
Chapter 2

**The Epidemiology of
Hearing Impairment in
Elderly People**

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TYPES AND CAUSES OF HEARING LOSS AMONG ELDERLY PEOPLE

Hearing impairment can be partial or complete. It can be unilateral (one ear) or bilateral (both ears), temporary or permanent, stable or progressive. Types of hearing impairment include conductive, sensorineural, mixed, and central processing disorders. These types are based on the site of structural damage or blockage (see figure 1). **Conductive hearing impairment** involves the outer and/or middle ear. **Sensorineural impairment** involves damage to the inner ear, the cochlea, and/or the fibers of the eighth cranial nerve. A **mixed hearing impairment** includes both conductive and sensorineural components. Causes of conductive and

sensorineural hearing impairment are listed in table 1.

A **central processing disorder** is a hearing impairment that influences complex aspects of hearing, such as understanding speech. The hearing

Table 1.—Causes of Conductive and Sensorineural Hearing Impairments

Causes of conductive hearing impairments:

External blockage: buildup of wax or presence of a foreign object in the ear.

Perforated *ear drum*.’ a hole or tear in the eardrum that can occur as a result of injury, sudden pressure change, or infection.

Genetic and *congenital abnormalities*.’ malfunction and/or malformation of the outer and/or middle ear that can occur in connection with hereditary disease or as a result of illness or injury before or at the time of birth.

Otitis *media*.’ middle ear infection with fluid accumulation.

Otosclerosis: hereditary disease process resulting in overgrowth of a small bone in the middle ear which interferes with sound conduction.

Causes of sensorineural hearing impairment:

Prenatal and birth-related causes: infections such as rubella contracted by expectant mothers, drugs taken during pregnancy, or difficult labor and delivery.

Hereditary causes: a variety of disorders that damage the cochlea or higher nerve centers and are usually present at birth; the gradual loss of hair cells in the cochlea that begins as young as the twenties and thirties in some individuals and may be caused by heredity.

Viral and bacteria/ infections: infections such as mumps, spinal meningitis, and encephalitis.

Trauma: a severe blow to the head, an accident, or a stroke or brain hemorrhage that affect the ear, nerve pathways, and auditory brain centers.

Tumors: tumors called acoustic neuromas that invade the eighth nerve.

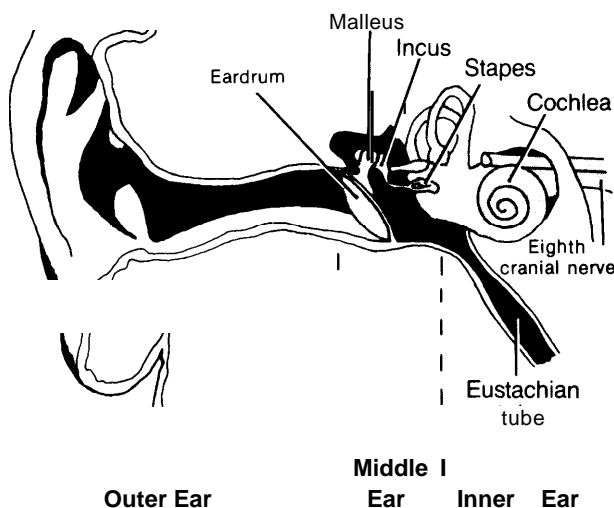
Noise: exposure to loud sounds that irreparably damage the hair cells.

Cardiovascular conditions: hypertension, heart disease, or other vascular problems that alter blood flow to the inner ear.

Ototoxic drugs: aspirin, some antibiotics, diuretics, and certain powerful anticancer drugs that damage the hair cells or other vital parts of the inner ear.

Meniere’s disease: a disorder characterized by fluctuating hearing loss, dizziness, and tinnitus; possible causes include allergy, hypothyroidism, diabetes, and syphilis.

Figure 1.—Structure of the Ear



In the healthy ear, sound waves gathered by the outer ear are transmitted through the eardrum and three small bones in the middle ear—the malleus, incus, and stapes—and into the inner ear. There sound is converted from vibrations into electrical impulses by tiny sensory receptors, called hair cells, in the cochlea. The electrical impulses pass through the eighth cranial nerve into the auditory centers of the brain.

SOURCE: Vicki Friedman, Washington University Medical Center at St. Louis

SOURCE: NINCDS, 1982 (124),

impaired person may hear the words but not make any sense out of them. Some words are difficult to interpret, almost as if the person were listening to a foreign language. This kind of hearing impairment can be caused by disorders of the auditory pathways in the brain. With aging, the speed of nerve impulses may slow or the brain may lose the ability to interpret words that come at a rapid pace.

