HEARING
An introduction to aging science brought to you by the American Federation for Aging Research
WHAT DO WE MEAN BY HEARING LOSS?

Before we can understand hearing loss, we must first understand what hearing entails. When we hear sounds, we really are interpreting patterns of movement of air molecules. We can describe sounds in terms of their frequency (or pitch) and intensity (or loudness).

Frequency is measured in hertz (Hz). Although our ears are sensitive to sounds ranging from 20 to 16,000 Hz, the sounds important for speech communication fall within the 500 to 3,000 Hz range.

Speech includes a mix of low and high frequency sounds. Vowel sounds like “u” are lower in frequency (250 to 1,000 Hz) and are usually easier to hear than high frequency sounds. Consonants like “s,” “h,” and “f” are higher in frequency (1,500 to 3,000 Hz) and are more difficult to hear—especially for those with age-related hearing loss. Consonants convey most of the meaning of what we say. Someone who cannot hear high-frequency sounds will have a difficult time understanding speech, especially in a noisy situation.

Intensity, or loudness, is measured in decibels (dB). A person with hearing within the normal range can hear sounds ranging from 0 to 140 dB. A whisper is around 30 dB. Conversations are usually 45 to 50 dB. Sounds that are louder than 90 dB can be uncomfortable to hear. A loud rock concert, for example, might be as loud as 110 dB. Sounds that are 120 dB or louder can be painful and can result in temporary or permanent hearing loss. It has been established that noise levels above 90 dB can cause permanent nerve type of hearing loss. For this reason, workers exposed to 90 dB or greater are required to wear ear protection.

Hearing loss is defined by how well a person can hear the frequencies or intensities most often associated with speech. Severity can be described as mild, moderate, severe, or profound. The term “deaf” is sometimes used to describe someone with a profound hearing loss, who cannot use hearing to process speech and language information—even with the use of hearing aids. The term “hard of hearing” is sometimes used to describe people who have a less severe hearing loss than deafness.

Hearing loss can affect one or both ears. A loss that affects one ear is called a unilateral loss. A loss that affects both ears is called a bilateral loss. Overall, there are three types of hearing loss: conductive, sensorineural (SNHL), and mixed hearing loss (combination of conductive and SNHL).

WHAT CAUSES HEARING LOSS?

Hearing loss may result from countless causes including infections, head injuries or tumors, some medicines, heredity, or even too much ear wax. It can also result from repeated exposure to very loud noise—including music. Changes in the way the ear works as a person ages can also affect hearing. Age-related hearing loss is common and is called presbycusis (prez-bee-KYOO-sis).

WHAT SHOULD YOU DO IF YOU SUSPECT A HEARING LOSS?

Hearing problems are serious. The most important thing you can do if you think you have a hearing problem is to consult with a physician or preferably an otolaryngologist (oh-toe-lair-in-GAH-luh-jist), a doctor who specializes in the conditions of the ear, nose, and throat. An otolaryngologist will try to find out why you have a hearing loss and offer treatment options. He or she may also refer you to an audiologist (aw-dee-AH-luh-jist) for a hearing test or other tests. An audiologist can recommend assistive listening devices or hearing aids.

Sometimes otolaryngologists and audiologists work together to find the treatment that is right for you. If you need a hearing aid, an audiologist can help you find the right one. Although children must be seen by a physician before they can be fitted for a hearing aid, adults do not always see a physician. Adults who do not see a physician before getting a hearing aid usually must sign a waiver.

CAN MY FRIENDS AND FAMILY HELP ME?

You and your family can work together to make hearing easier.
Here are some things you can do:

- Tell your friends and family about your hearing loss. They need to know that hearing is difficult for you. The more you tell the people you spend time with, the more they can help you.
- Ask your friends and family to face you when they talk so that you can see their faces.
- Pay attention to what is being said and to facial expressions and gestures.
- Ask people to speak louder, but not shout. Tell them they do not have to talk slowly, just more clearly.
- Be aware of noise around you that can make hearing more difficult. When you go to a restaurant, do not sit near the kitchen or near a band playing music. Background noise makes it difficult to hear people talk.
- Don’t try to speak or listen from the other room or while walking away.

