

The Prevalence and Trends of Instrumental Activities of Daily Living Impairments in the United States from 2008–2018

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Abstract.

Background: Instrumental activities of daily living (IADL) are neuropsychological-driven tasks that are linked to cognitive dysfunction. Examining population-based IADL deficits may reveal insights for the presence of these impairments in the United States.

Objective: This investigation sought to evaluate the prevalence and trends of IADL impairments in Americans.

Methods: A secondary analysis of data from the 2006–2018 waves of the Health and Retirement Study was conducted. The overall unweighted analytic sample included 29,764 Americans aged ≥ 50 years. Respondents indicated their ability to perform six IADLs: manage money, manage medications, use a telephone, prepare hot meals, shop for groceries, and use a map. Persons reporting difficulty or an inability to complete an individual IADL were considered as having a task-specific impairment. Similarly, those indicating difficulty or an inability to perform any IADL were classified as having an IADL impairment. Sample weights were utilized to generate nationally-representative estimates.

Results: Having an impairment in using a map (2018 wave: 15.7% (95% confidence interval (CI): 15.0–16.4) had the highest prevalence in individual IADLs regardless of wave examined. The overall prevalence of IADL impairments declined during the study period ($p < 0.001$) to 25.4% (CI: 24.5–26.2) in the 2018 wave. Older Americans and women had a consistently higher prevalence of IADL impairments compared to middle-aged Americans and men, respectively. The prevalence of IADL impairments was also highest among Hispanics and non-Hispanic Blacks.

Conclusion: IADL impairments have declined over time. Continued surveillance of IADLs may help inform cognitive screening, identify subpopulations at risk of impairment, and guide relevant policy.

Keywords: Aging, Alzheimer's disease, cognitive dysfunction, dementia, mass screening

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INTRODUCTION

Older Americans currently account for approximately 17% of the total United States population [1]. This growing older American demographic is projected to reach 98 million, nearly 25% of the United States population by the year 2060 [2]. Many older Americans are living with age-related morbidities, which in turn, threaten quality of life, independence, and longevity [3]. Therefore, population surveillance of such morbidities is critical for monitoring trends, informing healthcare providers, and guiding policy efforts and interventions to better serve the health needs of the growing older American population.

Alzheimer's disease and related dementias (ADRD) are a type of age-related morbidity that is projected to increase in line with the older growing American population [4]. Instrumental activities of daily living (IADL) are neuropsychological-driven tasks that, when impaired, may indicate onset cognitive decline and physical disablement [5]. IADLs are sensitive to cognitive declines because they are uniquely linked to several mental processes [6]. For example, executive functions that are crucial to cognitive functioning such as organization and planning contribute to managing medications and shopping for groceries [7]. Accordingly, IADLs are considered a feasible clinical and epidemiological indicator of cognitive function [6–8].

Questionnaires and interviews may serve as screening tools for referral to more sophisticated cognitive assessments [9]. However, dementia screening is not consistently recommended during routine geriatric health assessments [10]. Assessing a patient's ability to perform IADLs could be easily implemented in such routine health assessments because of their health-related predictive utility [11]. Given that IADLs are feasible to assess and connected to cognitive function [12], examining the prevalence and trends of IADL impairments may help to uncover additional trends in cognitive functioning. We sought to examine the prevalence and trends of IADL impairments in Americans.

MATERIALS AND METHODS

Participants

A secondary analysis of data from the 2006–2018 waves of the Health and Retirement Study (HRS) was conducted for this investigation. The 2006 wave was selected based on the concluding year of IADL preva-

lence estimates from other reports [13], while the 2018 wave included the most recent wave of available data from the HRS. Distinct HRS datafiles were joined to the RAND HRS dataset as needed [14]. The overarching purpose of the HRS is to observe the economic and health status of Americans over time [14]. HRS participation requires persons be aged at least 50 years, and new birth cohorts are included in the HRS every six years for maintaining national representation [14]. Those in the HRS are re-interviewed biannually and followed until death. Response rates have consistently been >80% [15].

The HRS utilizes a multistage probability design, including geographical stratification and oversampling for select demographic groups [16]. Participants provided written informed consent prior to entering the HRS, and the University's Behavioral Sciences Committee Institutional Review Board approved protocols. More details about the HRS are available elsewhere [16].

Measures

Age, sex, race, and ethnicity were reported at each wave. Respondents also communicated with trained interviewers at each wave about their ability to perform six IADLs: manage money, manage medications, use a telephone, prepare hot meals, shop for groceries, and use a map. Persons reporting difficulty or an inability to complete an individual IADL were considered as having an impairment in that specific task. Likewise, those indicating difficulty or an inability to perform any IADL were classified as having an IADL impairment.

