## Title
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## Journal
JAMA Psychiatry, 71(5)

## ISSN
2168-622X

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## Publication Date
2014-05-01

## DOI
10.1001/jamapsychiatry.2014.5

Peer reviewed

Published in final edited form as:
*JAMA Psychiatry*. 2014 May ; 71(5): 540–546. doi:10.1001/jamapsychiatry.2014.5.

# Chronicity of PTSD and Risk of Disability in Older Persons

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## Abstract

**Importance—**Little is known about the association of posttraumatic stress disorder (PTSD) with disability in late life. Most studies of late-life psychiatric disorders and function have focused on depression and generalized anxiety disorder (GAD).

**Objective—**To determine the association between PTSD and disability among older adults, and investigate if association differs by chronicity of PTSD.

**Design—**The Collaborative Psychiatric Epidemiology Surveys (CPES 2001-2003) includes three aggregated, nationally representative studies (National Comorbidity Survey Replication, National Survey of American Life, and National Latino and Asian American Study or NLAAS) totaling 20,013 participants 18 years and older. Analyses used weights and complex design-corrected statistical tests to infer generalizability to US population.

**Setting—**Continental US; additionally Alaska and Hawaii for NLAAS.

**Participants—**We studied 3,287 CPES participants aged 55 years and older (mean (SD) age=66 (8.7) years, 60% female).

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Portions of this manuscript were presented at the Gerontological Society of America's 2012 Annual Meeting, San Diego, California, November 14-18, 2012 and the American Association for Geriatric Psychiatry's 2013 Annual Meeting, Los Angeles, California, March 14-17, 2013.

Role of Sponsor: The sponsors had no role in the design or conduct of the study; collection, management, analysis, or interpretation of the data; or the preparation, review, or approval of the manuscript.

*Author Contributions*: Dr. Byers conducted the statistical analyses for this study. Dr. Byers had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

*Conflicts of interest*: The authors have no competing interests, including specific financial interests or relationships or affiliations relevant to the subject of this manuscript.

**Main Outcome Measures—**Disability was defined by 5 domains (out of role, self-care, mobility, cognition, and social) using the WHO-DAS.

**Results—**3.7% of older adults had a history of PTSD defined by *DSM-IV* criteria. Of these, approximately half had persistent PTSD in later life (age of onset < 55 years as well as a recent diagnosis) (1.8%). Examining three PTSD groups, frequency of any disability was 79.7% for persistent PTSD, 69.6% for pre-late-life (age of onset < 55 years and age at last diagnosis < 55 years), and 36.9% for no PTSD (*P* <.001). In logistic regression analyses, adjusting for demographics, smoking, individual medical conditions, depression, GAD, and substance use disorders, respondents with persistent PTSD were three times more likely to have any disability than respondents with no PTSD (odds ratio [OR], 3.18; 95% CI, 1.32-7.64). Global disability results were non-significant for pre-late-life relative to no PTSD (OR, 1.99; 95% CI, 0.97-4.08). In addition, the results suggest that persistent PTSD relative to no PTSD has a strong association with all individual domains.

**Conclusions and Relevance—**Disability in older Americans is strongly associated with PTSD, particularly PTSD that persists into later life. These findings suggest that monitoring and treatment of PTSD is important over the long term.

## Introduction

Although much is known about the strong relationship between geriatric depression and disability,[1-11] few studies have examined the impact of anxiety disorders on disability in late life. Of these studies, most have considered the association between generalized anxiety disorder (GAD) and disability.[11,12] However, little research has investigated the burden of posttraumatic stress disorder (PTSD)[13] and the occurrence of disability in late life.

Prior research has focused mainly on young veteran populations to assess PTSD and functional impairment. In examining archival data from the National Vietnam Veterans Readjustment Study, investigators found that middle-aged veterans with combat-related PTSD were at higher risk of physical limitations, not working, compromised physical health, and diminished well-being compared with veterans without PTSD.[14] Research using the Veterans Affairs Normative Aging Study examined the relationship between depressive symptoms and domains of functioning,[15] but did not consider the impact of PTSD symptoms on similar domains. In studies that have assessed community-based samples of older adults, anxiety symptom scales have been used, consistently finding a strong association between symptoms of anxiety and functional impairment.[11,16] However, the association between PTSD and disability has not been studied in a national sample using *DSM-IV*[17] clinical diagnosis criteria.

The purpose of our study was to determine the association of PTSD with disability in a large diverse probability sample of older adults. Moreover, we examine the chronicity of PTSD and its association with disability. We hypothesize that both pre-late-life PTSD and persistent PTSD will be associated with disability; however, persistent PTSD will have a much higher magnitude of association when compared to no PTSD. In addition, disability will be attributed to PTSD above and beyond its relationship to major depression, generalized anxiety disorder, and other comorbidities.

## Methods

### Participants

The Collaborative Psychiatric Epidemiology Surveys (CPES 2001-2003) data which combines three national studies (the National Comorbidity Study Replication, the National Survey of American Life, and the National Latino and Asian American Study) is a nationally representative survey of 20,013 non-institutionalized participants aged 18 years and older in the United States. The sampling designs and methods of the CPES have been described in detail elsewhere.[18]

The current sample consisted of 3287 community-based adults aged 55 years and older. The average age of the sample was approximately 66 years (*SD* = 8.7). The distribution was 60.1% women, 34.0% White, 35.5% Black, 17.7% Hispanic, 12.8% Asian. The CPES data were obtained from the Inter-university Consortium for Political and Social Research.[19] The institutional review boards of the University of California, San Francisco and the San Francisco Veterans Affairs Medical Center approved this study.

