



# Hearing Loss: Types, Causes, and Prevention

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## Prevalence of Hearing Loss

- Over 17% of the US population has some degree of hearing loss
  - 14.6% of baby boomers (ages 41-59) have hearing difficulty
  - 7.4% of Generation Xers (ages 29-40) already have hearing loss
  - 65% of people with hearing loss are younger than age 65 years
- 
- Most common birth condition
  - 16% of school age children
  - 1 in 5 teenagers

**HEARING LOSS  
IS AN EPIDEMIC  
AND A LEADING  
PUBLIC HEALTH  
CONCERN**



# Hearing Loss (HL) is a **Global Epidemic**

- **The most prevalent chronic disability globally** (World Health Organization (WHO), 2008)
- **538 million adults** have a significant bilateral permanent HL (Stevens et al, 2013)
- **Growing global health concern** (WHO, 2011)



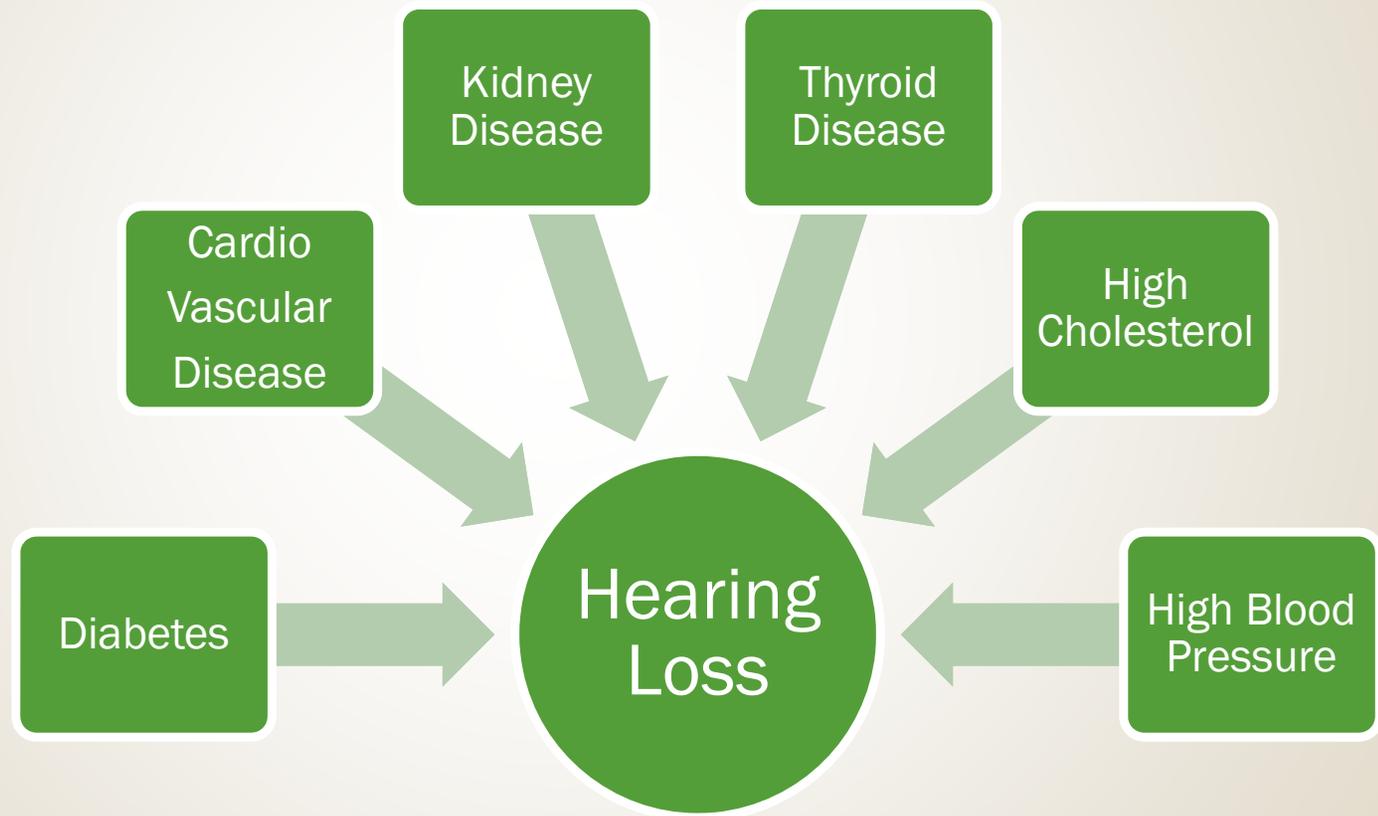
# Aging of America and Hearing Loss Penetration