Tinnitus is a condition that often accompanies hearing loss. It is a ringing, buzzing, or hissing in the ears or head that can be continuous or intermittent. The causes of tinnitus are not well understood but can include obstructions in the outer ear, perforation of the eardrum, middle ear infection, repeated exposure to loud noise, trauma, and some medications.

Presbycusis is the term most often used to describe hearing impairment in elderly people. The word presbycusis means "old hearing." It is usually defined as a sensorineural loss caused by changes in the inner ear, but some experts include middle ear changes associated with aging in the definition (124) and others emphasize the impact of changes in the eighth cranial nerve and auditory brain center (54).

The diagnosis of presbycusis is used for hearing impairment associated with a variety of sensory, neural, metabolic, mechanical, and vascular changes seen in elderly people. Yet little is known about the underlying causes of presbycusis and the term is sometimes used when no specific cause of the condition can be identified. Conditions that are frequently diagnosed as presbycusis include gradual loss of hair cells in the cochlea and fibrous changes in the small blood vessels that supply the cochlea.¹ Some researchers believe that these changes are caused primarily by environmental factors and disease while others believe they are primarily a result of normal aging (125). However, not all elderly individuals are affected by presbycusis, and some people over 90 retain acute hearing.

The diagnosis of presbycusis is sometimes given mistakenly when a specific cause of the hearing

¹The cochlea is dependent on a single artery for blood supply, making hearing very susceptible to damage as a result of cardiovascular disease (73).

impairment could be identified and possibly treated (73). For example, wax buildup in the outer ear frequently causes hearing impairment in elderly people. If presbycusis is diagnosed, the real problem—ear wax—might be missed and go untreated.

The term presbycusis can be confusing because it is used to describe three situations: 1) treatable conditions caused by disease, 2) conditions caused by disease for which no treatment is known, and 3) conditions believed to result from normal aging. For health care professionals, elderly people, and their families, a diagnosis of presbycusis may mistakenly imply that nothing can be done for the patient. Greater attention to isolating the cause of a person's hearing loss can help ensure prompt and effective treatment in some cases. In general, however, more research is needed to describe the underlying pathologies that cause presbycusis and to differentiate between treatable and untreatable causes of these conditions.

To develop a more complete understanding of hearing loss associated with aging, we must improve our knowledge about the basic mechanisms of hearing in the normal ear. While the normal functioning of the outer and middle ear is relatively well understood, the structural and biochemical mechanisms of the inner ear and auditory brain centers are less well understood. The cochlea, a pea-sized organ with more than a million moving parts, is one of the most complex mechanical structures in the human body. Only within the past decade have methods been developed to study this tiny structure. Research on the molecular structure and mechanical properties of hair cells in the cochlea and the biochemical processes by which sound vibrations are converted to neural impulses has significantly increased our understanding of the basic mechanisms of hearing (53). But little is known about how the damaged ear processes sound (88).

Lack of communication among researchers in this field has been a problem but recent research developments have stimulated increased interaction. A national conference on auditory biochemistry held in 1984 brought many prominent researchers together for the first time and participants hope that this process will be repeated regularly (30).

MEASURING HEARING IMPAIRMENT

Hearing impairment is measured by two methods: interviews and audiometric tests. Definitions of the levels of impairment reflect these two methods. The interview method relies on self-reported hearing loss and the resulting statistics are presented in categories such as: "no trouble hearing," "(can hear words spoken in a normal voice," "(can hear words shouted across a room," and "at best can hear words shouted in ear" (119). Audiometric tests measure an individual's response to sounds of varying intensity or loudness, and level of impairment is reported in terms of the weakest sound the individual can hear. Intensity of sound is measured in decibels; ²one scale used to define level of impairment is illustrated in table 2.

The level of hearing impairment that is considered significant varies for different surveys, research projects, and clinical applications. Hearing specialists and researchers continue to debate the most appropriate level to call significant for specific applications.³

Different surveys show different prevalence figures in part because they select different levels

²The decibel scale is a logarithmic scale (based on powers of 10) that measures intensity of sound or loudness. A small increase in decibels (dB) represents a large increase in loudness. For example, a sound at 40 dB is 10 times as loud as a sound at 30 dB and 100 times as loud as a sound at 20 dB.

