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Compliance with the ANSI Z133.1 — 2006 safety standard among arborists in New England ☆

Alex K. Julius [a,*], Brian Kane [a], Maria T. Bulzacchelli [b], H. Dennis P. Ryan III [a]

[a] University of Massachusetts — Amherst, Department of Environmental Conservation, United States
[b] University of Massachusetts — Amherst, Department of Public Health, United States

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ABSTRACT

Introduction: Arboriculture is hazardous work. A consensus safety standard exists, but little is known about compliance with it. This study aimed to determine whether accreditation and certification are associated with safety practices and to identify specific safety practices adhered to most and least. *Method:* Sixty-three tree care companies in southern New England were directly observed on job sites. Adherence to the American National Standards for Arboricultural Operations (ANSI Z133.1 — 2006) was compared across companies that were accredited, non-accredited with certified arborists on staff, and non-accredited without certified arborists on staff. *Results:* Companies with accreditation or certified arborists demonstrated greater safety compliance than those without. However, low compliance was found across all company types for personal protective equipment (PPE) use, chain saw safety, and chipper safety. *Conclusions:* Greater attention to PPE, chain saw, and chipper practices is warranted across the industry. Safety in non-accredited companies without certified arborists especially needs improvement. *Practical Application:* Only partial compliance was found among accredited companies and companies with certified arborists. Intervention strategies are needed for all company types for the use of PPE and safer use of chain saws and chippers.

1. Introduction

Arborists are exposed to many occupational dangers, and, thus, require a honed skill-set to reduce the likelihood of injury in the workplace. The Bureau of Labor Statistics reported 14.1 fatalities per 100,000 U.S. tree workers in 2003, which was much greater than the overall fatality rate of 4.0 fatalities per 100,000 workers (Wiatrowski, 2005). According to data from the Census of Fatal Occupational Injuries, 1285 workers in the United States died from 1992 to 2007 as a direct result of tree care operations, most commonly from contact with an object such as a tree or branch (42% of fatalities), falls (34%), and electrocutions (14%; Castillo & Menéndez, 2009). Mobile wood chippers were also quite dangerous; they were responsible for 31 deaths in the United States from 1992 to 2002 and approximately 155 amputations from 1992 to 1996 (Struttmann, 2004).

To help reduce work-related injuries and fatalities, an advisory group of arborists, government and insurance agencies, and manufacturers developed an industry standard in accordance with the American National Standards Institute (ANSI; Ryan & Kane, 2006). The ANSI Z133.1 — 2006 (ANSI, 2006) describes safe work practices for tree care operations and is designed to aid in the regulation of industry safety for governing bodies such as the Occupational Safety and Health Administration (OSHA). Established in 1972, the ANSI Z133.1, hereafter referred to as the Standard, has been revised several times: 1979, 1982, 1988, 1994, 2000, 2006, and 2012. The Standard is currently revised every six years. In an effort to mitigate the high injury and fatality rate, the Standard provides guidelines for safe arboricultural operations. These guidelines include specific processes for operating a chain saw, brush chipper, and aerial lift, and describe appropriate use of specific personal protective equipment (PPE). Although the Standard was implemented in 1972, little is known about compliance with it.

The tree care industry, through trade associations and affiliates, developed certifications and accreditation, in part, to educate arborists about safety in the workplace. Certifications and accreditation are voluntary. Accreditation is an extensive process, administered by the Tree Care Industry Association (TCIA), and safety is only one of its aspects. Accreditation was designed to develop a higher standard of tree care, giving a special designation to companies that uphold a code

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* Corresponding author at: International Society of Arboriculture, 2101 W. Park Ct., Champaign, IL 61821, United States. Tel.: +1 818 212 4622(Cell), +1 217 355 9411x235(Work).
E-mail addresses: alexkjulius@gmail.com, ajulius@isa-arbor.com (A.K. Julius).

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of ethics, employ professional staff, and adhere to the Standard. Safety requirements that companies must meet to become accredited include having a safety orientation for new employees, employing a Certified Treecare Safety Professional (CTSP) for companies with more than 10 employees, holding weekly safety meetings, and performing all arboricultural operations in compliance with the Standard. Companies must also employ at least one certified arborist or person with an associate's or higher degree in a field related to tree care for every 10 production employees. Accredited companies must be re-accredited after their first three years, and annual safety inspections associated with re-accreditation are random (TCIA, 2010).

The International Society of Arboriculture (ISA) arborist certification is granted to an individual who holds the minimum credential of three years of full-time experience in the tree care industry or college degree in a related field, and who successfully completes a professional exam (ISA, 2012). Among other topics, the ISA exam covers arboricultural safety, but it is purely a written exam; applicants do not need to demonstrate any field skills. Arborists maintain their ISA certification by accumulating 30 continuing education units at three-year intervals. These can be acquired through workshops, publications, and various other sources. ISA Certified Arborists® can pursue any or all of five additional certifications (utility specialist, municipal specialist, climber specialist, aerial lift specialist, board certified master arborist). Each requires different levels of technical knowledge and field experience; some require a skills test. It has been suggested that ISA Certified Arborists® provide a better breadth of arboricultural knowledge than those without certification (Lilly, 2001).

