

Sensorineural Hearing Loss (SNHL)

Externally-Led Patient-Focused Drug Development Meeting

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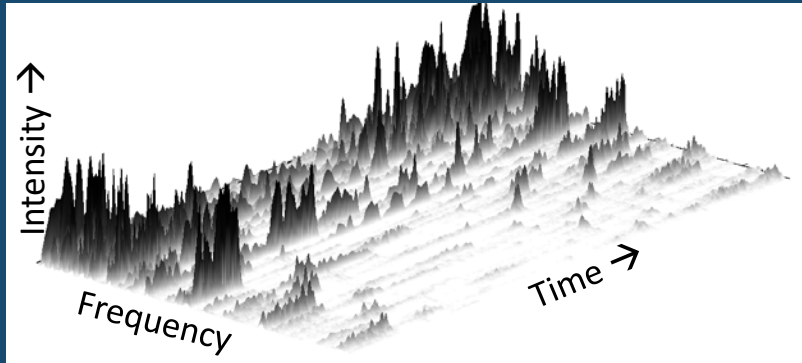
Director, Cochlear Center for Hearing & Public Health



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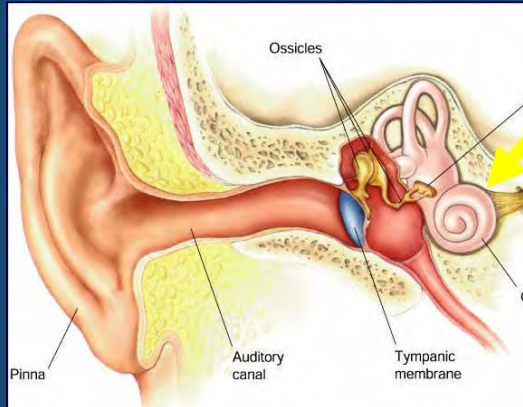
**Cochlear Center for
Hearing and Public Health**

Hearing depends on *peripheral auditory encoding* and *central auditory decoding*



**Sensorineural Hearing Loss
(Cochlear impairment)**

**Decreased sound
sensitivity &
distortion in sound
encoding**



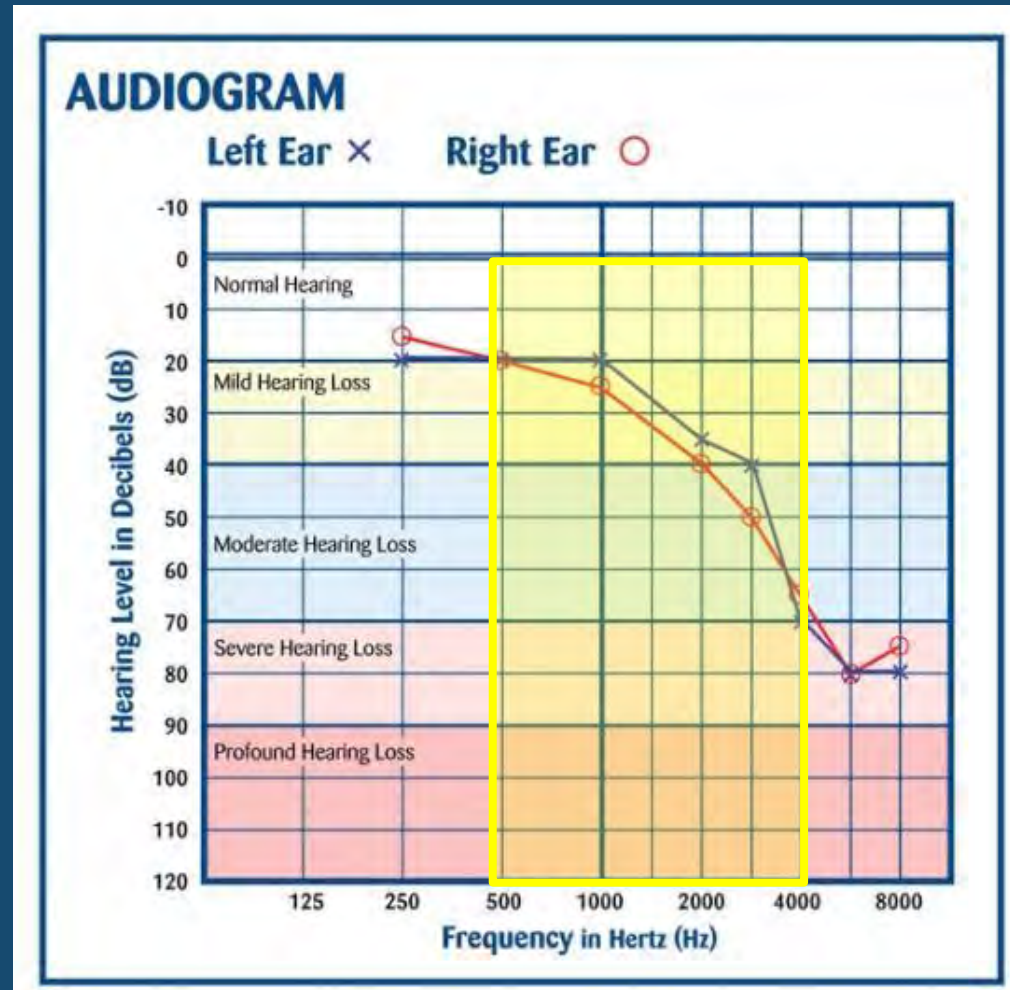
**Peripheral auditory
transduction
(encoding)**



