

Fire Safety — a Remarkable Success Story

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AS WITH ANY OTHER TECHNICAL PROFESSION, fire safety professionals tend to get deeply involved with daily issues, controversies, crises, and other events of the moment. This is natural and happens in all professions. But it can be healthy and refreshing to consider the remarkable achievements that have occurred in this field. Undoubtedly, the easiest way to measure the success of fire safety efforts is by considering the annual death toll due to fire. This is because fire fatalities are a categorical (“yes/no”) variable. Meanwhile, fire injuries or dollar losses are much harder to assess in a reliable manner.

Figure 1 shows the U.S. national fire death statistics as reported by two organizations: the National Safety Council (NSC)^[1] and the National Fire Protection Association (NFPA)^[2]. The period covered spans the entire record available — 1913 through 2018, a period of 106 years. Also shown is a curve-fit to the data which corresponds to:

$$y - \left(\frac{78,655}{x} - 38.1 \right)^2 \quad \text{for 1913 - 2010}$$

$$y = 1.04 \quad \text{for 2010 - 2018}$$

where x = year and y = death rate. The population of the United States has continually grown during this period, so simply the gross number of annual deaths would not be correctly indicative of the safety status; instead, it is important to normalize the number of deaths by the current U.S. population.

The results shown here are striking. Over the period of slightly more than one century, the death rate dropped from 9.13 deaths per annum, per 100,000 population, to 1.04 — a reduction of more than eightfold. These numbers are based on the curve-fit equation, which is helpful to smooth out annual fluctuations. The outlier in the NFPA data for 2001 represents the slightly under 3,000 individuals who perished in the World Trade Center attacks of September 11, 2001. More appropriately,

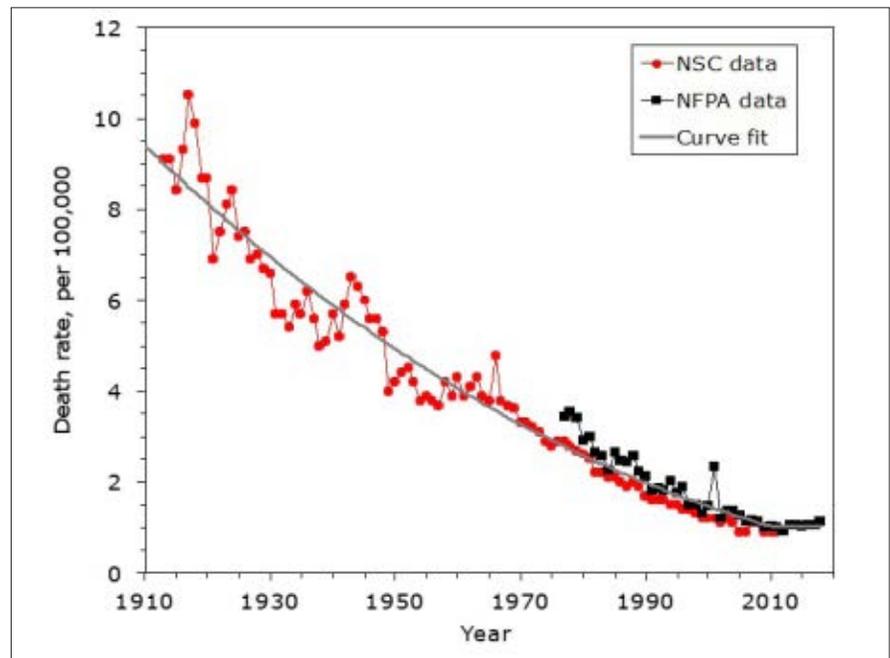


FIGURE 1. Annual Fire Death Rate from 1913 through 2018 (Source: NSC and NFPA data)

the NSC did not include these in their statistics. After all, the buildings were destroyed due to terrorist attacks, which should not be considered a fire loss, as such losses are normally understood.

An eightfold-plus improvement in anything is a remarkable achievement, so it is worth it to appreciate and savor this state of affairs. It is surprising that this situation has not received much more widespread

coverage, but it is also important to consider the reasons for this remarkable improvement. There is no way to do this by analysis of statistics. But it is possible to make a reasonable experience by means of professional experience. So, we should consider what are likely to be the primary reasons.

In the early parts of the 20th century, there were severe fire losses due to lack

of central heat in much of the country's housing. Instead, people tended to use coal or wood stoves, and especially, kerosene space heaters. There were notoriously unreliable and led to a large number of casualties.

Another factor was poor construction practices, which resulted in much of urban housing consisting of slums or very poor-quality housing, with wholly inadequate safety measures. It is important to remember that building codes were just starting to be utilized in the first decades of the 20th century. These have progressively gotten more sophisticated and more broadly encompassing.

A major factor is the rising of the educational level of the citizenry. In the first decade of the 20th century, a much smaller fraction of the population had a high school education, and an even smaller fraction

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were college graduates. The educational status has improved throughout the decades. Also, primary schools started teaching fire safety basics to children, which did not exist earlier.

Modern fire departments are vastly better equipped and trained than were their forebears a hundred years ago. This allows fires to be more effectively suppressed. Healthcare and EMS services also progressively improved, so that someone who might have been a fire victim 100 years ago

would have a higher chance of successful recovery today. Smoke detectors are a remarkable success story, especially due to their exceedingly low cost. Automatic sprinklers have also played a role, especially in reducing losses in hotels, schools, and institutions. Also, during the last several decades, smoking has greatly diminished.

Persistent safety improvements occurred despite some negative factors. Starting around 1970, plastics assumed a major role in furniture and furnishings. These have a higher fuel content and can show more rapid firespread, yet steady improvements continued right until the recent leveling off (2010 until now). Also, due to cost-saving measures, lighter weight and less fire-resistant construction methods became more popular in the last 30 to 40 years, yet improvements continued. Finally, it is worth noting that despite these successes, there still remain some areas where the profession should make further strides.^[3] 



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References

1. compiled from the annual *Injury Facts*.
2. compiled from annual NFPA reports.
3. Babrauskas, V., Some Neglected Areas in Fire Safety Engineering, *Fire Science & Technology (Tokyo)* 32:1, 35-48 (2013).