



Published in final edited form as:

J Community Health. 2011 October ; 36(5): 748–755. doi:10.1007/s10900-011-9369-3.

Hearing Loss and Older Adults' Perceptions of Access to Care

Nancy Pandhi,

Department of Family Medicine, University of Wisconsin, 800 University Bay Drive, Box 9445, Madison, WI 53705, USA

Department of Population Health Sciences, University of Wisconsin School of Medicine and Public Health, 707 WARF Building, 610 North Walnut Street, Madison, WI 53726, USA

Jessica R. Schumacher,

Department of Health Services Research, Management, and Policy, University of Florida, Gainesville, FL, USA

Steven Barnett, and

Department of Family Medicine and Community and Preventive Medicine, University of Rochester Medical Center, Rochester, NY, USA

Maureen A. Smith

Department of Population Health Sciences, University of Wisconsin School of Medicine and Public Health, 707 WARF Building, 610 North Walnut Street, Madison, WI 53726, USA

Nancy Pandhi: nancy.pandhi@fammed.wisc.edu

Abstract

We investigated whether hard-of-hearing older adults were more likely to report difficulties and delays in accessing care and decreased satisfaction with healthcare access than those without hearing loss. The Wisconsin Longitudinal Study (2003–2006 wave, N = 6,524) surveyed respondents regarding hearing, difficulties/delays in accessing care, satisfaction with healthcare access, socio-demographics, chronic conditions, self-rated health, depression, and length of relationship with provider/site. We used multivariate regression to compare access difficulties/delays and satisfaction by respondents' hearing status (hard-of-hearing or not). Hard-of-hearing individuals comprised 18% of the sample. Compared to those not hard-of-hearing, hard-of-hearing individuals were significantly more likely to be older, male and separated/divorced. They had a higher mean number of chronic conditions, including atherosclerotic vascular disease, diabetes and depression. After adjustment for potential confounders, hard-of-hearing individuals were more likely to report difficulties in accessing healthcare (Odds Ratio 1.85; 95% Confidence Interval 1.19–2.88). Satisfaction with healthcare access was similar in both groups. Our findings suggest healthcare access difficulties will be heightened for more of the population because of the increasing prevalence of hearing loss. The prevalence of hearing loss in this data is low and our findings from a telephone survey likely underestimate the magnitude of access difficulties experienced by hard-of-hearing older adults. Further research which incorporates accessible surveys is needed. In the meantime, clinicians should pay particular attention to assessing barriers in healthcare access for hard-of-hearing individuals. Resources should be made available to proactively address these issues for those who are hard-of-hearing and to educate providers about the specific needs of this population.

Keywords

Hearing loss; Healthcare access; Older adults; Presbycusis

Introduction

Hearing loss is prevalent in older adults and is the sixth most common chronic condition in the United States [1]. Thirty-seven million adults in the United States are hard-of-hearing (have some auditory capacity) or are deaf [2]. In Wisconsin, an estimated 46% of the population over age 47 has hearing loss [3]. Individuals with other chronic conditions and physical disabilities report decreased access to care [4] and are less satisfied with their health care [5–8]. Both adults who are hard-of-hearing or deaf [9–11] as well as the physicians who treat them [12] report mutual communication difficulties in the health care setting (e.g., medication safety risks created by problems communicating and understanding a therapeutic plan). As patient-centered communication is an essential element of a satisfactory patient-physician relationship [13–15], these findings have implications for access to care. Better access to care and satisfaction with care are linked to several beneficial patient outcomes including increased adherence [16], improved receipt of preventive services [17], and higher quality of care [18, 19].

Though individuals who are deaf are known to have difficulties and delays in accessing care [20, 21], much less is known about access to health care for hard-of-hearing individuals. This group, which is increasing in size partially due to the aging of the population [22, 23], may be at heightened risk for poor access to care. Older adults, a population disproportionately affected by hearing loss, have increased morbidity from other chronic conditions. This increased morbidity compounded with communication issues in the health care setting can lead to serious safety concerns. One prior study, limited to Medicare beneficiaries, found that “hard-of-hearing” and “deaf/very hard of hearing” individuals were more dissatisfied with access to care than those with no or minor hearing difficulties [24]. However, this sample contained a number of proxy respondents, and the research analyzed as separate groups those who were “hard-of-hearing” and “deaf/very hard-of-hearing.”

Our study objective was to investigate whether older adults who are hard-of-hearing are more likely than other adults to report experiencing difficulties and delays in accessing care and decreased satisfaction with access to care.

