

The Honorable Robert S. Lasnik

UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON
AT TACOMA

ANDREA SCHMITT; ELIZABETH
MOHUNDRO; and O.L. by and through
her parents, J.L. and K.L., each on their own
behalf, and on behalf of all similarly
situated individuals,

Plaintiffs,

v.

KAISER FOUNDATION HEALTH PLAN
OF WASHINGTON; KAISER
FOUNDATION HEALTH PLAN OF
WASHINGTON OPTIONS, INC.; KAISER
FOUNDATION HEALTH PLAN OF THE
NORTHWEST; and KAISER
FOUNDATION HEALTH PLAN, INC.,

Defendants.

NO. 2:17-cv-01611-RSL

DECLARATION OF FRANK R. LIN,
MD, PHD IN SUPPORT OF PLAINTIFFS'
MOTION FOR PARTIAL SUMMARY
JUDGMENT

I, FRANK R. LIN, declare:

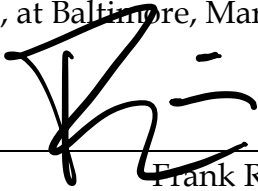
1. I am over the age of 18 and competent to testify to all matters stated herein.

All statements are made upon my personal knowledge.

2. Attached as *Exh. A* is the report I prepared for the Plaintiffs that presents a true and correct summary of my opinions in this matter, and to which my curriculum vitae is appended.

1 I declare under penalty of perjury under the laws of the State of Washington and
2 the United States of America that the foregoing is true and correct.

3 DATED this 30 day of May, 2023, at Baltimore, Maryland.

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6 Frank R. Lin, MD, PhD

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EXHIBIT A

Schmitt, et al.
v.
Kaiser Foundation Health Plan of Washington, et al.

Case No. 2:17-cv-1611-RSL

Expert Report
Frank R. Lin, MD, PhD
May 12, 2023

Frank R. Lin, MD PhD
Professor of Otolaryngology-HNS, Medicine, Mental Health, and Epidemiology
Johns Hopkins University

Expert Witness Summary of Hearing Loss

Executive Summary

Sensorineural hearing loss, a condition that involves the gradual deterioration of inner ear sensory function, is an inevitable part of aging that affects everyone over time. This kind of hearing impairment has far-reaching effects, not only disrupting communication and day-to-day activities, but also potentially impacting cognitive, physical, and mental health. From a medical standpoint, individuals are considered to have a hearing disability if they meet two criteria: (1) they have a clinically confirmed, measurable loss of hearing, as evidenced by audiometric tests; and (2) this hearing loss significantly and adversely impacts their daily functioning and activities.

Hearing aids are the primary medical device used to treat hearing loss and are essentially only used for this purpose. There are virtually no other indications or instances when hearing aids are used, other than for treatment of a hearing disability. Consequently, with only exceedingly rare exceptions, individuals who use hearing aids would be considered to have a hearing disability from the medical perspective. Despite potential hurdles such as cost, societal stigma, and inconvenience, individuals who use hearing aids feel compelled to use them because, without them, their ability to function is significantly limited.

Treatment with cochlear implants ("CIs") and osseointegrated implants (often called "Bone Anchored Hearing Aids" or "BAHAs") meets the needs of only a tiny minority (<2-5%) of individuals with hearing disabilities. CIs are surgically implanted into the cochlea (inner ear), and the placement of the electrode effectively results in the loss of any residual acoustic hearing in the implanted ear. As such, CIs are only used in individuals with the most severe forms of sensorineural hearing loss and when the patient continues to have a hearing disability despite using high-powered hearing aids. In contrast, osseointegrated implants are most commonly indicated for individuals with a permanent conductive hearing loss (rare) and when the patient is unable to benefit from using a hearing aid. These surgically implanted devices are simply not appropriate, and would not be prescribed, for >95%-98% of the individuals with disabling hearing loss.

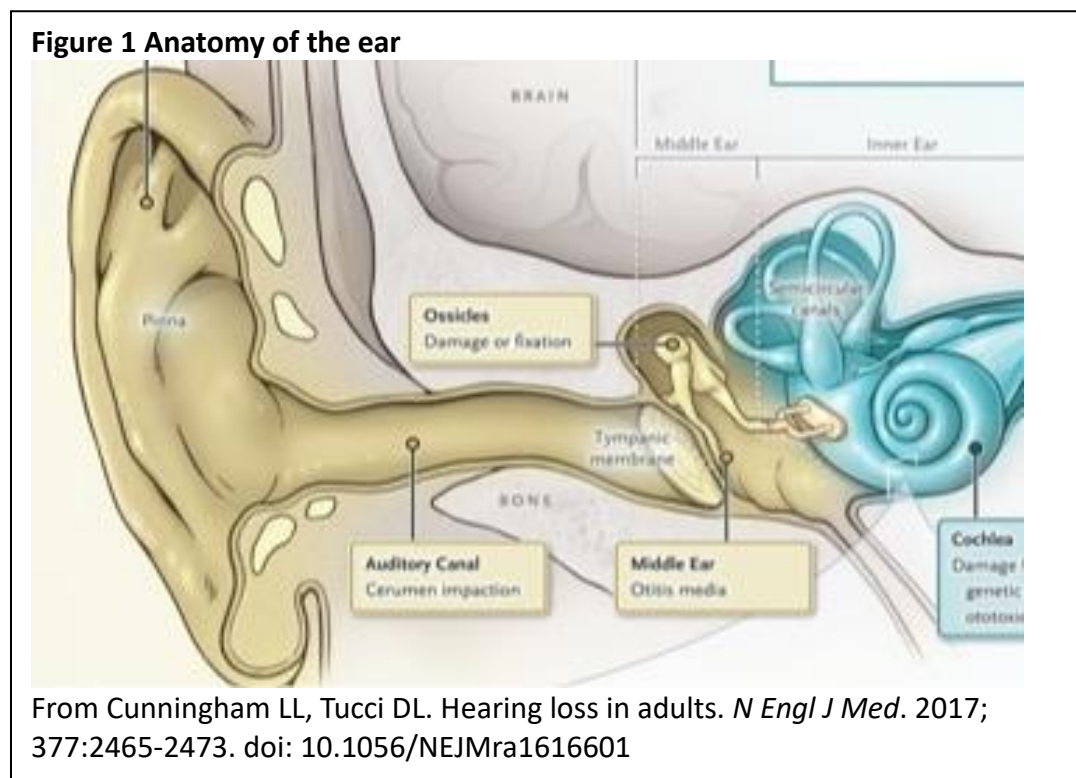
Health insurance policies that don't cover hearing aids nearly exclusively impact those living with a hearing disability. Medically speaking, the lack of coverage for hearing aids and related services deprives individuals with hearing disabilities of the necessary means to address their disability and to potentially mitigate the adverse impact that hearing loss and hearing disability can have on cognitive, social, physical, and mental health. In contrast, individuals without hearing impairments are generally well-served by health insurance policies. These policies cater

to their auditory health needs by allowing access to primary care physicians or offering referrals to audiologists and/or ENT specialists for diagnostic hearing tests and medical evaluations when needed. Thus, their hearing health requirements are fully met.

A. Hearing and Hearing Loss

A.1 Physiology of hearing and hearing loss

The physiological sense of hearing depends on special sense organs of the peripheral auditory system which encompasses the external (ear canal), middle (ear drum and ear bones), and inner ear (cochlea). Our ability to hear depends on the processing of sound in the peripheral auditory system that occurs in two sequential steps: 1) External & middle ear: sound waves are channeled through the ear canal to the middle ear where the ear drum (tympanic membrane) and ear bones (ossicles) convert the acoustic energy into mechanical energy that is transmitted into the inner ear; 2) Inner ear: the mechanical energy transferred into the cochlea is encoded and transduced into a neural signal by the sensory hair cells of the cochlea (Figure 1). These neural signals are then transmitted to the brain where the brain decodes the neural signal into meaning.



Hearing loss can result from dysfunction at any one of these levels. Any physical process that affects the transmission of sound waves through the ear canal or the movement of the ear bones in the middle ear will affect hearing and lead to what is called a *conductive hearing loss* –

meaning that the sound can't be conducted into the inner ear. For example, if someone has a lot of occluding ear wax or an ear infection that leads to a hole in the ear drum or fluid being trapped in the middle ear, sound will not be able to get to the cochlea as efficiently. This type of conductive hearing loss is generally temporary until the underlying problem is resolved or fixed (e.g., cerumen removed, middle ear infection resolves, hole in the eardrum heals or is surgically corrected).

In contrast, the hearing loss that nearly all humans will experience to some degree over time results from gradual pathological changes that occur in the inner ear. The sensitive sensory hair cells in the cochlea that convert sound energy into a neural signal and other parts of the cochlea that are critical for sound transduction can be damaged progressively from aging, noise exposure, genetic predisposition, etc., and unlike other cells of the body, these sensory cells in the cochlea cannot regenerate. This type of hearing loss is termed *a sensorineural hearing loss* – meaning that the *sensory* hair cells and *neural* encoding of sound are impaired. Individuals with sensorineural hearing loss will note that speech often sounds unclear or as if the speaker is mumbling or garbling their words.

A.2 Prevalence of hearing loss

Hearing loss prevalence has been extensively studied in prior epidemiological studies that have utilized random samples of the U.S. population. These studies have been based on objective audiometric testing involving a calibrated audiometer and sound attenuating booth to capture valid estimates of audiometric hearing loss. These tests involve having a participant wear ear phones and testing the minimum level of loudness (threshold, generally ranges from 0 decibels [dB] to 100 dB) at which the participant can hear tones of various frequencies (between 250 Hz to 8000 Hz) in each ear.

Based on clinical convention and according to World Health Organization standards¹, classification of an individual's hearing level for epidemiological purposes is based on averaging an individual's hearing thresholds from 500-4000 Hz (the frequencies most important for speech) in the person's better-hearing ear. This resulting value is termed the four-frequency pure tone average (PTA). Prior to 2021², a PTA 25 dB or better was considered normal hearing, 26-40 dB mild/slight hearing loss, 41-60 dB moderate hearing loss, 61-80 dB severe hearing loss, and 81 dB or greater profound hearing loss. More recently, the World Health Organization has adopted an updated classification system to align with the Global Burden of Disease system (Figure 2)¹: PTA <20 dB normal hearing, PTA 20-34.9 dB Mild, PTA 35-49.9 dB Moderate, PTA 50-64.9 dB Moderately Severe, 65-79.9 dB Severe, 80 dB or greater Profound/Complete. Given the relatively recent update to the classification system, both classification systems are still frequently in use. A recent estimate of hearing loss prevalence in the U.S. published by the expert witness in 2016 using the original WHO classifications of hearing loss severity is summarized in Figure 3.

Figure 2 WHO Classification System for Hearing Loss

Grade	Hearing threshold[‡] in better hearing ear in decibels (dB)	Hearing experience in a quiet environment for most adults	Hearing experience in a noisy environment for most adults
Normal hearing	Less than 20 dB	No problem hearing sounds	No or minimal problem hearing sounds
Mild hearing loss	20 to < 35 dB	Does not have problems hearing conversational speech	May have difficulty hearing conversational speech
Moderate hearing loss	35 to < 50 dB	May have difficulty hearing conversational speech	Difficulty hearing and taking part in conversation
Moderately severe hearing loss	50 to < 65 dB	Difficulty hearing conversational speech; can hear raised voices without difficulty	Difficulty hearing most speech and taking part in conversation
Severe hearing loss	65 to < 80 dB	Does not hear most conversational speech; may have difficulty hearing and understanding raised voices	Extreme difficulty hearing speech and taking part in conversation
Profound hearing loss	80 to < 95 dB	Extreme difficulty hearing raised voices	Conversational speech cannot be heard
Complete or total hearing loss/deafness	95 dB or greater	Cannot hear speech and most environmental sounds	Cannot hear speech and most environmental sounds
Unilateral	< 20 dB in the better ear, 35 dB or greater in the worse ear	May not have problem unless sound is near the poorer hearing ear. May have difficulty in locating sounds	May have difficulty hearing speech and taking part in conversation, and in locating sounds

* The classification and grades are for epidemiological use and applicable to adults. The following points must be kept in mind while applying this classification:

- While audiometric descriptors (e.g. category, pure-tone average) provide a useful summary of an individual's hearing thresholds, they should not be used as the sole determinant in the assessment of disability or the provision of intervention(s) including hearing aids or cochlear implants.
- The ability to detect pure tones using earphones in a quiet environment is not, in itself, a reliable indicator of hearing disability. Audiometric descriptors alone should not be used as the measure of difficulty experienced with communication in background noise, the primary complaint of individuals with hearing loss.

Unilateral hearing loss can pose a significant challenge for an individual at any level of asymmetry. It therefore requires suitable attention and intervention based on the difficulty experienced by the person.

‡ "Hearing threshold" refers to the minimum sound intensity that an ear can detect as an average of values at 500, 1000, 2000, 4000 Hz in the better ear (148, 156, 157).

From World Health Organization World Hearing Report, 2021

Figure 3 Prevalence of and Numbers of Individuals With Hearing Loss, by Age and Severity in the United States

Hearing Loss Category and Age, y	Prevalence, % (95% CI)					Number With Hearing Loss (Millions)				
	Mild	Moderate	Severe	Profound	Overall	Mild	Moderate	Severe	Profound	Overall
Bilateral ^a										
12-19 y	0.14 (0.04, 0.24)	0.03 ^b (0.00, 0.06)	... ^c	0.00 ^b (0.00, 0.01)	0.18 (0.07, 0.28)	0.05	0.01	... ^c	<0.01	0.06
20-29 y	0.34 ^b (0.00, 0.88)	0.07 ^b (0.00, 0.20)	... ^c	... ^c	0.42 ^b (0.00, 0.97)	0.15	0.03	... ^c	... ^c	0.18
30-39 y	1.01 ^b (0.18, 1.84)	0.55 ^b (0.00, 1.21)	0.08 ^b (0.00, 0.25)	... ^c	1.64 (0.23, 3.06)	0.41	0.23	0.03	... ^c	0.68
40-49 y	6.05 (3.71, 8.40)	0.48 ^b (0.00, 1.01)	... ^c	... ^c	6.53 (4.19, 8.88)	2.46	0.20	... ^c	... ^c	2.65
50-59 y	10.48 (7.34, 13.62)	2.13 (0.79, 3.46)	0.35 ^b (0.00, 0.78)	0.34 ^b (0.00, 0.99)	13.29 (9.76, 16.81)	4.57	0.93	0.15	0.15	5.80
60-69 y	19.94 (15.03, 24.84)	5.85 (3.53, 8.17)	0.76 ^b (0.00, 1.70)	0.25 ^b (0.00, 0.75)	26.80 (22.25, 31.35)	6.92	2.03	0.27	0.09	9.31
70-79 y	35.62 (31.03, 40.22)	15.83 (13.63, 18.04)	2.86 (1.60, 4.12)	0.30 ^b (0.02, 0.59)	54.62 (49.27, 59.97)	6.84	3.04	0.55	0.06	10.49
≥80 y	36.02 (32.03, 40.01)	37.92 (33.40, 42.44)	6.97 (4.94, 9.01)	0.56 ^b (0.01, 1.10)	81.47 (78.12, 84.82)	3.98	4.19	0.77	0.06	9.01
Total						25.39	10.66	1.77	0.35	38.17

From Goman & Lin, American Journal of Public Health, Oct 2016 Vol 106, No 10. Hearing loss severity based on the 4-frequency PTA in the better hearing ear: mild (> 25 dB through 40 dB), moderate (> 40 dB through 60 dB), severe (> 60 dB through 80 dB), or profound (> 80 dB).

Among individuals with hearing loss, distinguishing between the prevalence of a sensorineural hearing loss versus a permanent conductive hearing loss (i.e., not from a transient cause such as ear wax or an ear infection) is difficult to estimate given that a permanent conductive hearing loss is rare compared to the much more common sensorineural hearing loss. Additional specialized audiometric equipment (calibrated bone oscillator) is also required to measure conductive hearing, and this equipment is not typically used in epidemiological studies. One study of adults has estimated that 8% of adults with hearing loss have a conductive hearing loss³, but it's unclear how many of these individuals simply had a transient conductive hearing loss versus a permanent conductive hearing loss. From the expert witness's own clinical experience seeing patients in a busy tertiary care academic otology practice, I would estimate that <2-3% of adults with hearing loss have a component of a clinically significant permanent conductive hearing loss, and such a hearing loss is often super-imposed on an underlying sensorineural hearing loss.

A.3 Hearing disability

Hearing loss is typically diagnosed using audiometric testing, inspection of the ear canal and middle ear, and speech recognition tests. The goal of this evaluation is to determine whether there is an objective hearing loss and to rule out whether the hearing loss could be accounted for by other medical conditions. Once hearing loss is diagnosed through such objective studies and evaluation, a hearing care professional must also interview the patient to determine whether and how the measured hearing loss is impacting the patient's daily life.

