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Increased Depressive and Anxiety Symptoms Predict Increased Severity of Functional Impairment After Five Years: A Nationally Representative Retrospective Cohort Study

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| Purpose | Performing self-care and domestic life tasks are key aspects of functional independence for older adults. While both depression and anxiety symptoms are correlated with increased functional limitation, these disorders are often studied separately, despite frequent co-occurrence and plausible interaction, and without the consideration of social health. This study examined the impact of comorbid depressive and anxiety symptoms, controlling for social participation and loneliness, on severity of functional limitation in a nationally representative sample of older adults to improve patient-centered care. |
| Methods | The National Social Life, Health, and Aging Project (NSHAP) Rounds 2 and 3 data were utilized. Primary outcomes were self-reported difficulty with activities of daily living and instrumental activities of daily living. All analyses were weighted for Round 2 to account for NSHAP sampling design. |
| Results | Approximately one-quarter of respondents documented either depressive or anxiety symptoms, with 9.4% documenting both. Those with both depressive and anxiety symptoms reported the greatest number of functional limitations and greatest difficulty with tasks when assessed after 5 years. Using multivariate linear regression, poorer mental health status and increased comorbidity burden significantly predicted severity of functional limitation. While loneliness was associated with slightly worse function, increased social participation appeared to be a protective factor. |
| Conclusions | These results build on existing literature calling for a more holistic assessment of health – physical, mental, and social – and further emphasize the need for mental health interventions as an avenue to increase functional independence in older adults to improve patient experience and patient-centered care. (<i>J Patient Cent Res Rev.</i> 2025;12:21-31.) |
| Keywords | mental health; activity levels; epidemiology; depression; anxiety |

Patient-Friendly Recap

- Taking care of yourself and doing things in society can be affected by how connected you feel to others and how lonely, depressed, or anxious you feel.
- Older adults who have only anxiety do not appear to have more trouble with daily tasks than those who do not have anxiety or depression, but older adults who feel depressed (with or without anxiety) do appear to have more trouble.
- People who feel lonelier have more trouble taking care of themselves, but staying involved in the community helps them take better care of their basic needs.
- Mental health, staying socially active, and being able to do daily tasks are all connected, and more research is needed to help older adults age successfully.

The Centers for Disease Control (CDC) estimate that adults ≥ 65 years old will account for 25% of the population by 2060,¹ creating a growing need for research that can support functional independence and the best possible health outcomes throughout a person's life. While previous research in this area has primarily focused on specific comorbidities and diagnoses, geriatric syndromes (including depressive symptoms) and functional status have been shown to better predict health outcomes including mortality and poor self-rated health.² Furthermore, emergent concepts of successful aging propose that psychological and social health elements may

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compensate for expected declines in physical health and functioning.³ Many studies of older adults focus on one or two of these factors, despite a vast literature suggesting that all three (psychological, social, and physical factors) are important to the lived experience of older adults.³ Incorporating aspects of psychological health, social health, physical health, and function in a single model may better represent the lived experience of older adults,³ increasing the applicability of results to patient care. Moreover, such work contextualizes the experience of the patient, a key component of patient-centered care.⁴

Functional status is often defined by an individual's ability to perform activities of daily living (ADLs) and instrumental activities of daily living (IADLs; together, I/ADLs).⁵ ADLs can be broadly conceptualized as self-care tasks, including eating, bathing, dressing, and toileting.⁵ IADLs, on the other hand, can be understood as domestic life tasks that are often needed for community participation,⁵ such as shopping for food, taking medication, managing money, and driving. Notably, older adults have emphasized the importance of I/ADL assessment as part of high-quality care,⁶ and such assessment may be more practical for intervention compared to objective measures of physical function.⁷ As such, this method of assessment may be more useful in promoting patient-centered care and research.

Functional independence is affected by several individual characteristics that may be best conceptualized with a biopsychosocial framework.⁴ Biological factors that contribute to decreased functional ability include increased age,^{8,9} female gender,^{8,9} self-reported physical health,^{10,11} and number of comorbidities.¹² Psychological factors such as depression¹³ and anxiety¹³⁻¹⁵ are well documented contributors to functional limitation. Indeed, both depressive symptoms and formally diagnosed depression alike can increase functional limitation,^{9,16} and those with elevated depressive symptoms report a greater need for I/ADL assistance.¹⁷ Similar findings have been reported with anxiety symptoms.^{14,15} Although both depression⁹ and anxiety¹⁴ are correlated with decreased functional ability, co-occur in older adults,^{18,19} and are both more severe and have a greater impact on function and health when comorbid,²⁰ much of the research conducted in this area to date considers these two psychiatric phenomena distinctly and does not consider the role of social factors, which influence not only functional ability^{21,22} but also depression and anxiety symptoms.^{23,24} For example, maintaining an adequate social network with opportunities for social participation, such as religious activities and volunteer work,^{25,26} cultivates a sense of belonging, which can be a protective factor against depression.^{24,27} Prior work has correlated increased social participation

