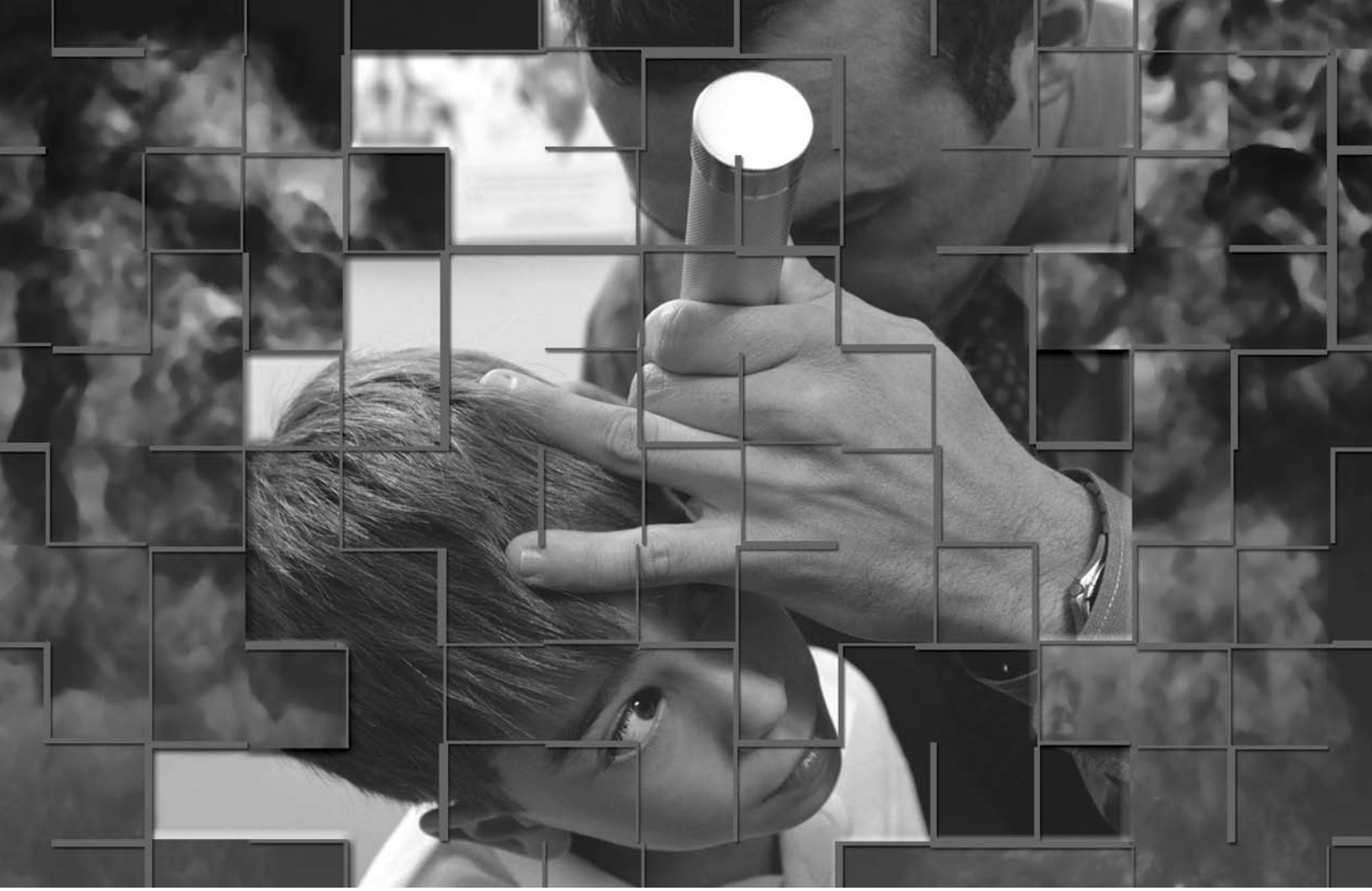

Fire Risks Series

Fire Risks for the Deaf or Hard of Hearing

FA-202/December 1999

FEMA

Fire Risks for the Deaf or Hard of Hearing

December 1999

U.S. Fire Administration
Mission Statement

As an entity of the Federal Emergency Management Agency, the mission of the United States Fire Administration is to reduce life and economic losses due to fire and related emergencies, through leadership, advocacy, coordination, and support. We serve the Nation independently, in coordination with other Federal agencies, and in partnership with fire protection and emergency service communities. With a commitment to excellence, we provide public education, training, technology, and data initiatives.

On March 1, 2003, FEMA became part of the U.S. Department of Homeland Security. FEMA's continuing mission within the new department is to lead the effort to prepare the Nation for all hazards and effectively manage Federal response and recovery efforts following any national incident. FEMA also initiates proactive mitigation activities, trains first responders, and manages Citizen Corps, the National Flood Insurance Program, and the U.S. Fire Administration.

