Hearing Loss in an Aging American Population: Extent, Impact, and Management

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Annu. Rev. Public Health 2014. 35:139–52

The *Annual Review of Public Health* is online at publhealth.annualreviews.org

This article's doi: 10.1146/annurev-publhealth-032013-182510

Keywords

age-related hearing loss, health-related quality of life, hearing aids, screening

Abstract

Despite contributing substantially to disability in the United States, age-related hearing loss is an underappreciated public health concern. Loss of hearing sensitivity has been documented in two-thirds of adults aged 70 years and older and has been associated with communication difficulties, lower health-related quality of life, and decreased physical and cognitive function. Management strategies for age-related hearing loss are costly, yet the indirect costs due to lost productivity among people with communication difficulties are also substantial and likely to grow. Hearing aids can improve health-related quality of life, but the majority of people with documented hearing loss do not report using them. Uncovering effective means to improve the utilization of hearing health care services is essential for meeting the hearing health care demands of our aging population. The importance of hearing for general well-being warrants an effort to enhance awareness among the general population of the indications of hearing loss and options for assistance.

INTRODUCTION

Hearing is a critical sensory function that allows people to communicate with others and identify possible dangers, such as sirens and alarms. The sense of hearing also serves to integrate individuals with their environment through the perception of normal, everyday sounds that characterize our environment and lets us feel connected to our world (46). Hearing impairment is a key contributor to the burden of chronic disability in the United States (55). Yet hearing difficulties, in particular difficulties perceiving and interpreting speech, are an under-recognized public health issue. Because these difficulties increase with age, they present significant challenges to the delivery of health care as the number of older adults continues to grow. The purpose of the current article is to provide an overview of the nature of age-related hearing difficulties; their prevalence, trends, and projection; the functional and economic impact of hearing loss on individuals and families; and the public health challenges of providing good hearing health care.

ASSESSING AGE-RELATED HEARING CHANGES

To appreciate the ways in which one determines the prevalence of hearing loss in epidemiological studies and the basis for variations in estimates, it is helpful to understand how alterations in the ability to hear are evaluated. Hearing sensitivity is usually assessed objectively in terms of how loud or intense a sound must be at any given frequency, or pitch, to be perceived. This assessment is accomplished most commonly by use of pure-tone audiometry (4). Usually, pure-tone audiometry is done while a person sits in a quiet environment. A pure tone of a specific frequency [measured in kilohertz (kHz)] is presented to one ear at various intensities until the sound intensity level [measured in decibels hearing level (dB HL)] at which an individual is just able to perceive the pure-tone 50% of the time is identified. This sound intensity level is known as the pure-tone threshold for that ear and frequency. A graphical display of pure-tone thresholds as a function of frequency is known as an audiogram and provides a representation of a person's ability to perceive sounds in a silent setting.

Age-related changes affecting the structures of the middle ear, damage to the sensory cells of the inner ear, or dysfunction of the auditory nerve result in decreased hearing sensitivity manifesting in measurable elevations in pure-tone thresholds. Elevated thresholds mean that the sound intensity level has to be increased in order for the sound to be perceived. Age-related changes often first affect the higher frequencies, those greater than 3 kHz. A typical audiometric configuration depicting age-related hearing loss has low- to mid-frequency thresholds within normal limits and markedly elevated high-frequency thresholds.

Adults with measurable hearing loss may or may not report a hearing disability. Although most speech sounds occur between 0.25 and 3 kHz, difficulty hearing certain consonants begins with decreased higher-frequency sensitivity even when speech-frequency thresholds are within normal limits. Because high-frequency consonants are important to speech understanding and the ability to distinguish between words such as "time" and "dime," loss of high-frequency sensitivity often causes an individual to misinterpret what is being said. People with this type of hearing loss are likely to hear vowel sounds correctly and may thus attribute the hearing problem to unclear speech. They may claim that others mumble or do not articulate well rather than recognize that they are experiencing a familiar pattern of hearing loss. The difficulty with understanding speech is aggravated by noisy environments, which often further obscure high-frequency sounds. Progression of hearing loss usually involves loss of hearing sensitivity at increasingly lower frequencies so that understanding speech becomes difficult even in a quiet environment. A functional description of hearing impairment by severity and frequency range is shown in **Table 1**.

