

Vision Impairment and Hearing Loss Among Community-Dwelling Older Americans: Implications for Health and Functioning

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Sensory problems are common experiences within the older US population. Of people aged ≥ 70 years, 18% report blindness in 1 or both eyes or some other trouble seeing, 33.2% report problems with hearing, and 8.6% report problems with both hearing and seeing.¹ Precisely because these experiences are so common, they are often overlooked or dismissed.² Moreover, normal age-related changes in hearing and vision may be confused with abnormal sensory changes that can compromise function. Likewise, abnormal changes due to eye and ear pathology may be confused with normal age-related sensory changes.

Hearing and vision problems are not manifest disabilities, and both can lead to misdiagnosis or misunderstanding. For example, an older person with vision problems may appear timid, hesitant, or confused, especially when confronted with a new situation.³ Similarly, older people with hearing loss may miss the nuances of conversation and appear confused, creating unjustified impatience on the part of those with whom they are speaking.⁴ These experiences may lead to isolation, disappointment, and frustration.⁵

When decrements in vision and hearing exceed normal age-related changes that are due to eye pathology, they may begin to compromise an older person's ability to carry out routine activities that define social roles and quality of life.⁶ Either hearing or vision loss can affect the most common and simple tasks. Sensory decline may compromise one's ability to hear whispered conversation or side remarks, write notes, read the newspaper, and recognize facial expressions.

The relation between vision and various health conditions and activity limitations among older people is well documented, but few studies are population based. Diminished vision is associated with decreases in

Objectives. We investigated the health, activity, and social participation of people aged 70 years or older with vision impairment, hearing loss, or both.

Methods. We examined the 1994 Second Supplement on Aging to determine the health and activities of these 3 groups compared with those without sensory loss. We calculated odds ratios and classified variables according to the *International Classification of Functioning, Disability and Health* framework.

Results. Older people with only hearing loss reported disparities in health, activities, and social roles; those with only vision impairment reported greater disparities; and those with both reported the greatest disparities.

Conclusions. A hierarchical pattern emerged as impairments predicted consistent disparities in activities and social participation. This population's patterns of health and activities have public health implications. (*Am J Public Health*. 2004; 94:823–829)

leisure activities,^{7,8} Instrumental Activities of Daily Living (IADL) performance and social function,² Activities of Daily Living (ADL),⁹ and compromised mobility^{10,11}; it is also associated with increases in hip fractures,¹² falls,¹³ depression,^{14,15} physician visits and hospitalizations,¹⁶ mortality,¹⁷ and family stress.^{18–20}

Hearing loss is associated with decreased functional and psychosocial impairments²¹; increased social isolation,²² depression,^{23,24} and rates of dementia²⁵; it is also associated with accelerated cognitive decline in dementia.²⁶ Declines in vision and hearing are associated with decreased quality of life,²⁷ increased physical disability measured by IADL among women,²⁸ imbalance,^{29,5} falls,^{30,31,13} hip fracture,¹² and mortality.^{32,33}

Few investigators have examined the discrete concerns associated with sensory loss as defined by hearing loss, vision impairment, and both vision impairment and hearing loss. Two recent articles are of particular interest. Keller et al.³⁴ examined ADL and IADL among a group of 576 older people seen at the University of Nebraska Medical Center. Vision impairment was defined as a near visual acuity of 20/70 or less, and hearing was measured by a whisper test. In this study,

51% of subjects were classified as having a hearing impairment only; 5% had a vision impairment only; 13% had a dual sensory impairment, and 32% had none. These 4 groups were compared in terms of mean ADL and IADL scores. Participants with sensory impairments showed diminished functional status as measured by ADL and IADL. Those with combined vision impairment and hearing loss demonstrated the greatest differences in functional status. The sample was not population based.