Working together to hear better may be tough on everyone for a while. It will take time for you to get used to watching people as they talk and for people to get used to speaking louder and more clearly. Be patient and continue to work together. Hearing better is worth the effort.

DIFFERENT KINDS OF HEARING LOSS

Normal hearing requires that all parts of the auditory pathway are working correctly. This includes the external ear, the middle ear, the inner ear, the auditory nerve, and the connection between the auditory nerve and the brain. The exact location and nature of the problem determines the type and severity of an individual’s hearing loss.

Conductive hearing loss is caused by a problem in the outer ear or middle ear. These losses usually affect all frequencies to the same degree, but are not usually severe. Conductive hearing loss happens when something blocks the sounds that are carried from the eardrum ( tympanic membrane) to the inner ear. For example, ear wax buildup, fluid in the middle ear, abnormal bone growth, a punctured eardrum, or a middle ear infection can cause this type of hearing loss. The most common cause of progressive conductive hearing loss in adults is otosclerosis, which causes fixation of the third ear bone (stapes). If ear wax blockage is a problem for you, the American Academy of Otolaryngology-Head and Neck Surgery suggests using mild treatments such as mineral oil, baby oil, glycerin, or commercial ear drops to soften ear wax. Also, you can use commercial ear-wax removal kits to clean out wax occasionally, if necessary. Never use cotton swabs. If you think you may have a hole in your eardrum, however, you should see your doctor. Medical or surgical treatment can usually restore conductive hearing loss.

Sensorineural hearing loss is caused by damage to the inner ear or auditory nerve. A sensorineural loss often affects a person’s ability to hear some frequencies more than others. This means that sounds may be distorted, even with the use of a hearing aid. Sensorineural losses can range from mild to profound and tend to be permanent.

Mixed hearing loss is a combination of conductive and sensorineural losses.

Central hearing loss is caused by a problem along the pathway from the inner ear to the auditory region of the brain or in the brain itself.

No matter what kind of hearing loss you may have, medical or surgical treatment, or hearing devices can improve hearing for most people.

HEARING LOSS AS A RESULT OF AGING

Roughly one-third of Americans more than 60 years of age, and about 40 to 50 percent of those 75 and older, have hearing loss.
Hearing loss directly related to aging (presbycusis) is common in people over the age of 50. People with this kind of hearing loss may have difficulty hearing what others are saying or may be unable to stand loud sounds. The decline is slow. Just as hair turns gray at different rates, presbycusis can develop at different rates. It is a sensorineural (sen-soh-re-NOO-ruhl) hearing loss.

This type of hearing loss often results from damage to the hair cells in the inner ear. Presbycusis may result from heredity, head injury, infection, illness, certain prescription drugs, diabetes, high blood pressure, and exposure to loud noise. The degree of hearing loss varies from person to person. Also, a person can have a different amount of hearing loss in each ear.

Some individuals may not want to admit that they have difficulty hearing. They may become depressed or withdraw from others to avoid feeling frustrated or embarrassed. It is easy to mistakenly call older people confused, unresponsive, or uncooperative just because they do not hear well.

Hearing problems that are ignored or untreated, however, can get worse. If you have a hearing problem, you can get help. See your doctor. Hearing aids, special training, certain medicines, and surgery are some of the choices that can help people with hearing problems.

The noise in your ears, tinnitus (tin-NY-tus), also common in older adults, is the ringing, hissing, or roaring sound in the ears frequently caused by exposure to loud noise or certain medicines. Tinnitus is actually a symptom and not a disease. It is present in 80% of patients with hearing loss. Tinnitus may come and go, or it can persist or stop altogether. For more information on tinnitus, please visit the Mayo Clinic Web site.

HEARING LOSS AS A RESULT OF MEDICATIONS

When genetically susceptible individuals come in contact with certain medications, ear poisoning (ototoxicity) can occur. This can result in temporary or permanent loss of hearing, loss of balance, or both.