An audiometric hearing loss as defined above in A.2 is not synonymous with hearing disability. The definition of disability adopted by the Centers for Disease Control ¹ states "A disability is any condition of the body or mind (impairment) that makes it more difficult for the person with the

condition to do certain activities (activity limitation) and interact with the world around them (participation restrictions).”

From a medical perspective, this definition is often operationalized as meaning that a patient would be considered to have a hearing disability if (1) they self-report functional restrictions in everyday activities requiring hearing (e.g., verbal communication with others, environmental sound awareness needed for safety, etc.) and (2) there is evidence of objective audiometric hearing loss (e.g., hearing thresholds greater than 20 dB). Different individuals with the same audiometric hearing loss may or may not have a hearing disability (i.e., report functional limitations) given that some individuals may be able to better compensate for reduced peripheral hearing through central brain processes (i.e., the brain adapts by better decoding the degraded auditory signal coming from the ear) or their lifestyles or communication partners make functional limitations less likely to occur (e.g., an individual frequently needing to communicate in noisy environments versus an individual retired and living alone at home).

A.4 Impact of hearing loss and hearing loss treatment on health

The impact of hearing loss in childhood has been well established over the past 50 years with evidence demonstrating that hearing loss in children affects parent-child dyadic relationships and behaviors, language and cognitive development, socialization, educational attainment, and later vocational opportunities. Likewise, the beneficial role of early childhood hearing screening and prompt intervention for hearing loss in reducing these sequela have been consistently demonstrated (comprehensive summary provided in WHO World Report on Hearing¹).

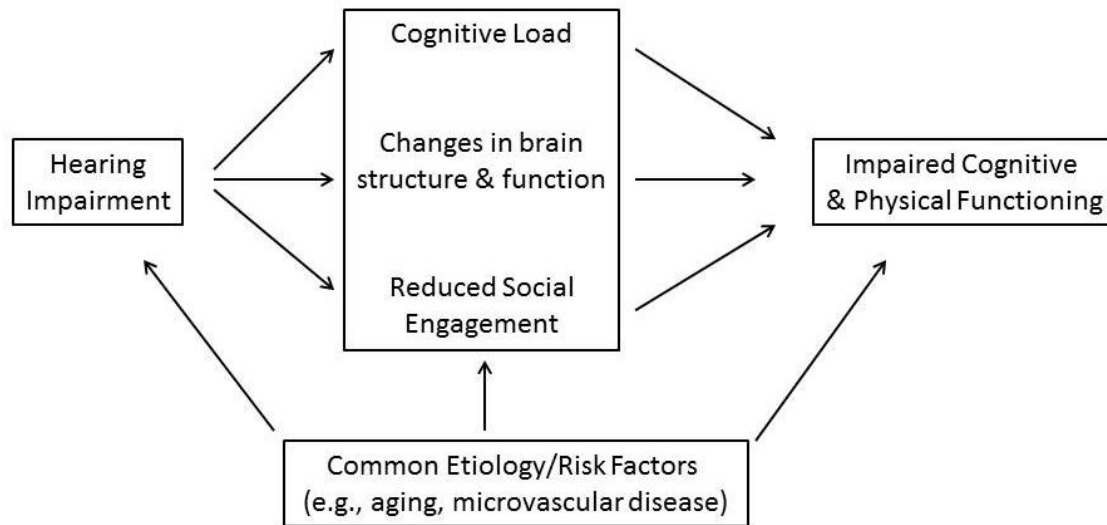
Over the past decade, similar research has also now established the impact of hearing loss on adults and the importance of hearing for maintaining optimal cognitive, physical, social, and mental functioning as we age. A conceptual model (Figure 4) developed by the expert witness and colleagues established the mechanisms through which hearing loss could affect these broad functional domains. This model demonstrates that while some common etiologies could underlie a simple correlation between hearing and poor health outcomes (e.g., age, vascular disease processes), there are 3 primary mechanistic pathways through which hearing loss could causally contribute to poorer health. These pathways are briefly summarized below⁴:

- *Cognitive load*: The brain has to recruit and use additional brain resources to compensate for the impoverished auditory encoding by the impaired cochlea. This process can place a ‘load’ on the brain and rob resources that would otherwise have been dedicated to thinking, memory, and other processes.
- *Changes to brain structure*: Experimental animal studies and observational studies of older adults demonstrate that parts of the brain that handle sound processing can begin to atrophy or shrink faster with hearing loss. Importantly, these parts of the brain are also important for cognitive and other abilities which can lead to cascading effects on other areas of brain function. At present, the two most common pathologic processes that can damage the brain as we age are from microvascular disease (e.g., from high blood pressure, diabetes, etc.) and from Alzheimer’s disease neuropathology, and not coincidentally, these are the two leading causes of dementia in late life. Increasingly,

research is also indicating that hearing loss may act as an additional “hit” along with these other two processes to adversely affect the brain over time.

- *Social isolation*: The effects of hearing loss on someone’s willingness to socially engage can often times be subtle. For example, some individuals may slowly give up going out

Figure 4 Conceptual model of how hearing loss impacts the functioning of adults



Reproduced from Lin & Albert, *Aging and Mental Health* 2014

with friends to restaurants, while others may completely withdraw and become introverted. This social isolation or loneliness is important—scientists have long known that social isolation in older adults is a direct risk factor for poorer health outcomes.

Epidemiologic research over the past decade has supported the hypothesized impact of hearing loss on these broader functional areas. The greatest amount of recent work has focused on cognitive decline and dementia in older adults. In these studies, hearing loss in older adults is consistently linked with the risk of dementia even after multiple other factors are accounted for in the analyses (e.g., effects of age, education, chronic diseases, etc.). These studies have demonstrated a direct ‘dose-response’ wherein the greater the severity of hearing loss, the greater the risk of being diagnosed with dementia over time. In 2017 and 2020, the results of a major convened review of risk factors for dementia published by the Lancet Commission^{5,6} concluded that among all known modifiable risk factors for dementia (e.g., obesity, smoking, diabetes, early life education), hearing loss in mid- to late-life was the single risk factor accounting for the greatest proportion of dementia risk.

Consistent with the conceptual model, the implications and potential consequences of hearing loss also extend beyond dementia⁷. Recent epidemiologic research has also demonstrated that hearing loss in older adults is linked with an increased risk of falls, depressive symptoms, greater risk of hospitalization and requiring institutionalization, and poorer physical functioning. In particular, for falls and physical functioning, the cognitive load imposed by hearing loss may

affect the overall brain resources needed to maintain balance particularly in the setting of additional stressors that could affect balance function in older adults (e.g., visual problem, arthritis, etc.). Loss of hearing may also subtly affect our ability to monitor our auditory environment (e.g., person approaching from behind) or even hear our own footfalls with walking—both of which could affect fall risk and an individual's overall physical functioning.

Prior research has clearly demonstrated the positive effects of hearing loss intervention in adults on improving hearing and communication outcomes (summarized in multiple consensus reports^{1,7,8}). Ongoing research is now extending our understanding of these proximal effects of hearing intervention on communication to potentially more distal effects on reducing risk of cognitive decline and dementia in late life⁹. An ongoing NIH-funded large scale randomized trial in the United States of treating hearing loss in adults that is being led by the expert witness will establish the definitive impact of hearing loss intervention on cognitive decline, brain health, and other functional outcomes in adults with trial results set to be made public in late 2023¹⁰.

B. Hearing Loss Treatment Modalities

The overarching goal of treating hearing loss is to improve hearing and reduce communication impairments in order to optimize daily function and safety. From a medical and audiological perspective, hearing loss treatment typically comprises 3 primary components: 1) Diagnostic audiological testing of hearing (perhaps followed by otolaryngological evaluation if there are any medical or surgical indications); 2) Audiological counseling and rehabilitative services (often in conjunction with use of hearing technologies); and 3) Hearing technology.

B.1 Diagnostic audiological testing

Diagnostic testing typically comprises an audiologist performing a visual examination of the ear and ear canal followed by comprehensive audiometric testing. This testing includes testing audiometric hearing thresholds, speech testing, and possible additional tests based on clinical necessity (e.g., tests of middle ear function). Further evaluation with an otolaryngologist may be further indicated based on the patient's symptoms or results of the audiological testing.

B.2 Audiological counseling and rehabilitative services

For patients presenting for management of hearing loss, audiologists provide counseling and rehabilitative services focused on understanding the nature and extent of the individual's hearing and communicative needs and then helping the patient address these needs through learning communication and lifestyle strategies to optimize hearing and communication. In addition, the audiologist will often instruct and support the patient in the use of indicated hearing technologies to help with hearing. These technologies can include both medically prescribed technologies as well as everyday hearing technologies such as amplified telephones, use of closed captioning, etc. For medically prescribed technologies, the audiologist will customize, program, and configure these technologies for the patient.

B.3 Hearing technologies

The principal hearing technologies for hearing loss in the medical and audiological setting include hearing aids, osseointegrated implants (BAHA-bone anchored hearing aid), and cochlear implants. Other forms of prescribed hearing technologies also exist (e.g., other types of implantable and non-implantable bone conduction hearing devices) but these are very rarely considered and even more rarely used. Overwhelmingly, hearing aids are the primary and predominant device used by individuals with a hearing disability to treat their hearing impairment.

B.3.a. Hearing aids Prescription hearing aids (also referred to as air conduction hearing aids) are medical devices regulated by the Food and Drug Administration and as such can only be provided through a licensed provider. Hearing aids are designed to be worn in or on the ear and are custom programmed and fit by a hearing professional (typically an audiologist or hearing instrument specialist). These devices as well as the associated programming and counselling provided by a hearing professional are considered the gold standard for optimal hearing rehabilitative care for the vast majority of individuals with hearing loss. Hearing aids will selectively amplify and filter sounds according to the patient's precise degree of hearing loss in order to optimize speech understanding and environmental sound awareness.

Prescription hearing aids are indicated for individuals with objective diagnosis of hearing loss (e.g., individuals with audiometric hearing loss [sensorineural or permanent conductive]) who also notice functional impairments related to hearing and communication. Hearing aids can be medically necessary and are effective at treating hearing loss. They are not considered "experimental or investigational" when used to treat hearing loss.

Other indications for use of a prescription hearing aid outside this above indication are theoretically possible (e.g., use of a hearing aid by an individual with tinnitus *without* audiometric hearing loss or use of a hearing aid by an individual with a central auditory processing deficit *without* audiometric hearing loss) but these situations are extremely rare. For example, in nearly 14 years as a practicing otologist at a tertiary academic medical center, I do not recall ever encountering a patient using hearing aids for one of these latter indications. Hearing aids are used occasionally by individuals with tinnitus or with central auditory processing disorders, but in nearly all of these cases, an audiometric hearing loss is also concurrently present. In sum, virtually no one uses prescription hearing aids unless they are experiencing a hearing disability.

B.3.b. Osseointegrated bone conduction implants Osseointegrated implants (also called BAHA devices) are surgically implanted devices that can directly conduct sound from an external sound processor into the skull where it is in turn transmitted through bone vibrations to the cochlea. A portion of the implant termed the fixture is permanently implanted into the bone around the ear and is not able to be practically removed. The surgery involves local or general anesthesia where an incision is made behind the ear, a small opening drilled into the bone

behind the ear, followed by introduction of a titanium prosthetic fixture into the bone where it will osseointegrate into place over several weeks. Once healed, an external sound processor is connected to the implanted fixture which can conduct sound into the bone. The primary indication for an osseointegrated implant is a permanent conductive hearing loss that cannot be successfully treated with a hearing aid. This can occur because of medical contraindications (e.g., post-surgical changes to the ear preventing successful hearing aid use) or other reasons (e.g., degree of conductive hearing loss is too large to allow for hearing aid use). Osseointegrated implants are also indicated for individuals with single sided deafness. In these cases, the implant is placed on the side of the deaf ear so sound coming to that side of the head can be transmitted to the cochlea on the other side of the head. This allows the patient to still hear sounds from their deaf side and aids in environmental sound awareness and communication.

B.3.c. Cochlear implants Cochlear implants are surgically implanted neuroprosthetic devices that are indicated only for individuals who have severe or greater audiometric sensorineural hearing loss and who cannot derive adequate benefit from using a hearing aid (typically defined by understanding <60% of spoken words correctly under best aided conditions with well-fit hearing aids). A cochlear implant surgery takes place under general anesthesia and requires 2-3 hours. During the surgery, bone is removed from behind the ear to access the cochlea under an operative microscope. The surgeon will then make an opening into the cochlea to thread an electrode array directly into the cochlea which when connected later to the external sound processor will send electrical impulses directly to the hearing nerve which will then stimulate the brain. A cochlear implantation is an irreversible procedure in that once an electrode array is inserted into the cochlea, nearly all remaining residual hearing in that ear will be lost and the patient will be dependent on the cochlear implant to hear in that ear. As such, a cochlear implant would never be indicated or considered for a patient whose hearing and communication needs are being sufficiently met using a hearing aid or other non-invasive approaches.

As a general rule, ENTs and other hearing care professionals would always recommend the most conservative, non-invasive treatment option first (e.g., typically hearing aids) for individuals with a hearing disability. As a result, CIs or osseointegrated implants are often not considered for a patient until they have failed a hearing aid trial. Consistent with this conservative approach to hearing loss management, I have often observed that many insurance companies have such a policy requirement for a hearing aid trial before coverage for a CI or osseointegrated implant would be permitted.

B.4 Comment on Kaiser coverage of hearing care treatment

I have reviewed documentation of Kaiser hearing coverage policies, and my understanding from this review is that Kaiser covers diagnostic audiological testing for hearing loss evaluation and also covers services and procedures related to cochlear implantation and BAHA (osseointegrated implant) surgery. In contrast, hearing aids and exams/services related to hearing aids are not covered.

C. U.S Regulatory Policies for Hearing Aids

C.1 Food and Drug Administration (FDA) hearing aid regulations of 1977

Hearing aids first became regulated as medical devices by the FDA in 1977. These FDA hearing aid regulations established technical standards for hearing aids and, along with related state-level regulations, effectively stipulated that hearing aids could only be sold through a licensed hearing professional. These regulations made sense at that time given that the analog hearing aids of that era had to be manually programmed and fit by a hearing professional in order for them to be safe and effective. The implications of this regulatory model is that patients could not obtain a hearing aid without going through a licensed hearing professional who served as the gatekeepers to this technology. Since most health insurance precluded coverage for hearing aids and any related audiological rehabilitative services, hearing aids became an out-of-pocket cost to most consumers whereby the consumer is charged a bundled cost for the hearing aids as well as for the support services of the hearing professional. The bundled related services can include outpatient visits with a licensed hearing professional to understand the patient's communicative and hearing needs, fit the hearing aids to the patient's ear anatomy, adjust the hearing aids acoustic settings to meet the user's needs, and instruct patients in the use of the hearing aids and any related technologies. Such services are necessary for prescription hearing aids to be safe and effective at treating hearing loss. Under this regulatory model that has promoted a gatekeeper model of hearing care delivery, the National Academies in 2016 estimated that the average cost for a pair of hearing aids was \$4700⁷.

C.2 Updated FDA hearing aid regulations released October 17, 2022

In October 2022, prompted by bipartisan federal legislation and reports from the White House and National Academies to increase the affordability and accessibility of hearing aids (the expert witness served on the National Academies consensus study and advised the White House on their report)^{7,12}, the FDA issued new regulations for over-the-counter hearing aids intended for adults with mild-to-moderate hearing loss¹³. These regulations will now permit manufacturers producing hearing aids that meet certain technical standards to directly sell these devices to consumers OTC rather than having a hearing professional as an intermediary. Over the next few years, these regulations are poised to lead to a sea change in the hearing care marketplace with the entrance of new companies into the previously protected hearing aid market and broadening the accessibility and affordability of hearing aids for consumers. However, it will likely take until at least 2024-2025 for this market to mature fully and appreciably affect consumers at scale given the need for companies to develop and seek regulatory approval for these devices, market development of new retail and distribution models for how to sell these products to consumers, and implementation of market strategies for how to educate consumers about when to use, how to use, and who should use these OTC hearing aid technologies.

D. Clinical Perspective and Recommendations for Hearing Aid Use

From the medical perspective, the decision to recommend that a patient use hearing aids is principally guided by a clinical diagnosis of hearing loss that would be amenable to hearing aid amplification (based on the audiometric and clinical exam) and patient report of significant functional hearing and communication limitations in daily life. With children where it may not be possible to assess functional limitations, hearing aids would routinely be recommended solely based on an audiometric diagnosis of hearing loss that would be amenable to amplification with hearing aids.

Despite evidence of the impact of hearing loss on health outcomes and the potential benefits of hearing loss intervention, rates of hearing aid use remain consistently low in the U.S. with rates of hearing aid use varying by hearing loss severity and age. The most robust data on hearing aid usage come from representative samples of adults across the U.S. A previous estimate of these data from an analysis by the expert witness (Figure 4) demonstrates rates of hearing aid use being 2-3% among those with mild hearing and 11-48% among those with moderate or greater hearing loss with increased rates of hearing aid use among older individuals¹⁵. Given the very low prevalence of hearing loss in children, obtaining valid estimates of rates of hearing aid in children cannot be reliably estimated with representative U.S. data.

