Article published online: 2022-12-01

Hearing Health Outcomes as a Function of Age, Gender, and Diversity

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ABSTRACT

The United States does not ensure equitable access to hearing health care for all age groups, largely because these services are costly and even unobtainable in some places. Barriers to care are discussed within a context of the social determinants of health, under-representativeness of hearing-care professionals from historically marginalized communities, older adults and age-related hearing loss, and associated health conditions. The MarkeTrak 2022 study generated a sample of 15,138 respondents with information on 43,597 individuals. Data analysis revealed that self-reported hearing difficulty appears to increase with age with a rate of 12.4% for adults 18 years of age and older. A substantial proportion of individuals with hearing difficulty assumed that their problem was age-related, followed by exposure to loud sound and noise. Individuals with hearing difficulty were nearly three to four times more likely to have tinnitus, cognitive problems, and issues with balance and falling than those with no hearing problems. Self-reported hearing difficulty was lower for historically marginalized groups (7%) than for the White population (12%). Recommendations are presented to reduce the burden of hearing difficulty and hearing aid deserts for rural and urban populations.

KEYWORDS: social determinants of health, barriers to care, marginalized communities, comorbidities, age-related hearing loss, hearing aid desert

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MarkeTrak 2022: Insights into the Evolving Hearing Market; Guest Editors, Thomas A. Powers, Ph.D. and Jan Kihm, M.S.

Semin Hear 2022;43:324–338.

Thieme Medical Publishers, Inc., 333 Seventh Avenue, 18th Floor, New York, NY 10001, USA
DOI: https://doi.org/10.1055/s-0042-1758377.
ISSN 0734-0451.

Health surveys, such as the MarkeTrak 2022 study, can present hearing-care professionals (HCPs) with vital operational information that can be used for delivery of products and services. Because the U.S. population is continuously growing, it may be helpful to understand how characteristics of age, gender, various medical conditions, and cultural diversity influence public perception of hearing health care. Sindhusake et al[1] compared audiometric responses with self-assessment questions and determined that self-reported hearing loss provides valid estimation of prevalence that is comparable to threshold testing. Studies with smaller samples have reported that self-report data should be coupled with audiometric screening.[2] Large-sample studies of self-reported data can provide representative information about the population and subgroups of the population. This type of research method has been administered by MarkeTrak for several years. For greater detail about the history of these studies, refer to the article titled *MarkeTrak—Tracking the Pulse of the Hearing Aid Market* by Carr and Kihm.

Various terms have been used to describe culturally diverse populations, such as underrepresented racial minorities; black, indigenous people of color (BIPOC); racially and ethnically minoritized groups; historically marginalized communities; and non-White, among others. Because negative connotations may be brought by the term *minority*, the use of this term will be avoided. For this report, the term historically marginalized appears most suitable.

Barriers to Hearing Health Care

A business practice can be elevated when its products and services are accessible to a wide catchment area, and barriers to care have been, first, realized, and then mitigated. A concept referred to as the social determinants of health (SDH) has been acknowledged by the World Health Organization (WHO) and U.S. government programs and policies as a central barrier to health and health care. SDH accounts for health disparities and inequities experienced by people around the world, including the United States. The WHO[3] defines the SDH as nonmedical factors that are capable of influencing health outcomes. Social determinants may be further described rising from the circumstances into which we are born, live, work, and grow old, including our health system. The SDH has a significant influence on health inequities. For example, segments of the population who have experienced increased rates of COVID-19 infection and death include poor communities, historically marginalized and indigenous people, low-paid essential workers, and homeless people. This is, in large part, due to inadequate access to health information, poor occupational health standards, crowded housing, poverty, and limited access to affordable wellness and preventive medical care, including vaccinations.[4]

A health disparity was defined by Healthy People 2020 (July 26, 2010) as *a particular type of health difference that is closely linked with social, economic, or environmental disadvantage*. Populations who experience discrimination or less acceptance due to race, ethnicity, gender, age, gender identity, mental health, cognitive or physical disability, socioeconomic status, or religion bear health disparities and obstacles to health care as a result of SDH. A national goal of Healthy People 2020 was, by way of policy and programs, to improve access to adequate health because *every person should be able to achieve the highest level of health possible, regardless of characteristics linked to discrimination*. An individual's ability to obtain good education, savings, nutritious food, health, employment, and safe housing can be linked to access to good health care. When these factors are poor, individuals and families are forced to make poor choices about their health. For example, some communities in the United States are classified as *food deserts*, because residents have no reasonable access to grocery stores with fresh fruits, vegetables, and other good nutritional choices. In food deserts, at least one-third of an urban population resides more than 1 mile from a grocery store or supermarket. In a rural community, a food desert exists when people reside more than 10 miles from a grocery store or supermarket. These conditions are typically associated with low-income residents. Reports indicate that these environmental factors influence the physical and mental health of populations in the United States and around the globe, and the

impact of these determinants follow affected individuals through their lifespan, even after they become highly educated, gainfully employed, and financially independent.

Healthy People 2020[5] aimed to create environments that promote good health, including screening tests and appointments with a qualified provider. Some Americans are less healthy due to the burden of SDH factors: poor education, unsafe neighborhoods, unclean water, food deserts, unavailable social activities, and a lack of good employment. These conditions are normally associated with high crime, a lack of public transportation and access to media and technologies, and poor access to adequate health care, which are adverse health determinations when aggregated. The effects of SDH are compounded as we age, acquire chronic diseases, and need more definitive health services.