Among the most problematic medications are life-saving drugs such as the aminoglycoside antibiotics, especially gentamicin, and some chemotherapy drugs. Even everyday medicines, such as aspirin and some diuretics, can be a problem for certain individuals. Also, Vicodin or the combination of acetaminophen and hydrocodone, may result in hearing loss.

Extreme noise—such as firecrackers exploding — experienced at close range can damage hearing permanently in an instant. Repeated exposure to engines and machines such as motorcycles or chain saws can erode hearing more slowly, but the result is the same — irreversible hearing loss.
If you suspect that a new medication may be affecting your hearing or your sense of balance, speak with your doctor immediately. He or she can consider another medication that may not have that side effect for you.

To learn more about ototoxicity, please go to the Vestibular Disorders Association (VEDA) Web site.

HEARING LOSS AS A RESULT OF NOISE EXPOSURE

Another reason for hearing loss may be exposure to too much loud noise. Many construction workers, farmers, musicians, airport workers, tree cutters, and people in the armed forces have hearing loss because of this problem.

Noise is not a new hazard. As early as the 1500s, it was noted that those who fired cannons suffered hearing loss from the noise. Too much noise exposure may cause a temporary change in hearing (your ears may feel stuffed up) or a temporary ringing in your ears (tinnitus).

According to the National Institute on Deafness and Other Communication Disorders (NIDCD), there are three things to consider about noise:

- How loud
- How long
- How close

The NIDCD wants you to know that an extreme noise—such as firecrackers exploding—experienced at close range can damage hearing permanently in an instant. Repeated exposure to engines and machines such as motorcycles or chain saws can erode hearing more slowly, but the result is the same—irreversible hearing loss. The NIDCD urges you to carry earplugs or other devices to protect your ears so that they last a lifetime.

Please also visit the U.S. Centers for Disease Control and Prevention (CDC) website for information about proper hearing protection you may wish to consider if you are exposed to noise on a regular basis.

HEARING AIDS

Hearing aids are tiny instruments you wear in or behind your ear to make sounds louder. The U.S. Food and Drug Administration (FDA) has rules to ensure that treatments for hearing loss—such as medicines, hearing aids, and other medical devices—are safe and effective. If you think you may have hearing loss, visit your doctor. He or she may refer you to an otolaryngologist or audiologist to determine the cause, type, and extent of your hearing problem and whether hearing aids will help you.

Things sound different when you wear a hearing aid, but an audiologist can help you get used to it. To find the hearing aid that works best for you, you may have to try more than one. Ask your audiologist whether you can have a trial period (usually 30 to 45 days) with a few different hearing aids. You and your audiologist can work together until you are comfortable.

Most hearing aids today are digital and can be adjusted and tuned to your hearing loss. Some hearing aids have multiple microphones that help deal with background noise.

Remember that when you buy a hearing aid, you are buying a product and a service. Find a hearing aid dealer (called a dispenser) who has the patience and skill to help you during the month or so it may take to get used to this device. You may need to have several fittings of your hearing aid, and you will need to get directions on how to use it.

Hearing aids use batteries, which you will need to change on a regular basis. They also may need repairs from time to time. Buy a hearing aid that has only the features you need.

What are the features of a standard hearing aid?

All hearing aids have these parts:

- A microphone, to pick up sound
- An amplifier, to make sound louder
- A speaker, to bring sound to the ear
- A battery

Types of hearing aids
Here are some of the most common types of hearing aids:

- **Behind-the-ear.** This kind of hearing aid fits behind the ear and carries sound to the ear through a custom ear mold.

- **In-the-ear (ITE).** These are custom-made to fit in the ear canal and outer ear. You can’t see any wires because they are inside the aid. They are useful for mild to moderate hearing loss.