Methods

Sample

We used data from the Wisconsin Longitudinal Study (WLS) survey, a long-term cohort study of a one-third random sample ($N = 10,317$) of men and women who graduated from Wisconsin high schools in the spring of 1957 and 8,778 of their randomly selected siblings [25]. In the 2003–2006 round of data collection, all surviving WLS participants were contacted via telephone. Respondents were traced and interviews were conducted and audio-recorded using computer-assisted techniques by the University of Wisconsin Survey Center. Interviews lasted approximately one hour. The response rate for this survey was 80% for graduates and 78% for siblings. Telephone interviews were followed by 54-page mail-out, mail-back surveys that took approximately 90 minutes to complete. Three mailings and one final telephone contact were made to encourage respondents to mail back their questionnaires. Among those who completed the telephone interview, a response rate of 88% for graduates and 81% for siblings was achieved.

We included participants who responded to both the telephone and mail survey and answered questions themselves about their hearing capability on the mail survey. We excluded 181 individuals who lacked insurance because this group was too small for analysis. The final sample size was 6,524. The study was approved by the Institutional Review Board at the participating university.

Variables/Measures

All variables were obtained through respondent self-report. Individuals were categorized as hard-of-hearing if they used hearing aids regularly but still reported problems hearing conversations in person or on the phone during the previous year. As only one in five people who would benefit from a hearing aid use one [26], we included as hard-of-hearing those who reported these problems and did not use a hearing aid regularly. We excluded individuals from the hard-of-hearing category who reported using hearing aids regularly and no problems with hearing conversations.

Items used to construct the two primary dependent variables, difficulties or delays in obtaining health care and satisfaction with access to care, are shown in Table 1. Items for satisfaction with access to care were from an eleven item subscale from the Group Health Association of America (GHAA) Satisfaction Survey [27].

We adjusted analyses for potentially confounding variables. Socio-demographic information included age, gender, marital status, education, total household income, and type of health insurance. Urban or rural residence was constructed using 2004 Rural–Urban Commuting Area (RUCA) codes [28].

Other variables relating to health and physician-patient relationship included the length of relationship with a usual provider in years, the length of relationship with a usual place of care in years, and self-rated health. Self-rated health was assessed with the question, “How would you rate your health at the present time?” Responses were on a 1–5 Likert scale (very poor, poor, fair, good, excellent) and included as a continuous variable. We constructed a count of the following 22 chronic conditions: asthma, bronchitis/emphysema, serious back trouble, circulation problems, kidney/bladder problems, ulcer, allergies, multiple sclerosis, high blood pressure, diabetes, cancer, coronary heart disease/myocardial infarction, stroke, arthritis, pain and stiffness in the joints, mental illness, chronic sinusitis, fibromyalgia, high cholesterol, irritable bowel syndrome, osteoporosis and prostate problems. We also examined diabetes and a count of atherosclerotic vascular disease conditions (high blood pressure, coronary heart disease/myocardial infarction, circulation problems, stroke, high cholesterol) separately due to the association of these conditions with acquired hearing loss [29–31].

Other included variables known to be related to acquired hearing loss and lower levels of access to care included smoking status [32–34] and depressive symptoms [35–37]. Depressive symptoms were measured using the Center for Epidemiological Studies Depression Scale [38], and then dichotomized (<16, >16). A score greater or equal to sixteen is indicative of clinically significant depressive symptoms [39].

Statistical Analysis

Data were analyzed using Stata 10.0 [40]. Initial analyses included means and percentages for all variables for the sample overall. Between hearing group differences were compared by chi-square for categorical variables and one-way analysis of variance for continuous variables. Next, using logistic regression, odds ratios and 95% confidence intervals were calculated for the difficulties and delays in accessing care and linear regression was used to estimate Betas and 95% confidence intervals for satisfaction with access to care. Regression

models compared individuals who were hard-of-hearing to those who were not hard-of-hearing for each dependent variable alone, and then in multivariable models that include all covariates simultaneously (age, gender, marital status, education, total household income, type of health insurance, urban or rural residence, length with a usual place, length with a usual provider, chronic conditions, smoking status, self-rated health, and depressive symptoms). Although the two continuous covariates, self-rated health and a count of chronic conditions were not normally distributed, results did not change significantly if these variables were entered in the model as categorical. We accounted for clustering of siblings within families by calculating confidence intervals and significance tests using the Stata 'robust' command, clustering family explicitly [41–43]. Wald tests were conducted to determine the statistical significance for groups of indicator variables. Results were considered statistically significant at a P value <0.05 .