FEMA

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OVERVIEW OF THE "FIRE RISKS" SERIES

This report is one in a series of four that discuss the increased fire risks for four groups of the general population:

- older adults;
- the mobility impaired;
- the deaf or hard of hearing; and
- the blind or visually impaired.

Older adults--those over 65 years of age--are a group with one of the highest fire risks in the United States, in large part because they are the fastest growing segment of the U.S. population. Of course, many older adults also may fall into the other three groups, since the elderly suffer some or all of these impairments to a much greater degree than does the general population.

People who are deaf or have hearing impairments, those who are blind or have vision impairments, and those with mobility impairments may face unique challenges in an emergency. Their ability to detect a fire or escape its effects may be hindered by their impairments. As a result, people with these impairments are at a greater risk of death or injury due to fire.

As might be expected, many of the fire safety issues are a concern for all four groups. This commonality is reflected in the reports, particularly in the fire safety tips, most of which apply to all the groups. These safety tips are presented in an Appendix at the end of each report, organized in three sections: before the fire, during the fire, and fire prevention. The tips that are common to all four groups are summarized here:

Before the fire:

- identify the nearest fire exit;
- install smoke alarms;
- live near an exit;
- plan and practice escape plans; and
- involve the fire department.

During the fire:

- get out and stay out;
- test doors before opening them;
- stay low and go;
- what to do if you are trapped; and
- stop, drop, and roll.

Fire prevention:

- cooking;
- electrical safety;
- smoking;
- space heaters;
- heating; and
- fireplaces.

EXECUTIVE SUMMARY

Fire safety is a much overlooked problem among people who are deaf or hard of hearing. They do not receive the same media, educational, or industry attention as does the hearing population. Many advancements in the prevention of fire injury and death over the past century have not addressed the fire safety needs of the deaf community. The most significant of those inventions is the audible smoke alarm. Smoke alarms have been credited with saving thousands of lives from fires each year. Conventional alarms, however, work less well for those who cannot hear. Additionally, traditional fire safety messages do not address the unique needs of the deaf community. Fire safety messages more than likely will not reach this population due to the lack of effective distribution channels.

By raising the level of fire safety awareness for the deaf and hard-of-hearing community, and for the surrounding population, we can eliminate many fire risks. Groups representing people with hearing impairments must collaborate with the fire service to educate each other and to reduce the risks posed by fires to nonhearing people.

The principal findings of this study are summarized below:

- Visual assessment is the primary means for people with hearing impairments to process information vital to everyday living. These individuals cannot rely on traditional audible smoke alarms. They require visual alarms equipped with strobe lights or vibration devices.
- Vibrating beds and pillows have been developed to awaken people who are deaf or hard of hearing and alert them to the presence of a fire. These beds and pillows are wired to a smoke alarm and vibrate when the alarm is activated.
- A portion of the deaf and hard-of-hearing population is also blind or visually impaired. Visual strobe lights are ineffective for this group. A vibrating bed and pillow alarm must be used instead.
- While specialized detection and alarm devices are available, there is a dearth of information about how to obtain them. In addition, these devices often are prohibitively expensive.
- Many people who are deaf or hard of hearing are not aware of provisions in the Americans With Disabilities Act (ADA) requiring that appropriate smoke alarms be provided by landlords, public buildings, etc.
- Public fire education generally is neither formatted for, nor directed to, people who are hearing impaired.

INTRODUCTION

People who are deaf or hard of hearing face a high risk for fire and fire-related injury. The hearing world dominates much of the way our society is structured physically and socially. Communication involves the free exchange of ideas, the receipt of such ideas, and reaching a mutual understanding about these ideas. This cannot be done when parties communicate through different media. Telephonic communication relies on the ability to speak and hear.

For those who cannot hear, the external world is foreign, obstructive, and potentially dangerous. This is especially true in the case of audible alarms. For centuries, public and individual warning signs have typically been sound oriented. Paul Revere used his voice to warn of the impending British invasion. During the height of the Cold War, warning sirens were used in air raid exercises to alert Americans to the possibility of nuclear attack. These modes of communication were the most effective ways to reach the greatest number of people. Fire and smoke alarms are no different. However, these life-saving devices are of little use to an individual who is hearing impaired. Light-equipped smoke alarms have been developed, but they are expensive and not widely available.

Significant progress has been made in developing fire protection and alerting devices and in educating the public about fire prevention. However, much remains to be done if people who are hearing impaired are to benefit from these advances.

Many deaf children receive targeted fire protection education in school. However, public service announcements disseminated through the mainstream media--particularly television and radio--may not reach people who are deaf or hard of hearing.

This report is divided into three principal sections. In the first section, the cultural perceptions of deaf and hard-of-hearing individuals are discussed, along with the impact that hearing loss has on daily life. The current estimates of the deaf and hard-of-hearing population also are presented in conjunction with projected estimates of future populations.

The second section focuses on the characteristics of deaf and hard-of-hearing people that place them at risk to injury, especially fire-related injury. The effectiveness of fire protection devices for deaf and hard-of-hearing people are discussed, as are educational programs.

