

Brief report

Age, Race, and Gender Factors in Incident Disability

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Abstract

Background: Incident disability rates enable the comparison of risk across populations. Understanding these by age, sex, and race is important for planning for the care of older adults and targeting prevention.

Methods: We calculated incident disability rates among older adults in the Cardiovascular Health Study, a study of 5,888 older adults aged ≥ 65 years over 6 years of follow-up. Disability was defined in the following two ways: (i) self-report of disability (severe difficulty or inability) in any of six Activities of Daily Living (ADL), and (ii) mobility difficulty (any difficulty walking half a mile or climbing 10 steps). Incident disability rates were calculated as events per 100 person years for age, gender, and race groups.

Results: The incidence of ADL disability, and mobility difficulty were 2.7 (2.5–2.8), and 9.8 (9.4–10.3) events per 100 person years. Women, older participants, and blacks had higher rates in both domains.

Conclusion: Incidence rates are considerably different based on the domain examined as well as age, race, and gender composition of the population. Prevention efforts should focus on high risk populations and attempt to ameliorate factors that increase risk in these groups.

Keywords: Disablement process, Physical function, Health disparities, Minority aging

Disability is a frequently used measure in aging research by virtue of its ability to define a phenotype that reflects the burden of disease, need for care, and quality of life of the older individual. Measures of physical function across the spectrum of the disablement process have been shown to predict adverse outcomes including further decline in function (1), hospitalization (2), dependency (3), and death (4). Due to this unique ability to integrate and capture multidimensional health, as well as predict multiple future health outcomes, functional status measures often serve as primary or secondary end-points for observational studies and clinical trials among older adults. However, planning such studies requires a prior knowledge of existing population risk.

Disability prevalence rates, although good estimates of disability burden, do not reflect population risk. Incidence rates from representative samples, however, are excellent measures of risk, but are less easily obtained. Even in longitudinal studies where disability is a primary outcome, the focus is on measures of association and very

few present overall incidence rates. Also, despite the wealth of evidence that age, gender, and race play a major role in the risk and burden of disability in populations, precise age, gender, and race stratified estimates of incident disability among U.S. older adults are unavailable in the public domain. In light of this clear need for incident disability rates, we aimed to calculate these using data from the Cardiovascular Health Study (CHS) and compare rates across different age, race, and gender categories.

Methods

Population

The CHS is a community based longitudinal study of cardiovascular risk factors among 5,888 adults aged 65 years and older in the United States. The study enrolled 5,201 participants in 1989–1990 and added 687 African Americans in 1992–1993. Participants provided written informed consent and the protocol was approved by

the institutional review boards at each participating center. Details of the design and recruitment methods have been published (5).

Participants completed an extensive interview and examination at the field centers at baseline. After enrollment, participants were seen annually, and were contacted by telephone at 6-month intervals until 1999. Participant contact by phone is ongoing; however a change in the way the disability questions were asked between 1999 and 2005 prevented us from using the data to ascertain incident disability during those years. Therefore, for this study, we evaluated disability among participants during the follow-up of the first 6 years after study entry for each cohort.

Measurement of Disability

During their annual clinical visits, CHS participants reported difficulty or inability in 6 ADLs (eating, dressing, bathing, toileting, walking around home, getting out of bed or chair) as well as mobility (walking up 10 steps and walking half a mile).

The first occurrence of severe difficulty or inability to perform any of six ADLs was defined as an *incident ADL disability event*. The first occurrence of self-reported difficulty in either mobility question was considered as an *incident mobility difficulty event*. For both the outcomes of interest, participants who were prevalent at baseline for that outcome were excluded from the analysis. Thus, we followed 5,729 participants for calculating incident ADL disability rates, and 4,233 for calculation of incident mobility difficulty rates until the occurrence of the event, death or end of follow-up. In supplementary analyses, we have defined disability using additional definitions and the results are presented as Supplementary Tables.

Statistical Analysis

All incidence rates were calculated as number of events per 100 person years of observation. Terminal missing data was censored at the last visit. If a participant reported the event after one or more missing visits, the mid-point of the time between the two visits with data (the visit when the event was reported and the prior visit) was considered as the time of occurrence of the event. This was done for 100 (12.6%) ADL disability events, and 145 (8.1%) mobility difficulty events. A 95% confidence interval for the incidence rate was calculated assuming a Poisson distribution for incident disability events.

To examine gender-race differences accounting for the competing risk of death, the Cumulative Incidence Function (CIF) of different disability outcomes was estimated using SAS macro %CIF. The CIFs of disability for different gender-race categories (all ages combined) were then compared using Gray's test for equality of CIF.