with fewer depressive symptoms and improved ability to execute activities of daily living.²⁸ Although social factors can be protective of mental health, social strain due to negative social exchanges, such as frequent criticism and excessive demands, can act as a source of distress leading to worsening mental health.²⁹ In a similar vein, social isolation (including loneliness) is predictive of more severe symptoms of depression and anxiety³⁰ and correlated with greater functional impairment.³¹ Both objective (such as participating in community activities) and subjective (such as loneliness or perceived social strain) aspects of social health are critical considerations when measuring social health.^{32,33} Beyond social health elements such as loneliness,^{30,31} participation,²⁸ and strain,^{29,34} socioeconomic status,³⁵ marital status,³⁶ educational attainment,³⁷ income,³⁵ and the presence of private insurance³⁵ have also been associated with changes in functional status. Additionally, functional status³⁸ and self-rated mental health³⁹ can vary with racial and ethnic identity. Given the interaction between social and psychological health,⁴⁰⁻⁴³ models incorporating both compensatory tactics may be particularly well-suited to explore concepts of successful aging,³ contextualizing the patient experience and promoting patient-centered findings.⁴

While some studies of disability have examined those with comorbid depression and anxiety,^{15,44} a gap remains regarding the joint impact of comorbid depression and anxiety symptoms on functional status among older adults and the contributory role of social participation and loneliness utilizing a longitudinal approach and a community-based, nationally representative sample. A better understanding of the contribution of depressive and anxiety symptoms, with the compensatory role of elements of social health (such as social participation and loneliness), to functional status (measured in a patient-centered way and contextualized by the biopsychosocial model) among aging US adults can guide targeted research and interventions to support individual and population health.

Guided by Young's model of successful aging³ and using nationally representative survey data of older adults, this study aimed to determine the impact of comorbid frequent anxiety and depression symptoms on functional limitation after 5 years, accounting for social participation and loneliness. Functional limitation was measured by assessing difficulties with activities of daily living (ADLs) and instrumental activities of daily living (IADLs), as patients report such measures to be an important part of quality care.⁶ As individuals with comorbid depression and anxiety experience more severe symptoms, we hypothesized that individuals with comorbid depression and anxiety symptoms at baseline will experience greater

I/ADL impairment at 5 years, controlling for social participation. Additionally, we hypothesized that social participation will be a protective factor against 5-year I/ADL impairment, while greater loneliness at baseline will predict greater I/ADL impairment in 5 years.

METHODS

Data Source and Participants

Data from Rounds 2 and 3 of the National Social Life, Health, and Aging Project (NSHAP)⁴⁵ were used for this study. A complex, multi-stage sampling design was used to select eligible participants. Participants were drawn from two cohorts (those born between 1920 and 1947 and those born between 1948 and 1965) and consisted of home-dwelling older adults. Information was collected in two components: 1) an in-person interview and 2) a leave-behind questionnaire.⁴⁶ Of all participants interviewed in Round 3, 85% completed the leave-behind questionnaire, which included the questionnaire for frequent anxiety symptoms.⁴⁶ Additional details regarding data collection and construction of sample weights⁴⁷ and an examination of response rates⁴⁶ have been previously published. Respondents who did not complete the instruments for anxiety symptoms, depressive symptoms, or functional status (i.e., ADLs and IADLs) were excluded from the analysis. Of the 7,573 participants with data from Rounds 2 and 3, 4,842 were included in our study. The present study was a secondary analysis of existing, publicly available de-identified data.

Measures

The primary outcomes were self-reported severity of ADL and IADL impairment.⁴⁸ For each ADL and IADL assessed (Box 1), participants were asked to report whether they currently had no difficulty (0), had some difficulty (1), had much difficulty (2), or were unable to do the task (3), excluding any difficulty expected to last less than 3 months. Separate scales were created for ADL (range: 0-21) and IADL (range: 0-24) severity, where higher score indicates greater difficulty and more severe impairment.⁴⁸ Those who volunteered that they had “never done” a task were excluded from the present analysis, as the goal was to compare to the participant’s baseline, which required completion of all tasks. For both ADL and IADL tasks, 411 participants either did not complete the question or answered that they had “never done” the task.