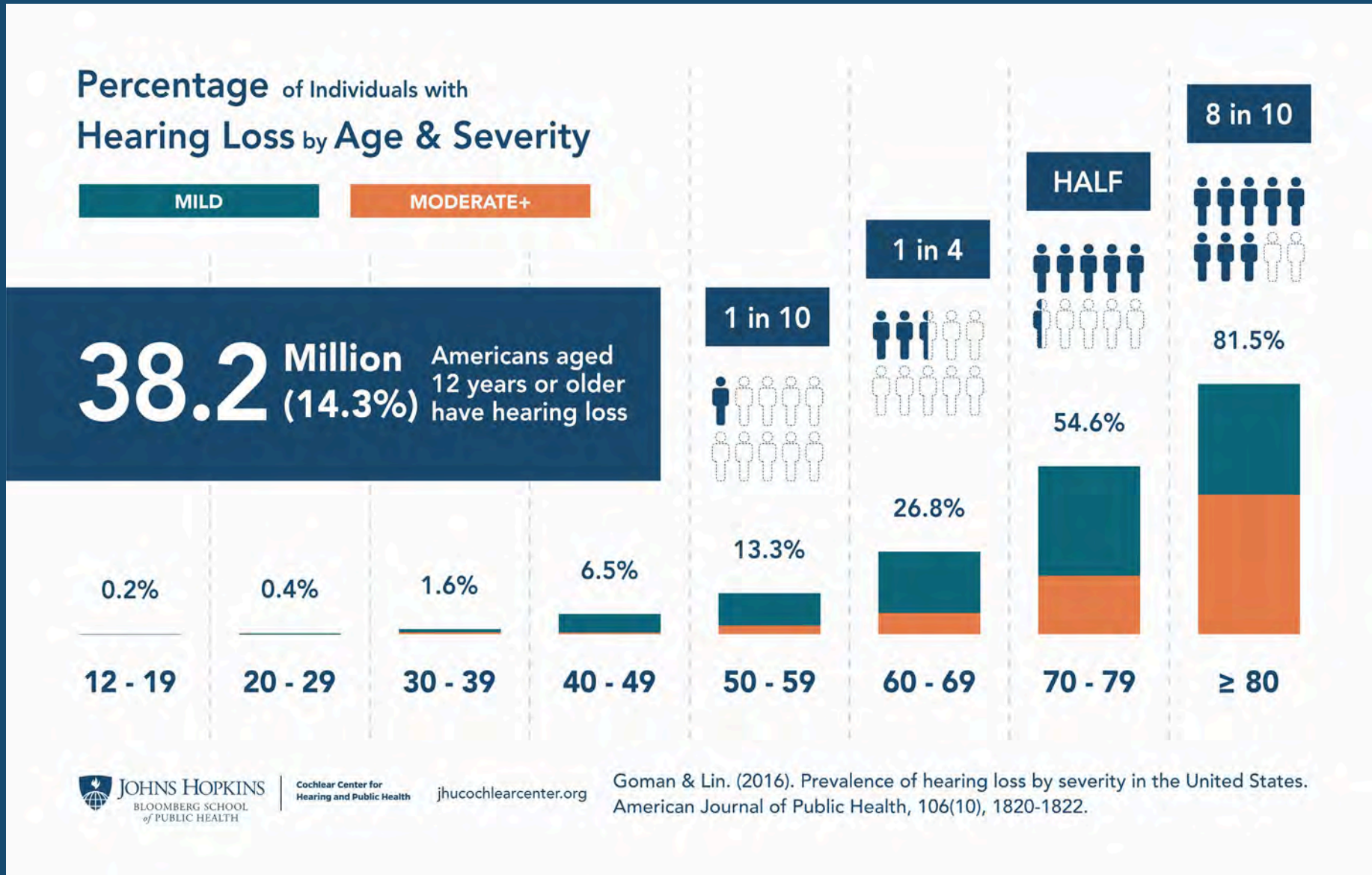
**Central auditory
processing
(decoding)**

