RESEARCH LETTERS

The Prevalence of Concurrent Hearing and Vision Impairment in the United States

The prevalence of dual sensory impairment (DSI) in hearing and vision has been estimated previously using self-reported data,[1] nonrepresentative population samples,[2] or populations outside of the United States.[3] These estimates may not accurately reflect the true burden of DSI in the United States. We determined the prevalence of DSI using objective assessments of hearing and vision in a nationally representative sample of US adults.

Methods. We analyzed data from the 1999-2006 cycles of the National Health and Nutritional Examination Surveys (NHANES), a study designed to assess the health of a nationally representative sample of noninstitutionalized, civilian US residents.[4]

Air conduction pure-tone audiometry performed in a sound attenuating booth was administered to a half-sample of all participants aged 20 to 69 years from 1999 through 2004 and all participants 70 years or older from 2005 through 2006 according to established NHANES protocols. A speech-frequency pure-tone average (average of hearing thresholds at 0.5, 1, 2, and 4 kHz) greater than 25 dB in the better ear was defined as hearing impairment per World Health Organization criteria.[5]

For all participants 20 years or older from 1999 through 2006, visual acuity was determined for each eye using the individual's presenting correction (if any) and reassessed after autorefraction in eyes with a presenting acuity worse than 20/25.[4] Visual impairment was defined by having a postautorefraction visual acuity worse than 20/40 in the better-seeing eye.

Four categories of sensory impairment were defined: DSI (concurrent hearing and vision impairment); hearing impairment (HI); vision impairment (VI); and no impairment (neither hearing nor vision impairment). Prevalence estimates were determined by age decade and sex.

Table. Prevalence (%) and Number (in Millions) of Adults by Hearing and Vision Impairment Status: National Health and Examination Surveys, 1999 Through 2006[a]

	Hearing and Vision Impairment[b]		Hearing Impairment[b,c]		Vision Impairment[b,c]		No Impairment[b]	
Age Group, y	Prevalence (95% CI)	No.	Prevalence (95% CI)	No.	Prevalence (95% CI)	No.	Prevalence (95% CI)	No.
Total population								
20-29	0	0.00	0.5 (0.0-1.0)	0.20	0.5 (0.2-0.9)	0.20	99.0 (98.4-99.6)	37.50
30-39	0	0.00	1.9 (0.8-3.0)	0.78	0.8 (0.2-1.4)	0.34	97.4 (96.2-98.6)	40.48
40-49	0.1 (0.0-0.3)	0.05	5.7 (4.0-7.5)	2.49	0.4 (0.0-1.1)	0.19	94.2 (92.5-95.9)	40.99
50-59	0.1 (0.0-0.2)	0.02	13.7 (10.7-16.7)	4.58	0.2 (0.0-0.4)	0.06	86.3 (83.1-89.5)	28.83
60-69	0.3 (0.0-0.7)	0.07	29.3 (24.6-34.0)	6.18	1.1 (0.4-1.9)	2.50	69.8 (65.0-74.6)	14.73
70-79	2.2 (1.0-3.8)	0.36	55.1 (48.0-62.2)	8.77	3.4 (1.9-5.0)	0.55	44.1 (37.3-50.9)	7.02
≥80	11.3 (7.8-14.8)	1.05	79.1 (76.0-82.2)	7.33	15.9 (11.9-19.8)	1.47	18.8 (15.0-22.6)	1.75
Total[d]		**1.54**		**30.32**		**5.31**		**171.29**
Men								
20-29	0	0.00	0.8 (0.0-1.7)	0.15	0.6 (0.2-1.0)	0.12	98.6 (97.6-99.5)	18.59
30-39	0	0.00	2.9 (1.0-4.8)	5.95	0.7 (0.0-1.4)	0.14	96.7 (94.9-98.5)	19.76
40-49	0.2 (0.0-0.6)	0.05	7.4 (4.5-10.3)	1.58	0.8 (0.0-2.1)	0.17	92.4 (89.3-95.5)	19.66
50-59	0	0.00	20.8 (16.1-25.6)	3.38	0.0 (0.0-0.0)	0.00	79.4 (74.3-84.8)	12.87
60-69	0.2 (0.0-0.5)	0.02	41.0 (34.7-47.2)	4.05	0.3 (0.0-0.6)	0.02	58.1 (51.6-64.6)	5.75
70-79	2.0 (0.0-4.1)	0.14	63.4 (56.2-70.5)	4.39	3.2 (0.0-6.7)	0.22	35.4 (28.1-42.8)	2.45
≥80	10.2 (4.8-15.6)	0.35	84.6 (79.0-90.3)	2.90	13.6 (8.0-19.2)	0.47	15.2 (9.9-20.6)	0.52
Total[d]		**0.55**		**22.40**		**1.13**		**79.59**
Women								
20-29	0	0.00	0.2 (0.0-0.5)	0.04	0.4 (0.0-1.1)	0.08	99.5 (98.8-100)	18.91
30-39	0	0.00	0.9 (0.0-1.9)	0.18	1.0 (0.0-1.9)	0.20	98.1 (96.9-99.3)	20.73
40-49	0	0.00	4.2 (1.5-6.9)	9.37	0.1 (0.1-0.4)	0.03	95.8 (93.4-98.3)	21.32
50-59	0.1 (0.0-0.4)	0.02	7.1 (4.7-9.5)	12.23	0.3 (0.0-0.8)	0.06	92.8 (90.1-95.4)	15.94
60-69	0.5 (0.0-1.1)	0.05	18.6 (13.7-23.4)	2.08	2.0 (0.6-3.3)	2.19	80.4 (75.3-85.6)	9.02
70-79	2.4 (0.0-5.0)	0.22	48.4 (38.5-58.5)	4.35	3.7 (2.2-5.2)	0.33	51.3 (14.9-42.8)	4.61
≥80	11.9 (4.7-19.2)	0.70	75.6 (69.7-81.5)	4.41	17.3 (10.6-24.0)	1.01	21.0 (16.0-26.1)	1.23
Total[d]		**0.99**		**32.67**		**3.90**		**91.74**

