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The Prevalence of Dizziness and Its Association With Functional Disability in a Biracial Community Population

Neelum T. Aggarwal,[1,2,3] David A. Bennett,[1,2,3] Julia L. Bienias,[2] Carlos F. Mendes de Leon,[2] Martha Clare Morris,[2] and Denis A. Evans[1,2,3]

[1]Rush Alzheimer's Disease Center, [2]Rush Institute for Healthy Aging, and [3]Department of Neurological Sciences, Rush University and Rush Presbyterian-St. Luke's Medical Center, Chicago, Illinois.

Background. Information regarding the prevalence of dizziness and its association with functional disability among African American and white residents from defined community populations is limited.

Methods. A total of 6,158 persons 65 years and older (78.8% of age-eligible persons) completed in-home interviews that included three common measures of self-reported disability: the Katz Activities of Daily Living (ADL) Scale, the Rosow-Breslau Functional Health Scale, and the Nagi Physical Disability Scale. A stratified random sample of 729 persons underwent a detailed evaluation that included questions on the frequency and severity of dizziness, which was defined as having an episode of dizziness or lightheadedness at least once a month.

Results. The overall prevalence of dizziness in this population was 9.6% (95% confidence interval [CI] 7.2–12.0). It increased with age, from 6.6% in those 65–74 years old, to 11.6% in those 75–84 years old, and to 18.4% in those persons ≥85 years old. It was more common in women (odds ratio [OR] 2.03, 95% CI 0.99–4.19) but was not associated with race. After adjusting for age, sex, and race, dizziness was associated with greater disability on the Rosow-Breslau (OR 2.29, 95% CI 1.18–4.46) and Nagi (OR 2.54, 95% CI 1.48–4.36) measures but not on the Katz ADL Scale (OR 1.18, 95% CI 0.64–2.20).

Conclusions. Dizziness is common among older persons and is associated with functional disability.

MOST information concerning dizziness comes from studies of persons who seek medical attention (1,2,3). Dizziness is a common problem among older persons, generating an estimated 8 million outpatient visits per year in the United States alone (1). Several conditions, including benign positional vertigo (4,5), orthostatic hypotension (5,6), and cardiovascular disease (5), may lead to dizziness in elderly persons. It has also been associated with age (7), female sex (7,8), and anxiety and depression (8). The frequency of dizziness reported in clinical settings ranges widely (8), due in part to clinic referral patterns and to varying definitions of the condition (3,9,10). Studies suggest that dizziness, although episodic, is frequently a longstanding symptom (11) and may be associated with disability (7,8). Because it is likely that many older persons with dizziness do not seek medical attention, large population studies are needed to determine its prevalence, its relation to age, sex, and race, and its relation to negative outcomes, such as disability. Few population studies that have examined the prevalence of dizziness among older persons have not depended on receipt of health care to identify subjects (7), and information on the relation of dizziness to race is limited.

As part of the Chicago Health and Aging Project, a longitudinal population-based study of common health problems of older persons, we estimated the prevalence of dizziness and its association with functional disability among African Americans and whites from a geographically defined biracial population of Chicago.

Methods

Subjects

Subjects for this study were participants in the Chicago Health and Aging Project (CHAP), a longitudinal study of risk factors for Alzheimer's disease and other chronic conditions in a geographically defined biracial community in Chicago. After a complete census in three contiguous neighborhoods (Washington Heights, Morgan Park, and Beverly) on the South Side of Chicago, all persons aged 65 years and over, including those living in nursing homes, were eligible for participation. A total of 6,158 residents (response rate of 78.8%), of whom 60.7% were women and 61.6% were African American, participated in an in-home interview that covered a broad range of health and social problems of older persons and also included brief tests of cognitive function.

A random sample of those interviewed, stratified by age, sex, race, and cognitive performance, underwent a detailed structured clinical evaluation performed by examiners blinded to data collected in the population interview. The median time between the population interview and the clinical evaluation was 4 months. Of the 1,056 subjects sampled for clinical evaluation, 86 died and 9 moved before being asked to participate; 729 (75.9%) of the remaining 961 were evalu-

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ated. Of the 729, we had complete data on dizziness for 672 (92.2%), and these data form the basis for the analysis. The study was approved by the Human Investigation Committee of Rush Presbyterian-St. Luke's Medical Center.