Age-Related Hearing Loss

Hearing health and medical professionals aim to deliver early identification of hearing loss for newborns, children, adults, and older adults. Unfittingly, the availability of screening programs for each of these age groups is incongruent. In 2017, Early Hearing Detection and Intervention (EHDI) was enacted to facilitate coordination and advancement of a national program for early identification and diagnosis of hearing loss in newborns and infants. This program includes young children who are at risk for infection-based hearing loss, craniofacial abnormalities, and genetic factors.[6] According to the Centers for Disease Control and Prevention (CDC), the role of the CDC and federal government is to aid states and territories with support for enhancement and implementation of EHDI programs.[7]

For school-aged children, a review of state-level recommendations for school hearing screenings revealed that 34 states have hearing screening mandates, seven states "recommend" hearing screenings only for school children, and the remaining employ no screening requirement. States that require or recommend hearing screenings for school children vary slightly regarding the ages of children screened, test frequencies of the administered screening, and criteria for *fail* or referral for further audiological examination. For adults and older adults, no universal hearing screening mandates exist in the United States, although a specific federal policy for occupational noise-exposed personnel has existed since 1981. It provides American workers with audiometric surveillance under the Occupational Safety and Health Administration Federal Rule,[8] while military personnel are surveilled by the Department of Defense hearing conservation program. Otherwise, adults and older adults are not covered by any hearing health regulation.

It is unclear whether adult hearing screening is beneficial. The U.S. Preventive Services Task Force[9] provided no hearing screening recommendation for adults, citing that evidence about the benefit and harm of screening the hearing of older persons was lacking. It has been recommended that adults be screened by an audiologist at least once every 10 years and then every 3 years after reaching 50 years of age.[10] Additionally, more frequent screenings are suggested for individuals with known exposures to hazardous sound or ototoxic chemicals and medications, or other risk factors associated with hearing loss and tinnitus. Rigters et al[11] conducted pure-tone audiometric tests on adults, reporting prevalence rates of 39% for those 66 to 69 years of age, 53% for those 70 to 79 years of age, and 82% for those 80 to 87 years of age. The National Institute of Deafness and Other Communicative Disorders (NIDCD) Epidemiology and Statistics Program analyzed National Health and Nutrition Examination Survey (NHANES) data and reported that adults 65 to 74 years of age and 75 years of age and older had a disabling hearing loss of 25 and 50%, respectively.[12] At a minimum, it seems prudent for medical providers to order a periodic hearing screening or evaluation for adults who are 65 years of age and older, given the increased rate of hearing loss and insufficient use of hearing aids that has been observed in this population.[13,14]

Using 2001–2010 data from NHANES, Goman and Liao[15] estimated that less than 1% of infants and children (0–19 years of age) in the United States had mild to moderate hearing loss, but over 80% of people $\geq$80 years of age exhibit mild to moderate hearing loss. Although examination and treatment of pediatric patients require advanced Doctor of Audiology (AuD) clinical skills, AuD programs should ensure adequate emphasis of adult-case coursework, given that there are far more people with

hearing loss in adult and older adult populations. Most AuD programs offer very little didactic course work on adult and older adult early identification, diagnostic testing, and audiologic rehabilitation services, whereas AuD pediatric-audiology training is offered in multiple courses.

Hearing Care Professional Access

Ideal hearing health care access should, theoretically, allow all members of society to choose their preferred HCP. Because hearing health services must be delivered across the lifespan to individuals and families from all walks of life, a representative number of diverse professionals should be available in multicultural communities. This should improve access, satisfaction, and follow-up for those needing to use the hearing health care system. So, it would be advantageous to determine if there is an appropriate level of diversity in the hearing care workforce.

Most of the clinical and science professions have had poor representation of historically marginalized individuals.[16] Table 1 is a display of U.S. population rates for race, ethnicity, gender, and age, including the HCP workforce. Data in first column represents population percentages calculated using U.S. Census[17] data. The second column includes data published by the American Speech-Language-Hearing Association[18] that show the composition of certified audiologists in the ASHA organization. Data in the final column were extracted from an occupation website, Zippia.com,[19] which provided demographic information about hearing-aid specialists. Emphasis was placed on disparities of 3% or more between the U.S. population and published rates for audiologists and hearing aid specialists.

Over several years of surveys, ASHA has demonstrated that historically marginalized communities have comprised a small percentage of the practicing audiologists. For example, the Black or African American U.S. population rate was 13.6%, while the rate of audiologists in ASHA was 2.4%, and hearing-aid specialist per Zippia.com was 8.7%, revealing disparities of 11.2 and 4.9%, respectively. Black or African American was the only race with disparities in both ASHA and Zippia. The Hispanic or Latino community represented the largest ethnic disparity between its estimated population (18.9%) and audiologists (3.4%) but revealed a reasonable proportion of hearing aid specialists

Table 1 Race, Ethnicity, Gender, and Age Percentages for the United States and Hearing Care Professional Workforce

	U.S. Census[a] Population (%)	ASHA[b] Audiologist (%)	Zippia.com[c] Hearing aid specialist (%)
Hispanic or Latino	18.9	3.4	16.1
American Indian	1.3	2.0	0.5
Asian	6.1	3.8	9.4
Black or African American	13.6	2.4	8.7
Native Hawaiian	0.3	0.1	–
White	75.8	91.9	63.4
Multiracial	2.9	1.5	–
Unspecified	–	–	1.9
Female	50.5	86.6	51.1
Male	49.5	13.4	48.9
Younger than 5 y	5.7	–	
Younger than 18 y	22.2	–	
18 to <65 y	61.0	89.2	
65 y and older	16.8	10.8	

[a]U.S. Census July 1, 2021 (https://www.census.gov/quickfacts/fact/table/US/PST045221).
[b]ASHA: American Speech-Language-Hearing Association survey of audiology members (January 1 to December 31, 2021).
[c]Zippia.com, The Career Expert, retrieved August 1, 2022 (https://www.zippia.com/hearing-aid-specialist-jobs/demographics/).

(16.1%). The White community exhibited the largest racial disparity between the population estimate (75.8%) and proportion of hearing-aid specialists (63.4%), but ASHA audiologists were overrepresented (91.9%). Females were overrepresented in the profession of audiology (86.6%), but exceptionally balanced in the hearing aid specialist occupation. Slightly more than one in ten audiologists were 65 years of age or older, which was not adequately representative of this growing segment of the U.S. population (16.8%).