A population-based investigation, however, by Reuben et al.³⁵ examined the National Health and Nutrition Examination Survey (NHANES I) to determine the relation between vision and hearing loss within a 10-year period and mortality and overall functional decline. The NHANES I provided a large sample (n=5677) whose subjects, aged 55–74 years, were followed for a decade. Those with hearing loss, vision impairment, and both vision impairment and hearing loss demonstrated higher rates of mortality, ADL dependency, and IADL dependency than did people without sensory impairment 10 years after collection of baseline data. Those with combined vision and hearing problems demonstrated the greatest declines in function

and the greatest rates of mortality. Those who acquired vision and hearing problems after baseline data were collected were not identified, and thus changes in their function were not recorded.

Comprehension of the magnitude of sensory problems in the older US population and the impact of these changes on this population's behaviors are important public policy and public health concerns in terms of surveillance, research, and intervention design.

METHODS

Second Supplement on Aging

The National Center for Health Statistics of the Centers for Disease Control and Prevention and the National Institute on Aging of the National Institutes of Health coproduced the Second Supplement on Aging (SOA-II) 1994 in September 1998.³⁶ The SOA-II closely replicates the 1984 Supplement on Aging (SOA) and the first Longitudinal Study on Aging (LSOA) that followed a cohort of older people in 3 waves. The LSOA allowed researchers to gain insight into changes in health and disability, social supports, as well as sex and socioeconomic differentials in health. The SOA-II was designed to build upon the knowledge gained from the SOA. In addition to providing comparisons with cross-sectional data on a population from the middle 1990s, the SOA-II provided baseline data for a second longitudinal study.³⁶

Data for the SOA-II were obtained from 4 sources: (1) the 1994 National Health Interview Survey (NHIS) Core Questionnaire, (2) the Access to Care Supplement to the 1994 NHIS, (3) Phase 1 of the National Health Interview Survey on Disability (NHIS-D), and (4) Phase 2 of the NHIS-D. Information for the first 3 sources was gathered during 1994. Data for the NHIS-D were collected in 2 phases. Phase 1 data were collected in 1994, and a series of screening criteria were used to identify people selected for the second phase of the NHIS-D, also known as the Disability Followback Study. Data for the NHIS-D were collected 7–17 months after the initial survey.

A total of 9447 people were interviewed for the SOA-II; all participants were aged ≥ 70 years. The SOA-II provides self-reported infor-

mation from older, noninstitutionalized civilians. Proxy responses (14.4% of the total) were accepted when a respondent was incapable of completing the interview. Data were weighted for age, sex, race, and nonresponse in order to produce national estimates. Due to the complex stratified cluster sampling design employed by the SOA-II, SUDAAN³⁷ was used to analyze data. The Taylor linearization “with replacement” design option was used to calculate standard error in order to provide more accurate variance estimates.

Sensory Impairment Variables in the SOA-II

For this study, we created 4 groups for analysis: those reporting hearing problems only, those reporting vision problems only, those reporting both vision and hearing problems, and those reporting no vision or hearing problems. The SOA-II contains 11 variables regarding vision. Two questions, respectively, concern diagnosis (cataract and glaucoma), blindness (in 1 or both eyes), and eyeglasses (used and prescribed); additional questions apply to cataract surgery, lens implant(s), contacts, and use of magnifiers. A global question deals with “trouble seeing even with glasses.” For this analysis, we cre-

ated a summary variable for vision problems that includes a positive response to the following characteristics: “blindness in one eye,” “blindness in both eyes,” and “trouble seeing even with glasses.”^{38,39}

The SOA-II contains 6 questions about hearing, including “deafness in one ear,” “deafness in both ears,” “any other trouble hearing,” “used hearing aid in past 12 months,” “used hearing aid in past 2 weeks,” and “cochlear implant.” For this analysis, we created a summary variable for “hearing problem” for any positive response to the variables “deafness in one ear,” “deafness in both ears,” and “any other trouble hearing.” No single variable characterizes both hearing and vision loss; therefore, we have used a positive response to both the hearing and vision summary variables to define compromised hearing *and* vision. For the estimated population, 58.0% reported no sensory impairment; 24.4% reported hearing impairment only, 9.4% reported vision impairment only, and 8.2% reported both vision and hearing impairment. Of the total estimated population, 89.9% were White, 7.7% Black, and 2.4% “other”; 52.6% were married; 36.9% were widowed; and 40.1% were males (Table 1).