ASSESSING SPEECH RECOGNITION

Pure-tone audiometry provides information about whether a sound is perceived, but it does not provide information about how well an individual understands the spoken word. To assess the latter, words are read to the individual through earphones or ear inserts at varying intensities, and the individual is asked to repeat the words back. Word recognition is assessed in terms of the number of words correctly understood at least 50% of the time. Finally, because most individuals communicate in environments where other conversations are occurring, methods to assess words understood in the presence of background noise may be used.

PREVALENCE AND TRENDS OF HEARING LOSS

National survey data collected as part of the National Health and Nutrition Examination Survey (NHANES) indicate that the prevalence of hearing impairment increases dramatically with age. Using the commonly computed four-frequency average threshold of 0.5, 1, 2, and 4 kHz, bilateral hearing loss of at least mild severity (see **Table 1**) doubles for every 10 years of life after the age of 50; this amounts to 15% of people between the ages of 50 and 59, 31% of those between the ages of 60 and 69 (1), and 63.1% of those aged 70 years and older (30). Among people aged 85 years and older, the prevalence is 80% (30). The prevalence of high-frequency loss (indicated by a pure-tone average of thresholds measured at 3, 4, and 6 kHz) increases from 36% among adults 50–59 years to 59% among adults 60–69 years (1), with even greater prevalence observed among those 70 years and older (using the average of pure-tone thresholds measured at 3, 4, 6, and 8 kHz) (30). Men are more likely to experience hearing impairment compared with women of the same age, and black Americans have better pure-tone thresholds and a lower prevalence of hearing impairment than do either white or Hispanic Americans (1, 19, 30). Race/ethnic differences in hearing sensitivity are not well understood. Hypotheses for these differences include melanin pigmentation providing protection for loss of sensory function within the cochlea (28) or differential lifetime exposure to noise (33) or other environmental factors related to hearing loss. An array of genetic factors that control molecular pathways within the inner ear and the auditory nerve have been identified (12), but to what extent genetic factors are related to race/ethnic differences in the prevalence of hearing loss is not known. Hearing loss also occurs along a socioeconomic gradient such that adults with less education or lower income have a greater likelihood of impairment, a pattern that has been replicated outside of the United States in countries such as Norway and Australia (1, 18, 30, 35).

Hearing loss that occurs as a consequence of prolonged exposure to high-intensity sound or acoustic trauma from a sudden, loud noise is known as noise-induced hearing loss. Intense noise

Table 1 Functional description of hearing impairment by severity of impairment and frequency range[a,b]

	Severity of impairment	
Frequency range	Mild (pure tone average threshold >25–40 dB HL)	Moderate to severe/profound (pure tone average threshold >40 dB HL)
Low or mid frequency (0.5–2 kHz)	Slight difficulty with understanding speech under ideal listening conditions	Considerable difficulty with understanding speech under ideal listening conditions
High frequency (≥3 kHz)	Slight difficulty with understanding speech under unfavorable listening conditions	Considerable difficulty with understanding speech under unfavorable listening conditions

[a]Reprinted with permission from the Annals of Internal Medicine.
[b]Abbreviations: dB HL, decibels hearing level; kHz, kilohertz.

exposure damages the sensory cells that respond to sound signals, typically those in the range of 3–6 kHz. Noise-induced hearing loss is characterized by decreased hearing sensitivity at these specific frequencies with corresponding elevated pure-tone thresholds on the audiogram. The prevalence of noise-induced threshold loss among US adults was recently estimated to be 12.8% among adults aged 20–69 years using NHANES data (33). There appears to be no marked increase in prevalence among people aged 50 years and older. Identifying noise-induced hearing loss in older adults may become more difficult as other determinants of hearing loss produce elevated high-frequency thresholds, which are superimposed on and obscure audiometric evidence of noise-induced hearing loss.

