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Functional limitations in older adults who have cognitive impairment without dementia

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Abstract

OBJECTIVE—Characterize the prevalence of functional limitations among older adults with cognitive impairment without dementia (CIND).

METHODS—Secondary data analysis was performed using the Aging, Demographics, and Memory Study (ADAMS) dataset. 856 individuals ≥ 71 years old were assigned to 3 diagnostic cognitive categories. A questionnaire was completed by a proxy informant regarding functional limitations for 744 of 856 respondents.

RESULTS—Of the 744 subjects, 263 (13.9%) had dementia, 201 (21.3%) had CIND, and 280 (64.8%) had normal cognition. Informants reported ≥ 1 IADL limitation in 45% of subjects with CIND compared to 13% of subjects with normal cognition and 85% of subjects with dementia ($p < .001$). The ADL impairments among individuals with CIND were primarily attributed to physical health problems (n=41; 40%).

CONCLUSIONS—Many individuals with CIND have impairment in a range of complex and basic daily activities, largely due to physical health problems.

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Keywords

ADL; IADL; functional limitations; functional impairment; cognitive impairment

1. INTRODUCTION

Cognitive impairment that does not meet the threshold of dementia affects approximately 22% of adults older than 70 in the United States (1, 2). Prior studies suggest that cognitive impairment without dementia (CIND) is associated with an increased risk for progression to dementia, with a 10–15% annual conversation rate compared to 1–2.5% conversion rate for cognitively healthy older adults (1, 3–6). Although individuals with CIND are below the threshold for a dementia diagnosis, prior research suggests that they already have increased neuropsychiatric symptoms and changes in everyday function (7–10).

Functional impairment in instrumental activities of daily living (IADLs) has been documented in prior clinic-based studies of older adults with mild cognitive impairment (MCI) (9, 11–14). Historically, the MCI construct has been limited to individuals with isolated memory impairment. More recently, the concept of MCI has expanded to include individuals with mild impairment in both memory and other cognitive domains. With the current definition of MCI there is significant overlap between MCI and CIND. Previous studies, which identify individuals with MCI within the historical (i.e. amnestic MCI) and current constructs of MCI (amnestic and non-memory MCI), suggest that IADLs involving memory and complex reasoning, such as use of transportation, managing medicines, and managing finances are predominantly affected.(9–11, 15–17) Although there is emerging data describing functional limitations in MCI from clinical samples, much less is known about the extent of functional limitations in a population-based sample of older adults with CIND where there is likely a higher prevalence of chronic medical conditions. Diagnostic criteria stipulate that individuals with CIND do not have impairment of basic ADLs attributable to cognitive impairment; therefore limitations in basic daily living tasks are due to other health problems. Furthermore, community-dwelling individuals with CIND who have functional limitations with more complex tasks are likely to have more heterogeneous etiologies such as comorbidities, and physical or sensory limitations than what is typically seen in a sample derived from a clinical research study. The combination of both mild cognitive and medical problems significant enough to interfere with IADLs and ADLs may increase the need for assistance from informal or formal sources.

Prior studies of functional limitations among those with CIND have been primarily based on non-representative samples from specialty clinic populations or participants in clinical trials. Population-based estimates are few: The Italian Longitudinal Study on Aging documented a weighted prevalence of ≥ 1 ADL limitation of 57% in CIND subgroup.(18) In the Canadian Study of Health and Aging, the reported prevalence of task-specific disability in the CIND subjects was 20.2% for bathing, 9.8% for dressing, 7.9% for grooming, and 8% for toileting. (19) In the current study, we used the national probability sample of the Aging, Demographics, and Memory Study (ADAMS) to determine the population-based prevalence of IADL limitations among older adults with normal cognition, CIND, and dementia and to determine what proportion of those limitations are due to cognitive versus physical health problems. By using a population-based sample in which a comprehensive assessment of cognitive status was performed, we are able to characterize the range of functional status within a heterogeneous CIND population.

2. METHODS

2.1 Sample

The ADAMS sample was identified from the larger Health and Retirement Study (HRS), an ongoing nationally representative cohort study of adults age 51 years and older. The HRS was designed to identify the health, social, and economic implications of aging in the United States, and the current sample includes approximately 20,000 participants.