Clinical Evaluation and Disability Assessment

The evaluation included a medical history, neurologic examination, cognitive testing, and laboratory testing. A senior neurologist examined each participant and reviewed all clinical evaluation data. All participants were asked whether they had ever been dizzy or lightheaded. If so, they were asked about the frequency and severity of their dizziness episodes. Frequency response categories were once a year or less, several times a year, once a month, several times a month, once a week, or several times a week; severity response categories were not severe at all, slightly severe, somewhat severe, very severe, or extremely. We were most interested in the potential impact of fairly regular episodes on disability. For most analyses, therefore, persons with episodes occurring once a month or more often were considered to have dizziness, and those with less frequent episodes were included among those free of dizziness. The severity categories were condensed into three groups for most analyses: very severe (very or extremely), moderately severe (slightly or somewhat), and not severe.

Three brief self-report measures of disability were used from the EPESE study (12). The Katz Activities of Daily Living (ADL) Scale (13) assessed whether the subject was able to perform each of the following six activities without help: eating, toileting, bathing, dressing, transferring, and walking across a room. Three items from the Rosow-Breslau Functional Health Scale (14) assessed the ability to walk half a mile, climb stairs, and do heavy housework. Items developed by Nagi (15) assessed the level of difficulty performing five physical activities: bending, stooping or crouching, pushing or pulling a large object, reaching above the shoulders, writing or handling small objects, and lifting or carrying 10 pounds of weight. Responses to each of the Nagi items were dichotomized, with moderate difficulty or greater denoting inability to perform that task.

For each disability measure, a summary score was computed by summing the individual items into three categories: no disability, moderate disability, and severe disability. As in other studies (16), having no or little difficulty corresponded to having no disability in any of the activities. For the Katz scale, limitation in one or two items indicated moderate disability and limitation in three items was considered severe. For the Rosow-Breslau measure, disability in one item was moderate disability; in two or three items, severe. For the Nagi measure, disability in one or two items was considered moderate disability; in three to five items, severe.

Clinical stroke was rated by the neurologist as probable, possible, or not present based on the clinical history of stroke and findings on the exam consistent with stroke. A rating of probable or possible was considered as stroke for all analyses. The subject's best visual acuity (with glasses) was assessed by using a Snellen card. For analyses, visual acuity was categorized by three levels: good (20/40, 20/50, 20/70), intermediate (20/100, 20/200), and poor (20/400, 20/400+). Evaluation of proprioception was conducted by specially trained nurse clinicians as part of a structured neurologic examination. Cardiovascular risk factors included self-report history for angina (ROSE questionnaire) (17), history of myocardial infarction (MI) or coronary, or coronary occlusion, and history of hypertension taken from the population interview. A total of three blood pressure (BP) measurements were taken from the clinical evaluation: two sitting and one standing (mmHg). Orthostatic (postural) hypotension was defined as a systolic BP difference of $\geq$20. Because we did sitting to standing BP rather than supine to standing, we also examined postural hypotension, defined as a systolic BP difference of $\geq$10. At the time of the clinical evaluation, medications taken over the previous two weeks that had the potential to cause dizziness were recorded by direct inspection. Use of drugs in the following categories was examined: antidiabetic, cardiac, antihypertensive, antipsychotic, antiparkinsonian, and anticholinergic drugs. Self-report of diabetes was collected at the time of the population interview. Clinical depression was based on the Diagnostic and Statistical Manual of Mental Disorders (DSM III-R) (18) and was rated by the neurologist as probable, possible, or no depression.

Statistical Analyses

All analyses took into account the unequal probabilities of selection due to the stratified random sample design. Variances were computed using replication-based methods (19).

We first examined the prevalence of dizziness and the degree to which it was modified by age, sex, and race in simple cross tabulations and by fitting logistic regression models. Next, we examined the association between dizziness and level of disability severity (none, moderate, and severe). We present both simple cross tabulations and the association adjusted for age, sex, and race through the use of ordinal logistic regression (proportional odds) models. For variables that had reasonable rates, we added them to the basic logistic regression models for each outcome singly and examined the change in association between dizziness and disability. Secondary analyses examined the degree to which the association between dizziness and disability might be accounted for in part by stroke, diabetes, or visual acuity and other potential confounding variables. Finally, to examine how frequency and severity of dizziness were related to disability levels, separate ordinal logistic regression models were fitted for each disability outcome with frequency and severity of dizziness as predictor variables.