Prevalence of hearing loss differs based on whether measurements are by self-report or by audiometric measurement of pure-tone thresholds (42, 49). An age-specific examination of the discrepancy comparing self-report data collected from the National Health Interview Survey (NHIS) with audiometric data gathered from the NHANES demonstrates that a report of having "a little hearing trouble or worse" can overestimate or underestimate the prevalence of bilateral hearing impairment of mild or worse severity on the basis of the four-frequency average threshold of 0.5, 1, 2, and 4 kHz. The direction and the magnitude of the difference vary by age; older people with audiometrically assessed hearing loss are relatively less likely to report hearing trouble even though they are more likely to be experiencing high-frequency losses and the severity of their speech frequency losses is greater than that of younger adults. This pattern holds for both males and females (**Figure 1**). Reasons why older people are less likely to report an audiometrically ascertained impairment may be related to an increased acceptance of hearing loss as a normal part of aging, fewer communication needs after leaving the workforce, and greater perceived stigma (59).

Based on a synthesis of national survey data, the trend in the age-standardized prevalence of hearing loss in the speech frequencies declined in the later part of the 1990s and was followed by a period of stabilization through about the year 2006 (**Figure 2**) (24). Examination of short-term audiometric trends in adults corroborates no recent worsening of pure-tone thresholds (1) or prevalence of hearing impairment (24) between 1999 and 2004. Longer-term comparisons at the national level indicate improved age-specific hearing thresholds and lower age-adjusted prevalence of hearing impairment assessed in 1999–2006 compared with those assessed in 1959–1962 (21, 22). Similarly, Zhan and colleagues have described a generational change in audiometrically assessed hearing loss comparing older adults from the Epidemiology of Hearing Loss Study (EHLS) to that of their adult children. The investigators observed a 32% lower age-adjusted odds of hearing impairment among the second generation compared with their parents who comprise a longitudinal cohort of adults, aged 48–92 years at baseline, from Beaver Dam, Wisconsin (66). Further investigation revealed this birth cohort effect to be partly attributable to improvements in socioeconomic circumstances, but the factors that are differential by socioeconomic status and account for improvements in hearing sensitivity have not been identified (67). Cohort differences in reported occupational noise exposure (2), cigarette smoking (10), or comorbidities such as cardiovascular disease or its risk factors (15) as well as diabetes (5) did not influence the generational effect. Although age-specific rates appear to be decreasing, the overall population burden of hearing loss in the United States will increase markedly owing to the aging of the population. The proportion of the US population aged 65 years and older is expected to increase from less than 15% (~48 million people) to 20.3% (almost 73 million people) by the year 2030 (56). Assuming the birth cohort effect persists through the year 2030, the investigators estimate more than 41 million people aged 65 years or older will experience hearing loss in one or both ears. If the declining trend has stabilized, this number is expected to be 48.3 million people, about double the current estimate of ~23 million people (K. Bainbridge, unpublished calculations).

