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Understanding the Association of Older Adult Fall Risk Factors by Age and Sex Through Factor Analysis

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Abstract

Our aim was to identify latent factors underlying multiple observed risk factors for older adult falls and to examine their effects on falls by age and sex. We performed exploratory factor analysis on 13 risk factors in the Behavioral Risk Factor Surveillance System. We used log-linear regression models to measure the association between the identified factors and older adults reporting falls. We identified two underlying factors: physical and mental health limitations. These shared a 50% correlation. Physical health limitations were more strongly associated with falls among men (prevalence ratio = 1.68, 95% CI = 1.65–1.71) than women (prevalence ratio = 1.51, 95% CI = 1.49–1.54). As physical health limitations increased, men aged 65–74 had a greater association with falls compared with other age-sex subgroups. Our findings highlight the composite relationship between age, sex, and physical and mental health limitations in association with older adult falls, and support the evidence for individually tailored, multifactorial interventions.

Keywords

physical health; mental health; accidental falls; risk factors; aged

Introduction

Almost 14 million, or more than one in four community-dwelling (i.e., noninstitutionalized) older adults (aged 65 or older) in the United States fall annually (Moreland et al., 2020). Among those who fall, around five million report injuries (Moreland et al., 2020) and about 980,000 are hospitalized due to a fall injury each year (Centers for Disease Control and Prevention, 2020). Falls are the leading cause of unintentional injury death among older

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adults and resulted in more than 36,000 deaths in 2020 (Centers for Disease Control and Prevention, 2020).

Multiple factors are related to increased fall risk among older adults including demographics (e.g., sex, age, race/ethnicity), health conditions (e.g., depression, arthritis), and functional limitations (e.g., ability to climb stairs, cognitive ability) (Ambrose et al., 2013; Bergen et al., 2019). The prevalence of certain risk factors [e.g., depression (Girgus et al., 2017), dementia (van der Flier & Scheltens, 2005), stroke (Appelros et al., 2009), binge drinking (Blazer & Wu, 2009), diabetes (Andes et al., 2019), and difficulty performing activities of daily living (ADL) (Liang J. et al., 2008)] differ by age and sex in the older adult population. The strength of association of falls with some risk factors [e.g., ADLs (O & El Fakiri, 2015), alcohol consumption (Chang & Do, 2015; O & El Fakiri, 2015), depression (Gale et al., 2016; Gale et al., 2018), and balance (Gale et al., 2016, 2018)] differs by sex. The number of co-morbidities increase with age (Vogeli et al., 2007), and some diseases cluster together more often than others (Bhattacharjee et al., 2017; Sinnige J. et al., 2013). However, knowledge about how these risk factors together influence fall risk, especially across age groups or by sex (Vu T., Finch C.F., & Day L., 2011) is limited.

Research aimed at identifying fewer risk factors or at examining how they cluster into subpopulations of varying fall risk is also lacking (Brodie et al., 2015; Helgadottir et al., 2015; Ward et al., 2019; Yamashita et al., 2012). Approaches varied among the few studies conducted, the risk factors considered, the methods used to measure them (e.g., self-report, clinical assessment), and the statistical methods used for analyses (e.g., factor analysis, cluster analysis). As a result, risk factor clusters or identified subpopulations were diverse and therefore not generalizable. Our study aims to add to this research by employing a statistical method that has already been used (Ward et al., 2019) (i.e., exploratory factor analysis) on a nationally representative dataset that collects information on both falls and fall risk factors through self-report. Exploratory factor analysis helps identify the few unmeasured or latent constructs/themes underlying multiple measured risk factors (Kim & Mueller, 1978). These latent constructs/themes, referred to as factors, explain most of the shared variance between the measured variables (Kim & Mueller, 1978). A previous study that used factor analysis did not examine the effect of the identified factors on falls by age group and sex (Ward et al., 2019).

The first objective of this study was to identify whether a smaller set of underlying constructs/themes (factors) represent 13 known fall risk factors. The second objective was to examine how the effects of these underlying factors differed by age and sex subgroup.