Sensorineural hearing loss and the status of the cochlea is most commonly measured with pure tone audiometry (but many other measures exist as well)

Pure tone average
(PTA) of 0.5, 1, 2, & 4
kHz tones in the
better-hearing ear



Prevalence of Hearing Loss by Age Decade

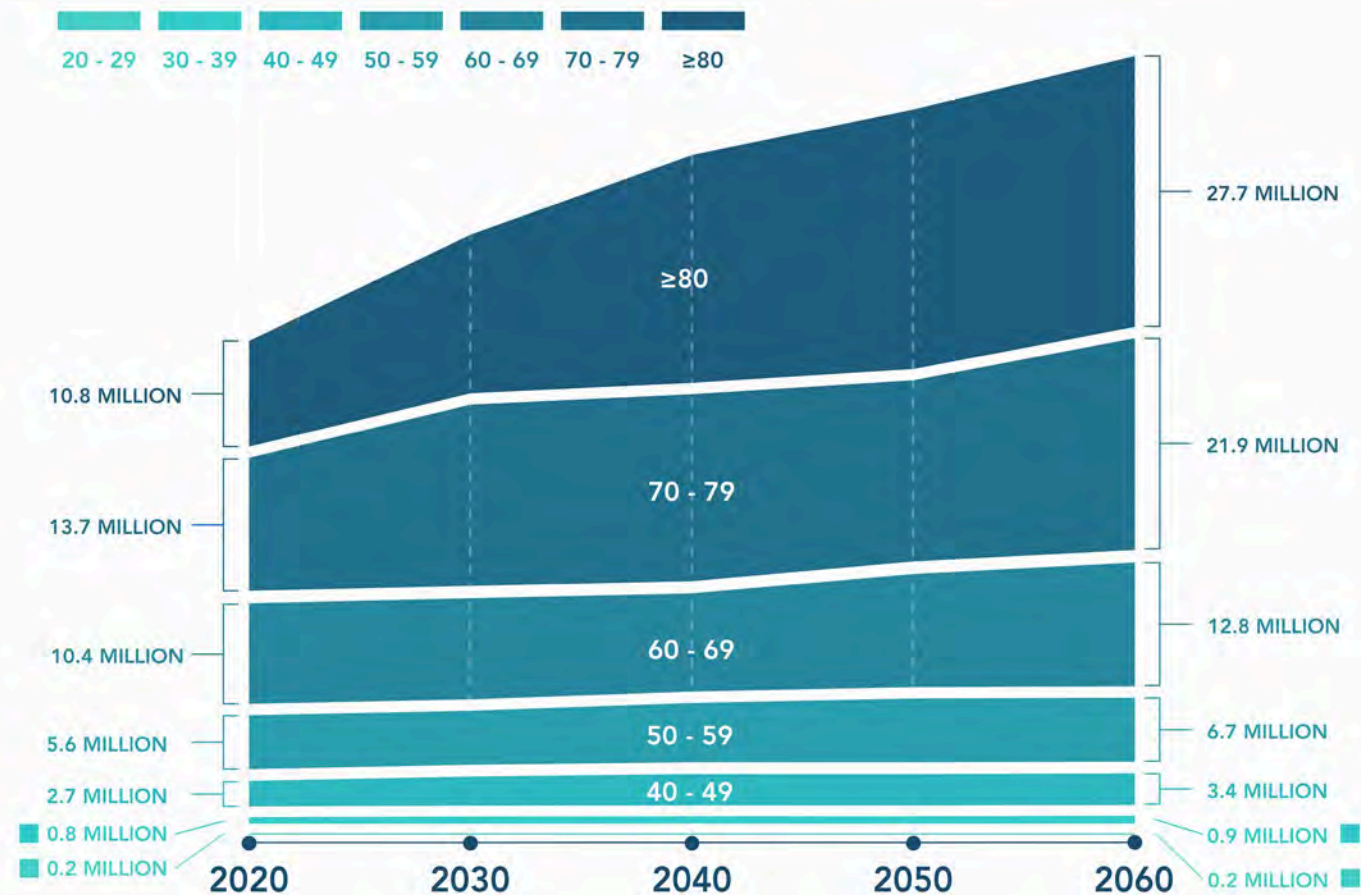


Hearing loss defined as a better-ear pure tone average of 0.5-4kHz tones > 25 dB

Estimated Number of Individuals with Hearing Loss by Age

73.5 Million

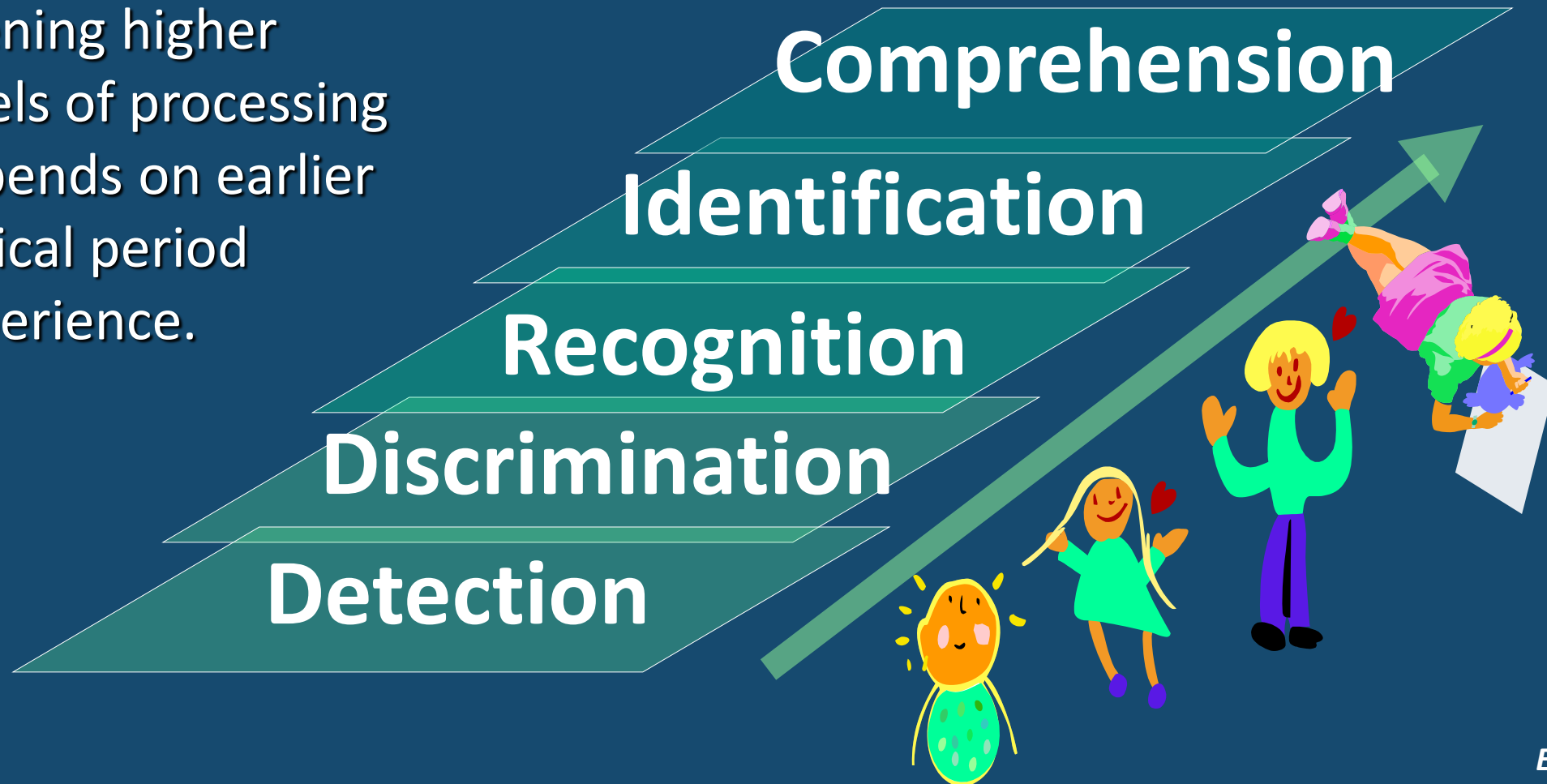
American adults are expected to have hearing loss in 2060