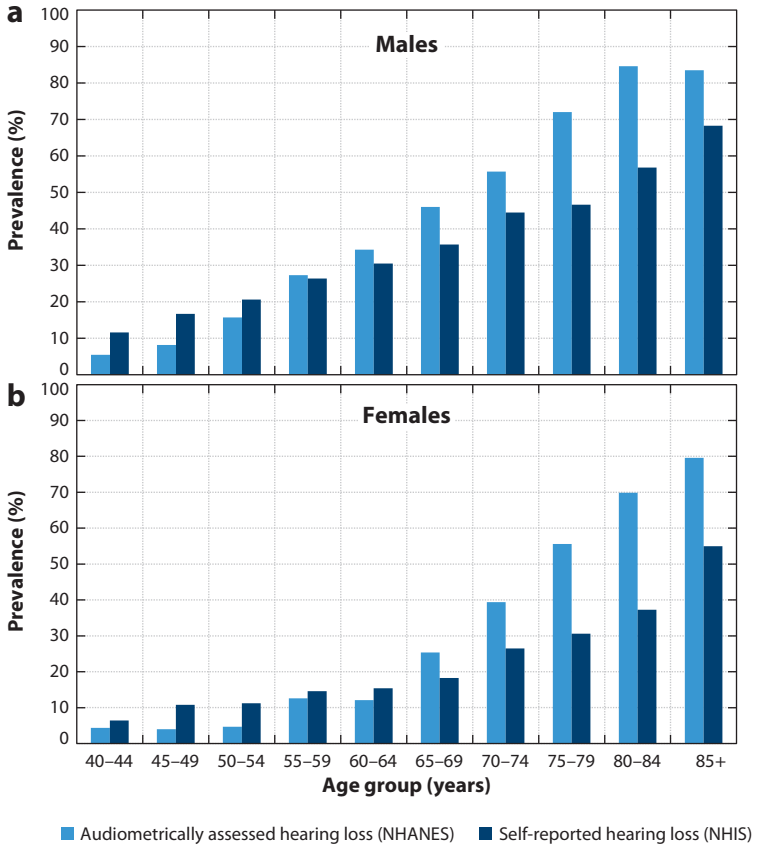

Figure 1

(*a*) Age-specific prevalence for noninstitutionalized US males reporting at least a little trouble hearing based on the 2007 National Health Interview Survey (NHIS), and audiometrically assessed, bilateral hearing loss of mild or worse severity based on the National Health and Nutrition Examination Survey (NHANES) 1999–2006 (for ages 40–69 years), 2005–2006 and 2009–2010 (for ages 70–79 years), and 2005–2006 (for ages 80 years and older). (*b*) Age-specific prevalence for noninstitutionalized US females reporting at least a little trouble hearing based on the 2007 National Health Interview Survey (NHIS), and audiometrically assessed bilateral hearing loss of mild or worse severity, based on the National Health and Nutrition Examination Survey (NHANES) 1999–2006 (for ages 40–69 years), 2005–2006 and 2009–2010 (for ages 70–79 years), and 2005–2006 (for ages 80 years and older).

IMPACT OF HEARING LOSS

Age-related hearing loss is a progressive condition for which there are good, but costly, management strategies, but for which there currently is no cure. People who begin to experience disabling effects of hearing loss in middle age will incur the financial burden and endure the health consequences for the remaining, typically large portion of their adult lives.

Physical Functioning

Hearing impairment is consistently associated with lower self-reported physical functioning and may therefore contribute to a loss of independence. As part of the EHLS, Dalton et al. (11)

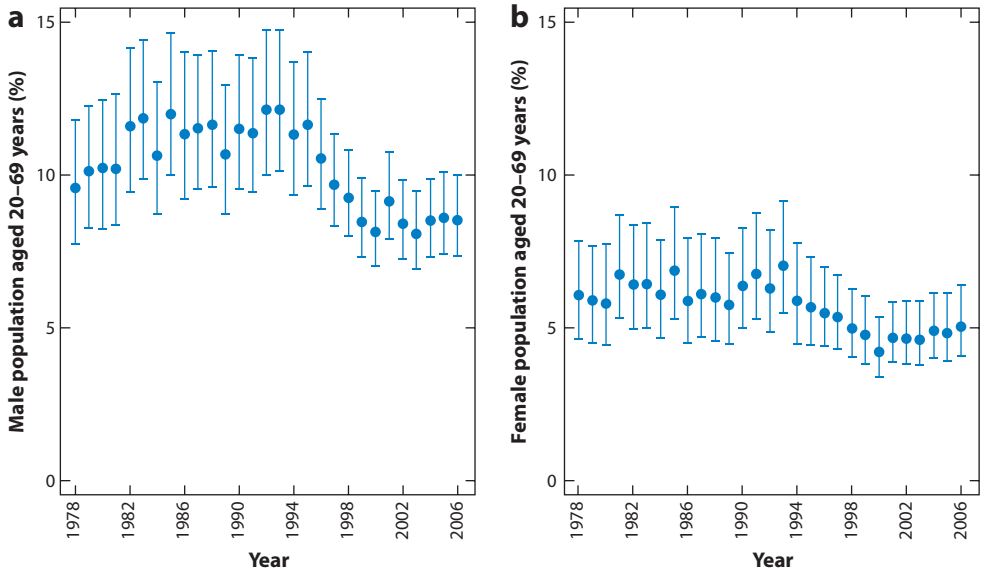

Figure 2

(*a*) Age-standardized prevalence of bilateral hearing loss of mild or worse severity in US males. (*b*) Age-standardized prevalence of bilateral hearing loss of mild or worse severity in US females. Error bars indicate 95% confidence intervals. From Reference 24 (Ikeda N, Murray CJL, Salomen JA. 2009. Tracking population health based on self-reported impairments: trends in the prevalence of hearing loss in US Adults, 1976–2006. *Am. J. Epidemiol.* 170:80–87), by permission of Oxford University Press.