The ADAMS is the first study of CIND and dementia in the United States that includes individuals from all regions of the country and which uses a single standardized diagnostic protocol in a community-based sample. The study began by recruiting a stratified random subsample of 1,770 individuals age 70 years or older from five cognitive strata based on participants' scores on the HRS cognitive items (from either the 2000 or 2002 wave). The HRS sample is selected using a multistage area probability sample design, and population weights are constructed so that valid inferences can be drawn for the entire U.S. population aged ≥ 51 and older. The ADAMS weight is a combined weight based on four weight factor components to account for: 1) each case's population representation in the full HRS panel from which ADAMS cases were subsampled; 2) the stratified subsampling of ADAMS cases from the full set of eligible HRS panel respondents; 3) nonresponse among the surviving members of the ADAMS sample; and 4) poststratification of weights to U.S. population controls.(20) The ADAMS initial assessments occurred between July 2001 and December 2003, on average, 13.3 months after participants' original HRS interview. Participants were 71 years of age or older at the time of their initial assessment. Additional details on the ADAMS sampling design and selection procedures are described elsewhere (21).

A total of 856 individuals (56% of the nondeceased target sample) participated in all phases of the dementia assessment; additional details on participation rates are reported elsewhere (21). The protocol required participation of both the HRS respondent and an informant who was familiar with the subjects' daily activities and medical history. Seventy-three percent of informants were a spouse or adult child, 71% were females, and in 53% of cases, the informant lived with the ADAMS participant. As part of the assessment, proxy informants provided information to a trained nurse interviewer about the participant's cognitive and functional status, neuropsychiatric symptoms, and medical history. The sample for the current analyses included the 744 of the 856 participants whose informant completed and returned the self-administered questionnaire. Of the ADAMS participants for whom questionnaires were not completed (n=112, 13.1% weighted percentage of total sample), 27 were cognitively normal, 40 had CIND, and 45 were demented. Within categories of cognitive impairment, there were no significant differences between participants for whom the questionnaire was and was not returned with respect to age, race, level of education, living arrangement, net worth, and gender.

2.2 Variables and Their Measurement

2.2.1 Dementia Assessment and Diagnosis—The ADAMS in-person evaluation was a 3–4 hour structured assessment conducted in the participant's residence by a nurse and neuropsychology technician, both specially trained in data collection for dementia evaluation. The participant completed neuropsychological test battery, a neurological examination, and a depression screening instrument. Informants reported: a chronological history of the participant's cognition and function, medical and psychiatric history, family history of memory problems, current medications use, and current behavioral and psychiatric symptoms.

Results of the Mini-Mental State Examination (MMSE), a brief measure of cognitive status, are reported in Table 1 to describe sample characteristics. (22) Forty-two of the entire ADAMS sample of respondents did not complete the MMSE due to severe cognitive impairment (n=37), refusal (n=1), and other reasons (n=4).

A consensus panel of clinicians used all available data to assign the final diagnosis of normal, CIND, or dementia. The definition of CIND and its subtypes were developed primarily on the basis of the accumulated clinical experience of a group of researchers involved in ADAMS as well as 3 other epidemiologic studies of dementia. (23–25) CIND was defined as mild cognitive, with or without functional impairment, reported by the participant or informant that did not meet the criteria for dementia or performance on neuropsychological measures that was both below expectation relative to education, reading level, and occupational attainment, and ≥ 1.5 SDs below published norms on any test. To reflect the variation in clinical presentation and potential differences in the cause of the impairment, the ADAMS consensus group used 12 diagnostic subcategories for CIND, unspecified cognitive impairment without dementia: prodromal Alzheimer disease, amnestic mild cognitive impairment(30 – 31), vascular cognitive impairment without dementia, stroke, medical conditions or sensory impairment, neurologic conditions, depression, other psychiatric disorders, low baseline intellect or learning disorder, past alcohol abuse, and current alcohol abuse.

Dementia diagnosis was based on criteria from the *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition*, and the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*. Differential diagnoses of Alzheimer's dementia(26) and vascular dementia(27, 28) were assigned based on currently accepted clinical criteria. For the present analyses, three general diagnostic cognitive categories (normal, CIND, and dementia) were used.