Results

Prevalence of Dizziness

The prevalence of ever having had an episode of dizziness or lightheadedness in our population was 41.4% (95% confidence interval [CI] 37.0–46.0). Almost 80% of these persons had episodes of dizziness either less than once a year or several times a year (Table 1). By contrast, 22.6% of those with episodes of dizziness experienced these symptoms at least once a month (Table 1). The overall estimated prevalence of dizziness in this community population, weighted to reflect the stratified sampling, was 9.6% (95% CI 7.2–12.0) (Table 2). The prevalence increased with age

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Table 1. The Number of Persons (n) and the Percentage (%) of Population With 95% Confidence Interval (CI), Weighted to Reflect the Stratified Sampling Among the 41.4% of the Population Who Experienced Episodes of Dizziness

Frequency of Episodes	n	% (95% CI)
Once a year or less	96	39.0 (30.1–48.0)
Several times a year	84	38.4 (30.6–46.2)
Once a month	26	7.5 (3.1–12.0)
Several times a month	24	4.5 (2.1–6.9)
Once a week	8	2.0 (0.17–3.74)
Several times a week	29	8.6 (5.01–12.28)

from 6.6% (95% CI 3.2–10.0) of persons 65–74 years old, to 11.6% (95% CI 7.3–16.0) of those 75–84 years old, and 18.4% (95% CI 15.5–21.2) of persons 85 years and older. Prior to adjustment for other variables, prevalence of dizziness appeared greater among women (12.1%, 95% CI 8.5–15.6) than men (5.8%, 95% CI 2.9–8.7) and approximately equal among African Americans (9.8%, 95% CI 6.6–13.0) and whites (9.3%, 95% CI 5.7–12.9). Because age, sex, and race are associated with one another, we also examined their associations with dizziness in analyses that considered all three variables simultaneously. In these adjusted analyses, the odds ratio (OR) of dizziness increased approximately 7% (95% CI 1.03–1.11) for each year of age; women were twice as likely as men to have dizziness (OR 2.03; of marginal statistical significance, 95% CI 0.99–4.19); and dizziness was not related to race (OR 1.33, 95% CI 0.71–2.52) (Table 3).

Dizziness and Disability

In unadjusted analyses, the percentage of persons experiencing dizziness weighted to reflect the stratified sampling appeared to increase with greater levels of self-reported disability (Table 4). For example, 5.4% of persons with no disability on the Rosow-Breslau measure experienced dizziness, compared with nearly 20% of persons with severe disability. However, disability is also related to age, sex, and race (7,15,20). In analyses controlling for age, sex, and race (Table 5), dizziness was associated with a 2.29-fold (95% CI 1.18–4.46) increase in odds of both moderate and

Table 2. Prevalence of Dizziness With 95% Confidence Interval (CI) by Age, Sex, and Race

	Sampled Persons		Prevalence of
	Total	n	Dizziness (95% CI)
Overall	672	87	9.6 (7.2–12.0)
65–74 yr	211	19	6.6 (3.2–10.0)
75–84 yr	284	37	11.6 (7.3–16.0)
≥85 yr	177	31	18.4 (15.5–21.2)
Male	323	31	5.8 (2.9–8.7)
Female	349	56	12.1 (8.5–15.6)
White	318	35	9.3 (5.7–12.9)
African American	354	52	9.8 (6.6–13.0)

Note: Number and population percentages are weighted to reflect the stratified sampling in the biracial community population.

Table 3. Odds Ratio for Dizziness by Age, Sex, and Race With 95% Confidence Interval (CI), Weighted to Account for Stratified Sampling Design

Correlate	Odds Ratio	95% CI
Age	1.07	1.03–1.11
Female	2.03	0.99–4.19
African American	1.33	0.71–2.52

severe disability on the Rosow-Breslau measure and a 2.54-fold (95% CI 1.48–4.36) increase in odds of both moderate and severe disability on the Nagi measure (Table 5). The association of disability on the Katz ADL Scale with dizziness was less, 1.18-fold, which was not statistically significant (95% CI 0.64–2.20).