investigated whether the degree of audiometrically assessed hearing-loss severity had an impact on impaired activities of daily living (ADLs), such as bathing, dressing, and eating, and instrumental activities of daily living (IADLs), such as using the telephone, doing light housework, managing money, and doing laundry. The cross-sectional analysis of adults aged 53–97 years demonstrated significant trends in the proportion of people reporting difficulties with both ADLs and IADLs by degree of hearing-loss severity, beginning around age 60 years. Furthermore, longitudinal observations from a population-based sample from Alameda County, California, suggest a greater likelihood of onset of both ADL and IADL disability for adults with a mean age of 65 years who report hearing problems such as difficulty understanding words in normal conversation (50).

Health-Related Quality of Life

The impact of hearing impairment on health-related quality of life has been replicated across several population-based studies using different validated instruments. Older adults with audiometrically assessed hearing loss or those who reported communication difficulties or greater social or emotional problems related to their hearing problems (as assessed from the screening version of the Hearing Handicap Inventory) had worse scores on both the physical health and mental health components of the Short Form 36 Health Survey (SF-36) (11). Australian population-based data from the Blue Mountains Hearing Study demonstrated trends in decreasing physical and mental health component scores across degree of hearing-loss severity among adults of mean age 67 years (7). Although the results are not generalizable to all adults aged 65 years and older, an analysis of self-reported hearing impairment among members of the American Association of Retired Persons (AARP) who purchased AARP Medicare supplemental insurance also found significantly lower

physical health component and mental health component scores as assessed using the Veteran's RAND health status/quality-of-life survey (VR-12) (17). Moreover, when comparing the magnitude of the effects, an inability to hear most of the things people say had a larger negative effect on both scores than did diabetes, hypertension, angina, and sciatica. Hearing difficulty ranked third behind respiratory disease and arthritis in negative impact on the physical health component score and second to digestive disorders on the mental health component score. Data from the 2003 Australian Survey of Disability, Aging and Carers also demonstrated that among adults aged 55 years and older, reporting a hearing disability was associated with lower age-specific health-related quality of life in both physical and mental health scales on the SF-12 quality-of-life survey (23).

Cognitive Functioning

Cross-sectional studies have suggested an association between hearing loss and prevalent cognitive function (28), and now results from an emerging literature indicate that hearing loss is associated with declining cognitive function. Observations from the Health, Aging, and Body Composition Study (Health ABC), a prospective cohort study of healthy, older adults aged 70–79 years at baseline (31), found lower (poorer) baseline scores and a greater six-year rate of decline among older adults with at least mild hearing impairment on two measures of cognitive function, the modified mini-mental state examination (52) and the digit symbol substitution test, a test of executive function (63). People with greater severity of hearing loss at baseline exhibited greater cognitive decline. Investigators from the Alameda County study also found that self-reported hearing difficulties were associated with lower levels of cognitive functioning across five years (61). Determination of the biological mechanisms that explain these associations will require further study but might include greater social isolation or increased cognitive demand resulting from hearing loss. Alternative explanations such as both conditions resulting from a common neuropathologic antecedent or biased ascertainment of cognitive function among older adults with hearing loss also need to be explored (54).