³This debate is relevant to screening programs and identification of patients who need treatment as discussed in rh. 4.

Table 2.—Hearing Loss in Decibels Related to Approximate Degree of Impairment

Hearing loss in decibels (dB)	Degree of impairment
0 to 20 dB	Normal
20 to 40 dB	Mild
40 to 55 dB	Moderate
55 to 70 dB	Moderately severe
70 to 90 dB	Severe
>90 dB	Profound deafness

SOURCE Knauf, 1978 (64).

of impairment as significant. Reported prevalence also varies depending on whether the interview or audiometric testing method is used. Prevalence figures based on interviews tend to **underestimate** the frequency of hearing impairment because many people, particularly elderly people, are not aware of their hearing loss or may deny or minimize its severity in an interview. Some experts believe that audiometric testing provides more accurate measurement but prevalence figures based on both methods are widely cited in the literature (10).

Four types of audiometric tests are commonly used to measure hearing loss: 1) pure tone air conduction, 2) bone conduction, 3) speech reception, and 4) speech discrimination. Pure tone air and bone conduction tests measure hearing loss at specific frequency levels. Hearing loss varies greatly according to frequency, especially in elderly people, and information about hearing deficits at specific frequencies is important for diagnosis, treatment, and research. The prevalence of hearing loss based on audiometric tests varies according to: 1) the sound frequency used; 2) the decibel level at which hearing impairment is recognized for that particular survey, called the fence; 3) whether one or both ears are tested; and 4) whether data are reported for the right or left ear, the better ear, the worse ear, or an average.

Some individuals are able to hear the pure tones used in air and bone conduction tests but have difficulty understanding speech because of problems in auditory discrimination. This condition, called **dysacusis**, is widespread among hearing impaired elderly people. Pure tone air and bone conduction tests underestimate the extent of dysacusis (69) and, as a result, prevalence estimates based on pure tone air and bone conduction tests are usually lower than those based on speech reception and speech discrimination tests (41).

PREVALENCE

The prevalence of hearing impairment varies by age, sex, race, income, and institutional status. Prevalence estimates also vary depending on whether they are based on interview or audiometric testing.⁴ There is ongoing debate about the accuracy of interview and audiometric tests for measuring hearing impairment and about the level of hearing loss that constitutes significant disability. These debates are relevant to understanding whether prevalence estimates are valid.

The data in the following discussions reflect our best understanding of the nationwide prevalence of hearing impairment. However, the generalizations may not apply in certain geographic areas. For example, chronic ear infections are common among certain ethnic groups in Alaska and Indians in some Southwestern States and this increases the prevalence of hearing impairment in those areas. Similarly, in areas where high-noise industries are concentrated, hearing loss is more common among persons of working age and older (10).

Age

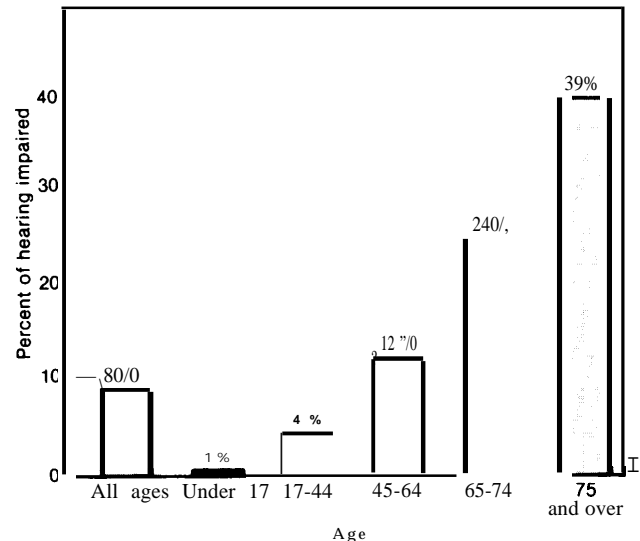
According to the 1977 National Health Interview Survey (NHIS), about 8 percent of the civilian, noninstitutionalized population experienced some degree of chronic hearing impairment. Prevalence rises from about 1 percent of those under age 17 to more than 38 percent of those over 75 (see figure 2).