MATERIALS AND METHODS

Study Sample

The 2022 MarkeTrak survey was conducted online using a representative sample of participants in the United States. Introduced to respondents as a population health survey, questions about a variety of conditions were asked, to provide a neutral platform for estimation of rates. This produced a sample of 15,138 household respondents with information on 43,597 individual members of the family. Retrieved in 2021, this was a multi-source sample that was aligned with key characteristics of the U.S. Census using upfront balancing and multistep weighting. The study accessed respondents from large, well-established, proprietary panels coupled with "river" sampling, which taps into less frequent or one-time responders, to add depth. The multiple-source approach delivers a more diverse respondent base than any online or mail panels. A two-step process was used where a head of household reporter profiled individuals in the family.

Statistical Analyses

For multivariate analyses, a hearing difficulty index was created as a more robust indicator of the level of difficulty, versus a single self-reported measure, using factor analysis. This technique assigned weightings to each of several subcomponents in the analysis to create a multimeasure index. This analysis forced the number of extracted factors to one using unrotated coefficients as weights. This generated a "score" for each person to represent their relative hearing difficulty. This score allowed the sample to be ranked and stratified.

RESULTS

According to respondents in the MarkeTrak study ($n = 43{,}957$), the overall rate of self-reported hearing difficulty was 10.2% weighted and the prevalence of bilateral hearing difficulty was 70%. On a rating scale of *not at all*, *slightly*, *moderately*, *very*, and *extremely important*, 72% of non–hearing aid owners with hearing loss indicated that it was *very* to *extremely important* to hear well, especially to interact at home with family members and to follow conversations that occur in noisy environments. The mean age of individuals with self-reported hearing difficulty was 57 years. The mean age of those who owned hearing aids was 60 years, compared to 56 years for non–hearing aid owners. Of non–hearing aid owners ($n = 2{,}072$), 52% indicated that they were unaware of any eligibility for third-party assistance to help cover some or all of the cost of hearing aids, and 18% were unsure. Overall, approximately 30% of non–hearing aid owners expressed that they had coverage or assistance with the cost of new hearing aids and Medicare was the most common source of coverage indicated. Insurance coverage prevailed as the most motivational factor of non–hearing aid owners to consider purchasing a hearing instrument sooner (44%), followed by a compelling hearing test (31%). Refer to the article titled *The Financing of Hearing Care: What We Can Learn from MarkeTrak 2022* of this issue by Windmill for finer detail on this topic.

Age-Related Hearing Loss

The severity of self-reported hearing loss appears to vary by age. Survey respondents who were 65 years of age and older were more likely than others to classify their hearing loss as *severe*, but not the most likely to classify their hearing loss as *profound*. Those in the middle-aged group (35–64 years of age) were more likely to rate their hearing loss as *mild*-to-*moderate* (84%). Individuals in the youngest age group (<35 years of age) were more likely than others to classify their hearing loss as profoundly impaired. Although slightly higher for males (11.3%) than for females (9.1%), Fig. 1

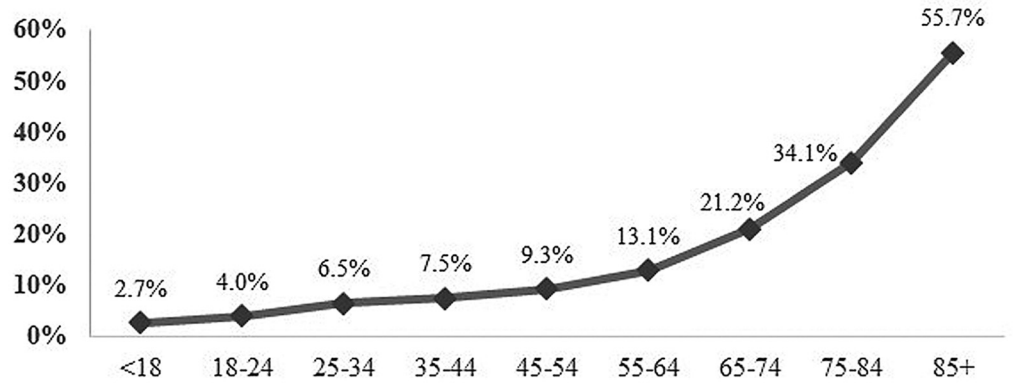

Figure 1 Rate of hearing difficulty by age group from 18 years of age and less to 85 years of age and older (n = 43,597).

illustrates that self-reported hearing difficulty appears to increase with age ($n = 43,957$). For adults 18 years of age and older, the rate of hearing difficulty was 12.4%. Adults 75 to 84 years of age were 4.5 times more likely to report hearing problems than adults who were 35 to 44 years of age, and adults 85 years of age or older were six times more likely to report hearing problems than those who were 45 to 54 years of age. These data have been stable across gender and age groups since the 2015 MarkeTrak study with no evidence of statistically significant differences.

Furthermore, adults who were 18 years of age or more, who reported being employed ($n = 16,472$, 43.3 years of age), indicated a lower hearing difficulty rate (9%) than individuals who were not employed ($n = 18,873$, 57 years of age), likely retired, and reported a higher rate of hearing difficulty (17%). The rate of hearing difficulty was relatively similar for education and income demographics, including high school or less ($n = 12,007$, 13%), some college ($n = 10,877$, 12%), college graduate ($n = 12,170$, 12%), income of less than $50,000 ($n = 18,713$, 11%), income of $50,000 to $99,999 ($n = 13,476$, 10%), and income of $100,000 or greater ($n = 10,036$, 8%).