TABLE 1—Demographic Characteristics of Community-Dwelling Adults Aged ≥ 70 Years, by Sensory Impairment: NHIS, 1994³⁶

	Percentage With Impairment				Total Sample (N = 9447)
	None (n = 5485)	Hearing (n = 2289)	Vision (n = 894)	Vision and Hearing (n = 779)	
Respondents	58.0	24.4	9.4	8.2	100.0
Gender					
Men	36.8	50.9	30.4	42.6	40.1
Women	63.2	49.1	69.6	57.4	59.9
Race					
White	88.5	93.8	86.1	92.2	89.9
Black	9.0	4.3	11.5	4.7	7.7
Other	2.5	1.9	2.4	3.2	2.4
Marital status					
Married, living with spouse	53.8	56.0	42.7	45.5	52.6
Married, spouse out of home	1.2	1.2	1.1	9.0	1.2
Widowed	35.3	35.0	43.8	46.0	36.9
Divorced	5.0	4.0	5.5	3.6	4.7
Separated	0.7	0.4	2.1	0.8	0.8
Never married	4.1	3.5	4.8	3.2	3.9

TABLE 2—Health Status of Community-Dwelling Adults Aged ≥ 70 Years, by Sensory Impairment: NHIS, 1994³⁶

	Percentage With Impairment			
	None	Hearing	Vision	Vision and Hearing
Excellent	16.4	14.4	9.5	7.7
Very good	26.1	21.7	18.5	12.0
Good	34.1	35.6	34.3	34.2
Fair	16.7	20.4	22.4	27.5
Poor	6.7	8.0	15.3	18.5

RESULTS

Health Conditions and Comorbidities

While the magnitude of the problem facing older people who experience sensory impairments is defined by these proportions, these population estimates do not characterize the effects of vision and hearing loss as older people perform various tasks (e.g., reading print or hearing conversation) or social roles (e.g., getting together with friends and relatives). Because valued activities and social roles generally define quality of life, sensory impairment has the capacity to greatly restrict older people. Knowing the patterns of these restrictions may lead to the development of public health and rehabilitation interventions that ameliorate the limitations created by vision and hearing loss. In this analysis, we employed the *International Classification of Functioning, Disability and Health* (ICF) as a conceptual framework. The ICF makes distinctions among impairments, activity limitations, participation restrictions, and the environment, and these concepts are useful for portraying the multidimensional experience of older people who report sensory loss.⁴⁰

Older people with vision impairment only were less likely to report their health as “excellent” (9.5% vs 16.4%) or “very good” (18.5% vs 26.1%) than were those who do not report sensory problems (Table 2). In addition, older people who reported vision problems were more likely to report their health as “poor” than people without sensory problems (15.3% vs 6.7%). Similarly, older people reported hearing loss only also were

less likely to report their health as “excellent” (14.4% vs 16.4%) or “very good” (21.7% vs 26.1%) than were those without sensory loss. Older people who reported both vision impairment and hearing loss reported much lower rates of excellent health (7.7% vs 16.4%) and higher rates of poor health (18.5% vs 6.7%).

Table 3 compares older people who reported sensory impairment (vision problems only, hearing problems only, and vision *and* hearing problems only) with older people who did not report sensory impairments, in terms of comorbid and related conditions. In all cases, a higher proportion of people with vision problems reported comorbid and secondary conditions. They were 1.8 times more likely to have experienced a fall in the past 12 months (26.0% vs 16.5%), 1.7 times as likely to have experienced a broken hip (6.3% vs 3.8%), and 2.6 times more likely to have experienced a stroke (15.0% vs 6.4%). Heart disease (28.8% vs 16.7%) and hypertension (54.3% vs 42.5%) were reported in higher proportions among those with vision problems.

Across the same variables, people with hearing loss only reported higher rates of comorbid and secondary conditions than did people who did not have sensory loss. Those with hearing loss were 1.7 times more likely to have experienced falls (25.0% vs 16.5%), 1.7 times more likely to report heart disease (25.7% vs 16.7%), and 1.4 times more likely to report stroke (8.9% vs 6.4%). People with hearing loss reported higher rates of hypertension and broken hips, but these differences were not significant.