⁴Prevalence figures based on interviews come from the 1977 National Health Interview Survey (NHIS), conducted by the National Center for Health Statistics (NCHS). NHIS is an annual nationwide survey. Respondents are asked about acute and chronic health conditions of all members of the household. In 1977, a special supplement to the NHIS focused on hearing impairment. NHIS data are believed to underestimate prevalence because some people deny or are unaware of their hearing impairments or may not consider their hearing loss a problem and because NHIS interviews are usually conducted with only one member of the household, who may not be aware of or report hearing impairments of other household members.

Prevalence figures based on audiometric testing come from the Health and Nutrition Examination Surveys (HANES), conducted from 1971 to 1975 by NCHS. A random sample of adults aged 25 to 74 in the civilian, noninstitutionalized population was tested using pure tone air and bone conduction tests at 4 frequency levels (500, 1,000, 2,000, and 4,000 Hertz) and a speech reception test. Air and bone conduction tests were reported for the right ear only; this lowers prevalence estimates because those with unilateral hearing loss in the left ear are not included.

Both NHIS and HANES underestimate overall prevalence in the elderly population because the institutionalized elderly, who have very high prevalence, are not included.

Figure 2.—Prevalence of Hearing Impairment, Including Tinnitus, in the Civilian, Noninstitutionalized Population, United States, 1977



SOURCE: NCHS, 1981 (120).

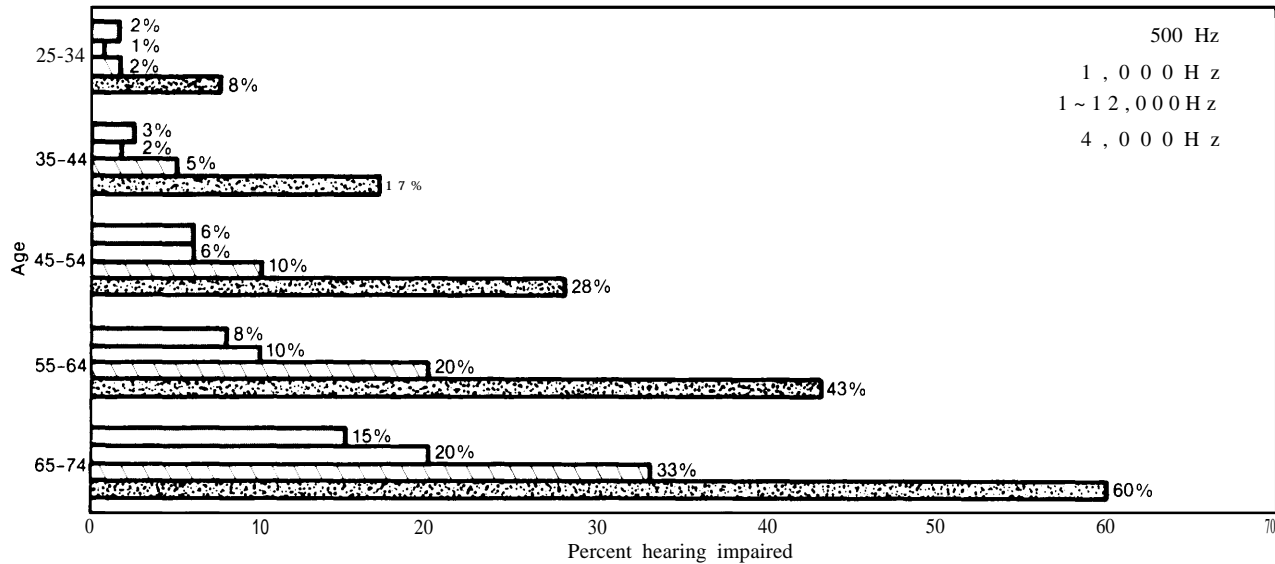
Audiometric surveys also show significant increases in hearing impairment with age and they indicate a higher overall prevalence than interview surveys (41, 51). For example, one national audiometric survey showed that almost 30 percent of individuals between 65 and 74 and 48 percent of those between 75 and 79 had impaired hearing for understanding speech (69).

Audiometric data show that hearing loss is greater for high frequency than for low frequency sounds for all age groups. As figure 3 indicates, hearing impairment at high frequencies is very common among elderly people.

While most speech is in the range of 500 to 2,000 Hz,⁵ sounds such as *s*, *th*, *k*, and *f* are heard at higher frequencies. Elderly individuals with hearing impairments at 4,000 Hz (i.e., almost 60 percent of all elderly people) are often unable to hear these sounds and this interferes with their understanding of normal speech.

⁵Frequency is measured in vibrations or cycles per second, called Hertz (Hz).