Secondary outcomes included a count of the number of ADLs and IADLs with which a participant had difficulty and the type of impairment. Two composite outcomes were created for overall functional impairment – a count of all tasks with which a respondent had at least some difficulty and a categorical variable to describe the type

Box 1. Activities Assessed by NSHAP

Activities of Daily Living (ADLs)

- Walking a block
- Walking across the room
- Dressing
- Bathing
- Eating
- Transferring in and out of bed
- Toileting

Instrumental Activities of Daily Living (IADLs)

- Meal preparation
- Money management
- Shopping for food
- Light housework
- Medication administration
- Telephone use
- Driving during the day
- Driving during the night

of tasks with which a respondent had difficulty (none, at least one IADL only, at least one ADL only, and at least one IADL and one ADL).

The exposure of interest was mental health status – specifically, both frequent depressive symptoms (FDS) and frequent anxiety symptoms (FAS). The NSHAP contains separate measures for FDS and FAS, which are based on the Center for Epidemiologic Services-Depression Scale⁴⁹ and the Anxiety Subscale of the Hospital Anxiety and Depression Scale,⁵⁰ respectively. FDS is assessed with 11 questions and 3 frequency categories, while FAS is measured with 7 items and 4 frequency categories.⁵¹ Following the scoring guidelines provided by NSHAP for Round 2⁵¹ and used previously with Round 3 data,⁵² FDS was considered a score ≥ 9 on the NSHAP measure, and FAS was considered a score ≥ 8 . Each of these cutoffs is proposed by the NSHAP investigators to approximate the prevalence of those with clinically relevant symptoms as described by the CES-D and HADS-A, respectively. An FDS or FAS designation can be understood as individuals more likely to suffer from an anxiety disorder. Neither of these scales has been validated in a clinical setting, so the word “symptom” is used throughout to specify the patient’s self-reported experience in the absence of a diagnosis. These two scales were used to create a composite variable describing overall mental health status, where respondents with a positive screen on both FDS and FAS measure were considered to have both FDS and FAS.

Indicators of overall health and sociodemographic factors assessed included age, race, ethnicity, gender, number of comorbidities, marital status, educational attainment, self-reported physical health, household income from the past year, presence of any private insurance in the past year (excluding Medicare and Medicaid), social strain, social participation, and loneliness. Comorbidities assessed included hypertension, arthritis, any heart condition, cancer other than skin cancer, diabetes, lung disease (emphysema, asthma, chronic bronchitis, and/or chronic obstructive pulmonary disease), stroke in the last 5 years, and dementia (including Alzheimer's) or mild cognitive impairment. To create a measure of comorbidity status, one point was assigned for each comorbidity documented, as has been done previously with these data.⁵³ Following the guidelines for measures of social health in NSHAP data,³³ marital status was collapsed into two categories – unpartnered/unmarried (which included those who were separated, divorced, widowed, and never married) and partnered/married (which included both those married and living with a partner). Self-reported physical health was assessed on a 5-point scale, where participants were asked to rate their physical health as “Excellent,” “Very good,” “Good,” “Fair,” or “Poor.” Social strain was conceptualized as strain from a partner, friends, and family and measured on a scale from 0-27, where a higher score indicated more social strain.³³ Notably, this questionnaire could only be completed by those who were partnered or married, as it asked about strain regarding one's partner. Social participation was measured by several questions about religious services, volunteering, attending group meetings, socializing with friends and family, and socializing with neighbors. Each domain was assessed using a Likert-type scale for each question ranging from never participating in those activities to participating several times a week, and all questions summed to form an overall social participation score ranging from 0-26, where higher score indicated more social participation.³³ Loneliness was assessed using 3 questions from the UCLA Loneliness Scale.³³ Participants rated how often they felt lonely on a scale where the response options were never, hardly ever, some of the time, or often. A participant's overall score varied from 0-9, with 0 indicating no signs of loneliness and higher scores indicating more signs of loneliness.

Statistical Analysis

NSHAP is designed to be nationally representative using weights to account for nonresponse and probability of selection.^{45,46} This survey design was accounted for in the entire statistical analysis, and weighted percentages are reported to describe distribution of variables. Round 2 weights were used throughout following the data documentation's guidelines for longitudinal analysis.