Methods

Sample

The Behavioral Risk Factor Surveillance System (BRFSS) is a nationally representative telephone survey that annually collects information about several health-related behaviors and chronic conditions among community-dwelling (i.e., noninstitutionalized) adults aged ≥18 years (Centers for Disease Control and Prevention, 2016, 2018a). Detailed information about BRFSS is available on their website (https://www.cdc.gov/brfss/index.html). The 2016 and 2018 BRFSS data were combined to account for random variation between years. One question collected information about fall history during these years, "In the past 12 months, how many times have you fallen?" The responses to this question ranged from 0 to 76 (Centers for Disease Control and Prevention, 2016, 2018b) and were dichotomized to include older adults who fell at least once and those who did not fall. This analysis was limited to adults ≥65 years of age in all 50 states and the District of Columbia resulting in a sample size of 301,689.

Exploratory Factor Analysis

Exploratory factor analysis (EFA) is a statistical method that identifies the common underlying themes or factors responsible for the covariation in a set of observed variables (Kim & Mueller, 1978; O'Rourke & Hatcher, 2013). EFA was conducted on 13 variables related to increased fall risk: 1) self-reported general health status (poor, fair, good, very good, excellent), 2) depression, 3) stroke, 4) diabetes, 5) alcohol use (non-drinker, drinker who didn't binge drink, binge drinker), 6) arthritis, 7) blindness or difficulty seeing even with glasses, 8) difficulty concentrating, remembering, or making decisions, 9) difficulty walking or climbing stairs, 10) difficulty dressing or bathing, 11) difficulty performing errands alone, 12) number of bad physical health (including physical illness and injury) days in a month (0, 1–13, or ≥14 days) and 13) number of bad mental health (including stress, depression, and problems with emotions) days in a month (0, 1–13, or ≥14 days). All variables were available in BRFSS as dichotomous with yes/no responses, except for those with categories specified above in parentheses.

We performed exploratory factor analysis using the SAS 9.4 software's PROC FACTOR command (SAS Institute, Inc., Cary, NC, USA). The data were determined suitable for EFA using Kaiser's sampling adequacy. A polychoric correlation matrix was used for EFA because all variables included were categorical (Holgado–Tello et al., 2008). The software extracted two factors.

Variables were assigned to factors if their factor loadings met the a priori determined cut-off of ≥0.5. Factor loadings can be interpreted as the correlation between a variable and a factor (Kim & Mueller, 1978). The more conservative cut-off of 0.5 was chosen over 0.4 to just retain variables with stronger loadings (Matsunaga, 2010; O'Rourke & Hatcher, 2013). Then, the "most interpretable" factor solution was retained based on the following criteria: 1) the variables loaded on each factor shared a similar conceptual meaning; 2) the variables loading on different factors seemed to measure different constructs; and 3) the factor pattern demonstrated a relatively simple structure. A simple structure is where most of the variables have high loadings on one component and near zero loadings (−0.1 to +0.1) on other components (O'Rourke & Hatcher, 2013.

We estimated Cronbach's alpha to check the internal consistency of the variables included under each factor. PROC SCORE was used to calculate a standardized scoring co-efficient for every variable in the factor analysis. Variables in each factor were standardized and multiplied with their scoring co-efficient. These weighted products were summed to create a continuous score for each factor.

Analysis of the Relationship Between Factors and Falls

SAS-callable SUDAAN's PROC LOGLINK was used to calculate crude and adjusted prevalence ratios. We ran separate log-linear models using each factor's score as the continuous independent variable and the dichotomous fall variable as the dependent variable. The following risk factor variables were included in the adjusted models: sex, age group, race/ethnicity (non-Hispanic (NH) white, NH black, Hispanic, NH American Indian/Alaskan Native, NH Asian/Pacific Islander, and NH Multi/other races), education level, marital status, urban/rural status, states (50 states and the District of Columbia), and the variables that did not load on either factor (alcohol use, stroke, diabetes, arthritis, and blindness) (Bergen et al., 2019). Crude and adjusted prevalence ratios were also produced and stratified by the three age groups (65–74, 75–84, and 85+ years), sex (males and females), and the six age-sex subgroups (males by three age groups and females by three age groups). Adjusted prevalence ratios by sex were adjusted for age group and adjusted prevalence ratios by age group were adjusted for sex (along with the above-mentioned variables). In addition to prevalence ratios, the crude percentages of older adults who fell at different percentile levels of each factor were also calculated by age-sex subgroups. t-tests were used to statistically test between-subgroup differences.