Older people with both vision and hearing loss were 3.0 times more likely to have fallen in the past 12 months than were people without vision or hearing problems (37.6% vs 16.5%), and 2.1 times more likely to have broken a hip (7.4% vs 3.8%). They were 1.5 times more likely to report hypertension (53.2% vs 42.5%), 2.4 times more likely to report heart disease (32.6% vs 16.7%), and 3.6 times more likely to have had a stroke (19.7% vs 6.4%).

Older people with visual impairment were 2.0 times more likely to report being frequently depressed or anxious than were older people without sensory problems (12.0% vs

5.8%). Although not significant, those with hearing loss only reported slightly higher rates of depression (8.0% vs 5.8%) than did people without sensory loss, and people with both vision and hearing loss only were 2.7 times more likely to report depression.

Activity Limitations

The ICF defines activity as “the nature and extent of performance of a function by a person” and activity limitations as “problems of the performance of activities in nature, duration, and quality.”⁴⁰ Older people with vision impairments only were 3.0 times as likely to report difficulty walking than people without sensory problems (39.0% vs 17.8%), while those with vision problems were 3.3 times more likely to report difficulty getting outside than people without sensory problems (25.1% vs 9.3%) (Table 3). Likewise, people with vision impairments were 2.8 times more likely to report difficulty getting into and out of a bed or chair (19.4% vs 8.0%), 3.1 times more likely to report difficulty managing medication (10.8% vs 3.7%), and 3.5 times more likely to report difficulty preparing meals (19.2% vs 6.3%).

Older people with hearing loss only also reported greater difficulties with activities than did people without sensory problems. These limitations were not as great as those among older people with vision impairments. One fourth (24.5%) of people with hearing loss reported difficulty walking compared with 17.8% of those who did not report hearing loss. In addition, people who reported hearing loss were 1.3 times more likely to report difficulty getting outside (11.8% vs 9.3%), 1.5 times more likely to report difficulty getting into and out of a bed or chair (11.7% vs 8.0%), and 1.6 times more likely to report difficulty managing medication (5.7% vs 3.7%) than were people without sensory problems.

Older people with both vision and hearing impairment were 4.3 times more likely to report difficulty walking (48.2% vs 17.8%), 4.7 times more likely to report difficulty getting outside (32.4% vs 9.3%), and 3.8 times more likely to report difficulty getting into or out of a bed or chair (24.8% vs 8.0%). In addition, this group was 4.7 times more likely to report difficulty preparing meals (23.9% vs 6.3%)

TABLE 3—Health Conditions, Activity Limitations, and Social Participation of Community-Dwelling Adults Aged ≥ 70 Years, by Sensory Impairment: NHIS, 1994³⁶