Bivariate analysis of all covariates across mental health status groups was conducted, using an Analysis of Variance (ANOVA) for normally distributed continuous variables, the Kruskal-Wallis test for non-normally distributed continuous variables, and chi-squared tests for categorical variables. All outcome variables were examined across mental health status groups, using ANOVA for differences in mean ADL and IADL difficulty and count of needs. Chi-squared test was used to examine differences in the type of impairment across mental health groups. The relationship between the severity of I/ADL difficulty at the time of Round 3 assessment and mental health status at Round 2 was assessed utilizing multivariate linear regression. Separate models were fit for severity of ADL and IADL difficulty, adjusting for predictors that differed significantly across mental health groups in bivariate analysis. Both unadjusted and adjusted models were tested to ensure that the addition of covariates improved model fit. As Akaike Information Criterion (AIC) was much lower for all adjusted models and ANOVA showed significantly improved fit (Supplemental Table 1), further analysis focused exclusively on the adjusted models. To reduce multicollinearity, the relationships between specific, related variables were investigated. Self-rated health and count of comorbidities were significantly related. As comorbidity count can more easily be assessed in clinical settings, this variable was retained. Beta estimates, 95% confidence intervals, standard error, and p-values were reported for each predictor variable. R² values were reported for adjusted models.

All analysis was conducted in R⁵⁴ using version 4.0.0 and RStudio, using packages including ‘survey’⁵⁵ (statistical analysis for complex survey-based design), ‘tableone’⁵⁶ (for table creation and assessment of group differences), ‘tidyverse’⁵⁷ (data management), and ‘ggsurvey’⁵⁸ (exploratory data visualization accounting for complex survey design). All statistical tests utilized two-tailed tests at $\alpha = 0.05$.

RESULTS

Approximately 34% of individuals had frequent anxiety symptoms (FAS), frequent depressive symptoms (FDS), or both at Round 2 data collection (Table 1). Compared to those with FAS alone and those with neither FAS nor FDS, those who documented frequent depressive symptoms were more often female and documented poorer self-rated physical health (Table 1). Additionally, those with any FDS had lower educational attainment and lower household income in the past year (Table 1). Respondents documenting neither FDS nor FAS were more often privately insured. The distribution of race and ethnicity was not statistically significant across mental health groups; however, this could be due to the

Table 1. Study Sample Characteristics by Mental Health Status

| | Overall | Neither Anxiety nor Depressive Symptoms | Frequent Depressive Symptoms | Frequent Anxiety Symptoms | Frequent Anxiety & Depressive Symptoms | p |
|--|----------------------|---|------------------------------------|---------------------------------|--|--------|
| Weighted Sample Size (n (%)) | 2558.83 | 1684.43 (65.8%) | 353.54 (13.8%) | 280.07 (10.9%) | 240.8 (9.4%) | |
| Age (median [IQR]) | 70.00 [66.00, 77.00] | 70.00 [66.00, 77.00] | 74.00 [67.00, 80.00] | 69.00 [65.00, 77.00] | 71.00 [66.00, 78.29] | 0.052 |
| Female (%) | 52.7 | 50.6 | 58.9 | 51.4 | 60.4 | 0.034 |
| Race/Ethnicity (%) | | | | | | 0.789 |
| White | 85.5 | 85.8 | 86 | 83.5 | 85.5 | |
| Black | 6.1 | 5.9 | 7.1 | 6.2 | 6.3 | |
| Hispanic, Non-Black | 5.7 | 5.5 | 4.6 | 7.5 | 6.6 | |
| Other | 2.6 | 2.8 | 2.3 | 2.8 | 1.6 | |
| Education (%) | | | | | | 0.005 |
| Less than High School | 12.8 | 10.7 | 18.7 | 14.7 | 16 | |
| High School Degree or Equivalent | 25.1 | 24 | 26.9 | 26 | 29 | |
| Some College ^a | 33.5 | 33.2 | 34.4 | 34.5 | 33.6 | |
| Bachelor's Degree or Higher | 28.6 | 32.1 | 20 | 24.9 | 21.4 | |
| Partnered/Married (%) | 85.3 | 86 | 74.5 | 91.5 | 85.8 | <0.001 |
| Self-Reported Physical Health (%) | | | | | | <0.001 |
| Poor | 4.9 | 3 | 10.1 | 3.9 | 11.9 | |
| Fair | 18 | 13.7 | 30.3 | 18.4 | 29.2 | |
| Good | 31.8 | 30.9 | 30.4 | 35.9 | 35.2 | |
| Very good | 32.5 | 36.6 | 23.1 | 31.1 | 19.5 | |
| Excellent | 12.7 | 15.7 | 6.2 | 10.6 | 4.1 | |
| Number of Comorbidities^b (mean (SD)) | 1.81 (1.31) | 1.69 (1.27) | 2.13 (1.50) | 1.80 (1.22) | 2.17 (1.33) | 0.003 |
| Household Income (%) | | | | | | <0.001 |
| \$0-\$24,999 | 22.5 | 19 | 29.8 | 19.6 | 41.5 | |
| \$25,000-\$49,999 | 29 | 28.6 | 34.9 | 27.5 | 24.5 | |
| \$50,000-\$99,999 | 33.4 | 34.5 | 30.6 | 37.9 | 24 | |
| \$100k or higher | 15.1 | 17.9 | 4.6 | 15 | 10 | |
| Any Private Insurance (%) | 71.3 | 72 | 69.4 | 73.7 | 65.9 | 0.436 |
| Social Participation (mean (SD)) | 13.68 (5.75) | 14.02 (5.66) | 13.02 (6.07) | 13.29 (5.40) | 12.64 (6.10) | 0.003 |
| Loneliness (mean (SD)) | 3.11 (2.26) | 2.52 (2.06) | 4.22 (2.24) | 3.68 (2.11) | 4.90 (2.20) | <0.001 |