Figure 3.—Prevalence of Hearing Impairment Among Adults by Frequency of Tone, United States, 1971-75^a



These data are based on air conduction tests. Figures include individuals who were able to hear the tones at 31 decibels or more at least 50 percent of the time.

SOURCE: NCHS, 1960 (1 16).

Gender

Interview surveys indicate that elderly men have a higher prevalence of hearing impairment than elderly women. The 1977 NHIS found that among people 65 to 74, about 29 percent of men reported hearing impairments compared to only 20 percent of women. Among those 75 and over, 44 percent of men but only 35 percent of women reported hearing impairments (121). Some experts suggest that these different rates are the result of lifelong exposure to loud noise while hunting, serving in the military, or working in farm and factory occupations (10, 129).

Longitudinal studies indicate that men and women aged 50 to 80 experience hearing loss in the same frequency range, but hearing loss increases more rapidly in men than in women. After age 80, these differences in hearing impairment between men and women become indistinguishable (54, 123).

Audiometric data show much higher prevalence of high frequency hearing impairment for elderly men than for elderly women, but elderly women have similar or slightly higher prevalence at low

frequencies (54). For example, air conduction tests used in the Health and Nutrition Examination Survey (HANES) showed that 78 percent of the men from age 65 to 74 had hearing loss at 4,000 Hz, compared to only 46 percent of the women in that age group. In contrast, at 500 Hz about 12 percent of elderly men and 18 percent of elderly women had hearing loss, while at 1,000 Hz about 18 percent of elderly men and 21 percent of elderly women had hearing loss.^b Bone conduction tests produced similar findings (116). The reason for this variation in prevalence for men and women at different frequencies is not known.

Race

The 1977 NHIS indicated a substantially lower prevalence of hearing impairment among nonwhites of all ages than among their white counterparts (see table 3).

Audiometric data show a more complex relationship between race and hearing impairment, HANES data indicate that elderly nonwhites have

^aFigures include individuals who were able to hear the tones at 31 dB or more at least 50 percent of the time.

Table 3.—Prevalence of Hearing Impairment, Including Tinnitus, in the Civilian, Noninstitutionalized Population, by Race and Selected Age Groups, United States, 1977

Age	Race		
	White	All	other
Under 17 years	1 %		1 %
17 to 44	4		3
45 to 64	13		8
65 to 74	25		18
75 and over	39		31

SOURCE: NCHS, 1981 (120)

a lower prevalence of severe hearing impairments than elderly whites, but a higher prevalence of moderate hearing impairments.⁷ This distinction is true for pure tone air conduction measures at 500, 1,000, 2,000, and 4,000 Hz. On speech reception tests elderly nonwhites had a higher prevalence of hearing impairment at all levels of severity except profound deafness (116). The difference between these results and data from interview surveys suggest that elderly nonwhites may be less likely than elderly whites to report hearing impairment in an interview.

Income

In general, persons with low family income have a higher rate of hearing impairment at all ages than their wealthier counterparts. For example, the 1977 NHIS found that the rate of impairment for persons aged 65 to 74 with annual family incomes below \$3,000 was about 30 percent. For the same age group with incomes in excess of \$15,000, the rate was about 20 percent (121). With only minor variation, this inverse relationship between income and hearing loss is sustained for all age categories. Although the reasons for this relationship are not known, it may be because low income people have poorer general health, poor primary health care, and greater exposure to environmental noise

⁷For this comparison, hearing impairment above 50 dB is considered severe, while impairment from 31 dB to 50 dB is considered moderate.

and this results in higher prevalence of hearing impairment (10, 42).

Institutionalization

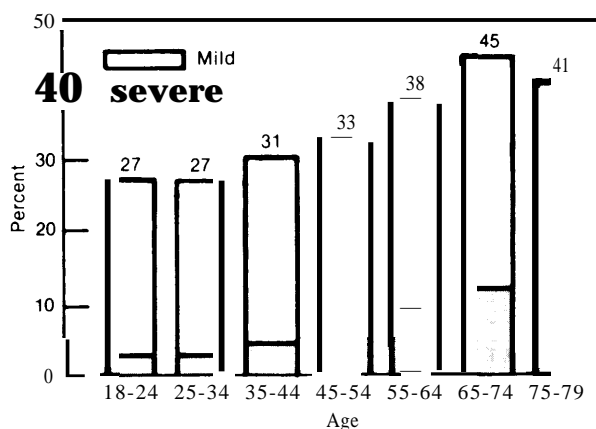
The prevalence of hearing loss among institutionalized elderly people is greater than among noninstitutionalized elderly people. One survey in a Veterans Administration nursing home found that 90 percent of the residents had hearing impairments (132). A review of research on hearing loss among nursing home residents found prevalence estimates ranging from 48 to 82 percent (98). The variation among these findings is attributed to: different methods of measuring hearing loss, the types of nursing homes studied, characteristics of the selected population, lack of uniform interpretation of "hearing loss" and lack of information about threshold sensitivity at individual frequencies.