The reasons underlying this low rate of use are multifactorial and include ageism, ableism and stigma pertaining to hearing aid use (e.g., appearing 'old', 'enfeebled', 'impaired' as often perpetuated in tropes and the popular media), lack of accessibility and affordability of hearing aids and related services, inherent limitations of hearing aids in not being able to fully 'correct' hearing loss, and poor consumer awareness of the health importance of hearing loss⁷. Consistent with these barriers, previous studies have found that the average delay from hearing loss diagnosis and candidacy for hearing aids to patient adoption of hearing aids is 8.9 years¹⁴.

Figure 5 Prevalence of hearing aid use

Table. Prevalence and Number of Individuals 50 Years or Older With Hearing Loss^a Using Hearing Aids in the United States^b

Variable	Prevalence of Hearing Aid Use Among Adults With Hearing Loss ^a \geq 25 dB, % (95% CI) ^c						No. With Hearing Loss ^a \geq 25 dB (in Millions)
	Sex		Hearing Loss Severity ^d		Total		
	Male	Female	Mild (25-40 dB)	Moderate or Greater (>40 dB)	Overall Prevalence of Hearing Aid Use	No. With Hearing Aids (in Millions)	
Age, y							
50-59	4.3 (0-9.5)	4.5 (0-13.5)	2.7 (0-6.6)	11.8 (0-27.5)	4.3 (0-8.8)	0.2	4.5
60-69	7.3 (2.5-12.1)	7.2 (1.4-13.0)	2.6 (0-5.2)	23.9 (10.6-37.2)	7.3 (3.6-10.9)	0.4	6.1
70-79	21.1 (14.5-27.6)	12.7 (6.0-19.5)	3.4 (0.3-6.5)	47.8 (37.0-58.6)	17.0 (12.4-21.6)	1.5	8.8
\geq 80	28.1 (20.3-35.9)	17.9 (11.2-24.7)	3.4 (0-7.7)	35.7 (28.7-42.7)	22.1 (18.5-25.8)	1.6	7.3
Estimated total No. of individuals with hearing aids and with hearing loss (in millions)						3.8 ^d	26.7

^aHearing loss was defined as a speech frequency pure tone average of hearing thresholds at 0.5-, 1-, 2-, and 4-kHz tones presented by air conduction in the better hearing ear of 25 dB or greater.

^bData were derived from the 1999-2006 National Health and Nutrition Examination Survey.

^cAll values represent prevalence percentage unless otherwise noted.

^dNumbers do not sum to group total because of rounding.

From Chien and Lin, Arch Int Medicine, 2012

E. Conclusion

An exclusion of all coverage for hearing aids and hearing aid examinations eliminates coverage of the essential treatment required by individuals with a hearing disability. After a hearing loss diagnosis, treatment with hearing aids is the service that the overwhelming majority of individuals with a hearing disability need and require to address their disability. For the vast majority of individuals with a hearing disability, hearing aids and related services would be considered medically necessary and effective at treating hearing loss. Prescription hearing aids should be covered when prescribed or recommended by licensed providers, just like other types of medical equipment.

Expert Witness Review of Audiological Files

I reviewed the audiological files provided by Plaintiffs' counsel for each of the three named plaintiffs. Based on the files reviewed I conclude that each plaintiff has a clinically significant hearing impairment based upon objective medical records including audiograms. Based upon the objective studies, I would expect that each named plaintiff would benefit from prescription hearing aids, which the records reflect that they have received. For Plaintiff Schmitt and Plaintiff O.L., based upon the records provided, hearing aids are essentially the only medical device that would be indicated to effectively treat their hearing loss. The records are insufficient for me to determine whether Plaintiff Mohundro could be eligible for a CI in her left worse-hearing ear; however, it appears from the records that her needs are presently met with hearing aids, such that a CI would not be clinically recommended.

Patient name: Elizabeth Mohundro, DOB 2/10/1976

Files reviewed:

2/6/23 Pure tone audiogram with air and bone conduction testing and word recognition score testing

12/20/2017 Pure tone audiogram with air and bone conduction testing and word recognition score testing

Summary:

In 2017, the patient's right ear had audiometric findings consistent with a low frequency mild downsloping to a moderately severe to severe sensorineural hearing loss from 1-8 kHz. Word recognition score in the R ear at 80dB is 92%. In contrast, the left ear demonstrates a mild downsloping to a profound/complete hearing loss. Bone conduction testing was not performed in the left ear so I'm unable to determine if there is a mixed conductive and sensorineural component to the Left hearing loss or whether it is primarily sensorineural in nature. The left ear has a word recognition score of 18% at 85 dB presentation level.

Her 2022 audiogram is generally stable compared to her 2017 audiogram with some interval minor progression (~5 dB) in the R ear and a more pronounced progression at the 4 kHz in the left. Speech discrimination scores are stable.

Based on only a review of her audiogram demonstrating a Right ear with essentially a moderate to moderately severe sensorineural hearing loss and nearly a non-hearing left ear (as indicated by the extremely poor speech discrimination score), I would expect Ms. Mohundro to have functional difficulties with localizing sound, understanding speech with any background competing noise, and also noticing some difficulty even in quiet settings if she is not face to face with the speaker or the sound source is distant or of poor quality.

Patient name: Olivia Leitich, DOB 7/23/2008

Files reviewed:

9/15/2022 Pure tone audiogram with air and bone conduction testing and tympanometry, otoscopic findings

Summary: Both ears with symmetrical hearing. Both ears with normal to 1kHz downsloping to a flat 60 dB moderately severe sensorineural loss in both ears with some trace asymmetry at 2kHz (R ear worse at 75dB versus 60 dB in the left). Tympanometry demonstrating normal curves with no evidence of middle ear dysfunction. Speech discrimination testing results are not available.

Based on review of the limited audiological assessment (speech testing not available), I would expect Miss Leitich to have difficulty with speech understanding given the pronounced loss of audibility at the mid and higher frequencies. This would be most apparent with a distant speaker or with any type of background noise or in the presence of multiple talkers.

Patient name: Andrea Schmitt, DOB 8/11/1978

Files reviewed:

3/13/2013 Pure tone audiogram with air conduction testing and word recognition score testing, otoscopic findings

11/23/2016 Pure tone audiogram with air and bone conduction testing

9/22/2021 Pure tone audiogram with air conduction testing and word recognition score testing, otoscopic findings

Summary: Ms. Schmitt's most recent audiogram from 2021 demonstrates symmetrical air-conduction thresholds. Bone conduction testing was not completed but based on the symmetrical pattern, this is likely a bilateral sensorineural hearing loss. Both ears demonstrate normal low-frequency hearing to 750 Hz downsloping steeply to severe hearing loss from 1500 to 8000 Hz. Word recognition testing is 84% in the Right ear and 68% in the Left ear. There is progression in high-frequency hearing loss when comparing her 2013 to 2021 audiogram. Her 2016 audiogram is intermediate between the 2013 and 2021 audiogram except for a slight conductive component noted in the R ear at 500 Hz of unclear significance and possible transient in nature or related to testing artifact.

Based on review of her most recent 2021 audiogram demonstrating a bilateral mid-to-high frequency severe sensorineural hearing loss and word recognition scores demonstrating generally poorer speech understanding in the L ear greater than the R ear, I would expect that Ms. Schmitt would have significant difficulty understanding speech with distant speakers or with any type of background noise or multiple speakers.

DATED: May 12, 2023, at Albufeira, Portugal.

A handwritten signature in black ink, appearing to be 'F. Lin', written over a horizontal line.

Frank R. Lin, MD, PhD

1. See

[\(https://www.cdc.gov/ncbddd/disabilityandhealth/disability.html#:~:text=A%20disability%20is%20any%20condition,around%20them%20\(participation%20restrictions\)\)](https://www.cdc.gov/ncbddd/disabilityandhealth/disability.html#:~:text=A%20disability%20is%20any%20condition,around%20them%20(participation%20restrictions)) (last visited May 9, 2023).

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Exhibit A

**CURRICULUM VITAE
FRANK ROBERT LIN, M.D. Ph.D.**

May 2023

Frank R. Lin

DEMOGRAPHIC AND PERSONAL INFORMATION

Current Appointments:

- 2011-present Core Faculty, Center on Aging and Health, Johns Hopkins University
- 2014-present Joint Appointment in Epidemiology, Johns Hopkins University Bloomberg School of Public Health
- 2014-present Joint appointment in Geriatric Medicine & Gerontology, Department of Medicine, Johns Hopkins University School of Medicine
- 2014-present Joint Appointment in Mental Health, Johns Hopkins University Bloomberg School of Public Health
- 2014-present Associate Faculty, Welch Center for Prevention, Epidemiology, and Clinical Research, Johns Hopkins University School of Medicine and Bloomberg School of Public Health
- 2018-present Director, Cochlear Center for Hearing and Public Health, Johns Hopkins Bloomberg School of Public Health
- 2018-present Professor of Otolaryngology-Head & Neck Surgery, Medicine, Mental Health, and Epidemiology, Johns Hopkins University

Personal Data:

Johns Hopkins University School of Medicine
Department of Otolaryngology—Head & Neck Surgery
601 N. Caroline Street, 6th Floor
Baltimore, MD 21287
Tel: 443-287-6509 (Clinical)
410-502-0150 (Research)
Fax: 410-502-6713
Email: flin1@jhmi.edu
Website: <https://www.jhsph.edu/cochlear-center>

Education and Training:

- 1994 – 1998 Bachelor of Science, Biochemistry, Brown University
- 1998 – 1999 Intensive Chinese language study, Taiwan Normal University, Beijing Language and Culture University
- 1999 – 2003 Doctor of Medicine, Johns Hopkins University School of Medicine
- 2003 – 2004 Intern in General Surgery, Johns Hopkins Hospital
- 2004 – 2008 Doctor of Philosophy, Clinical Investigation, Johns Hopkins University Bloomberg School of Public Health
- 2004 – 2009 Resident in Otolaryngology—Head & Neck Surgery, Johns Hopkins Hospital
- 2010 Visiting Fellow in Otology, Fisch International Microsurgery Foundation, Switzerland

Professional Experience

- 2010 – 2014 Assistant Professor, Department of Otolaryngology-Head & Neck Surgery, Johns Hopkins University School of Medicine
- 2011-present Core Faculty, Center on Aging and Health, Johns Hopkins Medical Institutions
- 2014-2018 Associate Professor, Departments of Otolaryngology-HNS, Geriatric Medicine, Mental Health, and Epidemiology; Johns Hopkins University
- 2014-present Associate Faculty Member, Welch Center for Prevention, Epidemiology, and Clinical Research, Johns Hopkins University School of Medicine and Bloomberg School of Public Health
- 2018-present Director, Cochlear Center for Hearing and Public Health, Johns Hopkins Bloomberg School of Public Health
- 2018-present Professor of Otolaryngology-Head & Neck Surgery, Medicine, Mental Health, and Epidemiology, Johns Hopkins University

PUBLICATIONS**Original Research [OR]**

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- 157) Nicholas SO, Koh EJ, Wee SL, Eikelboom RH, Jayakody DMP, **Lin F**, Ng TP, Heywood RL. Peripheral Hearing Loss and Its Association with Cognition among Ethnic Chinese Older Adults. *Dement Geriatr Cogn Disord.* 2021;50(4):394-400. doi: 10.1159/000519291. Epub 2021 Sep 30. PMID: 34592737.
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Review Articles [RA]

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 - 12) **Lin FR**. Hear and Now. *Cerebrum.* 2020 Oct 1;2020:cer-07-20. PMID: 33216829; PMCID: PMC7664819.
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Case Reports [CR]

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Book chapters [BC]

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- 2) **Lin FR**, Niparko JK, Francis HW. *Outcomes in cochlear implantation: assessment of quality of life impact and economic evaluation of the cochlear implant*. In: Eisenberg L (ed). Clinical Management of Children with Cochlear Implants. Plural Publ, 2009
- 3) **Lin, FR**, Niparko, JK, Francis, HW. Outcomes in Cochlear Implantation: Assessment of Quality-of-Life Impact and Economic Evaluation of the Benefits of the Cochlear Implant in Relation to Costs. *Cochlear Implants: In Principles & Practices*. Lippincott Williams & Wilkins, 2009.
- 4) **Lin FR**. *Hearing loss and aging*. In: Goldman M, Troisi R, Rexrode K (eds). Women and Health, Elsevier, 2012.
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- 6) Parham K, **Lin FR**, Blakley BW. *Age-Related Hearing Loss*. In: Sataloff RT, Johns MM, Kost KM (eds) *Geriatric Otolaryngology*. Thieme, 2015.
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- 8) Semenov YR, **Lin FR**, Francis HW, Niparko JK. *Outcomes in cochlear implantation: assessment of quality of life impact and economic evaluation of the cochlear implant*. In: Eisenberg L (ed). Clinical Management of Children with Cochlear Implants. Plural Publ 2016
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Other Publications

JAMA Viewpoints & Other Peer-Reviewed Editorials [ED]

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- 2) Whitson HE, **Lin FR.** Hearing and Vision Care for Older Americans: Sensing a Need to Update Medicare Policy. JAMA. 2014 Nov 5;312(17):1739-40. PMID: 25369486
- 3) **Lin FR,** Albert M. Hearing loss and dementia - who is listening? Aging Ment Health, 2014 Aug; 18(6):671-3. PMID: 24875093
- 4) **Lin FR,** Hazzard WR, Blazer DG. Priorities for Improving Hearing Health Care for Adults: A Report From the National Academies of Sciences, Engineering, and Medicine. JAMA. 2016 Aug 23-30;316(8):819-20. PMID: 27254725
- 5) **Lin FR,** Whitson HE. The Common Sense of Considering the Senses in Patient Communication. J Am Geriatr Soc. 2017 Apr 24. Epub ahead of print. PMID: 28436020
- 6) **Lin, FR.** Time for a Top-Down Approach to Hearing Aid Affordability and Accessibility. Am J Public Health. 2018 Feb;108(2):166-168. PubMed PMID: 29320290.
- 7) Reed NS, **Lin FR,** Willink A. Hearing Care Access?: Focus on Clinical Services, Not Devices. JAMA. 2018 Oct 23;320(16):1641-1642. doi: 10.1001/jama.2018.11649. PubMed PMID: 30242394.
- 8) **Lin FR.** Making Sense of the Senses in Aging Research. *J Gerontol A Biol Sci Med Sci.* 2020;75(3):529-530. doi:10.1093/gerona/glaa028
- 9) **Lin FR,** Reed NS. The Pure-Tone Average as a Universal Metric-Knowing Your Hearing. JAMA Otolaryngol Head Neck Surg. 2020 Dec 23. doi: 10.1001/jamaoto.2020.4862. Epub ahead of print. PMID: 33355634.
- 10) Deal JA, **Lin FR.** USPSTF Recommendations for Hearing Loss Screening in Asymptomatic Older Adults-A Case of Missing Evidence and Missing Treatment Options. JAMA Netw Open. 2021 Mar 1;4(3):e210274. doi: 10.1001/jamanetworkopen.2021.0274. PMID: 33755162.
- 11) **Lin FR,** Reed NS. Over-The-Counter hearing aids: How we got here and necessary next steps. J Am Geriatr Soc. 2022 May 5. doi: 10.1111/jgs.17842. Epub ahead of print. PMID: 35512226.
- 12) **Lin F,** Sheehan M, Reed N, Sampson I. Web Exclusive. Annals Graphic Medicine - Medicare Hearing Policy: A Path Forward. Ann Intern Med. 2022 Oct;175(10):W120-W135. doi: 10.7326/G21-0092. Epub 2022 Oct 11. PMID: 36215710.

National Academies of Science, Engineering, and Medicine Summaries & Consensus Statements [GL]

- 1) IOM (Institute of Medicine) and NRC (National Research Council). Hearing loss and healthy aging: Workshop summary. Washington, DC, National Academies Press 2014. * I was the Co-Chair of this two-day workshop for the IOM and was a co-author of this summary
- 2) National Academies of Science, Engineering, and Medicine. Hearing health care: Priorities for improving access and affordability. Washington, DC, National Academies Press 2016. * I was a member of the NASEM expert committee that wrote this consensus study report.
- 3) National Academies of Science, Engineering, and Medicine. The Promise of Assistive Technology to Enhance Activity and Work Participation. Washington, DC, National Academies Press 2017. * I was a member of the NASEM expert committee that wrote this consensus study report.
- 4) National Academies of Science, Engineering, and Medicine. Evaluating Hearing Loss for Individuals with Cochlear Implants. Washington, DC, National Academies Press 2021. * I was a member of the NASEM expert committee that wrote this consensus study report.