The following other health conditions were identified based on self- or informant-report during the 2000 and 2002 core interview waves of the Health and Retirement Study: diabetes mellitus, heart problem, stroke, psychiatric problem, falls, and vision and hearing problems. A vision problem was defined as self or proxy-report of fair or poor eyesight despite the use of corrective lenses. Hearing impairment was defined as self or proxy-report of fair or poor hearing despite the use of hearing aids. Depression data was available for 737 of the 744 ADAMS participants in our sample. The Composite International Diagnostic Interview-Short Form (CIDI-SF) is a brief self-report of depressive symptomatology that may be used to estimate probable diagnosis of a major depressive episode. The CIDI-SF is a structured diagnostic interview designed for use by trained nonclinical interviewers that screens for DSM-IV disorders. For those who were unable to provide self-reported information because they were too impaired, depression was measured from the Neuropsychiatric Inventory (NPI).

2.2.2 Measurements of Functional Limitation—Functional limitations were assessed by informant self-administered informant questionnaire that asked whether the participant had difficulty in specific ADLs (bathing, dressing, eating, toileting, transfers, and walking) or IADLs (grocery shopping, preparing meals, taking medication, managing money and making phone calls). Questions were based on Katz instruments of ADL and IADL function (29–31) and have been used in multiple prior studies (16, 32–36). The response options for each item were "yes", "no", or "inapplicable (doesn't do or can't do)" or "don't know". "Yes" responses were coded as having difficulty; "no" responses were coded as not having difficulty. As part of the dementia assessment, the study nurse conducted a semi-structured clinical interview with the informant that included questions about whether the study participant had difficulty with daily activities and whether any problems endorsed were due

to physical health or cognitive problems. The response options for the cause of the problem were “memory”; “physical health problems”; “both memory and physical health problems”; or, “neither”. The responses to these questions were used to determine whether the functional limitations were attributable to cognitive or physical problems.

2.2.3 Sociodemographic factors—Demographic variables included in the analysis were age, sex, race (non-Hispanic White, non-Hispanic Black, and Hispanic), marital status, educational attainment, living arrangement, nursing home residence, and net worth. These variables were obtained from the 2000 and 2002 HRS core and tracker files.

2.3 Analysis

All analyses were conducted using STATA 10.1. Using ADAMS sampling weights, we computed the prevalence of ADL and IADL limitations within each of the three cognitive categories: demented, CIND and normal cognition. Sample characteristics and the reasons for daily living tasks difficulty among the three cognitive categories were listed as proportions and compared using chi-square tests, as appropriate. We could not perform in-depth analysis to determine the reasons for IADL and ADL impairment because of insufficient overlap in IADL tasks and limited sample size of CIND participants with ADL functional limitations.

We used logistic regression to characterize the association of ADL and IADL functional impairment with cognition. The final logistic model included age and health, factors that are associated with IADL and ADL functional limitations. Model 1 included age. Model 2 included age in addition to respondents’ chronic medical conditions, and sensory impairment. All results were adjusted for the ADAMS complex sampling design.

3. RESULTS

Of 744 ADAMS participants, 263 had dementia: 199 (70.5%) with Alzheimer’s disease, 42 (16.9%) with Vascular Dementia, and 22 (12.6%) were demented due to other etiologies (Parkinson’s disease, Progressive Supranuclear Palsy, Normal Pressure Hydrocephalus, frontal lobe dementia, severe head trauma, alcoholic dementia, ALS with dementia, hypoperfusion dementia and probable Lewy body dementia). Of the 201 (21.3%) ADAMS subjects with CIND, most causes of mild cognitive impairment were due to prodromal Alzheimer’s dementia (34.5%), vascular (11.2%), stroke (17.8%), and medical conditions (22.3%) causes. Depression and mental retardation accounted for less than 6% of CIND cases. There were no cases that were classified as CIND due to another psychiatric disorder. Analyses were performed with and without CIND cases due to mental retardation (n=5) showed no major differences; so they were included in all results. Table 1 summarizes the demographic and health characteristics of ADAMS subjects separately within demented, CIND and normal cognition categories. Overall, the sample represented a wide age range, including a significant percentage of respondents who were ≥ 90 years of age. As expected, respondents with dementia were the oldest age group with a mean age of 85.4 ± 6.9 years ($p < .001$). There were no significant differences among groups with respect to gender ($p = .09$) and race/ethnicity ($p = 0.13$). Those with CIND and dementia had less education than the cognitively normal participants ($p < .001$). The average MMSE summary score for the demented group, 14.2 ± 6.3, was significantly lower than the normal and CIND groups ($p < .001$).