### Measures

**Diagnostic Assessment—**The CPES psychiatric diagnoses were determined using the World Health Organization's World Mental Health (WMH) Survey Initiative version of the Composite International Diagnostic Interview (CIDI).[20] The WMH-CIDI is a fully structured lay interview that generates lifetime and 12-month diagnoses according to the *International Classification of Diseases, 10th Revision*[21] and *DSM-IV*[17] criteria. In the present analyses, the *DSM-IV* criteria were used. The primary mental disorder examined was PTSD. MDD (Major Depressive Disorder), GAD, substance use disorders (including alcohol and drug abuse/dependence), and a number of medical comorbid disorders were examined as confounders.

**Chronicity of PTSD—**We were able to determine whether onset of PTSD was in later life (age ≥ 55 years) versus pre-late-life (age < 55 years) or whether it was persistent in later life (i.e., age < 55 years and age ≥ 55 years) based on age of onset of PTSD as well as age of the most recent PTSD diagnosis, which was defined by most current PTSD or last diagnosis at age ≥ 55 years. We defined three categories for PTSD chronicity over the respondent's lifetime: 1) no history of PTSD; 2) pre-late-life PTSD, which included age of onset < 55 years and age at last diagnosis < 55 years; and 3) persistent PTSD in later life, which included both age of onset < 55 years and a recent diagnosis of PTSD at age ≥ 55 years. Using this definition, the majority (96%) of respondents with persistent PTSD had a diagnosis within the 12 months prior to their interview (65/68), while 2 respondents had PTSD 1 year prior, and 1 had PTSD 7 years prior. Because we were interested in the chronic nature of PTSD into late life, we excluded 27 respondents who were first diagnosed with PTSD after age 55. In addition, there were 7 respondents with missing data on age of onset and most recent PTSD diagnosis who were excluded from the original sample.

**Disability—**Disability was defined by 5 domains (out of role, self-care, mobility, cognition, and social) of the World Health Organization Disability Assessment Schedule (WHO-

DAS).[22,23] Out of role was measured by number of days during past 30 days when the respondent was completely unable to work or carry out their normal activities because of physical or mental health problems. The other domains were a product of frequency (number of days) and severity of problems (none, mild, moderate, severe) respondents reported experiencing in past 30 days. All domains were scored on a 0 to 100 scale, where higher scores indicated worse functioning. Because the domains were highly skewed, we examined binary outcomes of any disability (> 0) in each domain. In addition, we created two global disability measures: 1) any disability measure which was defined as any difficulty in at least one of the five disability domains; and 2) a standardized global disability score computed by averaging z-scores of all 5 domains.

**Other Variables—**The demographic variable included in analyses were age, gender, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and Asian), education (completed 0-11 or ≥ 12 years), marital status (married/cohabitating, divorced/separated/widowed or never married), and income defined by the poverty index (i.e., the ratio of household income to poverty threshold used in the 2001 Census and adjusted for household size; categorized as low [≤ 1.5 times poverty line], middle [> 1.5-6.0 times], and high [> 6 times]).[24-26] In addition, we determined smoking status, creating a dichotomous variable for current smoking (yes/no). The medical conditions included in analyses were those that are prominent in older adults and associated with disability and mental health disorders, that is, history of stroke, heart attack or heart disease, diabetes mellitus, chronic lung disease, cancer, and arthritis.

## Statistical Analyses

To produce nationally representative estimates, clustering and weighting techniques were implemented in order to reduce systematic bias and imprecision imbedded in the complex sampling design. Thus, percents represent weighted proportions by PTSD group and statistical differences were estimated based on the Rao-Scott chi-square which corrects for the complex design.[27] The standard errors were determined from a recalculation of variance using the Taylor Series linear approximation method.[28]

We examined the association between the PTSD groups and global disability, first, by assessing weighted logistic regression analyses, and, then, validating our findings by linear regression analyses. All analyses were also adjusted for demographic variables, current smoking, individual medical conditions (i.e., arthritis, stroke, heart disease/attack, diabetes, chronic lung disease, and cancer), and lifetime MDD, GAD and substance use disorders. We used any disability (i.e., difficulty in any of the five disability domains) for logistic regression analyses, and standardized global disability scores (z-scores) for the linear regression analyses.

Next, logistic regression analyses were assessed in greater detail, estimating the association of pre-late-life and persistent PTSD in later life with the five disability domains. The reference group was no PTSD. In order to assess the confounding influence of other psychiatric disorders (i.e., MDD, GAD, and substance use disorders), we examined three separate models: Model 1 – an unadjusted model; Model 2 – adjusted for demographic

characteristics, current smoking, and medical conditions; and Model 3 – adjusted for variables in Model 2 plus lifetime psychiatric disorders. Odds ratios and 95% confidence intervals were estimated, along with design-corrected likelihood ratio statistics and Wald chi-square tests.

Statistical tests were two-tailed with $P < .05$ defining statistical significance. All analyses were performed using SAS Survey procedures, version 9.1.3 (SAS Institute Inc., Cary, NC). Unless otherwise specified all results presented are based on weighted analyses.

## Results

In unweighted analyses, the age distribution for the overall sample was as follows: 49.7% aged 55 to 64 years, 31.7% aged 65 to 74 years, 15.6% aged 75 to 84 years, and 3.0% 85 years and older. Among the individual PTSD groups, the age distribution was as follows, respectively: 1) No PTSD: 48.8%, 32.2%, 15.9%, and 3.1%; 2) Pre-late-life: 63.6%, 25.0%, 11.4%, and 0%; 3) Persistent: 75.0%, 19.1%, 4.4%, and 1.5%.