Congressional Testimony

- 1) **Lin FR.** "Examining Improvements to the Regulation of Medical Technologies." Oral and written testimony delivered before the Health Subcommittee of the House of Representatives on the Over-the-Counter Hearing Aid Act of 2017 (H.R. 1652). May 2, 2017.
<https://docs.house.gov/Committee/Calendar/ByEvent.aspx?EventID=105908>

Books

- 1) **Lin, Frank,** author. Hearing Loss For Dummies / Frank Lin, Nicholas Reed. 1st. Indianapolis : John Wiley & Sons inc., 2022.

FUNDING

EXTRAMURAL Funding

Research Extramural Funding- Current (total costs)

- 9/26/19 – 8/31/23 ARIC Neurocognitive Study (ARIC-NCS) Renewal
 NIA/NHLBI/NIDCD/NINDS/NIH
 ~\$35,000,000
 MPI: Josef Coresh & Rebecca Gottesman
 Role: Co-I, Chair of the hearing committee for the collective ARIC-NCS study group

- 6/1/17 – 5/31/23 Aging, Cognition, and Hearing Evaluation in Elders (ACHIEVE) Randomized Trial
 NIA/NIH
 R01AG055426
 \$15,426,522
 Role: MPI: Frank Lin (35%)/Josef Coresh; Note: This grant is the culmination of my foundational epidemiological studies linking hearing loss with cognitive decline and dementia from 2010-2013 which then led to the R34 clinical trial planning grant from 2014-2016 that resulted in the development and funding for this clinical trial. This is the largest trial ever funded by the NIH related to hearing.

- 9/30/19 – 5/31/23 Admin. Suppl. To R01AG055426 Aging, Cognition, and Hearing Evaluation in Elders
 Randomized Trial
 NIA/NIH
 3R01AG055426-03S1
 \$1,159,601
 Role: PI. This supplement funds the expansion of the ACHIEVE sample size from N=850 to N=977.

- 9/1/18 – 5/31/23 Hearing loss, brain aging, and speech-in-noise performance in the ACHIEVE study
 NIA/NIH
 R01AG060502
 \$3,165,191
 Role: PI (10%); Note: This grant will fund the addition of an MRI ancillary to the parent ACHIEVE and ARIC studies

- 2/1/19 – 1/31/23 Contribution of sensorimotor function to risk and pathogenic mechanisms of Alzheimer’s
 disease and related dementias
 NIA/NIH
 R01AG061786
 \$3,164,651
 Role: MPI (10%)

- 9/1/21 – 5/31/26 Randomized trial of telehealth vs conventional hearing care delivery in the ACHIEVE Study
 NIDCD/NIA
 R01DC019408
 \$3,154,952
 Role: MPI (10%)

- 8/15/22 – 7/31/27 Long-term effects of hearing intervention on Brain Health in the Aging and Cognitive Health
 Evaluation in Elders (ACHIEVE) randomized study [Official award notice pending]
 R01AG076518
 \$16,753,830

Role: MPI (10%)

6/15/22 – 5/31/27 Addressing Hearing Loss as a Common Unmet Contributor to Neuropsychiatric Symptoms
R01AG076525
\$4,091,967
MPI: Carrie Nieman, Esther Oh
Role: Co-I

9/1/22-8/31/27 Extending Capacity for Affordable, Accessible Hearing Care through Peer Mentorship
R21/R33DC020149
\$2,538,125
PI: Carrie Nieman
Role: Co-I

9/15/22 – 8/31/27 Early Age-Related Hearing Loss Investigation (EARHLI): A Randomized Controlled Trial to Assess Mechanisms Linking Early Age-Related Hearing Loss and Alzheimer's Disease and Related Dementias
R01AG075083
PI: Justin Golub
Role: Co-I

Research Extramural Funding- Previous

7/1/04 – 6/30/06 Quality of Life after Early Childhood Cochlear Implantation
Clinical Research Loan Repayment Award
NIDCD/NIH
Role: PI (no effort)

6/1/10 – 11/30/10 Hearing Loss and Frailty
Research Career Development Award
Johns Hopkins Pepper Older Americans' Independence Center. NIA/NIH
\$33,788
Role: PI (15% effort)

12/1/10 – 11/30/15 Hearing Loss and Aging
K23 Career Development Award
K23DC011279
\$1,095,620
Role: PI, (75% effort); Note: No cost extension from 12/1/15 – 11/30/16

10/1/11 – 9/31/15 Hearing Loss and Aging
Triological Society/American College of Surgeons Clinician Scientist Award
\$320,000
Role: PI, (no effort)

5/12 – 4/13 Double-blind, randomized, placebo-controlled, single-dose, crossover study of the safety and efficacy of two fixed doses of PF-04958242 in subjects with age-related sensorineural hearing loss
Pfizer Pharmaceutical Contract
\$ 423,674
PI: John Carey
Role: Co-I (10% effort)

9/10/14 – 8/31/15 Reducing the Symptom Burden of Cognitive Impairment through Affordable and Accessible Hearing Health Care
Johns Hopkins Alzheimer's Disease Research Center. NIA/NIH

- \$28,060
Role: PI, (no effort)
- 9/1/14 – 5/31/16 Planning a trial of hearing rehabilitative treatment to reduce cognitive decline in older adults (R34)
NIA/NIH
\$467,564
Role: Co-PI: Frank Lin (10%) and Josef Coresh; Note: This 2 year grant from the NIA funded the planning and development of a RCT to investigate if hearing loss treatment can reduce the risk of cognitive decline and dementia in older adults. The grant for the full-scale ACHIEVE clinical trial was submitted in June 2016.
- 7/1/15 – 6/30/17 Strengthening Informal Support Resources with Strategic Methodological Advances
P30AG048773
NIA/NIH
\$1,181,267
PI: David Roth
Role: Pilot Project PI, 2%
- 12/1/17 – 11/30/18 Admin. Suppl. to U01AG052445-01 Stress, Mental Disorders, Accelerated Aging, and Dementia: a 35-year Cohort Study
NIA/NIH
3U01AG052445-02S1
\$99,075
PI: Adam Spira, William Eaton
Role: Co-I (4%); Note: This supplement funds the addition of hearing testing into the Epidemiologic Catchment Area study which my group will help implement and oversee.
- 9/1/15 – 8/31/19 ARIC Neurocognitive Study (ARIC-NCS)
NIA/NHLBI/NIDCD/NINDS/NIH
\$3,495,835
PI: Josef Coresh
Role: Co-I (23% effort), Chair of the hearing committee for the collective ARIC-NCS study group; Note: The ARIC-NCS renewal grant funds a Visit 6 and 7 for the ~5000 participants followed in the ARIC-NCS study. I lead the hearing subunit which is implementing hearing testing across the 4 study sites and have an R01-sized allocation off the parent award.
- 12/16/19 – 11/20/21 Extending Affordable, Accessible, Community-Delivered Hearing Care to Home Care (Exploratory Development Award/Supplement to R33DC015062)
3R33DC015062-05S1
\$87,749
Role: PI. This supplement funds an underrepresented minority trainee to develop an extension of the HEARS intervention.
- 12/1/15 – 11/30/22 Implementing a Community Health Worker Model of Providing Hearing Health Care Services to Older Adults
R21/R33DC015062
NIDCD/NIH
\$2,494,615
Role: PI; (40% effort); Note: The intellectual property and materials developed as part of this award are being licensed to a non-profit organization, AccessHEARS, that I co-founded.
- 12/1/17 – 11/30/22 Admin. Suppl. to R33DC015062 Community-Delivered Affordable, Accessible Hearing Care to Reduce Symptom Burden in Alzheimer’s Disease: Adaptation of the HEARS Intervention

3R33DC015062-03S1

\$404,580

Role: PI. This supplement funds the adaptation of the HEARS intervention to patients with Alzheimer’s disease and related dementias.

Education Extramural Funding

Clinical Extramural

3/1/16 – 11/30/16 A clinical trial protocol to determine the effects of cochlear implantation on cognitive functioning in older adults
Cochlear America
\$79,482
Role: PI, (15%)

System Innovation or Quality Improvement Extramural Funding

Other Extramural Funding – Current Philanthropy

7/1/22 – 6/30/25 Understanding and Addressing the Impact of Hearing Loss on Older Adults
Eleanor Schwartz Charitable Foundation
Total gift: \$600,000
Role: PI (15%)

4/1/18 – 3/31/28 Funding for the Cochlear Center for Hearing and Public Health
Cochlear Ltd
\$10,000,000
Role: Center Director

Other Extramural Funding – Previous Philanthropy

2012 -2022 Understanding and Addressing the Impact of Hearing Loss on Older Adults
Eleanor Schwartz Charitable Foundation
\$1,290,000
Role: PI, (no effort) Note: This foundation has funded my research program since 2012 with \$890K through 2020.

2014 Miriam Hardy Estate
Total gift: \$250,000
Role: PI, (no effort); Note: This was a gift to support my ongoing research at the Bloomberg School of Public Health

Other Extramural Funding - Current

2016-2020 AARP
\$400,000 grant to Access HEARS
PI: N/A – grant awarded to AccessHEARS; Note: This grant was awarded to AccessHEARS, a nonprofit 501(c)3 that I co-founded with my mentee, Carrie Nieman, and which is dedicated to ensuring accessibility and affordability of hearing care for older adults. This grant supports the non-profit in disseminating the hearing intervention developed under R33DC015062.

INTRAMURAL Funding

Research Intramural Funding - Previous

7/1/14 – 6/30/15 Providing hearing health care to patients at the Johns Hopkins Memory Clinic
Johns Hopkins Advanced Translational Incubator Pilot Program Grant
\$35,000
Role: PI

Education Intramural Funding

Clinical Intramural Funding

System Innovation or Quality Improvement Intramural Funding

Other Intramural Funding

CLINICAL ACTIVITIES

Clinical focus:

My clinical expertise is in the medical and surgical management of hearing loss in adults and other otologic conditions. In particular, I am an expert in how hearing loss impacts the cognitive functioning of older adults, treatment strategies for mitigating the effects of hearing loss on cognitive decline and dementia, and surgical approaches (e.g., cochlear implantation) toward treating hearing loss.

Medical Licensure

2010-present Maryland Board of Medicine, License # D0069781

Board Certification

2010-present Board Certified, American Board of Otolaryngology-Head & Neck Surgery

Clinical (Service) Responsibilities

2010-present Attending surgeon in Otolaryngology-HNS with subspecialty expertise in Otology (20%)

Clinical Productivity

2010-present My targeted clinical effort is between 10-20%. On average, I see patients during one day of clinic per week generating 1-2 surgical cases/month

Clinical Draw

2010-present The vast majority of my patients come from the mid-Atlantic region including Pennsylvania, Delaware, West Virginia, and Virginia.

Membership in or examiner for specialty board

Clinical Program Building/Leadership

Clinical Demonstration Activities

Development of nationally/internationally recognized clinical standard of care

EDUCATIONAL ACTIVITIES

Educational Focus

My educational efforts focus on training the next generation of clinicians and researchers to conduct interdisciplinary research spanning the fields of otolaryngology, audiology, geriatrics, epidemiology, and public health. In my research group, I mentor multiple pre- and post-doctoral fellows and junior faculty from both the School of Medicine and Bloomberg School of Public Health. I co-founded an epidemiology course on sensory loss and aging at the Bloomberg School of Public Health. I also continue to teach and mentor otolaryngology residents who work with me in my clinic and operative cases.

Teaching

Classroom Instruction

JHMI/Regional

- 2011 Small group instructor, 1st year medical students, Clinical Epidemiology. Johns Hopkins School of Medicine
- 11/11 Lecturer, Community adults, Mini Med School on Aging and Health. "Hearing loss and healthy aging," Johns Hopkins Odyssey Program in partnership with Center on Aging and Health
- 2013-present Lecturer, Bloomberg School of Public Health students, Epidemiology of Aging Course,

- “Epidemiology of hearing loss and healthy aging” - Course is held annually, Johns Hopkins Bloomberg School of Public Health
- 2013-present Lecturer, School of Medicine graduate students, Structure and Function of the Auditory System, “Hearing loss epidemiology in older adults”- Course is held biennially, Johns Hopkins School of Medicine
- 2015-2018 Course Co-founder & Co-director, Bloomberg School of Public Health students, Epidemiology of Sensory Loss in Aging (340.699.01, 3 credits) course held annually, Johns Hopkins Bloomberg School of Public Health

National
International

- 7/2019 Course director, “East Asians Fellows Program in Aging, Hearing and Public Health”, Johns Hopkins Bloomberg School of Public Health (1 week intensive course based in Baltimore)
- 6/21-8/21 Course co-director, “Latin American Fellows Program in Aging, Hearing, and Public Health”, Johns Hopkins Bloomberg School of Public Health (virtual program prepared in collaboration with JHBSPH Center for Teaching and Learning)

Clinical Instruction

JHMI/Regional

- 2010-present Attending, 3rd and 4th year medical students rotating on OHNS service, Teaching in clinic and the operating room, Johns Hopkins School of Medicine
- 2011-present Lab instructor, Otolaryngology-HNS residents, Temporal Bone Dissection Course, Annual course, Johns Hopkins School of Medicine

National
International

CME Instruction

JHMI/Regional

- 7/08 Lecturer, Practicing otolaryngologists, Second Annual Johns Hopkins Update in Otolaryngology - Head & Neck - “Outcomes after early pediatric cochlear implantation: current & future perspectives” -Johns Hopkins School of Medicine
- 8/08 Recorded lecturer, Practicing otolaryngologists, Practical Reviews in Otolaryngology, “Optimizing outcomes after pediatric cochlear implantation,” “Bilateral pediatric cochlear implantation,” “Socioeconomic and parental impact on language learning after pediatric cochlear implantation,” “Developing measures of real-world communication” - Oakstone Medical Publ
- 5/12 Lecturer, Primary care physicians, Johns Hopkins Philip A. Tumulty Topics in Clinical Medicine, “Epidemiologic Impact and Clinical Management of Hearing Loss”-Johns Hopkins School of Medicine
- 2/14 Lecturer, Primary care physicians and geriatricians, 41st Johns Hopkins Annual Current Topics in Geriatrics - “Can you hear me now? What hearing changes we need to know about in older adults” - Johns Hopkins School of Medicine
- 2/15 Lecturer, Primary care physicians and geriatricians, 42nd Johns Hopkins Annual Current Topics in Geriatrics -“Hearing loss in Older Adults: Why it Matters and What to Do?” - Johns Hopkins School of Medicine
- 1/19 Lecturer, “Hearing loss and Dementia – What Do We Know and What Do We Tell Our Patients”, Updates in Otolaryngology Meeting, Pennsylvania State University Milton S. Hershey Medical Center, Marco Island, FL
- 1/19 Lecturer, “Single Sided Deafness – What to Do?”, Updates in Otolaryngology Meeting, Pennsylvania State University Milton S. Hershey Medical Center, Marco Island, FL
- 1/19 Lecturer, “Over-the-Counter Hearing Aids: What’s Already Happened and What’s About to Come?”, Updates in Otolaryngology Meeting, Pennsylvania State University Milton S. Hershey Medical Center, Marco Island, FL

National

- 2/20 Lecturer, “Hearing Loss, Cognition & Dementia - From Epidemiology to Clinical Trials & Public Policy”, Ultimate Colorado Mid-Winter Meeting in Otolaryngology, University of Colorado, Vail, CO
- 1/23 Lecturer, “OTC Hearing Aids – What’s Happened & What’s Coming Next for U.S. Hearing Care Policy”, Ultimate Colorado Mid-Winter Meeting in Otolaryngology, University of Colorado, Vail, CO

International

- 8/13 Lecturer, Primary care physicians, New Zealand Medical Association General Practice Conference and Medical Exhibition, “Epidemiology and Clinical Management of Hearing Loss in Older Adults,” “Hearing Loss In Older Adults: Implications for Healthy Aging”- University of Otago, Dunedin, New Zealand