Overall depression prevalence was 11.9% in our study sample. ADAMS participants with dementia had a higher proportion of depressive symptoms compared to those in the CIND and normal cognitive categories (20% vs. 14.8% vs. 9.3%; $p = .04$). Subjects who were cognitively normal had the fewest chronic conditions 2.16 ± 1.27, compared to 2.75 ± 1.44

in the CIND group, and 2.64 ± 1.5 in the demented group ($p < .001$). Those with dementia and CIND had a similar mean number of chronic conditions (p=.12, two-way comparison). Those with dementia had higher reports of stroke compared to respondents with normal cognition and CIND (36.3% vs 20.6%; $p< .001$, two-way comparison). Both the demented and CIND groups had higher reports of visual and auditory problems compared to the cognitively normal group ($p <.01$; two-way comparison). Similar frequencies of falling were reported in the demented and CIND groups.

Individuals with CIND had a higher mean number of IADL limitations than the normal cognition group, but fewer than those with dementia (Table 2). In viewing each IADL item separately (Table 2), participants with CIND more often needed assistance with cooking ($p= .001$), grocery shopping ($p= .001$), using the telephone ($p < .001$), managing money (p=.002), and medications ($p= .008$) compared to the participants with normal cognition. Forty-one (41 of n=93) percent of informants for ADAMS participants with CIND attributed household task difficulty to physical health problems; 34% (n= 24) to both memory and physical health problems. Cooking was the only task that overlapped between the IADL Katz items and the household tasks included in the ADAMS questionnaire; therefore, additional interpretation was limited.

The CIND group had a mean number of 1.04 ADL limitations Approximately 40% of individuals with CIND had ≥1 ADL limitation compared to 17% with normal cognition (p=.03; two-way comparison). Considering each ADL item separately (Table 2), the individuals with dementia consistently had the highest likelihood of ADL limitations across each individual task. Also, ADL limitations such as walking (p=.002), bathing ($p <.001$), toileting (p=.01), and dressing (p=.001) were more common among those with CIND compared to the normal group. However, those with CIND had similar reports of eating (p=.36) and transferring (p=.06) difficulty as the normal group.

Informants of ADAMS participants from the dementia subgroup attributed bathing and dressing difficulty to memory (n=49, 28.9% and n=61, 33.1%, respectively) or both to memory and a physical health problem (n=63, 38.8% vs. n=63, 36%) more often than those from CIND and normal subgroups ($p <.001$). Bathing and dressing difficulty were primarily attributable to physical health problems, rather than cognitive reasons in the CIND population when compared to the dementia subgroup (bathing: Dementia, n=49, 28.9% vs. CIND, n=35, 84%; two-way comparison, $p < .001$) (dressing: Dementia, n=41, 30.9% vs. CIND, n=32, 92.8%; two-way comparison, $p < .001$). There were similar proportions of informants identifying physical health problems as being the primary reason for bathing and dressing difficulties between the CIND and normal subgroups (bathing: CIND, n=35, 84% vs. Normal: n=13, 9%; two-way comparison, p=.27) (dressing: CIND, n=32, 92.8% vs. Normal, n=14, 100%; two-way comparison, p=.16). Eating difficulty was infrequent within the CIND (n=9) and normal (n=3) cognitive subgroups.

Adjusted association between cognitive subgroup and functional limitations

Table 3a shows the logistic regression models for the relationship of ADL limitations to normal cognition, CIND and dementia. In the unadjusted model, those with CIND had a greater odds (3.57: 95% CI: 1.97–6.44) of reporting ≥ 1 ADL limitations compared to the cognitively normal group. Although the odds ratio attenuated after age adjustment, CIND remained independently associated with a higher odds of ≥ 1 ADL limitations. The age category, ≥ 90 years, exerted the greatest influence on the model. Those with dementia had significantly greater odds of possessing ≥ 1 ADL limitations when compared to the cognitively normal and CIND groups in all regression models.