^a Some college includes vocational certificates, associate's degree, and time spent in a bachelor's program without completing the degree.

^b Comorbidities assessed include hypertension, arthritis, any heart condition, cancer other than skin cancer, diabetes, lung disease (emphysema, asthma, chronic bronchitis, chronic obstructive pulmonary disease), stroke in the last 5 years, dementia (including Alzheimer's), or mild cognitive impairment.

bias of the available data given that 85.5% of study participants were white.

Across mental health status groups, there were statistically significant differences in all measurements of functional status (Table 2). Overall, those with both FDS and FAS documented the greatest average number of needs (I/ADLs) and greatest severity of difficulty with ADLs and IADLs (Table 2). Additionally, across mental health groups, those with both FDS and FAS contained the greatest proportion of individuals requiring help with at least one ADL and at least one IADL (46.2%; Table 2), followed by those with FDS alone (43.1%; Table 2). Respondents with neither FDS nor FAS or with FAS alone were more often considered independent (55.3% and 47%, respectively; Table 2).

Using multivariable linear regression to predict the severity of functional limitations in Round 3, the presence of comorbid FDS and FAS (ADL: β 0.564 [95% CI: 0.065, 1.063], IADL: β 0.755 [95% CI: 0.126, 1.384]), comorbidity burden (ADL: β 0.385 [95% CI: 0.255, 0.515], IADL: β 0.292 [95% CI: 0.132, 0.453]), household income in the past year, and age at Round 2 demonstrated significant differences in predicting severity of difficulty with ADLs and IADLs (Table 3). The presence of FDS (β 0.720 [95% CI: 0.030, 1.410]), female gender (β 0.639 [95% CI: 0.337, 0.940]), and lack of social participation (β -0.046 [95% CI: -0.088, -0.005]) were significant predictors of IADL severity alone. Among the predictors measured, reporting both FAS and FDS corresponded to the greatest increase in severity of ADL and IADL difficulty (Table 3). Regardless of mental health status, household income between \$50,000-\$99,999 (ADL: -0.679 [-1.079, -0.280], IADL (-0.642 [-1.232, -0.051]) predicted less severe difficulty with both ADLs and IADLs. Household income above \$100k was a significant predictor of less severe difficulty with ADLs (-0.517 [-0.964, -0.069]) (Table 3). The loneliness variable was not a significant predictor of ADL/IADL severity (Table 3). Social strain could only be assessed among married or partnered participants due to the questionnaire in NSHAP and was not a significant predictor of ADL or IADL severity (Supplemental Table 2).