- ✓ 60% of all baby-boomers\*
- ✓ The third most common condition in those over 65\*
- ✓ Two out of every three adults over 70 have a clinically significant hearing loss\*\*
- ✓ **Note: Only 14% of physicians screen for hearing loss during a physical** (Better Hearing Institute)

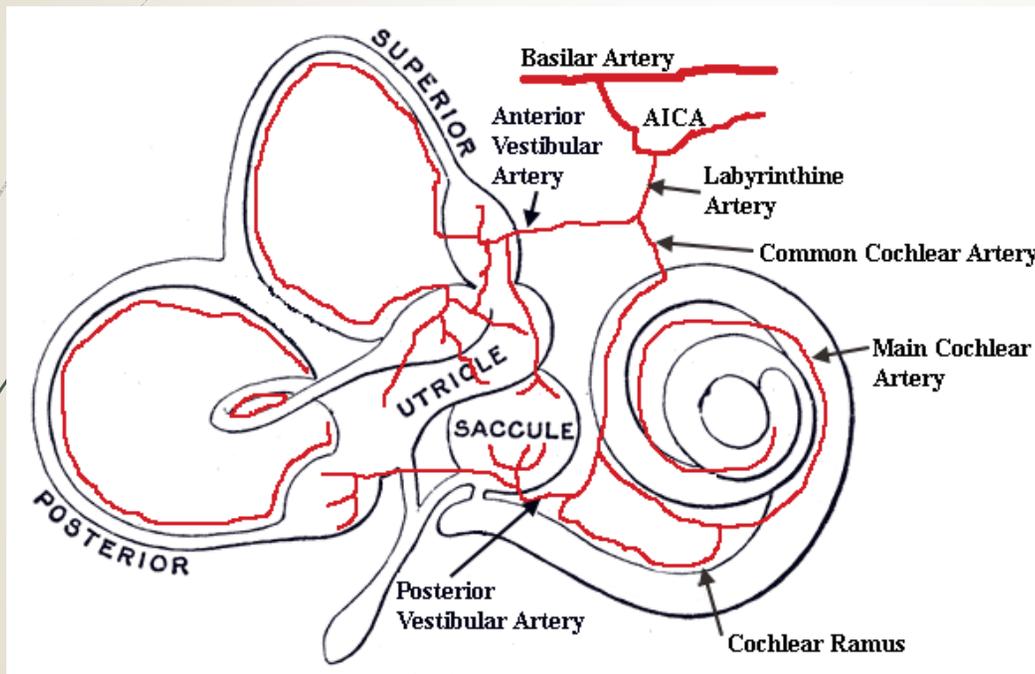
\*The *Hearing Journal*, June 2012, Vol. 65, No. 6, page 26

\*\*[www.linresearch.org/research.html](http://www.linresearch.org/research.html)

# Causes of Hearing Loss: Health Conditions



# Inner Ear Blood Supply



- ▶ A single artery, the labyrinthine/internal auditory artery, supplies the inner ear with oxygenated blood
- ▶ Any conditions that affect this blood supply can cause hearing loss

