

UC San Diego

UC San Diego Previously Published Works

Title

Behavioral Epidemic of Loneliness in Older U.S. Military Veterans: Results From the 2019-2020 National Health and Resilience in Veterans Study

Permalink

<https://escholarship.org/uc/item/19b3x5jt>

Journal

American Journal of Geriatric Psychiatry, 30(3)

ISSN

1064-7481

Authors

Straus, Elizabeth
Norman, Sonya B
Tripp, Jessica C
et al.

Publication Date

2022-03-01

DOI

10.1016/j.jagp.2021.07.006

Peer reviewed

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.ajgonline.org

Regular Research Article

Behavioral Epidemic of Loneliness in Older U.S. Military Veterans: Results From the 2019-2020 National Health and Resilience in Veterans Study

Elizabeth Straus, Ph.D., Sonya B. Norman, Ph.D., Jessica C. Tripp, Ph.D.,
Jack Tsai, Ph.D., Lauren M. Sippel, Ph.D., Dilip V. Jeste, M.D.,
Steven M. Southwick, M.D., Robert H. Pietrzak, Ph.D., M.P.H.

ARTICLE INFO

Article history:

Received March, 16 2021

Revised July, 14 2021

Accepted July, 14 2021

Key Words:

Loneliness
veterans
suicidality
PTSD
depression
functioning

ABSTRACT

Objective: This study aimed to characterize the current prevalence of loneliness, and the relation between loneliness severity and mental and physical health conditions, suicidality, and functional measures in a predominantly older sample of U.S. military veterans. **Methods:** This cross-sectional study used data from the National Health and Resilience in Veterans Study, which surveyed a nationally representative sample of U.S. veterans ($N = 4,069$; mean age = 62) from November 2019 through March 2020. Veterans were classified into one of 3 groups based on their current level of loneliness (hardly ever, sometimes, often) on an adapted version of the Revised UCLA Loneliness Scale. A comprehensive range of mental and physical health, and functioning variables were assessed using valid and reliable self-report assessments. **Results:** A total of 56.9% of veterans endorsed feeling lonely sometimes (37.2%) or often (19.7%). Loneliness severity was independently associated with a range of mental health (odds ratios [ORs] = 1.21–33.30), physical health (ORs = 1.21–6.80), and functional difficulties (d 's = 0.09–0.59). Relative to hardly ever feeling lonely, feeling lonely often or sometimes was associated with a more than 12- and three-fold greater likelihood of current suicidal ideation (29.0% versus

From the VA San Diego Healthcare System (ES, SBN, JCT), San Diego, CA; Department of Psychiatry (ES, SBN, JCT), University of California, San Diego, CA; U.S. Department of Veterans Affairs National Center for PTSD (SBN, LMS), White River Junction, VT; VA Center of Excellence for Stress and Mental Health (SBN), San Diego, CA; U.S. Department of Veterans Affairs National Center on Homelessness Among Veterans (JT), Tampa, FL; School of Public Health (JT), University of Texas Health Science Center at Houston, San Antonio Campus, San Antonio, TX; Department of Psychiatry (LMS), Geisel School of Medicine at Dartmouth, Hanover, NH; Departments of Psychiatry and Neurosciences (DVJ), and Sam and Rose Stein Institute for Research on Aging, University of California, San Diego, CA; Department of Psychiatry (SMW, RHP), Yale School of Medicine, New Haven, CT; and the U.S. Department of Veterans Affairs National Center for PTSD (RHP), VA Connecticut Healthcare System, West Haven, CT. Send correspondence and reprint requests to Elizabeth Straus, Ph.D., VA San Diego Healthcare System, 3350 La Jolla Village Drive, San Diego, CA 92161.

© 2021 American Association for Geriatric Psychiatry. Published by Elsevier Inc. All rights reserved.

<https://doi.org/10.1016/j.jagp.2021.07.006>

7.3% versus 1.5%), even after adjustment for sociodemographic, military, and psychiatric risk factors. **Conclusions:** Loneliness is highly prevalent in U.S. military veterans, with more than half endorsing feeling lonely sometimes or often, and 1-of-5 reporting feeling lonely often. Loneliness severity was independently associated with a broad range of mental and physical health and functional measures, as well as suicidal ideation. Results underscore the importance of loneliness as a transdiagnostic prevention and intervention target in the U.S. veteran population. (Am J Geriatr Psychiatry 2021; ■■■:■■■–■■■)

Highlights

- What is the prevalence and health burden associated with loneliness in a nationally representative sample of U.S. military veterans?
- In this cross-sectional study (N = 4,069), 56.9% of veterans endorsed experiencing loneliness sometimes (37.2%) or often (19.7%), with loneliness demonstrating an incremental association with a range of psychiatric, physical health, and functional conditions. Relative to veterans who reported hardly ever feeling lonely, those who reported feeling lonely often or sometimes had a 12- and three-fold greater likelihood of suicidal ideation.
- Given the “dose-response” relationship between loneliness and health and functioning, loneliness may be an important transdiagnostic prevention and intervention target.