DISCUSSION

Functional assessments are a critical aspect of high-quality care for older adults.⁶ Exploring associations among social health, mental health, and functioning, contextualized by the biopsychosocial model⁴ and model of successful aging,³ can identify opportunities for patient-centered interventions to improve the health of older adults. Consistent with our initial hypothesis, the

Table 2. Functional Status as Measured by Activities of Daily Living and Instrumental Activities of Daily Living by Mental Health Group

| | Overall | Neither Anxiety nor Depressive Symptoms | Frequent Depressive Symptoms | Frequent Anxiety Symptoms | Frequent Anxiety & Depressive Symptoms | p |
|------------------------------------|-------------|---|------------------------------------|---------------------------------|--|--------|
| n | 2558.83 | 1684.43 (65.8%) | 353.54 (13.8%) | 280.07 (10.9%) | 240.8 (9.4%) | |
| I/ADL Difficulties (mean (SD)) | 1.72 (2.75) | 1.27 (2.28) | 2.98 (3.53) | 1.55 (2.72) | 3.27 (3.39) | <0.001 |
| Severity of Difficulty (mean (SD)) | | | | | | |
| ADL | 0.70 (1.50) | 0.57 (1.35) | 1.20 (1.86) | 0.49 (1.08) | 1.30 (2.01) | <0.001 |
| IADL | 0.76 (1.41) | 0.58 (1.26) | 1.29 (1.83) | 0.64 (1.01) | 1.55 (1.79) | <0.001 |
| Count of Tasks (mean (SD)) | | | | | | |
| ADL | 0.80 (1.50) | 0.59 (1.25) | 1.47 (1.99) | 0.67 (1.39) | 1.42 (1.92) | <0.001 |
| IADL | 0.95 (1.52) | 0.70 (1.28) | 1.55 (1.85) | 0.92 (1.51) | 1.86 (1.90) | <0.001 |
| Type of Assistance (%) | | | | | | <0.001 |
| Independent | 48.2 | 55.3 | 31.8 | 47 | 22.9 | |
| IADL Help Only | 20.6 | 19.2 | 19.4 | 26.3 | 25.3 | |
| ADL Help Only | 7.1 | 7.7 | 5.7 | 6.5 | 5.6 | |
| Both ADL and IADL Help | 24.2 | 17.8 | 43.1 | 20.2 | 46.2 | |

Table 3. Multivariate Linear Regression for Severity of Functional Limitations (ADLs and IADLs)

| | ADL Severity | | | | IADL Severity | | | |
|---|---------------|-------------------------|--------------|------------------|---------------|-------------------------|--------------|------------------|
| | β | 95% CI | SE | p | β | 95% CI | SE | p |
| Mental Health | | | | | | | | |
| Neither Anxiety nor Depressive Symptoms (Ref) | - | - | - | - | - | - | - | - |
| Frequent Depressive Symptoms | 0.142 | (-0.31, 0.593) | 0.222 | 0.527 | 0.720 | (0.030, 1.410) | 0.339 | 0.041 |
| Frequent Anxiety Symptoms | -0.017 | (-0.434, 0.400) | 0.205 | 0.934 | 0.489 | (-0.185, 1.163) | 0.331 | 0.149 |
| Frequent Anxiety & Depressive Symptoms | 0.564 | (0.065, 1.063) | 0.245 | 0.028 | 0.755 | (0.126, 1.384) | 0.309 | 0.020 |
| Age | 0.046 | (0.012, 0.080) | 0.017 | 0.009 | 0.091 | (0.044, 0.138) | 0.023 | <0.001 |
| Gender | | | | | | | | |
| Male (Ref) | - | - | - | - | - | - | - | - |
| Female | 0.203 | (-0.093, 0.499) | 0.145 | 0.171 | 0.639 | (0.337, 0.940) | 0.148 | <0.001 |
| Education | | | | | | | | |
| Less than High School (Ref) | - | - | - | - | - | - | - | - |
| High School Degree or Equivalent | -0.494 | (-1.069, 0.081) | 0.282 | 0.089 | -0.519 | (-1.313, 0.276) | 0.390 | 0.193 |
| Some College ^a | -0.39 | (-1.036, 0.256) | 0.317 | 0.228 | -0.324 | (-1.188, 0.539) | 0.424 | 0.450 |
| Bachelor's Degree or Higher | -0.391 | (-1.033, 0.251) | 0.315 | 0.224 | -0.634 | (-1.465, 0.198) | 0.408 | 0.130 |
| Marital Status | | | | | | | | |
| Unpartnered/Unmarried (Ref) | - | - | - | - | - | - | - | - |
| Partnered/Married | 0.227 | (-0.037, 0.490) | 0.129 | 0.089 | 0.321 | (-0.051, 0.694) | 0.183 | 0.089 |
| UCLA score | | | | | | | | |
| | 0.041 | (-0.046, 0.127) | 0.043 | 0.346 | 0.023 | (-0.067, 0.114) | 0.045 | 0.603 |
| Social Participation | | | | | | | | |
| | -0.025 | (-0.051, 0.002) | 0.013 | 0.068 | -0.046 | (-0.088, -0.005) | 0.021 | 0.031 |
| Number of Comorbidities^b | | | | | | | | |
| | 0.385 | (0.255, 0.515) | 0.064 | <0.001 | 0.292 | (0.132, 0.453) | 0.079 | <0.001 |
| Insurance (%) | | | | | | | | |
| No (Ref) | - | - | - | - | - | - | - | - |
| Yes | 0.267 | (-0.054, 0.588) | 0.158 | 0.100 | 0.329 | (-0.051, 0.709) | 0.186 | 0.087 |
| Household Income (%) | | | | | | | | |
| \$0-\$24,999 (Ref) | - | - | - | - | - | - | - | - |
| \$25,000-\$49,999 | -0.111 | (-0.504, 0.283) | 0.193 | 0.571 | 0.023 | (-0.644, 0.690) | 0.327 | 0.943 |
| \$50,000-\$99,999 | -0.679 | (-1.079, -0.280) | 0.196 | 0.002 | -0.642 | (-1.232, -0.051) | 0.290 | 0.034 |
| \$100k or higher | -0.517 | (-0.964, -0.069) | 0.220 | 0.025 | -0.379 | (-1.101, 0.344) | 0.355 | 0.294 |
| R ² | 0.165 | | | | 0.146 | | | |