The final section of this report provides tips to fire service professionals for enhancing fire safety for people with disabilities. A reproduction-ready Appendix presents fire safety tips. Fire service professionals may photocopy the Appendix for use in public education activities.

Estimates

The National Institute on Deafness and Other Communication Disorders (NIDOCD), a division of the National Institutes of Health (NIH), estimates that there are 28 million deaf and hard-of-hearing individuals in the United States (Reference 1). The NIDOCD uses a higher estimate than traditional reporting agencies, such as the National Center for Health Statistics (NCHS), which estimates that deaf and hard-of-hearing persons number approximately 22 million in the United States (Reference 2). This discrepancy is worth noting due to the complexities in tracking and reporting mechanisms.

Both the Census Bureau and NCHS use survey forms to derive their estimates, and due to the subjectivity of the participant's response, their results may not be entirely accurate. The definitions of deafness and hearing loss are not universal and are described in the surveys in the context of functional limitations. If hearing loss does not restrict daily activities, many individuals may not regard themselves as hard of hearing, even if they would benefit from a hearing aid. Furthermore, hearing loss may go undiagnosed for years, which is especially true for people of low socioeconomic backgrounds who may not be under a doctor's care and thus subjected to scheduled hearing tests (Reference 3). In other cases, people may be reluctant to admit to themselves that they have a hearing problem, or they may choose not to report it. Furthermore, populations in prisons, skilled nursing facilities, and retirement homes--as well as the homeless--are not screened (Reference 2). Consequentially, these cases are not reported and thus contribute to the discrepancies in the reporting agencies' estimates. To compensate for the lack of unreported cases, the NIDOCD estimates that 28 million Americans are deaf or hard of hearing--about one in nine people in the United States.

Hearing impairment is extremely common in the older adult population. Presbycusis, a form of hearing loss in the elderly, is considered by some to be a normal part of aging (Reference 4). In fact, nearly 40 percent of the population over the age of 65 has experienced some degree of hearing loss (Reference 2). The subtleties of hearing loss do not make themselves immediately evident, and only when discrepancies are noted is hearing loss identified.

Hearing Loss

Hearing loss may be classified in many ways. It can be total, unilateral (one ear), or bilateral (two ears), and it may result from problems in sound conduction, nervous sensation, or both. Problems in sound conduction generally result from dysfunctions of the external or middle ear. That is, sounds do not get to the sensory structures of the ear. Disorders of nervous sensation (sensorineural problems) usually are related to deterioration of the cochlea, often from loss of hair cells in the Organ of Corti. With fewer hairs to vibrate, the ear's function is impaired (Reference 4).

Hearing loss can be caused by a number of factors, both biological and environmental. Biologically, hearing loss can be as simple as impacted earwax or fluid behind the eardrum, or as complex as a congenital syndrome or a brain tumor. Certain drugs such as nonsteroidal anti-inflammatories, antibiotics, or heavy doses of aspirin can lead to a hearing impairment. Certain blood vessel and blood coagulation disorders--including hypertension and blood clots--also can lead to hearing loss (Reference 4). The most common cause of hearing loss in infants and young children is chronic middle-ear infection, also known as otitis media (Reference 5). Otosclerosis is a chronic condition found in older people that restricts the vibration of the bone leading to the inner ear, causing hearing loss. It usually can be treated with antibiotics, surgery, hearing aids, and other techniques (Reference 6). Finally, age-related hearing loss (presbycusis) involves a progressive loss of hearing, beginning

with high-frequency sounds, such as speech. It is believed that presbycusis is a result of long-term noise exposure. The disorder occurs in about 25 percent of people aged 65 to 75 years old, and in 50 percent of those over age 75 (Reference 4).

Prolonged exposure to sound levels of 85 decibels or higher can lead to hearing loss. Normal conversation is approximately 60 decibels. Sounds that exceed the 85-decibel level include lawnmowers (90 decibels), car horns (110 decibels), and rock concerts or jet engines (120 decibels). Individuals who are exposed to high noise levels can prevent hearing loss by wearing ear plugs or ear muffs. Exposure to atmospheric pressure changes also can cause hearing loss. Rapid changes in atmospheric pressure can occur during flying or diving (Reference 4).

Some forms of hearing loss are treatable. In some cases, earwax removal or eardrum puncture repair may resolve a hearing deficit. Surgery sometimes can repair conductive-type hearing loss. Hearing loss caused by prolonged exposure to loud noise has been found to disappear when the noise is eliminated. Hearing loss caused by medications often can be corrected by changes in dosage or brand of medication. If hearing loss is found to be caused by other medical conditions, the treatment of that disorder sometimes can restore hearing (Reference 4).

Of the common disabilities found among people in the United States, deafness and hearing impairments tend to lead to isolation and resulting psychological disturbances, as people are tempted to withdraw themselves socially because of their disability (Reference 7). Isolation also may increase communication problems and frustration, as well as hinder social adjustment. Speech therapy and rehabilitation, sign language, and lip reading facilitate communication between hearing-impaired and hearing individuals and among people in the hearing-impaired population.