In weighted analyses, we found that 3.7% of older adults had pre-late-life PTSD with approximately half of these (1.8%) persisting into later life. Weighted bivariate analyses of demographic characteristics, current smoking, medical conditions, and lifetime psychiatric disorders by PTSD group are presented in Table 1. Respondents with PTSD were younger on average than those with no PTSD (60-62 vs 68 years old; $P < .001$). Nearly 40% of respondents with pre-late-life PTSD smoked compared with 16% with no PTSD and 21% with persistent PTSD in later life ($P = .004$). Of the medical conditions, stroke showed the strongest significant association to PTSD. As expected, psychiatric disorders were strongly related to PTSD. Nearly 50% of respondents with pre-late-life PTSD had a diagnosis of MDD in their lifetime, while for those with persistent PTSD it was approximately 40%, and for those with no PTSD it was 11%. The patterns were similar for GAD and substance use disorder, but the prevalence was lower.

### PTSD and Global Disability Score

Across the PTSD groups, frequency of any disability was 79.7% for persistent PTSD in later life, 69.6% for pre-late-life, and 36.9% for no PTSD ($P < .001$). In logistic regression analyses, adjusting for demographics, smoking, and medical conditions, respondents with pre-late-life PTSD were three times more likely to have any disability than respondents with no PTSD (odds ratio [OR], 3.12; 95% CI, 1.50-6.48), while respondents with persistent PTSD were over four times more likely to have any disability relative to those with no PTSD (OR, 4.34; 95% CI, 2.01-9.36) (Table 2). After additional adjustment for depression, GAD, and substance use disorders, the association between pre-late-life PTSD and disability became non-significant (OR, 1.99; 95% CI, 0.97-4.08; $P = .06$); however, although there was slight attenuation, the association remained strong and significant for persistent PTSD (OR, 3.18; 95% CI, 1.32-7.64; $P = .01$).

For the standardized global disability score analyses, we found similar results. In linear regression models, adjusting for demographics, current smoking, medical conditions, depression, GAD, and substance use disorders, we found a statistically significant difference

for persistent PTSD compared with no PTSD ($\beta = 0.40$, SE = 0.16, $t_1 = 2.50$, $P = .01$) but no difference for pre-late-life PTSD compared with no PTSD ($\beta = 0.08$, SE = 0.10, $t_1 = 0.80$, $P = .43$) .

### PTSD and Domains of Disability

Prevalence of disability increased going from no PTSD to pre-late-life to persistent PTSD in later life for all WHO-DAS domains (Figure 1). For example, prevalence of impairment in mobility was 22.3%, 49.0%, and 58.9%, respectively. Prevalence for self-care was least impressive (5.3%, 11.8%, and 12.6%, respectively).

In Model 1 (unadjusted models) of Table 2, we found that associations were strong and statistically significant for both pre-late-life PTSD (3 to 6-fold increased odds of disability compared with no PTSD) and persistent PTSD (5 to 12-fold increased odds) across all individual domains of disability, except self-care. After adjusting for demographic variables, smoking, and medical conditions (Model 2), results remained similar but attenuated. Estimates were reduced even more after addition of MDD, GAD, and substance use disorders to the model with meaningful changes (Model 3). For example, the association of persistent PTSD with difficulties in cognition reduced from OR, 9.00 (Model 1) to OR, 4.88 (Model 2) to OR, 3.48 (95% CI, 1.63-7.45). In Model 3, the only domains that remained significantly associated with pre-late-life PTSD were mobility (OR, 2.24; 95% CI, 1.26-4.00) and social disability (OR, 2.31; 95% CI, 1.09-4.87), with difficulties in cognition marginally significant, while, although attenuated, all persistent PTSD effects remained.

## Discussion

This study provides evidence that persistence of PTSD in later life is a prominent predictor of disability in late life above and beyond other psychiatric disorders and medical conditions. In summary, the findings showed that persistent PTSD was associated with global disability. Moreover, persistent PTSD had a strong association with all individual WHO-DAS domains of disability. Although the statistical difference between persistent PTSD and pre-late-life PTSD was not directly tested, persistent PTSD had a higher magnitude of association with disability when compared to no PTSD. This study confirms that PTSD is a highly chronic disorder and that such chronicity compromises function in later life.

Few prior studies have considered the association of PTSD with disability, and no study that we are aware of has examined the chronicity of PTSD and its association with disability in older adults. Our findings are consistent with results from Vietnam veterans who have experienced severe combat-related trauma. The National Vietnam Veterans Readjustment study found that PTSD increased the odds of any physical limitation by 3-fold, and increased the odds of not working by 7-fold ($P < .05$) in over 1,000 middle-aged male veterans, adjusting for demographics and medical and psychiatric comorbidities.[14] Furthermore, in a study of over 1,000 female veterans (mean age = 46 years), those with PTSD were found to have two and four times more impairment in role functioning and social functioning, respectively, than those without PTSD.[29] However, unlike these other studies, our study is generalizable to the larger population of older Americans, assessing

chronicity of PTSD into late life and examining global disability as well as multiple individual domains of disability.