SAS-callable SUDAAN v11 was used to calculate the percentages and to perform regression analysis. Adults with responses of "Don't know/Not sure," "Refused," or "Not asked or missing" for any of the above variables were excluded from analyses.

Results

Exploratory Factor Analysis

There were two underlying factors common to eight of the 13 variables (Table 1). The first factor, labelled physical health limitations, included five risk factors: 1) self-reported general health status, 2) difficulty walking/climbing stairs, 3) difficulty dressing/bathing, 4) difficulty performing errands alone, and 5) number of bad physical health days. The second factor, labelled mental health limitations, included three variables: 1) depression, 2) difficulty concentrating, remembering, or making decisions, and 3) number of bad mental health days. The eigenvalue for the physical health limitations factor was 4.77 and was 0.92 for the mental health limitations factor. The scree plot showed a linear decline after the second factor. We performed and compared both orthogonal (Varimax) and oblique (Promax) rotations. Oblique (Promax) rotation was chosen as the solutions differed and the resulting two factors were found to be correlated with each other. The physical and mental health limitation factors had a 54% ($r = 0.54$) correlation with each other.

The final communality estimates (the proportion of a variable's variance explained by the factor it is loaded on) ranged from 0.47 to 0.73 for the eight variables included in either factor (Table 1). Cronbach's alpha for the physical health limitations factor and the mental health limitations factor were 0.74 and 0.58, respectively (Table 1).

Relative Association Between Factors and Falls

Physical Health Limitations.—The proportion of older adults reporting a fall increased by 58% (prevalence ratio (PR) = 1.58, 95% CI = 1.56, 1.60) with every unit increase in physical health limitations (Table 2). After adjusting for demographics, geography, and health characteristics not included in either factor, the prevalence ratio for a fall compared with no fall remained significant for physical health limitations (PR = 1.50, 95% CI = 1.48, 1.52).

By age group, a unit increase in physical health limitations was associated with more 65–74 year olds reporting a fall (PR = 1.63, 95% CI = 1.61, 1.66) when compared with those aged 75–84 (PR = 1.53, 95% CI = 1.50, 1.57) and 85+ (PR = 1.46, 95% CI = 1.41, 1.52). When adjusted for other variables including sex, this significant difference only persisted between those aged 65–74 (PR = 1.53, 95% CI = 1.50, 1.56) and those 85 and over (PR = 1.42, 95% CI = 1.36, 1.48). With each unit increase in physical health limitations, men (PR = 1.68; 95% CI = 1.65, 1.71) were more likely than women (PR = 1.51; 95% CI = 1.49, 1.54) to report falling. The bigger effect, per unit increase in physical health limitations among men, remained after adjusting for control variables.

The proportion of older adults who reported falls rose significantly with each unit increase in physical health limitations in all six age-sex subgroups. Among these subgroups, more men aged 65–74 reported falls per unit increase (PR = 1.74, 95% CI = 1.70, 1.78) when compared with all other age-sex subgroups including men aged 75–84 years (PR = 1.60, 95% CI = 1.54, 1.66), men aged 85 years and older (PR = 1.50, 95% CI = 1.42, 1.58), and women in all age groups (65–74: PR = 1.55, 95% CI = 1.52, 1.58; 75–84: PR = 1.49, 95% CI = 1.44, 1.53; 85+: PR = 1.45, 95% CI = 1.39, 1.52). After adjusting, more men aged 65–74 fell with each unit increase in physical limitations, compared with women in all age groups and men aged 85 and over.

Mental Health Limitations.—With every unit increase in mental health limitations, older adults reporting a fall increased by 42% (PR = 1.42, 95% CI = 1.40, 1.44) (Table 2). After adjusting for demographics, geography, and health characteristics not included in either factor, the prevalence ratio for a fall compared with no fall remained significant (PR = 1.32, 95% CI = 1.30, 1.34).

By age group, a unit increase in mental health limitations was associated with a higher proportion of 65–74 year olds (PR = 1.47, 95% CI = 1.45, 1.49) reporting a fall when compared with those aged 75–84 (PR = 1.38, 95% CI = 1.35, 1.42) and those aged 85+ (PR = 1.32, 95% CI = 1.26, 1.37). When adjusting for other variables including sex, this significant difference only persisted between those aged 65–74 (PR = 1.33, 95% CI = 1.31, 1.36) and those aged 85+ (PR = 1.24, 95% CI = 1.19, 1.30). With unit increase in mental health limitations, there was no significant difference between the crude and adjusted prevalence ratios of men and women.

