

# Do We All Do the Same Things? Applicability of Daily Activities at the Intersection of Demographics

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**Objective:** To evaluate the extent to which demographic factors—and their intersections—influence the applicability of items assessing activities of daily living (ADLs) in a sample of older adults. **Method:** Participants' ( $n = 44,713$ ) Functional Activities Questionnaire (FAQ) scores from a multicenter database were evaluated to see how participant and collateral demographics, contextual, and clinical characteristics impacted ADL nonapplicability (NA). Collateral, contextual, and clinical characteristics were matched in those with and without NA. The effect of participant demographics and their interactions on NA responses were modeled with logistic regression. **Results:** At least one FAQ item (most commonly bill payment, taxes, playing games, and meal preparation) was rated as NA in up to one third of participants across ethnoracial groups. Dementia staging had the largest impact on NA, followed by participant demographics. In a matched sample, logistic models revealed that participant demographics, in particular sex, best predicted NA. However, meaningful interactions with ethnoracial group were noted for bill payment, taxes, meal preparation, and game engagement, suggesting that demographic intersections (e.g., younger vs. older Latinxs) meaningfully predict whether a given ADL was applicable to an individual participant. **Conclusions:** Neuropsychology is predicated on accurate assessments of both cognition and daily functioning and, in an increasingly diverse aging population, there should be careful consideration of demographic factors, their interactions, and historical contexts that drive day-to-day demands. This study establishes limitations of existing measures and paths forward for creating fair measures of functioning in older adults.

## Key Points

**Question:** How do demographic factors influence whether functional measures apply to the daily lives of older adults? **Findings:** For up to a third of participants, standard daily activity questions were not applicable, and nonapplicability was driven by identity intersections. **Importance:** These results inform use of established functional questionnaires in diverse samples so as to not disproportionately exclude minoritized individuals (e.g., application of scoring procedures that omit items). **Next Steps:** Understand why “common” activities are not applicable to minoritized groups, design improved measures of activity, and apply suggested methods in representative samples.

**Keywords:** activity of daily living, diversity, gender, dementia, mild cognitive impairment

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*continued*

The impact of cognitive decline on activities of daily living (ADLs) sits at the center of modern conceptualizations of aging and neurodegenerative disease. ADLs are comprised of different functional tasks and roles, including basic activities of bodily care and autonomy (BADLs), activities instrumental to independent living (IADLs), and advanced activities that establish individual identity and social roles (e.g., hobbies, volunteering; AADLs; Reuben & Solomon, 1989; Takechi et al., 2012). Certain ADL impairments help to distinguish conditions such as dementia and mild cognitive impairment (MCI) in Alzheimer's disease and related dementias (ADRD) in current and proposed diagnostic criteria, and functional impairment serves as a core marker that anchors the clinical significance of neuropsychiatric symptoms (Albert et al., 2011; American Psychiatric Association, 2013; Jack et al., 2018; McKhann et al., 2011). Especially in ADRD, measuring the impact of interventions on real-world functioning is a critical endpoint for clinical trials, required by current regulatory guidance for pharmacological trials (Edgar et al., 2019). Furthermore, much of the debate surrounding recently developed ADRD pharmacological treatments centers on how much meaningful impact the interventions have on day-to-day life (Petersen, 2022), especially in minoritized ethnic and racial groups (Manly & Glymour, 2021).

In neuropsychological research and clinical practice, it is common to use structured interviews and questionnaires to inquire about daily activities. Among these measures, Pfeffer's Functional Activities Questionnaire (FAQ; Pfeffer et al., 1982) is one of the most frequently utilized and serves as the primary ADL measure for large aging-related databases such as the National Alzheimer's Coordinating Center (NACC) Uniform Data Set (Besser et al., 2018). Prior research with the NACC sample and FAQ has found the measure to have attractive measurement properties in older adult samples (González et al., 2021, 2022; Teng et al., 2010), including lack of item bias among subgroups of race, ethnicity, sex, and educational attainment (González et al., 2023).

While we are encouraged by these findings, as researchers and psychologists, there was a major element that gave us pause. Many large studies of FAQ derived from the NACC database, our own work included (e.g., Benge et al., 2022; González et al., 2022; Graves et al., 2023), tended to include only cases with all items completed on this instrument. Although missing data occur in any large-scale data collection effort, the FAQ, as originally designed and as implemented by the NACC, codes multiple categories of missing responses. Missing FAQ items can thus be marked as (a) "not applicable/never did" for where informants stated the item did not apply to a participant

who never did such activity; (b) "do not know/not observed" for an activity not observed by the rater, but that the participant has presumably done; and (c) missing because the form or item was not completed. Clearly, not all missingness on the FAQ is the same: within the "missing" data of the FAQ, there were participants for whom the item(s) was evaluated by a collateral who noted that the task was not applicable to the lived experience of the participant.

As clinicians, we frequently encounter similar phenomena when assessing daily living performance with interviews and questionnaires. For example, inquiring about kitchen safety may lead to responses such as "They never were in the kitchen; that was a spouse's responsibility," or questions about bill pay might be met with the verbal equivalent of a not applicable/never did response because that household responsibility was never their responsibility or did not exist in their environment of origin.

While modern missing data techniques, such as multiple imputation (Schafer, 1999), have been developed to address missing data, their applicability assumes data are missing at random (MAR), which may not be true in this scenario: There are many likely valid and nonrandom reasons for certain ADLs being not applicable to a given person, which may systematically covary with relevant clinical characteristics. By excluding participants who had missing data because it was not applicable to their daily lives, we worried that we were potentially marginalizing individuals and not "seeing" the real-world experiences of those impacted by ADRD. This may be particularly true in instances where demographic factors and their intersections (e.g., the intersection of birth cohort, biological sex, and educational attainment) may influence what ADLs were ever applicable to a given person.


Take for example, a rather common daily activity such as cooking. In the United States, women tended to have a disproportionate share of meal preparation duties relative to men, though this gap is both closing in younger cohorts and is attenuated by the attainment of educational level (Flagg et al., 2014) especially in individuals from European countries (Méjean et al., 2017). As another example, financial management activities in individuals of Hispanic ethnicity in the United States tend to vary significantly from that of non-Hispanic Americans, driven by a number of features such as lack of availability of banks and credit or increased reliance on cash payments (Watchravesringkan, 2008).