A study of hearing impairment in a nursing home in Canada pointed out the inadequacy of self reports for assessing hearing impairment in this type of setting (22). Residents were interviewed about their hearing ability and given audiometric tests. Fifty percent of the residents acknowledged a hearing loss in interviews, but audiometric testing showed that 75 percent actually had hearing impairments. Eight percent of the residents reported hearing loss when there was no audiometric evidence of impairment, while 33 percent reported normal hearing but actually had clinically significant loss. Audiometric testing should be a routine procedure for elderly people admitted to nursing homes since hearing loss, including unrecognized loss, can affect a person's ability to function normally.

Prevalence of Tinnitus

The prevalence of tinnitus increases with age (see figure 4) and more women than men report tinnitus (69).

Figure 4.— Prevalence of Tinnitus, by Severity and Selected Age Groups, United States, 1960-62^a



^aPercentage figures rounded to nearest whole number.

SOURCE: Leske, 1981 (69).

THE IMPACT OF HEARING IMPAIRMENT

Clinical Impact

Hearing impairment lessens a person's ability to hear environmental sound without amplification. In some cases it also diminishes the ability to discriminate between sounds even with amplification. This condition is common among hearing impaired elderly people and results in the complaint, "I can hear you, but I can't understand you" (54, 89). Some research indicates that auditory discrimination is a problem even for some elderly people with normal hearing as measured by pure tone audiometric tests. This is less often true of younger people with normal hearing measured in the same way (63).

Loss of the ability to hear high-frequency sounds is characteristic of hearing impairment in many elderly people. At birth the human being is able to hear sounds as high as 30,000 Hz, but each year of life results in some loss. By the teens, many individuals can hear only up to 20,000 Hz, and by old age many people cannot hear sounds at 4,000 Hz or even 2,000 Hz, the level of some speech sounds (32).

Elderly people with hearing impairment usually have diminished ability to hear low-intensity sounds, but their ability to hear very loud or high-

intensity sounds can remain unchanged. This can make it uncomfortable to use hearing devices that amplify all sounds uniformly because relatively loud sounds that are amplified then become intolerably loud (89).

Another common characteristic of hearing impairment in elderly people is an inability to tune out background noise. Many elderly people experience difficulty hearing in a noisy environment because they cannot separate speech from background noise (54, 82). Although available data are not conclusive, studies suggest that elderly people have more difficulty hearing in a noisy environment than younger people with comparable hearing ability. Furthermore, even elderly individuals with *normal* hearing ability, measured by audiometric tests, can experience problems with background noise (31,44). Sound reverberations in large rooms such as auditoriums and churches also interfere with speech perception among many elderly people.^a

In the normal ear, the *efferent system* is a system of complex neural mechanisms that act to con-

^aCh. 3 discusses the implications of these findings for hearing aid design, the use of assistive listening devices, and environmental design technologies. Implications for screening programs and identification of people who need treatment are discussed in ch. 4.

trol discrimination of sound, detection of sound signals in noise, and localization of sound. Little is known about how this system inhibits response to some auditory signals and tunes out unwanted sound. Further, it is not known how the efferent system changes with age and whether such changes are part of why elderly people have difficulty understanding speech in noisy environments. Continued research on the mechanisms of selective inhibition could help increase our understanding of hearing impairment in the elderly (30).

psychosocial Impact

Hearing impairment causes psychological and social difficulties because it interferes with a person's ability to communicate effectively. Communication plays an essential role in maintaining relationships and the quality of life, and hearing loss deprives not only the individual, but also family and friends, of easy communication. Repeated instances of unheard or incorrectly heard communication are frustrating for the individual and everyone he converses with and may cause all those involved to initiate conversation less frequently. When these frustrating situations occur over prolonged periods, family relationships can be severely strained. Hearing loss also can affect a person ability to speak clearly because his own voice sounds distorted, and this can add another impediment to communication.