In all the six age-sex subgroups, significantly more older adults fell compared with those who did not, with a unit increase in mental health limitations. The increase was larger among men aged 65–74 (PR = 1.49, 95% CI = 1.46, 1.53) compared with both women aged

75–84 (PR = 1.39, 95% CI = 1.35, 1.44) and women aged 85+ (PR = 1.27, 95% CI = 1.20, 1.35). After adjusting, men 65–74 years only had a higher prevalence ratio (PR = 1.37, 95% CI = 1.33, 1.40) than women aged 85+ (PR = 1.20, 95% CI = 1.13, 1.27).

Percentage of Older Adults Who Fell by Factor Score

Physical Health Limitations.—In the absence of physical health limitations, a significantly lower percent of men aged 65–74 fell when compared with any other sub group ($p < 0.01$) (Figure 1). Absent limitations, a significantly higher percent of men aged 85+ reported falls than younger men ($p < 0.01$). But the percent of 85+ men who reported falls was not statistically different from those of women in any of the three age groups. As the physical health limitation scores increased, fall percentages among men aged 65–74 rose relatively more than in other subgroups. At its highest score, more men aged 65–74 fell than women in any of the three age groups (65–74, $p = 0.04$; 75–84, $p < 0.01$, 85+, $p < 0.01$). For the same score, more men aged 85+ fell than women aged 75–84 ($p < 0.01$) and 85+ ($p = 0.02$).

Mental Health Limitations.—Absent mental health limitations, a significantly higher percent of men and women aged 85+ reported falls when compared with the younger subgroups ($p < 0.01$) (Figure 2). At the highest mental health limitation score, more men aged 85 and older fell when compared with any other subgroup ($p < 0.01$). The percentage of 85+ year-old women who fell was not significantly different from any of the younger age groups.

Discussion

Through exploratory factor analysis, we determined that eight of the 13 older adult fall risk factors had two common underlying factors. Specifically, a major portion of the co-variance in eight of the 13 could be explained by physical health limitations and mental health limitations.

A previous study that performed factor analysis on fall risk factors (Ward et al., 2019) showed three underlying factors: neuromuscular attributes, memory-related cognition, and non–memory-related cognition. Neuromuscular attributes (Ward et al., 2019), which was the underlying factor for leg strength, leg velocity, trunk-extensor-muscle endurance, pain, and mobility self-efficacy scores could be a construct similar to our physical health limitations factor, which underlies difficulty walking/climbing stairs, difficulty dressing/bathing, difficulty performing errands alone, general health status, and number of bad physical health days. More research is needed to investigate how well the physical health limitations factor measures the neuromuscular attributes described in Ward et al. (2019). The mental health limitations factor in our study, however, includes variables measuring both mental health (depression, stress, and emotional problems) and cognition (difficulty concentrating, remembering, or making decisions), unlike Ward et al.’s (2019) memory-related cognition, and non–memory-related cognition factors. Our mental health limitation factor had a Cronbach’s alpha of 0.58 and consisted of only three items. Although, Cronbach’s alpha underestimates the internal consistency when there are fewer than 8 items (Henson, 2001; O’Rourke & Hatcher, 2013), our mental health limitations factor could also be measuring more than one construct. Future research may benefit from using more comprehensive data on both mental health and cognition.

Physical and mental health limitations in this sample were correlated. Physical and cognitive functioning are known to be associated with each other in the older adult population (Clouston et al., 2013). Several studies showed that the interaction of impaired physical and cognitive functioning increased fall risk (Callisaya et al., 2016; Martin et al., 2013). Depression is strongly associated with falls and has similar risk factors as falls including cognitive impairment, poor self-rated health, impaired ADL, slow walking speed, poor balance, weakness, and low energy and activity levels (Biderman et al., 2002; Caligiuri & Ellwanger, 2000; Kvelde et al., 2010). The correlation between the factors supports the need for using mental health indicators (Hoffman et al., 2017) with the more commonly used physical health indicators for screening falls.