Thus, in order to accurately measure the day-to-day activities of individuals from diverse backgrounds, one needs to consider a broad array of demographic intersections (ethnoracial identity, gender, and age, among others) and understand how these influence

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 The data are available at <https://naccdata.org/>

 The experimental materials are available at [https://osf.io/7muxt/?view\\_only=6386dd6959344b60951df409ae585c32](https://osf.io/7muxt/?view_only=6386dd6959344b60951df409ae585c32)

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the day-to-day demands and expectations an older adult needs to meet. By not measuring activities with appropriate items that capture actual day-to-day responsibilities, we likely miss understanding the real-world experience of some individuals impacted or at risk for ADRD.

Thus, two important concepts emerge. First, much research on ADL performance to date excludes individuals with “missing data,” and there is reason to suspect that these data are not MAR but reflects a positive endorsement of differences in ADL exposure, acquisition, and/or daily demands. Second, such differences are potentially systematically related to intersectional facets of culture, ethnoracial identity, and gender. Furthermore, the intersectionality of these factors may induce differing demands on day-to-day activities and responsibilities, which is important for those working with aging populations to understand. This understanding is critical, given that functional ability informs clinical decisions ranging from diagnosis to need for supervision as well as designing, conducting, and interpreting trial and treatment outcomes. Knowing the pattern and systematic covariates of ADL applicability can inform a complementary focus on methods of appropriately addressing missingness (e.g., appropriateness of multiple imputation, alternate short-form development). Earlier studies have implemented these methods in item banks of ADLs where the MAR assumption was met, but no studies have explored the patterns of ADL applicability in one of the most frequently used functional measures in ADRD research (Holman et al., 2004).

Therefore, the current article seeks to explore these complex relationships. Particularly, we will answer the following questions:

1. How applicable are daily activity questions to the lives of older adults, particularly those of under-represented and cross-cultural groups?
2. How does the intersection of demographics, such as ethnoracial group, gender, and age, influence the applicability of specific ADLs?

## Method

### Statistical Analysis, Transparency, and Openness

Sample inclusion and exclusion are listed below, and descriptives and analyses below follow APA Style journal article reporting standards. We first split the participants into two groups: those who did and did not have not applicable/never did (hereinafter shortened to NA/ND) responses on the FAQ. We univariately analyzed the group status’ relationship to participant demographics, coparticipant demographics, habitation and relationship status, referral characteristics, and clinical status. This included chi-square test with adjusted Cramer’s *V* effect size, Welch’s *t* test with Cohen’s *d* effect size, and analysis of variance with eta-square effect size.

Labeling of effect sizes was done in accordance to guidelines compiled by Ben-Shachar et al. (2020) for: (1) Cramer’s *V*: negligible (<.05), very small (.05–.09), small (.10–.19), medium (.20–.29), large (.30–.39), and very large (>.39); (2) Cohen’s *d*: negligible (<.20), small (.20–.49), medium (.50–.79), and large (>.79); and (3) eta-square: negligible (<.01), small (.01–.05), medium (.06–.13), and large (>.13).

Next, we implemented propensity score matching (PSM) of nonparticipant factors that were significantly related to NA/ND response presence in the first set of analyses. PSM is used to ensure

similar distributions of covariates among groups and is typically implemented in nonrandomized observational studies to reduce any confounding bias in outcome estimates. We implemented logistic estimation of propensity score distance with nearest neighbor matching, done without replacement, using a 2:1 ratio and 0.1 caliper width. PSM success was evaluated by ensuring standardized mean differences for all matched covariates were <0.2, while also ensuring no target cases (i.e., individuals with NA/NDs) were discarded due to limited matches (Zhao et al., 2021). If PSM, was unsuccessful, we considered changing the caliper width, ratio, and/or number of covariates to match on.

The impact of participant demographics on NA/ND ADLs was evaluated using generalized linear models with logit link for binomial outcomes (i.e., logistic regression) in the matched subsample. Regression diagnostics, parameter estimation, and model evaluation were estimated for each item, with and without interactions terms (i.e., predictor products). Odds ratios (*OR*s, or their reciprocals) for each parameter were interpreted as very small (1.00–1.43), small (1.44–2.47), medium (2.48–4.27), and large (>4.27; Ben-Shachar et al., 2020). Logistic models and fit were evaluated with the concordance (*C*-) statistic and Hosmer–Lemeshow goodness-of-fit index. *C* statistics were interpreted as unacceptable (<.50), limited (.50–.69), acceptable (.70–.79), excellent (.80–.89), and outstanding (≥.90; Hosmer et al., 2013). Hosmer–Lemeshow indices were derived using recommended decile binning, and a statistically significant result indicates limited fit. After recoding FAQ NA/ND responses, we implemented listwise deletion for other analyzed variables, as we wanted stable samples across models. The Benjamini–Hochberg false discovery rate correction was applied to each model.

Analyses were run within the R environment (Version 4.2.3) and supplemented by relevant packages including *MatchIt* (Version 4.5.2, Ho et al., 2011), *car* (Version 3.0-12, Fox & Weisberg, 2019), *parameters* (Version 0.20.2, Lüdtke et al., 2020), *performance* (Version 0.10.2, Lüdtke et al., 2021), *effectsize* (Version 0.8.3; Ben-Shachar et al., 2020), and *interactions* (Version 1.1.5; Long, 2019). Study and analyses were not preregistered. Data are available from NACC (<https://naccdata.org/>), and script for conducting analyses in the current article is available on the Open Science Framework repository: [https://osf.io/7muxt/?view\\_only=1c88f2db64c840a4b105337bcd5e471](https://osf.io/7muxt/?view_only=1c88f2db64c840a4b105337bcd5e471).

### Sample

Participants were selected from the NACC. Inclusion criteria were that an individual was presenting for an initial visit to an Alzheimer’s Disease Research Center (ADRC) with a coparticipant. No explicit exclusion criteria were applied; however, as we describe below in detail, certain analyses focused on subgroups with >5% representation in the sample. Data from 43 ADRCs, collected between June 2005 and December 2021, were utilized. Each ADRC has its own institutional review board approval and different enrollment strategies, ranging from community-based outreach to clinical referrals.

### Measurement

#### ADL Functioning

The FAQ is a 30-point collateral reported measure where a coparticipant rates an individual’s ability to complete 10 instrumental

and advanced activities (e.g., financial organization, medication management, hobby engagement). Prior research with NACC cohorts has evaluated FAQ performance across a broad range of psychometric properties and found it to have good reliability and strong evidence of validity, including minimal bias in diverse subgroups (González et al., 2022, 2023) when these items were rated as applicable for a given person.