Hearing loss limits a person's ability to enjoy many forms of entertainment, such as television, radio, music and theater, and as a result he may withdraw from them. Similarly, some hearing impaired people stop going to church and social gatherings because they cannot hear well enough to enjoy these activities (32, 54). Hearing impairment also limits access to information that is normally available through personal communication, television, radio, and telephone. Elderly people who have both hearing and visual impairments are even more severely limited in their access to information.

Aging can bring many kinds of losses: loss of income and decreased sense of usefulness associated with retirement; loss of relationships due to the death of spouse, siblings, and friends or due to a physical move from a familiar home or com-

munity; and diminished health, energy, and mobility. While most elderly people cope well with these losses, hearing impairment can hinder the coping process by interfering with the person's ability to become involved in new activities, form new relationships, and arrange for needed services (10).

For some people, hearing impairment can lead to withdrawal, social isolation, and depression caused by lack of interpersonal communication and contact. One British study found a significant relationship between depression and hearing impairment among community dwelling elderly people (51). Another study, however, found no correlation between hearing impairment and either depression or social interaction (112). The researchers suggest that the subjects in the latter study may not be typical of the elderly population because of their general good health, economic security, and high level of education. Further research is needed to clarify the relationship between these variables.

Clinical observation suggests that there is a relationship between hearing impairment and psychopathology in some individuals. Particularly when hearing impairment occurs gradually, as it often does in later life, deaf and hard-of-hearing individuals sometimes develop delusions of persecution and other paranoid reactions. These symptoms may occur because the older person is not aware of his hearing impairment—he notices that others seem to be talking in his presence but too quietly for him to hear or that they are laughing about something he cannot hear. He becomes suspicious and may accuse them of excluding him deliberately. When they deny these accusations, he may become more suspicious.

Research has demonstrated this relationship between hearing impairment and paranoid symptoms (139). College students were hypnotized to induce temporary hearing impairment and then asked to work with others on a joint project. These subjects tended to develop symptoms of paranoia, including suspiciousness, grandiosity, irritability, and judgmental attitudes.

Some clinicians and long-term care providers have suggested that hearing impairment can cause or exacerbate mental deterioration in old age (10).

One study found a significant relationship between hearing impairment and dementia (51). The relationship did not hold up, however, when age was controlled, indicating that while both hearing impairment and dementia are associated with advancing age, they are not otherwise correlated. Another study showed that hearing impaired individuals do as well as individuals with no hearing problems on *nonverbal* tests of cognition but less well on *verbal* tests (112). It is not known whether these results occur because the hearing impaired individuals do not hear the questions on verbal tests clearly or whether some types of hearing impairment interfere with cognitive processes for encoding and recalling verbal messages.

Changes in brain function associated with aging can affect hearing, according to a report prepared by the Working Group on Speech Understanding and Aging of the National Academy of Sciences. The report, to be published in 1986, indicates that physiological changes in the brain that affect overall brain function (not only the auditory brain centers) can result in slowed response to auditory stimuli (113). Continued research on the relationship between cognitive change and hearing loss is needed.

Perhaps more important than any actual relationship between hearing impairment and mental deterioration is a widespread assumption in society that elderly persons who are hearing impaired are also confused (30, 112, 124). A strong tendency exists to stereotype elderly people as senile (95) and the additional factor of a hearing loss increases stereotyping. In a study conducted in an acute care hospital, health care professionals described their impatience with elderly persons with hearing losses (9). Several respondents said the method they used in interactions was to "scream at them." This behavior was considered acceptable since the patients were old "and probably senile, too."

Other negative attitudes about individuals with hearing impairments are also widely held. People seem to be more sympathetic to visible impairments and may be more sympathetic to blind people than to those with hearing impairments. Moreover, there is an unfortunate tendency to blame the hearing impaired person for his or her disability, especially if the person is also old. This ten-

dency may partially explain the sense of shame that many hearing impaired people feel (82). Finally there is a common belief among health care providers, as well as among the general public, that hearing loss in elderly people is not treatable (10).

A study comparing hearing impaired elderly people who did not seek treatment with those who did seek treatment identified two factors that affected whether people sought help: 1) the severity of the impairment, and 2) the onset of hearing impairment before retirement age. Both elderly individuals and their physicians can have negative attitudes about hearing loss that begins in old age. This can play an important role in determining which individuals seek treatment (55).