[a] Hearing impairment defined as having a speech-frequency pure-tone average of hearing thresholds at 0.5-, 1-, 2-, and 4-kHz tones of greater than 25 dB in the better-hearing ear; vision impairment defined as having postautorefraction visual acuity worse than 20/40 in the better-seeing eye.

[b] Impairment categories: hearing and vision impairment (DSI), individuals with simultaneous hearing and vision impairment); hearing impairment (HI); vision impairment (VI); and no impairment (individuals without hearing or vision impairment).

[c] The HI and VI categories are not mutually exclusive.

[d] Numbers do not sum to group total due to rounding.

The US population counts were estimated using the midpoint of population totals in each NHANES 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.

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Results. We estimate that from 1999 through 2006 approximately 1.5 million Americans 20 years or older had DSI, with nearly all affected individuals being older adults (**Table**). For individuals younger than 70 years, the prevalence of DSI was less than 1%, but among individuals 80 years or older, 11.3% had DSI, and only 19% remained free of having any sensory impairment. Prevalence rates for DSI were not substantively different between men and women at any age decade. At each age decade, the prevalence of HI was greater in men than in women; however, the prevalence of VI was not different between men and women at any age.

Comment. To our knowledge, this study presents the first national prevalence estimates of DSI in the United States based on objective data. Our results demonstrate that 1 in 9, or 11.3%, of all adults 80 years or older has prevalent DSI. This estimate is substantially higher than previous national estimates of DSI based on self-reported impairment among older adults[1] (6.6%). Other estimates of DSI prevalence using objective assessments were based on a cohort of veterans[2] or an Australian population[3] and may not be generalizable to US adults.

Despite the relatively high prevalence in older adults, there is an inadequate understanding of the impact of DSI on cognition and physical functioning. Concurrent vision impairment could potentially accelerate the rate of cognitive decline and dementia previously reported in individuals with hearing impairment alone.[6] There is also a lack of research examining how to effectively treat or rehabilitate older adults with DSI. Interdisciplinary, collaborative research efforts between ophthalmologists, otolaryngologists, and geriatricians are urgently needed to investigate the impacts of DSI, as well as to examine possible treatment and rehabilitative strategies in older adults.

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Characteristics of Cluster Randomized Trials: Are They Living Up to the Randomized Trial?

Cluster randomized control trials (RCTs) are a form of prospective study where groups of individuals are allocated to an intervention. They offer the unique advantage of rigorously evaluating practices that cannot feasibly be randomized to the individual—such as public health or quality programs.[1] While

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cluster RCTs can test questions traditional RCTs cannot, the design requires more participants to achieve equivalent statistical power.[1] Over the last decade, the number of cluster RCTs have grown dramatically,[2] but some researchers remain uncertain of how to interpret this study design.