Cultural Perceptions

To the hearing world, people who are deaf or hard of hearing are significantly impaired and at a disadvantage. However, many deaf and hard-of-hearing people do not perceive themselves as impaired. They communicate through a different language and medium--sign language or lip reading. The deaf community uses sign language--specifically American Sign Language, or ASL--to communicate. Instead of hearing spoken words, lip readers read words by watching the shape of the speaker's mouth as words are formed. Just as translators are required for individuals speaking a foreign language, the deaf and hard-of-hearing community feels its members deserve the same courtesy. Communication can be enhanced with modest accommodations.

As with other disabilities, deafness and hearing loss are not well accommodated in the hearing world. Until the ADA (42 U.S.C. 12181) was passed in 1991, accommodations for people who are deaf or hearing impaired were neither customary nor required.

Federal Laws and Regulations

Americans With Disabilities Act. The ADA prohibits discrimination against individuals with disabilities, and requires that accommodations be made for these individuals. Almost all privately owned facilities that provide goods or services to clients, customers, or patrons must comply with the ADA. It prohibits private businesses such as restaurants, hotels, and retail stores from discriminating against individuals with disabilities. The ADA stipulates that the responsibility for providing interpreter services, adaptive equipment, or accessibility to other services or facilities rests with the proprietor of the building entity. The law contains four sections listing required services and programs for the hearing impaired: employment, government, public accommodations, and telecommunications (Reference 8).

As a result of this legislation, people who are deaf or hard of hearing are entitled to assistive technology in public places. Such technologies include telecommunication devices for the deaf (TDD's), text telephones (TTY's), and visual smoke alarms, security system alarms, doorbells, ringers, and door locks. Many deaf and hard-of-hearing individuals have installed these devices in their private homes, although the ADA does not mandate doing so. These devices may be installed permanently or packaged for portable use when the individual is away from home.

Statutes and Regulation. Under Title II of the ADA, the Department of Justice certifies local building codes. All of the National Standard codes (BOCA, NFPA, etc.) are certified. As a result, most landlords are required to provide visual smoke alarms to their tenants (Reference 9). Several sections of the 1997 Code of Federal Regulations (CFR) require landlords to provide and install high-intensity visual alarms for tenants who are deaf or hard of hearing. Landlords who benefit from a variety of Federal government programs or other Federal subsidies are required to provide visual fire alarms to their deaf and hard-of-hearing residents at no cost. The sections of the Federal code that apply to landlords and building design are 42 U.S.C. 4151--4157, 7CFR1930--Subpart C (Management and Supervision of Multiple Family Housing Borrowers and Grant Recipients), and 24CFR570.614--Section 570.614 (Architectural Barriers Act and Americans With Disabilities Act).

Residence

People who are deaf or hard of hearing place great value on living independently. These individuals are widely dispersed in many communities and are clustered together in others. They live in apartments, dorms, group homes, and single-family homes. In many cases, deaf or hard-of-hearing people reside with hearing family members and relatives. Despite their specific needs, these individuals assimilate in the environment that suits the hearing members of their family. The most pressing fire safety issue for people who are deaf or hard of hearing is whether they will be alerted to danger in time to escape. Many rely on their family members to notify them when a doorbell chimes, a phone rings, or an alarm sounds, but other people may not be a reliable alerting mechanism in the event of a fire. Smoke and toxic fumes are nondiscriminating killers. A hearing family member or caregiver overcome by fumes may not be able to alert a sleeping deaf person in time for both to escape.

Apartment living may represent equally challenging fire safety issues for deaf and hard-of-hearing people. Highrise buildings pose significant threats to timely egress in the event of a fire. Smoky hallways, long and dark corridors, and multiple flights of stairs are among some of the characteristics that make efficient building exit difficult. Once again, early detection and warning are key to survival. If a fire occurs outside an apartment, a localized fire alarm will sound, alerting the building occupants. Deaf occupants will not hear this audible warning and may remain in the building until escape no longer is possible. Even if the smoke alarms in the hallways are equipped with flashing lights, they are of little help to a deaf person behind the closed door of his or her apartment.

Apartments for deaf and hard-of-hearing people should be equipped with special smoke alarms for alerting residents. Smoke alarms installed in the apartments and equipped with lights or vibration devices must be linked to smoke alarms located in the common areas of the building (hallways, lobby, service rooms). The centrally located alarms then will trigger the alarms in the occupants' apartments, even if there is no fire or smoke in the apartments.

Several deaf or hard-of-hearing people in focus groups reported experiences with a fire erupting in their building. These respondents claimed to have had no knowledge of the fire, and had not been made aware of it until the fire department broke in and evacuated them (Reference 10). The estimated time from the first alarm until the occupants were evacuated was 30 to 60 minutes. None of these respondents had specialized smoke alarms installed in their apartments.