Self-Reported Morbidity

Fig. 2 is a display of the self-reported causes of hearing problems for respondents who own hearing aids ($n = 1,139$) and non-owners ($n = 2,079$). Respondents were allowed to select multiple causes; however, the figure displays only causes that achieved a rate of 8% or higher. Fig. 2 demonstrates that a substantial proportion of individuals with hearing difficulty have assumed that their problem is age related (40–45%), although exposure to sound, in various forms, was commonly cited as a contributing factor as well (7–33%). Overall, the hearing aid owners and non-owners have rated the cause of their hearing problem similarly, with a few exceptions. Twice as many hearing aid non-owners indicated that exposure to loud music was a cause of their hearing loss, and hearing aid owners were twice as likely to identify a genetic condition as a contributing factor. Hearing aid owners were more likely to list *present at birth*, *genetic condition*, and *noise exposure from the military* as causes of their hearing problem, while non-owners of hearing aids were more likely to list *noise exposure from loud music*, *noise exposure on the job or school*, and *head trauma*.

Responses to several of the more prevalent factors were then stratified by age group. Fig. 3 reveals that self-reported morbidity of hearing difficulty was viewed differently across the age groups in the study sample. Only data that revealed age-group differences of 10% or greater were included in Fig. 3. The remaining contributing factors yielded rates that were between 3 and 7% and included surgery, alcohol and drug use, medication, and sudden onset.

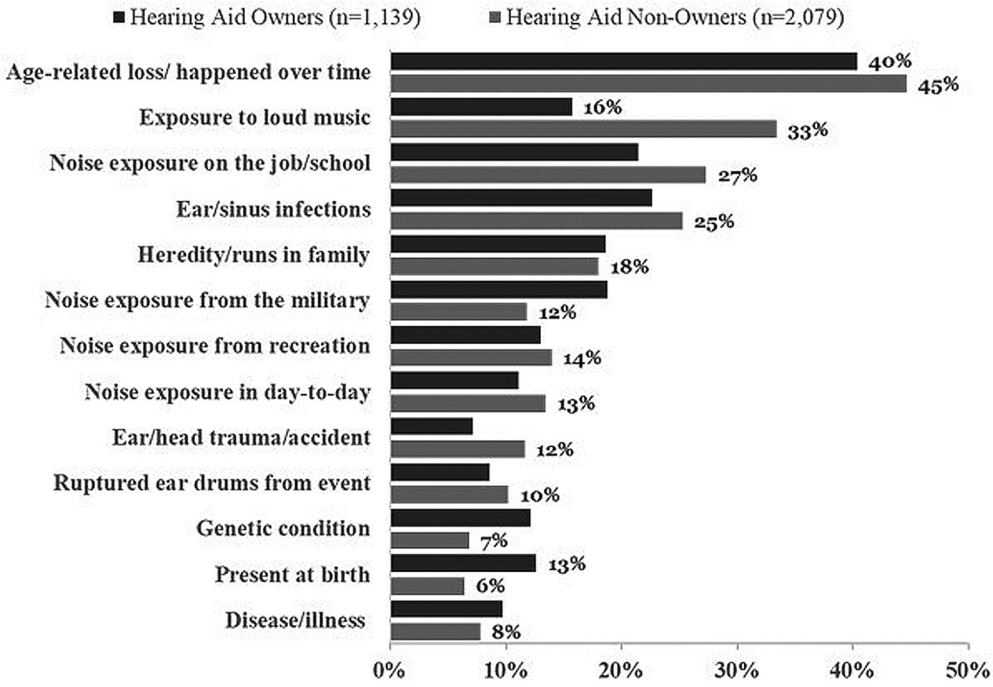

Figure 2 Self-reported causes of hearing problems. Multiple responses were allowed. Only responses with proportion of 8% and greater have been shown.

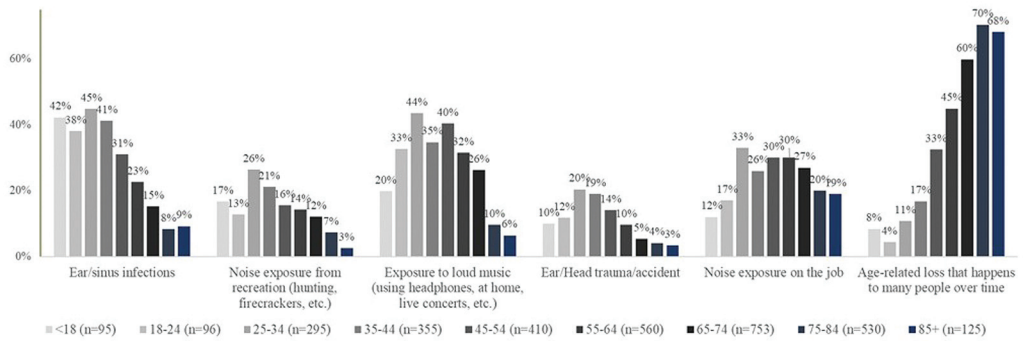

Figure 3 Self-reported causes of hearing problems by age group. Multiple responses were allowed. Only the largest differences between age groups have been shown.

The only self-reported condition that demonstrated a rate that increased with age was age-related hearing loss. Factors more commonly reported by younger adults were related to noise but appeared to reach peak prevalence around the group that was 25 to 34 years of age.

The prevalence of causes related to noise exposure varied by gender, level of education, and work status. Male respondents, individuals without a college degree, and those who were working, were more likely to report military, workplace, and recreational noise exposure as the causes of their hearing problem (Fig. 4). In addition, respondents who were working were more inclined to report ear or sinus infections. Individuals who were not working were more likely to report age-related causes, possibly because they were older and retired. Males ($n =$ 1,780) were almost six times more likely to identify military noise as a cause of hearing

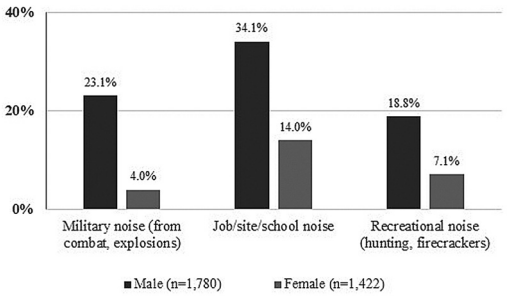

Figure 4 Self-reported causes of hearing problems by gender. Only responses with differences of 10% and greater have been shown.

difficulty, and more than twice as likely as females ($n = 1,422$) to select job or school or recreational noise as a cause. All other contributing factors produced gender differences that were below 10% and have not been displayed. These include marital status, race, and income status.