Health Condition	Hearing Loss Only			Vision Impairment Only			Both Hearing and Vision Loss			No Vision or Hearing Loss, %
	%	OR	95% CI	%	OR	95% CI	%	OR	95% CI	
Diabetes	12.8	1.4	1.1-1.6	17.9	2.0	1.6-2.5	18.6	2.1	1.7-2.5	9.8
Arthritis	62.0	1.4	1.3-1.6	66.3	1.7	1.4-2.1	71.3	2.2	1.9-2.6	53.2
Hypertension	44.5	1.1	1.0-1.2 ^a	54.3	1.6	1.4-1.9	53.2	1.5	1.3-1.8	42.5
Heart disease	25.7	1.7	1.5-1.9	28.8	2.0	1.7-2.4	32.6	2.4	2.0-2.8	16.7
Other heart condition	8.2	1.3	1.1-1.6	11.4	1.9	1.5-2.4	11.6	2.0	1.5-2.6	6.2
Stroke	8.9	1.4	1.2-1.8	15.0	2.6	2.1-3.2	19.7	3.6	2.9-4.4	6.4
Depression	8.0	1.2	0.9-1.5 ^a	12.0	2.0	1.5-2.6	16.0	2.7	2.1-3.5	5.8
Broken hip	4.5	1.2	0.9-1.5 ^a	6.3	1.7	1.2-2.3	7.4	2.1	1.5-2.7	3.8
Fallen in past 12 mos	25.0	1.7	1.5-1.9	26.0	1.8	1.5-2.1	37.6	3.0	2.6-3.6	16.5
Injured from fall	54.5	0.9	... ^a	55.7	1.0	0.7-1.4 ^a	57.5	1.1	0.8-1.4 ^a	56.0
Osteoporosis	8.0	1.0	0.9-1.2 ^a	11.4	1.5	1.2-2.0	16.3	2.3	1.7-3.1	7.7
Confused	7.4	1.4	1.1-1.8	11.4	2.2	1.7-3.0	14.0	2.8	2.2-3.8	5.4
Activity limitation										
Unable to walk quarter mile	34.9	1.5	1.3-1.7	51.4	2.9	2.5-3.4	60.7	4.2	3.6-5.0	26.7
Unable to take 10 steps	26.6	1.4	1.2-1.6	43.2	2.9	2.4-3.4	50.1	3.8	2.2-4.5	20.8
Difficulty bathing	13.7	1.4	1.2-1.6	23.4	2.8	2.3-3.3	29.5	3.8	3.2-4.5	10.0
Difficulty dressing	9.2	1.5	1.3-1.8	12.3	2.1	1.7-2.6	19.6	3.6	2.9-4.6	6.3
Difficulty getting out of a bed or chair	11.7	1.5	1.3-1.8	19.4	2.8	2.4-3.4	24.8	3.8	3.0-4.7	8.0
Difficulty walking	24.5	1.5	1.3-1.7	39.0	3.0	2.5-3.5	48.2	4.3	3.7-5.0	17.8
Difficulty going outside	11.8	1.3	1.1-1.5	25.1	3.3	2.7-3.9	32.4	4.7	4.0-5.5	9.3
Difficulty using toilet	5.7	1.2	1.0-1.6 ^a	11.3	2.6	2.1-3.3	12.8	3.0	2.3-3.9	4.6
Difficulty preparing meals	8.9	1.5	1.2-1.8	19.2	3.5	2.8-4.4	23.9	4.7	3.8-5.8	6.3
Difficulty buying groceries	13.8	1.4	1.2-1.6	32.1	4.1	3.4-5.0	36.9	5.1	4.2-6.2	10.3
Difficulty using money	5.9	1.8	1.4-2.3	12.9	4.3	3.3-5.5	16.7	5.8	4.4-7.5	3.4
Difficulty using a telephone	6.4	3.6	2.8-4.6	8.5	4.9	3.6-6.6	14.9	9.1	7.0-12.0	1.9
Difficulty doing light housework	9.5	1.4	1.2-1.7	15.7	2.5	2.0-3.2	21.6	3.7	3.0-4.6	6.9
Difficulty going places	14.9	1.5	1.2-1.7	33.5	4.2	3.5-5.0	36.6	4.8	4.0-5.8	10.7
Difficulty taking medicine	5.7	1.6	1.2-2.0	10.8	3.1	2.3-4.2	13.5	4.0	3.1-5.3	3.7
Social participation										
Visiting with friends	70.9	0.9	0.8-1.0	66.8	0.7	0.6-0.8	63.4	0.6	0.5-0.7	73.9
Phoning friends	75.7	0.6	0.5-0.7	79.8	0.8	0.6-0.9	72.1	0.5	0.4-0.6	83.9
Visiting with relatives	77.6	1.1	1.0-1.3 ^a	73.5	0.9	0.7-1.0 ^a	75.2	1.0	0.8-1.1 ^a	75.9
Phoning relatives	84.8	0.8	0.7-0.9	85.5	0.8	0.6-1.0 ^a	81.2	0.6	0.5-0.7	88.1
Attending church	49.3	0.8	0.7-0.9	43.6	0.7	0.6-0.8	41.7	0.6	0.5-0.7	53.8
Going to movies	25.8	0.8	0.7-0.9	21.1	0.6	0.5-0.7	19.5	0.6	0.4-0.7	30.7
Eating out	65.9	1.0	0.9-1.1 ^a	56.3	0.7	0.6-0.8	55.8	0.6	0.6-0.8	66.0
Getting exercise	38.8	0.9	0.8-1.0 ^a	33.7	0.7	0.5-0.8	32.7	0.7	0.6-0.8	41.8

Note. OR = odds ratio; CI = confidence interval.