## Causes of Hearing Loss: Diabetes

- High blood glucose levels associated with diabetes may cause damage to the small blood vessels in the inner ear, similar to the way in which diabetes can damage the eyes and the kidneys
- Hearing loss is two times as common
- Pre-diabetes have 30% higher rate of hearing loss



## Causes of Hearing Loss: Cardiovascular Disease

- ▶ Inadequate blood flow and trauma to the blood vessels of the inner ear can contribute to hearing loss
- ▶ "The inner ear is so sensitive to blood flow that it is possible that abnormalities in the cardiovascular system could be noted here earlier than in other less sensitive parts of the body." —David R. Friedland, MD, PhD, President and Vice-Chair of Otolaryngology and Communication Sciences at Medical College of Wisconsin
- ▶ Hearing loss is 54% more common (Harvard)
- ▶ Hearing loss occurs in 80% of sufferers (Wisconsin)





## Causes of Hearing Loss: Kidney Disease

- ▶ There are structural and functional similarities between tissues in the inner ear and in the kidney
- ▶ Toxins that accumulate in kidney failure can damage nerves, including those in the inner ear
- ▶ Incidences of 20-87% have been reported
- ▶ Diabetes is the cause of 44% of cases

# Causes of Hearing Loss: High Blood Pressure

- ▶ As hearing declines with age, the average change in hearing thresholds per decade is significantly greater in those with high blood pressure as compared to normal hearing subjects (C. Sreenivas, 2011)
- ▶ Hypertension is an accelerating factor of hearing loss due to aging (C. Sreenivas, 2011)
- ▶ Any condition that affects your blood can consequently affect the blood supply to the inner ear, resulting in hearing loss



## Causes of Hearing Loss: Thyroid Disease

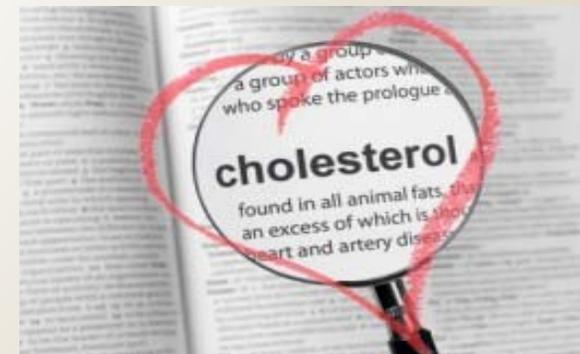
- ▶ Hypothyroidism (underactive thyroid) is commonly linked with hearing loss
- ▶ Ear development and hearing function depend on thyroid hormones
- ▶ About half of people with low thyroid function have hearing loss



*Approximately 3% of people with **Meniere's syndrome** have hypothyroidism; and in some, control of the thyroid disease eliminates the symptoms of Meniere's syndrome.*

# Causes of Hearing Loss: High Cholesterol

- ▶ High cholesterol and triglycerides (a type of fat found in your blood that is used for energy) can be significant in the development of tinnitus, hearing loss and vertigo
  - ▶ High triglycerides also increases your risk for cardiovascular disease
- ▶ Chronic dyslipidemia associated with elevated triglycerides may reduce auditory function (Journal of Otolaryngology-Neurology, 2006)
- ▶ As hearing declines with age, the average change in hearing thresholds per decade is significantly greater in those with high cholesterol as compared to normal hearing subjects (C. Sreenivas, 2011)