Survey respondents were queried about their general health status. Besides hearing difficulty, participants were asked if they had any problems with tinnitus (a bothersome sensation of ringing, buzzing, hissing, or whooshing in one or both ears that may be constant or intermittent), poor eyesight (farsightedness, nearsightedness, or low vision), cognition (problems with memory, language, thinking, or judgment), sleep difficulty, falling, depression, loneliness or social isolation, diabetes, high blood pressure, back problems, and cancer. Fig. 5 is a display of the prevalence data for participants younger than 35 years ($n = 16,604$), individuals 35 to 64 years of age ($n = 14,858$), and people 65 years of age and older ($n = 12,495$) across conditions. The figure illustrates that hearing difficulty, tinnitus, poor eyesight, hypertension, and balance problems become more prevalent as the population ages. More than half of the youngest age group (55%) selected *none of the health conditions*, but a far lower proportion (15%) of the oldest age group indicated that they had no health concerns. Across all respondents, poor vision and high blood pressure, followed by hearing difficulty, represented the most prevalent health concerns, collectively.

Unspecified tinnitus (23%), cognitive and memory problems (21%), and falling or balance

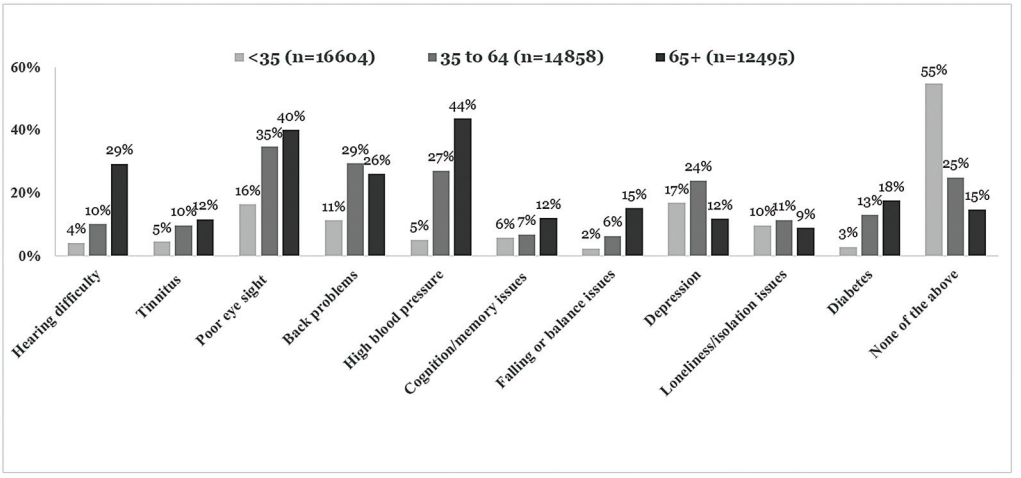

Figure 5 Prevalence of medical conditions across age groups.

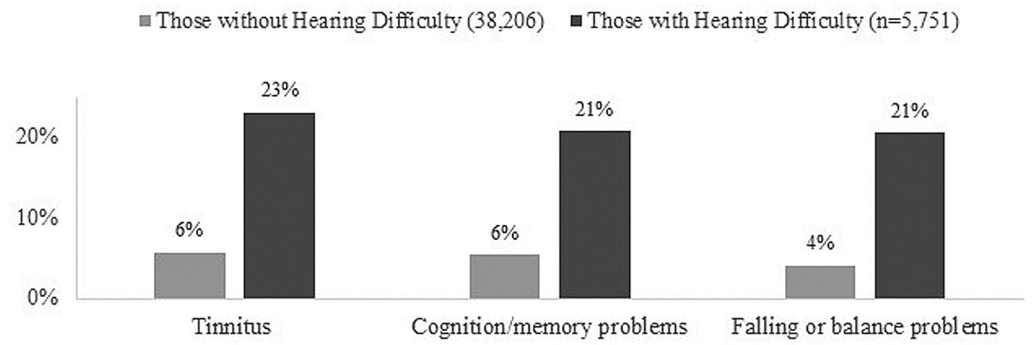

Figure 6 Conditions with higher prevalence rates among those with self-reported hearing difficulty, compared to those without hearing difficulty.

problems (21%) in respondents with self-reported hearing difficulty ($n = 5,751$ unweighted and $n = 4,467$ weighted) presented substantially higher comorbidity rates than the group without hearing difficulty ($n = 38,206$), which failed to demonstrate prevalence rates in any of the health conditions that exceeded 6% (Fig. 6). Hence, individuals with hearing difficulty were nearly three to four times more likely to have tinnitus, cognitive problems, and issues with balance and falling than people who report no hearing problems. As shown in Fig. 7, when household heads ($n = 15,138$) were questioned about conditions that might be linked to hearing difficulty, tinnitus was selected most frequently (48%), followed by falling and balance problems (33%), cognitive issues (24%), and several mental and emotional health conditions (depression, memory loss, sleep difficulty, and loneliness). Fifteen percent ($n = 2,361$) of the household heads were previously diagnosed with COVID-19. Among this subgroup, 44% reported that COVID-19 either impacted or may have impacted their hearing or balance. Hearing difficulty was perceived to be linked to COVID-19 by 10% of the household heads who participated. Upon further analysis, the rate of depression increased as the classification of hearing difficulty was more severe, especially for hearing aid non-owners (data not shown).

