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Prevalence of Untreated Hearing Loss by Income among Older Adults in the United States

Sara K. Mamo, AuD, PhD,

Department of Otolaryngology-Head & Neck Surgery and the Center on Aging and Health at the Johns Hopkins School of Medicine.

Carrie L. Nieman, MD, MPH,

Department of Otolaryngology-Head & Neck Surgery and the Center on Aging and Health at the Johns Hopkins School of Medicine.

Frank R. Lin, MD, PhD

Departments of Otolaryngology-Head & Neck Surgery and Geriatric Medicine at the Johns Hopkins School of Medicine, the Departments of Epidemiology and Mental Health in the Johns Hopkins Bloomberg School of Public Health, and the Johns Hopkins Center on Aging and Health.

Abstract

Age-related hearing loss is highly prevalent and only 20% of adults with hearing loss report using hearing aids. A major barrier to increased hearing aid use is the high out-of-pocket costs associated with hearing aids. The objective of this brief report is to estimate the numbers of millions of Americans 60 years or older with untreated hearing loss stratified by income level. Using multiple cycles from the National Health and Nutrition Examination Survey (NHANES; 1999–2006 and 2009–2010), the prevalence of untreated hearing loss is reported based on audiometric hearing tests and self-reported hearing aid use from a cross-sectional, nationally representative sample. Overall, approximately 20 million Americans 60 years or older have an untreated clinically significant hearing loss. Importantly for the nearly six million low-income older adults with untreated hearing loss, the high cost of hearing aids makes hearing treatment particularly inaccessible for this vulnerable population.

Keywords

Hearing loss; aging; hearing aids; low-cost amplification

Age-related hearing loss (ARHL) is independently associated with accelerated cognitive and physical decline, and the mechanistic pathways hypothesized to underlie these associations may be amenable to hearing loss treatment.^{1–3} However, less than 20% of adults with a clinically significant hearing loss report hearing aid use.⁴ This finding is likely due, in part, to the high cost of hearing aids that are not routinely covered by third-party payers (average \$3,000–4,000 out-of-pocket cost).⁵ Given the public health implications of hearing loss, the

Institute of Medicine (IOM) convened a workshop on hearing loss and healthy aging in 2014 that has been followed by an ongoing IOM consensus study that will develop national recommendations on how to develop accessible and affordable hearing health care for U.S. adults.^{6,7}

The objective of this brief report was to estimate the number of individuals with untreated hearing loss in the U.S. stratified by income level. While the high prevalence of untreated hearing loss has been reported previously,^{4,8} it is important to characterize the burden in low-income adults to guide national efforts at providing accessible and affordable hearing care. While there are barriers other than cost that contribute to the low use of hearing aids among adults with hearing loss, the high cost of hearing care with no third-party payer support likely represents an initial insurmountable barrier for low-income Americans. Further, low-income adults are likely at greatest risk for adverse health outcomes such as cognitive impairment^{9,10} and falls¹¹ that may be exacerbated by age-related hearing loss. For all these reasons, accessibility and affordability of hearing treatment deserves targeted attention and novel approaches to meet the needs of low-income older adults.

For this report, hearing loss was defined as at least a mild hearing loss in the better hearing ear as measured by an audiometric exam, because even adults with mild hearing loss are likely to experience communication difficulties in everyday listening situations (e.g., at a restaurant, in the car). Individuals vary widely on communication abilities given their listening needs and coping strategies; moreover, speech understanding declines gradually over time. Treating hearing loss early can improve communication and possibly promote healthy aging.^{6,7,12}

Methods

We analyzed data from the 1999–2006 and 2009–2010 cycles of the National Health and Nutritional Examination Surveys (NHANES), an on-going epidemiological survey that includes questionnaires and physical examinations to assess the health and functional status of the civilian, non-institutionalized U.S. population. Sampling of the U.S. population occurs through a multistage probability sampling design that includes selective oversampling for underrepresented subgroups, such as adults 70 years and older, low-income individuals, and ethnic minorities. We accounted for the complex sampling design in all analyses by using sample weights according to National Center for Health Statistics (NCHS) guidelines, which allows for data to be generalized to the U.S. population.¹³ Demographic characteristics of our analytic cohort of older adults with hearing loss are presented in Table 1.