Workshop/Seminars

JHMI/Regional

National

International

Mentoring *indicates first-authored publication by my mentee

Pre-Doctoral Advisees/Mentees

- 6/11– 8/11 Danisa Clarrett, M.D., Currently: Internal medicine resident at University of Alabama at Birmingham; Role: Primary mentor for MSTAR summer program. I mentored Danisa when she was an NIA MSTAR (Medical Student Training in Aging Research) Summer Student at Johns Hopkins; Co-Authored Publications: OR 36
- 8/11-present Lingsheng Li, Currently: Internal Medicine resident, Johns Hopkins Bayview Medical Center; Role: Primary mentor. Lingsheng was formerly my clinical research coordinator from 2011-2012, and I have continued to mentor her since she started medical school in 2012. She returned to work with me for a summer as a MSTAR student in 2013. Co-Authored Publications: OR 26, 32*, 36, 43, 45*, 48, 73, 78, 79, 85, 87* Awards: 3rd place for poster in “Patient-oriented and Epidemiology Projects” at American Medical Student Association National Convention, 2014 AGS Annual Scientific Meeting Presidential Poster Award
- 6/12 – 6/16 Kevin Contrera, M.D., Currently: Otolaryngology-HNS resident at Cleveland Clinic; Role: Primary mentor. I first worked with Kevin for his scholarly concentration project after his first year of medical school in summer 2012. I continued mentoring him for the rest of medical school including during the year off when he pursued an MPH between his 3rd and 4th years of medical school. Awards: Excellence in Medical Student Research at Johns Hopkins Medical Student Research Day 2012, Watt-Hansell Award and J. Howard Beard Fellowship, TL1 Trainee Award by the Predoctoral Clinical Research Training Program (PC RTP), AMA Foundation’s 2014 Leadership Award. Co-Authored Publications: 38*, 42, 59*, 63*, 69*, 71*, 73, 75, 79*, 82, 85*
- 6/12 – 6/16 Janet Choi, M.D., Currently: Otolaryngology-HNS resident at University of Southern California; Role: Primary mentor. Similar to Kevin, I also first worked with Janet for her scholarly concentration project after her first year of medical school in summer 2012. I continued mentoring her for the rest of medical school including during the year off when she did an MPH between her 3rd and 4th years of medical school. Awards: 2013 AOA Carolyn L. Kuckein Student Research Fellowship, 3rd place in 2014 Johns Hopkins Research on Aging Showcase, TL1 Trainee Award by the Predoctoral Clinical Research Training Program (PC RTP). Co-Authored Publications: OR 38, 42*, 63, 66, 69, 73*, 75*, 76*, 79, 82
- 7/12 – 6/13 David Chen, M.D., Currently: Otolaryngology-HNS resident at Johns Hopkins; Role: Primary mentor. David was a 3rd year medical student who took a year off from medical school to do research with me. Awards: 1st place in 2013 Johns Hopkins Research on Aging Showcase. Co-Authored Publications: OR 33, 35, 36*, 40*, 44, 48*, 54*, 58, 75, 87
- 9/12 – 6/13 Danielle Foley, M.H.S.; Currently: Statistician at Center for Medicare and Medicaid Services Role: Co-mentor. I co-mentored Danielle along with Kevin Frick as she was pursuing her MHS

- in Health Policy and Management. Co-Authored Publications: 41*, 47, 91
- 6/13 - 7/14 Yoon-kyu Sung, Currently: Medical student at Drexel University College of Medicine. Role: Primary mentor. Yoon-Kyu joined my research group after completing his undergraduate degree with a plan to gain research experience before going to medical school. Co-Authored Publications: OR 58, 73, 78*, 79, 85, 87
- 6/13 – 8/13 Fiona Gispén, M.D., Currently: Resident in Psychiatry, Massachusetts General Hospital; Role: Primary mentor. I mentored Fiona for her summer scholarly concentration project after her first year of medical school; Co-Authored Publications: OR 44*, 75
- 7/13 – 5/15 Rebecca Kamil, M.D., Currently: Johns Hopkins Otolaryngology-HNS resident; Role: Primary mentor. I mentored Rebecca when she took a year off after her 3rd year of medical school at Einstein to do research with me at JHU. Co-Authored Publications: OR 43*, 49*, 52*, 72*; BC 7
- 5/15 – 5/16 Nicole Kendig, Currently: Private Practice; Role: Co-mentor. I served as a co-mentor to Nicole on her Au.D. thesis which investigated the performance of a conventional hearing aid vs. other-the-counter hearing devices on speech-in-noise performance; Co-Authored Publications: OR 88
- 5/16 – 5/17 Meredith Frank; Currently: 4th year Au.D. student at Towson University; Role: Co-mentor. I served as a co-mentor to Meredith on her Au.D. thesis which is using qualitative research methods to ascertain audiologists’ knowledge and perspectives on hearing devices and alternative hearing delivery models.
- 5/16 – 5/17 Toni Greene-Oliver; Currently: 4th year Au.D. student at Towson University; Role: Co-mentor. I served as a co-mentor to Toni on her Au.D. thesis which is investigating performance of over-the-counter hearing devices when fit by an audiologist versus by the user.
- 6/16 – 8/16 Tess Gao; Currently: Medical student at University of Toledo; Role: Primary mentor. Tess joined my research group as part of the NIA MSTAR program.
- 2/17 – 8/17 Jeremy Applebaum; Currently: 2nd year medical student at Johns Hopkins; Role: Primary mentor. Jeremy worked in my research group full-time over the summer gathering follow-up data on long-term social function and loneliness after cochlear implantation in adults
- 2/17 – 8/17 Matthew Hoyer, Currently: 2nd year medical student at Johns Hopkins; Role: Primary mentor. Matthew worked in my research group full-time over the summer gathering follow-up data on long-term quality of life and depressive symptoms after cochlear implantation in adults. Awards: Johns Hopkins Dept of Otolaryngology Student Research Award
- 3/17 – 8/17 Michael Harper; Currently: 2nd year medical student at Johns Hopkins; Role: Primary mentor. Michael worked in my research group full-time over the summer conducting a systematic review of hearing loss and social isolation/loneliness.
- 3/17-6/19 Aishwarya Shukla; Currently: 2nd year medical student at Johns Hopkins; Role: Co-mentor. Aishwarya worked in my research group over the 2017 summer conducting a systematic review of the impact of hearing loss on patient-provider communication. She took year off between 2018-2019 to work with me and pursue an MPH.
- 5/17-5/18 Christina Downs, Currently: 2nd year Au.D. student at Towson University; Role: Co-mentor. I was a co-mentor to Christina on her Au.D. thesis which will investigate the use of audiologist-fit hearing aids vs. OTC hearing devices on spatial localization.
- 5/17-5/18 Tiffany Conaster, Currently: 2nd year Au.D. student at Towson University; Role: Co-mentor. I was a co-mentor to Tiffany on her Au.D. thesis which will investigate the use of audiologist-fit hearing aids vs. OTC hearing devices on speech-in-noise in reverberant conditions.
- 6/17 – 8/17 Luke Zhu; Currently: 4th year biomedical engineering undergraduate at Johns Hopkins; Role: Mentor. Luke worked with my research group during summer 2017 on various projects research projects and will also shadow me in clinic/surgery.
- 6/17- 8/17 Brenda Oduola; Currently: 1st year Au.D. student at Towson University; Role: Mentor. Brenda worked with my research group during summer 2017 on a QI/QA initiative at Bayview Medical Center to screen for hearing loss in inpatients and to then provide a hearing/communicative intervention.

Post-Doctoral Advisees/Mentees

- 1/12 – 5/13 Bonnielin Swenor, Ph.D.; Currently: Assistant Professor, Johns Hopkins Wilmer Department of Ophthalmology; Role: Secondary mentor. I mentored Bonnie as her T32 epidemiology of aging

- mentor during her last year of her graduate studies (Ph.D. in Epidemiology at Johns Hopkins received 5/13); Co-Authored Publications: OR 29*, 74
- 7/12 – 6/14 Dane Genter, M.D., Currently: Facial plastic surgery fellow at Johns Hopkins; Role: Primary mentor. Dane worked with me for 2 years supported by our department’s T32-supported research block. His research focused on the association of hearing loss with broader health economic outcomes and physiologic stress. Co-Authored Publications: OR 33*, 35, 40, 44, 48, 49, 50*, 55*, 58*, 59, 74, 75, 87; BC 5*
- 10/12 – 6/13 Paul Mick, M.D., Currently: Clinical otologist and clinical Assistant Professor, Department of Surgery, Faculty of Medicine, University of British Columbia, Canada; Role: Primary mentor. Paul is an otolaryngologist from Canada who took a year off to pursue an MPH at Harvard. I served as his primary mentor on an epidemiologic study of hearing loss and social isolation during his MPH year and have continued to mentor him informally since he graduated with his MPH; Co-Authored Publications: OR 37*, 47*
- 1/13 – 7/13 David Mener, M.D.; Currently: Private practice otolaryngologist; Role: Primary mentor. I worked with Dave during a dedicated 6 month research block in his 3rd year of his otolaryngology residency. Co-Authored Publications: OR 35*, 61*
- 7/13-present Carrie Nieman, M.D. M.P.H.; Currently: Johns Hopkins Otolaryngology-HNS instructor; Assistant Professor effective 7/1/18; Role: Primary mentor. Carrie initially worked with me for 2 years as part of a T32-supported postdoctoral research block. Her research focused on implementing a novel, low cost hearing intervention in underserved, minority neighborhoods in Baltimore. I continue to mentor her on her ongoing research and on academic career development as she prepares to transition from residency. In 2015, we co-founded Access HEARS, a 501(c)3 non-profit organization which is disseminating the hearing intervention that we previously developed during her T32 block and which we are continuing to work on. Our non-profit was recently awarded a \$250K grant from the AARP Foundation. Awards: American Academy of Otolaryngology-Head & Neck Surgery CORE grant 2013, Butler-Williams Scholars Program 2014, AARP Foundation Prize for Best Business Plan, 2nd place at the 2014 Johns Hopkins University Business Plan Competition, Johns Hopkins Center for Innovative Care in Aging Pilot Grant 2014, American Auditory Society Mentored Student Award 2014, American Academy of Otolaryngology Resident Leadership Grant 2013 & 2014. Regional semi-finalist Global Social Venture Competition 2015; First place, Maryland Society of Otolaryngology Resident Research Symposium, 2015; Semi-finalist, Global Action Business Plan Competition, 2015; First place, Johns Hopkins Otolaryngology-HNS Resident Research Symposium, 2016; The Triological Society’s Southern Section James Harrill MD Resident Research Award, 2016; Her K23 submission on which I am her primary mentor recently received a perfect score (10) on the first submission. Co-Authored Publications: OR 62*, 65, 66, 76, 81, 82*, 83, 84, 90; BC 7
- 11/13-present Jennifer Deal, Ph.D., Currently: Assistant Scientist, Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health; Role: Primary mentor. I have mentored Jennifer since 2013 on studies of hearing loss and cognitive/physical functioning. She is now funded by a K01 award with my being her primary mentor. Co-Authored Publications: OR 53*, 63, 67*, 68*, 69, 72, 74, 75, 92*
- 8/14 – 5/15 Deema Almutawa, M.B.B.S., Currently: Research Specialist, Department of Otolaryngology, UCSF; Role: Capstone mentor. I served as Deema’s capstone mentor while she was doing her MPH at Johns Hopkins.
- 8/14 – 5/15 Razan Basonbul, M.B.B.S., Currently: Postdoctoral research fellow, Massachusetts Eye & Ear Infirmary; Role: Capstone mentor. I served as Razan’s capstone mentor while she was doing her MPH at Johns Hopkins.
- 8/14-present Sara Mamo, Au.D., Ph.D., Currently: Assistant Professor, Department of Communication Disorders, School of Public Health and Health Sciences, University of Massachusetts, Amherst. Role: Primary mentor. Sara joined me as a postdoctoral fellow in 2014 and was promoted to Instructor in 2016. She submitted a K23 award with my being her primary mentor in 2/16. Shortly after submitting her K award, however, she was recruited by U. Mass Amherst and was offered a job opportunity which we could not match at Hopkins. She accepted a tenure-track Assistant Professor position that began 1/17. As a result, she later withdrew her K23 application. This was later submitted at U Mass Amherst and was funded on the first submission, and I continue to be a co-mentor for her on this K23 award. Co-Authored Publications: 65*, 71, 76, 81*, 82, 83, 84*, 89, 90; RA 7; BC 9

- 6/15-present Nicholas Reed, Au.D. Currently: Instructor. Department of Otolaryngology-HNS, Johns Hopkins School of Medicine. Promotion to Assistant Professor effective 7/1/18. Ph.D. student at Johns Hopkins Bloomberg School of Public Health. Role: Primary mentor. Nick joined me as a postdoctoral fellow in 2015. He was promoted to Instructor in 7/16 and has started a Ph.D. in Clinical Investigation at the Bloomberg School of Public Health where I continue to serve as his primary mentor. Awards: Awarded NIH KL2 award covering 90% of his salary, tuition, and research costs to support his Ph.D. in the GTPCI program. Nick is the first audiologist in the U.S. to ever receive an NIH KL2 award. Current NIA K23 awardee on which I am his primary mentor. Co-Authored Publications: 65, 86, 88*, 89*, 92
- 6/15 – 12/15 Matthew Huddle, M.D., Currently: Consultant at Boston Consulting Group; Role: Primary mentor. Matt joined my research group during his 6 month research block during his 3rd year of otolaryngology residency. Recently, he has decided to leave clinical medicine to pursue health care consulting. Publication: 74*, 91*
- 9/15-5/20 Sara Alcorn, M.D., Currently:Fellow, Department of Radiation Oncology, Johns Hopkins; Ph.D candidate, Graduate Training Program in Clinical Investigation (GTPCI); Role: I was Sara’s academic advisor in the GTPCI program
- 10/15-6/18 Adele Goman, Ph.D., Currently: Postdoctoral fellow, Department of Otolaryngology-HNS, Johns Hopkins; Role: Primary mentor. Adele completed her Ph.D. in Psychology at the University of York in the United Kingdom and joined me initially as a postdoctoral fellow in 2015 to acquire additional training in epidemiology and clinical trials. She is now an Instructor in SOM and is the project manager for the ACHIEVE trial. Co-Authored Publications: 77*, 86*, 91, 92
- 10/15-present Jon Suen, Au.D. Currently: Postdoctoral fellow, Department of Otolaryngology-HNS, Johns Hopkins; He is presently in Ph.D. program at the Johns Hopkins School of Nursing pursuing research on community-based programs for hearing loss. Jon is the first audiologist to ever pursue a Ph.D. at the JHUSON. Role: Primary mentor. Jon joined my research group after completing his Au.D. at Gallaudet. Before starting his PhD at the School of Nursing in 2018, he worked with me on implementation of the HEARS intervention in the community and is learning principles of community-engaged research and social design with our partners at the Maryland Institute College of Art.
- 5/16 – 12/17 Heather Weinreich, M.D., M.P.H., Currently: Assistant Professor, Department of Otolaryngology - HNS Johns Hopkins. Role: Secondary mentor. I have begun to meet regularly with Heather since early 2016 to help guide her early academic career development in otology and epidemiologic research.
- 5/16-present Justin Golub, M.D., Currently: Assistant Professor, Department of Otolaryngology-HNS Columbia University; Role: Secondary mentor. I am mentoring Justin and helping him develop an academic plan to study hearing and cognitive/brain functioning. He submitted a K23 award in 2/17 on which I am a co-mentor.
- 9/16-present Perry Kuo, M.D., Currently: Postdoctoral fellow, National Institute on Aging; Role: Secondary mentor. Perry is currently a first-year Ph.D. student and his thesis will involve studying the association of hearing loss with physical activity and mobility measured with actigraphy.
- 9/16-6/19 Courtenay Holscher, M.D., Currently: Resident, Department of Surgery, Johns Hopkins; Ph.D candidate, Graduate Training Program in Clinical Investigation (GTPCI); Role: I am Courtenay’s academic advisor in the GTPCI program
- 9/16-6/19 Christine Haugen, M.D., Currently: Resident, Department of Surgery, Johns Hopkins; Ph.D candidate, Graduate Training Program in Clinical Investigation (GTPCI); Role: I am Christine’s academic advisor in the GTPCI program
- 11/16-6/2020 Nicole Armstrong, Ph.D., Currently: Post-doctoral fellow, National Institute on Aging; Role: Primary Co-mentor. Nicole and I first started working together during her last year of graduate school in epidemiology at Johns Hopkins from 2016-2017. She has been a post-doctoral fellow since 5/17 at the NIA where I co-mentor her with Susan Resnick on studies of how hearing loss is associated with brain structure and function in the Baltimore Longitudinal Study of Aging.
- 1/17-1/19 Madeline Sterling, M.D., Currently: T32/AHRQ research fellow at Cornell Medical College; Role: Secondary mentor. Madeline is a general internist doing a research fellowship at Cornell with an interest in studying how hearing loss may affect patient-provider communication in patients with

heart failure. I am mentoring her on epidemiological studies of how hearing loss affects patients with heart failure.

6/17-5/21 Danielle Powell, Au.D. Currently: Ph.D. candidate, Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health; Role: Secondary mentor. Danielle is the first Au.D. to ever pursue a Ph.D. in epidemiology at the Bloomberg School of Public Health.