Table 3b shows the logistic regression model results for ≥ 1 IADL functional limitations by cognitive category. The dementia and CIND groups were associated with higher odds of ≥ 1 IADL limitations compared to the cognitively normal group (CIND OR: 4.67; 95% CI: 2.37–9.21) in the age-adjusted model; Dementia OR: 27.98; 95% CI: 14.42–54.28) the odds ratios reached statistical significance in all of the models.

One possible explanation for the presence ADL and IADL limitations among those with CIND is increased prevalence of comorbid conditions which may which may contribute to functional limitations at higher rates than would be found due to cognitive impairment alone. To test this hypothesis, we created Model 2 controlling for chronic conditions such as stroke and sensory impairment. These models demonstrate higher odds of ≥ 1 ADL impairment (OR: 2.44; 95% CI: 1.36– 4.38) and ≥ 1 IADL limitations (OR: 3.51; 95% CI: 1.92–6.43) compared to the normal group. Stroke exerted the greatest effect on both models. This suggests that CIND in non-clinical samples, individuals with CIND have both IADL and ADL impairments that are not accounted for by age and a few selected medical or sensory conditions. ADL impairments were still primarily attributed to physical problems in this group as previously noted.

4. DISCUSSION

Cognitive impairment without dementia affects a large segment of older adults. We found that IADL limitations were present in approximately 45% of those with CIND using a stratified, random subsample of older adults from 5 cognitive strata. Individuals with CIND had significantly more IADL and ADL limitations than those with normal cognition, but significantly fewer than those with dementia. Grocery shopping and cooking were the IADLs most often affected in those with CIND. Walking, bathing, and dressing difficulty were the ADLs most commonly affected in those with CIND. ADL limitations in bathing and dressing were primarily attributable to physical health problems, rather than cognitive reasons in the CIND and cognitively normal population. The reason for walking difficulty was not available in the informant questionnaire; therefore, could not be further analyzed. We had difficulty interpreting the reasons for IADL difficulties due to insufficient overlap between the Katz IADL measures and the ADAMS informant questionnaire.

Little research has been conducted on everyday function in individuals with CIND in a population-based sample. In fact, much of what is known about the frequency of IADL limitations among individuals with CIND has been drawn from specialty clinic samples or participants in clinical trials. These studies are often careful to exclude CIND patients with any functional decline due to medical or psychiatric illnesses at baseline or only report functional decline due to cognitive impairment (15, 37, 38). Therefore, it is difficult to compare our results from a population-based study where all-comers are included to clinical samples in which there is selective patient sampling to meet appropriate inclusion and exclusion criteria.

Our study has several strengths, including a population-based sample of a relatively large number of subjects with CIND and dementia and a comprehensive assessment and diagnostic protocol to classify respondents' cognitive status. Nevertheless, there are limitations that warrant comment. The ADAMS participation rate (56%) was lower than hoped for, although it was comparable to other population studies of this age group, such as the Cardiovascular Health Study (participation rate of 57.3%)(39) and the Canadian Study of Health and Aging (68.5%)(40). Nonparticipation could result in selection bias. Nonresponse bias was addressed in ADAMS using archived information from prior interviews. Sample weights were adjusted for non-response bias by using information available from prior waves of data in the Health and Retirement Study (41). Available measures were used to

create response multivariate and propensity models to adjust for factors that could contribute to significant selection bias. Of note, cognitive strata were not found to be a significant predictor in multivariate and propensity models ($p > .10$). ADAMS sample selection weights were further adjusted for non-response based on the response propensity models. There may still be remaining nonresponse bias that might have affected the analyses despite the sampling weights which account for differential nonresponse.

We relied on informant-based assessments of functional impairment which may have some inaccuracies; however informant reports are generally thought to be more reliable than self-report because individuals who are cognitively impaired may have a lack of awareness of functional limitations (8, 42, 43). Lastly, the information about functional limitations and the reasons for such limitations was collected using separate questionnaires. The two questionnaires differed somewhat on the activities they asked about. Consequently, there was insufficient overlap to allow for in-depth analysis of the etiology of limitations of specific IADL and ADL activities.