Results

Table 2 indicates the study population socio-demographic characteristics overall and by hearing capability. Eighteen percent of individuals in the sample were hard-of-hearing. The 1,203 individuals who were hard-of-hearing differed significantly from the 5,321 who were not hard-of-hearing. Those who were hard-of-hearing were older, more likely to be male, separated/divorced, and to have Medicare insurance as compared to private or other public insurance. The length of a relationship with a usual place or usual provider did not vary by hearing status (data not shown).

Table 2 also shows the difference in utilization and health characteristics by hearing capability, and overall. Individuals who were hard-of-hearing differed from those not hard-of-hearing by having a higher average number of chronic conditions. They were proportionally more likely to have diabetes mellitus, atherosclerotic vascular disease, clinically significant depressive symptoms, and had slightly lower self-rated health. Thirteen percent of those hard-of-hearing reported experiencing difficulties and delays in healthcare access in the past 12 months as compared to 8% of those not hard-of-hearing ($P < 0.01$). Satisfaction with access to care was significantly lower for those hard-of-hearing, compared to those without hearing difficulty ($P < 0.01$).

As shown in Table 3, after adjustment for potential confounders, hard-of-hearing individuals still were more likely to report difficulties and delays in accessing healthcare in the past 12 months. Other significant predictors of reporting difficulties and delays in accessing care were having a bachelor's degree as compared to a high school education or less, having an increased number of chronic conditions, and having significant depressive symptoms.

Also shown in Table 3, after adjustment, satisfaction with access to care was similar in those who were and were not hard-of-hearing. Significant predictors of higher satisfaction with access to care were female gender, Medicare insurance, and higher self-rated health. Those who had significant depressive symptoms reported significantly lower satisfaction with access to care as compared to those without significant depressive symptoms.

Discussion

We found individuals who were hard-of-hearing as compared to those not hard-of-hearing to be significantly more likely to report experiencing difficulties and delays in accessing care. The disparity in access persisted even after controlling for several variables known to influence health care access and satisfaction. However, the two groups did not differ on satisfaction with access to care.

Our findings differ from prior studies that found lower satisfaction with access to care in populations with disabilities [24, 44–46]. However, our study design allowed us to include variables not included in these prior studies that are known to have an important effect on satisfaction with access to care. In particular, we adjusted for depression, which has a significant negative effect on satisfaction with access to care [47]. Our unadjusted results did reveal a statistically significant difference in satisfaction with access to care between groups (Table 2). Alternatively, differences in sample populations also may account for our varying results. In particular, nearly one-third of the responses to the Medicare Care Beneficiary Survey were completed by proxies, allowing for representation from those with more profound disabilities such as severe hearing loss [24]. The focus in our sample was on those hard-of-hearing, but able to complete their own telephone surveys. Alternatively, our sample was predominantly well educated and white. Therefore, some of our differences may be explained by the different socio-demographic factors of our sample as compared to samples drawn from nationally representative surveys.

Our findings of similar satisfaction with access to care despite significant differences in perceived difficulties and delays in accessing care adds to the literature suggesting that detailed questions about barriers to accessing care may be more helpful than a summary satisfaction measure. Discrepancies between overall high satisfaction scores and reported problems with care have been reported after hospitalization [48, 49] leading to a call for specificity in patient feedback when identifying problems for intervention [50].

Our findings should be considered in light of several limitations. Our sample represents individuals who were attending Wisconsin high schools in the 1950s and therefore is limited in geographical and racial/ethnic diversity. Our classification of individuals as hard-of-hearing is based on self-report and thus may be subject to misclassification bias. However, the accuracy of self-reported hearing loss has been validated in older adult populations [51]. Next, the proportion of individuals with hearing loss in our sample was substantially lower than that estimated in an age matched older adult population. This discrepancy is partially explained by the relatively high education bias and income in our sample, as hearing loss is inversely associated with these factors [3]. Also, by using data from respondents to a combined telephone and mail survey, our findings excluded hard-of-hearing individuals who could not use a telephone because of their hearing loss, did not feel comfortable answering questions on the telephone [52, 53], or did not own a phone [54]. By excluding these individuals it is likely that analyses of the Wisconsin Longitudinal Study data underestimate actual disparities in access to care. Further research in this area incorporating methods other than telephone surveys is needed.