Thesis Committees

- 1/13 Kim Kiely, Ph.D. candidate in Developmental Psychology and Aging, Australian National University, Canberra - “Out of sight, out of mind: population estimates and dynamic interplay between age-related decline in hearing and cognitive functioning during late life” - Role: Thesis reviewer
- 5/16 Nicole Kendig, Au.D. candidate; Towson University - “Objective and subjective comparative analysis of personal sound amplification products and a hearing aid” - Role: Thesis committee member
- 4/17 Toni Greene-Oliver Au.D. candidate, Towson University - “Objective comparative analysis of self-fit personal sound amplification products using three types of fitting protocols: out-of-the-box self-fit, advanced-user self-fit, and audiologist-fit” - Role: Thesis committee member
- 5/17 Meredith Frank Au.D. candidate, Towson University; “Developing a community health model for delivering audiology services” - Role: Thesis committee member
- 1/19 Courtenay Holscher, Ph.D candidate in Clinical Investigation, Johns Hopkins Bloomberg School of Public Health, “Understanding Post-Donation Kidney Function in Living Kidney Donors” - Role: Thesis committee member
- 3/19 Christine Haugen, Ph.D. candidate in Clinical Investigation, Johns Hopkins Bloomberg School of Public Health, “Liver Transplantation and Older Adults” - Role: Thesis committee member
- 5/19 Sara Alcorn, Ph.D candidate in Clinical Investigation, Johns Hopkins Bloomberg School of Public Health, “Improving Providers’ Survival Estimates and Selection of Prognosis- and Guidelines-Appropriate Radiotherapy Regimens for Patients with Symptomatic Bone Metastases: Development and Evaluation of the BMETS Model and Decision Support Platform” - Role: Thesis committee member
- 5/20 Pauline Croll, Ph.D candidate in epidemiology, Erasmus Medical College, Rotterdam, Netherlands “Hearing Function and Brain Health in the Elderly: Interrelations and risk factors” – Role: Thesis committee member
- 11/20 Nattawan Utoomprurkporn, Ph.D.candidate in Auditory Science , University College London, “Validation of a cognitive screening tool for hearing impaired older adults” – Role: Thesis committee member
- 4/21 Pablo Amezcua, Ph.D. candidate in epidemiology, Johns Hopkins Bloomberg School of Public Health, “The Association of Hearing Impairment with Physical Activity and Function in Older Age” – Role: Thesis committee member
- 5/21 Danielle Powell, Ph.D. candidate in epidemiology, Johns Hopkins Bloomberg School of Public Health, “Hearing Loss and Late-Life Mental Health” – Role: Thesis committee member

Educational Program Building/Leadership

Educational Demonstration Activities to External Audience

RESEARCH ACTIVITIES

Research Focus

The foundational epidemiologic studies that I led from 2010-2014 investigating the impact of hearing loss on older adults has pioneered our current worldwide public health understanding of hearing loss in adults. These results have led to the funding of a >\$20M randomized trial that I lead which will determine if treating hearing loss in older adults can reduce the risk of cognitive decline and dementia. My research also served as the primary basis for the 2017 and 2020 Lancet Commission reports on dementia which concluded that hearing loss (a heretofore unrecognized risk factor for dementia) was the single largest modifiable risk factor for dementia which carried the greatest

attributable risk for dementia compared to all other known risk factors (e.g., cardiovascular risk factors, low education, etc.)

In parallel, I have assumed national leadership roles for initiatives focused on hearing loss, aging, and public health. I co-chaired a National Academies of Science, Engineering, and Medicine (NASEM) workshop on hearing loss in 2014, and subsequently, from 2015-16, I served on an expert NASEM committee that developed consensus recommendations on hearing loss, and I also directly advised the White House on their parallel initiative to broaden access to hearing care. These efforts directly led to current national initiatives on hearing loss from Congress (Over-the-Counter Hearing Aid Act of 2017), the Food and Drug Administration, and the Federal Trade Commission. I have been called on to meet with legislators, legislative staff, and/or ministry/department of health officials in the United States, France, Japan, and New Zealand.

My broader academic research and advocacy efforts directly led to federal passage of the Over-the-Counter Hearing Aid Act of 2017 which was passed as part of the broader FDA Reauthorization bill. This law will result in a sea change in how hearing aids can be made available to consumers/patients. This law directly overturns 40 years of established regulatory precedent and will vastly affect manufacturing, distribution channels, insurance coverage, etc, and will carry worldwide ramifications since the U.S. will be the first country in the world to allow for regulated OTC sales of hearing aids. This federal law reflects the result of my prior research and work with the White House, National Academies, and with Senator Warren’s office (including my testimony before Congress).

Research Program Building/Leadership

- 2011-present Research group leader, Johns Hopkins Center on Aging and Health (COAH)
 Role: I oversee the leading research group in the world studying questions at the interface of hearing loss, gerontology, and public health. My research group (www.linresearch.org) is based at COAH where I am responsible for mentoring, advising, overseeing, and funding 10-15 predoctoral/postdoctoral trainees, junior faculty, and research staff.
- 2018-present Director, Cochlear Center for Hearing and Public Health, Johns Hopkins Bloomberg School of Public Health - The Cochlear Center is the first center of its kind at any school of public health that is focused on addressing the impact of hearing loss on public health. This Center reflects the direct outgrowth of my academic trajectory from 2010-2017 where I was able to establish the impact of hearing loss on older adults through epidemiologic studies, launch a definitive randomized trial to develop evidence for the impact of hearing loss treatment, and catalyze federal legislative change in the U.S. The funding for this Center (\$10M gift from Cochlear Ltd as well as >\$20M in existing funded NIH grants to Center faculty focused on hearing and Center mission areas) will provide me the opportunity to project the progress that I’ve been able to make from 2010-2017 in the U.S. on a broader international scale.

The development of this Center evolved over a year of discussions between me, University leadership, and Cochlear Limited, an Australian company that exclusively develops cochlear implants and other implantable hearing technologies. The executive leadership at Cochlear has long been interested in my research because of the foundational case it makes for why hearing is important to public health (despite the fact that my research is not directly focused on cochlear implants or other technologies that Cochlear manufactures). Cochlear and the Center share the belief that hearing and effective communication are fundamental to human health and functioning but that hearing loss (particularly among older adults) remains poorly addressed in society and not yet a priority in the spheres of public health and public policy. Cochlear’s \$10M gift to the Johns Hopkins Bloomberg School of Public Health to create this Center reflects this shared vision. This funding provides support for the core Center infrastructure and for Center faculty and student recruitment and support as a fraction of the overall funding that supports the mission areas of this Center, the vast majority of which (>\$20M) comes from NIH funding.

Research Demonstration Activities

Inventions, Patents, Copyrights

Technology Transfer Activities

- 2017-present Licensing of intellectual property for the HEARS intervention and curriculum that is currently being tested in NIH R33DC015062 (PI: Lin). In 2015, I co-founded a nonprofit organization, Access

HEARS (www.accesshears.com), that is licensing the HEARS intervention from Johns Hopkins to allow for commercialization and dissemination of this intervention.

SYSTEM INNOVATION AND QUALITY IMPROVEMENT ACTIVITIES

System Innovation and Quality Improvement Efforts within JHMI

- 4/12 - 12/12 Initiated/implemented project to install hearing induction loops throughout the OHNS clinic in JHOC 6 to improve accessibility for patients with hearing loss per the American with Disabilities Act.
- 11/16-6/19 Co-leading a project with my trainee, Nick Reed, and Peter Pronovost to implement hearing screening and provision of a hearing intervention to older adult inpatients at the Johns Hopkins Hospital and Bayview Medical Center

System Innovation and Quality Improvement Efforts outside of JHMI

System Innovation and Quality Improvement Program Building/Leadership

ORGANIZATIONAL ACTIVITIES

Institutional/Administrative Appointments

- 2012 – 2013 Subject matter expert for Neurotology, EPIC Specialty Validation
- 2016 – 2019 Member, Curriculum and Academic Standards Committee, Graduate Training Program in Clinical Investigation
- 2016 – 2019 Member (representing Graduate Training Program in Clinical Investigation), Schoolwide Committee on Academic Standards, Johns Hopkins Bloomberg School of Public Health
- 2020- 2021 Member, Task Force on Diversity, Equity and Inclusion in Research at Johns Hopkins

Editorial Activities

Editorial Board Appointments

- 2014-2020 Member of Editorial Board, Journal of Gerontology: Medical Sciences
- 2021-present Associate Editor, Journal of Gerontology: Medical Sciences

Journal Peer Review Activities

- 2006–present Archives of Otolaryngology-Head & Neck Surgery
Otology & Neurotology
International Journal of Pediatric Otorhinolaryngology
- 2007-present Ear and Hearing
- 2011-present Journal of Clinical Epidemiology
American Journal of Audiology
The Laryngoscope
Journal of the American Medical Association
Journal of Gerontology: Medical Sciences
Canadian Medical Association Journal
Journal of Speech, Language, and Hearing Research
- 2012-present American Journal of Public Health
Hearing Research
- 2014-present New England Journal of Medicine
Neurology
Journal of the American Geriatrics Society
Journal of Geriatric Psychology and Neurology
- 2015-present American Journal of Preventive Medicine
Nature Reviews Neurology

Other Peer Review Activities

Advisory Committees, Review Groups/Study Section

- 6/11 Ad hoc study section member, NIDCD/NIH Special Emphasis Panel on Translational Research
- 11/12 Ad hoc study section member, NIDCD/NIH Special Emphasis Panel

- 5/13 Ad hoc study section member, NIDCD/NIH Special Emphasis Panel
- 9/13-2/14 Co-Chair and planning committee member, Workshop on Hearing Loss and Healthy Aging, Institute of Medicine of the National Academies
- 1/14 Ad hoc study section member, NIDCD/NIH Special Emphasis Panel
- 10/14 Ad hoc study section member, NIDCD/NIH Special Emphasis Panel
- 11/14 Ad hoc study section member, NIH Academic Research Enhancement: Healthcare Delivery and Methodologies Study Section
- 4/15- 6/16 Committee member, Committee on Accessible and Affordable Hearing Health Care, Health and Medicine Division, National Academies of Sciences, Engineering, and Medicine
- 2/16 Ad hoc study section member, NIA GEMSTAR Special Emphasis Panel
- 3/16-3/17 Member, Committee on the Use of Selected Assistive Products and Technologies in Eliminating or Reducing the Effect of Impairments, Health and Medicine Division, National Academies of Sciences, Engineering, and Medicine
- 6/16 Ad hoc study section member, NIDCD/NIH U01 Clinical Trial Special Emphasis Panel
- 7/18-present Member, Board on Health Sciences Policy, Health and Medicine Division, National Academies of Sciences, Engineering, and Medicine, Washington, DC
- 3/2020 Ad hoc study section member, NIDCD/NIH Special Emphasis Panel
- 5/2020 Ad hoc study section member, NIDCD/NIH Special Emphasis Panel
- 6/2020 Ad hoc study section member, NIDCD/NIH Special Emphasis Panel
- 6/20-3/21 Member, Committee on Evaluating Hearing Loss for Individuals with Cochlear Implants, Health and Medicine Division, National Academies of Sciences, Engineering, and Medicine
- 3/21-6/21 Member, Invited Workgroup Member, National Alzheimer’s Project Act Subcommittee on Risk Reduction
- 3/21 Ad hoc study section member, NIA GEMSTAR Special Emphasis Panel
- 10/21-present Member, Forum on Aging, Disability, and Independence, National Academies of Sciences, Engineering, and Medicine, Washington, DC
- 3/22 Ad hoc study section member, NIA GEMSTAR Special Emphasis Panel
- 7/22 Ad hoc study section member, NIH

Professional Societies

- 2004-present American Academy of Otolaryngology—Head & Neck Surgery
 - 2004-present Member
 - 10/09-1/12 Member, Subcommittee on Implantable Hearing Devices,
 - 9/12-8/15 Member, Hearing Committee
 - 9/12-present Member, Geriatric Otolaryngology Committee
- 2010-present Gerontological Society of America
 - 2010-present Member
 - 10/10-11/11 Member, Health Sciences Planning Committee
- 2010-present Association for Research in Otolaryngology
 - 2010-present Member
 - 3/11-3/14 Member, Diversity and Minority Affairs Committee
- 2010-present Member, American Auditory Society
- 2015-present Member, Alzheimer’s Association

Conference Organizer

JHMI/Regional

National

- 10/17 Co-Chair of planning committee and conference; Workshop on Sensory Impairment and Cognitive Decline, National Institute of Aging/American Geriatrics Soc U13-sponsored meeting; Bethesda, MD

International

- 7/2019 Director, 1st Annual Johns Hopkins East Asian Fellow Program in Aging, Hearing, and Public Health, Johns Hopkins Bloomberg School of Public Health
- 8/2022 Co-director, Chulalongkorn University-Johns Hopkins Cochlear Center Joint Asia Fellows Program in Aging, Hearing, and Public Health, Bangkok, Thailand

Session Chair
JHMI/Regional

National

- 8/11-5/12 Steering Committee Member and Session Moderator, 12th International Conference on Cochlear Implants, Baltimore, MD
- 11/11 Symposium Chair, Symposium on “Age-Related Hearing Loss: Epidemiology, Impact, and Treatment”- Gerontological Society of America Conference, Boston, MA
- 10/13 Session Co-Chair, American Cochlear Implant Alliance Annual Meeting CI 2013, Washington, D.
- 11/13 Symposium Co-Chair, Symposium on “Aging of the hearing and vestibular system – significance to older adults and what to do”- Gerontological Society of America Conference, New Orleans LA
- 11/13 Symposium Co-Chair, Symposium on “Functional consequences of age-related hearing loss for older adults” - Gerontological Society of America Conference, New Orleans, LA
- 1/14 Workshop Co-Chair, Workshop on Hearing Loss and Healthy Aging - Institute of Medicine/ National Academy of Sciences, Washington, DC - www.iom.edu/hearingloss-aging
- 11/14 Symposium Chair, Symposium on “Hearing impairment, cognition, and brain function – insights from epidemiologic and clinical studies” - Gerontological Society of America Conference, Washington, DC
- 11/14 Symposium Chair, Symposium on “Innovative and disruptive approaches toward hearing health care delivery in the community” - Gerontological Society of America Conf, Washington, DC
- 11/14 Symposium Chair, Symposium on “Implications of hearing impairment for physical and mental functioning in older adults” - Gerontological Society of America Conference, Washington, DC
- 3/15 Symposium Chair, Symposium on “Hearing Loss in Older Adults: Public Health Implications & Management” - American Academy of Audiology, San Antonio, TX
- 5/16 Symposium chair and moderator, Scientific symposium on “Novel Approaches toward Addressing Hearing Loss – Ideas on the Cutting Edge” - International Federation of the Hard of Hearing/Hearing Loss Association of America Annual Convention, Washington DC
- 11/16 Symposium Chair, Symposium on “Addressing hearing loss in older adults to improve cognitive, social, and physical functioning” - Gerontological Society of America, New Orleans, LA
- 7/17 Symposium Co-Chair, Symposium on “Hearing loss initiatives from the National Academies and the White House – recommendations and progress” - International Association for Geriatrics and Gerontology, San Francisco, CA
- 11/17 Chair, Clinical Roundtable on “Hearing loss, brain function, and healthy aging” - Society for Neuroscience, Washington, DC

International

- 6/14 Conference Chair, Hearing and Cognition Symposium; Amplifon Centre for Research & Studies, Krakow, Poland

Consultantships

- 4/11–12/11 Pfizer Inc. Role: Consultant for clinical trial planning and design
- 7/12–6/15 Cochlear Americas; Role: Consultant for clinical trial and research study planning for topics related to hearing loss in older adults
- 7/12–7/16 Autifony Inc, Role: Scientific Advisory Board member and consultant for clinical trial planning, DSMB since 2015
- 6/13–5/16 Pfizer Inc. Role: Scientific Advisory Board for Pfizer’s Neuroscience Research Unit portfolio programs and clinical studies in support of the hearing loss platform.
- 5/17-4/19 Boehringer-Ingelheim; Role: Consultant for epidemiology of hearing loss and pharmacologic approaches toward hearing loss
- 6/19-2/23 Frequency Therapeutics; Role: Consultant for epidemiology of hearing loss and pharmacologic approaches toward hearing loss treatment
- 10/22-present Apple Inc; Role: Consultant for topics related to hearing loss and hearing technologies

Board Membership

- 4/14-present Hearing Loss Association of America

- 4/14 – 3/15 Member, Board of Trustees
- 1/17 – 3/18 Member, Board of Trustees
- 3/18 – present Professional Advisory Board
- 1/16-present Co-founder and member of Board of Trustees, AccessHEARS
- 3/16-3/23 Member, Scientific Advisory Board, Fondation Pour L’Audition, Paris, France
- 4/23-present Member, Scientific Advisory Board, Sharper Sense

RECOGNITION

Honors/Awards

- 1997 Junior Prize in Biochemistry, Brown University
- 1998 Lealyn B. Clapp Prize for best senior thesis, Brown University
- 1998 William Gaston Premium Scholarship to the best biochemistry concentrator, Brown University
- 1998 *Magna Cum Laude* with Honors, Brown University
- 1999 - 2003 Maryland State Senatorial Scholarship
- 2003 Travel award, Association for Research in Otolaryngology
- 2005 Maryland State Senatorial Scholarship
- 2008 AAO-HNS Resident Leadership Grant
- 2009 AAO-HNS Resident Leadership Grant
- 2009 Trainee Scholarship, Symposium on Cochlear Implants in Children
- 2010 Awarded Tilghman Traveling Fellowship for support of surgical sabbatical and training with the Fisch International Microsurgery Foundation.
- 2011 First place, Johns Hopkins 4th Annual Research on Aging Showcase
- 2012 Eleanor Roosevelt Humanitarian Award for Pioneering Research in Hearing and Aging, Center for Hearing and Communication, New York
- 2013 Awarded honorary membership in the British Cochlear Implant Group (BCIG)
- 2013 Jack Abramson Memorial Lecturer; North Shore Long Island Jewish Medical Center
- 2014 Awarded the Dr. James B. Snow, Jr. Award for furthering scientific research in the field of hearing loss, Hearing Loss Association of America
- 2014 Herbert S. Birkett Memorial Lecturer, McGill University
- 2015, 2017 Recognition for Excellence in Teaching for Epidemiology of Sensory Loss in Aging, Johns Hopkins Bloomberg School of Public Health
- 2016 Matthew-Rubins Endowed Lectureship, University of Pittsburgh
- 2017 Guest of Honor, American Society for Geriatric Otolaryngology Annual Meeting

