

Study suggests frailty makes elderly more likely to die in home fires

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A firefighter helps an elderly couple plan for their escape from a home fire. A new NIST study suggests that seniors are more likely to die in residential fires and that fire safety measures should address their age-related vulnerability. Credit: US Fire Administration

A new study by the National Institute of Standards and Technology

(NIST) shows scientifically for the first time that an individual's ability to respond quickly to a residential fire determines who dies and who gets injured. Home fire deaths, the NIST researchers state, are more likely among those they define as frail populations—persons who are not in robust health and primarily age 65 and older—while nonfatal injuries occur more often in adults ages 20 to 49.

The findings suggest that vulnerability to fires in homes could be mapped for communities across the United States based on age demographics, and in turn, measures designed to prevent fire deaths and injuries could be targeted to the appropriate populations to maximize their effectiveness.

The study appears in the research journal *Injury Prevention*.

Previous research, said David Butry, chief of the Applied Economics Office in NIST's Engineering Laboratory, tried to link both fire deaths and injuries in homes to the overall fire risk rather than the role of occupant vulnerability once a fire was underway. "Those studies couldn't say whether the elderly disproportionately fall victim to fires because they live in places with higher-than-average fire ignition threats or because they are unable to respond quickly to a fire and get to safety," he said.

In their study, Butry and his colleague, NIST economist Stanley Gilbert, used U.S. Census data to define the populations of interest; data from the National Fire Incident Reporting System, a national database managed by the Department of Homeland Security, to document the number of fire events and injuries/fatalities from fires; and statistics from the Centers for Disease Control and Prevention on deaths from natural causes for comparison with fire-related fatalities. The researchers used the National Fire Protection Association definition for homes that excludes other residences such as nursing homes, other assisted living facilities, institutions and hotels. They focused on the five-

year period from 2009 to 2013.

What Butry and Gilbert found during that interval was that home fires resulted in an average of 2,740 deaths and 13,300 injuries per year, accounting for 84 percent and 77 percent of all fire-related fatalities and injuries, respectively. Thirty-two percent of all home fire deaths were among the elderly age 65 and older, although they represented only 13 percent of the U.S. population. In contrast, adults between ages 20 and 49 made up 42 percent of the population but represented only 25 percent of home fire deaths.

The opposite proved true for injuries from home fires. Butry and Gilbert found that adults ages 20 to 49 experienced 50 percent of the nonfatal injuries while those aged 65 or older were recorded at 13 percent. Neither the disproportionately high [death](#) rate among the elderly nor the high [injury](#) rate among young to middle-aged adults could be completely explained by the overall risk of a fire occurring.

"If fire risk was the critical factor in determining the number of deaths and injuries, then we should have seen no differences in the rates for the elderly and adults 20 to 49," Butry explained. "But we did find differences between the age groups, so another factor had to be involved."

Gilbert said that the NIST study strongly suggests that communities should evaluate and address home fire risks for occupants based on age. "Our findings indicate that frailty, especially in elderly populations, hinders the ability to escape and should be recognized as a key factor in home fire deaths," he said. "Therefore, measures to overcome this population-specific vulnerability, such as automatic sprinklers in bedrooms, may help reduce the number of fatalities."

The findings of the NIST study will be put to work immediately as they

are incorporated into a recently launched national interactive online tool that defines "fire risk environments" across the United States. Known as the Fire-Community Assessment/Response Evaluation System (link is external), or FireCARES, the big data analytical system provides fire departments with a decade of research on structure fires and related deaths and injuries in various communities. It also makes available building plans, residential and mobile housing locations, public health and census data, and statistics on vulnerable populations. FireCARES was developed and established by NIST and eight partners in the [fire](#) research, first response and safety communities to address needs revealed in two NIST-led studies on residential and high-rise fires.

"The overarching goal of FireCARES is to assist emergency responders in making sound decisions, based on quantifiable data," said Lori Moore-Merrell, assistant to the general president of the International Association of Fire Fighters and FireCARES project manager. "The insights gleaned from this study not only have immediate impact on the risk assessment portion of the FireCARES project, but also on overall emergency response planning in local communities."

Butry and Gilbert next plan to use different models to confirm the findings of the study reported in *Injury Prevention*. "We also hope to tackle some outstanding questions, such as how do you identify a person as frail or not, moving our research from group-level to individual metrics," Butry said.

More information: Stanley W Gilbert et al, Identifying vulnerable populations to death and injuries from residential fires, *Injury Prevention* (2017). [DOI: 10.1136/injuryprev-2017-042343](https://doi.org/10.1136/injuryprev-2017-042343)

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