In conclusion, our findings suggest that adults who are hard-of-hearing are more likely to experience difficulties and delays in accessing health care as compared to those who are not hard-of-hearing. Further investigation is needed into why hard-of-hearing individuals report more difficulties and delays in accessing care. This research could examine the age of onset of hearing difficulty in relation to differences in health care behavior, and incorporate survey methods other than telephone surveys. Our findings are concerning for multiple reasons. First, with the increasing prevalence of hearing loss [23], access to care issues will be heightened for more of the population. Furthermore, as there is significant co-morbidity associated with hearing-loss, poor access [55, 56] compounded by known communication difficulties in the physician-patient relationship [9–12] poses serious health risks. Clinicians should pay particular attention to assessing barriers in access to care for hard-of-hearing individuals. Resources should be made available to proactively address the access to care issues for those who are hard-of-hearing and to educate providers about the specific needs of this population.

Acknowledgments

We acknowledge that this project was supported by the Community-Academic Partnerships core of the University of Wisconsin Institute for Clinical and Translational Research (UW ICTR) funded through an NIH Clinical and Translational Science Award (CTSA), grant number 1 UL1 RR025011. In addition, Nancy Pandhi is supported by a National Institute on Aging Mentored Clinical Scientist Research Career Development Award, grant number 1 K08 AG029527. Steven Barnett is supported by grant K08 HS15700 from the Agency for Healthcare Research and Quality (AHRQ). This research uses data from the Wisconsin Longitudinal Study (WLS) of the University of Wisconsin-Madison. Since 1991, the WLS has been supported principally by the National Institute on Aging (R01 AG09775, R01 AG033285), with additional support from the Vilas Estate Trust, the National Science Foundation, the Spencer Foundation, and the Graduate School of the University of Wisconsin-Madison. A public use file of data from the Wisconsin Longitudinal Study is available from the Wisconsin Longitudinal Study, University of Wisconsin-Madison, 1180 Observatory Drive, Madison, Wisconsin, 53706 and at <http://www.ssc.wisc.edu/wlsresearch/data/>. The opinions expressed herein are those of the authors.

References

- Collins JG. Prevalence of selected chronic conditions: United States, 1990–1992. *Vital Health Statistics*. 1997; 10(194):1–89.
- Pleis JR, Lethbridge-Cejku M. Summary health statistics for U.S. adults: National Health Interview Survey, 2005. *Vital Health Statistics*. 2006; 10(10):1–153.
- Cruickshanks KJ, Wiley TL, Tweed TS, et al. Prevalence of hearing loss in older adults in Beaver Dam, Wisconsin: The epidemiology of hearing loss study. *American Journal of Epidemiology*. 1998; 148:879–886. [PubMed: 9801018]
- Hwang W, Weller W, Ireys H, Anderson G. Out-of-pocket medical spending for care of chronic conditions. *Health Affairs (Millwood)*. 2001; 20:267–278.
- Patrick DL, Scrivens E, Charlton JRH. Disability and patient satisfaction with medical care. *Medical Care*. 1983; 21:1062–1075. [PubMed: 6228699]
- Hall JA, Milburn MA, Epstein AM. A causal model of health status and satisfaction with medical care. *Medical Care*. 1993; 31:84–94. [PubMed: 8417273]
- Jha A, Patrick DL, MacLehose RF, Doctor JN, Chan L. Dissatisfaction with medical services among Medicare beneficiaries with disabilities. *Archives of Physical Medicine and Rehabilitation*. 2002; 83:1335–1341. [PubMed: 12370864]
- Kerr EA, Smith DM, Kaplan SH, Hayward RA. The association between three different measures of health status and satisfaction among patients with diabetes. *Medical Care Research and Review*. 2003; 60:158–177. [PubMed: 12800682]
- Iezzoni LI, O'Day BL, Killeen M, Harker H. Communicating about health care: Observations from persons who are deaf or hard of hearing. *Annals of Internal Medicine*. 2004; 140:356–362. [PubMed: 14996677]
- Zazove P, Niemann LC, Gorenflo DW, et al. The health status and health care utilization of deaf and hard-of-hearing persons. *Archives of Family Medicine*. 1993; 2:745–752. [PubMed: 8111500]
- Barnett S. Communication with deaf and hard-of-hearing people: a guide for medical education. *Academic Medicine*. 2002; 77:694–700. [PubMed: 12114142]
- Ralston E, Zazove P, Gorenflo DW. Physicians' attitudes and beliefs about deaf patients. *Journal of the American Board of Family Practice*. 1996; 9:167–173. [PubMed: 8743229]
- Roter DL, Hall JA, Katz NR. Relations between physicians' behaviors and analogue patients' satisfaction, recall, and impressions. *Medical Care*. 1987; 25:437–451. [PubMed: 3695654]
- Henbest RJ, Stewart M. Patient-centeredness in the consultation. 2: Does it really make a difference? *Family Practice*. 1990; 7:28–33. [PubMed: 2318368]
- Roter DL, Stewart M, Putnam S, Lipkin M Jr, Stiles W, Inui T. Communication patterns of primary care physicians. *Journal of the American Medical Association*. 1997; 277:350–356. [PubMed: 9002500]
- Sherbourne CD, Hays RD, Ordway L, DiMatteo MR, Kravitz RL. Antecedents of adherence to medical recommendations: Results from the Medical Outcomes Study. *Journal of Behavioral Medicine*. 1992; 15:447–468. [PubMed: 1447757]

