Hearing loss is highly prevalent in older adults and has been found to be associated with incident dementia, falls, and poorer cognitive functioning. These associations may be mediated through a causal pathway, but the role of hearing aids and other forms of rehabilitative interventions in possibly mitigating these outcomes remains unknown. To understand the scope of current hearing loss treatment and the extent to which hearing loss remains untreated in the United States, we estimated the overall prevalence of hearing aid use among US adults 50 years and older with audiometric hearing loss using a nationally representative data set.

Methods. We analyzed data from the 1999-2006 cycles of the National Health and Nutritional Examination Surveys (NHANES), an ongoing epidemiological survey designed to assess the health and functional status of the civilian, noninstitutionalized US population. Hearing aid use was assessed with an interviewer-administered questionnaire and was based on whether an individual reported wearing a hearing aid at least once a day (1999-2004) or for at least 5 h/wk (2005-2006). Air-conduction pure-tone audiometry was administered to a half sample of all participants aged 50 to 69 years from 1999 through 2004 (n=1888) and all participants 70 years and older from 2005 through 2006 (n=717). Audiometry was performed in a sound-attenuating booth according to established NHANES protocols. A speech frequency pure-tone average (average of hearing thresholds at 0.5-, 1-, 2-, and 4-kHz tones presented by air conduction in the better ear) of 25 dB or greater was defined as hearing loss per World Health Organization criteria, and this is the level at which hearing loss begins to impair communication in daily life. United States population counts were estimated using the midpoint of population totals in each cycle and averaged across combined cycles when appropriate. We accounted for the complex sampling design in all analyses by using sample weights according to National Center for Health Statistics guidelines.

Results. We estimate that 3.8 million or 14.2% of Americans 50 years or older with hearing loss from 1999 through 2006 wear hearing aids (Table). The prevalence of hearing aid use is consistently low (<4%) in individuals with mild hearing loss across all age decades but generally increases with older age in individuals with moderate or greater hearing loss. Overall, the prevalence of hearing aid use in individuals with hearing loss of 25 dB or greater increases with every age decade, from 4.3% in individuals aged 50 to 59 years to 22.1% in individuals 80 years and older. There are an estimated 22.9 million older Americans with audiometric hearing loss who do not use hearing aids.

Comment. For individuals 50 years and older in the United States with hearing loss, 1 in 7 individuals uses a hearing aid, and for working-aged adults (50-59 years), the rate of hearing aid use declines to less than 1 in 20. These are the first national estimates of hearing aid prevalence in the US population based on audiometric data and a large, well-characterized representative sample. Previous estimates have ranged between 10% and 20% and have come from industry-supported marketing surveys or cohorts that are not representative of the US population. The low observed rate of hearing aid use in the United States likely has various causes including a general perception of hearing loss being an inconsequential part of the aging process, the absence of health insurance reimbursement for hearing rehabilitative services, and the lack of research on the impact of hearing loss treatment.

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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male</th>
<th>Female</th>
<th>Mild (25-40 dB)</th>
<th>Moderate or Greater (&gt;40 dB)</th>
<th>Overall Prevalence of Hearing Aid Use</th>
<th>No. With Hearing Aids (in Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-59</td>
<td>4.3</td>
<td>4.5</td>
<td>2.7</td>
<td>11.8</td>
<td>4.3</td>
<td>0.2</td>
</tr>
<tr>
<td>60-69</td>
<td>7.3</td>
<td>7.2</td>
<td>2.6</td>
<td>23.9</td>
<td>7.3</td>
<td>0.4</td>
</tr>
<tr>
<td>70-79</td>
<td>21.1</td>
<td>17.9</td>
<td>3.4</td>
<td>47.8</td>
<td>17.0</td>
<td>1.5</td>
</tr>
<tr>
<td>≥80</td>
<td>28.1</td>
<td>17.9</td>
<td>3.4</td>
<td>35.7</td>
<td>22.1</td>
<td>1.6</td>
</tr>
<tr>
<td>Estimated total No. of individuals with hearing aids and with hearing loss (in millions)</td>
<td>3.8d</td>
<td>26.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

b Data were derived from the 1999-2006 National Health and Nutrition Examination Survey.

c All values represent prevalence percentage unless otherwise noted.

d Numbers do not sum to group total because of rounding.
Only 1 moderately sized randomized controlled trial of hearing aids has ever been conducted to examine the broader impact of hearing aids, and this study showed positive effects of hearing aids on cognition and other functional domains. Recent research demonstrating strong associations between hearing loss and domains critical to aging (dementia, cognitive functioning, and falls) highlights the need for further intervention studies to determine the possible role of hearing rehabilitative modalities in helping to mitigate these adverse outcomes. If these studies demonstrate even a small beneficial effect of hearing loss treatment, these findings would have significant implications for public health, given that nearly 23 million older adults have untreated hearing loss.

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Author Contributions: Dr Lin had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Chien and Lin. Analysis and interpretation of data: Chien and Lin. Drafting of the manuscript: Chien and Lin. Critical revision of the manuscript for important intellectual content: Chien and Lin. Statistical analysis: Chien and Lin. Obtained funding: Chien and Lin. Study supervision: Chien and Lin.

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COMMENTS AND OPINIONS

Anti-biotics

In their excellent Review Article on the principles of conservative prescribing, Schiff et al make only infrequent specific reference to antibiotics. Yet herein lies great opportunity for more judicious prescribing, the importance of which is punctuated by the multiple-drug-resistant organism and Clostridium difficile epidemics, the “collateral damage” of antibiotics. Because antibiotics are relatively so efficacious, safe, and inexpensive, they are prone to overuse. Inconsiderable attention has been given to when to withhold antibiotics and when to discontinue them once in use. Antibiotic stewardship programs address judicious use, and we recently reviewed specific guidelines for limiting antibiotic use.

In our review, we cited common infections and situations when antibiotics should be withheld in the first place, including viral respiratory syndromes, selected cases of otitis media, asymptomatic bacteriuria in both non-catheterized and catheterized patients, selected cases of skin and soft-tissue infections, and “low-grade fever.”

Also, the traditionally accepted duration of antibiotics should be shortened for such common infections as acute exacerbations of chronic bronchitis, pneumonias, urinary tract infections, intra-abdominal infections, and Staphylococcus aureus bacteremia, as well as for surgical prophylaxis.

While acknowledging that we need more and better data, we suggest that regulatory agencies already begin enforcing existing guidelines for the withholding and withdrawing of antibiotics, to confront the multiple-drug-resistant organism and C difficile epidemics, as the Centers for Medicare & Medicaid Services has done for surgical antibiotic prophylaxis.

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