Both physical and mental health limitations were strongly associated with falls among both sexes and across all age groups. However, subgroups of men aged 65–74 and 85+ had unique patterns. As physical health limitations increased, men aged 65–74 were more likely to report falls than women and older men. This contrasts with the findings in the overall older adult population where women were more likely to report falls than men; older age groups more likely to report falls than those aged 65–74 (Moreland et al., 2020). One probable explanation to this is mathematical. In the absence of physical health limitations, fewer men aged 65–74 reported falls compared with other sub groups. Therefore, with each unit increase in physical health limitations, the relative rise in the percentage of men aged 65–74 who reported falls (prevalence ratio) was higher than in other subgroups. However, this can only be a partial explanation because at the highest physical health limitation score, more men aged 65–74 reported falls than women in any of the three subgroups. Men aged 85+ had a unique pattern in that, unlike women of the same age group, a consistently high percentage reported falls across all physical and mental health limitation scores. At the highest physical health limitations score, more men aged 85+ reported falls than women aged 75–84 and 85+. At the highest mental health limitation score, more men aged 85+ reported falls than all other subgroups.

Men with reported physical and mental health limitations may be different from women with similar limitations. This is an important finding because men and women’s fall risk and their attitudes towards fall prevention could be more different than we previously understood. Studies show that while a lower proportion of men report nonfatal falls than women (Moreland et al., 2020), a higher proportion of men have fall-related fatalities (Burns & Kakara, 2018). Although the reasons for this difference are unknown, men’s view of fall prevention is dissimilar to women. They are less receptive to fall prevention messages and are less likely to participate in fall prevention programs (Liddle et al., 2017; Sandlund et al., 2017). Fewer men than women seek medical care and/or discuss falls with a healthcare provider (Stevens et al., 2012).

While adhering to gender norms could be a barrier to fall prevention, it could also influence behavior and provide more opportunities for a fall. Men are more likely to report falling while performing hazardous activities or tasks with high levels of difficulty compared with women (Pereira et al., 2013). Older men, in general, report more activity than older women (Keadle et al., 2016; Sun F., Norman I.J., & While A., 2013). Older adults in the 65–74-year age group are the most physically active, however, activity decreases with age (Keadle et al., 2016; Sun F. et al., 2013). Additionally, twice as many adults aged 65–74 years were in the labor force in 2016, compared with those in the 75–84 year age group (Roberts, Ogunwole, Blakeslee, & Rabe, 2018) and more men aged 65–74 years are in the labor force (30%) than women in the same age group (22%) (Roberts et al., 2018). Potentially, men, especially those in the 65–74 age group, are more likely to perform activities that expose them to a higher fall risk even when they have physical health limitations. Data on daily activity, activity at the time of a fall, and on fall risk factors including physical health limitations are needed to fully examine the relationship.

Although being mobile and active may have provided more opportunities for a fall among men aged 65–74 years with physical health limitations, it should be stressed that physical activity in the form of structured exercises that focus on improving strength and balance reduce fall risk (Bauman et al., 2016). Moderate-intensity physical activity was shown to prevent the onset and progression of limitations in basic ADLs among community-dwelling older adults (Tak et al., 2013). Studies have shown that physically active older adults had a reduced risk of developing dementia (Bauman et al., 2016) and that a combination of strength, balance, and endurance training improved basic ADL ability in patients with all types of dementia (Blankevoort et al., 2010). Additionally, physical activity is known to improve mental well-being (Bauman et al., 2016).

This study has limitations. First, the names of the factors, physical and mental health limitations, were chosen based on what we thought best represented the variables and might not actually assess an older adult's "true" limitations. Second, the functional limitation questions in BRFSS (e.g., difficulty walking/climbing stairs, difficulty dressing/bathing) ask only if the respondent has the limitation and do not assess severity (Centers for Disease Control and Prevention, 2016, 2018b). Therefore, determining if the severity of physical health limitations differed between age-sex subgroups was not possible. Older adults with very severe ADL limitations may fall less often than those with moderate limitations (Henry-Sanchez et al., 2012). Third, BRFSS does not collect data on some important fall risk factors such as osteoporosis, fall risk medications, fear of falling, pain, walking aids, and other ADLs and IADLs not included in the study. Hence, we may be missing factors that contribute to differences by age and sex. Fourth, BRFSS is self-reported data and is subject to recall bias. A thorough clinical assessment of physical and mental health factors (including cognitive health) may provide rich physiologic data that could explain the underlying mechanisms leading to falls. Fifth, the median response rates across the nation in 2016 and 2018 were 47% and 50%, respectively, and could have caused a non-response bias. However, BRFSS mitigates non-response with their weighting procedures (Centers for Disease Control and Prevention, 2016, 2018a).