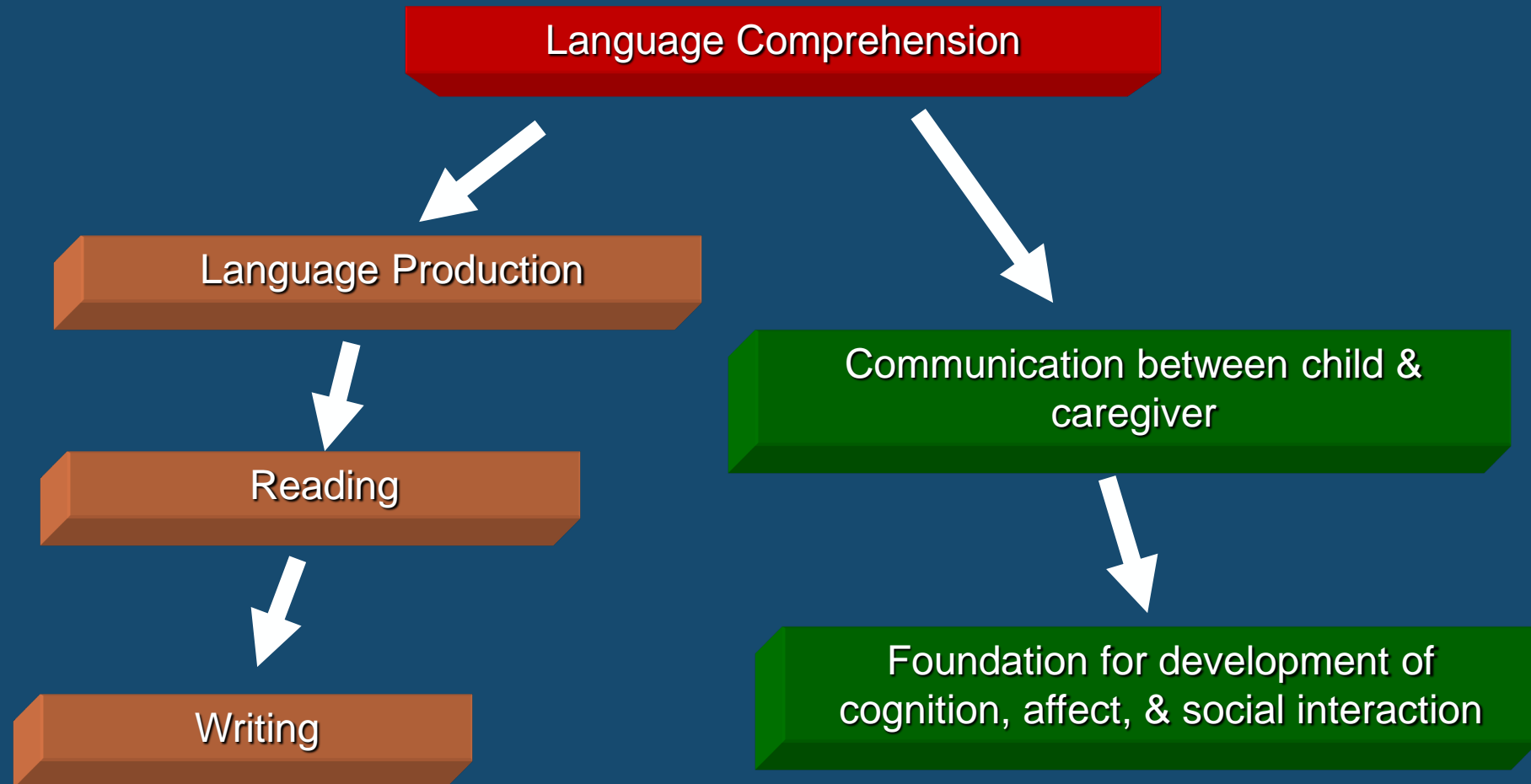
Implications of Pediatric Hearing Loss

Hierarchy in Language Learning

Opening higher levels of processing depends on earlier critical period experience.