Specialized Smoke Alarms

Places of public accommodation and employment are required to provide specialized smoke alarms and other assistive devices to their deaf and hard-of-hearing patrons. The ADA requires hotels, businesses, and recreation facilities to install and make these items available (Reference 8). As a result, deaf individuals can reserve a hotel room with a light-flashing smoke alarm, specialized communications devices, and other accommodations. They can also eat in restaurants, go to the movies, or work in an environment where the appropriate smoke alarms are installed.

Under its rule on Title II of the ADA, the U.S. Department of Justice has chosen to require the provision of appropriate smoke alarms by certifying local building codes. As these codes are brought into compliance with the ADA, landlords will be forced to provide strobe light fire alarms to their residents (Reference 9). Several deaf and hard-of-hearing participants in market research groups discussed their attempts to obtain specialized smoke alarms from their building managers (Reference 10). More often than not, the building managers were noncooperative, evasive, and difficult to work with. Many hearing-impaired individuals gave up out of sheer frustration at the problems they

encountered simply in trying to communicate with their managers. Others claimed their managers refused to cooperate or ignored their requests. Some settled for the conventional alarms already installed. Only one respondent reported success in obtaining a specialized alarm from his building manager. Many of the respondents indicated that they were not aware of how and where to purchase specialized smoke alarms. They also stated that they had not received any information on specialized alarms from local disability support organizations.

To an individual unable to hear, conventional smoke alarms are of limited use. Manufacturers have responded to this need by developing specialized smoke alarms that use flashing lights or vibrating materials to alert hearing-impaired occupants of a fire. Because of the small potential market, such ventures are modest at best. Furthermore, these developments have received very little publicity and thus are largely unknown to the populations most in need of them. Market research in a sample of deaf and hard-of-hearing individuals revealed that, while they recognize the importance of specialized smoke alarms, only a small percentage actually has one installed at home (Reference 10). The most common reasons cited for not having a visual or vibrating smoke alarm were the high cost and relative unavailability of such products. Still others were unaware of the very existence of such smoke alarms.

Flashing lights are useful only if they are installed where a hearing-impaired person can see them. A properly functioning flashing alarm does no good if the hearing-impaired person is asleep in a room without one. To combat this issue, certain manufacturers have devised an alarm that vibrates the bed or pillow to rouse a sleeping individual. While this is a good idea, it is not a complete solution. In some cases, the individual may not be sleeping in a bed so equipped (e.g., a fire may erupt when the individual is napping on the couch). In any case, more than one alarm would be most beneficial. Ideally, all alarms in the home would be interconnected, so that, if an alarm in one part of the house detected a fire, all alarms would activate.

Public Fire Education

Public fire education has made great strides in this country and around the globe. Fire is a universal problem that can be reduced and even prevented through concerted educational efforts. Although fire affects all people, certain groups are more vulnerable and subsequently at higher risk for fire-related injuries and death than others.

Deaf and hard-of-hearing people are at high risk from fires and fire-related injuries. Unfortunately, they are a much-overlooked community for a variety of reasons. There is a lack of quantifiable measures of fire deaths and injuries in the deaf and hard-of-hearing community. Neither the NCHS nor the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) includes data on the presence or degree of disability of a fire victim. When left up to the fire service, reporting agencies may only speculate as to whether the individual was impaired. Such impairments can range from physical disabilities to alcohol and drugs. The legal implications of false assumptions and theoretical reasons deter many in the fire service from ascertaining whether such impairments existed. In many scenarios, the fire service simply cannot determine whether an auditory, visual, mental, or physical disability prohibited the victim from escaping the fire based on the evidence at hand. Of these disabilities, deafness and hearing impairments may be the most difficult to detect.

Deaf and hard-of-hearing people often are underserved in public fire education efforts. Market research revealed some disturbing findings about public education directed toward the deaf and hard-of-hearing communities (Reference 10). Respondents were asked their opinion on the availability, applicability and appropriateness, and frequency of public fire education messages addressed to the population as a whole versus those addressed specifically toward their community. The vast majority

of respondents felt that their fire safety needs were not being addressed through mainstream media messages. They felt that current public safety announcements (PSA's) are directed at children and do not apply to them. Most of them indicated that they have never designed or practiced a fire escape plan, as the idea had never been introduced to them. Furthermore, the group of respondents were unaware of the existence of specialized smoke alarms or how to obtain them.

Clearly, this sample does not represent the entire deaf and hard-of-hearing population. Nevertheless, respondents felt confident that they spoke for the majority of the Nation's deaf and hard-of-hearing individuals.

Educational Barriers

Some of the most effective fire safety education for children comes in the early school years, yet the vast majority of the school programs are designed exclusively for the hearing community. The programs address not only fire drills at school, but also fire and injury prevention and fire safety in the home. The fire safety messages for the home environment are very important, since this is where children are more likely to be alone or asleep. At school, a deaf or hard-of-hearing child likely will be able to follow his or her classmates to safety, observe an activated fire alarm affixed with a strobe light, or even see flames or smell smoke. At home, however, these children must be made aware of fire prevention and safety measures, in case they encounter a fire emergency when they are alone. They should know how to dial 9-1-1 without supervision and how to execute the "Stop, Drop, and Roll" procedure.