Hearing measures

Air conduction pure tone audiometry was administered per established NHANES protocols to a half sample of adults 60–69 years from 1999–2004 (n = 1,031) and to all adults 70 years or older in 2005–2006 and 2009–2010 (n = 1669). The half of the sample tested in the 1999–2004 cycles were selected randomly per NHANES Audiometry Protocol.¹⁴ Hearing loss was defined as a speech-frequency average (0.5, 1, 2, and 4 kHz) of >25 dB Hearing Level (HL) in the better hearing ear. Hearing aid use was coded as ‘yes’ if the person reported having ever worn a hearing aid in an interviewer-administered questionnaire.

Income measures

Income category was reported both in terms of household income and the family income-to-poverty ratio (FIPR), which is an index based on poverty guidelines per year and state of testing. Household income was divided into three categories based on generating sample groups roughly consistent with defined cut points.¹³

Analysis

All analyses were conducted using STATA 12.1 (College Station, TX). The proportion of those who responded ‘yes’ to hearing aid use were calculated per age group and per income category using survey weights according to NCHS. Following NCHS guidelines, Taylor Series Linearization method was used for variance estimation.¹⁴ Prevalence estimates were calculated by pooling data across NHANES cycles, and U.S. population estimates were calculated based on the 2011 American Community Survey (ACS), which was the recommended population survey for the 2011–2012 NHANES cycle.¹⁵ Although each NHANES cycle has a corresponding population survey for prevalence estimates, we generated estimates via only the most recent population counts in order to reflect the current scope of the problem and the rapidly aging population.

Results

Across all age groups and income categories, a majority of individuals with hearing loss did not use hearing aids. The prevalence of untreated hearing loss trended towards higher for adults of low- versus high-income across all age groups, regardless of whether low socioeconomic status was defined by household income or FIPR (Table 2). Focusing on FIPR because it is a more generalizable income metric, prevalence estimates of untreated hearing loss for this specific sample ranged from 88% (95% CI: 79–96%) of low-income adults in the 60–69 years group to 66% (95% CI: 57–76%) in the high-income adults in the 80 and older group.

Extending these findings beyond our sample statistics, we estimate that six million Americans 60 years or older with a total household income less than \$20,000 and 4.6 million Americans 60 years or older with a FIPR \geq 1.3 (corresponding to the poverty level at which government agencies provide services such as supplemental nutrition assistance and Medicaid¹⁷) have untreated hearing loss.

Discussion

The prevalence of untreated hearing loss is high across all age groups and income brackets in older adults. However, the nearly 6 million people with annual household incomes of less than \$20,000 or the 4.6 million within 130% of the poverty line experience an increased financial constraint that likely limits access to treatment. Given the independent associations and potentially direct contributions between age-related hearing loss and increased risks of cognitive^{1,3,18} and physical^{2,19} declines, hearing loss should not be viewed as an inconsequential part of the aging process. While increasing treatment for all older adults with hearing loss is a public health initiative, the increased financial limitations and burden for millions of older adults in the low-income bracket must be uniquely addressed.

The magnitude of the number of low-income older adults with untreated hearing loss will inform current IOM efforts and recent initiatives by the White House Presidential Council of Advisors on Science and Technology to address issues of aging and technology. For example, some currently available over-the-counter low-cost personal sound amplifiers may serve as useful tools to support active communication among those adults with hearing loss who are not able to access traditional hearing aids.²⁰ Importantly, future hearing care strategies to address this disparity will likely need to extend beyond lowering costs to developing novel models of hearing care that can overcome other key barriers, such as community-based models of care delivery that increase access to hearing care for older adults. This point highlights the fact that best-practice audiology services do not simply rely on technology, but also incorporate communication strategies and expectation management to enhance the successful use of an amplification device. Future studies should examine effective solutions that not only increase device access, but also successful use of amplification devices through both low-cost amplification options and community-delivered services.

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Table 1.

