

Learn the Sounds of Fire Safety™

By Drew Hinton, President/CEO of Arrow Safety, LLC

Fire Prevention Week™ is upon us! As a former career firefighter, this was one of the best times of the year for me. Rather than having to see members of our community when their home is on fire or when they've been in a car wreck, we were able to take a proactive approach and talk about fire prevention, both in and out of the workplace. We would get to go to local schools, have someone on our crew put on all of their turnout gear (typically the "probie"), and discuss the sounds of fire safety. However, there is so much more than just knowing what a fire alarm sounds like. The 2021 Fire Prevention Week™ campaign from the National Fire Protection Association (NFPA) is called "Learn the Sounds of Fire Safety"™.

Do Your Kids Know What A Smoke Alarm Sounds Like?

"Hear a beep? Get on your feet!" We should be teaching our children that whenever they hear a smoke alarm go off, they need to get out of the house and go to a designated safe place. But how many of us, as adults, need to remember that, too? How many of us have heard a smoke alarm go off in our house or heard a fire alarm at work and just sat there saying to ourselves "This is just another drill..." or "Did somebody burn something in the oven?" While it's ok to take a quick glance around if there's no smoke present, we don't want to spend too much time investigating and end up trapped in a dangerous situation. Make a quick assessment, and unless you can verify it's a fire alarm within a few seconds, evacuate and proceed to a safe place. You can always verify later if your favorite casserole was left in the oven a little too long.



Is "Beep, Beep, Beep" the Best?

In one recent study published online in *Pediatric Research*, researchers examined four different smoke alarms to determine which ones worked best to wake children from deep sleep and prompt them to perform an escape procedure: a male voice, female voice, combination of a low-frequency tone plus a female voice (hybrid alarm), or high-frequency tone. The research included 188 children ages 5 to 12 years

old studied at a sleep research center in Columbus, Ohio. The researchers found that the male voice, female voice, and hybrid voice-tone alarms awakened **85-89%** of children and prompted **84-89%** to “escape” from the bedroom, compared with **56%** awakened and **55%** escaped for the high-frequency tone alarm.

In a real fire, there is a narrow window of time for everyone to get out of the burning building (ever seen the [NIST study on a dry Christmas tree?](#)). If a child takes too long to wake up and escape, serious injuries or death could occur. In this study, the median time to escape for the male voice, female voice, and hybrid voice-tone alarms was **12-13 seconds**, whereas it was more than a minute and a half - **96.5 seconds** - for the high-frequency tone alarm. The study authors concluded that there were no significant differences in the effectiveness of the male voice, female voice, or hybrid alarms when compared with each other, and that they all outperformed the high-frequency tone alarm. When used in children’s sleep areas, the male voice, female voice, or hybrid alarms may reduce residential fire-related injuries and deaths among children old enough to perform self-rescue.



According to Mark Splaingard, MD, co-author of the study and director of the Sleep Disorders Center at Nationwide Children’s, “Children are remarkably resistant to awakening by sound when asleep. Children sleep longer and deeper than adults and require louder sounds to awaken than adults, which means they are less likely to awaken and escape a nighttime home fire. The fact that we were able to find a smoke alarm sound that reduces the amount of time it takes for many children to wake up and leave the bedroom could save lives.”

This was the fourth study in a series looking at children’s responses to various types of non-traditional smoke alarms. The [original study in 2006](#) tested the concept of using the mother’s voice to wake children from deep sleep and prompt their “escape.” It demonstrated that the alarm was effective, but researchers needed to figure out what component of the alarm’s signal was responsible for success: the use of a child’s first name in the voice message, specifically the mother’s voice (vs. any human voice), or the frequency of the signal.

A [study published in 2019](#) tested mother’s voice smoke alarms that did and did not include the use of the child’s first name in the message; these alarms were compared with each other and to a high-frequency tone alarm. **Researchers found that a sleeping child was about three times more likely to be awakened by one of the three mother’s voice alarms than by the tone alarm.** The median time to escape for the high-frequency tone alarm was 282 seconds - **nearly five minutes** - while the median times to escape for the mother’s voice alarms ranged from **18 to 28 seconds**. Importantly, no significant differences were found between each pair of the voice alarms, regardless of whether the child’s name was included in the message. Therefore, personalizing the alarm message with the child’s first name **did not** increase alarm effectiveness, which simplifies the development of an effective and practical smoke alarm for sleeping children.

A [study published in 2020](#) tested four smoke alarm signals: the voice of the child’s mother, the voice of a

female stranger, a low-frequency tone, and a high-frequency tone. The two voice alarms and low-frequency tone alarm significantly outperformed the high-frequency tone alarm, with the low-frequency tone alarm and female stranger’s voice alarm performing best. This confirmed that a generic female voice worked as well as the mother’s voice, again simplifying the development of an effective smoke alarm for sleeping children.

While having an alarm that wakes children is important, it also needs to wake the adults in the home. A fifth study, recently published in *Injury Epidemiology*, evaluated whether the alarms that are effective in awakening children and prompting their escape were also effective among adults 20-49 years old. Almost all (149 of 150) adults awakened and performed the escape procedure to all four alarms (female voice, male voice, low-frequency tone, and high-frequency tone). The median time to awaken was **two seconds** for the high-frequency tone alarm and **one second** for the other three alarms. The median time to escape for the high-frequency tone alarm was **12 seconds**, compared with **10 seconds** for the low-frequency tone alarm and **nine seconds** each for the female and male voice alarms.



“Our research demonstrates that smoke alarms developed for the unique developmental requirements of sleeping children are also effective among sleeping adults,” said [Gary Smith, MD, DrPH](#), lead author of these studies and director of the Center for Injury Research and Policy at Nationwide Children’s Hospital. “Switching from the use of a high-frequency tone alarms that many people currently have in their homes to a smoke alarm that uses a low-frequency tone, male or female voice, or a voice-low-frequency tone hybrid signal may reduce residential fire-related injuries and deaths among sleeping children old enough to perform self-rescue, while also successfully alerting sleeping adult members in the household.”



Summary

Based on the studies listed above, smoke alarms are not a “one size fits all” device. While traditional smoke alarms that beep may work for some, it may not work for others, potentially placing their life at risk. However, one thing is for certain – they save lives! Going back to my career with the fire department, we (unfortunately) responded to countless residential structure fires where there was not a working smoke detector present in the home. Ideally, you want a smoke alarm to be installed inside each bedroom, outside each sleeping area, and on every level of the home. On levels without bedrooms, install smoke

alarms in the living room (or den or family room) or near the stairway to the upper level, or in both locations.

If you are in need of a new smoke detector and cannot afford one, many local fire departments across the country will come to your home and install one for you free of charge. Test your smoke detectors monthly and replace the batteries every six months to ensure you will be alerted when there is smoke in the area.

For more information about the National Fire Protection Association's Fire Prevention Week campaign, visit www.nfpa.org/Events/Events/Fire-Prevention-Week.

Thank you and have a safe week!



Drew Hinton, CSP, CHMM, EMT

President/CEO

Arrow Safety, LLC

P: (270) 670-4718

E: drew@arrowsafetyus.com

www.arrowsafetyus.com

