

When Smoke Alarms Are a Nuisance

A Call to Action

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There is a clear analogy between smoke detectors and child car seats. Both technologies have been enthusiastically embraced, and their widespread distribution has saved many thousands of lives. However, the issue of car seat misuse has led to a reevaluation of engineering and educational approaches for child occupant protection.¹ It is time for a similar comprehensive reevaluation of smoke detectors for home fire safety.

Smoke detectors have been enormously effective in reducing deaths from house fires.^{2,3} This is especially good news for children younger than 15 years, who make up one quarter of the 4000 annual deaths from fires and burns in the United States.⁴ Yet many deaths continue to occur because installed detectors are nonfunctioning when a fire occurs. According to Hall,² "One-fifth of homes with smoke detectors and one-third of homes with smoke detectors that have reported fires have no smoke detectors that work."

In several studies, the major reason for inoperability is that residents intentionally disable the detectors because of frequent false alarms. These "nuisance alarms" usually are due to smoke from cooking or moisture from bathrooms.⁵⁻⁷ Investigation of smoke detectors that failed to alarm in residential fires in 15 US cities found that 59% were disconnected from their power sources. Of these, 35% were said by the occupant to have had a problem, primarily unwanted alarms.³ A survey in one Native American community in North Dakota found that 48% of smoke detectors were inoperable. In 86% of cases, they had been disconnected or their batteries had been removed as a result of nuisance alarms.⁸ At the Fort McDowell Indian Reservation in Arizona, 50% of smoke detectors were inoperable. In 64% of these cases, residents had disconnected the de-

tectors because of nuisance alarms.⁹ Of homes with ionization detectors in 4 rural Alaskan villages, 92% had at least 1 false alarm within 6 months after installation; 19% were disconnected from their batteries because of frequent nuisance alarms.¹⁰ An evaluation of smoke detector distribution programs in Minnesota, North Carolina, and Oklahoma found that, 3 to 4 years later, 27% of households had nonworking detectors. Twenty-one percent of residents reported having removed the battery because of nuisance alarms.¹¹

Buttons to silence the detectors during false alarms (so-called hush buttons) are of limited value. The inconvenience of accessing and repeatedly activating the button prompts many adults to simply disconnect the batteries or remove the detector.¹² The high percentage of alcohol involvement among adult victims who die in house fires (85% of victims who died in cooking-related fires were legally impaired in one study)¹³ suggests another possible reason for impatience with hush buttons. Also, people with impaired judgment may activate the hush button in the event of an actual fire, negating the early-warning opportunity.¹⁴

There is a better approach to the nuisance alarm problem: installation of photoelectric, rather than ionization, smoke detectors. When properly installed and maintained, either ionization or photoelectric smoke detectors provide adequate warning to allow the occupants to evacuate in most residential fire scenarios.¹⁵ However, photoelectric smoke de-

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tectors are far less prone to nuisance alarming than are ionization detectors. A study from Alaska, for example, found that homes with ionization detectors had more than 8 times the rate of false alarms as those with photoelectric detectors.¹⁰ Photoelectric detectors also have the advantage of increased sensitivity to smoldering fires.¹⁶ Smoldering fires are often ignited by smoking materials contacting upholstery or bedding. According to Bradley,¹⁷ "[I]t is not unusual for a fire to smolder for hours before open burning begins. This is why many fatal fires occur at night when everyone is asleep." Smoking materials are the leading ignition source for fatal fires in both apartment houses and single- and 2-family dwellings, which together account for 83% of all home fire deaths.¹⁷ Careless smoking is responsible for up to 65% of deaths from fatal house fires.¹⁸

The vast majority (about 90%) of existing residential detectors are of the ionization type.³ Why have photoelectric detectors not been more widely installed? The primary reason is cost: \$19 to \$26, compared with \$6 to \$13 for ionization detectors. The second reason is lack of availability. We recently visited hardware stores and large retailers such as Sears and K-Mart in 3 cities (Bemidji, Minn; Queens, NY; and Albuquerque, NM). We found 100 ionization models at the 17 retailers, but only 10 photoelectric detectors at 8 stores. Another barrier is the absence of consumer education about the nuisance alarm problem and the value of photoelectric detectors. Nearly all the public informational material on smoke detectors either ignores the subject of nuisance alarms or suggests purchase of ionization detectors with hush buttons.

Ongoing research by the Consumer Product Safety Commission, the University of Washington's Injury Prevention Center, and other groups will undoubtedly further define the variables for maximizing smoke detector performance. However, we believe there is already sufficient justification for promoting photoelectric detectors in family dwellings. We strongly recommend that smoke detector distribution programs switch to photoelectric detectors in communities where nuisance alarms are likely to be a frequent problem. Dwellings with smaller living spaces (<90 m² [<1000 sq ft]) and households that use frying as a frequent cooking method are 2 clear risk factors for nuisance alarms.¹⁰ Although photoelectric detectors now cost more than ionization models, in a free-market economy, prices will fall as demand increases. We also urge that consumer education materials from the American Academy of Pediatrics, Safe Kids Campaign, Centers for Disease Control and Prevention, National Fire Protection Association, and Consumer Product Safety Commission discuss the value of photoelectric detectors, particularly in reference to nuisance alarms and for households with smokers. Finally, when ionization detectors are installed, we recommend that they be placed at least 6 m (20 ft), and preferably 7.5 m (25 ft), from cooking surfaces and at least 3 m (10 ft) from bathroom doors to reduce nuisance alarms.⁸

"Smarter" smoke detectors with microprocessors that can differentiate between residential fires and non-fires may be available in the future.¹⁹ For now, in homes where nuisance alarms are not a major problem, a combination of photoelectric and ionization detectors—

connected directly to the home's electrical system ("hard wired") with battery backup—should provide maximum protection. Detectors should be placed on each level of multistory homes, both inside and outside sleeping areas.

Smoke detectors should be replaced every 10 years, a recommendation that affects tens of millions of existing detectors.²⁰ We suggest that, in homes at risk of nuisance alarms, photoelectric detectors be installed to replace aging ionization detectors, as well as in new construction. An exception would be areas (such as basements or garages) where flaming fires are more likely to occur. Fire safety legislation and ordinances should be reexamined to evaluate promotion of photoelectric detector use. The American Academy of Pediatrics Committee on Accident and Poison Prevention, the American Burn Association, or the Centers for Disease Control and Prevention's National Center for Injury Prevention and Control might take the lead in such a reevaluation.

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