Increasing numbers of deaf and hard-of-hearing children are being mainstreamed into traditional school settings. It is imperative that they are not overlooked in any aspect of their education, but especially in fire safety programs. Schools and fire departments must ensure that deaf and hard-of-hearing children know how to react in a fire emergency independent of a hearing individual.

Communication Barriers

Deaf and hard-of-hearing people rely on unique means for communicating with each other and the outside world. These mechanisms vary with the degree of hearing loss. To the individual with only partial hearing loss, something as simple as a hearing aid may make it possible to communicate with others. For individuals with complete hearing loss, verbal communication may not be possible. Many deaf people cannot use auditory clues to process information in their environment; they must rely entirely on visual clues to understand messages being sent. Sign language and lip reading are the primary means by which deaf individuals communicate, and their effective use is dependent on the person's ability to see. In the event of a fire, a person's line of sight may be hampered by smoke, making it difficult or impossible to see to read a person's lips or hands. Instructions from firefighters may be obscured, which may interfere with rescue attempts. In addition, firefighters may be wearing breathing apparatus that cover their faces, making lip reading impossible. The same may hold true for the individual who is not entirely deaf but does not use a hearing aid or has temporarily removed it. In the often chaotic environment of a fire, voices and sounds tend to be muffled, further contributing to failure to recognize instructions and to escape in time.

FIRE SAFETY FOR SPECIAL-NEEDS POPULATIONS: TIPS FOR FIRE SERVICE PROFESSIONALS

You have been asked to provide advice on the fire safety needs of a deaf or hard-of-hearing individual. Where do you begin? There are the "generic" fire safety tips routinely given out to all who ask, but how do you tailor your recommendations to those with special needs? The first thing to remember is that the generic fire safety tips still apply. Individuals with physical impairments or disabilities are people first and foremost, and will benefit from the years of conventional wisdom that created existing fire safety programs.

Recommendations for Assisting Deaf or Hard-of-Hearing People in an Evaluation of Their Fire Safety Needs

Focus groups found that being identified as "special" or "needy" was a concern for individuals who are deaf or hard of hearing (Reference 10). This mirrors the findings of a 1981 fire safety report from the National Center for a Barrier Free Environment. That study concluded that impaired individuals often feel that official concern for fire safety can restrict their freedom of choice--for example, denying an impaired student a bedroom on the upper floor of a college dormitory (Reference 11). These opinions also reflect those expressed at the Solutions 2000 Conference, held by the USFA and the North American Coalition for Fire and Life Safety Education in April of 1999. In addition, individuals in the focus groups also worried about falling victim to crime if their home was marked for fire department recognition of their needs. The key to dealing with deaf or hard-of-hearing persons is to acknowledge their ability to help themselves, while guiding them to recognize their limitations in an emergency situation without drawing undue attention to them as impaired individuals.

The importance of exit drills should be stressed to assist deaf or hard-of-hearing individuals in recognizing their physical limitations in crisis settings. If the individual lives on an upper floor or requires other special assistance, it is important for the fire service to be involved in these drills, if at all possible. Deaf or hard-of-hearing individuals may have an unrealistic view of the capabilities of the fire department. There may be unforeseen obstacles or barriers to exit or rescue. These should be identified and addressed before a fire occurs.

The use of smoke alarms must be strongly advocated. The USFA considers smoke alarms to be the single most important piece of fire safety technology employed today. The importance of early recognition of a fire cannot be stressed enough in populations where physical limitations may increase the time needed to exit a burning building safely.

If you are called upon to assess the needs of someone who is deaf or hard of hearing, the Center for Fire Research at the National Institute of Standards and Technology (formerly the National Bureau of Standards) recommends assessment of the following seven risk factors (Reference 12):

1. **The risk that the individual will resist leaving the structure.** For example, is the individual fearful of leaving with a stranger; unwilling to leave pets, belongings, and cherished items; or exhibiting confusion or other symptoms consistent with possible mental impairments?

2. **The individual's response to fire drills.** For example, does the individual's escape plan work during drills?

3. **The individual's response to instructions.** For example, are there language differences or other communication barriers?

4. **The individual's mobility impairments (and the resources necessary to overcome them).** For example, is the individual capable of reasonably safe self-rescue from a burning structure? How much can the person assist his or her rescuers?

5. **The need for extra help.** This may be related to the actual egress or the period immediately following. For example, a ventilator-dependent quadriplegic may require medical resources once outside the structure.

6. **The individual's waking response to alarms.** Will there be a difference between the day time and night-time fire safety needs of the individual?

7. **The probability that the individual will lose consciousness in an emergency.** For example, is the individual dependent on specific equipment for life support? Is there adequate backup to provide for emergency situations?