On the FAQ, each activity is rated on a 4-point ordinal scale (from *normal* with a raw score of 0 to *dependent* with a raw score of 3), with higher scores indicating more functional difficulty. In addition to the ordinal scale, respondents can designate an item as not applicable/never did or do not know/not observed. For this article, we focus on the applicability (NA/ND) of FAQ items.

### Participant Demographics

Demographic characteristics evaluated in the current article included sex, age, years of education, language use (recoded based on frequency: English, Spanish, other), and ethnic and racial identity. Given the focus on demographic intersections, we elected to focus analyses on groups that comprised greater than 5% of the sample and are the most frequent ethnoracial groups in the United States, resulting in a recoded ethnoracial variable: non-Hispanic White, non-Hispanic Black, and Hispanic White.

### Coparticipant Demographics

Demographic characteristics of the coparticipants collected in the NACC that were evaluated included sex, years of education, and ethnic and racial identity (recoded into a single ethnoracial variable based as above). These variables were included as they have been demonstrated to impact total functional ratings on this measure (Graves et al., 2023; Hackett et al., 2020).

### Other Contextual Variables

A broad array of other variables has been shown to influence ADL ratings, and these were included in the current models. First, living situation (including whether the individual is living in the community or in a facility), whether the coparticipant lives with the participant, and the relationship of the coparticipant to participant were all considered, as habitation and relationship status can impact total functional ratings (Hackett et al., 2020). In addition, referral characteristics coded by NACC (referral source and reason for referral clinical or not) were coded as well. This inclusion was based upon the influence referral characteristics have on functional ratings, with a nonclinical referral status associated with better functioning, as well as systematic differences in demographic factors between these two referral streams (Gleason et al., 2019).

### Clinical Characteristics

The primary clinical characteristic coded by NACC that was included in this study was dementia stage as measured by the Clinical Dementia Rating Scale (CDR Dementia Staging Instrument; Morris, 1997), recoded according to scoring criteria outlined by O'Bryant et al. (2010) that allows for staging a given participant into cognitively unimpaired, MCI, or dementia categories.

## Results

### Demographic and Informant Reporting Characteristics of the Three Ethnoracial Groups

Participants' ( $n = 44,713$ ) demographics are found in Table 1. Given the large sample size, statistically significant differences in age among the three ethnoracial groups were found, though the effect size was small ( $F = 19.91$ ,  $\eta^2 < .01$ , 95% CI [.00, .01]). Years of education differed between groups with a large effect size ( $F = 3462.90$ ,  $\eta^2 = .14$ , 95% CI [.14, .15]). The three groups also differed in distribution of participant's sex ( $\chi^2 = 801.53$ ,  $V = .14$ , 95% CI [.11, .15]), frequency of MCI or dementia according to Clinical Dementia Rating Scale ratings ( $\chi^2 = 250.50$ ,  $V = .05$ , 95% CI [.05, .06]), and source of informant completing the FAQ ( $\chi^2 = 3011.9$ ,  $V = .19$ , 95% CI [.19, .20]). Two thousand six hundred ninety-seven individuals reported an ethnoracial identity other than the three above, with all other groupings occurring in less than 5% of the sample and were excluded from subsequent analyses.

### Total Number of Not Applicable Items and Impact on Participants Included in Studies

Respondents (25.6% non-Hispanic White, 21.9% non-Hispanic Black, and 34.4% Hispanic) had at least one item rated as not applicable on the FAQ. Put another way, in studies that require "valid" responses on all items from the FAQ for inclusion, the presence of not-applicable items would lead to excluding data from 8,169 non-Hispanic White, 1,170 non-Hispanic Black, and 1,185 Hispanic participants from the study. The rate of not applicable responses for each ethnoracial group for the entire sample is presented in Figure 1. Ethnoracial proportions among those who did and did not have NA/ND responses are listed within Table 1; the NA/ND group had a lower proportion of non-Hispanic White individuals and a higher proportion of Hispanic individuals.

However, in addition to ethnoracial identity, demographic, clinical, and nonparticipant contextual characteristics systematically differed across those with at least one NA/ND response; these factors are known from prior work to influence ADL impairment severity. Rates of dementia were higher among those with an NA/ND response (largest effect;  $\chi^2 = 2518.70$ ,  $V = .24$ , 95% CI [.23, .25]), with additional differences noted in the sex distribution of participants (men had a higher proportion of NA/NDs;  $\chi^2 = 948.50$ ,  $V = .15$ , 95% CI [.12, .16]), language use (Spanish speakers had a higher proportion of NA/NDs;  $\chi^2 = 222.09$ ,  $V = .07$ , 95% CI [.06, .08]), years of education (those with <12 years had a higher proportion of NA/NDs;  $t = 15,097$ ,  $d = .18$ , 95% CI [.16, .21]), and age (those older than 70 had a higher proportion of NA/NDs;  $t = -14.63$ ,  $d = -.16$ , 95% CI [-.18, -.14]). Given the overlap between language and ethnoracial group (i.e., 99% of Spanish speakers were Hispanic/Latinx), it was omitted from later logistic regressions. Contextual factors, including living environment of the participant (those who lived with a spouse or other family had a higher proportion of NA/NDs;  $\chi^2 = 837.65$ ,  $V = .14$ , 95% CI [.13, .15]), cohabitation status of the coparticipant (those who lived with coparticipants had a higher proportion of NA/NDs;  $\chi^2 = 817.73$ ,  $V = .14$ , 95% CI [.11, .15]), and coparticipant relationship to the participant (those who were spouses or siblings to coparticipants had a higher proportion of NA/NDs;  $\chi^2 = 851.08$ ,  $V = .14$ , 95%