^aNot significant.

and 4.0 times more likely to report difficulty managing medication (13.5% vs 3.7%).

Participation Restrictions

Differences in social participation were substantial, although more modest than differences in activity limitations (Table 3). Older people reporting sensory problems were less likely to report visiting friends in the past 2 weeks. Nearly 74% of older people without sensory loss reported visiting friends; 70.9% of those with hearing loss only reported visiting friends; 66.8% of those with vision impairment only reported visiting friends; and 63.4% of those with both vision impairment and hearing loss reported visiting friends. There were no significant differences among the 4 groups regarding visiting with relatives. Older people with hearing loss only were as likely to eat out as those without sensory impairment, but people reporting vision or vision *and* hearing problems were about two thirds as likely to eat out at a restaurant. Older people with both hearing loss and vision impairment reported substantial difficulty sustaining social participation activities; they were, for example, half as likely to phone friends and about two thirds as likely to attend church.

In addition, the SOA-II asked about desired level of social activity—whether the amount of social activity was “too much,” “about enough,” or if the respondent “would like to do more” (Table 4). About one fifth (21.6%) of older people without sensory loss reported having too little social activity. By contrast, about one fourth (25.1%) of older people with hearing loss reported “would like to do more” and about one third of those with vision impairment (31.0%) or vision impairment and hearing loss (33.7%) reported that they “would like to do more.” These responses were consistent with the social participation measures discussed above.

DISCUSSION

A hierarchical pattern emerges from our examination of the comorbid conditions and activity limitations among the older US population who reported hearing or vision impairments or loss of both hearing and vision. These findings are consistent with those

TABLE 4—Level of Social Activity Reported by Community-Dwelling Adults Aged ≥ 70 Years, by Sensory Impairments: NHIS: 1994³⁶

Level of Social Activity	Percentage With Impairment			
	Hearing	Vision	Vision and Hearing	None
Too much	3.1	2.3	3.2	2.4
About enough	71.8	66.7	63.1	76.0
Would like to do more	25.1	31.0	33.7	21.6

found by other investigators.^{35,36} Older people who reported only hearing problems demonstrate higher rates of comorbid conditions in relation to their peers without hearing loss. Likewise, older people reported only vision problems demonstrated substantially higher rates of comorbid conditions and substantially greater difficulty in performance of activities than those without sensory impairments or those with hearing impairments only. Older people with both hearing and vision problems reported even greater rates of comorbidities and activity limitation than the other 3 groups.

Because of the confounding relation between comorbidities and activity limitations, neither vision impairment nor hearing loss alone defines the experience of older people who reported sensory impairment. Vision impairment or hearing loss rarely occur in isolation; instead, they occur in the context of other age-related physiologic and psychosocial changes.

One would expect activity limitations to become translated into societal participation restrictions. For example, difficulties in travel would probably increase the difficulty in maintenance of social relationships. The hierarchical patterns among older people who reported hearing loss, vision loss, or both hearing and vision loss were repeated in the selected societal participation measures in this analysis.

The societal participation measures must be interpreted with care because all of the participation questions asked an individual whether he or she had performed a function within the past 2 weeks. Therefore, a positive response to getting together with friends may mean that a respondent has only been with 1 friend once in 2 weeks. Moreover, participation measures inquiring about “visiting with

friends” and “visiting with relatives” were broadly phrased. These questions did not capture the active or passive nature of these encounters. For example, whether the respondent left home to visit (an active role) or whether others came to the respondent’s home to visit (a passive role) is unknown.