Note the emphasis on performance-based assessment. The risk assessment cannot be based on an individual's impairment, but rather must be based on his or her demonstrated abilities to evacuate a structure in an emergency.

Building Design and Codes

The following recommendations are based on *Design for Accessibility,* a guide for architects on designing barrier-free environments (Reference 13). They should provide some insight into the role of building design in the fire safety needs of the population.

- Provide exit signs set to flash (less than 5 hertz) when a fire alarm sounds. These signs should be connected to the emergency power system.

- Provide audible fire alarms that exceed the average ambient sound level by a minimum of 15 decibels (15 phones). These alarms should exceed a noise of 30 seconds or less by a minimum of 5 decibels (5 phones). The maximum audible emergency signal should not exceed 120 decibels (120 phones).

- Provide visual/light alarm signals in all areas occupied by individuals who are deaf or hard of hearing.

- Provide under-pillow vibrating alarm signals in bedrooms for deaf or hard-of-hearing individuals.

- Provide a minimum of two accessible exits or horizontal exits for all accessible areas of all buildings.

- Where there is only one accessible exit, provide a minimum of one fireproof refuge area (fire-rated enclosed elevator lobby preferred, or enlarged landing area in a fire-rated stair enclosure). The fire refuge area should be a minimum of 16 square feet (1.5 square meters) outside of exit circulation paths. Provide an occupancy/call system from refuge areas to fire department enunciator location or entrance vestibules.

- Cover open fireplaces with tempered glass doors and guard them by a 9- to 18-inch (23- to 46-cm) raised hearth.

- Provide fire detectors, especially in institutions, in accordance with the recommendations presented in the table below:

Recommended Smoke Alarms

Type of Smoke Alarm				
Area of Residence in Which to Install Alarm	**Rate of Temperature Rise**	**Fixed Temperature, Adjustable**	**Fixed Temperature, Permanent Setting 175° to 240°F (79° to 116°C)**	**Smoke/Products of Combustion**
Kitchen	Preferred			
Basement	Preferred	Acceptable		
Storage	Preferred	Acceptable		
Trash	Preferred	Acceptable		
Garage		Preferred		
Accessible Attic			Preferred	
Sleeping Area				Preferred
Hallways	Acceptable			Preferred

Source: Based on Robert James Sorensen, *Design for Accessibility* (New York: McGraw-Hill Book Company), 1979.

Instructional Materials

In addition to the reproduction-ready fire safety materials provided in the Appendix at the end of this report, other materials, such as "Emergency Procedures for Employees With Disabilities in Office Occupancies," is available from the USFA Publications Office or on its Web site at www.usfa.fema.gov

CONCLUSIONS

Deaf and hard-of-hearing people are just as capable as the hearing community when it comes to fire safety. Early detection and escape are the most important keys to surviving a fire. Smoke alarms provide an urgent message that demands an immediate response. Because hearing-impaired people communicate through special means, they require specialized warning devices. Flashing lights and vibrating smoke alarms are essential fire protection devices for people who are deaf or hard of hearing. These alarms complement, rather than compensate for, the inability to hear.

Fire safety messages that are meant to help the hearing population also apply to people who are deaf or hard of hearing. The difference in providing public fire education lies not in content modification, but in packaging. It is not easy to reach the hearing-impaired through the mainstream media, which is addressed principally to hearing people. As a result, hearing-impaired people do not usually benefit from the life-saving advice that fire prevention and protection messages provide.

With the right knowledge and tools, deaf and hard-of-hearing people can help save their own lives, as well as those of their loved ones, in the event of a fire. By instituting behavioral practices as well as engineering modifications, hearing-impaired people may no longer have to be at greater risk. Fire protection and prevention have grown by leaps and bounds over the past several decades, helping to decrease fire death rates in the United States by exponential numbers. Public education and advancements in fire safety technologies have contributed greatly to this trend. The same benefits can accrue to deaf and hard-of-hearing people by delivering programs that address the unique fire safety needs of this community.

APPENDIX: FIRE SAFETY TIPS FOR HEARING-IMPAIRED PEOPLE

The following fire safety tips are organized in three sections: before the fire, during the fire, and fire prevention. While these tips represent many fire safety approaches, the use of smoke alarms and exit planning should be considered the most crucial. According to the USFA, smoke alarms are the single most important piece of fire safety equipment in use today. Exit planning also is extremely important, especially for individuals who may have difficulty exiting a burning building.

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Before the Fire

Identify the Nearest Emergency Exit. Whether you are at home or elsewhere, you always should know the location of the nearest exit. This could save your life in an emergency.

Install Smoke Alarms. The single most important step you can take to save your life during a fire is to install a smoke alarm that suits your needs. A working smoke alarm can make a vital difference in the event of a fire, and may reduce the risk of dying in a fire by as much as 60 percent. A properly functioning smoke alarm can alert you to the presence of deadly smoke while there is still time to escape. Place visual alarms inside each sleeping area, and connect them to other alarms on every floor of your home. Keep smoke alarms clean by vacuuming or having someone vacuum them regularly. Test batteries monthly, and replace them annually. Ask friends, family members, building managers, or someone from the fire department to install and test the batteries of a smoke alarm if it is hard to reach. Be aware that the ADA may require your landlord to provide an appropriate alarm. If your smoke alarms are hardwired (connected to the electric circuitry of your residence), make sure they also are equipped with battery backups.