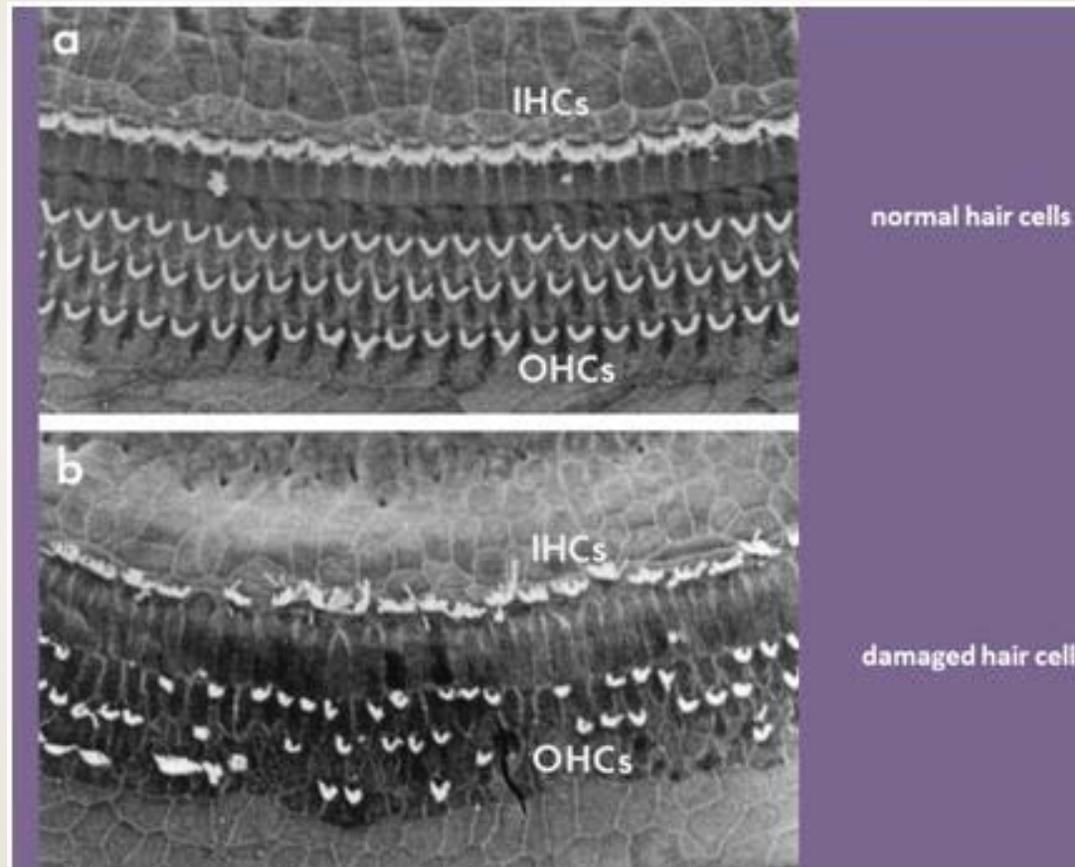


# Causes of Hearing Loss: Personal factors

- Noise exposure
  - 12 million Americans have hearing loss as a result of exposure to noise
  - Military noise exposure—gunfire, explosions (acoustic trauma)
  - Occupational noise exposure—factories, machinery, printing presses, farming equipment
  - Recreational noise exposure—hunting, motorcycles, car racing, snowmobiling



# Normal vs. Damaged Inner Ear



# Causes of Hearing Loss: Personal factors

## ▶ Smoking

- ▶ Adversely affects heart health
- ▶ Smokers are 2X more likely to have hearing loss
- ▶ Smoking increases the chance of developing hearing loss by 45%
- ▶ 46% of those exposed to second-hand smoke have hearing loss



# Causes of Hearing Loss: Personal factors

- ▶ Family history of hearing loss
  - ▶ Medical conditions: Otosclerosis, Meniere's disease
  - ▶ Congenital hearing loss
  - ▶ Familial-linked hearing loss
- ▶ Ototoxic medications
  - ▶ Chemotherapy agents
    - ▶ Carboplatin, Cisplatin, Vincristine, etc.
  - ▶ Antibiotics
    - ▶ Gentamicin, Erythromycin Neomycin, etc.
  - ▶ Diuretics
    - ▶ Lasix/furosemide, Edecrin/ethacrynic acid, Bumex/bumetanide
  - ▶ Pain Relievers\* (at risk for ototoxicity with use >2x per week)
    - ▶ Advil, Motrin (Ibuprofen), Aleve, Naproxen, Aspirin, Bufferin, Excedrin