Because history of stroke, diabetes, and decreased visual acuity can be associated with disability and dizziness, we also considered the effect of each of these variables on the association of dizziness with functional disability. First, in separate analyses, we examined the association of each of these variables with prevalence of dizziness, controlling for age, sex, and race. Second, in separate analyses, we examined the effect of each of these variables on the relation of dizziness to disability. Although these measures were all related to disability, the association of dizziness with disability was unchanged after including these conditions in the analyses (data not shown). Several other variables that could potentially confound the relationship of dizziness to disability were also examined. We did not find any relation between dizziness and cardiovascular risk factors, including self-reported history for angina and history of myocardial infarction or coronary, or coronary occlusion, or either definition of orthostatic hypotension; visual acuity or proprioception; and drug use, including antidiabetic, cardiac, antihypertensive, antipsychotic, antiparkinsonian, and anticholinergic drugs, or the total number of any of these drugs. Because these variables were not related to dizziness they were not considered as potential confounders in further

Table 4. Association of Dizziness With Degree of Disability on Each of the Disability Scales, Weighted to Account for the Stratified Random Sampling Design

Scale and Degree	Sampled Persons		Prevalence of
of Disability	Total†	n	Dizziness (95% CI)
Katz			
No disability	517	62	8.9 (5.9–11.8)
Moderate	85	7	7.3 (0.5–14.2)
Severe	70	18	21.9 (14.1–29.7)
Rosow-Breslau			
No disability	344	27	5.4 (2.3–8.5)
Moderate	132	23	13.0 (5.6–20.4)
Severe	189	37	19.2 (13.5–24.5)
Nagi			
No disability	285	18	4.6 (1.9–7.4)
Moderate	213	29	10.1 (4.8–15.3)
Severe	165	38	20.5 (13.8–27.2)

†Due to missing data for the Rosow-Breslau and Nagi scales, the total number of sampled persons varies.

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Table 5. Association of Disability and Dizziness After Adjustment for Age, Sex, and Race

Correlate	Odds Ratio by Disability Measure		
	Katz OR (95% CI)	Rosow-Breslau OR (95% CI)	Nagi OR (95% CI)
Dizziness	1.18 (0.64–2.20)	2.29 (1.18–4.46)	2.54 (1.48–4.36)
Age	1.12 (1.08–1.15)	1.13 (1.10–1.16)	1.08 (1.04–1.12)
Female	1.72 (0.90–3.28)	2.22 (1.47–3.35)	2.94 (1.81–4.79)
African American	2.16 (1.20–3.89)	2.10 (1.43–3.09)	1.40 (0.79–2.49)

analyses. There were too few persons with clinically diagnosed depression ($n = 7$) to perform meaningful analyses.

Additional logistic regression analyses were conducted to examine whether frequency or severity of dizziness modified its association with disability. Frequency was associated with disability on the Nagi (OR 2.09, 95% CI 1.41–3.10) and Rosow-Breslau (OR 1.78, 95% CI 1.18–2.68) measures after adjustment for age, sex, and race but not with disability on the Katz scale (OR 1.11, 95% CI 0.73–1.69). There was no significant increase in the prevalence of disability due to severity of dizziness in adjusted analyses for the Katz, Rosow-Breslau, or Nagi measure.

Discussion

In this large community study, regular episodes of dizziness was a common problem among older persons. Its prevalence increased with age among persons over the age of 65, and was higher among women but was not associated with race. Dizziness was associated with a twofold increase in the prevalence of disability on two of the three disability measures.

Clinic-based studies indicate that dizziness is among the most common reasons why older persons visit a physician. In one study, it was the most common presenting complaint of patients aged 75 and older visiting an ambulatory clinic (2). The frequency of reports of dizziness in clinical settings varies widely from 5% to 90% (21), but because reports from clinics typically reflect the specific referral patterns of each facility, it is likely that many persons with dizziness do not seek medical attention.