17. DeVoe JE, Fryer GE, Phillips R, Green L. Receipt of preventive care among adults: Insurance status and usual source of care. *American Journal of Public Health*. 2003; 93:786–791. [PubMed: 12721145]
18. Franks P, Clancy CM, Gold MR. Health insurance and mortality. Evidence from a national cohort. *Journal of the American Medical Association*. 1993; 270:737–741. [PubMed: 8336376]
19. Narayan KMV, Gregg EW, Fagot-Campagna A, et al. Relationship between quality of diabetes care and patient satisfaction. *Journal of the National Medical Association*. 2003; 95:64–70. [PubMed: 12656451]
20. Steinberg AG, Barnett S, Meador HE, Wiggins EA, Zazove P. Health care system accessibility. Experiences and perceptions of deaf people. *Journal of General Internal Medicine*. 2006; 21:260–266. [PubMed: 16499543]
21. Barnett S, Franks P. Health care utilization and adults who are deaf: Relationship with age at onset of deafness. *Health Services Research*. 2002; 37:105–120. [PubMed: 11949915]
22. Shargorodsky J, Curhan SG, Curhan GC, Eavey R. Change in prevalence of hearing loss in US adolescents. *Journal of the American Medical Association*. 2010; 304:772–778. [PubMed: 20716740]
23. Agrawal Y, Platz EA, Niparko JK. Prevalence of hearing loss and differences by demographic characteristics among US adults - Data from the National Health and Nutrition Examination Survey, 1999–2004. *Archives of Internal Medicine*. 2008; 168:1522–1530. [PubMed: 18663164]
24. Iezzoni LI, Davis RB, Soukup J, O’Day B. Satisfaction with quality and access to health care among people with disabling conditions. *International Journal for Quality in Health Care*. 2002; 14:369–381. [PubMed: 12389803]
25. Hauser, RM.; Willis, RJ. Survey design and methodology in the Health and Retirement Study and the Wisconsin Longitudinal Study. In: Waite, LJ., editor. *Aging, health and public policy: Demographic and economic perspectives*. New York: Population Council; 2004. p. 209-235.
26. Popelka MM, Cruickshanks KJ, Wiley TL, Tweed TS, Klein BE, Klein R. Low prevalence of hearing aid use among older adults with hearing loss: The Epidemiology of Hearing Loss Study. *Journal of the American Geriatrics Society*. 1998; 46:1075–1078. [PubMed: 9736098]
27. Davies, AR.; Ware, JE. *GHAA’s consumer satisfaction survey and user’s manual*. 2nd Ed.. Washington, DC: Group Health Association of America; 1991.
28. WWMAI Rural Health Research Center. [Accessed December 21, 2010] ZIP Code RUCA approximation methodology [Internet]. at <http://depts.washington.edu/uwruca/index.php>.
29. Bainbridge KE, Hoffman HJ, Cowie CC. Diabetes and hearing impairment in the United States: audiometric evidence from the National Health and Nutrition Examination Survey, 1999 to 2004. *Annals of Internal Medicine*. 2008; 149:1–10. [PubMed: 18559825]
30. Friedland DR, Cederberg C, Tarima S. Audiometric pattern as a predictor of cardiovascular status: development of a model for assessment of risk. *The Laryngoscope*. 2009; 119:473–486. [PubMed: 19235737]
31. Gopinath B, Schneider J, Rochtchina E, Leeder SR, Mitchell P. Association between age-related hearing loss and stroke in an older population. *Stroke*. 2009; 40:1496–1498. [PubMed: 19246693]
32. Cruickshanks KJ, Klein R, Klein BEK, Wiley TL, Nondahl DM, Tweed TS. Cigarette smoking and hearing loss—The Epidemiology of Hearing Loss study. *Journal of the American Medical Association*. 1998; 279:1715–1719. [PubMed: 9624024]
33. Wilper AP, Woolhandler S, Lasser KE, McCormick D, Bor DH, Himmelstein DU. Health insurance and mortality in US adults. *American Journal of Public Health*. 2009; 99:2289–2295. [PubMed: 19762659]
34. Kahende JW, Adhikari B, Maurice E, Rock V, Malarcher A. Disparities in health care utilization by smoking status—NHANES 1999–2004. *International Journal of Environmental Research and Public Health*. 2009; 6:1095–1106. [PubMed: 19440435]
35. Arlinger S. Negative consequences of uncorrected hearing loss—A review. *International Journal of Audiology*. 2003; 42:17–20.
36. Monzani D, Galeazzi GM, Genovese E, Marrara A, Martini A. Psychological profile and social behaviour of working adults with mild or moderate hearing loss. *Acta Otorhinolaryngologica Italica*. 2008; 28:61–66. [PubMed: 18669069]