A number of companies manufacture strobe lights or vibratory smoke alarms for hearing-impaired people. Many of the companies producing these special alarms already offer communication and other assistive devices to people who are deaf or hard of hearing. If you have any questions about how to obtain an alarm, contact the fire department or the U.S. Department of Housing and Urban Development (HUD). If you live in an apartment building, the owner may be required to provide you with a specialized smoke alarm. Make sure you place appropriate alarm devices in every room in which you may sleep (e.g., living room, den, bedroom).

Keep a Telecommunication Device Nearby. Make sure a TTY/TDD or phone (if you use one) is next to your bed, within arm's reach. Keep emergency telephone numbers and hearing aids (if necessary) handy as well.

Plan and Practice Escape Plans. Knowing your escape plan is one of the most important steps you can take to save your life in a fire. Plan your escape around your capabilities. Know at least two exits from every room. Make sure you can unlock all your doors and windows. Be sure you know how to open your windows. If security devices such as bars are installed across the windows, ensure that they release from the inside. Make any necessary accommodations to facilitate escape.

Involve the Fire Department. Ask the local fire department to help you plan an escape route, and inform them of your special needs. Ask your fire department to help identify any fire hazards in your home and explain how to correct them. Any areas you plan to use as a rescue area must be identified and agreed upon by you and officials from the fire department. Learn the fire department's limitations, and make the officials aware of yours.

During the Fire

Get Out and Stay Out. Leave your home as soon as possible. Do not try to gather personal possessions or attempt to extinguish a fire. Do not use the elevator. Once out, do not go back inside.

Test the Doors Before Opening Them. Using the back of your hand, reach up high and touch the door, the doorknob, and the space between the door and the frame. If anything feels hot, keep the door shut and use your second exit. If everything feels cool, open the door slowly and exit as low to the ground as possible if smoke is present.

Stay Low and Go. Crawl low and keep under the smoke, if you are physically able. If not, try to cover your mouth and nose to avoid breathing toxic fumes, and make your way to safety as quickly as possible.

What to Do If You Are Trapped. Close all the doors between you and the fire. Fill cracks in doors and cover all vents with a damp cloth to keep smoke out. If possible, call the fire department and tell them where you are located. Signal rescuers from a window with a light-colored cloth.

Stop, Drop, and Roll. If any part of you catches fire, do not run and do not try to extinguish the flames with your hands. Cover your face with your hands. Drop to the ground, rolling over and over. If you have another disability that prevents your taking these actions, try to keep a flame-resistant blanket or rug nearby to smother any flames.

Fire Prevention

Cooking. Never leave the stove unattended while cooking. If you need to step away from the stove, turn it off. Wear tight-fitting clothing when cooking over an open flame, and keep towels and pot-holders away from the flame. If food or grease catches fire, smother the flames by sliding a lid over the pan and turning off the heat. Do not try to use water to extinguish a grease fire. When deep-frying, never fill the pan more than one-third full of oil or fat. Never put foil or other metals in the microwave. Make sure the stove is kept clean and free of grease buildup. Turn pot handles away from the front of the stove so they cannot be knocked off or pulled down.

Electrical Safety. Electric blankets should conform to the appropriate standards and have overheating protection. Do not wash blankets repeatedly as this can damage their electrical circuitry. If an appliance begins to smell suspicious or emit smoke, unplug it immediately. Replace all frayed or broken electrical cords. Never use an appliance with exposed wires. Never overload extension cords, and keep them out of traffic areas. Use only electrical appliances evaluated by a nationally recognized laboratory such as Underwriters Laboratories (UL).

Smoking. Never smoke in bed. Make sure that you are alert when you smoke. If a gas stove or oxygen source is nearby, do not smoke. Place signs stating that oxygen is in use and warning visitors to refrain from smoking. Do not smoke while under the influence of alcohol or if you are taking prescription drugs that can cause drowsiness or confusion. Never leave smoking materials unattended, and collect them in large, deep ashtrays. Check around furniture, especially upholstered furniture, for any discarded or smoldering smoking materials. Soak the ashes in the ashtray before discarding them.

Space Heaters. Give space heaters space. Keep heaters at least 3 feet from any combustible material, including people. Follow the manufacturers' directions regarding operation, fueling, and maintenance of your space heater. Do not use heaters or other heating devices to dry clothing.

Fireplaces. Open fireplaces can be hazardous; they should be covered with tempered glass doors and guarded by a raised hearth 9 to 18 inches high.

For more information, contact:

The United States Fire Administration
Office of Fire Management Programs
16825 South Seton Avenue
Emmitsburg, MD 21727

Or visit the USFA Web site: www.usfa.fema.gov

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