**Table 1**  
*Demographic and Clinical Descriptive Data for the Total and Propensity Score Matched Sample*

Demographic and clinical group	N (%) / M (SD)			
	Total sample	PSM sample	No NA/ND	At least one NA/ND
Total	44,713	28,536	19,024	9,512
Ethnoracial group				
Non-Hispanic White	32,884 (78.3%)	22,516 (78.9%)	15,109 (79.4%)	7,407 (77.9%)
Non-Hispanic Black	5,537 (13.2%)	3,384 (11.9%)	2,330 (12.2%)	1,054 (11.1%)
Hispanic/Latinx	3,598 (8.6%)	2,636 (9.2%)	1,585 (8.3%)	1,051 (11%)
Language				
English	40,951 (91.7%)	26,276 (92.1%)	17,698 (93%)	8,578 (90.2%)
Spanish	2,517 (5.6%)	1,918 (6.7%)	1,104 (5.8%)	814 (8.6%)
Other	1,179 (2.6%)	342 (1.2%)	222 (1.2%)	120 (1.3%)
Sex				
Male	19,160 (42.9%)	13,992 (49%)	8,701 (45.7%)	4,221 (55.6%)
Female	25,553 (57.1%)	14,544 (51%)	10,323 (54.3%)	4,221 (44.4%)
Age				
Years	71.53 (10.45)	71.79 (10.19)	71.42 (10.36)	72.54 (9.80)
Group				
<60	5,243 (18.2%)	3,252 (11.4%)	2,339 (12.3%)	913 (9.6%)
60–69	12,662 (28.3%)	7,803 (27.3%)	5,406 (28.4%)	2,397 (25.2%)
70–79	16,610 (37.1%)	10,882 (38.1%)	6,996 (36.8%)	3,886 (40.9%)
≥80	10,198 (22.8%)	6,599 (23.1%)	4,283 (22.5%)	2,316 (24.3%)
Education				
Years	15.13 (3.46)	14.97 (3.55)	15.12 (3.38)	14.67 (3.84)
Level				
<12	3,389 (7.6%)	2,424 (8.5%)	1,369 (7.2%)	1,055 (11.1%)
12–15	16,096 (36.3%)	10,578 (37.1%)	6,990 (36.7%)	3,588 (37.7%)
≥16	24,871 (56.1%)	15,534 (54.4%)	10,665 (56.1%)	4,869 (51.2%)
Diagnosis				
Unimpaired	16,735 (37.4%)	5,890 (20.6%)	4,226 (22.2%)	1,664 (17.5%)
Mild cognitive impairment	17,397 (38.9%)	14,015 (49.1%)	8,859 (46.6%)	5,156 (54.2%)
Dementia	10,581 (23.7%)	8,631 (30.2%)	5,939 (31.2%)	2,692 (28.3%)

Note. PSM = propensity score matched; NA/ND = not applicable/never did.

CI [.12, .15]); referral characteristics (those who were clinically referred had a higher proportion of NA/NDs;  $\chi^2 = 416.93$ ,  $V = .10$ , 95% CI [.09, .11]) also differed significantly between those with and without an NA/ND response. Coparticipant demographics had small but statistically significant differences between those with and without an NA/ND rating. Those whose coparticipant was a woman had a higher proportion of NA/NDs ( $\chi^2 = 90.48$ ,  $V = .05$ , 95% CI [.04, .06]), those whose coparticipant identified as Hispanic had a higher proportion of NA/NDs ( $\chi^2 = 186.71$ ,  $V = .07$ , 95% CI [.06, .08]), and those whose coparticipant had lower education had a higher proportion of NA/NDs ( $t = 11.68$ ,  $d = .13$ , 95% CI [.11, .16]).

### How Did Individual Demographics and Intersections Predict Not Applicable/Never Did Responses?

Given that the presence of an NA/ND response on the FAQ seemed to identify a group of participants that systematically differed from “complete” FAQ responders on a host of factors and characteristics that could meaningfully impact ADL ratings, PSM was utilized to equate the three ethnoracial groups on key characteristics to allow for prediction of NA/ND ratings on individual items. These key characteristics included: cognitive impairment stage; referral characteristics; habitation status and relationship of the coparticipant; and sex, education, and ethnoracial identity of the coparticipant. Using the PSM procedure outlined in the Method section, a successful 2:1 match was created for the 9,512 individuals with NA/ND responses,

which resulted in a subsample of 28,557 individuals (see Table 1 for matched descriptive data and Supplemental Table 1 for standardized mean difference in each variable after PSM).

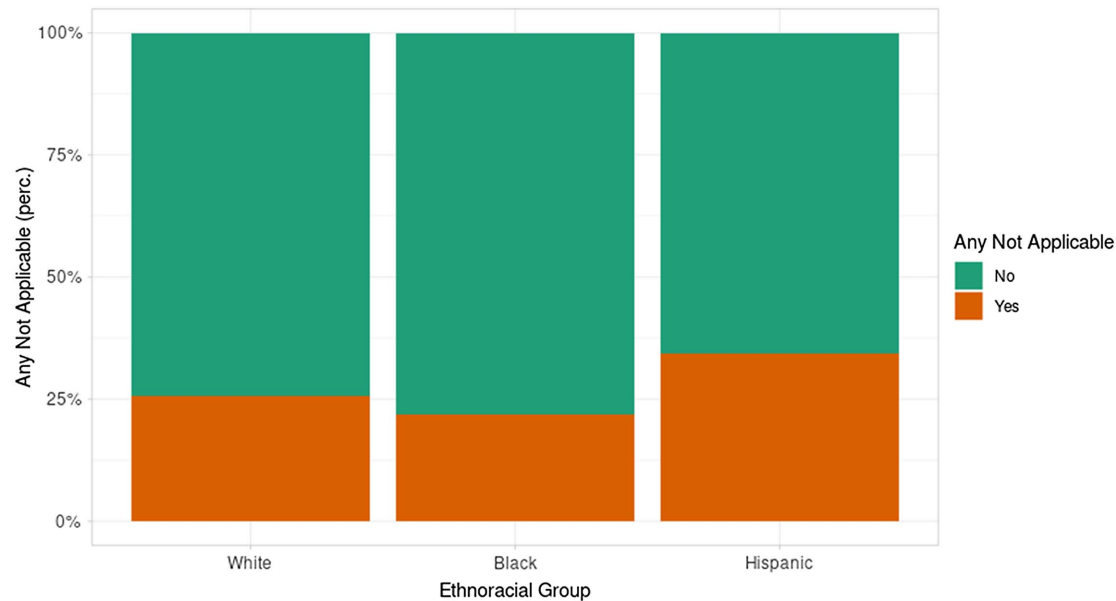
Using the PSM sample, models suggested that participant demographics were a statistically significant predictor of the applicability of each of the ADL items. A summary of which demographic characteristics emerged as significant main (i.e., noninteractive) predictors of item applicability are summarized in Table 2. Participant demographic factors provided the best performance and fit in predicting meal preparation ( $C$ -statistic = .75) and shopping ( $C$ -statistic = .71) NA/ND responses and were weakest at predicting playing games NA/ND responses ( $C$ -statistic = .59).