- **Completely in-the-ear-canal (CIC).** This kind of hearing aid is custom-made to fit in the ear canal. There are no outside wires or tubes. These hearing aids are smaller than in-the-ear models and are almost impossible to see. They help people with all but the worst degree of hearing loss.
You may see ads that say you can buy a hearing aid without being examined by a physician. This is true; it is up to you. Should you decide that you don’t want a medical exam to rule out a medical reason for the hearing loss, however, you will have to sign a written statement called a waiver. The waiver says that the company or person selling the hearing aid has told you that FDA has determined that it is in your best health interest to have a medical examination by a licensed physician—preferably one who specializes in ear diseases—before buying a hearing aid, but that you decided not to have the medical exam.

If you have a question about hearing loss, you can contact the U.S. Food and Drug Administration through their toll-free number—(888) INFO-FDA [(888) 463-6332]—or visit their Web site.

Visit the American Speech-Language Hearing Association or the American Academy of Audiology for links to Audiologists and Hearing Aid information.

The Mayo Clinic Web site has additional information on choosing the right hearing aid.

See also the Consumer’s Guide to Hearing Aids, newly published for 2011, a 31-page booklet you may wish to purchase. The booklet was produced by Self Help for Hard of Hearing People.

Other sites to visit also include the American Academy of Otolaryngology Head and Neck Surgery and the House Research Institute, formerly the House Ear Institute.

COCHLEAR IMPLANTS

If your deafness is profound, a physician may suggest a cochlear (COKE-lee-ur) implant. Adults have been receiving cochlear implants since 1969, and today, children as young as one year old are receiving them. In this surgery, a doctor puts a small electronic device under the skin behind the ear. The implant bypasses damaged structures in the inner ear and on to the brain. This mechanism directly stimulates the auditory nerve, allowing some deaf individuals to learn to hear and interpret sounds and speech. Unfortunately, these implants are not helpful for all types of deafness or hearing loss.

Cochlear implants have three parts: a headpiece, a speech processor, and a receiver. The headpiece includes a microphone and a transmitter. It is worn just behind the ear where it picks up sound and sends it to the speech processor, a beeper-sized device that can fit in your pocket or on a belt.

The speech processor converts the sound into a special signal that is sent to the receiver. The receiver, a small round disc about the size of a quarter that a surgeon places under the skin behind one ear, sends a sound signal to the brain.

OTHER DEVICES AND STRATEGIES THAT CAN HELP YOU HEAR

There are many products that can help you live well with less-than-perfect hearing. The list below includes some examples of the many choices:

- **Personal listening systems.** These technologies help you hear what you want to hear while eliminating or lowering other noises around you. Some, called auditory training systems and loop systems, make it easier for you to hear someone in a crowded room or group setting. Others, such as FM systems and personal amplifiers, are better for one-on-one conversations.

- **TV listening systems.** These systems likewise help you listen to the television or the radio without being bothered by other noises around you. These systems are usually infrared and allow the hearing impaired person to hear TV without disturbing others.

- **Alerts.** Special devices such as doorbells, smoke detectors, and alarm clocks can give you a signal such as a flashing light to let you know when someone is ringing the front door bell or when the phone is ringing. Similar devices may work with a vibration that you can feel.

- **Direct audio input hearing aids.** These devices are hearing aids that can be plugged into TVs, stereos, microphones, auditory trainers, and personal FM systems to help you hear better.

- **Telephone amplifying devices.** Some telephones are designed to work with certain hearing aids. If your hearing aid has a “T” switch, you can ask your telephone company about getting a phone with an amplifying coil (T-coil). If your hearing aid is in the “T” position, this coil is activated when you pick up the phone. It allows you to listen at a comfortable volume and helps lessen background noise. You can also buy a special type of telephone receiver and other devices to make sounds louder on the phone.
• **Mobile phone amplifying devices.** To help people who use a T-coil hear better on mobile phones, an amplifying device called a loopset is available. The wire loop goes around your neck and connects to the mobile phone. The loop transmits speech from the phone to the hearing aid in your ear. It also helps get rid of background noise to make it easier to talk in a noisy environment.

• **Auditorium-type assistive listening systems.** Many auditoriums, movie theaters, churches, synagogues, and other public places are equipped with special sound systems for people with hearing loss. These systems are usually infrared and send sounds directly to your ears to help you hear better. If the auditorium uses a loop system, a telecoil is needed in the hearing aid.