Hierarchy of Language and Child Development

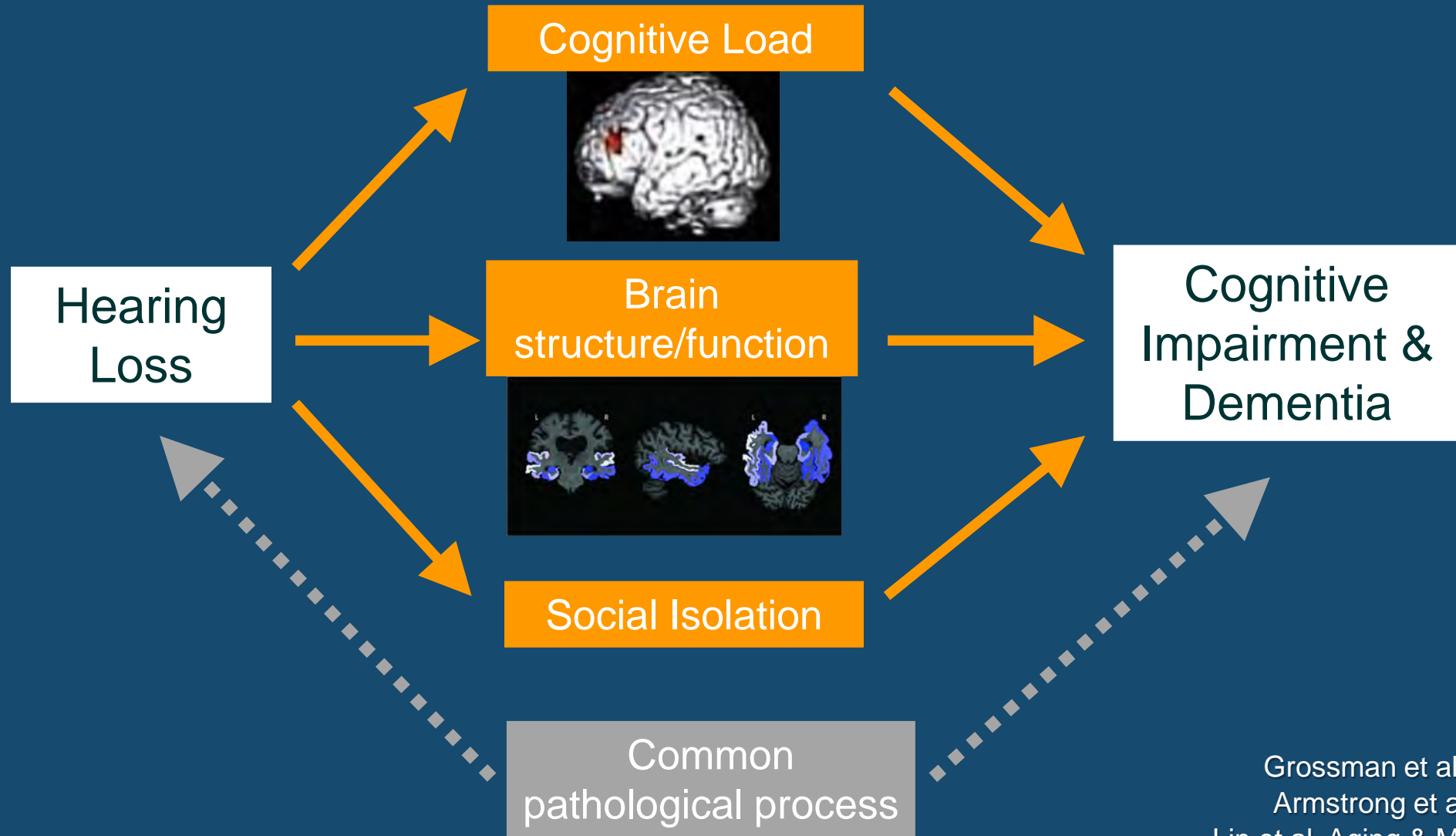


Implications of Adult Hearing Loss

- Increasingly identified as an independent risk factor for dementia, brain aging, healthcare expenditures, and impaired physical functioning in epidemiological studies
- Hypothesized mechanisms include effects of hearing loss on social engagement, brain structural change, loss of environmental sound cues, and cognitive load