Family Impact

Given the importance of communication within a relationship, it stands to reason that communication difficulties as a result of hearing impairment may negatively affect family members, especially in a shared living environment. Various effects have been described, such as frustration with communication, avoidance of social situations, and altered home environments due to factors such as increased television volume (48), but few population-based studies have assessed the impact of hearing impairment on a spouse or partner. Wallhagen et al. (62) examined data from the Alameda County study to determine whether a report of hearing disability had an impact on a variety of well-being measures on a spouse. Results indicated that a person whose spouse reports hearing disability is somewhat more likely to report poor physical functioning, such as having less energy than expected for one's age, symptoms of depression, or not feeling happy. In contrast, data from more than 13,000 couples in the Nord-Trondelag Hearing Loss study, a population-based study of residents from a single county in Norway, showed that spouses of people with audiometrically assessed hearing loss exhibited no greater symptoms of anxiety, depression, or subjective well-being as compared with spouses of people without hearing impairment (3). Gender-specific analyses from both studies indicate that a husband's hearing loss may have greater impact on the well-being of his wife than the reverse. A newly available, validated instrument to assess hearing-related quality of life in spouses of people with hearing loss may prove informative in assessing family impact (45).

Economic Impact

Data from the National Ambulatory Medical Care Survey indicate that between 2005 and 2007, an estimated 2.9 million outpatient clinic visits to office-based physicians for progressive sensorineural hearing loss occurred among patients 65 years and older in the United States (32). Estimates of the health care costs related to these visits or for auditory referrals have not been generalizable. Direct health care costs associated with the first year of treatment for age-related hearing loss have been estimated to be $1,292 per person, but this estimate is based on reimbursement costs related to audiometric screening, diagnostic evaluation, binaural hearing aids, and hearing aid fitting that were negotiated by the State of California for its Medicaid beneficiaries and likely does not reflect costs for people who do not qualify for these benefits. For people who experience the onset of a severe or profound hearing loss at age 65 years or older, lifetime costs associated with managing hearing loss have been estimated at $43,000 per person, an estimate that includes their lower workforce participation and their reduced wages compared with people who do not have this degree of hearing loss (36). Similar lifetime cost estimates for older people with hearing impairment of lesser severity are not available. As the number of individuals who either desire to or need to remain in the workplace beyond age 65 increases, the societal impact of hearing loss will become increasingly important.

MANAGEMENT OF AGE-RELATED HEARING LOSS

The most common management strategy for age-related hearing loss is a hearing aid that is usually worn in or behind the ear. Hearing aids selectively amplify complex sound signals based on sound frequency, loudness, or direction (25). The available features and cost of hearing aids vary considerably. Hearing aids do not repair the underlying damage that has occurred to the sensory system, but they can offer better speech intelligibility in different listening environments. However, most people require a period of adaptation before deriving the full benefit of a hearing aid, and these individuals need to understand that their brain needs to readapt to sounds that have not been heard in a long time (6).

Effectiveness of Hearing Aids

A recent systematic review concludes that hearing aids improve the health-related quality of life by reducing the psychological, emotional, and social effects of hearing loss (8). The review notes the importance of choice of outcome measure to the weight of the evidence. Quality-of-life measures, such as the Hearing Handicap Inventory for the Elderly (HHIE), which are specific to hearing disability, are more likely to result in larger effect sizes than are more general quality-of-life measures, such as the SF-36, which are less sensitive to changes in communication-related quality of life that amplification is designed to improve. Supportive evidence from two randomized controlled trials indicates that the use of hearing aids can improve hearing-related quality of life among older adults with mild to moderate hearing loss (38, 65). In the first trial, participants were evaluated with respect to social, affective, cognitive, and physical domains of quality of life using five different instruments including the HHIE (58), which measures the emotional and social effects of hearing loss, and the Quantified Denver Scale of Communication Function (QDS) (53), another instrument designed specifically to assess communication difficulties. People randomized to hearing aid use reported greater improvements in the social and emotional domains of the HHIE than did people randomized to a four-month waiting period. The hearing aid users also demonstrated improvement in communication ability and modest improvement in negative affect

as assessed by the Geriatric Depression Scale. Results demonstrated opportunities for greater health-related quality of life regardless of the magnitude of hearing loss at baseline. Improvements were observed up to one year after hearing aid fitting (39). More recently, data comparing the effectiveness of receiving a standard hearing aid, a programmable hearing aid with settings for different listening environments, or an assistive listening device corroborated the earlier findings (65). Users of the programmable aid and the standard hearing aid demonstrated improvements in the social and emotional domains captured by the HHIE as well as improved communication ability assessed with the revised Denver Scale of Communication Function and the Abbreviated Profile of Hearing Aid Benefit (APHAB) (9). Current evidence has not shown that hearing aid use improves cognitive function (38, 57) or slows the rate of cognitive decline (31).