Of the prior non-military studies, only one recent study that we are aware of targeted older adults. Although this study found that lifetime PTSD was related to multiple physical health issues including reduction in role functioning in late life, the authors did not assess other specific domains of disability or chronicity of PTSD.[30] Other prior studies examined small samples that included young adults. For example, a study of 368 primary care patients aged 18 years and older found that those with current (1-month) PTSD were more impaired in work, family and social functioning scales than those without PTSD.[31] In a more recent study of 321 trauma-exposed primary care patients 18 years and older, the authors found results similar to our study, where current PTSD was associated with the most impairment (i.e., work loss, social and family impairment) and history of past PTSD with no current PTSD the next most.[32] In a sample of 95 survivors of the 2001 World Trade Center attack aged 19 years and older, high PTSD symptoms were found to be highly associated with social-occupational impairment.[33] Another study assessed 49 cases with two or more posttraumatic stress symptoms (PTSS) over their lifetime and 147 controls 18 years and older in the community and found that social, financial, physical (chronic illness and bed days), and psychological domains of disability were related to PTSS.[34] Our findings build on this prior work by showing that the impact of clinically-based PTSD on function is evident at the population-level and into later life, when individuals are most vulnerable to disability. In addition, we assessed domains of disability, besides role and social functioning, that are particularly pertinent to older age, including mobility, cognition, and self-care.

Multiple studies have provided evidence that depression is associated with functional impairment.[1-11] However, finding that PTSD is associated with disability independent of depression and other prominent psychiatric disorders has important implications. These findings suggest that if left unresolved PTSD in older adults will have significant functional consequences. Therefore, by identifying chronicity of PTSD as a prominent predictor, we are able to show that monitoring and treatment of PTSD is imperative over the long term. In addition, although not as encompassing as persistent PTSD, pre-late-life PTSD was significantly associated with specific domains of disability, that is, mobility and social functioning, and only marginally associated with cognition. These findings could be explained by persistent effects of trauma exposure on functional status that are not related to having the diagnosis of PTSD or depression.

The impact of chronic PTSD on disability in late life can potentially be explained by similar underlying mechanisms of depression and disability. It is possible that PTSD itself is disabling or PTSD causes increased disability from other sources, such as poorer health behaviors.[11] The persistence of symptomatic distress arising from trauma exposure over the long term may have an adverse impact on health similar to models of allostatic load.[35] This may be why individuals with persistent PTSD into later life are more disabled. One possible pathway is through dysregulation of the hypothalamic-pituitary-adrenocortical axis (HPA) following exposure to trauma.[36] It is hypothesized that dysfunction of the HPA system leads to increased glucocorticoid signaling and hippocampal degeneration, which, with repetitive

stress responses to trauma cues, may predispose an individual to adverse health outcomes. Another possible pathway may be through executive-type cognitive impairments associated with PTSD.[37]

Furthermore, our findings suggest that the persistent PTSD group may be different in other ways besides their risk associated with function. The higher prevalence of adverse medical conditions in this group may suggest that persistent PTSD is an indicator of other health risks. Future studies need to examine other important adverse outcomes potentially associated with this group, such as stroke, heart disease, and diabetes.

The strengths of this study include a large nationally representative sample of community-dwelling older Americans, information on clinically-relevant *DSM-IV* PTSD, and carefully measured disability domains. In addition, we attempted to carefully adjust for possible confounding from medical and psychiatric comorbidities. Finally, we focused on the impact of chronic PTSD. To our knowledge, our study is the first to examine the chronicity of PTSD into late life and its association with disability.

There are limitations of this study. First, the CPES surveys underrepresent homeless, institutionalized, and old-old (75-84 years) and oldest-old (≥ 85 years) older adults. Thus, given this is a community-based sample of non-institutionalized older respondents, power for analyses and interpretation of results for the oldest-old respondents is limited. Second, even though the WMH-CIDI was shown to have good concordance with the Structured Clinical Interview for *DSM-IV*,[38] it is still a lay-administered interview rather than a clinically-administered assessment. Third, there may be issues of stigma, whereby older adults with mental illness might be less inclined to participate in a mental health survey. There may be also respondents with PTSD who were excluded from the study because of difficulty recalling symptoms. Although it is possible that older adults may be less likely to remember past trauma, retrospective reporting of such serious events such as trauma have been found to be minimally affected by bias.[39] Instead, there may be a mortality effect, whereby traumatized adults are more likely to die at a younger age resulting in an overrepresentation of non-traumatized older respondents.[40] Fourth, it is important to note that the study was not able to take the number of years with the disorder into account either in the definition or in the analyses. Furthermore, future research needs to examine other important covariates not accounted for in the current study such as dementia. Finally, the association between PTSD and disability may be bidirectional, which suggests further investigation in longitudinal analyses.

Our study emphasizes the importance of improving the monitoring and treatment of PTSD over the long term. The impairment in role functioning, mobility, cognition, and social functioning reflect diminished quality of life for older Americans with pre-late-life PTSD, particularly PTSD that persists into later life. Considering the projected expansion of the elderly population, increased life expectancy, and the health and economic costs of mental health disorders, the potential public health burden of PTSD implicated by this study are concerning. Thus, future studies are needed to identify the reasons underlying PTSD's effect on disability and to investigate better interventions that will reduce risk of impairment.

## Acknowledgments

This research used the Collaborative Psychiatric Epidemiology Surveys (CPES) data, 2001-2003. The Inter-university Consortium for Political and Social Research (Ann Arbor, Michigan) is responsible for the preparation, organization, and access of the public use of this data [http://www.icpsr.umich.edu/CPES]. We thank the CPES researchers who participated in collecting the data that made this project possible.