Hearing Loss & Dementia

Common Cause or Modifiable Risk Factor



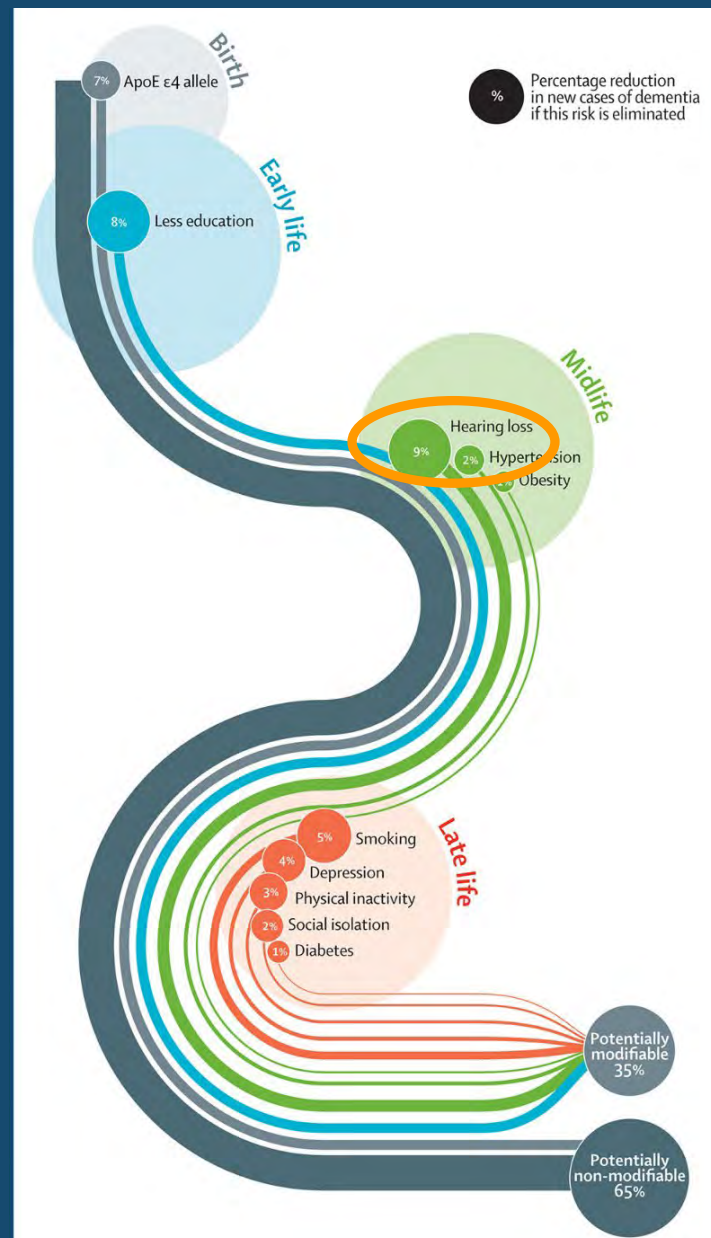
Grossman et al, Brain Lang, 2002
Armstrong et al, JAMA Oto, 2019
Lin et al, Aging & Mental Health, 2014

Lancet Commission on Dementia Prevention, Intervention & Care

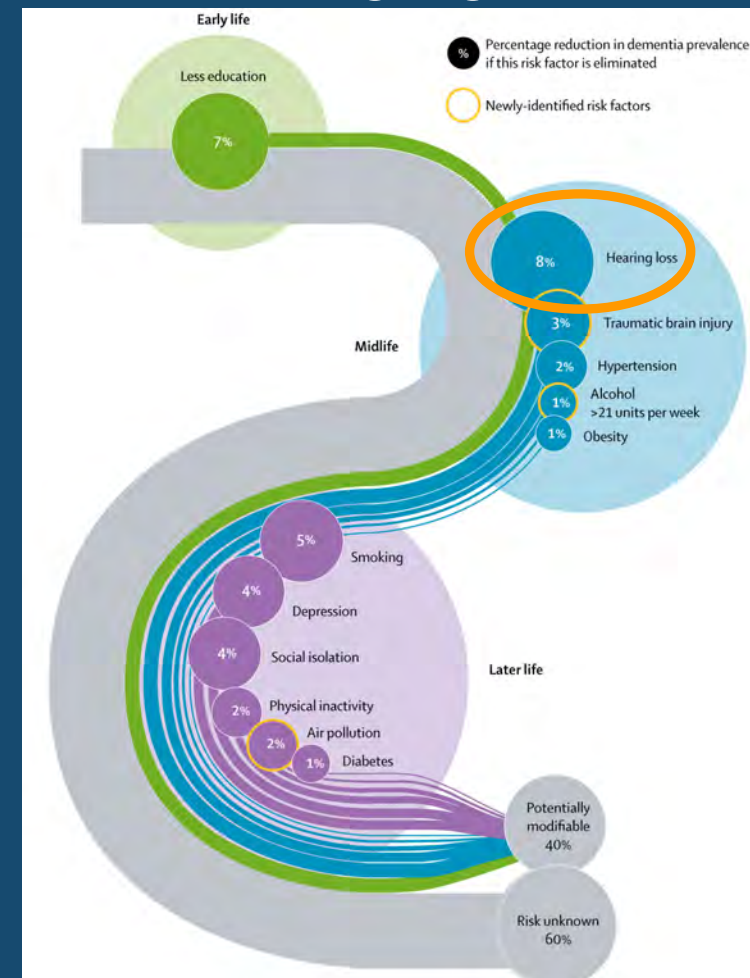
Potentially Modifiable Risk Factors for Dementia

G. Livingston et al., Lancet

2017



2020



Hearing loss in mid & late life identified as the largest potentially modifiable risk factor for dementia