Invited Talks

JHMI/Regional

- 10/10 Invited Speaker, “Hearing Loss and Aging” - Hearing Loss Association of Baltimore Meeting; Hearing and Speech Agency, Baltimore, MD
- 4/11 Invited Speaker, “Hearing Loss and Aging” - Baltimore Longitudinal Study of Aging Conference; National Institute on Aging
- 12/11 Invited Speaker, “Hearing loss and dementia” - Baltimore Taiwanese Medical Association Annual Meeting
- 2/12 “Hearing loss and aging”- Johns Hopkins Bloomberg School of Public Health Epidemiology Seminar Series, Baltimore
- 10/12 Invited Speaker, “Hearing loss and healthy aging” - Hearing and Speech Agency, Baltimore
- 1/13 “Hearing loss and healthy aging”- Welch Center for Prevention, Epidemiology, and Clinical Research, Johns Hopkins, Baltimore
- 5/13 Invited Speaker, “Hearing loss and cognitive functioning in older adults” - Waxter Wisdom Workshop on Memory Loss, Baltimore
- 5/13 Invited Speaker, “Hearing loss and healthy aging” - Baltimore County Department of Aging Senior Solutions Conference, Baltimore
- 1/14 Grand Rounds Speaker, “Hearing loss in older adults – a public health perspective” - Division of Geriatrics and Gerontology, Johns Hopkins Department of Medicine, Baltimore, MD
- 2/14 Invited Seminar Speaker, “Hearing and dementia – insights from epidemiologic studies: Johns Hopkins Memory and Alzheimer’s Treatment Center, Baltimore, MD

- 2/16 Invited Speaker, “Hearing Loss in Older Adults- a public health perspective” - 5th Annual Towson University Medical Audiology Symposium, Towson, MD
- 3/17 Invited Speaker, “Hearing, cognition, and brain aging” - Alzheimer’s Disease Research Center; Johns Hopkins University, Baltimore, MD
- 3/17 Invited Speaker, “Hearing, cognition, and brain aging”- Alzheimer’s Association Regional Meeting, Hunt Valley, MD
- 5/17 Invited Speaker “Hearing loss in older adults: translating epidemiologic findings to national policy” Johns Hopkins Center on Aging and Health Scientific Seminar Series; Baltimore, MD
- 10/17 Seminar Speaker, “Hearing loss in older adults: from epidemiologic insights to clinical trials & public policy” - Johns Hopkins Wilmer Dana Center for Preventative Ophthalmology, Baltimore, MD
- 9/18 Seminar Speaker, “Hearing loss in the third era of public health” – Johns Hopkins Cochlear Center for Hearing and Public Health, Baltimore MD
- 11/18 Invited Speaker, “Hearing loss in the third era of public health – where we’re headed with the Cochlear Center” – Maryland Commission on Aging, Laurel, MD
- 3/21 Seminar Speaker, “Hearing, aging, and public health – from epidemiology to public policy in the U.S.” – University Maryland at Baltimore Gerontology Program (Virtual presentation)
- 5/21 Seminar Speaker, “Hearing loss in older adults”, Johns Hopkins Division of Geriatrics

National

- 8/10 Invited speaker and panel member, “Hearing loss and incident dementia,” Workshop on Sensory and Motor Dysfunction in Aging and Alzheimer’s Disease, Sponsor: National Institute on Aging
- 5/11 Invited Speaker, “Bilateral Cochlear Implantation” - Alexander Graham Bell Society Meeting, Washington, D.C.
- 9/11 Invited speaker and panel member, “Hearing loss and cognition” -Prevention of Blindness Society Convened Expert Panel on “How Aging Sight and Hearing Loss Impact Cognition,” Washington DC
- 3/12 Panel Seminar Speaker, “Issues in Cognition, Audition, and Amplification: A Panel Discussion” - American Academy of Audiology Annual Meeting, Boston, MA
- 5/12 Panel Seminar Speaker, “Hearing Impairment: Strategies to Promote Increased Safety and Quality of Care”- American Geriatrics Society Annual Meeting, Seattle, WA
- 6/12 Invited Speaker, “Hearing loss and healthy aging” - Hearing Loss Association of America Annual Convention, Providence, RI
- 6/12 Invited Speaker, “Hearing loss and healthy aging” - National Institute on Aging Summer Retreat, Bethesda, MD
- 8/12 Keynote Speaker, “Hearing loss and healthy aging”- International Hearing Aid Conference (IHCON), Tahoe, CA
- 9/12 Panel Seminar Speaker, “Comprehensive Management of Presbycusis: Central and Peripheral”- American Academy of Otolaryngology-HNS Annual Meeting, Washington, D.C.
- 6/13 Invited Speaker, Cochlear Limited Annual Board of Directors Meeting, “Hearing loss and healthy aging” – Denver CO
- 9/13 Invited Speaker, “Hearing loss and cognitive decline” - New York University Brain Plasticity and Cochlear Implant Workshop, New York, NY
- 10/13 Invited Speaker, “Hearing loss, cognitive decline, and brain aging: a public health perspective” - Indiana University Aging and Speech Communication Conference, Bloomington, IN
- 12/13 Invited seminar speaker, “Hearing loss in older adults – a public health perspective” - Administration on Community Living, U.S. Department of Health and Human Services; Washington, D.C.
- 1/14 Invited Speaker, “Hearing loss, dementia, and public health”- Med El Meeting on Hearing Implants for Older Adults, New York City, NY
- 3/14 Invited keynote speaker, “Hearing loss in older adults - a public health perspective”- Joint Defense Veteran Audiology Conference; Las Vegas, NV
- 5/14 Invited keynote speaker, “Hearing loss in older adults - a public health perspective”- Friends of the Congressional Hearing Health Caucus Luncheon, United States House of Representatives; Washington, D.C.
- 7/14 Invited seminar speaker, “Hearing loss in older adults – a public health perspective”- National Center for Rehabilitative Auditory Research, Veterans Administration, Portland, Oregon

- 11/14 Keynote speaker, “Hearing Loss and Aging: Consequences, Implications, and Creating Better Outcomes through Alternative Models of Care” - Academy of Doctors of Audiology Annual Convention, Las Vegas, NV
- 9/15 Invited Speaker, “Hearing Loss in Older Adults- a public health perspective”- California Academy of Audiology, San Jose, CA
- 9/15 Invited Speaker, “Hearing Loss in Older Adults- a public health perspective” - National Center for Rehabilitative Auditory Research, Veterans Administration, Portland, Oregon
- 9/15 Invited Speaker, “Hearing Loss in Older Adults- a public health perspective”- North Carolina Speech, Hearing and Language Association, Inc, Wilmington, NC
- 10/15 Invited Speaker, “Hearing Loss in Older Adults- a public health perspective”- Massachusetts Academy of Audiology, Natick, MA
- 10/15 Invited Speaker, “Hearing and Dementia—a public health perspective” - Hearing and Communication Neuroscience Symposium, University of Southern California, Los Angeles, CA
- 11/15 Invited Speaker, “Hearing Loss and Healthy Aging –a public health perspective”- American Speech-Language Hearing Association Research Symposium - Denver, CO
- 1/16 Invited Symposium Speaker for AAAS Symposium on “At a Loss for Words, or Losing My Mind? New Views on Language Problems in Aging” - “Hearing Loss and Dementia – Who’s Listening” - American Association for the Advancement of Science, Washington, D.C.
- 5/16 Invited Special Speaker, “Hearing Loss in Older Adults- a public health perspective”- American Otological Society, Chicago, IL
- 5/16 Invited Symposium Speaker, “Hearing & Vision Services for Older Adults – Barriers and Potential Solutions” - American Geriatrics Society, Long Beach, CA
- 2/17 Invited Speaker for John K. Niparko Tribute Session - “Hearing loss in older adults – a public health perspective” - Association for Research in Otolaryngology Annual Meeting, Baltimore, MD
- 3/17 Invited Speaker, “Overview of hearing loss in adults – what we know and what needs to be done”- Stanford Center on Longevity, Stanford, CA
- 3/17 Invited speaker/panelist, Panel on “The Costs and Benefits of Hearing Health Care Regulations” - Federal Trade Commission Workshop on Now Hear This: Competition, Innovation, and Consumer Protection Issues in Hearing Health Care, Washington, D.C.
- 5/17 Invited Oral Congressional Testimony before the Health Subcommittee of the Energy and Commerce Committee of the House of Representatives, “Examining Improvements to the Regulation of Medical Technologies” - Washington, D.C.
- 7/17 Invited Speaker/Panelist, “Hearing Loss and Cognitive Decline – Observational Results and Embedding of a Randomized Trial in ARIC” - International Association for Geriatrics and Gerontology, San Francisco, CA
- 9/17 Miniseminar Speaker, “Hearing Loss & Cognition in Older Adults – From Epidemiology to the ACHIEVE Randomized Trial” - American Academy of Otolaryngology-Head & Neck Surgery, Chicago, IL
- 11/17 Invited Speaker and Clinical Roundtable Chair, “Hearing Loss, Cognition, and Dementia”- Society for Neuroscience, Washington, DC
- 12/17 Invited Speaker, “Hearing Loss & Cognition in Older Adults – From Epidemiologic Insights to Public Health Action” – Aging and Speech Communication Conference, Tampa FL
- 9/18 Miniseminar speaker, “Hearing Loss in Older Adults – From Epidemiology to Clinical Trials & Public Policy in the U.S.”, - American Academy of Otolaryngology-Head & Neck Surgery, Atlanta, GA
- 2/19 Seminar Speaker, “Hearing Loss, Cognition, & Dementia - From Epidemiologic Insights to Clinical Trials” – Association for Research in Otolaryngology, Baltimore, MD
- 3/19 Seminar discussant, “Age-Related Hearing Loss as a Risk Factor for Late Life Depression & Cognitive Decline” – American Association of Geriatric Psychiatry, Atlanta, GA
- 3/19 Seminar Speaker, “Hearing Loss in the Third Era of Public Health: From Epidemiology to Public Policy” – American Academy of Audiology, Columbus, OH
- 6/19 Invited Speaker, “Hearing, Aging & Public Health: From Epidemiology to Public Policy” – NIDCD/NIH, Bethesda, MD
- 10/19 Invited Speaker, “Hearing, Aging, & Public Health: From Epidemiology to Public Policy” – Knowles Hearing Center Symposium on Hearing and Cognition, Northwestern University, Evanston, IL

- 11/19 Invited Speaker, “Over-the-Counter Hearing Aid Act – From Research to Public Policy in the U.S.” – American Speech, Language, and Hearing Association Annual Meeting, Orlando, FL
- 6/20 Invited Grand Rounds Speaker, “Hearing, Aging, & Public Health: From Epidemiology to Public Policy” - House Ear Clinic, Los Angeles, CA (Grand Rounds held virtually because of the COVID-19 pandemic)
- 9/20 Invited Speaker, “Hearing Loss and Dementia” – NIDCD Advisory Council, Bethesda, MD (meeting held virtually because of the COVID-19 pandemic)
- 11/20 Seminar Speaker, “Hearing Loss in Older Adults: Implications for Cognitive Load and Brain Structure/Function” - Gerontological Society of America Annual Conference (conference held virtually because of the COVID-19 pandemic)
- 4/21 Invited Speaker, “Sensorineural hearing loss” – Externally-Led Patient-Focused Drug Development Meeting hosted by the Hearing Loss Association of America in collaboration with the Food and Drug Administration (Virtual)
- 9/21 Invited Franklin M. Rizer Memorial Lecturer, “Hearing loss and dementia – from epidemiological insights to the ACHIEVE trial” – American Neurotology Society (Virtual)
- 11/21 Invited Speaker, “Hearing Loss, Cognition, & Dementia From Epidemiologic Insights to the ACHIEVE Trial” – Florida Combined Otolaryngology Meeting, Naples, Florida
- 1/22 Invited Speaker, “Medicare Hearing Care Policy” – Center for Medicare Advocacy National Webinar
- 5/22 Invited Speaker, “Hearing Loss and Medicare” – 2022 National Voice of Medicare Summit (Virtual Conference)
- 9/22 Invited Speaker, “Converting Need into Demand – the Hearing Number Initiative” – Consumer Technology Association Health Standards Meeting, San Diego
- 11/22 Invited Speaker, “Update on Over-the-Counter Hearing Aids in the U.S.” – Gerontological Society of America Corporate Leaders Meeting, Indianapolis
- 1/23 Invited Panelist, Panel on “The New World of Over-the-Counter Hearing Aids” – Consumer Electronics Show, Las Vegas
- 3/23 Invited Speaker, “Hearing, Aging & Public Health” – Joint Defense Veterans Audiology Conference, Las Vegas
- 4/23 Invited Speaker, “Hearing Loss & Dementia” – Association for Chemoreception Sciences Annual Conference, Bonita Springs (Virtual presentation)
- 4/23 Invited Speaker, “Hearing Loss & Dementia” – Indiana University Clinical and Translational Sciences Institute Annual Meeting

International

- 6/10 Invited Speaker, “Classification of inner ear malformations”- Cochlear Implantation Forum on Inner Ear Malformations, Lucerne, Switzerland
- 10/11 Keynote speaker, “Hearing loss and dementia” - Cochlear symposium at Politizer Society Meeting, Athens, Greece
- 3/12 Invited International Speaker and Moderator, “Implications of hearing loss for older adults” - Ge Cochlear Science and Research Seminar: Symposium on aging and implantable hearing devices, Paris, France
- 8/12 Keynote speaker, “Hearing loss and healthy aging”- Oticon Outlook International Conference, Copenhagen, Denmark
- 2/13 Invited International Speaker, “Hearing loss and healthy aging” - Elite Hearing Network Annual Meeting, Punta Cana, DR
- 3/13 Invited International Speaker and Panelist, “Hearing loss and healthy aging” - Israeli Academy of Otolaryngology-Head & Neck Surgery, Eilat Israel
- 3/13 Invited International Speaker, “Hearing loss and dementia”- British Cochlear Implant Group Annual Meetings, Ayrshire, Scotland
- 5/13 Invited International Speaker, “Hearing loss and healthy aging” - Swedish Association of Otorhinolaryngology-Head and Neck Surgery, Lund, Sweden