Barriers to Amplification

Many studies demonstrate the limited use of hearing health care among those who might be considered good candidates for assistance. Despite demonstrable benefits of hearing aids to communication ability and quality of life, only about 40% of adults aged 70 years and older who could benefit from hearing aids use them (30). Comparing the prevalence of hearing aid use in a single community across two time periods suggests no improvements in usage have been attained over the past 15 years (40, 44), despite advances in hearing aid technology (25).

Aside from degree of hearing sensitivity (16, 30, 40), self-reported hearing ability (16, 43, 64) and reported hearing handicap (16, 40) are most consistently associated with pursuit of amplification. A recent review, however, highlights that hearing function alone is likely to be insufficient to prompt individuals to seek help (34). Two studies, conducted within communities where hearing aid use is low, investigated specific reasons why people who might benefit opted not to acquire a hearing aid. The most commonly cited reasons, shared across the US and Australian contexts, were cost, inconvenience, the poor experience of others, and perceived lack of need (14, 16). In a review of the help-seeking literature, Saunders et al. (47) found that factors associated with help seeking for hearing impairment were similar to those associated with help seeking for other chronic medical conditions such as alcohol dependence, erectile dysfunction, and urinary incontinence. They argue that help-seeking behaviors should be examined within the framework of a multifactorial model, such as the health belief model, the theory of reasoned action, or the stages of change. These models could facilitate an understanding of individual behaviors and provide information about ways behaviors can be changed to increase the use of hearing health services. In addition, individual behaviors occur within the context of life circumstance, and several studies demonstrate that hearing aid use varies by socioeconomic factors such as education and income (14, 27, 30, 44).

For some, the recognition of need for hearing services follows from receiving a hearing evaluation. Among participants from the Beaver Dam Offspring Study (BOSS), 55% of adults aged 70 years or older had a hearing test in the past 5 years (40). Having talked to a doctor about a hearing problem was strongly associated with having had a hearing test. Yet, the study found ample opportunity for improvement. Of those who had seen a doctor for a hearing or ear problem, 50% had not had a hearing test within the past 5 years, and among those 55 years and older, 19% exhibited at least a mild hearing impairment that might have been identified with a referral to a hearing evaluation. Similarly, 85% of older adults with documented hearing loss but who were not currently wearing hearing aids, recruited from hearing health care services, reported that they had not had their hearing assessed or hearing issues addressed by their primary care practitioner (60).

Among people who decide to acquire hearing aids, adherence is notably low. For example, an analysis of BOSS data showed that, among adults who had ever used a hearing aid, 41% reported no current use (40). Studies indicate this problem of "in the drawer" hearing aids may be related to

lack of perceived benefit or the high cost of batteries. Among older adults, other medical conditions such as reduced manual dexterity or poor visual acuity may affect the ability to insert or maintain the hearing aid (13).

Aural rehabilitation is a process that facilitates the ability to minimize or prevent the limitations and restrictions that hearing loss can impose on well-being and communication. Services might include providing guidance to the person with hearing loss and their family members concerning the psychosocial and communicative effects of hearing loss, strategies to function in difficult listening situations, and an orientation to assist in the adaptation to hearing aids. Studies designed to test the use of aural rehabilitation, as an alternative or supplement to hearing aid fittings, to improve communication and quality of life in older adults with hearing loss need to be conducted (20, 26).

ROUTINE SCREENING: THE US PREVENTIVE SERVICES TASK FORCE REPORT

Because only 41% of US adults aged 70 years and older report having had a hearing examination in the past 5 years (41), screening primary care patient populations to identify and refer likely candidates for hearing intervention to diagnostic hearing evaluation has intuitive appeal. However, the US Preventive Services Task Force (USPSTF) stated that, because of insufficient evidence, it is unable to recommend guidelines for or against routine screening for asymptomatic adults over 50 years of age for age-related hearing loss (37).