HEALTHCARE UTILIZATION

AMONG PERSONS WITH & WITHOUT HEARING LOSS

Over 10 Years,
persons with hearing loss had

17% Increased Risk of
EMERGENCY
DEPARTMENT
VISIT

44% Increased Risk of
30 DAYS
READMISSION

2.5 Days Longer During
HOSPITAL
STAYS

47% Increased Rate of
HOSPITALIZATION



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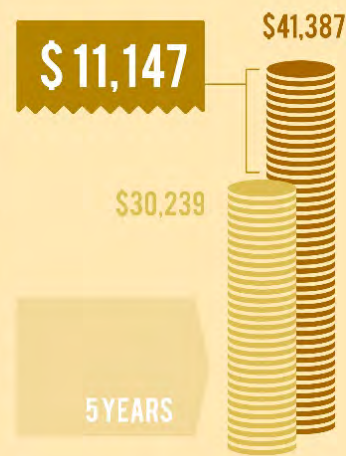
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• Source: Reed et al. (2019). Trends in health care costs and utilization associated with untreated hearing loss over 10 years. JAMA Otolaryngology–Head & Neck Surgery, 145(1), 27–34

DIFFERENCE IN MEAN TOTAL HEALTHCARE COST AMONG PERSONS WITH & WITHOUT HEARING LOSS

NO HEARING LOSS

HEARING LOSS

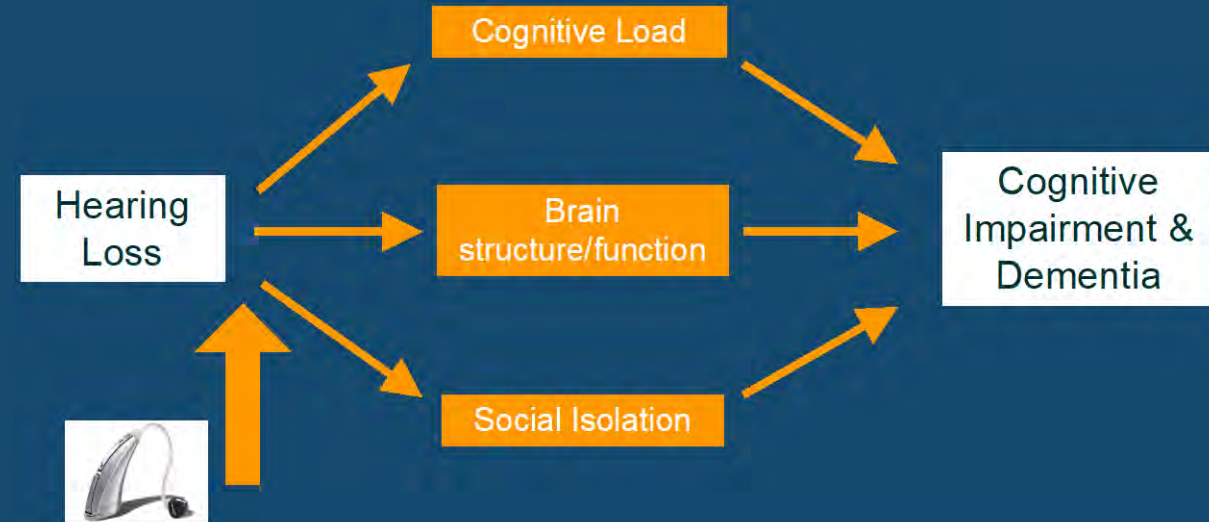


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HL treatment could have potential positive effects on both short- (social function) and longer-term (dementia risk, health care costs) outcomes



- Definitive effects of HL treatment cannot be established through observational studies despite strong suggestive evidence of positive impact of HL treatment
- Ongoing NIH-funded randomized trial (ACHIEVE, n ~1000 adults 70-84 yrs) set to finish in 2023
 - Will provide definitive RCT evidence of impact of HL treatment with hearing aids on risk of cognitive decline/dementia, brain aging, social and physical function, and health care costs

Management of Sensorineural Hearing Loss

- **Current management**
 - Clinic-based auditory rehabilitation (auditory needs assessment, communication strategies, etc.) & sensory management with hearing aids and other assistive technologies
 - Cochlear implantation evaluation for those with severe or greater HL
- **Novel approaches to hearing loss treatment**
 - Alternative service delivery models → e.g., telehealth, community health workers, etc.
 - Direct consumer access to OTC hearing aids (pending release of legislated-mandated FDA regulations)
 - Innovations in amplification strategies & signal delivery

A stylized, light blue globe is positioned on the left side of the image, showing the continents of North and South America. The globe is set against a dark blue background that features a series of vertical, slightly wavy lines of varying heights, creating a textured, water-like effect.

www.jhucochlearcenter.org

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