In terms of social involvement, obvious differences exist between having a relative drop in once in 2 weeks and having daily interactions. These questions were not sufficiently sensitive to gauge social interaction. The question about level of social activity (“about enough,” “too much,” or “would like to do more”) may be a useful summary measure of social participation. Additionally, it is important to remember that this analysis reports the correlations from cross-sectional data; therefore, the causal sequence cannot be inferred.

These findings underscore the importance of the recently published *Healthy People 2010*⁴¹ goals of primary prevention and rehabilitation in both vision and hearing (Chapter 28) as well as objectives to increase social participation and life satisfaction among all people with disabilities and the removal of environmental barriers (Chapter 6). Common eye conditions, especially diabetic retinopathy, glaucoma, and cataract, respond well to treatment.^{42,43} Similarly, routine audiometric screenings or questionnaires remain effective strategies for early identification of hearing problems.⁴⁴ Moreover, those in the aging network, which serves a broad range of concerns among older people, need to be mindful of the particular circumstances of older persons’ sensory impairment. Finally, the national vision rehabilitation program (funded under Title VII, Chapter 2 of the Rehabilitation Act of 1973, as amended) may be required to address multiple health and functional concerns.

Further examination of the health implication of these data may be productive given the relation between sensory loss and activity limitations and our hypothesized impact on health outcomes. Examples include examination of the implications of visual impairment on difficulty in meal preparation and nutritional outcomes, the impact on physical conditioning by difficulty in walking, and the ability to manage medication to achieve pharmacologic compliance. These findings also point to concerns regarding older persons’ management of their environment, a concept advanced in the ICF. For example, Long et al.¹⁰ demonstrated the presence of sidewalks as a predictor of walking outside for people with diminished vision. Moreover, standard print size may impede the ability of visually impaired elders to comply with drug therapies.⁴⁵ Improvement of the acoustical characteristics of environments by modification of reverberant rooms and noisy ventilation systems is associated with increased capacity to use residual hearing.⁵

In addition, these findings indicate that social roles of older people with bimodal sensory loss may be compromised. Kemp⁴⁶ and Gignac and Cott^{47(p743)} refer to social participation roles as “valued activities.” These data do not indicate the kinds of strategies older people employ to sustain valued activities in the face of multiple impairments.

These findings suggest 3 areas requiring additional inquiry.

Activity limitations and secondary conditions. Additional attention should be given to the relation between activity limitations and conditions and circumstances secondary to sensory impairment. That is, what are the health relations among older people with vision impairment between difficulty walking and general conditioning to hypertension and heart disease? What is the relation among older people with vision impairment between difficulty preparing meals and nutrition?

Environment and behavior. Additional attention should be given to the relation of the environment and the behaviors of people who have sensory problems. That is, would the presence of sidewalks and larger print on medicine bottles make a difference in the general health and activities of older people with vision problems? How does environmen-

tal noise hinder elders with hearing impairment from understanding conversations?

Strategies for participation. Additional attention should be given to understanding the strategies used by older people to sustain participation in the community. That is, how do older people with activity limitations arrange their lives to continue social participation? What is the nature of the social interactions for elders with sensory impairments? Although not different quantitatively, are these relations qualitatively more dependent in nature than for nonimpaired elders?

The untangling of relations among sensory loss, comorbidities and secondary conditions, activity limitations, and restrictions in participation pose significant public health challenges. ■

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Contributors

J.E. Crews planned the study, conducted the literature review, and wrote most of the article. V.A. Campbell planned the analytical design, conducted the analysis, and wrote portions of the article.

Human Participant Protection

No protocol was needed for this study. The National Center for Health Statistics' *National Health Interview Survey, 1994: Second Supplement on Aging*, a publicly available data set, contains no individual identifiers.

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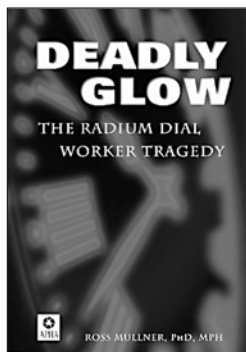
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