Conclusion

The effects of the individual risk factors considered in our study were previously reported (Bergen et al., 2019). However, we arrived at three conclusions by identifying the common themes underlying these risk factors. First, screening for and addressing mental health limitations, as part of fall prevention, may be as important as screening and addressing physical health limitations. The Updated American Geriatrics Society/British Geriatrics Society (AGS/BGS) recommendations for falls assessment, for example, includes questions about gait and balance but does not assess for depression (Panel on Prevention of Falls in Older Persons, 2011). Second, men with physical and mental health limitations could be different from women with similar limitations. We may need to understand men's perspectives, make fall prevention more appealing for them, and motivate them to take action (Liddle et al., 2017; Sandlund et al., 2017). Two possibly beneficial strategies are motivational interviewing techniques to understand men's attitudes towards falls prevention (Kiyoshi-Teo et al., 2020) and conducting fall prevention exercise programs in "male-friendly" places (Liddle et al., 2017). However, more research about falls risk among men with physical and mental health limitations and effective strategies to increase male participation in fall prevention is needed.

Finally, the composite relationship between physical health limitations, mental health limitations, age, and sex in association with older adult falls reinforces the benefits of a multifactorial approach to prevention. Multiple risk factors exist for older adult falls and the risk factor profiles may vary between older adults. Multifactorial falls interventions are known to be effective in reducing falls (Lee & Yu, 2020). In a multifactorial intervention, a healthcare provider (e.g., physician, nurse) screens and assesses an older adult for fall risk and based on the individual's unique risk factor profile administers or refers the older adult to other providers (e.g., physical therapist, occupational therapist, pharmacist) for interventions (e.g., physical therapy, home-modification, medication management). While assessing for risk factors, healthcare providers could enquire older men (and women) about daily activities that may increase their fall risk (e.g., cleaning roof gutters, shoveling snow) and counsel them. Centers for Disease Control and Prevention's STEADI initiative provides multiple resources, for healthcare providers to screen, assess, and intervene, which could be accessed here—https://www.cdc.gov/steadi/index.html.

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What this paper adds

- Mental health and physical health limitations are correlated and are both strongly associated with falls
- Falls risk among men with physical and mental health limitations may be different from women with similar limitations
- As physical health limitations increase, more men aged 65–74 were likely to report falls than women and older men. A higher percent of men aged 85+ reported falls across all levels of physical and mental health limitations compared with women of the same age-group.

Applications of study findings

- Findings suggest screening for and addressing mental health limitations, as part of fall prevention, may be as important as screening and addressing physical health limitations
- The falls risk profiles among older adults vary between individuals. While screening and assessing for an individual's risk factors, heath care providers could consider enquiring about daily behaviors which might put an older adult at an increased risk.
- Health care providers could consider motivational interviewing techniques to understand men's barriers to falls prevention. More research into sex differences in falls risk and increasing falls prevention uptake among men could be beneficial.