The USPSTF review found only one randomized controlled trial that aimed to assess the effectiveness of screening for hearing loss. The intent of this trial was to determine whether patients being randomized to one of three hearing-screening protocols resulted in greater use of hearing aids than that of a control group (64). The study population included more than 2,300 veterans, the majority of whom reported they had a hearing loss at baseline. The screening strategies included using (*a*) a tone-emitting otoscope to detect impaired hearing sensitivity at a single frequency, and (*b*) the screening version of the Hearing Handicap Inventory for the Elderly (HHIE-S) to assess social and emotional consequences of hearing loss, and (*c*) a dual screening protocol for patients who tested positive on either screening test, who were then referred to audiology services. After one year, the data showed that hearing aid use was significantly greater among those screened by the tone-emitting otoscope and among those who received the dual screening tests, although overall rates of use were low.

Various screening tests, including but not limited to those tested in the intervention trial, offer good patient acceptability, accuracy, and reliability (4). Most screening tests are low cost, but an ongoing challenge will be the attainment and continued use of any prescribed hearing aids owing to their cost, perceived stigma, and perceived benefit if diagnosis is confirmed. Because the USPSTF report stated that harms from screening and diagnosis are likely small to none, the question becomes which screening protocols might be implemented and in which populations they should be implemented to optimize benefit. In their review of screening tests, Bagai et al. (4) provide a simple algorithm for the primary care setting, which includes audiometry referrals for patients reporting symptoms on a single question, such as "do you have any difficulty with your hearing?," and a second screening test with either the whisper test or an audioscope for patients who report no symptoms. Standardization of the whisper test remains an issue with this approach.

The USPSTF report recommends trials to evaluate the effect of screening in patients older than 70 years. Targeting older age groups would likely result in a greater number of confirmed cases owing to higher prevalence and may result in greater use of hearing aids (or other

rehabilitative intervention) if conclusions from this sample of military veterans can be generalized. However, some data suggest that younger people adapt more easily to hearing aids (6). The Task Force also recommended expanding the aim of the randomized controlled trials to demonstrate not just greater uptake, use, or satisfaction with hearing aids, but improvements in health outcome measures such as emotional functioning, social functioning, communication ability, and cognitive functioning. To fully document benefit, investigators must ensure that any effective patient screening evolves in parallel with management strategies that provide measurable value.

CONCLUSION

Although trends have been improving in the prevalence of age-related hearing loss, the public health burden associated with this condition will remain substantial owing to its strong association with age and the aging of the population. Evidence indicates that hearing loss has a negative impact on health-related quality of life especially with respect to the social and emotional aspects of communication. Use of hearing aids can ameliorate these communication problems and increase health-related quality of life. Some evidence also shows that hearing loss is associated with cognitive decline. No good evidence has been demonstrated, however, that amplification improves cognitive function. Hearing aid use has remained at suboptimal levels, so more research is needed to understand help-seeking behaviors and the contextual factors that determine the decision to pursue amplification. Audiology referrals by primary care providers may provide one way to increase the use of hearing aids, but evidence is currently insufficient to promote this approach. Addressing these challenges will increase the likelihood that we meet the hearing health care needs of an aging population and improve the potential for individuals with hearing problems to remain healthy, engaged, participating members of their families and communities.

FUTURE ISSUES

1. What metrics can be developed to quantify the personal, family, and societal costs of hearing loss, especially in persons aged 65 years and older or those not in the workforce?
2. To what extent might either improvements in screening protocols in the primary care setting or targeting groups at higher risk of age-related hearing loss increase the use of hearing health care services that result in improved communication and health-related quality of life in older adults?
3. Would a hearing health–focused educational program for primary care providers increase the likelihood of patient referral to hearing health services?
4. To what extent would the systematic use of aural rehabilitation enhance adaptation to and use of hearing aids?

DISCLOSURE STATEMENT

Margaret Wallhagen is a member of the Board of Trustees for the Hearing Loss Association of America. She is the recipient of an NIDCD-funded grant: "Primary Care Intervention Promoting Hearing Health Care Service Access and Use." The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

ACKNOWLEDGMENTS

The authors thank Amy Donahue and Howard Hoffman for helpful comments and May Chiu and Katalin Losonczy for research assistance.

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