Nursing home residents are very likely to have hearing impairments that can be particularly devastating for several reasons. The move to a nursing home requires adjustment to a new environment, new people, and new daily routines. Hearing impairment interferes with the individual's ability to develop relationships with staff and other patients and to fully understand the daily schedule. One regular visitor to a nursing home reports a comment that is heard all too often with regard to hearing impaired residents, "Don't bother talking to her, she can't hear you" (14).

Some hearing impaired nursing home residents have mobility impairments that interfere with their ability to interact with others and other sensory impairments, such as vision and speech deficits, that further reduce their ability to socialize. These multiple impairments compound the isolation often associated with severe hearing loss. Finally, many nursing home residents have irreversible mental impairments caused by strokes, primary degenerative dementias such as Alzheimer's disease, or other disease conditions. In this context, it is easy for nursing home employees to assume that hearing impaired residents who do not answer questions correctly and do not seem to understand the daily routine are also mentally impaired. The impact of this assumption on the hearing impaired resident's quality of life can be very severe.

Denial of Hearing Impairment

Many elderly people deny they have a hearing problem despite substantial evidence to the con-

trary. Many authors have discussed the problems of denial and refusal to seek treatment (76), but little attention has been given to the underlying reasons for it. Elderly people who deny or avoid confronting a hearing loss are not doing so in a vacuum. Negative social attitudes about hearing impairment and growing old encourage denial. Hearing impairment is not visible, and invisibility facilitates denial. In addition, hearing impairment in elderly people often has a very gradual onset that can make it difficult to recognize.

For elderly persons with one or more life-threatening illness, hearing impairment may seem insignificant in comparison. The onset of depression, withdrawal, paranoia, and other mental health

problems associated with hearing impairment is slow and insidious and may seem unrelated to the hearing loss. An elderly person's inability to receive aural cues can lead to accidents, though the causes may seem ambiguous. Likewise, difficulties in communication and social relationships may not be attributed to hearing loss, even when the loss is acknowledged. As a result, hearing impairment often is mistakenly seen as unimportant by elderly people, their families, and health care providers (10). This denial of the importance of hearing impairment and our failure to recognize its full impact on independent functioning are clear obstacles to effective treatment.

DEAFNESS

Only a small percentage of elderly people are deaf. There is no consensus about the exact prevalence of deafness, in part because of variation in the method used to measure hearing impairment and the level of impairment that is defined as deafness. However, estimates using audiometric tests indicate that about 2 to 4 percent of all elderly people are deaf (116, 119). Among people over 75, prevalence increases somewhat, and if people with severe hearing impairments are included, prevalence increases significantly.

For practical purposes elderly deaf people can be divided into three groups: 1) those who became deaf very early in life before language was acquired, 2) those who became deaf during early or middle life after language was acquired, and 3) those who became deaf during later life. People who have been deaf since childhood have usually learned to use sign language and have deaf and nondeaf friends and associates with whom they can communicate using sign language.⁸ Since their method of communication is manual, their ability to communicate usually does not diminish with age. Some people who became deaf in early or middle life use speechreading as their preferred mode of communication. Visual impairments acquired

late in life can interfere with their ability to use speechreading techniques.

Individuals who become deaf late in life face different problems. Sign language is an entirely new and complex system of communication that they must learn if they are to interact with other deaf people who use sign language. Yet their relatives and lifelong friends seldom know sign language. The result can be extreme social isolation.

People who are deaf and people with partial hearing loss are similar in some ways and very different in others. Both groups can benefit from increased awareness of their communication problems among their families, friends, health care and social service providers, and others who interact with them. Yet the devices and hearing services that are most effective for each group are different. For example, sign language and telecommunication devices that rely on visual messages, such as the telecommunication devices for the deaf (TDDs) described in chapter 3, are most effective for deaf people. In contrast, hearing aids, assistive listening devices, and telephone amplifiers are more appropriate for those with partial hearing loss.

In the past, hearing research and many hearing services have focused on deaf and very seriously hearing impaired people, and less emphasis has

⁸This network of informal relationships is often referred to as the "deaf community."

been placed on partial hearing loss (10). When deaf people and those with partial hearing loss are combined into a single category—"the hearing impaired"—at least 16 million people are included. Yet this large number is sometimes used to justify funding for research programs and hearing services focused primarily on the deaf—a group of

about 2 million people. Self-help groups for hard-of-hearing people have pointed out this discrepancy (109) and funding agencies and hearing research centers are slowly readjusting their research and service priorities to encompass the very large proportion of hearing impaired people who are not deaf.