (August-October)					
All tree-related injuries	58	53	47	0.84 (0.58-1.22)	1.22 (0.83-1.81)
Fall	12	9	9	0.69 (0.29-1.65)	1.09 (0.43-2.73)
Machine related	16	17	19	0.98 (0.50-1.94)	0.97 (0.50-1.87)
Struck by	29	23	15	0.73 (0.42-1.27)	1.66 (0.87-3.19)
Other	1	4	4	—[e]	—[e]

[a]Tree-related injuries were determined by using text from chief-complaint fields from emergency department (ED) visit records submitted to EpiCenter,[18] an online system that receives real-time ED data from acute-care hospitals and satellite EDs in New Jersey. The number of EDs that submitted data to EpiCenter varied during the reporting period and ranged from 62 in 2011 to 78 in 2014.

[b]Hurricane Sandy made landfall on October 29, 2012. The year before Hurricane Sandy is defined as November 1, 2011, through October 31, 2012. Hurricane Sandy year is defined as November 1, 2012, through October 31, 2013. The year after Hurricane Sandy is defined as November 1, 2013, through October 31, 2014.

[c]The rate ratio is estimated using Poisson regression analysis, comparing the count of injuries occurring from each quarter during the Hurricane Sandy year with the year before and the year after Hurricane Sandy, after adjusting for volume of visits reported.

[d]Significant at $P < .05$.

[e]Unable to estimate because of insufficient sample size.

19 of which occurred during October 29-31, including 10 struck-by injuries.

Discussion

Application of a new tree-related injury classifier to all ED chief-complaint data reported in New Jersey during the 4-year period identified 698 tree-related injuries among adults aged 18-65. The number of probable tree-related injuries increased significantly in the quarter after Hurricane Sandy made landfall in 2012, particularly in the first 30 days, when tree-care companies, local governments, utility companies, residents, and volunteers were working to restore electricity and basic infrastructure. Compared with similar timeframes in the year before and after Hurricane Sandy, most of the increase in tree-related injuries occurred among men who were struck by objects or other materials, primarily trees or branches. This finding is consistent with evidence describing the hazards of coping with downed and damaged trees compared with the hazards of working on upright trees. Downed trees can be unstable and unpredictable and are prone to shifting suddenly; damaged trees have easily broken or dislodged branches and are often in roadways with moving vehicles. Prevention of struck-by injuries requires hazard recognition and control, effective employee training, and appropriate selection and use of personal protective equipment.[21,22] Other mechanisms of tree-related injury also increased, including falls and machine-related injuries, but these increases were not significant and occurred at a lower rate than struck-by injuries. Focus groups with tree-care workers after Hurricane Sandy confirmed the hazardous conditions, including downed trees, long hours, grueling conditions, and the involvement of some companies with inadequate training and preparation.[23]

Although no directly comparable injury data are available, our results agree in general with previous research.

In 2 reports, the Centers for Disease Control and Prevention described the number of deaths directly related to Hurricane Sandy based on Red Cross mortality reports[24] and on injuries among a previously assembled cohort.[25] The most common outcomes were drownings and unspecified injuries sustained during clean-up and repair. An evaluation of all work-related injuries after Hurricane Sandy[14] found an increase among men in high-impact communities in the quarter after Hurricane Sandy; however, more consistent increases in work-related injuries occurred the following summer, during rebuilding. Tree-related injuries are seasonal in general; more tree-related injuries occur during the nonwinter months when residents and workers are outside than in the winter months. As such, it is important to compare the injury rates within seasons. Even within seasons, we found substantial increases in tree-related injuries during some years that coincided with other 2011 storms (eg, Hurricane Irene and Snowtober). Thus, the RRs for injury varied substantially, depending on which years and months served as the comparison. Data on the total volume of ED visits were available by month, so we defined the start of the Hurricane Sandy period as November 1, 2012, close to the date of impact. However, if we had included struck-by injuries occurring in the last 2 days of October in the Hurricane Sandy group, the RR in struck-by injuries associated with Hurricane Sandy likely would have been even stronger than that shown in our results. Overall, the results highlight the potential for ongoing but intermittent increases in tree-related injuries associated with extreme weather events.