• **Lip reading or speech reading.** Special teachers can help you learn how to lip read or speech read. People who do this pay close attention to others when they speak. They watch how the mouth and the body move when someone is talking.

**WHERE TO GO FOR HELP WITH YOUR HEARING**

See your physician about any suspected hearing loss. He or she will refer you to the appropriate health-care professional who specializes in hearing—such as an audiologist or an otolaryngologist. Hearing tests are painless. If the hearing test shows that you have a hearing loss, there may be one or more ways to treat this loss. Possible treatments include medication, surgery, or a hearing aid.

If you carry supplemental health insurance, check with your insurance company to see whether they provide any coverage toward a hearing aid. Hearing aids are not covered by Medicare. They are covered by Medicaid, but only in some states and only if you are in a very low income group. Benefits and programs vary considerably from state to state. Look in the Government section of your telephone book under County Social Services, and request an appointment to determine your eligibility for a hearing aid. Veterans of military service may qualify for assistance with hearing aids and other rehabilitative services as well. If you are a veteran, you should contact the U.S. Department of Veterans Affairs.

If you cannot pay out of pocket for a hearing aid, do not have insurance, and none of the above government agencies can be of help, you still may be able to find help from some other source. Hearing Loss Association of America suggests a number of resources that may be of assistance. You may need to make a number of calls, but your investment of time may pay dividends.
The following are national or regional resources that may be able to help low-income individuals get hearing aids:

- **Hear Now**
  Provides recycled and used hearing aids to low-income persons. (800) 648-HEAR

- **Hear USA Foundation and Hearing Aid Bank**
  Provides financial assistance to low-income families and persons for hearing aids. (888) 835-HEAR

- **Travelers Protective Association Scholarship Trust for the Deaf and Near-Deaf**
  Provides assistance for mechanical devices, medical care, and/or specialized education or treatment, to those who demonstrate financial need. U.S. citizens only. Grants may be used to purchase hearing aids, assistive listening equipment, or may help with the cost of a cochlear implant. (314) 371-0533

- **Easter Seals**
  More than 400 local service centers with varying services. Provides some assistance to low-income adults and children with hearing aids and other rehabilitative devices. (312) 726-6200 www.easterseals.com

- **Lions Club International**
  Assists low income individuals with purchasing hearing aids.

- **Quota International**
  Assists low income individuals with purchasing hearing aids (202) 331-9694 www.quota.org/

- **Sertoma International**
  Assists low-income persons with purchasing hearing aids (816) 333-8300 www.sertoma.org/

- **Better Hearing Institute**
  (800) EAR-WELL www.betterhearing.org/

**Other resources:**

- Local agencies serving deaf and/or hard of hearing people may know about local clinics, hearing aid banks, and state assistive technology loan programs that provide services on a sliding scale basis according to income.

- Many of your local civic organizations, such as the Kiwanis and Lions Clubs, may be able to provide financial assistance to purchase or acquire hearing aids and other assistive devices. Check your local phone directories or the Chamber of Commerce for a listing of civic organizations in your area.

- In many situations, organizations, government agencies, educational institutions, and employers are required by federal or state law to provide auxiliary aids and services for communication access (but not hearing aids). Some of these situations are: employers with 15 or more employees, hotels, hospitals, senior centers, and residential facilities. If you are inquiring about communication assistance in one of these situations, call the Disability and Business Technical Assistance Center at (800) 949-4232 for more information.

- State assistive technology programs may provide temporary loans of equipment, loans for purchasing equipment, information and referral services, and demonstration centers. To find out more about your own state’s programs, click on “Technical Assistance Project” at www.resna.org/ and then click on “state and territory assistive technology programs.”

- State telephone equipment programs can be found via www.tedpa.org/. These programs vary quite widely in what they provide and what their eligibility requirements are, but some provide free or low-cost telephone equipment to eligible residents.

Source: Hearing Loss Association of America. Used with permission.

More resources—State agencies for the deaf and hard of hearing