Culturally Diverse Populations

The rate of hearing difficulty was stratified by race and ethnicity, including the mean age for each subgroup (Fig. 8). For this segment of the

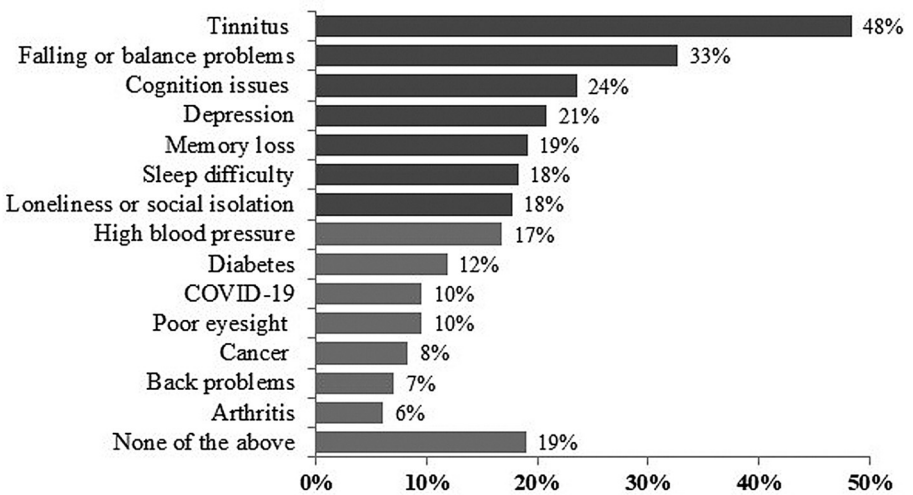

Figure 7 Conditions thought to be linked to hearing difficulty by household heads (n = 15,138).

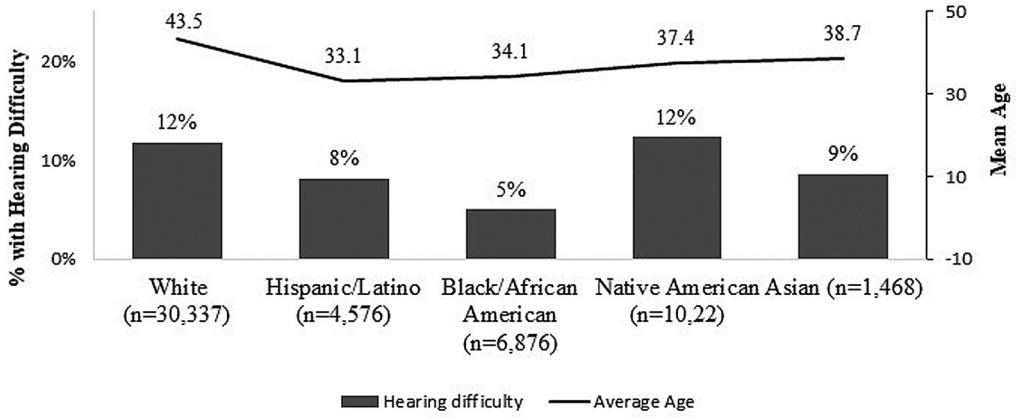

Figure 8 Rate of hearing difficulty by race and ethnicity with group-mean ages shown.

survey, race was a multiple-choice item. For this analysis, *White* was composed of respondents who did not select any other race. Historically marginalized participants were those individuals who identified as *Black or African American*, *Native American*, *Asian American*, or *Hispanic or Latino American* solely, or in addition to *White*. The rate of self-reported hearing difficulty was lower for historically marginalized groups (7%, $n = 13{,}605$) than for the White population (12%, $n = 30{,}337$). The mean age of the historically marginalized participants was 35.2 years of age, compared to 43.5 years of age for the White respondents. Self-reported hearing difficulty for the historically marginalized groups was 12% for Native Americans ($n = 1{,}022$), 9% for Asian Americans ($n = 1{,}468$), 8% for Hispanic or Latino Americans ($n = 4{,}576$), and 5% for the Black or African Americans ($n = 6{,}876$). These data are illustrated in Fig. 8, including the mean age of each race and ethnic subgroup. The self-reported rate of hearing difficulty for Native American participants was similar to White respondents and the highest of all historically marginalized groups. Black and African American respondents expressed a disproportionately low rate of hearing difficulty in comparison to White and Native American participants, which could not be explained entirely by age differences. In addition, the mean age of the historically marginalized groups was lower than the mean age of the White respondents.

The MarkeTrak 2022 study included collection of data on hearing aids fitted in person by a hearing care professional (e.g., audiologist, hearing instrument specialist, otolaryngologist), remotely by a hearing care professional (via an Internet phone, video call, or application), or without assistance from a hearing care

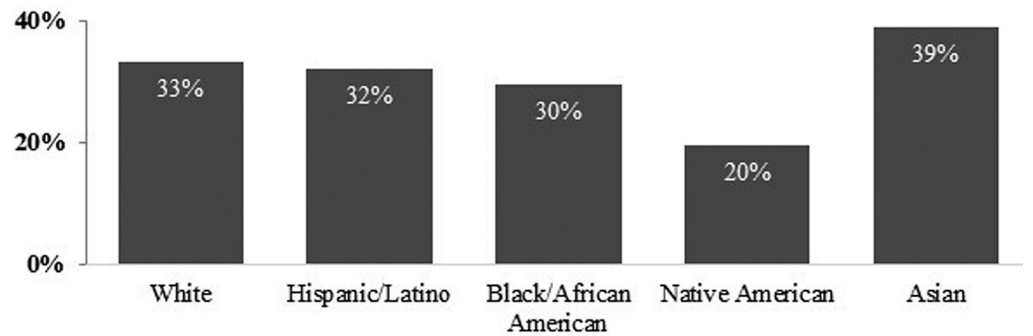

Figure 9 Adoption rates for in-person hearing aids fittings by race and ethnicity.