## Shared Characteristics of Hearing Loss & Dementia

- Gradual with long-term roots
- Subtle symptoms at onset
- Unrecognized, minimized and often undiagnosed
- Similar etiologies



## Social-Related Risk Factors for Dementia:

- Low Involvement in Leisure Activities
- Limited Social Interactions
- Sedentary Lifestyle

## Health-Related Risk Factors for Dementia:

- Diabetes\*\*\*
- Atherosclerosis\*\*\*
- Blood Pressure\*\*\*
- Cholesterol\*\*\*
- Depression\*\*\*
- Chronic Kidney Disease\*\*\*
- Smoking\*\*\*
- Homocysteine Blood Levels\*\*\*
- High Estrogen Levels
- Alcohol Abuse

\*\*\* *Risk Factors Shared with Hearing Loss*



2011

**“Hearing Loss and Incident  
Dementia”\***

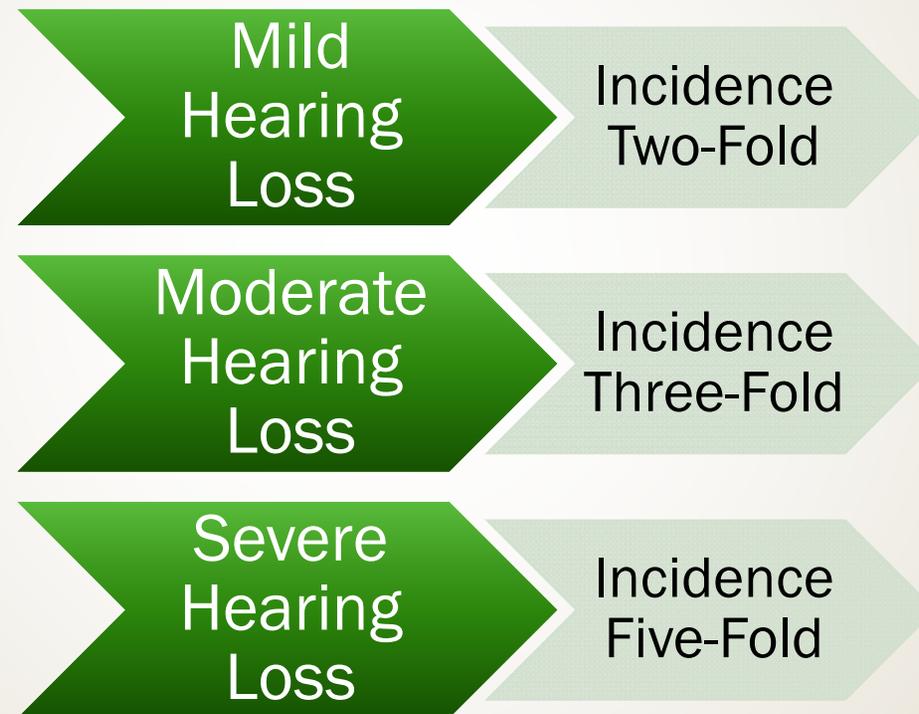
**“Hearing Loss and Cognition  
Among Older Adults in the  
United States\*\*”**

Frank R. Lin, MD PhD *et al*  
Johns Hopkins School of Medicine  
Center on Aging

\**Arch Neurol.* 2011 February; 68(2): 214-220

\*\**J Gerontol A Biol Sci Med Sci.* 2011 May; 66A(5): 582-590

# Magnitude of Hearing Loss and Risk for Dementia





“The risk of developing **Alzheimer’s disease** specifically also increased with hearing loss, such that for every 10 dB of hearing loss, the extra risk increased by **20%**”



Attributed to  
Two Factors:

“The strain of decoding sounds over the years may overwhelm the brains of people with hearing loss, leaving them more vulnerable to dementia”

“HL could also lead to dementia by making individuals more socially isolated, a known risk factor for dementia and other cognitive disorders”

. . . Frank Lin, MD, PhD



# Concentric Rings of Audibility become *smaller and smaller over time*

Listener progressively experiences  
**STRAIN OF DECODING SOUND**

- Only hears if speaker gets close to listener
- Only hears if speaker gets listener's attention
- Only hears if speaker speaks slowly and articulates clearly
- Only hears if there is no background noise
- Only hears if speaker does not have a dialect or an accent



# Concentric Rings of Social Isolation become *larger and larger over time*

Listener begins to experience  
SOCIAL ISOLATION by progressively  
avoiding more and more –

- Individuals
- Places
- Experiences

# SOCIAL Signs of Hearing Loss

- ▶ Think other people are mumbling or are muffled
- ▶ Trouble hearing unless you can see the speakers face
- ▶ Difficulty following conversation involving two or more people
- ▶ Trouble hearing women and children
- ▶ Difficulty hearing in noisy situations
- ▶ Require frequent repetition





# EMOTIONAL Signs of Hearing Loss

- Feeling annoyed because you have difficulty understanding other people
- Feeling embarrassed when meeting new people or when you misunderstand
- Feeling anxious about being unable to hear
- Withdrawal from social situations



# Consequences of UNTREATED Hearing Loss

- **Irritability**, Negativity, Anger
- Fatigue, Tension, Stress
- Avoidance or **Withdrawal**
- Social Rejection and **Loneliness**
- Reduced Alertness
- **Impaired Memory (link to dementia)**
- Diminished Psychological and Overall Health



# Consequences of UNTREATED Hearing Loss—Significant Other

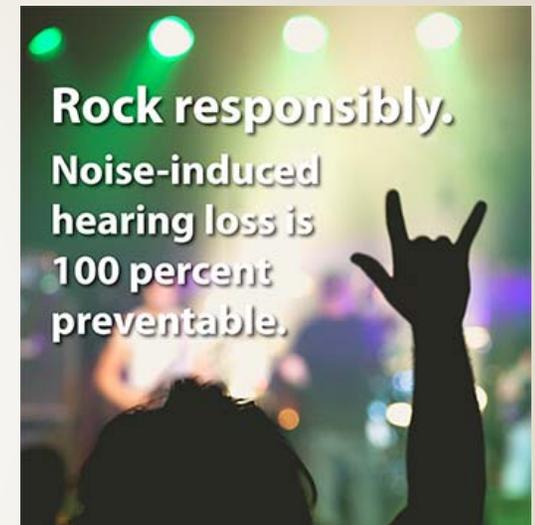
- More than a third of married adults over age 50 with hearing loss believe their hearing loss has a **negative impact on their marriage.**
  - Asking for repetition
  - Debates on volume of the television
  - Less socialization
  - Reduced attendance to social events

# Hearing Loss Prevention



**33%** of all hearing loss is **100%** preventable.

It only takes a few minutes with an audiologist to discover how to protect and optimize your hearing over a lifetime.



**Rock responsibly.**  
Noise-induced hearing loss is 100 percent preventable.

# Hearing Loss Prevention—Personal Factors

## ➤ Get Pro-Active!

### ➤ Healthy low-fat diet

- Following a low fat/low cholesterol diet can help reduce your blood cholesterol and triglyceride levels, which can result in improvement in tinnitus symptoms and reduce your risk for cardiovascular disease

### ➤ Regular exercise

### ➤ Quit smoking





# Hearing Loss Prevention—Personal Factors

- **Get your hearing tested!**
  - Obtain a baseline hearing evaluation
  - If there is a hearing loss, obtain the appropriate rehabilitation (medical referral, wax removal, hearing aids, TV amplifiers, etc.)