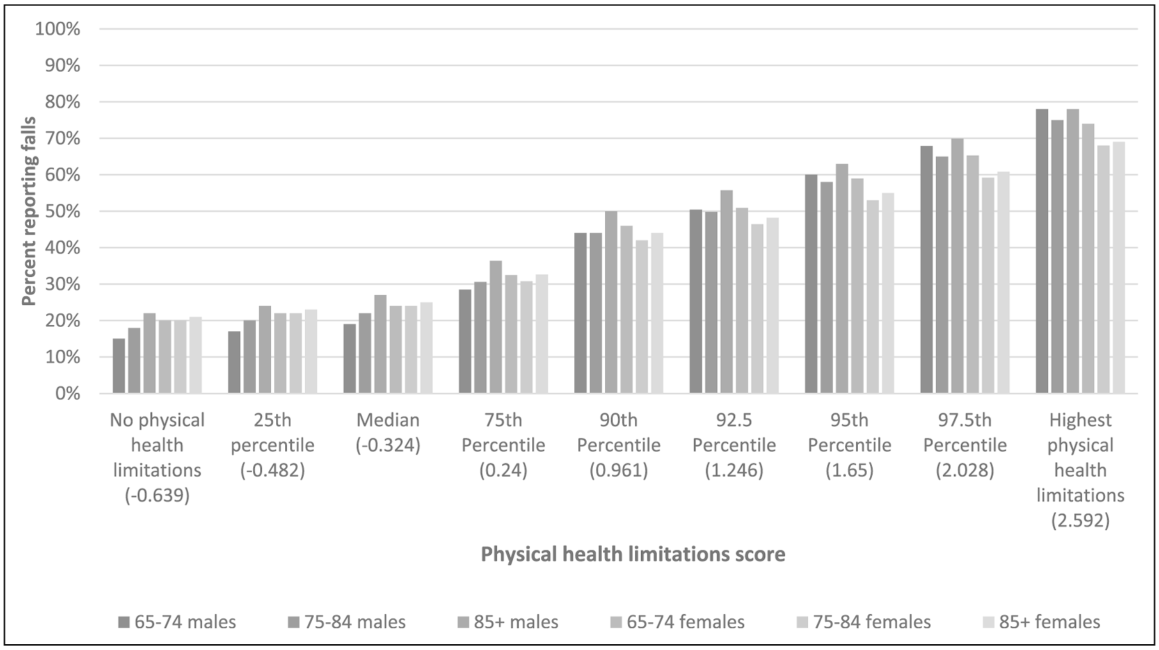

Figure 1.

Percentage of adults 65 years and older who reported falling by physical health limitation score, Behavioral Risk Factor Surveillance System, 2016–2018.

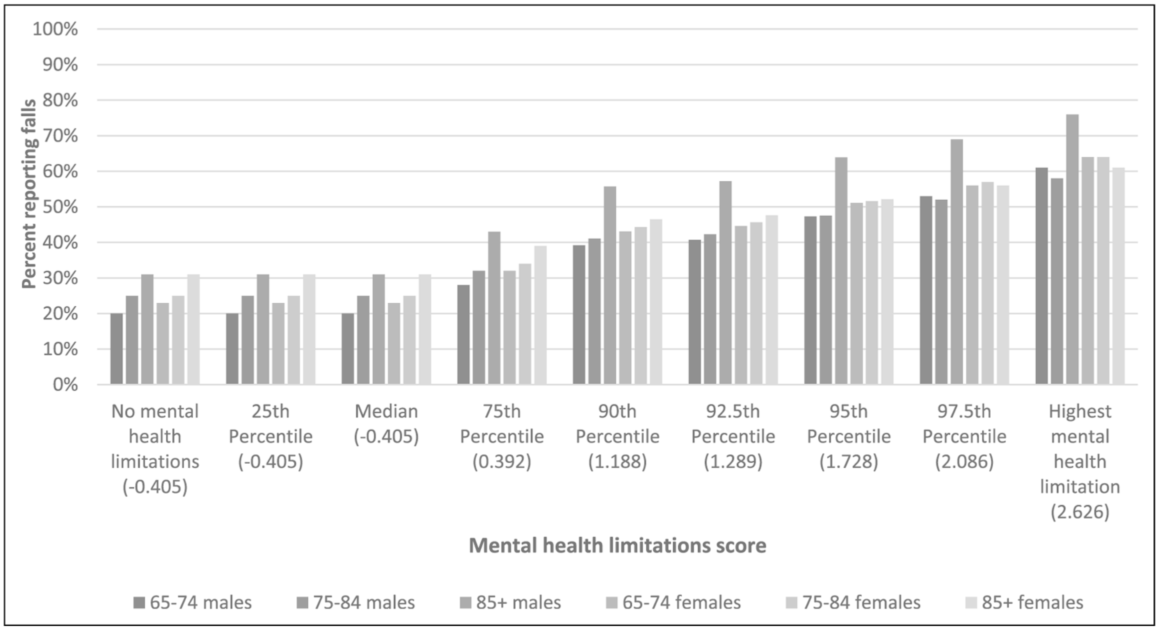

Figure 2.

Percentage of adults 65 years and older who reported falling by mental health limitation score, Behavioral Risk Factor Surveillance System, 2016–2018.

Table 1.

Rotated Factor Structure with Factor Loadings and Final Communality Estimates, Behavioral Risk Factor Surveillance System, 2016–2018.