37. Abrams TE, Barnett MJ, Hoth A, Schultz S, Kaboli PJ. The relationship between hearing impairment and depression in older veterans. *Journal of the American Geriatrics Society*. 2006; 54:1475–1477. [PubMed: 16970669]
38. Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. *Application of Psychological Measures*. 1977; 1:385–401.
39. Berkman LF, Berkman CS, Kasl S, et al. Depressive symptoms in relation to physical health and functioning in the elderly. *American Journal of Epidemiology*. 1986; 124:372–388. [PubMed: 3740038]
40. Version 10. College Station, TX: StataCorp LP; 2007. *Stata Statistical Software*. [computer program]
41. Huber, PJ. The behavior of maximum likelihood estimates under non-standard conditions. Paper presented at: Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability; Berkeley and Los Angeles, CA. 1967.
42. White H. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica*. 1980; 48:817–838.
43. Rogers WH. SG17: regression standard errors in clustered samples. *Stata Technical Bulletin*. 1993; 13:19–23.
44. Fouts BS, Andersen E, Hagglund K. Disability and satisfaction with access to health care. *Journal of Epidemiology and Community Health*. 2000; 54:770–771. [PubMed: 10990482]
45. Meng YY, Jatulis DE, McDonald JP, Legorreta AP. Satisfaction with access to and quality of health care among Medicare enrollees in a health maintenance organization. *Western Journal of Medicine*. 1997; 166:242–247. [PubMed: 9168681]
46. Jatulis DE, Bundek NI, Legorreta AP. Identifying predictors of satisfaction with access to medical care and quality of care. *American Journal of Medical Quality*. 1997; 12:11–18. [PubMed: 9116525]
47. Desai RA, Stefanovics EA, Rosenheck RA. The role of psychiatric diagnosis in satisfaction with primary care—Data from the Department of Veterans Affairs. *Medical Care*. 2005; 43:1208–1216. [PubMed: 16299432]
48. Cleary PD, Edgman-Levitan S, McMullen W, Delbanco TL. The relationship between reported problems and patient summary evaluations of hospital care. *QRB Quality Review of Bulletin*. 1992; 18:53–59.
49. Jenkinson C, Coulter A, Bruster S, Richards N, Chandola T. Patients' experiences and satisfaction with health care: Results of a questionnaire study of specific aspects of care. *Quality and Safety in Health Care*. 2002; 11:335–339. [PubMed: 12468693]
50. Fitzpatrick R. Capturing what matters to patients when they evaluate their hospital care. *Quality and Safety in Health Care*. 2002; 11:306. [PubMed: 12468687]
51. Sindhusake D, Mitchell P, Smith W, et al. Validation of self-reported hearing loss. The Blue Mountains Hearing Study. *International Journal of Epidemiology*. 2001; 30:1371–1378. [PubMed: 11821349]
52. Parsons, J.; Baum, S.; Johnson, T. Inclusion of disabled populations in social surveys: Review and recommendations. Chicago: University of Illinois; 2000.
53. Kirchner C. Improving research by assuring access. *Footnotes*. 1998; 26:7.
54. Barnett S, Franks P. Telephone ownership and deaf people: Implications for telephone surveys. *American Journal of Public Health*. 1999; 89:1754–1756. [PubMed: 10553404]
55. Mulrow CD, Aguilar C, Endicott JE, et al. Quality-of-life changes and hearing impairment—A randomized trial. *Annals of Internal Medicine*. 1990; 113:188–194. [PubMed: 2197909]
56. Strawbridge WJ, Wallhagen MI, Shema SJ, Kaplan GA. Negative consequences of hearing impairment in old age: A longitudinal analysis. *The Gerontologist*. 2000; 40:320–326. [PubMed: 10853526]

Table 1

Items used to construct difficulties or delays in obtaining health care and satisfaction with access to care dependent variables

Difficulties or delays in obtaining health care^a

In the past 12 months, did you experience difficulty or delay in obtaining any type of health care, or not receive health care that you thought you needed due to any of the reasons listed below?