To model the role of demographic intersections at predicting whether a given activity was considered as NA/ND or not, additional logistic regressions were conducted that included interaction terms. Demographic interactions (a mathematical representation of identity intersections) emerged as significant predictors for the applicability of items measuring bills (Table 3), taxes (Table 4), games (Table 5), meal preparation (Table 6), and remembering dates (Supplemental Table 2). These tables also included parameters from the five models. The other five items did not have statistically significant interactions after controlling for multiple comparisons, and their full interaction model parameters are excluded.

Summarizing the results from the main effects and interaction models, we note that across items, sex—either alone or in its intersection with other demographic characteristics—emerged as a

**Figure 1**

Percentage of the Total Sample Who Had Any Item on the Functional Activity Questionnaire Rated “Not Applicable/ Never Did” by Ethnoracial Group



Note. See the online article for the color version of this figure.

potent predictor of ADL item applicability. On average, men were more likely to have the meal preparation item ( $OR = 7.69$ ) and shopping ( $OR = 4.76$ ) item to be particularly not applicable to them. However, interactions are important: With increasing education the inverse was true, and in these scenarios women were more likely to have been rated as having the meal preparation item not apply to them (see Figure 2).

With regard to recurring bills, generally, men were more likely for this item to not apply ( $OR = 1.89$ ). However, sex and ethnoracial group interactions revealed how demographic intersections influence modify trend, with Hispanic/Latinx women more likely to have bills not apply to them ( $OR = 1.79$ ) relative to Hispanic/Latinx men.

**Table 2**

Summary of the Effect Size of Participant Characteristics in Predicting Not Applicable/Never Did Responses by Activity

Activity	Gender	Age	Education	Ethnoracial group	Language
Bills	a	a	a	a	a
Taxes	a		a	a	
Shopping	a,b	a			
Games		a	a	a	
Stovetop	a,b	a			
Meal preparation	a,b	a		a	
Current events	a	a	a		
Attending	a				
Remember dates					
Travel	a	a	a		

Note.  $n = 28,536$ .

<sup>a</sup> Statistically significant main effect. <sup>b</sup> Medium or larger effect size.

A similar intersectional effect manifested for the tax preparation item wherein, generally, women were more likely to have this not apply to them ( $OR = 1.23$ ). However, for Hispanic women ( $OR = 1.25$ ) and non-Hispanic Black men ( $OR = 1.85$ ), rates of applicability were reduced relative to their peers (Figure 3). Furthermore, the influence of ethnoracial identity changed with increasing age: Older Hispanic individuals were more likely to have the taxes items rated as NA/ND, whereas the inverse was true for older White American individuals (Figure 4).

Regarding games, within interaction models, Black American and Hispanic individuals were less likely to have this item rated as applicable to them (respective  $OR$ s = 3.61 and 4.87). However, the inverse was true for Black Americans with increasing education, wherein they were less likely to have not played games. With recalling dates, there was an interaction between age and gender, wherein older men were less likely to have this activity apply to them ( $OR = 1.05$ ).

## Discussion

### How Applicable Are Daily Activity Questions to the Lives of Older Adults, Particularly Those of Underrepresented and Cross-Cultural Groups?

We noted that rates of NA/ND responses on the FAQ were both quite common and represented a group of respondents who differed in meaningful ways from those for whom all items were rated as applicable. For non-Hispanic White older adults, 25.6% of respondents had at least one item marked as not applicable versus 21.9% for non-Hispanic Black participants and 34.4% of Hispanic respondents. This finding in and of itself causes some concern, as nearly one fifth to one third of older adults across ethnoracial groups

**Table 3**

*Interactions Representing Demographics and Odds of Having the Bills Item Rated as “Not Applicable/Never Did”*

Interaction	OR	95% CI	Significance
Constant	2.13	[0.55, 8.31]	0.32
Sex—female relative to male	0.73	[0.37, 1.46]	0.38
Age at visit	<b>0.98</b>	<b>[0.96, 1.00]</b>	<b>0.05</b>
Years of education	<b>0.85</b>	<b>[0.78, 0.92]</b>	<b>0.001</b>
Ethnoracial group			
Non-Hispanic Black vs. non-Hispanic White	0.49	[0.12, 2.04]	0.36
Hispanic vs. non-Hispanic White	<b>0.28</b>	<b>[0.09, 0.85]</b>	<b>0.05</b>
Sex × Age	<b>0.99</b>	<b>[0.98, 1.00]</b>	<b>0.04</b>
Sex × Education	1.02	[1.00, 1.05]	0.08
Sex × Ethnoracial Group			
Female non-Hispanic Black	<b>0.62</b>	<b>[0.46, 0.83]</b>	<b>0.008</b>
Female Hispanic/Latinx	<b>1.79</b>	<b>[1.34, 2.40]</b>	<b>0.001</b>
Age × Education	<b>1</b>	<b>[1.00, 1.01]</b>	<b>0.05</b>
Age × Ethnoracial Group			
Older non-Hispanic Black	1.01	[0.99, 1.03]	0.25
Older Hispanic/Latinx	<b>1.02</b>	<b>[1.01, 1.07]</b>	<b>0.03</b>
Education × Ethnoracial Group			
More educated non-Hispanic Black	0.97	[0.93, 1.01]	0.22
More educated Hispanic/Latinx	<b>0.96</b>	<b>[0.94, 0.99]</b>	<b>0.03</b>

*Note.* Statistically significant interaction predictors are presented in bold.  $n = 28,536$ . OR = odds ratio; CI = confidence interval.

have some items from a very commonly used measure not applying to their day-to-day lives. Put in another way, if a “complete” FAQ is required for a given study on the real-world lived experience of ADRD, excluding participants because of inapplicable ADLs would result in the exclusion of over 34% of Hispanic individuals. This group is historically underrepresented in research, and exclusion would further undermine enrollment and perpetuate systemic marginalization. Given the critical importance in recruiting, retaining, and understanding outcomes in diverse

samples impacted by ADRD (Díaz-Santos et al., 2023), careful attention to this phenomena is warranted.