Statistical analysis

All analyses were conducted with SAS 9.4 software (SAS Institute; Cary, NC). HRS analytic guidelines steered our analyses [17]. Survey weights, which accounted for the complex sampling design, were used to obtain nationally representative estimates. Descriptive characteristics were presented unweighted as mean \pm standard deviation for continuous variables or frequency (percentage) for categorical variables as indicated to increase interpretability. Prevalence estimates for Americans with impairments in individual IADL tasks were presented at each wave, and the overall prevalence of IADL impairments were similarly shown at each wave. IADL impairment prevalence estimates were then stratified by age group (50–64 years (middle-

aged); ≥ 65 years (older)), sex (male, female), and race and ethnicity (Hispanic, non-Hispanic Black, non-Hispanic Other, non-Hispanic White). Prevalence estimates were weighted and presented alongside 95% confidence intervals (CI).

Separate multilevel logistic regression models for examining trends in IADL impairments were conducted with the survey weights included for overall impairments, age group, sex, and race, and ethnicity. To account for the longitudinal design, repeated measures of individual participants in multiple waves were modelled using a random intercept for each participant. For each model, the binary outcome was IADL impairment. For the overall model, the only predictor was time (i.e., survey wave). For assessing trends by age group, the model adjusted for time, age group (reference: middle-aged), and the interaction between time and age group. Similarly, for the model of trends by sex, the model adjusted for time, sex (reference: female), and time-by-sex interaction. In the final model, there was a predictor for time, race, and ethnicity (reference group: non-Hispanic White) and the interaction between time and race/ethnicity.

As another supplementary analysis, we performed an unweighted crude, cross-sectional multilevel logistic regression model to examine the association between IADL impairment and cognitive impairment. A random intercept for individuals was included. Cognitive functioning was determined with a modified version of the Telephone Interview of Cognitive Status (TICS) [18]. Persons aged < 65 years and ≥ 65 years with TICS scores ≤ 11 and ≤ 10 had a cognitive impairment, respectively [19–21]. This supplementary analysis necessitated that we include the TICS, which is a separate measure from our principal analyses, and therefore, $n = 1,410$ participants were removed from this individual analysis for not having TICS scores. An alpha level of 0.05 was used for all analyses.

RESULTS

The overall unweighted baseline descriptive characteristics of the 29,764 participants are shown in Table 1. Participants were aged 63.8 ± 10.9 years and were mostly female (56.5%). Table 2 presents the overall prevalence of individual IADL impairments. At each wave, the prevalence of Americans with impairments in using a map was highest, while impairments in managing medications were often

Table 1
Unweighted overall baseline descriptive characteristics of the participants

	Overall ($n = 29,764$)
Age (y)	63.8 ± 10.9
Age Category (n (%))	
Middle-Aged Adult (n (%))	17,312 (58.2)
Older Adult (n (%))	12,452 (41.8)
Sex (n (%))	
Male (n (%))	12,959 (43.5)
Female (n (%))	16,805 (56.5)
Race and Ethnicity (n (%))	
Hispanic	4,072 (13.7)
Non-Hispanic Black	5,845 (19.6)
Non-Hispanic Other	1,192 (4.0)
Non-Hispanic White	18,655 (62.7)

Results are presented as mean \pm standard deviation or frequency (percentage) as indicated.

lowest. Table 3 shows the overall prevalence of IADL impairments. The prevalence of IADL impairments trended downward over time ($p < 0.001$), such that IADL impairments were 31.9% (CI: 31.1, 32.7) in the 2006 wave, estimates trended downward to 25.4% (CI: 24.5, 26.2) in the 2018 wave.

Table 4 presents the prevalence of IADL impairments by age group. Older Americans had a higher prevalence of IADL impairments compared to middle-aged Americans at each wave. For example, the prevalence of IADL impairments in middle-aged Americans was 19.2% (CI: 17.9–20.4) in 2018, while the corresponding IADL impairment prevalence in older Americans was 31.3% (CI: 30.2–32.5). Additionally, a downward trend in the prevalence of IADL impairments was observed in older Americans ($p < 0.001$), but not in those who were middle-aged.