^a Some college includes vocational certificates, associate's degree, and time spent in a bachelor's program without completing the degree.

^b Comorbidities assessed include hypertension, arthritis, any heart condition, cancer other than skin cancer, diabetes, lung disease (emphysema, asthma, chronic bronchitis, chronic obstructive pulmonary disease), stroke in the last 5 years, dementia (including Alzheimer's), or mild cognitive impairment.

Ref – denotes reference group. Bold text indicates significant beta value ($p < 0.05$). SE – denotes standard error.

current study found that comorbid FDS and FAS predicted increased difficulty with I/ADLs at 5 years, controlling for social participation, loneliness, and demographic factors. This study estimated that approximately 34% of older adults experience FAS, FDS, or both (Table 1), consistent with other nationally representative surveys^{14,51} and analyses of NSHAP data.⁵³ As both depressive symptoms and formally diagnosed depression alike can increase functional limitations^{9,16} and mental illness is often underrecognized and underdiagnosed in older adults, it is important to use a broader and more comprehensive assessment of mental health rather than relying on formal diagnoses alone when examining functional outcomes.

Consistent with existing literature, the presence of FDS (with or without FAS) significantly increased the severity of future functional limitation.⁵⁹ In contrast, FAS alone did not have a statistically significant impact on severity of functional limitation (Table 3). While we expected comorbid depression and anxiety symptoms to have the strongest effect on 5-year I/ADL impairment, there were no apparent differences between those with FDS alone and those with both FDS and FAS. A prior study examining the impact of depression and anxiety on functional impairment determined that the unique impact of depression was greater than that of anxiety.⁶⁰ Furthermore, there is known to be reciprocity between physical health and depression,⁶¹ which is likely to impact severity of difficulty with I/ADLs. Other work in the general population has shown that anxiety symptoms precede the onset of depressive symptoms,¹⁹ mediated by social support,⁶² and thus, depressive symptoms may be evidence of more severe and/or long-standing impairment.²⁹ As most of the literature to date focuses on depression and anxiety separately, the present findings will need to be validated to explore any differential impact of anxiety and depressive symptoms on functional status. Alternatively, there may be other constellations of symptoms that are more closely related to functional impairment than what is measured as FAS in the present study, potentially explaining why there were few apparent differences in characteristics and functional status between respondents with FAS alone and those with neither FAS nor FDS. Further research is needed to determine whether depressive symptoms have a greater impact on severity of functional limitation as compared to anxiety symptoms or whether a different, more comprehensive model of mental health⁶³ is needed to better understand the contributing factors to functional limitation in older adults.