### Understanding and Controlling for Potential Reasons for the Lack of Applicability of Items: the Role of Demographic Intersectionality

What predicts this phenomenon of nonapplicability? To explore this question, we first note that those having an item rated as NA/ND

**Table 4**

*Interactions Representing Demographics and Odds of Having the Taxes Item Rated as “Not Applicable/Never Did”*

Interaction	OR	95% CI	Significance
Constant	<b>8</b>	<b>[2.45, 26.18]</b>	<b>0.001</b>
Sex—female relative to male	<b>0.52</b>	<b>[0.29, 0.93]</b>	<b>0.04</b>
Age at visit	<b>0.97</b>	<b>[0.29, 0.93]</b>	<b>&lt;.001</b>
Years of education	<b>0.78</b>	<b>[0.72, 0.84]</b>	<b>&lt;.001</b>
Ethnoracial group			
Non-Hispanic Black vs. non-Hispanic White	1.46	[0.52, 4.11]	0.51
Hispanic vs. non-Hispanic White	<b>0.24</b>	<b>[0.09, 0.60]</b>	<b>0.004</b>
Sex × Age	1	[0.99, 1.01]	0.98
Sex × Education	<b>1.07</b>	<b>[1.04, 1.09]</b>	<b>&lt;.001</b>
Sex × Ethnoracial Group			
Female non-Hispanic Black	<b>0.54</b>	<b>[0.44, 0.68]</b>	<b>&lt;.001</b>
Female Hispanic/Latinx	1.25	[0.98, 1.61]	0.1
Age × Education	<b>1</b>	<b>[1.00, 1.00]</b>	<b>&lt;.001</b>
Age × Ethnoracial Group			
Older Non-Hispanic Black	1.01	[1.00, 1.02]	0.1
Older Hispanic/Latinx	<b>1.02</b>	<b>[1.01, 1.03]</b>	<b>.001</b>
Education × Ethnoracial Group			
More educated non-Hispanic Black	<b>0.93</b>	<b>[0.90, 0.96]</b>	<b>&lt;.001</b>
More educated Hispanic/Latinx	0.98	[0.96, 1.00]	0.1

*Note.* Statistically significant interaction predictors are presented in bold.  $n = 28,536$ . OR = odds ratio; CI = confidence interval.

**Table 5**

*Interactions Representing Demographics and Odds of Having the Games Item Rated as “Not Applicable/Never Did”*

Interaction	OR	95% CI	Significance
Constant	<b>0.08</b>	<b>[0.02, 0.33]</b>	<b>0.002</b>
Sex—female relative to male	<b>3.4</b>	<b>[1.69, 6.83]</b>	<b>0.002</b>
Age at visit	1.01	[0.99, 1.03]	0.55
Years of education	0.93	[0.85, 1.01]	0.16
Ethnoracial group			
Non-Hispanic Black vs. non-Hispanic White	<b>3.61</b>	<b>[1.24, 10.50]</b>	<b>0.05</b>
Hispanic vs. non-Hispanic White	<b>4.87</b>	<b>[1.82, 12.99]</b>	<b>0.005</b>
Sex × Age	<b>0.98</b>	<b>[0.98, 0.99]</b>	<b>&lt;.001</b>
Sex × Education	1	[0.98, 1.02]	0.92
Sex × Ethnoracial Group			
Female non-Hispanic Black	0.95	[0.76, 1.20]	0.73
Female Hispanic/Latinx	1.13	[0.87, 1.46]	0.49
Age × Education	1	[1.00, 1.00]	0.23
Age × Ethnoracial Group			
Older non-Hispanic Black	1	[0.99, 1.02]	0.67
Older Hispanic/Latinx	0.99	[0.98, 1.00]	0.17
Education × Ethnoracial Group			
More educated non-Hispanic Black	<b>0.93</b>	<b>[0.90, 0.96]</b>	<b>&lt;.001</b>
More educated Hispanic/Latinx	0.97	[0.95, 1.00]	0.11

*Note.* Statistically significant interaction predictors are presented in bold.  $n = 28,536$ . OR = odds ratio; CI = confidence interval.

differed on a variety of contextual, reporter, clinical, and demographic factors beyond ethnoracial identity. Factors including participant clinical characteristics (i.e., dementia severity), coparticipant characteristics (e.g., relationship of the rater to the patient), and other contextual factors (e.g., referral characteristics) influenced the applicability of ADL ratings. These factors have been shown to significantly impact ADL impairment severity in prior work, highlighting that multiple factors, ranging from the participant's backgrounds, to the rater, to the referral stream need to be

systematically considered when creating measures of daily activities (Gleason et al., 2019; Graves et al., 2023). Although it is clear how dementia severity negatively affects functional ability, it is unclear why dementia severity would impact NA/ND ratings by coparticipant. Is it that individuals who have more NA/ND ADLs had less stimulation throughout life and thus less cognitive reserve, which increases the risk for cognitive impairment? Could there be hindsight bias, where coparticipants project current ADL engagement into the past and report NA/ND instead of that the individual

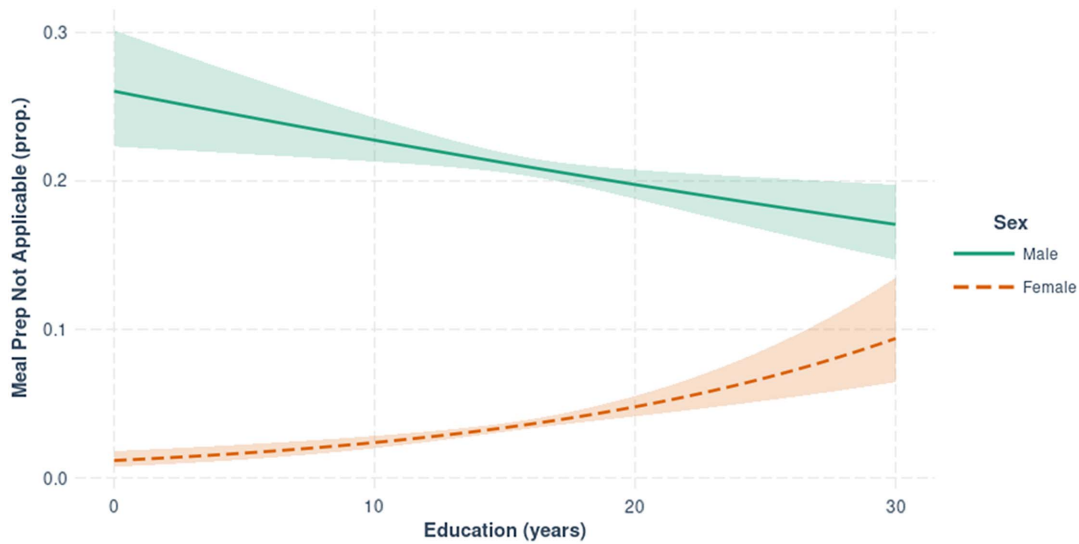
**Table 6**

*Interactions Representing Demographics and Odds of Having the Meals Item Rated as “Not Applicable/Never Did”*