This study identified functional deficits in a wide range of IADLs and ADLs in the general CIND population; this has not been previously described in tertiary referral specialty clinic samples. Furthermore, we found that in non-clinical samples, individuals with CIND have both IADL and ADL impairments that are not accounted for by age and a few selected medical or sensory conditions. Although many of these limitations reportedly were not due to cognitive impairment, they present added challenges to individuals with CIND and their caregivers, especially among those with progressive cognitive decline. Community-based programs that are designed to care for patients with dementia and support their caregivers may fall short of meeting the needs of the CIND population and their caregivers in their current design. Focused interventions to improve everyday function within the CIND population may facilitate a sustained ability to live independently through addressing care needs.

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Table 1

Sample characteristics for ADAMS subjects, by diagnostic category

	All	Demented	CIND	Normal	p-value
Overall	744 (100)	263 (100)	201(100)	280 (100)	
Age (mean ± SD)	81.6 ± 7.1	85.4 ± 6.9	81.4 ± 6.9	77.9 ± 5.4	< .001
70–79 years	311 (59.3)	50 (20.5)	77 (42.0)	184 (73.3)	< .001
80–89 years	320 (33.8)	140 (60.1)	93 (46.0)	87 (24.1)	
≥ 90 years	113 (6.95)	73 (19.4)	31 (12.0)	9 (2.6)	
MMSE$^{\gamma}$(Range 0–30)					
Mean ± SD	21.8 ± 7.2	14.2 ± 6.3	23.1 ± 4.3	27.1 ± 2.9	<.001
Number (%) completed	713 (98.4)	233 (88.9)	200 (99.9)	280 (100)	< .001
Gender					.09
Male	313 (39.9)	82 (31.1)	102 (46.7)	129 (39.5)	
Female	431 (60.1)	181(68.9)	99 (53.3)	151 (60.5)	
Education (yr)					< .001
<12	379 (34.1)	154 (49.5)	119 (44.8)	106 (27.2)	
12	177 (28.6)	62 (28.5)	49 (31.6)	66 (27.7)	
>12	188 (37.3)	47 (22.0)	33 (23.6)	108 (45.1)	
Net worth					< .001
≤ 5,500	180 (13.2)	94 (32.4)	56 (19.6)	30 (7.0)	
5,501–74,000	185 (20.2)	66 (27.9)	61 (26.6)	58 (16.4)	
74,001–249,600	187 (29.3)	56 (20.0)	45 (27.0)	86 (32.1)	
≥249,601	192 (37.3)	47 (19.7)	39 (26.8)	106 (44.4)	
Living arrangement					< .001
Married	288 (48.1)	56 (26.9)	84 (42.9)	148 (53.1)	
Unmarried, LWA	133 (12.4)	66 (27.6)	39 (19.6)	28 (7.8)	
Unmarried, LA	251 (39.4)	78 (45.5)	70 (37.5)	103 (39.1)	
Nursing home residence	72 (5.3)	63 (26.9)	8 (5.2)	1 (0.7)	< .001
Race/ethnicity					.13
Non-Hispanic, White	544 (87.4)	190 (84.7)	135 (84.5)	219 (88.9)	
Non-Hispanic, Black	122 (7.0)	50 (10.7)	37 (9.7)	35 (5.4)	

	All	Demented	CIND	Normal	p-value
Hispanic	78 (5.6)	23 (4.7)	29 (5.8)	26 (5.7)	
Depression (n=737)	107 (11.9)	57 (20.0)	28 (14.8)	22 (9.3)	.04
Chronic illness					
Mean number	2.50±1.43	2.64±1.50	2.75±1.44	2.16±1.27	< .001
Stroke	141 (14.2)	85 (36.3)	37 (20.6)	19 (7.3)	< .001
Diabetes	143 (20.5)	37 (16.3)	55 (29.8)	51 (18.3)	.04
Heart problem	250 (30.2)	92 (38.7)	91 (46.7)	67 (23.0)	< .001
Psychiatric problem	156 (18.3)	75 (28.0)	42 (18.4)	39 (16.1)	.06
Cancer	136 (18.7)	49 (18.8)	33 (19.2)	54 (18.6)	.98
Lung	76 (9.3)	20 (10.4)	35 (18.1)	21 (6.2)	.009
Falls	309 (36.4)	138 (48.6)	91 (48.9)	80 (29.7)	< .001
Vision Problem	275 (29.7)	118 (42.9)	91 (40.5)	66 (21.9)	.006
Hearing Problem	272 (29.6)	110 (45.7)	88 (41.5)	74 (22.3)	.002

CIND-Cognitively impaired, not demented; LWA-living with another; LA-living alone

Values in parentheses are weighted column percentages derived using the ADAMS sampling weights.