The prevalence of IADL impairments by sex are shown in Table 5. Females had a higher prevalence of IADL impairments at each wave compared to males. In the 2018 wave, females had a IADL impairment prevalence at 29.8% (CI: 28.6–30.9), while males had an IADL impairment prevalence at 20.2% (CI: 19.0–21.4). Nonetheless, the prevalence of IADL impairments significantly declined during the study period for both males and females ($p < 0.01$). Table 6 presents the prevalence of IADL impairments by race and ethnicity. Persons identifying as Hispanic and non-Hispanic Black had the highest prevalence of IADL impairments compared to non-Hispanic Whites. The prevalence of IADL impairments decreased over time for persons categorized as Hispanic, non-Hispanic Black, and non-Hispanic White ($p < 0.001$), but not non-

Table 2
Overall prevalence of individual instrumental activities of daily living impairments

	Weighted Frequency Impaired	Weighted Prevalence Impaired (%)	95% CI
2006 Wave			
Manage Money	7,718,318	10.0	9.5, 10.5
Manage Medications	3,294,401	4.3	4.0, 4.6
Use a Telephone	3,790,657	4.9	4.6, 5.3
Prepare Hot Meals	8,260,668	10.7	10.2, 11.2
Shop for Groceries	9,897,676	12.9	12.3, 13.4
Use a Map	15,832,651	20.6	19.9, 21.2
2008 Wave			
Manage Money	7,312,488	10.0	9.5, 10.5
Manage Medications	3,228,201	4.4	4.1, 4.8
Use a Telephone	3,731,850	5.1	4.8, 5.4
Prepare Hot Meals	7,596,201	10.4	9.9, 10.9
Shop for Groceries	8,720,055	11.9	11.4, 12.5
Use a Map	14,899,372	20.4	19.7, 21.0
2010 Wave			
Manage Money	9,043,235	9.6	9.1, 10.1
Manage Medications	3,806,939	4.0	3.7, 4.4
Use a Telephone	4,605,733	4.9	4.6, 5.2
Prepare Hot Meals	8,113,646	8.6	8.2, 9.1
Shop for Groceries	10,105,896	10.7	10.2, 11.2
Use a Map	15,789,388	16.8	16.2, 17.4
2012 Wave			
Manage Money	8,116,765	9.0	8.5, 9.4
Manage Medications	3,589,333	4.0	3.7, 4.3
Use a Telephone	4,234,507	4.7	4.3, 5.0
Prepare Hot Meals	7,925,220	8.7	8.3, 9.2
Shop for Groceries	9,604,500	10.6	10.1, 11.1
Use a Map	14,948,419	16.5	15.9, 17.1
2014 Wave			
Manage Money	8,170,727	9.5	9.0, 10.0
Manage Medications	3,707,898	4.3	3.9, 4.6
Use a Telephone	4,253,187	4.9	4.6, 5.3
Prepare Hot Meals	7,463,799	8.6	8.2, 9.1
Shop for Groceries	9,279,329	10.7	10.2, 11.3
Use a Map	15,234,396	17.6	17.0, 18.3
2016 Wave			
Manage Money	9,385,667	8.7	8.2, 9.2
Manage Medications	4,260,201	3.9	3.6, 4.3
Use a Telephone	4,459,865	4.1	3.8, 4.4
Prepare Hot Meals	8,455,537	7.8	7.4, 8.3
Shop for Groceries	10,737,604	9.9	9.4, 10.4
Use a Map	16,161,859	15.0	14.4, 15.6
2018 Wave			
Manage Money	8,567,511	8.3	7.8, 8.9
Manage Medications	3,689,518	3.6	3.2, 3.9
Use a Telephone	4,245,289	4.1	3.8, 4.5
Prepare Hot Meals	7,923,317	7.7	7.2, 8.2
Shop for Groceries	10,206,511	9.9	9.3, 10.5
Use a Map	16,183,194	15.7	15.0, 16.4

Hispanic Other. Appendix 1 shows the results of the IADL impairment trends analyses. The results of the supplementary analysis examining IADLs and cognitive impairment showed that persons with an IADL impairment had 2.14 (CI: 2.04–2.24) greater odds for cognitive impairment.