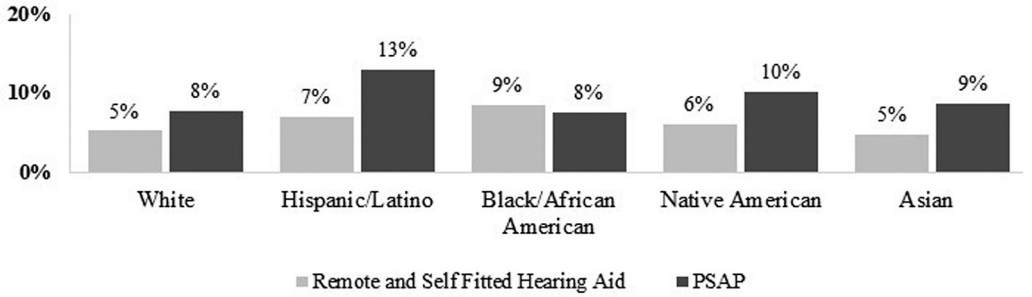

Figure 10 Adoption rates for remote and self-fitting hearing aids and personal sound amplification products by race and ethnicity.

professional, also termed self-fitted. When White (33.1%, $n = 4{,}558$), Hispanic or Latino (32.1%, $n = 447$), and Black or African American (29.5%, $n = 445$) groups were compared, adoption rates for in-person fitted hearing aids of those who self-reported hearing difficulty were similar (Fig. 9). The lowest hearing aid adoption rate was observed for Native Americans (20%, $n = 147$), while the highest was for Asian Americans (38.8%, $n = 162$). The in-person hearing aid adoption rate for the aggregated historically marginalized groups (31.8%) was similar to the rate of White respondents.

As shown in Fig. 10, the adoption rates for remote and (self)-fitting hearing aids and personal sound amplification products (PSAPs) were slightly higher for historically marginalized groups than for White participants. The lowest remote (self)-fitted hearing aid adoption rate was observed for Asian Americans (4.7%), while the highest adoption rate was for the Black or African American group (8.5%). Hispanic or Latino American respondents demonstrated the highest rate of PSAP use (13%), followed by Native American participants (10.2%). Refer to the article by Jorgensen for more detail about hearing-aid adoption.

DISCUSSION

Self-Reported Health Problems

Most hearing health appointments begin with a polite greeting and individualized case history. From the MarkeTrak 2022 self-reported health conditions and other outcomes, we are reminded that HCPs must listen acutely and document the client's health perception, history of exposures, and comorbidities. Participants with self-reported hearing difficulty reported increased tinnitus, cognitive and memory issues, and falls and balance problems when compared to those without hearing difficulty, which has been highlighted in other studies.[20–24] Of those diagnosed with the COVID-19 virus, almost half experienced subsequent problems with hearing and balance. Concerns about hearing, tinnitus, cognition, and balance have been associated with psychological and psychosocial problems[25,26] and chronic illnesses; so, empathetic counseling and listening by HCPs is imperative.

More non-owners of hearing aids indicated that exposure to loud music was a cause of their hearing difficulty, so, for these encounters, HCPs should be prepared for exploration of exposure history, followed by hearing loss prevention counseling. If a client is repetitively exposed to loud sound without proper protection, it should be made clear that a conventional hearing instrument cannot be worn in those conditions and hearing protection training must be provided. Hearing aid owners can benefit from a similar counseling and education approach, although MarkeTrak respondents more often reported genetics and military noise as the cause of their hearing problems. People who serve in the military experience periodic health assessments, physical exams, and occupational hearing tests, which include ongoing counseling and education about hazardous noise exposure and hearing conservation. Such military experiences make people more aware of their health risks and methods of remediation.

General health inquiries were a key element of the MarkeTrak 2022 study, which identified that hearing difficulty, tinnitus, poor eyesight, hypertension, and balance problems become more prevalent as we age. Thus, case-history questions about these conditions may be incorporated into the encounter and recommendations for consultation with general medicine or primary care may be initiated using applicable referral procedures. Once proper consultations and referrals have been made, interprofessional collaboration with a tinnitus and hyperacusis specialist, physical therapist, otolaryngologist, mental health provider, optometrist, physician, and care coordinator, if needed, may enhance patient satisfaction and improve health outcomes.

Populations who receive hearing health support services are not all the same. Thus, the service product should not be the same, or *one-size fits most*. Hearing health support services are evolving with technology and hearing aid owners need a moderate level of education and rehabilitation for any new hearing instrument, especially older adults.[27]

Those in the HCP disciplines should pursue interprofessional collaboration with primary care,[28] mental health,[29] and optometry[30] to make appropriate referral and follow-up of those we serve.

Early Identification and Intervention

Noise exposure and loud music were secondary only to age-relatedness[31] as most prevalent self-reported causes of hearing difficulty. In some instances, a history of occupational and recreational noise exposure and the aging process coincide with worker retirement.[32] For older study participants, the rate and progression of self-reported hearing difficulty (21% for those 65–74 years of age, 34% for those 75–84 years of age, and 56% for those 85 years of age and older) generally concurred with published data.[11] The growth of hearing loss in the retired community is steep, and to mitigate associated health problems, hearing difficulties in retired adults should be identified and managed promptly. This must be done through local or state initiatives because adults and older adults are not covered by any hearing health regulations.

According to Sindhusake et al,[1] mild hearing loss is the most prevalent degree of impairment in adults (39%). Mild hearing loss can be managed with amplification, unless contraindicated, to avoid the development of other health complications, such as decreased social participation,[33,34] cognitive decline,[35] and depression.[36–38] Given the self-reported health conditions identified in this study, adults and older adults with mild hearing difficulty should be counseled promptly on any risks associated with their condition and appropriate medical and ancillary referrals should be made as well.