Population studies are needed to characterize the prevalence of dizziness and whether it varies by age, sex, or race. Three previous population-based studies have estimated the prevalence of ever having been dizzy or of having been dizzy in the past year. These studies report prevalences ranging from 27% to 34% (7,8,20). The prevalence of dizziness found in this study is lower because we restricted most analyses to regular episodes, at least once each month. The prevalence of ever having been dizzy was approximately 40%, comparable to previous reports. Our study, like previous population studies, found that the prevalence of dizziness increased with age and was more common in women. Only one previous study, of persons coming to medical attention, examined possible racial differences in dizziness; it also did not find significant differences between African Americans and whites (8).

Persons who reported that their dizziness was severe were also asked to characterize their dizzy symptoms. Twenty-eight persons reported the sensation as spinning or turning. The total episodes ever reported of spinning, turning, or moving was between 2 and 10, and the average duration was between 5 seconds and 5 minutes. Of those who complained of the spinning sensation, only 21 saw a physician because of the sensation of dizziness (data not shown). Although these numbers are too small to reliably upweight to the population, they suggest that only a minority of persons with dizziness experience symptoms of vertigo and seek medical attention as a result of dizziness.

The relation of dizziness to functional disability has been examined primarily among persons seeking medical attention (4,6,9,22). Kroenke and coworkers (4), in their prospective study of dizziness in patients in ambulatory care, reported that more than half of persons with dizziness complained that it interfered with their ADLs. Reports of the relation of dizziness to disability in population studies are conflicting. In one study, dizziness was defined by its effect on daily functioning (8). Another study, using data from the Longitudinal Study of Aging (LSOA), reported that among persons without functional disability at baseline, dizziness (defined as sometimes having trouble with dizziness) was not related to incident functional disability 2 years later, after controlling for other potential causes of disability (7). It is possible that the association of dizziness with functional disability in this study was due in part to use of a definition requiring at least monthly episodes of dizziness.

Our study suggests that dizziness was associated with disability on the Nagi and Rosow-Breslau scales but not on the Katz scale. The greatest difference between the Katz ADL Scale and the other two measures is that it assesses the most basic activities required for independent living (e.g., toileting, bathing, crossing a small room), whereas the Rosow-Breslau and Nagi measures assess ability to carry out somewhat more demanding but not necessarily crucial activities (e.g., heavy housework, walking one-half mile, pushing large objects). It seems possible, therefore, if the cross-sectional association found in this study reflects an effect of dizziness on disability, that the effect is on ability to perform these more demanding activities; i.e., older persons perceive that episodes of dizziness during these activities might place them at risk of fall or other injury, and therefore they intentionally restrict these activities, but they still retain the ability to carry out the most basic activities. Alternatively, it is possible that persons do not curtail their basic ADLs as measured with the Katz disability scale.

Several strengths of the study increase confidence in its findings. All persons from a geographically defined biracial population were eligible for participation, and high rates of participation were achieved in both the population interview and clinical evaluation. Uniform structured questions regarding the frequency and severity of symptoms were used to define dizziness, and it was defined independent of its effect on daily functioning. Disability was assessed with widely used measures (23). Finally, the association of dizziness and disability was not the result of confounding from one or more of several variables that could be related to dizziness and disability.

Our study, however, is not without limitations. Our study relies on self-report of dizziness, as well as self-report of

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disability, as part of a structured interview rather than on a careful evaluation by a skilled neurologist. It is possible, therefore, that some persons with mild dizziness were missed, due to the absence of provoking measures commonly employed in clinical practice. We did not examine the relation of dizziness to direct physical performance measures. It is also possible that persons with dizziness report more problems with ADLs but perform equally well on performance tests. Finally, our study was cross-sectional, making it premature to draw any causal inferences.

Regular episodes of dizziness was a common complaint in this community population of older persons and appeared to be associated with greater occurrence of disability over and above any association with chronic illness, especially in functions involving the lower extremities. Dizziness may be an important factor in continued independent living by older persons. So far, it has received little attention as a risk factor for disability, and physicians should be alerted to its potential impact on daily function in older persons. Future study into underlying conditions that could account for the association between dizziness and disability could have substantial health implications for older persons.