Social health may also play a role in functional status. While individual psychological functioning demonstrated a stronger relative effect on future functional status compared to social participation and loneliness, social

support and mental health are known to be related and bidirectional in later life.²³ Thus, while the unique effect was small, the current modeling may not fully capture the complexity of these interactions. Consistent with prior literature and our hypotheses, loneliness predicted increased difficulty with I/ADLs, in accordance with Young's model;³ lack of social resources may limit older adults' ability to compensate for physical decline, resulting in decreased functioning. Furthermore, loneliness and depression are known to be interrelated,^{64,65} which may suggest a lack of both psychological and social resources to compensate for physical decline.⁶⁶ Consistent with our initial hypotheses and the literature correlating increased social participation with better functional status,²⁸ social participation had a slight protective effect on future functional status. As social participation has been tied to improved cognitive performance in older adults,^{22,28} social participation may act as a preventive measure to maintain cognitive functioning needed to carry out I/ADLs. This may be even more crucial for women.²¹ Studies focused on the relationship between social health and functional capacity during late life found that individuals screening positive for early cognitive impairment had smaller network sizes, decreased access to social resources, and lower levels of community involvement.⁶⁷ Thus, increasing social health by encouraging community involvement and participation may be one avenue to promoting successful aging. In contrast to the existing literature, being married or partnered predicted a slight increase in severity of functional difficulty. The presence of a spouse is typically a protective factor for depression,²⁴ yet the quality of this relationship may vary and become a source of social strain. In the present study, social strain was only evaluated in those with partners and predicted a slight increase in severity of functional difficulty (Supplemental Table 2). As social support can vary across the lifespan,⁶⁸ with older adults placing greater value on friends and peers, other assessments of social support need to be explored.

Consistent with other studies, respondents with FDS were more often female,⁵¹ had lower educational attainment,¹⁷ and reported more comorbidities.¹⁷ Like other studies,⁶⁹ additional comorbidities corresponded to increased odds of I/ADL difficulty. Additionally, previous work using a comprehensive model of health has demonstrated that the most vulnerable older adults were the most financially disadvantaged.⁵² In this study, greater financial resources (measured as annual household income) were a protective factor against more severe I/ADL difficulty (Table 3). As there were statistically significant differences in household income across mental health groups (Table 1), socio-economic status may also interact with mental health and impair functional status.

This study has several limitations. All data for this study were self-reported, which was crucial to assess the perception of an individual's I/ADL difficulty and has been validated elsewhere as a predictor of subsequent disability.⁷ Additionally, a complete-case approach was used for missing data. As the anxiety symptoms instrument was administered in the leave-behind questionnaire, there may be differences in individual characteristics and functional status between those who returned the questionnaire and those who did not. Preliminary examination of these groups suggests that the sample presented here may be biased towards white individuals, those with greater income and educational attainment, those with better self-reported physical health, and those with less pronounced ADL needs (Supplemental Table 3). Future research could focus on data for which anxiety and depressive symptoms were assessed in a comparable manner to increase generalizability. Additionally, alternative approaches to measuring functional status have been proposed, such as using stages that account for the variation in type of difficulty by task and creating a hierarchical order of functional impairment.⁵ Such an approach may prove more useful for population health estimates, as it indicates not only how many tasks are found to be difficult or the overall level of difficulty but also the specific combinations of tasks that lead to functional impairment.⁵ As the impact of depressive symptoms on ADLs may differ by gender,⁴⁸ future stratified analyses may prove beneficial to further explore the interactions between social, psychological, and physical health to create targeted interventions.

This study has several notable strengths including selection of variables according to a guiding framework for successful aging,³ a comprehensive view of mental health that includes both depressive and anxiety symptoms, use of varied assessments of functional limitation, longitudinal approach, and a large, nationally representative sample size. Additionally, the use of symptom-level questionnaires may better represent the reality of older adults, who experience symptoms of anxiety and/or depression but do not meet criteria for formal diagnosis. This increases the generalizability of the results to community-dwelling older adults in the United States.

CONCLUSIONS

To create policy and individual-level, patient-centered interventions that best support functional status over the entire life course, it is vital to understand the impact of social participation, loneliness, physical health, and psychological health on functional status, considering each patient as a whole person. Comorbid depressive and anxiety symptoms are common in older adults and predict more

severe functional impairment than either alone, controlling for social participation and loneliness. Understanding the interaction between depressive and anxiety symptoms and functional impairment as part of the overall patient experience may help patients feel seen and heard by their providers. Conducting a holistic evaluation of mental health, social health, and their relationship to functional impairment can improve our understanding of aging, help better identify potentially vulnerable older adults, and help more effectively develop targeted interventions for independence in the aging population.

Author Contributions

Study design: DeMarco, Hinyard, Subramaniam. Data acquisition or analysis: DeMarco, Zocher, Hinyard. Manuscript drafting: DeMarco, Zocher, Miyamoto. Critical revision: All.

Conflicts of Interest

None.

Data Availability Statement

The data used in this analysis are publicly available via the National Archive of Computerized Data on Aging (<https://www.icpsr.umich.edu/web/NACDA/series/706>).

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