* $p < .05$

$^{\gamma}$ Forty-two respondents did not complete MMSE due to severe cognitive impairment (n=37), subject refusal (n=1), and other reasons (n=4).

Table 3

Descriptive characteristics of functional limitations, by cognitive category

	All	Demented	CIND	Normal	p-value
Overall	744 (100)	263 (100)	201 (100)	280 (100)	
Mean # (+/− SD)					
ADLs	1.48 (2.14)	2.88 (2.40)	1.04 (1.71)	.49 (1.31)	< .001
IADLs	1.65 (2.04)	3.56 (1.86)	1.11 (1.50)	.25 (.76)	< .001
ADL impaired, n(%)					< .001
0	433 (69.5)	73 (26.1)	126 (57.7)	234 (82.7)	
1–3	160 (17.2)	78 (31.0)	51 (24.3)	31 (12.0)	
4–6	151 (13.3)	112 (43.0)	24 (18.0)	15 (5.3)	
IADL impaired, n(%)					< .001
0	385 (70.4)	31 (15.0)	108 (54.7)	246 (87.4)	
1–3	165 (18.2)	64 (24.8)	71 (33.9)	30 (11.7)	
4–5	194 (11.4)	168 (60.2)	22 (11.4)	4 (.9)	
ADL tasks, n (%)					
Walking	214 (23.5)	128 (54.4)	51 (33.3)	35 (13.7)	< .001
Bathing	246 (20.7)	170 (61.1)	50 (30.3)	26 (9.0)	< .001
Dressing	210 (19.2)	144 (55.2)	41 (27.4)	25 (8.8)	< .001
Eating	111 (9.7)	87 (35.7)	11 (7.9)	13 (4.8)	< .001
Toileting	151 (12.9)	115 (46.0)	24 (16.8)	12 (4.6)	< .001
Transfers	172 (17.6)	114 (47.1)	33 (20.7)	25 (10.2)	< .001
IADL tasks, n(%)					
Cooking	263 (20.4)	190 (68.5)	53 (30.3)	20 (6.9)	< .001
Grocery shopping	282 (22.6)	194 (71.1)	60 (30.1)	28 (9.7)	< .001
Using telephone	234 (14.3)	184 (65.6)	44 (20.6)	6 (1.28)	< .001
Taking medicines	223 (13.7)	180 (64.4)	34 (16.0)	9 (2.1)	< .001
Managing money	227 (14.5)	189 (68.9)	32 (15.2)	6 (2.6)	< .001

Values in parentheses are weighted column percentages derived using the ADAMS sampling weights.

Table 4

a-The association of cognitive category with ≥ 1 ADL limitations Odds ratio (95% Confidence Interval)			
Cognitive subgroup	**Univariate**	**Model 1**	**Model 2**
Normal	Reference	Reference	Reference
CIND	3.57 (1.97–6.44)	3.17 (1.73–5.80)	2.44 (1.36–4.38)
Dementia	13.54 (8.07–22.71)	11.50 (6.74–19.62)	7.94 (4.61–13.68)

b-The association of cognitive category with ≥ 1 IADL limitations Odds ratio (95% Confidence Interval)			
Dementia subgroup	**Univariate**	**Model 1**	**Model 2**
Normal	Reference	Reference	Reference
CIND	3.53 (1.48–8.43)	4.67 (2.37–9.21)	3.51 (1.92–6.43)
Dementia	25.08 (11.20–56.18)	27.98 (14.42–54.28)	21.65 (11.63–40-30)

Model 1: Includes age

Model 2: Includes Model 1 + stroke, diabetes, heart problem, fall, hearing and vision impairment, and lung problem.