Compared with data on tree-related ED visits, data on fatalities among tree-care workers showed a greater proportion of falls and electrocutions and a lower proportion of machine-related injuries. Struck-by injuries are a substantial proportion of both fatal and nonfatal occupational injuries.[26] Nearly all of the tree-related injuries identified in our study occurred among men, and the number of tree-related injuries among women did not increase after Hurricane Sandy. This finding suggests that most injuries occurred through active engagement with trees by workers and presumably some residents, rather than through incidental injuries under general storm conditions. In the United States, tree-care workers, utility maintenance workers, and volunteers performing tree work are primarily men.[27]

This study identified a large number of chainsaw injuries ($n = 235$) during the 4-year period and an increase in machine-related injuries after Hurricane Sandy. An additional >200 cases did not identify the type of saw, many of which were probably chainsaws. Our results confirm previous research indicating substantial injuries associated with chainsaws, both among consumers[6] and among employees of tree-care companies.[26] Substantial educational resources and equipment are available to prevent injuries from chainsaws,[28] but appropriate personal protective equipment (eg, goggles) and work practices (eg, not cutting above the waist) are often not used. Julius et al[29] noted that most employees of tree-care companies did not routinely use recommended personal protective equipment or safety procedures for chainsaws. Education and intervention in advance of extreme weather, or in conjunction with campaigns that raise awareness of expanding populations of tree pests,[30] could improve chainsaw safety among residents, volunteers, and workers.

Limitations

This study had several limitations. First, although almost all EDs reported chief complaints, some minor injuries might have been treated at independent urgent or primary care centers, which do not report to EpiCenter. Second, without another more detailed data source, we could not determine whether keywords identified all tree-related injuries in ED records. Although the tree-related injuries we identified probably did involve interactions with trees or parts of trees, we could not further investigate false negatives. For example, falls from aerial lifts that are used in construction, utility work, and tree care might not indicate if a tree was involved. Third, this study required substantial staff member time and expertise to manually review text, even after possible tree-related injuries were identified electronically. Finally, the text and variables reported by facilities via EpiCenter provide limited information about the case. Because diagnostic codes were sometimes but not always available in EpiCenter, we could not measure the severity of injuries. Demographic data on patients, such as ethnicity and payer, also were not available. For example, Hispanic workers constitute an increasing proportion of tree-industry fatalities[31] and the tree-care workforce in general,[4] and examining subgroups could better target prevention in vulnerable groups. Even if available, diagnostic and disposition codes in the ED record, including codes for disease and external cause, do not generally indicate the mechanism or cause of the injury except in general ways. For example, previous work showed that most ED billing records in New Jersey were missing the code for location.[13] For injuries, the external cause of injury codes usually identify the probable mechanism (eg, struck-by or fall) but do not further identify the circumstances. Even medical records often do not include important details, such as whether the injury is work related and the circumstances of injury.

Conclusions

Tree-care services are a major industry, putting many workers at potential risk of injury because of the large number of private arborist and landscaping companies, in addition to utility companies, state agencies, and municipalities. Almost all of these entities perform tree trimming and removal services using potentially hazardous equipment and practices. Data on risks to workers, homeowners, volunteers, and others from tree removal and trimming, including during recovery from weather events, are limited. This study used the chief-complaint field text from ED visit records to show an increase in tree-related injuries after a natural disaster and

identified mechanisms of injury that might be prevented through improved planning. For example, advanced planning for storms could include disseminating techniques to safely handle storm-downed trees or expanding resources for untrained chainsaw users. Further research is needed to evaluate prevention strategies for reducing tree-related injuries.

Acknowledgments

The authors acknowledge the important role of our stakeholder advisory group, which shared important insights about tree-care practices and storm response. We thank Heather Jordan and Stella Tsai for their help in obtaining and processing data. We also appreciate the administrative support and oversight led by Mitchel Rosen at the Rutgers School of Public Health and Margaret Lumia at the New Jersey Department of Health.

Declaration of Conflicting Interests

The authors declared no conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors declared the following funding with respect to the research, authorship, and/or publication of this article: the US Department of Health and Human Services Office of the Assistant Secretary for Preparedness and Response grants to support collaborative scientific research related to recovery from Hurricane Sandy (Grant # HITEP140016).

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