DEMOGRAPHIC CHARACTERISTICS OF INDIVIDUALS 60 YEARS WITH HEARING LOSS^a BY AGE CATEGORY IN THE UNITED STATES, NHANES 1999–2006, 2009–2010

Demographics	60–69 years (n = 291) ^b No. (%)	70–79 years (n = 571) ^b No. (%)	80+ (n = 523) ^b No. (%)
Sex, female	92 (31.6)	235 (41.2)	248 (47.4)
Race			
White	142 (48.8)	392 (68.7)	433 (82.8)
Black	35 (12.0)	78 (13.7)	34 (6.5)
Hispanic	99 (34.0)	85 (14.9)	40 (7.6)
Other	15 (5.2)	16 (2.8)	16 (3.1)
Education			
< HS	144 (49.5)	209 (36.6)	207 (39.6)
HS grad	65 (22.3)	163 (28.5)	117 (22.4)
Some college or more	82 (28.2)	198 (34.7)	198 (37.9)
Refused / Don't know	0 (0.0)	1 (0.2)	1 (0.2)
Household Income ^c			
\$20,000	90 (30.9)	181 (31.7)	157 (30.0)
\$20,000–45,000	90 (30.9)	201 (35.2)	189 (36.1)
\$45,000	73 (25.1)	153 (26.8)	134 (25.6)
Refused / Don't know	1 (0.3)	33 (5.8)	41 (7.8)
Family income- to- poverty ratio			
<1.3	81 (27.8)	163 (28.5)	122 (23.3)
1.3–3.5	110 (37.8)	256 (44.8)	240 (45.9)
>3.5	100 (34.3)	152 (26.6)	161 (30.8)
Hearing loss category			
Mild loss (> 25 dB HL)	215 (73.9)	357 (62.5)	228 (43.6)
Moderate or worse loss (> 40 dB HL)	76 (26.1)	214 (37.5)	56.4

^aHearing loss defined as speech-frequency pure tone average (PTA) >25 dB HL in the better hearing ear – 500, 1000, 2000, 4000 Hz used to calculate PTA.

^bSample n's show the number of persons in the sample with hearing loss.

^cNumbers do not sum to group total because of missing data.

Table 2.

PREVALENCE AND NUMBER OF INDIVIDUALS 60 YEARS WITH UNTREATED HEARING LOSS^a PER INCOME CATEGORY IN THE UNITED STATES, NHANES 1999–2006, 2009–2010

	60–69 years (n = 291) ^b		70–79 years (n = 571) ^b		80 and older (n = 523) ^b		Total Population Estimates
	Prevalence	Population Estimates	Prevalence	Population Estimates	Prevalence	Population Estimates	
Total Household Income							
< \$20,000	0.84 (0.74,0.95)	2,132,000	0.83 (0.78,0.88)	1,904,000	0.74 (0.67,0.81)	1,919,000	5,955,000
\$20,000–44,999	0.91 (0.83,1.00)	2,853,000	0.77 (0.69,0.85)	2,686,000	0.67 (0.60,0.74)	2,118,000	7,656,000
> \$45,000	0.75 (0.61,0.88)	2,413,000	0.70 (0.64,0.77)	1,959,000	0.66 (0.57,0.75)	1,436,000	5,808,000
TOTAL UNTREATED^c		7,397,000		6,549,000		5,473,000	19,419,000^d
Poverty–Income Ratio							
0–1.30	0.88 (0.79,0.96)	1,651,000	0.84 (0.79,0.90)	1,594,000	0.70 (0.61,0.78)	1,312,000	4,557,000
> 1.30–3.50	0.88 (0.80,0.96)	2,909,000	0.75 (0.68,0.83)	3,413,000	0.70 (0.65,0.76)	2,839,000	9,161,000
> 3.50	0.73 (0.61,0.85)	2,755,000	0.72 (0.65,0.79)	1,988,000	0.66 (0.57,0.76)	1,822,000	6,564,000
TOTAL UNTREATED^c		7,315,000		6,994,000		5,973,000	20,283,000^d

^aHearing loss defined as speech–frequency pure tone average (PTA) >25 dB HL in the better hearing ear – 500, 1000, 2000, 4000 Hz used to calculate PTA.

^bSample n’s show the number of people in the sample with hearing loss.

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

^dNumbers differ due to some missing data in the total household income variable.