Age-related hearing loss was a chief cause selected by owners and non-owners of hearing aids; yet, recreational noise and loud music were chosen most often by younger and middle-aged respondents. In the United States, hearing screenings are generally inaccessible for adults; so, public health messaging should be used to educate and alleviate apprehension for amplification candidates. Information may be designed to lead specific age groups to products and services they are more likely to use. For example, younger adults may benefit more hearing loss prevention education, while older people might benefit from information about communication strategies and how to locate various types of HCP services.

According to published reports, the rate of hearing loss in adults increases gradually from age 30 to 79 and exceeds 80% for those 80 years of age and above. The rate of hearing loss for individuals below age 20 is less than one-tenth of 1%. For children in educational settings, hearing screenings are required or recommended in more than 80% of the states, facilitating more timely access to hearing health and rehabilitative services for students. Yet, a corresponding program for adults is inaccessible. Untreated hearing loss has been associated with social isolation, loss of productivity, depression, and cognitive decline in adults.[39] Wellness hearing screenings would serve as a conduit for older adults to access definitive professional hearing care, referrals for any associated conditions, and amplification services. The WHO published specific hearing screening recommendations for all ages. For adults, they recommended that, beginning at 50 years of age, a hearing screening should be administered every 5 years, but at 65 years of age, it should be conducted every 1 to 3 years. If

started at 50 years of age, this would encompass five screenings over 20 years.

Health Care Barriers

According to the WHO,[3,4] disease may be prevented through the provision of healthy environments, consisting of safe housing, healthy food, clean water, quality health care, good education, and community centers. On the other hand, unhealthy environments lead to health inequities and disparities that produce barriers to care. Quality health care is an element that should offer a community, minimally, access to a health care system, including wellness and health promotion, and ingress to ancillary services. A large urban community without access to hearing care professional services might be considered a *hearing health or hearing aid desert*, as it is more likely that individuals who could benefit from hearing health support cannot obtain it. Within a *hearing health or hearing aid desert*, there is probably a higher prevalence of non-owners of hearing aids, persons who need hearing health counseling and audiologic rehabilitation, and people presenting with the types of comorbidities mentioned previously. Communities characterized as *hearing aid deserts* would be unhealthy environments for all segments of the population, particularly older adults, given the sequel of conditions associated with age-related hearing loss. Community members with unmanaged hearing problems could experience problems with job performance, personal safety, and marital and family relationships, which would place an additional burden on the community.

Telemedicine might be a viable interim solution for amelioration of *hearing aid deserts*, but HCPs must first recognize that teleconference platforms inherently present communication difficulties for those with hearing problems.[40] Although virtual appointments may be considered, rural *hearing aid deserts* offer intensified barriers to care for those with hearing difficulties.[41] Rural communities present a lack of populous to support a local HCP, in addition to lagging infrastructure for reliable digital communications. Communities with *hearing aid deserts* must, first, attract HCPs to provide service in their population. Then, mechanisms for maintaining quality care, while reducing the cost of care, must be created. Insurance coverage for hearing instruments is in high demand, but the high cost of these technologies, without a subsidy, is a barrier to care.

Gaps were detected between the population of racial and ethnicity groups in the United States and representativeness within hearing health fields, namely, audiologists and hearing aids specialists. Approximately two-thirds of the hearing aid specialists were White, which underrepresented that community. The Black or African American population showed disparities in both the number of audiologists and hearing aid specialists; so, diversification is needed in those disciplines. By the same token, the Black and African American sample in the MarkeTrak study represented the lowest rate of self-reported hearing difficulty. Nieman et al[42] analyzed NHANES data to compare hearing thresholds in older Black, White, and Hispanic adults with similar noise exposure history. Similarly, they discovered that Black adults had the best hearing and White and Hispanic adults had similar hearing. They also reported that Black and Hispanic adults were less likely to adopt hearing aids than White adults when age and hearing were similar, but sample sizes were small. Along those lines, Pittman et al[43] concluded that a limited number of investigations have included representative samples of historically marginalized people, constraining the external validity of most studies intended to represent the U.S. population.

Recommendations

Local and state medical authorities would be better served if they reduced the burden from *hearing aid deserts* because hearing difficulty appears to be a passageway to other health problems. So, if we believe that hearing health is a fundamental right of every human being, the following might be considered: (1) besides Medicare, develop more viable mechanisms for insurance and payment of hearing instruments and related services[44]; (2) encourage HCPs to always inquire about or assess for tinnitus, cognitive problems, and falls during case history as part of their assessment; (3) to increase diversity and access to care in the HCP workforce, AuD programs should recruit and admit

more students from marginalized communities by embracing holistic graduate application review practices, recognizing homophily, and offering equitable clinical internships and externships; (4) to increase diversity and access to care in the HCP workforce, employers of hearing aid specialists should recruit, train, and hire specialists based on the demographic profile of their target population; and (5) call for medical providers to refer adults for hearing screening at least once every 10 years, then every 3 years after reaching 50 years of age.[10]

CONCLUSION

Authorities suggest that SDH accounts for about 30 to 55% of health outcomes[4]; so, it is imperative that factors that contribute to unhealthy communities be alleviated. As such, access to care and affordability of services were important characteristics that emerged from the MarkeTrak study, which aligns with SDH. If a goal is to increase hearing aid adoption and customer satisfaction, then funding support for payment, and increased access to in-person HCP care, must be prioritized because an adequate number of HCPs should be available across U.S. communities. To reach that mark, we need to recruit, train, and attract HCPs to practice in underrepresented localities, both rural and urban. In addition, an increased number of diverse HCPs would improve access for marginalized populations. Finally, to identify the magnitude and burden of *hearing aid deserts* in the United States, descriptive research investigations must be conducted. These data could be transformative; in that, medical leaders would then be armed with information to target specific communities for quality hearing health care improvements, including a diverse range of qualified HCPs and services.

CONFLICT OF INTEREST

There are no conflicts of interest.

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