Funding/Support: Dr. Byers is supported by a Department of Defense grant (W81XWH-11-2-0189), which was administered by the Northern California Institute for Research and Education and with resources of the San Francisco Veterans Affairs Medical Center. Dr. Yaffe is supported, in part, by a K24 Midcareer Investigator Award (AG031155) from the National Institute on Aging. The National Comorbidity Survey Replication (NCS-R) was supported by the National Institute of Mental Health (U01-MH60220), with supplemental support from the National Institute of Drug Abuse (R01-DA12058-05), the Substance Abuse and Mental Health Services Administration, the Robert Wood Johnson Foundation (044708), and the John W. Alden Trust. The National Survey of American Life (NSAL) was supported by the National Institute of Mental Health (U01-MH57716), with supplemental support from the Office of Behavioral and Social Sciences Research at the National Institute of Health, and the University of Michigan. The National Latino and Asian American Study (NLAAS) was supported by the National Institute of Mental Health (U01-MH062209 and U01-MH62207), with supplemental support from the Office of Behavioral and Social Sciences Research at the National Institute of Health, the Substance Abuse and Mental Health Services Agency, and the Latino Research Program Project (P01-MH059876).

## References

1. Alexopoulos GS, Vrontou C, Kakuma T, et al. Disability in geriatric depression. Am J Psychiatry. 1996; 153(7):877–885. [PubMed: 8659609]
2. Steffens DC, Hays JC, Krishnan KR. Disability in geriatric depression. Am J Geriatr Psychiatry. 1999; 7(1):34–40. [PubMed: 9919318]
3. Stuck AE, Walthert JM, Nikolaus T, Büla CJ, Hohmann C, Beck JC. Risk factors for functional status decline in community-living elderly people: a systematic literature review. Soc Sci Med. 1999; 48(4):445–469. [PubMed: 10075171]
4. Penninx BW, Guralnik JM, Ferrucci L, Simonsick EM, Deeg DJ, Wallace RB. Depressive symptoms and physical decline in community-dwelling older persons. JAMA. 1998; 279(21):1720–1726. [PubMed: 9624025]
5. Penninx BW, Leveille S, Ferrucci L, van Eijk JT, Guralnik JM. Exploring the effect of depression on physical disability: longitudinal evidence from the established populations for epidemiologic studies of the elderly. Am J Public Health. 1999; 89(9):1346–1352. [PubMed: 10474551]
6. Wang L, van Belle G, Kukull WB, Larson EB. Predictors of functional change: a longitudinal study of nondemented people aged 65 and older. J Am Geriatr Soc. 2002; 50(9):1525–1534. [PubMed: 12383150]
7. Bruce ML, Seeman TE, Merrill SS, Blazer DG. The impact of depressive symptomatology on physical disability: MacArthur Studies of Successful Aging. Am J Public Health. 1994; 84(11): 1796–1799. [PubMed: 7977920]
8. Bruce ML. Depression and disability in late life: directions for future research. Am J Geriatr Psychiatry. 2001; 9(2):102–112. [PubMed: 11316615]
9. Fried LP, Ferrucci L, Darer J, Williamson JD, Anderson G. Untangling the concepts of disability, frailty, and comorbidity: implications for improved targeting and care. J Gerontol A Biol Sci Med Sci. 2004; 59(3):255–263. [PubMed: 15031310]
10. Lenze EJ, Schulz R, Martire LM, et al. The course of functional decline in older people with persistently elevated depressive symptoms: longitudinal findings from the Cardiovascular Health Study. J Am Geriatr Soc. 2005; 53(4):569–575. [PubMed: 15817000]
11. Lenze EJ, Rogers JC, Martire LM, et al. The association of late-life depression and anxiety with physical disability: a review of the literature and prospectus for future research. Am J Geriatr Psychiatry. 2001; 9(2):113–135. [PubMed: 11316616]
12. Porensky EK, Dew MA, Karp JF, et al. The burden of late-life generalized anxiety disorder: effects on disability, health-related quality of life, and healthcare utilization. Am J Geriatr Psychiatry. 2009; 17(6):473–482. [PubMed: 19472438]