- Couldn't afford medical care
- Insurance company wouldn't approve
- Cover or pay for care
- Insurance required a referral, but couldn't get one
- Doctor refused to accept insurance plan
- Medical care was too far away
- Too expensive to get there
- Couldn't get there when doctor's office was open
- Didn't know where to get care
- Took too long to get an appointment
- Couldn't get through on telephone to make an appointment

Satisfaction with access to care^{b,c}

Thinking about your own health care, how would you rate the following?

- Convenience of doctor's office
 - Hours when the doctor's office is open
 - Access to specialty care if needed
 - Access to hospital care if needed
 - Access to medical care in an emergency
 - Access to mental health care if needed
 - Arrangements for making medical appointments by phone
 - Length of time spent waiting at the office to see the doctor
 - Length of time between making appointment for routine care and day of visit
 - Availability of medical information or advice by phone
 - Access to medical care whenever needed
 - Services available for getting prescriptions filled
-

^a Response is yes/no

^b Response on a 1–5 scale (poor, fair, good, very good, excellent)

^c Items for satisfaction with access to care were from an eleven item subscale from the Group Health Association of America (GHAA) Satisfaction Survey [27]

Table 2

Demographics, health factors, and health care access by hearing capability

	Overall population (N = 6,524)	By hearing capability		P value
		Not hard-of-hearing (N = 5,321)	Hard-of-hearing (N = 1,203)	
Mean age (SD)	64 (5)	64 (5)	65 (5)	<0.01
40–54	5	5	4	
55–64	46	47	43	
65+	49	48	53	
Female	53	55	41	<0.001
Marital status				<0.01
Married	79	79	78	
Separated/divorced	10	10	12	
Widowed	7	7	7	
Never married	4	4	2	
Educational attainment				0.23
High school or less	52	51	52	
Some college	17	17	17	
College	15	15	16	
Post-graduate	16	16	14	
Total household income (\$)				0.34
Less than \$30,000	17	17	17	
\$30,000–\$44,999	15	15	15	
\$45,000–59,999	13	13	13	
\$60,000–\$74,999	11	11	11	
Greater than \$75,000	30	31	29	
Missing	13	13	15	
Rural residence	33	32	35	0.28
Health insurance				0.03
Private	47	48	44	
Medicare + other private	40	39	42	
Medicare	12	11	13	
Other public	2	2	1	
Ever a regular smoker	55	54	57	0.08
Number of chronic conditions mean (SD) ^a	3.6 (2.5)	3.5 (2.5)	4.2 (2.7)	<0.001
Atherosclerotic vascular disease	49	47	55	<0.001
Diabetes	12	12	15	<0.01
Self-rated health mean (SD) ^b	4.0 (0.69)	4.0 (0.68)	3.9 (0.71)	<0.001
High depressive symptomatology ^c	35	33	46	<0.001
Difficulties/delays in health care access	9	8	13	<0.001
Satisfaction with access to care mean (SD) ^d	3.6 (0.7)	3.7 (0.7)	3.6 (0.7)	<0.001

Values represent percents unless specified otherwise

^aThe following 22 chronic conditions were measured in this count: asthma, bronchitis/emphysema, serious back trouble, circulation problems, kidney/bladder problems, ulcer, allergies, multiple sclerosis, high blood pressure, diabetes, cancer, coronary heart disease/myocardial infarction, stroke, arthritis, pain and stiffness in the joints, mental illness, chronic sinusitis, fibromyalgia, high cholesterol, irritable bowel syndrome, osteoporosis and prostate problems

^bSelf-rated health was assessed with the question, “How would you rate your health at the present time?” Responses were on a 1–5 Likert scale (very poor, poor, fair, good, excellent)

^cDepressive symptoms were measured using the Center for Epidemiological Studies Depression Scale [38], and a score greater or equal to sixteen as indicative of clinically significant depressive symptoms [39]