Interaction	OR	95% CI	Significance
Constant	<b>0.14</b>	<b>[0.03, 0.65]</b>	<b>0.05</b>
Sex—female relative to male	<b>0.06</b>	<b>[0.02, 0.15]</b>	<b>&lt;.001</b>
Age at visit	1.01	[0.99, 1.03]	0.3
Years of education	0.92	[0.84, 1.02]	0.26
Ethnoracial group			
Non-Hispanic Black vs. Non-Hispanic White	<b>0.15</b>	<b>[0.03, 0.67]</b>	<b>0.05</b>
Hispanic vs. Non-Hispanic White	0.69	[0.18, 2.49]	0.66
Sex × Age	0.99	[0.98, 1.00]	0.28
Sex × Education	<b>1.09</b>	<b>[1.06, 1.13]</b>	<b>&lt;.001</b>
Sex × Ethnoracial Group			
Female non-Hispanic Black	1.15	[0.80, 1.62]	0.55
Female Hispanic/Latinx	0.96	[0.63, 1.43]	0.84
Age × Education	1	[1.00, 1.00]	0.28
Age × Ethnoracial Group			
Older non-Hispanic Black	1.01	[1.00, 1.03]	0.28
Older Hispanic/Latinx	1	[0.98, 1.01]	0.74
Education × Ethnoracial Group			
More educated non-Hispanic Black	1.03	[0.99, 1.08]	0.28
More educated Hispanic/Latinx	1.03	[1.00, 1.07]	0.17

*Note.* Statistically significant interaction predictors are presented in bold.  $n = 28,536$ . OR = odds ratio; CI = confidence interval.



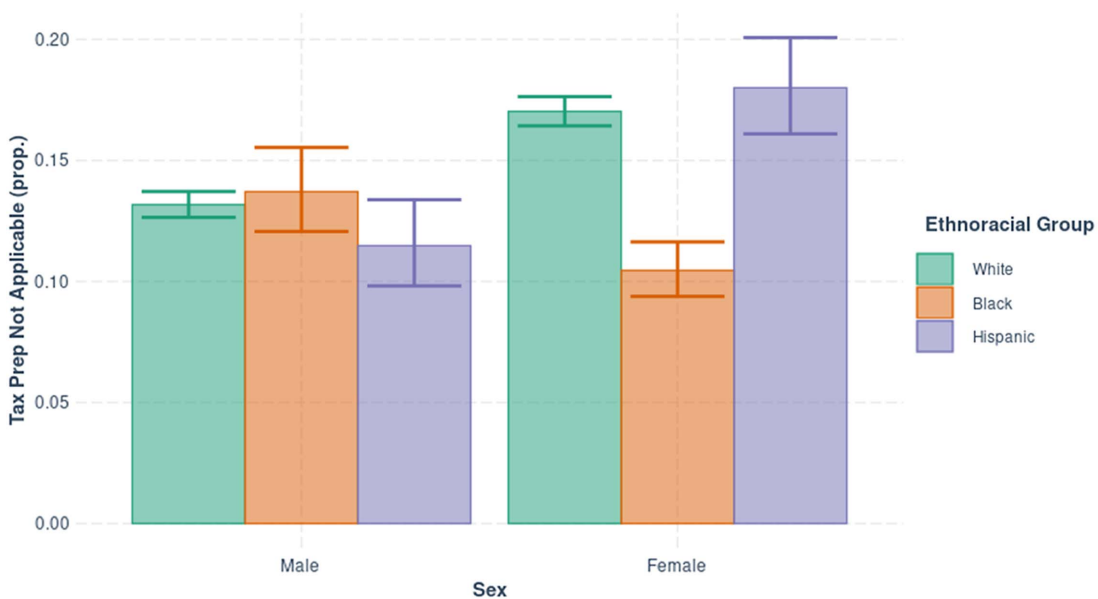
**Figure 2***Proportion of the Sample With Meal Preparation Not Applicable as a Function of Sex and Education*

Note. See the online article for the color version of this figure.

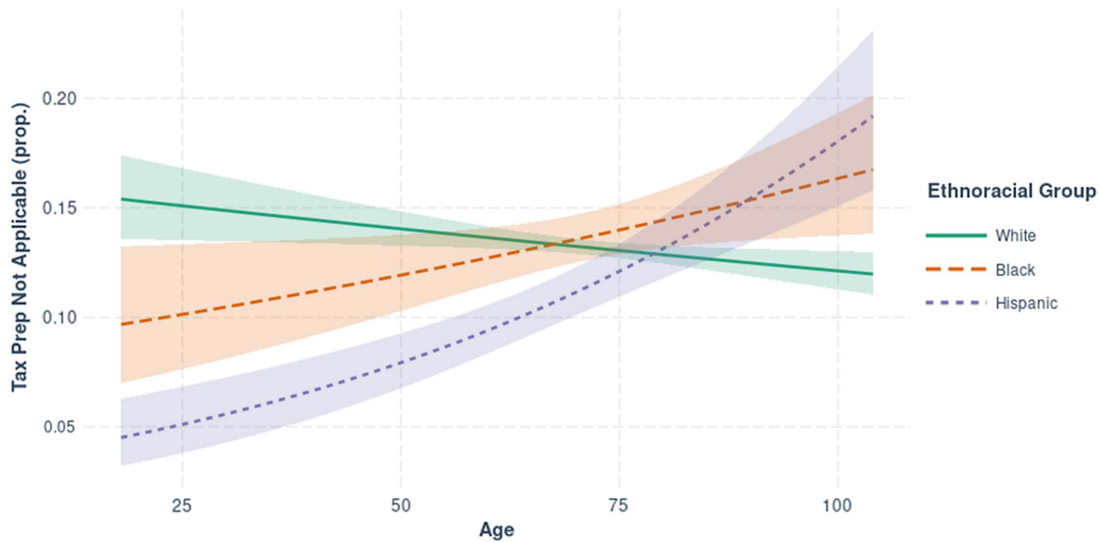
is dependent? Understanding this would be a beneficial future direction for research.

Addressing how contextual and rater influences impact ADL ratings is an issue that has received relatively scant research attention. However, we demonstrate one technique for approaching this difficulty, namely using PSM to create matched samples within ethnoracial groups on these critical variables. PSM is a technique that is not frequently utilized in neuropsychological literature (only

nine articles at the time of this writing are found on PubMed for the keywords “neuropsychology” and “propensity score matching”) and may be limited to situations where the research database has sufficient sample size to allow for complex matching algorithms (Bottigliengo et al., 2021). That being said, given both the importance of care partners to ADRD research and the need to lower barriers for entry for minoritized members of the community, additional methodological innovation may be needed to help adjust

**Figure 3***Proportion of the Sample With Taxes Item Not Applicable as a Function of Sex and Ethnoracial Group*

Note. See the online article for the color version of this figure.