	Physical Health Limitations	Mental Health Limitations	
Variables	Factor loading[1]	Factor loading[1]	Final communality estimates[2]
Self-reported health status	**0.68**	0.08	0.53528159
Blind or difficulty seeing	0.44	0.09	0.2541782
Difficulty concentrating, remembering, or making decisions	0.27	**0.5**	0.46670098
Difficulty walking or climbing stairs	**0.86**	−0.01	0.73124429
Difficulty dressing or bathing	**0.78**	0.07	0.6645088
Difficulty performing errands alone	**0.80**	0.06	0.68998618
Alcohol use	−0.39	0.11	0.12374024
Stroke	0.39	0.03	0.16608243
Arthritis	0.32	0.14	0.17609112
Depression	−0.06	**0.79**	0.58383454
Diabetes	0.39	−0.05	0.13183182
Number of bad mental health days	−0.08	**0.87**	0.67054935
Number of bad physical health days	**0.54**	0.24	0.48929919
Cronbach's alpha alpha	0.74	0.58	NA

[1] Factor loadings can be interpreted as the correlation between a variable and a factor. Variables with factor loadings of ≥0.5 (in bold) under a factor were assigned to be a part of that factor.

[2] The final communality estimates are the proportion of variance of the variables accounted for by the common factors.

Table 2.

Association of physical and mental health limitations with older adults having a fall by age and sex, Behavioral Risk Factor Surveillance System, 2016–2018.

Demographics		All Age Groups PR (95% CI)[a]	65–74 year PR (95% CI)[a]	75–84 year PR (95% CI)[a]	85+ year PR (95% CI)[a]
Physical health limitations					
Both sexes	Crude	1.58 (1.56, 1.60)[b]	1.63 (1.61, 1.66)	1.53 (1.50, 1.57)	1.46 (1.41, 1.52)
	Adjusted	1.50 (1.48, 1.52)[b]	1.53 (1.50, 1.56)	1.49 (1.45, 1.53)	1.42 (1.36, 1.48)
Male	Crude	1.68 (1.65, 1.71)	1.74 (1.70, 1.78)	1.60 (1.54, 1.66)	1.50 (1.42, 1.58)
	Adjusted	1.59 (1.55, 1.63)	1.65 (1.60, 1.70)	1.55 (1.48, 1.61)	1.45 (1.35, 1.54)
Female	Crude	1.51 (1.49, 1.54)	1.55 (1.52, 1.58)	1.49 (1.44, 1.53)	1.45 (1.39, 1.52)
	Adjusted	1.45 (1.42, 1.48)	1.46 (1.43, 1.50)	1.45 (1.40, 1.51)	1.39 (1.32, 1.47)
Mental health limitations					
Both sexes	Crude	1.42 (1.40, 1.44)[b]	1.47 (1.45, 1.49)	1.38 (1.35, 1.42)	1.32 (1.26, 1.37)
	Adjusted	1.32 (1.30, 1.34)[b]	1.33 (1.31, 1.36)	1.30 (1.26, 1.33)	1.24 (1.19, 1.30)
Male	Crude	1.43 (1.41, 1.46)	1.49 (1.46, 1.53)	1.36 (1.30, 1.42)	1.39 (1.31, 1.47)
	Adjusted	1.34 (1.31, 1.37)	1.37 (1.33, 1.40)	1.27 (1.21, 1.33)	1.32 (1.24, 1.40)
Female	Crude	1.40 (1.38, 1.42)	1.44 (1.41, 1.47)	1.39 (1.35, 1.44)	1.27 (1.20, 1.35)
	Adjusted	1.31 (1.29, 1.33)	1.32 (1.29, 1.35)	1.31 (1.27, 1.35)	1.20 (1.13, 1.27)

Note: Adjusted models were controlled for the following variables: sex, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanics, non-Hispanic American Indians/Alaskan Natives, non-Hispanic Asian/Pacific Islanders, and non-Hispanic Multi/other races), age group, education level, marital status, urban/rural status, states (50 states and the District of Columbia), alcohol use, stroke, diabetes, arthritis, and blindness.

[a] PR = Prevalence Ratio; 95% CI = 95% confidence interval.

[b] Overall crude and adjusted prevalence ratios (both sexes and all ages).