^dSummary measure of 11 items where 1 = poor and 5 = excellent

Table 3

Adjusted odds ratios and Betas with 95% confidence intervals for difficulties and delays in care and satisfaction with access to care

	Experienced difficulties/delays in care in the past 12 months		Satisfaction with access to care	
	OR	95% CI	Beta	95% CI
Hard-of-hearing	1.85	(1.19, 2.88)	-0.06	(-0.15, 0.02)
65+ years old	0.99	(0.57, 1.71)	-0.07	(-0.17, 0.03)
Female	1.23	(0.80, 1.89)	0.10	(0.02, 0.17)
Marital status				
Separated/divorced	1.25	(0.62, 2.52)	-0.08 ^a	(-0.20, 0.05)
Widowed	1.52	(0.77, 3.02)	0.00	(-0.14, 0.13)
Never married	1.94	(0.85, 4.45)	-0.03	(-0.20, 0.15)
Educational attainment				
Some college	1.64	(0.95, 2.83)	0.04	(-0.06, 0.15)
College	2.38	(1.34, 4.26)	0.11	(0.00, 0.22)
Post-graduate	1.39	(0.72, 2.69)	0.12	(0.00, 0.23)
Total household income (\$)				
\$30,000–\$44,999	0.98	(0.52, 1.84)	-0.05	(-0.16, 0.05)
\$45,000–\$59,999	1.18	(0.62, 2.24)	0.03	(-0.08, 0.14)
\$60,000–\$74,999	0.96	(0.45, 2.04)	0.10	(-0.03, 0.23)
Greater than \$75,000	1.02	(0.53, 1.95)	0.07	(-0.04, 0.17)
Missing	0.80	(0.24, 2.65)	0.04	(-0.14, 0.22)
Residence				
Rural resident	0.67	(0.42, 1.05)	0.01	(-0.06, 0.08)
Health insurance				
Medicare + other private	1.42	(0.79, 2.55)	0.04	(-0.07, 0.14)
Medicare	1.14	(0.48, 2.68)	0.22	(0.08, 0.36)
Other public	3.99 ^a	(1.37, 11.6)	0.11	(-0.17, 0.39)
Ever a regular smoker	1.27	(0.84, 1.92)	0.06	(-0.01, 0.13)
Number of chronic conditions ^b	1.11	(1.02, 1.22)	0.01	(-0.01, 0.02)
Atherosclerotic vascular disease ^c	0.80	(0.52, 1.24)	0.03	(-0.05, 0.10)
Diabetes ^d	0.70	(0.40, 1.22)	0.01	(-0.09, 0.10)
Self-rated health ^e	0.87	(0.62, 1.24)	0.12	(0.06, 0.17)
High depressive symptomatology ^f	1.63	(1.07, 2.49)	-0.16	(-0.23, -0.08)

Bold values indicate statistical significance at $P < 0.05$

This model included the following covariates: age, gender, marital status, education, total household income, type of health insurance, urban or rural residence, length with a usual place, length with a usual provider, chronic conditions, smoking status, self-rated health, and depressive symptoms. Referent groups were: not hard-of-hearing, less than 65 years old, male, married, high school or less, total household income under \$30,000, urban resident, private insurance, never a smoker, no chronic conditions, no atherosclerotic vascular disease, no diabetes, very poor self-rated health, and no clinically significant depressive symptoms

^aResults were not significant when tested as a group of indicator variables

^bThe following 22 chronic conditions were measured in this count: asthma, bronchitis/emphysema, serious back trouble, circulation problems, kidney/bladder problems, ulcer, allergies, multiple sclerosis, high blood pressure, diabetes, cancer, coronary heart disease/myocardial infarction, stroke, arthritis, pain and stiffness in the joints, mental illness, chronic sinusitis, fibromyalgia, high cholesterol, irritable bowel syndrome, osteoporosis and prostate problems

^cA separate model that did not include the number of chronic conditions gave the following results: atherosclerotic vascular disease OR 0.94 (0.45–1.36) and Beta 0.03 (–0.03 to 0.10)

^dA separate model that did not include the number of chronic conditions gave the following results: diabetes OR 0.78 (0.45–1.36) and Beta 0.01 (–0.08 to 0.11)

^eSelf-rated health was assessed with the question, “How would you rate your health at the present time?” Responses were on a 1–5 Likert scale (very poor, poor, fair, good, excellent)

^fDepressive symptoms were measured using the Center for Epidemiological Studies Depression Scale [38], and a score greater or equal to sixteen as indicative of clinically significant depressive symptoms [39]