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Address correspondence to to Neelum T. Aggarwal, MD, Rush Alzheimer's Disease Center, 1645 W. Jackson Boulevard, Suite 675, Chicago, IL 60612. E-mail: nervedocs@aol.com

References

1. Sloane P. Dizziness in primary care: results from the National Ambulatory Medical Care Survey. *J Fam Pract.* 1989;29:33–38.
2. Cypress BK. *Patterns of Ambulatory Care in Internal Medicine: The National Ambulatory Medical Care Survey, US, Jan 1980–Dec 1981.* DHHS publication (PHS) 84-1741. Hyattsville, MD: National Center for Health Statistics, Public Health Service; 1984.
3. Drachman DA, Hart CW. An approach to the dizzy patient. *Neurology.* 1972;22:323–334.
4. Kroenke K, Lucas CA, Rosenberg ML, et al. Causes of persistent dizziness: a prospective study of 100 patients in ambulatory care. *Ann Intern Med.* 1992;117:898–904.
5. Sloane PD, Baloh RW. Persistent dizziness in geriatric patients. *J Am Geriatr Soc.* 1989;37:1031–1038.
6. Sixt E, Landahl S. Postural disturbances in a 75-year-old population, I: prevalence and functional consequences. *Age Ageing.* 1987;16:393–398.
7. Boult C, Murphy J, Sloane PD, Mor V, Crone C. The relation of dizziness to functional decline. *J Am Geriatr Soc.* 1991;39:858–861.
8. Sloane P, Blazer D, George LK. Dizziness in a community elderly population. *J Am Geriatr Soc.* 1989;37:101–108.
9. Bailey KE, Sloane PD, Mitchell M, Preisser J. Which primary care patients with dizziness will develop persistent impairment? *Arch Fam Med.* 1993;2:847–852.
10. Tilvis RS, Hakala SM, Valvanne J, Erkinjuntti T. Postural hypotension and dizziness in a general aged population: a four-year follow-up of the Helsinki Aging Study. *J Am Geriatr Soc.* 1996;44:809–814.
11. Colledge NR, Barr-Hamilton RM, Lewis SJ, Sellar RJ, Wilson JA. Evaluation of investigations to diagnose the cause of dizziness in elderly people: a community based controlled study. *Br Med J.* 1996;313: 788–792.
12. Cornoni-Huntley J, Brock DB, Ostfeld AM, et al., eds. *Established Populations for Epidemiologic Studies of the Elderly: Resource Data Book.* DHHS publication 86-2443. Bethesda, MD: National Institute on Aging; 1986.
13. Katz S, Akpom CA. A measure of primary sociobiological functions. *Int J Health Serv.* 1976;6:493–509.
14. Rosow I, Breslau N. A Guttman health scale for the aged. *J Gerontol.* 1966;21:556–559.
15. Nagi SZ. An epidemiology of disability among adults in the United States. *Milbank Memorial Fund Q.* 1976;54:439–468.
16. Beckett LA, Brock DW, Lemke JH, et al. Analysis of change in self-reported physical function among older persons in four population studies. *Am J Epidemiol.* 1996;143:766–778.
17. Rose GA, Blackburn H, Gillum RF, Prineas RJ. *Cardiovascular Survey Methods.* Geneva, Switzerland: WHO; 1982.
18. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders.* 3rd ed. revised (DSM III-R). Washington, DC: APA; 1987.
19. Lee ES, Forthofer RN, Lorimor RJ. *Analyzing Complex Survey Data.* Beverly Hills, CA: Sage Publications; 1989.
20. Colledge N, Wilson JA, Macintyre CA, MacLennan WJ. The prevalence and characteristics of dizziness in an elderly community. *Age Ageing.* 1994;23:117–120.
21. Hinchcliffe R. Epidemiology of balance disorders in the elderly. In: Hinchcliffe R, ed. *Hearing and Balance in the Elderly.* Edinburgh, Scotland: Churchill-Livingstone; 1983:227–250.
22. Sloane PD, Linzer M, Pontinen M, Divine GW. Clinical significance of a dizziness history in medical patients with syncope. *Arch Intern Med.* 1991;151:1625–1628.
23. Mendes de Leon CF, Beckett LA, Fillenbaum GG, et al. Black–white differences in risk of becoming disabled and recovering from disability in old age: a longitudinal analysis of two EPESE populations. *Am J Epidemiol.* 1997;145L:488–497.

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