# Hearing Loss Prevention

- ▶ If you work in an at-risk occupation: check with your employer to make sure that your jobsite has an effective program to adequately protect your hearing, meeting federal or state regulations.
- ▶ Wear hearing protection, such as earplugs or earmuffs, consistently when using loud equipment at work or at home
  - ▶ Foam earplugs—pharmacy
  - ▶ Earmuffs—sporting goods stores
  - ▶ Custom hearing protection—ask your audiologist

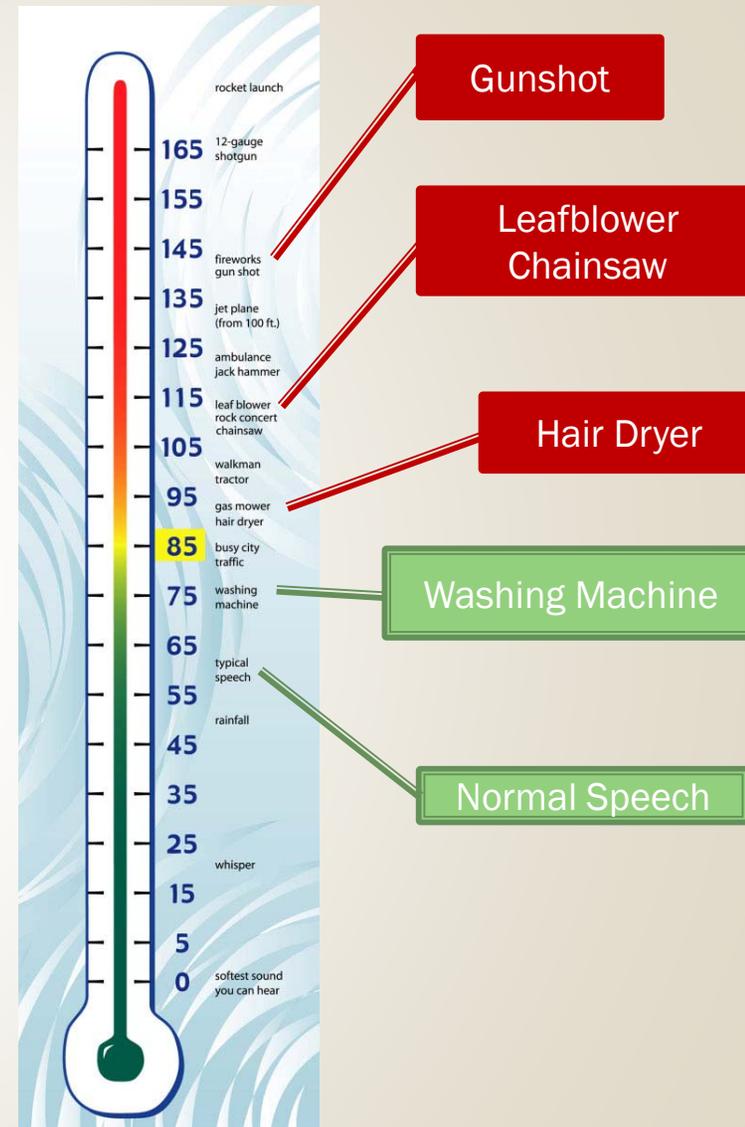


Photo from: <http://www.dangerousdecibels.org/education/information-center/decibel-exposure-time-guidelines/>



# Hearing Loss Prevention

- ▶ Limit exposure to noisy activities at home
  - ▶ Monitor your listening level/length of listening time to personal listening devices
  - ▶ Consider investing in higher quality earphones that block out background noise to help you moderate your listening levels in noisier places
- ▶ Keep an "eye" on your hearing – see an audiologist routinely for hearing testing, or if offered through your employer, ensure you know your hearing test results and track it year-to-year