- 8/13 Invited International Speaker, “Hearing loss in older adults: a public health perspective”- Amplifon Hearing Seminar, Auckland, New Zealand
- 10/13 Opening Keynote Speaker, “Hearing loss and healthy aging: a public health perspective”- Canadian Academy of Audiology, St. Johns, Newfoundland, Canada
- 11/13 Invited International Keynote Speaker - “Hearing loss and cognition: insights from epidemiologic studies”- Société Française de Réflexion Sensori-Cognitive, Paris, France
- 2/14 Invited International Speaker, “Hearing loss in older adults – a public health perspective”- Ida Institute, Copenhagen, Denmark
- 4/14 Invited keynote speaker, “Hearing loss in older adults - a public health perspective” - Giovanni Lorenzini Foundation International Workshop on “Hearing Loss and Cognitive Decline – Is there a Link?”- Bologna, Italy
- 4/14 Invited speaker, “Hearing loss in older adults - a public health perspective” - Cochlear Science and Research Seminar: Cochlear Implantation in the Elderly – Overview, Practice, and Discussion, Paris, France
- 5/14 Invited international speaker, “Hearing loss, cognitive decline, and brain aging” - Symposium on “Hearing and the Brain: Translating research into practice” - Macquarie University, Sydney, Australia
- 6/14 Conference chair and keynote speaker, “Hearing loss and dementia – insight from epidemiologic studies”- Amplifon Centre for Research and Studies Hearing and Cognition Symposium, Krakow, Poland
- 9/14 Invited Panel Moderator, Special Panel on Implantation in the Elderly, 8th International Symposium on Objective Measures in Auditory Implants - Toronto, Canada
- 9/14 Invited speaker, “Hearing loss in older adults – a public health perspective”- World Health Summit, Berlin, Germany
- 6/15 Invited Speaker, “Hearing loss in older adults – a public health perspective”- Johns Hopkins Saudi Aramco Community Outreach Lecture, Dammam, Saudi Arabia
- 6/15 Invited Presidential Lecture Keynote Speaker, “Hearing loss, cognition, and dementia – a public health perspective”- Swiss Society of Oto-Rhino-Laryngology-Head and Neck Surgery Annual Meeting, Lugano, Switzerland
- 1/16 Invited Speaker, “Hearing Loss in Older Adults- a public health perspective”- Elite Hearing Network Annual Conference, Cancun, Mexico
- 4/16 Invited International Speaker, “The ACHIEVE (Aging, Cognition, and Hearing Evaluation in Elders”) Trial; Cochlear Symposium on Aging and Implantable Hearing Solutions, Madrid, Spain
- 5/16 Invited Keynote Plenary Speaker, “Understanding the Association of Hearing Loss & Dementia” - Audiology Australia, Sydney, Australia. *Note: Prior to my scheduled talk, I had to cancel this trip for family reasons that prevented me from making an extended overseas trip in 5/16. As a result, I delivered my address via a prerecorded presentation that was shown at the conference.*
- 9/16 Invited International Keynote Speaker, “Hearing loss and healthy aging – a public health perspective” “Public Health Approaches to Addressing Hearing Loss in Older Adults – Early Results & Future Directions, Tel Aviv University, Tel Aviv, Israel
- 10/16 Invited International Speaker, “Hearing, Cognition, & Brain Aging” - Cochlear Global Research Symposium, Sydney, Australia
- 1/17 Invited International Keynote Speaker, “Hearing loss, cognition, and brain aging”- International Symposium on Dementia/Depression, Convened by Diet Member Keizo Takemi; Tokyo, Japan
- 6/17 Invited International Keynote Speaker, “Hearing loss, cognition, and dementia – insights from epidemiologic studies”- International Federation of Otolaryngology Societies Congress, Paris, France
- 9/17 Invited Seminar Speaker, “Hearing loss in older adults – from epidemiologic insights to clinical trials & public policy” - Macquarie University Hearing Hub, Sydney, Australia
- 9/17 Invited International Keynote Speaker, “Age-Related Hearing Loss, Cognition, Dementia, & Brain Aging: Insights from Epidemiologic Studies” - University of Chile International Workshop on “From Presbycusis to Dementia: A Basic and Clinical Approach” -Valparaiso, Chile
- 12/17 Invited International Speaker, “Hearing loss, aging, and public health” - Cochlear Think Tank, London, UK
- 3/18 Invited Keynote Speaker, “Hearing loss, aging, and public health” – Amplifon Ageing and Hearing Loss: State of the Art and New Steps, Milan, Italy

- 5/18 Invited Keynote Speaker, “Hearing loss in older adults – a public health perspective” – East Asian Society of Otolaryngology, Seoul, Korea
- 7/18 Invited Keynote Speaker “Aging, Hearing, and Public Health – From Epidemiology to Clinical Trials and Public Policy in the U.S.”, British Society of Otolaryngology, Manchester, UK
- 10/18 Invited Speaker, “Hearing loss, Aging and Public Health”, “Hearing loss in Older Adults in the United States – Role of Over-the-Counter Hearing Aids”, “Addressing Hearing loss in Older Adults – Innovative Approaches” - Brazilian Academy of Otolaryngology Meeting, Joao Pessoa, Brazil
- 1/19 Invited Keynote Speaker, “Aging, Hearing loss and Public Health” - Cochlear Nordic Symposium, Malmo, Sweden
- 2/19 Invited Keynote Speaker, “Hearing loss, Cognition and Dementia – From Epidemiologic Insights to Clinical Trials and Public Policy” - KIND Foundation Symposium on Hearing and Cognition, Berlin, Germany
- 5/19 Invited Keynote Speaker, “Hearing, Aging & Public Health: From Epidemiology to Public Policy”- Macquarie University, Sydney, Australia
- 6/19 Invited Keynote Speaker, “Hearing Loss, Aging & Dementia: From Epidemiology to the ACHIEVE Trial” – Cognitive Hearing Science for Communication Conference, Linkoping University, Linkoping, Sweden
- 7/19 Invited Keynote Speaker, “Hearing Loss, Aging, & Public Health”; “Addressing Hearing Loss from the Public Health Perspective” – New Zealand Audiological Society Annual Conference, Queenstown, New Zealand
- 7/19 Invited Keynote Speaker, “Hearing, Aging & Public Health: From Epidemiology to Public Policy” - Triton Hearing Annual Conference, Queenstown, New Zealand
- 9/19 Invited Keynote Speaker, “Hearing, Aging, & Public Health” - Hearing Forum Andermatt, Andermatt, Switzerland
- 11/19 Invited Keynote Speaker, “Hearing, Aging, & Public Health – From Epidemiology to Public Policy in the U.S.”- Pindrop Foundation Adult Cochlear Implant Forum, Auckland, New Zealand
- 2/20 Invited Keynote Speaker, “Hearing Loss in Older Adults – A Public Health Perspective”- Hearing and Balance 2020, Sao Paulo, Brazil
- 3/20 Invited Speaker, “Hearing Loss, Cognition, and Brain Aging”- University College London Auditory Processing Disorder Master Class, London (Virtual lecture given COVID-19 pandemic)
- 6/21 Invited Grand Rounds Speaker, “Hearing Loss and Dementia” - Chinese University Hong Kong Department of Otolaryngology, Hong Kong (Virtual lecture)
- 6/21 Invited Speaker, “Hearing Loss and Dementia” - Scientific Meeting of the Otorhinolaryngology Department of Hospital de Clinicas de Porto Alegre (hospital of the Federal University, Porto Alegre, Rio Grande do Sul, Brazil) (Virtual lecture)
- 8/21 Invited Speaker, “Hearing Loss and Dementia” - International Symposium on Auditory and Audiological Research, Denmark (Virtual lecture)
- 10/21 Invited Speaker, “Hearing Loss in Older Adults - A Public Health & Policy Perspective from the United States”- Chilean ENT National Meeting (Virtual lecture)
- 12/21 Invited Speaker, “Hearing Loss, Cognition, & Dementia - From Epidemiologic Insights to the ACHIEVE Trial” – Asia Pacific Symposium on Cochlear Implants and Related Sciences, Australia (Virtual lecture)
- 3/22 Invited Speaker, “Hearing Loss & Dementia - From Epidemiologic Insights to the ACHIEVE Trial” – 2022 Rotman Research Institute Annual Conference on Aging & Brain Health (Virtual Conference)
- 4/22 Invited Speaker, “Hearing Loss & Dementia” and “Hearing Loss in Older Adults – A Public Health and Policy Perspective from the United States” – Brazil Academy of Audiology Annual Conference (Virtual lecture)
- 4/22 Invited Speaker, “Hearing Loss & Dementia - From Epidemiologic Insights to the ACHIEVE Trial” – GICCA 2022 (Congress of the Iberoamerican Group of Cochlear Implants and Related Sciences), Punta del Este, Uruguay
- 5/22 Invited Seminar Speaker, “Hearing Loss & Dementia - From Epidemiologic Insights to the ACHIEVE Trial” - Department of Logopedics, Phoniatrics and Audiology, Lund University, Sweden (Virtual lecture)

- 6/22 Invited Speaker, “Hearing Loss & Dementia” – Symposium on ‘What do we mean by population-based approaches to dementia risk reduction?’; Alzheimer’s Disease International Conference 2022 (Virtual lecture)
- 8/22 Invited Speaker, “Public Health Approaches to Address Hearing Loss in Older Adults” – Macquarie University/Australian Hearing Hub, Sydney, Australia
- 8/22 Invited Speaker, “Success Through Collaboration – The Story of Hearing Loss, Aging, & Public Health” – Chulalongkorn University MDCU 75th Anniversary Congress, Bangkok, Thailand
- 12/22 Invited Speaker, “Addressing Hearing Loss in Adults Through a Public Health and Market Perspective” - International Centre for Evidence in Disability (ICED) at the London School of Hygiene & Tropical Medicine (Virtual lecture)
- 3/23 Invited Speaker, “Hearing Loss, Aging & Public Health” – Tel Aviv University Healthy Longevity Research Center Symposium (Virtual lecture)

Visiting Professorships

Regional

- 7/12 “Hearing loss and healthy aging”- University of Maryland Pepper Older Americans Independence Center, Baltimore, MD

National

- 9/12 “Hearing loss and public health”- CUNY Department of Audiology, New York City
- 11/12 “Hearing loss and healthy aging—Parts 1 and 2”- University of North Carolina Department of Otolaryngology-HNS
- 12/12 “Hearing loss and healthy aging”- Grand Rounds speaker, Department of Epidemiology; University of Miami
- 12/12 “Hearing loss and dementia”- Grand Rounds speaker, Departments of Otolaryngology-HNS and Neurosurgery, University of Miami
- 1/13 “Hearing loss and healthy aging”- University of South Florida, Tampa
- 9/13 “Hearing loss in older adults: a public health perspective”- University of Pennsylvania Department of Otolaryngology-HNS
- 10/13 “Hearing loss in older adults – a public health perspective”- Visiting Professor and Grand Rounds Speaker, University of Florida Department of Otolaryngology-HNS; Gainesville, Florida
- 10/13 “Hearing loss in older adults – implications for healthy aging”- Visiting Professor and Seminar Speaker, University of Florida Institute of Aging, Gainesville, FL
- 12/13 “Hearing loss and healthy aging – a public health perspective”- Visiting Professor and Invited Dean’s Seminar Speaker, Bouvé College of Health Sciences, Northeastern University, Boston, MA
- 12/13 “Hearing loss in older adults – a public health perspective”- Visiting Professor for Jack Abramson Memorial Lecture, Department of Otolaryngology-Head & Neck Surgery, North Shore Long Island Jewish Medical Center, New Hyde Park, NY
- 3/15 “Hearing loss in older adults—a public health perspective”- Visiting Professor and Grand Rounds Speaker -Duke University Department of Otolaryngology-Head & Neck Surgery, Durham, NC
- 12/15 “Hearing Loss in Older Adults- a public health perspective”- Visiting Professor and Grand Rounds Speaker, Department of Otolaryngology-HNS- University of Iowa, Iowa City, IA
- 9/16 “Hearing loss and healthy aging – a public health perspective”- Visiting Professor for Matthew-Rubins Endowed Lectureship and Department of Communication Science and Disorders, University of Pittsburgh- Pittsburgh, PA
- 1/17 “Hearing loss and healthy aging – a public health perspective”- Department of Otolaryngology-Head & Neck Surgery, University of Colorado; Denver, CO

International

- 3/12 “Hearing loss in older adults – who’s listening?”- UCL Ear Institute, London, UK
- 3/12 “Hearing loss in older adults – who’s listening?”- MRC Institute of Hearing Research, Nottingham, UK
- 8/12 “Hearing loss and healthy aging”- Eriksholm Research Center, Copenhagen, Denmark

- 5/14 “Hearing loss in older adults - a public health perspective”- Centre for Research on Aging, Health & Well-Being, Australian National University, Canberra, Australia
- 11/14 “Hearing loss in older adults – a public health perspective”-Visiting Professor and Invited Speaker for Annual Birkett Lectureship; McGill University, Montreal, Canada
- 3/17 “Hearing loss and healthy aging – a public health perspective”- University of Otago, Wellington, New Zealand
- 3/17 “Hearing loss and healthy aging – a public health perspective”- University of Auckland, New Zealand
- 5/18 “Aging, Hearing & Public Health – From Epidemiologic Insights to Clinical Trials & Public Policy in the United States” – National Yang Ming University, Taipei, Taiwan
- 9/18 “Aging, Hearing, and Public Health – From Epidemiology to Clinical Trials and Public Policy in the U.S.”, Peking University School of Public Health, Beijing, China
- 9/18 “Aging, Hearing, and Public Health – From Epidemiology to Clinical Trials and Public Policy in the U.S.”, Tongren Hospital, Beijing, China
- 2/19 “Hearing Loss, Aging, and Public Health”, Hannover Medical School, Hannover, Germany
- 10/19 Multiple lectures on “Hearing, Aging, and Public Health” and “Hearing Loss, Cognition, and Brain Aging”. Eisdell Moore Center Invited Visiting Professor at the University of Auckland, University of Canterbury, and University of Otago, New Zealand

Exhibit B

EXHIBIT B

***Schmitt v. Kaiser Foundation Health Plan of Washington, et al.*
USDC (W.D. Wash.), No. 2:17-cv-01611-RSL**

Documents Reviewed for Expert Report by Frank R. Lin, MD, PhD

Source Documents

- ATScale Global Partnership for Assistive Technology, *Product Narrative: Hearing Aids, A Market Landscape and Strategic Approach to Increasing Access to Hearing Aids and Related Services in Low and Middle Income Countries*, December 2019
- Frank R. Lin & Marilyn Albert (2014), *Hearing loss and dementia – who is listening?*, *Aging & Mental Health*, 18:6, 671-673, DOI: 10.1080/13607863.2014.915924
- Gill Livingston, et al., *Dementia prevention, intervention, and care*, *The Lancet Commissions*, www.thelancet.com, published online July 20, 2017
[http://dx.doi.org/10.1016/S0140-6736\(17\)31363-6](http://dx.doi.org/10.1016/S0140-6736(17)31363-6)
- National Academies of Sciences, Engineering, and Medicine (2016), *Hearing health care for adults: Priorities for improving access and affordability*, Washington, DC: The National Academies Press. doi: 10.17226/23446
- Bolajoko O. Olusanya, et al., *Hearing loss grades and the International classification of functioning, disability and health*, *Bull World Health Organ.* 2019; 97:725–728 | doi: <http://dx.doi.org/10.2471/BLT.19.230367>
- *World report on hearing*, Geneva: World Health Organization; 2021. Licence: CC BY-NC-SA 3.0 IGO.

Case Documents

- KAISER_001860-1862
- KAISER_002056-2061
- KAISER_002073-2076
- KAISER_003796-3815
- KAISER_003816-3875
- KAISER_003876-3916
- KAISER_003917-3922
- KAISER_003923-3937
- KAISER_003938-3941
- KAISER_003970
- KAISER_003973-4009
- KAISER_004010-4019
- MUNSON_0001-0004
- SCH_0001-0665
- SCHMITT 000200-0201 CONFIDENTIAL
- SCHMITT 000203-0204 CONFIDENTIAL
- SCHMITT 000211-0212 CONFIDENTIAL

EXHIBIT B (continued)

***Schmitt v. Kaiser Foundation Health Plan of Washington, et al.*
USDC (W.D. Wash.), No. 2:17-cv-01611-RSL**

Documents Reviewed for Expert Report by Frank R. Lin, MD, PhD

Additional Source Documents:

- *Aging America & Hearing Loss: Imperative of Improved Hearing Technologies*, (October 2015) (White House President's Council of Advisors on Science and Technology (PCAST)).
https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_hearing_tech_letterreport_final.pdf
- CDC, *Disability and Health Overview: Impairments, Activity Limitations, and Participation Restrictions*,
[https://www.cdc.gov/ncbddd/disabilityandhealth/disability.html#:~:text=A%20disability%20is%20any%20condition,around%20them%20\(participation%20restrictions\)](https://www.cdc.gov/ncbddd/disabilityandhealth/disability.html#:~:text=A%20disability%20is%20any%20condition,around%20them%20(participation%20restrictions)) (last visited May 9, 2023).
- Chien W, Lin FR. Prevalence of hearing aid use among older adults in the United States. *Arch Intern Med.* Feb 13 2012;172(3):292-3. doi:172/3/292 [pii] 10.1001/archinternmed.2011.1408
- Cruickshanks KJ, Wiley TL, Tweed TS, et al. Prevalence of hearing loss in older adults in Beaver Dam, Wisconsin. The Epidemiology of Hearing Loss Study. *AmJEpidemiol.* 1998;148(9):879-886.
- Cunningham LL, Tucci DL. *Anatomy of the ear*. Hearing loss in adults. *N Engl J Med.* 2017; 377:2465-2473. doi:10.1056/NEJMr1616601
- De Lew N. Medicare: 35 Years of Service. *Health Care Financ Rev.* 2000;22(1):75-103.
- Deal JA, Goman AM, Albert MS, et al. Hearing treatment for reducing cognitive decline: Design and methods of the Aging and Cognitive Health Evaluation in Elders randomized controlled trial. *Alzheimers Dement (N Y).* 2018;4:499-507. doi:10.1016/j.trci.2018.08.007
- Goman & Lin, *Prevalence of and Numbers of Individuals With Hearing Loss, by Age and Severity in the United States*. *American Journal of Public Health*, Oct 2016 Vol 106, No 10.
- Jiang F, Mishra SR, Shrestha N, et al. Association between hearing aid use and all-cause and cause-specific dementia: an analysis of the UK Biobank cohort. *Lancet Public Health.* May 2023;8(5):e329-e338. doi:10.1016/S2468-2667(23)00048-8
- Livingston G, Huntley J, Sommerlad A, et al. Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. *Lancet.* 08 2020;396(10248):413-446. doi:10.1016/S0140-6736(20)30367-6
- Simpson AN, Matthews LJ, Cassarly C, Dubno JR. Time From Hearing Aid Candidacy to Hearing Aid Adoption: A Longitudinal Cohort Study. *Ear Hear.* 2019;40(3):468-476. doi:10.1097/AUD.0000000000000641