Results

Incidence rates of ADL disability and mobility difficulty stratified by age group, race, and gender are presented in Tables 1 and 2. The overall incidence of ADL disability was 2.7 (2.5–2.8) and mobility difficulty was 9.8 (9.4–10.3) events per 100 person years. Across both definitions, rates were higher for women than for men. ADL disability incidence was 3.1 (2.8–3.3) events per 100 person years for women and 2.1 (1.9–2.4) events per 100 person years for men. For mobility difficulty, the rates per 100 person years were 11.1 (10.5–11.8) for women and 8.4 (7.8–9.0) for men.

When similar age-gender groups among the two races were compared, there was no marked race difference in the ADL disability

Table 1. Events, Person-Years, and Event Rates (per 100 person years) Over 6 y for Incident ADL Inability Events Among 5,729 CHS Participants Free of ADL Disability at Baseline

Sex by Race by Age	At Risk (n)	Number with event (n)	Person Years	Rate (95% CI)
Female	3,285	532	17,383.6	3.1 (2.8–3.3)
White				
65–69	1,044	110	5,826.6	1.9 (1.6–2.3)
70–74	840	110	4,590.9	2.4 (2.0–2.9)
75–79	546	94	2,825.1	3.3 (2.7–4.1)
80–84	219	62	1,056.8	5.9 (4.6–7.5)
≥85	81	37	289.3	12.8 (9.3–17.7)
Black				
65–69	189	32	1,038.2	3.1 (2.2–4.4)
70–74	172	30	871.4	3.4 (2.4–4.9)
75–79	120	33	546.0	6.0 (4.3–8.5)
80–84	52	17	232.4	7.3 (4.5–11.8)
≥85	22	7	106.9	6.6 (3.1–13.7)
Male	2,444	261	12,513.8	2.1 (1.9–2.4)
White				
65–69	636	41	3,468.0	1.2 (0.9–1.6)
70–74	694	61	3,716.6	1.6 (1.3–2.1)
75–79	439	48	2,217.0	2.2 (1.6–2.9)
80–84	246	35	1,119.7	3.1 (2.2–4.4)
≥85	94	29	351.4	8.3 (5.7–11.9)
Black				
65–69	118	12	605.8	2.0 (1.1–3.5)
70–74	118	15	611.2	2.5 (1.5–4.1)
75–79	54	11	236.4	4.7 (2.6–8.4)
80–84	30	5	128.4	3.9 (1.6–9.4)
≥85	15	4	59.4	6.7 (2.5–17.9)
Total	5,729	793	29,897.4	2.7 (2.5–2.8)

Note: ADL = Activities of Daily Living, CI = Confidence interval.

Table 2. Events, Person-Years, and Event Rates (per 100 person years) Over 6 y for Incident Mobility Difficulty Among 4,233 CHS Participants Free of Mobility Difficulty at Baseline

Sex by Race by Age	At Risk (<i>n</i>)	Number Having Event (<i>n</i>)	Person Years	Rate (95% CI)
Female	2,271	1,075	9,691.2	11.1 (10.5–11.8)
White				
65–69	785	310	3,591.0	8.6 (7.7–9.7)
70–74	635	286	2,830.4	10.1 (9.0–11.4)
75–79	382	212	1,522.7	13.9 (12.2–15.9)
80–84	125	74	460.1	16.1 (12.8–20.2)
≥85	27	16	93.1	17.2 (10.5–28.1)
Black				
65–69	120	60	508.8	11.8 (9.2–15.2)
70–74	106	61	398.9	15.3 (11.9–19.7)
75–79	61	36	199.0	18.1 (13.1–25.1)
80–84	19	14	51.7	27.1 (16.1–45.8)
≥85	11	6	35.6	16.9 (7.6–37.6)
Male	1,962	726	8,651.2	8.4 (7.8–9.0)
White				
65–69	547	157	2,641.8	5.9 (5.1–7.0)
70–74	581	205	2,671.0	7.7 (6.7–8.8)
75–79	347	135	1,467.3	9.2 (7.8–10.9)
80–84	170	84	622.5	13.5 (10.9–16.7)
≥85	65	39	188.5	20.7 (15.1–28.3)
Black				
65–69	95	41	388.8	10.6 (7.8–14.3)
70–74	90	34	405.3	8.4 (6.0–11.7)
75–79	39	36	164.9	9.7 (6.0–15.8)
80–84	20	7	85.6	8.2 (3.9–17.2)
≥85	8	8	15.7	51.1 (25.6–102.2)
Total	4233	1801	18,342.4	9.8 (9.4–10.3)

Note: CI = Confidence interval.

category except in the 75–79 age group among women, where the rate for white women was 3.3 (2.7–4.1) and for black women was 6.0 (4.3–8.5). In the mobility difficulty domain, black men had a significantly higher rate than white men in the 65–69 age group and black women had higher rates than white women in the 70–74 age group.