# Suggested Treatment Plans:

- ✓ Early and Aggressive Hearing Loss Management
- ✓ Patient Empowerment Strategies - Classes
- ✓ Hearing Loops for Large Venues
- ✓ Amplified Telephones
- ✓ Television Amplifiers



(Remensnyder, L.S. A New Take on Research: Dementia and Hearing Loss, *Audiol. Today*, Nov/Dec 2011, p 64-65)



“Our findings potentially have ***significant implications for public health.*** Hearing loss is highly prevalent, and hearing loss may be both potentially preventable and ***treatable with rehabilitative devices and strategies that remain grossly underutilized.***”

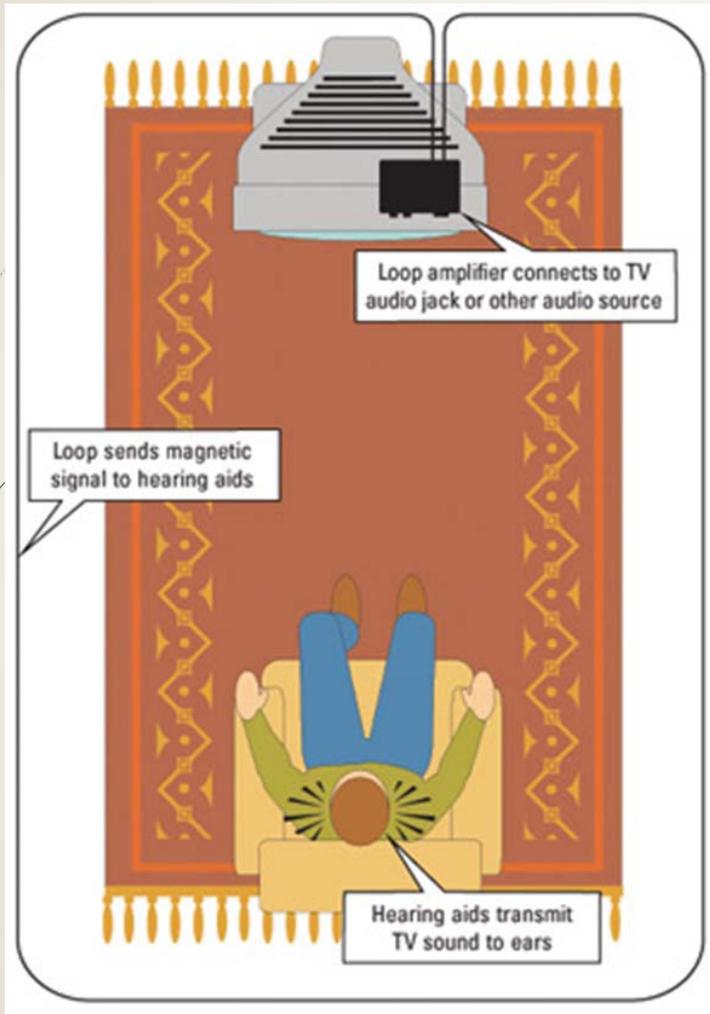
. . . Frank Lin, MD, PhD

*“NOT to simply fit a hearing aid but instead to ensure that the individual can communicate effectively in all settings...”*

*“Active promotion and advocacy for the installation of hearing loop systems in all public spaces ...”*



Frank Lin, MD, PhD., Johns Hopkins Medicine  
(<http://www.linresearch.org/research.html>)



## Hearing Loops *Efficiently Resolve:*

- ✓ Background Noise
- ✓ Reverberation
- ✓ Distance Issues
- ✓ **Social Isolation**
- ✓ **Cognitive Load**

# Hearing Enrichment (Aural Rehabilitation) Classes

## **Patient Empowerment:**

- Communication Strategies
- How to Position Yourself to Hear
- The relationship between Vision and Hearing
- Prevention of Hearing Loss
- How to Preserve Hearing
- Ototoxic (Hearing Toxic) Medications
- Rights under Americans with Disabilities Act