DISCUSSION

Our results indicate that approximately a quarter of Americans aged at least 50-years are living with an IADL impairment, and from 2006–2018, the prevalence of such impairments have gener-

Table 3
Overall prevalence of instrumental activities of daily living impairments

	Weighted Frequency Impaired	Weighted Prevalence (%)	95% CI
2006 Wave	24,572,730	31.9	31.1, 32.7
2008 Wave	23,013,983	31.5	30.6, 32.3
2010 Wave	25,825,108	27.4	26.7, 28.2
2012 Wave	24,075,756	26.6	25.8, 27.3
2014 Wave	24,140,310	27.9	27.1, 28.7
2016 Wave	26,696,870	24.7	24.0, 25.5
2018 Wave	26,152,938	25.4	24.5, 26.2

Table 4
Prevalence of instrumental activities of daily living impairments by age group

	Weighted Frequency Impaired	Weighted Prevalence (%)	95% CI
Middle-Aged			
2006 Wave	8,872,807	22.0	20.8, 23.1
2008 Wave	7,378,928	21.1	19.8, 22.4
2010 Wave	10,637,620	19.8	18.8, 20.8
2012 Wave	8,693,113	18.2	17.2, 19.2
2014 Wave	8,215,440	20.1	18.9, 21.3
2016 Wave	10,649,355	18.0	17.0, 19.0
2018 Wave	9,786,474	19.2	17.9, 20.4
Older			
2006 Wave	15,699,923	42.7	41.7, 43.7
2008 Wave	15,635,055	40.8	39.8, 41.8
2010 Wave	15,187,488	37.4	36.4, 38.5
2012 Wave	15,382,643	35.7	34.7, 36.8
2014 Wave	15,924,870	34.9	33.8, 35.9
2016 Wave	16,047,515	32.7	31.6, 33.8
2018 Wave	16,366,464	31.3	30.2, 32.5

Table 5
Prevalence of instrumental activities of daily living impairments by sex

	Weighted Frequency Impaired	Weighted Prevalence (%)	95% CI
Females			
2006 Wave	15,323,153	36.2	35.1, 37.3
2008 Wave	14,600,179	36.3	35.1, 37.4
2010 Wave	16,234,557	31.7	30.7, 32.7
2012 Wave	15,050,337	30.5	29.5, 31.5
2014 Wave	15,254,077	32.4	31.3, 33.5
2016 Wave	16,794,106	28.9	27.8, 30.0
2018 Wave	16,499,160	29.8	28.6, 30.9
Males			
2006 Wave	9,249,577	26.6	25.4, 27.8
2008 Wave	8,413,804	25.5	24.3, 26.7
2010 Wave	9,590,551	22.3	21.2, 23.3
2012 Wave	9,025,419	21.8	20.7, 22.9
2014 Wave	8,886,233	22.5	21.3, 23.6
2016 Wave	9,902,764	19.8	18.7, 20.8
2018 Wave	9,653,778	20.2	19.0, 21.4

ally declined. When examining task-specific IADLs, the prevalence of impairment in using a map were highest. The prevalence of IADL impairments were greatest in older Americans and females. Moreover, Hispanics and non-Hispanic Blacks had the highest

prevalence of IADL impairments. Our findings provide insights into the presence of IADL impairments among United States adults, and how IADL impairments have changed over time. While opportunities may exist for improving how we assess IADLs, exam-

Table 6
Prevalence of instrumental activities of daily living by race and ethnicity

	Weighted Frequency Impaired	Weighted Prevalence (%)	95% CI
Hispanic			
2006 Wave	2,704,619	46.7	43.7, 49.7
2008 Wave	2,464,569	44.0	41.0, 47.0
2010 Wave	3,016,288	39.3	36.6, 42.0
2012 Wave	2,978,606	38.6	35.9, 41.3
2014 Wave	3,180,426	42.0	39.0, 44.9
2016 Wave	3,784,898	34.9	32.5, 37.3
2018 Wave	3,963,406	37.8	35.0, 40.5
Non-Hispanic Black			
2006 Wave	3,217,197	45.3	42.9, 47.6
2008 Wave	2,903,112	42.7	40.2, 45.1
2010 Wave	3,902,153	41.1	39.0, 43.2
2012 Wave	3,577,302	39.2	37.0, 41.3
2014 Wave	3,672,139	42.2	39.9, 44.5
2016 Wave	3,960,722	34.9	32.8, 36.9
2018 Wave	3,921,686	36.0	33.8, 38.3
Non-Hispanic Other			
2006 Wave	721,474	35.1	29.6, 40.7
2008 Wave	726,831	37.7	31.7, 43.6
2010 Wave	937,116	29.4	25.0, 33.9
2012 Wave	857,821	27.1	22.8, 31.3
2014 Wave	918,888	30.1	25.5, 34.7
2016 Wave	1,399,168	25.0	21.4, 28.7
2018 Wave	1,448,271	27.0	22.8, 31.1
Non-Hispanic White			
2006 Wave	17,929,440	28.8	28.0, 29.7
2008 Wave	16,919,471	28.7	27.8, 29.6
2010 Wave	17,969,551	24.3	23.5, 25.1
2012 Wave	16,662,027	23.6	22.7, 24.4
2014 Wave	16,368,857	24.3	23.4, 25.2
2016 Wave	17,552,082	21.8	20.9, 22.7
2018 Wave	16,819,575	22.0	21.0, 23.0

ining IADLs remains a simple screening method for cognitive impairment and age-related disablement.