13. Böttche M, Kuwert P, Knaevelsrud C. Posttraumatic stress disorder in older adults: an overview of characteristics and treatment approaches. Int J Geriatr Psychiatry. 2012; 27(3):230–239. [PubMed: 21538540]
14. Zatzick DF, Marmar CR, Weiss DS, et al. Posttraumatic stress disorder and functioning and quality of life outcomes in a nationally representative sample of male Vietnam veterans. Am J Psychiatry. 1997; 154(12):1690–1695. [PubMed: 9396947]
15. Achat H, Kawachi I, Spiro A 3rd, DeMolles DA, Sparrow D. Optimism and depression as predictors of physical and mental health functioning: the Normative Aging Study. Ann Behav Med. 2000; 22(2):127–130. [PubMed: 10962705]
16. Mehta KM, Yaffe K, Brenes GA, et al. Anxiety symptoms and decline in physical function over 5 years in the health, aging and body composition study. J Am Geriatr Soc. 2007; 55(2):265–270. [PubMed: 17302665]
17. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4th. Washington, DC: American Psychiatric Association; 1994.
18. Heeringa SG, Wagner J, Torres M, Duan N, Adams T, Berglund P. Sample designs and sampling methods for the Collaborative Psychiatric Epidemiology Studies (CPES). Int J Methods Psychiatr Res. 2004; 13(4):221–240. [PubMed: 15719530]
19. Alegria, M.; Jackson, JS.; Kessler, RC.; Takeuchi, D. COLLABORATIVE PSYCHIATRIC EPIDEMIOLOGY SURVEYS (CPES), 2001-2003 [UNITED STATES] [Computer file], ICPSR20240-v2. Ann Arbor, MI: Institute for Social Research, Survey Research Center [producer]; Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]; 2007. 2008-06-19
20. Kessler RC, Ustün TB. The World Mental Health (WMH) Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). Int J Methods Psychiatr Res. 2004; 13(2):93–121. [PubMed: 15297906]
21. World Health Organization. International Classification of Diseases. 10th rev (ICD-10). Geneva, Switzerland: World Health Organization; 1992.
22. Rehm J, Ustun TB, Saxena S, et al. On the development and psychometric testing of the WHO screening instrument to assess disablement in the general population. Int J Methods Psychiatr Res. 1999; 8(2):110–122.
23. Chwastiak LA, Von Korff M. Disability in depression and back pain: evaluation of the World Health Organization Disability Assessment Schedule (WHO DAS II) in a primary care setting. J Clin Epidemiol. 2003; 56(6):507–514. [PubMed: 12873644]
24. Kessler RC, Berglund P, Demler O, et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). JAMA. 2003; 289(23):3095–3105. [PubMed: 12813115]
25. Wang PS, Lane M, Olfson M, Pincus HA, Wells KB, Kessler RC. Twelve-month use of mental health services in the United States: results from the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005; 62(6):629–640. [PubMed: 15939840]
26. Proctor, BD.; Dalaker, J. US Census Bureau. Current population reports. Washington, DC: US Government Printing Office; 2002. Poverty in the United States: 2001.
27. Rao JNK, Scott AJ. The analysis of categorical data from complex sample surveys: chi-squared tests for goodness of fit and independence in two-way tables. J Am Stat Assoc. 1981; 76(374): 221–230.
28. Levy, PS.; Lemeshow, S. Sampling of Populations. New York, NY: John Wiley & Sons; 1999.
29. Dobie DJ, Kivlahan DR, Maynard C, Bush KR, Davis TM, Bradley KA. Posttraumatic stress disorder in female veterans: association with self-reported health problems and functional impairment. Arch Intern Med. 2004; 164(4):394–400. [PubMed: 14980990]
30. Pietrzak RH, Goldstein RB, Southwick SM, Grant BF. Physical health conditions associated with posttraumatic stress disorder in U.S. older adults: results from wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. J Am Geriatr Soc. 2012; 60(2):296–303. [PubMed: 22283516]
31. Stein MB, McQuaid JR, Pedrelli P, Lenox R, McCahill ME. Posttraumatic stress disorder in the primary care medical setting. Gen Hosp Psychiatry. 2000; 22(4):261–269. [PubMed: 10936633]

32. Westphal M, Olfson M, Gameroff MJ, et al. Functional impairment in adults with past posttraumatic stress disorder: findings from primary care. Depress Anxiety. 2011; 28(8):686–695. [PubMed: 21681868]
33. Malta LS, Levitt JT, Martin A, Davis L, Cloitre M. Correlates of functional impairment in treatment-seeking survivors of mass terrorism. Behav Ther. 2009; 40(1):39–49. [PubMed: 19187815]
34. Amaya-Jackson L, Davidson JR, Hughes DC, et al. Functional impairment and utilization of services associated with posttraumatic stress in the community. J Trauma Stress. 1999; 12(4):709–724. [PubMed: 10646189]
35. McEwen BS, Wingfield JC. The concept of allostasis in biology and biomedicine. Horm Behav. 2003; 43(1):2–15. [PubMed: 12614627]
36. D'Andrea W, Sharma R, Zelechoski AD, Spinazzola J. Physical health problems after single trauma exposure: when stress takes root in the body. J Am Psychiatr Nurses Assoc. 2011; 17(6): 378–392. [PubMed: 22142975]
37. Aupperle RL, Melrose AJ, Stein MB, Paulus MP. Executive function and PTSD: disengaging from trauma. Neuropharmacology. 2012; 62(2):686–694. [PubMed: 21349277]
38. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of *DSM-IV* disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005; 62(6):593–602. [PubMed: 15939837]
39. Wells JE, Horwood LJ. How accurate is recall of key symptoms of depression? A comparison of recall and longitudinal reports. Psychol Med. 2004; 34(6):1001–1011. [PubMed: 15554571]
40. Acierno R, Gray M, Best C, et al. Rape and physical violence: comparison of assault characteristics in older and younger adults in the National Women's Study. J Trauma Stress. 2001; 14(4):685–695. [PubMed: 11776417]