**Figure 4***Proportion of the Sample With Taxes Item Not Applicable as a Function of Age and Ethnoracial Group*

Note. See the online article for the color version of this figure.

for these differences at the level of the individual. One such approach could be creating different normative definitions of ADL impairment by characteristics such as rating source or living situation. Alternatively or in addition, exploration of short form of scales with the most applicable items or methods of prorating scores (and establishing their equivalence) could be a solution for addressing this problem. For example, in this sample, a short form of the five most applicable FAQ items (travel, attention, current events, dates, stove use) had a Cronbach  $\alpha$  of 0.95. Such scales that include items that are the most broadly applicable to diverse samples may allow for fairer measurement of daily activity levels while allowing far greater inclusion of marginalized populations. However, further convergent and criterion validation would be necessary to explore this approach.

That being said, once groups of participants across the three ethnoracial groups were matched on nonparticipant factors, complex interrelationships were noted between demographic identities and the applicability of ADL items. Applicability of items tapping kitchen and financial activities were lowest overall. Traditionally in the United States, such activities have tended to be strongly influenced by gender norms and employment patterns, namely the tendency of women to be in charge of household chores and finances and of men to work outside the home and have fewer responsibilities in this domain (Neuhaus, 2003; Pearse & Connell, 2016). Indeed, we saw such tendencies reflected in the data, with men disproportionately having items related to cooking (7 times as often as women) and, to a lesser extent, shopping (4 times as women) being rated as not applicable to them.

We note, however, that these culturally constructed gender norms have shifted over the years, with women increasingly entering the workforce and with surveys suggesting that, while women continue to bear the brunt of household responsibilities, still these trends are slowly changing (England et al., 2020). Thus, future cohorts of individuals who had different expectations and premorbid skills and

experiences will likely in turn have different patterns of applicability of ADL items. It remains to be seen whether these changes in day-to-day responsibilities will lead to different impressions of the functional impact of cognitive decline with age and neurodegenerative disease. For example, while rates of dementia seem higher in women than in men right now (Beam et al., 2018), is this at least in part reflective of greater demands to perform complex daily tasks like cooking or household financial management that may show functional impairments sooner or to a greater degree than in a man who had similar cognitive impairments but fewer ADL demands to draw attention to these declines?

Especially for financial management tasks, demographic factors intersected in complex ways to make items more or less applicable. For example, Spanish and other language speakers were two to three times more likely to have a bill pay item not apply to them, where female non-Hispanic Black respondents were more likely to have the bill pay item be applicable to them. Education also intersected significantly with sex, such that with increasing education, females showed a slight increase in tendency for bill pay items to not apply to them. In much the same way that gender norms have shifted over years, the ongoing and continuing trend for women and persons of color to have higher educational attainment (Broido, 2004) is likely to shift the responsibility and day-to-day demands on the next generation of older adults.

Overall, our results highlight the critical role that intersectionality of demographics has on shaping the day-to-day demands and activities of the populations we serve and, in turn, has implications for attempting to create valid measures of daily functioning across populations and cultures. These findings also highlight the need to critically reevaluate instruments as cultural, societal, and other factors change. Instrumentation is rarely helpful without consideration of the individual's unique social and cultural context, and ADLs should be supplemented with qualitative clinical interview or quantification of sociocultural variables and integrative

conceptualization. Furthermore, there is an urgent need to develop methods and instruments that are “living” (e.g., computer adaptive, regularly updated item banks with relevant activities) and can adapt to a changing world, technological demands, and other shifts that change how day-to-day life is lived.

## Implications of Findings

What defines “independence” in daily activities, and is it the same for all older adults? Our present study suggests that the answer to these questions is complicated and relies in part on a close consideration of complex demographic intersections. As the aging population becomes increasingly diverse in the United States and around the world, these myriad intersectional demographics will need to be considered in designing instruments of daily activities. Furthermore, with increasing emphasis on recruiting and incentivizing study partners to help lower the entry for these study partners in clinical studies (Largent et al., 2018), there needs to be consideration of how systemic differences may influence collateral reports or who those collaterals are.

The present study does not directly address other important factors that may drive day-to-day functional demands and, in turn, the applicability of ADL measures. For example, a truly cross-cultural neuropsychological evaluation would account for differences in daily demands in cultures well beyond the three ethnoracial groups considered in our present study. Relatedly, differences in family structures seem to have a potent impact on perceived and actual demands for daily functioning (McCleary & Blain, 2013). Finally, as we noted in a prior publication, the FAQ was published in 1982, a time period well before the internet and modern technologies dramatically reshaped how many older adults are performing instrumental daily activities (Benge et al., 2024).

Thus, the path forward likely includes the need for neuropsychologists to develop several skill sets and methodologies. For example, this study highlights both the need to consider rater impacts on daily activity performance and also highlights the potential utility of PSM to help control for the myriad of factors that can influence rating differences in large samples. Furthermore, techniques such as item response theory scoring may allow for calculation of scores that account for individual item characteristics across groups, as well as opening up potential to create living and adaptable ADL item sets that can be linked and can equate to historical data to create equivalent measures across populations with dramatically different backgrounds. As noted in the Introduction section, when the “missing at random” assumption is met, other options for imputing missing data may also be considered (see Holman et al., 2004, for an imputation method comparison). Finally, we highlight that neuropsychologists should take note of how individuals who have fewer or different day-to-day demands may also be those at risk for experiencing fewer cognitively and socially stimulating behaviors, which can in turn raise risk for ADRD.

## Limitations

The primary limitations of this study relate to the lacking knowledge of why an item was rated as not applicable/never did by a given respondent. Future studies can follow up on this finding by using semistructured interviews to determine why these items might be not applicable or perceived as otherwise unratable. These studies

may also consider the do not know/not observed response option and its relevance to functional ratings. Other constraints on generality include the NACC sample in and of itself. It is not representative of the larger aging population in the United States, has differing enrollment patterns for different demographic groups (which we analyzed and matched for), does not include information on socioeconomic status, and does not include global participants.

## Conclusions

Our daily demands are shaped by a host of identity intersections, and older adults are no exceptions. For neuropsychological research in ADRD to meet goals of diversity and inclusion, these complex interactions need to be understood to help devise instruments and scoring techniques that capture the real-world lived experience for all older adults.

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