The decline of IADL impairments overtime could be attributed to recent technological and medical advancements. Impairments in using a map reign as the most prevalent IADL impairment in Americans, but its prevalence has generally declined the most compared to the other IADLs over time. With sophistication in technologies, the ability to disseminate and use a map may have declined in relevance. Global Positioning Systems (i.e., GPS), which are currently found on most mobile devices, may replace the need for a person to utilize spatial awareness skills for reading a map [22]. Replacing this technologically unsuitable IADL with an appropriate modern-day substitution may better serve clinicians when screening for cognitive dysfunction and recognize the true functional capacity of their patient. The prevalence of impairments in shopping for groceries and preparing hot meals have similarly shown noteworthy declines during the period examined. A possible explanation

might be within Americans' increased use of convenience foods prepared outside of the home [23].

IADL impairments tend to increase with age, and thus it was not surprising that our findings indicated older adults had a higher prevalence of IADL impairments compared to middle-aged persons. Our findings of a higher prevalence of IADL impairments in females may be associated with the high prevalence of cognitive impairment in said population [24, 25]. Several studies indicate that females have a higher prevalence of cognitive impairment compared to males possibly due to socio-economic status, psychosocial factors, cardiovascular and metabolic diseases, sex hormone changes in midlife, genetics, and lack of educational opportunities [24, 25]. Changing gender and societal norms in America may also influence the acquired IADL impairment prevalence disparity between males and females. The high prevalence of IADL impairments in Hispanic and non-Hispanic Blacks may be due to health disparities and lack of access to care [26,

27]. IADLs in this regard may be best observed in tandem with observing the personal narratives and social determinants of health and quality of life. Such issues persist within a pattern of health determinants, outcomes, and resources associated with social inequities, such as social exclusion, blocked opportunities, or unequal returns on effort within societal structures [28]. Structural equation models have also shown that psychosocial factors are related to both social determinants and health outcomes [29].

IADLs remain a simple-to-collect indicator of cognitive dysfunction and physical disablement. While the prevalence of IADLs in American adults should continue being monitored, we also recommend that the current tasks included in IADL assessments be modernized. For example, the ability to use a map could be outdated such that technological advancements have decreased the relevance of this task. Possible refinement of IADLs to be modernized could be especially important as technological resources continue advancing and middle-aged persons phase into older adulthood. Moreover, not all individual IADL impairments have equal health-related severity, and as refinements to IADLs might be considered, acknowledging how each task is linked to future health should be contemplated [30]. Regardless, the surveillance of neuropsychological-driven tasks such as IADLs will continue providing insights into cognitive impairment.

Some limitations should be noted. Although self-report information is common for population-based studies such as HRS and IADL assessments, self-report biases may have nevertheless existed in our findings. While we chose to limit the stratified analyses to age, gender, and race and ethnicity for interpretability, other sub-group analyses may have relevance and should be considered in future investigations. Our principal results did not examine the association between IADLs and cognitive dysfunction, but future work may examine these associations more closely, including how individual IADLs and basic self-care tasks might be linked to cognitive impairment. Despite these limitations, our investigation revealed IADL impairment prevalence and trends in American adults using population-representative data, with weighted prevalence estimates at each wave. We recommend IADLs continue to be surveilled alongside other cognitive indicators as the older American demographic increases to help inform screening and intervention.

Conclusions

The overall prevalence of IADL impairments, which is a strong marker of cognitive function, have declined from 2006–2018 in Americans aged at least 50 years. Older adults and females showed greater IADL impairment prevalence compared to middle-aged adults and males, respectively. Additionally, the prevalence of IADL impairments were greatest in Hispanics and non-Hispanic Blacks. Examining IADLs remains a simple method for initial screenings of cognitive dysfunction and disablement during aging. Insights into the presence of IADL impairments among Americans, and how IADL impairments continue changing over time are important to inform healthcare providers as early detection of IADL impairment provides a critical window for implementation of a targeted cognitive function intervention.

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CONFLICT OF INTEREST

The authors have no conflict of interest to report.

SUPPLEMENTARY MATERIAL

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