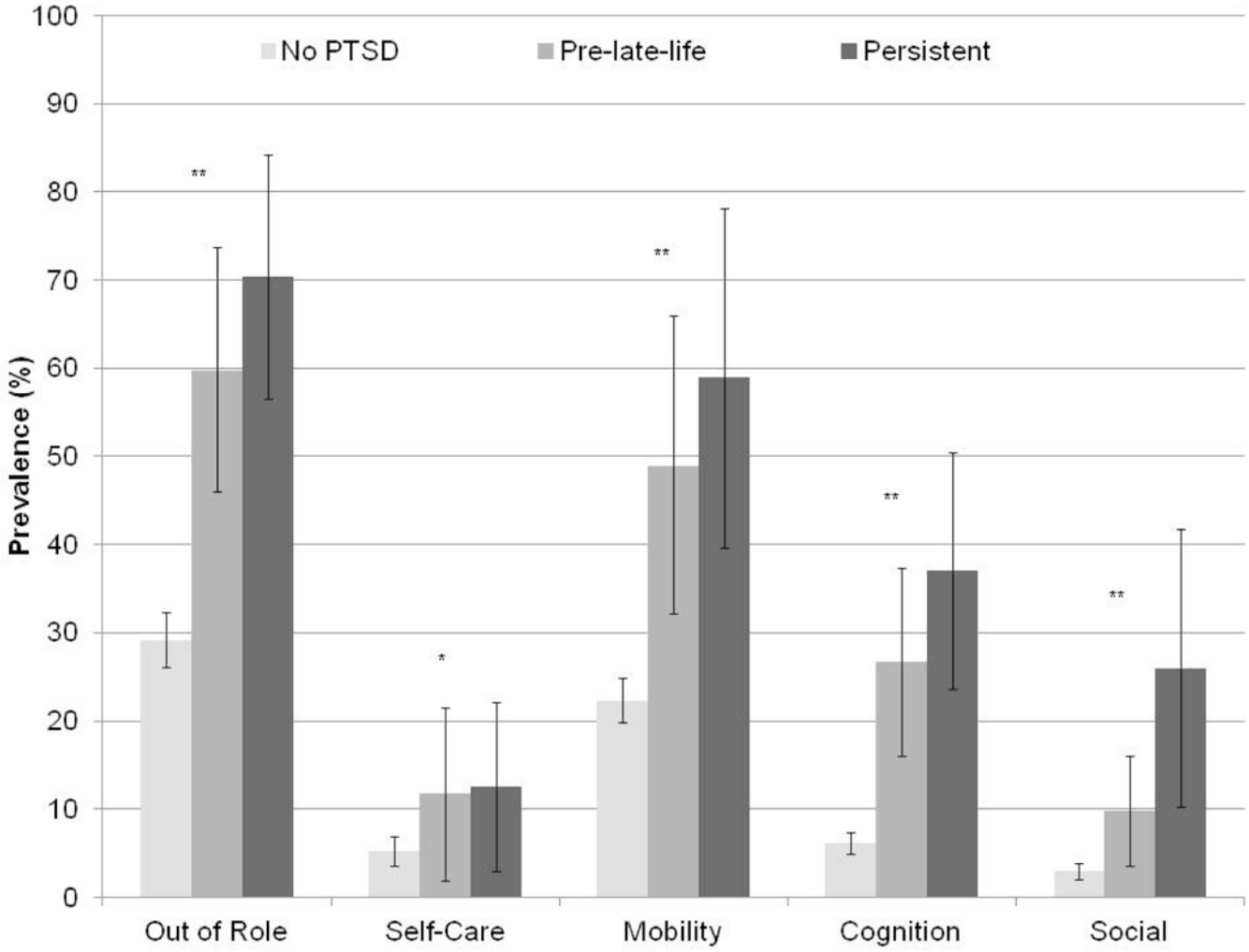


**Figure 1. Prevalence of any difficulty in individual domains of disability across PTSD occurrence**

$^{**}P < .001$; $^{*}P < .05$ (based on Rao-Scott $\chi^2_{[2]}$ weighted analyses); the I bars indicate 95% confidence intervals.

**Table 1**

**Characteristics of Adults 55 Years and Older From the CPES by No, Pre-Late-Life, and Persistent *DSM-IV*/WMH-CIDI Posttraumatic Stress Disorder (N= 3287)**

| | PTSD Occurrence, Weighted % (SE) or Mean (SE) | | | | |
|---|---|---|---|---|---|
| **Characteristic** | **No n=3131** | **Pre-late-life n=88** | **Persistent[a] n=68** | **F-value or Rao-Scott $\chi^2$ [df]** | ***P* Value** |
| Age, years, mean (SE) | 68.3(0.4) | 62.6(1.0) | 59.9(0.6) | $86.2_{[2,157]}$ | <.001 |
| Female gender , % (SE) | 55.8(1.7) | 76.7(6.6) | 77.1(6.7) | $15.1_{[2]}$ | <.001 |
| Race/Ethnicity, % (SE) | | | | $4.6_{[6]}$ | .60 |
| Non-Hispanic White | 79.6(1.5) | 82.9(4.6) | 76.8(5.6) | | |
| Non-Hispanic Black | 8.9(0.7) | 10.1(2.8) | 13.4(3.8) | | |
| Hispanic | 6.8(0.7) | 2.9(1.1) | 5.5(2.0) | | |
| Asian[b] | 4.7(0.6) | 4.2(2.9) | 4.3(2.5) | | |
| Married/cohabitating, % (SE) | 61.4(1.6) | 51.8(7.5) | 49.7(8.9) | $3.4_{[2]}$ | .18 |
| Education, < 12 years, % (SE) | 26.7(1.8) | 24.3(7.1) | 27.2(7.3) | $0.11_{[2]}$ | .95 |
| Income, % (SE) | | | | $7.8_{[4]}$ | .10 |
| Low | 22.2(1.2) | 39.0(9.0) | 33.5(7.3) | | |
| Middle | 56.5(1.8) | 48.3(9.1) | 45.7(7.1) | | |
| High | 21.3(1.7) | 12.7(4.7) | 20.7(8.2) | | |
| Smoking, current, % (SE) | 16.3(1.0) | 35.6(6.3) | 21.1(7.6) | $11.3_{[2]}$ | .004 |
| Medical Conditions, % (SE) | | | | | |
| Arthritis | 52.8(1.7) | 59.2(7.8) | 70.8(8.5) | $5.2_{[2]}$ | .07 |
| Stroke | 5.8(0.9) | 2.1(1.5) | 16.4(7.5) | $6.4_{[2]}$ | .04 |
| Heart Disease/Attack | 17.1(1.6) | 16.9(5.7) | 24.1(9.6) | $0.9_{[2]}$ | .64 |
| Diabetes | 15.8(0.9) | 13.6(4.8) | 26.1(7.2) | $3.7_{[2]}$ | .16 |
| Chronic Lung Disease | 4.6(0.7) | 10.6(4.6) | 10.4(4.9) | $4.9_{[2]}$ | .09 |
| Cancer | 15.4(1.5) | 17.2(5.2) | 10.0(5.3) | $0.89_{[2]}$ | .64 |
| Psychiatric Conditions, % (SE) | | | | | |
| MDD, % (SE) | 10.8(0.8) | 47.7(8.8) | 37.8(8.8) | $79.3_{[2]}$ | <.001 |
| GAD, % (SE) | 4.1(0.5) | 23.7(4.3) | 26.6(8.1) | $115.0_{[2]}$ | <.001 |