Participants who were older had higher disability rates than the younger age groups in both disability outcomes. For ADL disability, the highest rates among all age groups were seen among Caucasian women over 85 years. In the mobility difficulty domain, black men over 85 years also demonstrated high rates, however, because of the small sample and few events, these estimates are less reliable.

The Grays test of equality of CIFs demonstrated an overall significant difference in the risk among participants developing ADL disability across the different gender–race categories when all ages were combined ($p < .0001$, Bonferroni corrected p value cutoff = .008). On pairwise comparisons, black women had a higher risk of developing ADL disability compared to black men ($p < .0001$), white women had a higher risk than white men ($p < .0001$), and black women had a higher risk than white women ($p < .0001$). However, there was no difference in risk between white men and black men ($p = .20$) and white women and black men ($p = .13$). A similar pattern was found when disability was defined as mobility difficulty.

Discussion

Incident disability rates during 6 years of follow-up in the Cardiovascular Health Study were higher in the mobility domain. Additionally, we found that women had much higher rates than men, and blacks had higher rates than whites in some age-gender groups.

In the InChianti study, ADL disability (self-report of need for help in at least one ADL) incidence was found to be 20.4% over 9 years (6). The rates are similar to CHS, however, due to the difference in definitions, it is not possible to make any inferences regarding similarity or differences between the U.S. and Italian populations. In the Religious Orders Study, incident ADL disability rate was 4.4 per 100 person years (7). Disability was defined as need for assistance or inability to do one or more ADL tasks; the higher rates compared to CHS, are likely to be due to just the differences in the definition used.

Incident mobility disability rates of 15.1 per 100 person years for women and 10.7 per 100 person years for men were reported in the EPESE study (8). We observed a lower incidence rate (9.8 per 100 person years) despite using a broader definition than EPESE, indicating that this difference may reflect the reduction in prevalence of mobility disability noted in the United States in the 1990s (9). The Health ABC study reported a mobility difficulty rate of 7.9 per 100 person years (10). In this, as well as other reports from Health ABC, persistence of the disability for 2 consecutive years has been incorporated into the definition which may account for the lower rate in Health ABC.

Age is a well-known risk factor for disability. Our findings demonstrate the persistently higher risk that age adds from the beginning of old age to the oldest old. ADL disability (defined as needing help in any one of six ADLs) incidence rate was 16.4% per year in the 90+ study, suggesting that disability rates will continue to climb with age even among the oldest old (11).

Women have higher disability prevalence rates than men in all age groups and across all disability domains (12) although the strength of the association between gender and disability varies across studies and depends on disability domains assessed. Differences in

socioeconomic status and health conditions (13), lower mortality, higher disability levels at outset (14) as well as higher incidence rates (15) have been cited as reasons for the higher prevalence rates. Our results clearly demonstrate higher incidence rates of ADL disability and mobility limitations among women compared to men, unadjusted for the factors that make women more vulnerable.

Older black people have been shown to have higher rates of disability than older whites (16). Previous research has suggested that the higher disability rates among blacks could be mostly explained by lower income and education (17); higher rates of obesity and diabetes among blacks have also been identified to play a role (18).

Strengths of our study include a large community based sample of older adults followed for 6 years, annual reports of disability and adequate representation of blacks allowing comparison across races, except among the oldest. Our limitations include a focus on self-report of functional status; however, self-reported status of physical function continues to be the criterion-standard of disability assessment. We did not examine disability recovery rates in our analysis. However, in supplementary analyses, we found persistent ADL difficulty rates to be lower than incident ADL difficulty rates indicating considerable recovery after a report of ADL difficulty. Although mortality rates in the age-sex groups track closely with U.S. census rates for the same birth cohorts (19), the recruitment was not designed to ensure a truly representative sample, thus some caution must be used in generalizing these results. Lastly, participation rate was somewhat lower in African Americans (47.5%) compared to the original cohort (57.3%), likely selecting a slightly healthier subset which would bias the disability rate differences towards the null.

Conclusions

Crude incident disability rates based on self-report of inability and difficulty in ADL, and mobility domains demonstrate higher rates for women and blacks. Prevention efforts should focus on high risk populations and attempt to ameliorate factors that increase risk in these groups.

Supplementary Material

Supplementary data is available at *The Journals of Gerontology, Series A: Biological Sciences and Medical Sciences* online.

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Conflict of Interest

None reported.

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