Other qualifications are available to arborists in New England. For example, professional associations in Massachusetts and New Hampshire administer voluntary certification programs for arborists seeking associated credentials (MAA, n.d.; NHAA, 2014). In these states, applicants must pass an exam to become certified. In some states, individuals who wish to practice arboriculture must meet mandatory standards. For example, Connecticut, Maine, and Rhode Island require licensing of arborists (Connecticut DEEP, 2013; Maine DACF, 2014; Rhode Island DEM, 1996).

To the extent that the accreditation and certification processes focus on safety, it might be expected that workers in companies that are accredited or have a certified arborist on staff would be more likely to exhibit safe work practices in accordance with the Standard than companies without accreditation or certified arborists. However, no research to date has examined differences in safety practices between different types of companies. The objectives of this study are: (a) to determine whether accreditation and certification are associated with safety practices and (b) to identify specific safety practices most and least commonly followed by tree care workers.

2. Method

2.1. Study design

A cross-sectional comparative study design was used to assess safety practices among workers engaged in residential and utility arboriculture. Companies were initially classified into three categories: (a) accredited (Class A); (b) non-accredited with certified arborists on staff (Class C); and (c) non-accredited without certified arborists on staff (Class N). A fourth category (Class C_{CO}) was later created to include only the subset of companies in Class C not engaged in utility arboriculture. Companies were directly observed on job sites to determine their level of compliance with the Standard. Potential confounders included several job characteristics: (a) job tasks (e.g. climbing, rigging, ornamental pruning, all other pruning, removal); (b) tools required for each task (e.g. chain saw, aerial lift, chipper, crane); (c) job site location (e.g., street side, private property, utility); (d) time of day; (e) day of the week; (f) real estate value of the property on which crews worked; (g) local median household income; and (h) distance traveled from the company's office to the job site. Job tasks, tools required, job site location, time of day, and day of week were recorded by the observer. Real estate value was estimated from Zillow's Zestimate feature (Zillow, n.d.). Median household income was obtained from the 2000 Census (U.S. Census Bureau, n.d.). Distance traveled was estimated using Mapquest's Maps & Directions feature (Mapquest, n.d.).

2.2. Study population

The study area was defined as a circle with a radius of 80 miles (128 km) around Amherst, Massachusetts, and included parts of Massachusetts, Connecticut, Rhode Island, New York, New Hampshire, and Vermont. The following major cities were included in this area: Albany, Boston, Hartford, New Haven, Providence, and Springfield. The 80 mile (128 km) radius around Amherst was chosen to include both a large pool of prospective companies and a variety of communities, while maintaining a feasible driving distance throughout the region.

Lists of all accredited companies and certified arborists for hire within the study area were gleaned from TCIA's online Accreditation Directory (TCIA, 2011) and ISA's online Arborist Search tool (ISA, n.d.). Each company in Classes A and C was numbered in alphabetical order, and a random number generator was used to select 20 companies for each category. Multiple branches of the same company were considered individually since previous work in other industries has demonstrated the importance of an individual crew leader with respect to safety awareness (Kines et al., 2010). This was consistent with the authors' personal experience and communication with safety officers from tree care companies. Companies in Class N were not pre-selected because readily available directories provide insufficient, often outdated, information. Instead, companies in Class N were sampled opportunistically while observing pre-selected companies in Classes A and C. Companies employing a certified arborist frequently include a prominent logo on vehicles. This filter was used in the field to determine whether a company would be eligible for Class N. After data collection, all companies originally considered to be in Class N were checked against TCIA's Accreditation Directory (TCIA, 2011) and a list of certified arborists (ISA, n.d.). While attempting to acquire 20 observations in Class C, three additional companies (2 in Class N and 1 in Class A) were observed. The final sample size was 21, 20, and 22 companies in Classes A, C, and N, respectively.

2.3. Data collection

A data collection form was developed for field use (one-sided, standard letter size); it included 30 aspects of the Standard arranged in 6 summary groups (Table 1). Three criteria were used to select aspects of the Standard to include: (a) the likelihood that a violation of the aspect would result in a potentially injury-causing incident; (b) the ease of determining compliance from a distance; and (c) the extent to which the authors' personal observation and anecdotal evidence suggested a high degree of non-compliance. Although it is not required in the Standard, “not operating a chain saw above the shoulders” was included as an aspect of safety because this suggestion occurs in chain saw user manuals (Husqvarna, 1991; Stihl, 2000). Compliance was treated as a binary response (yes = 1, no = 0), and individual aspects of the Standard were interpreted strictly. During a pilot test, two observers independently observed 3 three companies; inter-rater reliability was 94%.

All observations were made between July and December 2010 by the lead author. From the list of randomly selected companies in Classes A and C, an individual company was selected for observation on a particular day based on the observer's location, with some attempt to stratify observations by company type, month, day of the week, and time of day. For example, if a company in Class C was observed near Boston, MA on a Monday, the observer would pick a company in Class A in Boston to observe on Tuesday. The observer arrived at the office of the first company