| Characteristic | PTSD Occurrence, Weighted % (SE) or Mean (SE) | | | | |
|---|---|---|---|---|---|
| | No n=3131 | Pre-late-life n=88 | Persistent[a] n=68 | F-value or Rao-Scott $\chi^2$ [df] | *P* Value |
| Substance use,[c] % (SE) | 7.1(0.7) | 27.4(8.7) | 22.9(8.8) | $23.1_{[2]}$ | <.001 |

Abbreviations: CPES, Collaborative Psychiatric Epidemiology Surveys; WMH-CIDI, World Mental Health Survey version of the Composite International Diagnostic Interview; MDD, Major Depressive Disorder (lifetime), GAD, Generalized Anxiety Disorder (lifetime); n, unweighted; % (SE), weighted percent with standard error; mean (SE), weighted mean with standard error.

[a] Defined as pre-late-life onset with persistence in later life.

[b] Asian includes Pacific Islander.

[c] Substance use disorder (lifetime) defined by alcohol abuse, alcohol dependence, drug abuse, or drug dependence.

**Table 2**

**Association between *DSM-IV*/WMH-CIDI Posttraumatic Stress Disorder and Disability in Late Life among Adults 55 Years and Older (N=3287)**

| | OR (95% CI) | | | | | |
|---|---|---|---|---|---|---|
| **PTSD Occurrence** | **Any Disability** | **Out of Role** | **Self-Care** | **Mobility** | **Cognition** | **Social** |
| **MODEL 1 (Unadjusted)** | | | | | | |
| Pre-late-life[a] | 3.92 (2.11-7.28) | 3.60 (2.01-6.45) | 2.39 (0.83-6.88) | 3.35 (1.69-6.61) | 5.59 (3.30-9.48) | 3.56 (1.89-6.73) |
| *P* Value | <.001 | <.001 | .10 | <.001 | <.001 | <.001 |
| Persistent[a, b] | 6.73 (3.17-14.28) | 5.76 (2.80-11.87) | 2.58 (0.96-6.93) | 4.98 (2.34-10.60) | 9.00 (4.95-16.36) | 11.51 (5.13-25.83) |
| *P* Value | <.001 | <.001 | .06 | <.001 | <.001 | <.001 |
| **MODEL 2 (Adjusted[c])** | | | | | | |
| Pre-late-life[a] | 3.12 (1.50-6.48) | 2.61 (1.24-5.48) | 1.89 (0.66-5.39) | 3.06 (1.66-5.65) | 4.05 (1.84-8.93) | 3.95 (1.89-8.24) |
| *P* Value | .002 | .01 | .23 | <.001 | <.001 | <.001 |
| Persistent[a, b] | 4.34 (2.01-9.36) | 3.40 (1.65-7.04) | 2.53 (1.04-6.15) | 3.74 (1.76-7.94) | 4.88 (2.81-8.47) | 10.53 (4.23-26.18) |
| *P* Value | <.001 | .001 | .04 | <.001 | <.001 | <.001 |
| **MODEL 3 (Adjusted[d])** | | | | | | |
| Pre-late-life[a] | 1.99 (0.97-4.08) | 1.66 (0.78-3.52) | 1.23 (0.45-3.41) | 2.24 (1.26-4.00) | 2.39 (1.01-5.65) | 2.31 (1.09-4.87) |
| *P* Value | .06 | .19 | .69 | .006 | .05 | .03 |
| Persistent[a, b] | 3.18 (1.32-7.64) | 2.54 (1.14-5.69) | 1.95 (0.61-6.22) | 3.08 (1.33-7.13) | 3.48 (1.63-7.45) | 8.21 (2.85-23.64) |
| *P* Value | .01 | .02 | .26 | .009 | .001 | <.001 |

Abbreviations: WMH-CIDI, World Mental Health Survey version of the Composite International Diagnostic Interview.

[a] Reference group is no PTSD disorder.

[b] Defined as pre-late-life onset with persistence in later life.

[c] Estimates are based on a multivariable logistic regression model, where PTSD occurrence is adjusted for demographic characteristics, smoking, and medical conditions.

[d] Estimates are based on a multivariable logistic regression model, where PTSD occurrence is adjusted for other lifetime psychiatric disorders (i.e., GAD, MDD, and substance use disorders) as well as demographic characteristics, smoking, and medical conditions.