OBJECTIVE

Loneliness is defined as subjective or perceived social isolation or subjective distress related to the discrepancy between an individual’s desired and actual social connections.^{1–3} Loneliness is a significant public health concern that is associated with a 40% increased risk of dementia and a 26% increased risk of premature mortality.^{4,5} It affects a large segment of the U.S. population, with estimates varying from more than 1 in 3 adults to 3 in 4 adults over the age of 45 reporting feeling lonely.^{6,7} The prevalence of loneliness may be even higher during times of national upheaval. Indeed, a recent survey of U.S. adults found that during the third week of shelter-in-place guidelines in response to the COVID-19 pandemic, 43% endorsed elevated levels of loneliness.⁸ A wide range of mental and physical health correlates of loneliness have been identified, including depression, posttraumatic stress disorder (PTSD), and chronic health conditions such as heart disease and diabetes.^{2, 9–12} The high prevalence and negative health consequences associated with loneliness in the U.S. have led

researchers and a former U.S. surgeon general¹³ to label loneliness as a “behavioral epidemic.”¹⁴ Furthermore, a 2020 report commissioned by the American Association of Retired Persons and produced by the National Academies of Science, Engineering, and Medicine highlighted the particular burden of loneliness on the health and well-being of older adults.³

To date, the majority of research on loneliness has focused on general population samples, and scarce research has examined the prevalence and burden of loneliness on the health and functioning of U.S. military veterans. A significant proportion of veterans may experience loneliness given risk factors associated with older age (i.e., median age of male veterans versus non-veterans is 65 versus 44) such as living alone, and higher prevalence of mental and physical health, and functional difficulties, as well as a 1.5-fold higher rate of suicide relative to non-veterans.^{15–19} However, only one study of which we are aware has examined loneliness in a nationally representative sample of U.S. veterans. Results revealed that older age, disability in activities of daily living, lifetime traumas, perceived stress, and current depressive and PTSD symptoms were associated with greater loneliness.⁹ While this study elucidated a range of

correlates of loneliness, it did not examine whether loneliness independently contributed to common health and functional problems among veterans. Given that the majority of U.S. veterans are not engaged in mental health treatment²⁰ or enrolled in the Veterans Health Administration (VA) healthcare system,²¹ it is critical to examine the prevalence and burden associated with loneliness in a predominantly older nationally representative sample of U.S. veterans. If loneliness is a unique contributor to prevalent health and functional difficulties, it may serve as an important transdiagnostic target of prevention and treatment efforts for this vulnerable population.

Extant studies of population-based, non-veteran samples suggest that loneliness may be a transdiagnostic risk factor for a range of common mental and physical health, and functioning problems. Longitudinal and meta-analytic findings indicate that loneliness is associated with greater severity of depressive^{10,22} and generalized anxiety disorder symptoms,²³ cognitive decline,^{24,25} and greater risk of coronary heart disease, stroke, and chronic pain.^{26,27} The health burden associated with loneliness is not limited to mental and physical health disorders, however. Cross-sectional and longitudinal studies have also found that loneliness increases the risk of suicidal ideation (SI) and suicide attempts (SAs), even after adjusting for sociodemographic, psychiatric, and other social connectedness factors.^{10,28–31} In a nationally representative sample of adult households from England, loneliness displayed a “dose-response” relationship with SI and SAs. After adjustment for a range of sociodemographic, physical and mental health disorders, individuals who reported experiencing loneliness “very much” had a 5-to-11-fold greater likelihood of lifetime and post-12 month SI, respectively, and a 3-to-17-fold greater likelihood of lifetime and past 12-month SAs. Collectively, these studies suggest that loneliness may be independently associated with adverse health outcomes and functional difficulties. They also point to the role that loneliness may play in suicidality, a major public health issue in the veteran population.

There are two notable characteristics of the loneliness literature to date. First, the vast majority of studies on the impact of loneliness in non-veteran samples have focused on the relation between loneliness and select psychiatric disorders (e.g., major depressive disorder; MDD), physical health conditions (e.g., coronary heart disease), or functional domains (e.g.,

cognitive impairment). Given that veterans often have co/multi-morbid mental and physical health disorders,^{32,33} it is important to examine whether loneliness severity is associated with a range of psychiatric, physical health, and functional problems. Second, relatively few studies have analyzed data from nationally representative samples to examine whether the relationship between loneliness and health and functioning differs based on loneliness severity.³¹ Of note, one study of older adults used a dichotomous measure of loneliness, and also included sensitivity analyses to examine loneliness severity; however, this was in a non-veteran sample.²⁴ This is a notable limitation given that the association between loneliness, and health and functioning status may vary based on whether individuals experience a moderate (i.e., experiencing loneliness sometimes) or severe (i.e., experiencing loneliness often) level of loneliness. Examining the severity of loneliness will clarify whether there is a “dose-response” relationship with measures of mental and physical health, and functioning. Characterization of how the full range of loneliness relates to these measures may help inform targeted prevention efforts to promote the health and well-being of veterans and other vulnerable populations.

To address these gaps, we analyzed data from a large, contemporary, nationally representative sample of predominantly older U.S. military veterans to evaluate the following 3 aims: 1) characterize the current prevalence of loneliness; 2) examine the association between loneliness severity and likelihood of screening positive for a range of lifetime and current psychiatric disorders (i.e., major depressive disorder, PTSD, alcohol and drug use disorders), lifetime physical health conditions (e.g., heart disease, sleep disorders), and functional difficulties (i.e., mental and physical health, cognitive, and psychosocial domains); and 3) determine whether loneliness is associated with current SI and lifetime SAs after adjusting for sociodemographic and military characteristics, and lifetime screening status for psychiatric disorders. We hypothesized that loneliness would show a “dose-response” association with screening positive for lifetime and current psychiatric disorders, lifetime physical health conditions, functional difficulties, and SI/SAs, with veterans who are often lonely being most at risk for these outcomes relative to those who are sometimes or hardly ever lonely.

METHODS

Participants and Procedure

Participants were drawn from the National Health and Resilience in Veterans Study (NHRVS), which surveyed a nationally representative sample of 4,069 U.S. veterans from November 20, 2019–March 20, 2020 (median completion date: November 21, 2019). Veterans were recruited from KnowledgePanel, a probability-based, online survey panel maintained by Ipsos, a multinational survey research company. Households are sampled using the U.S. Postal Service Deliver Sequence File (DSF). The panel is comprised of over 50,000 households that covers approximately 98% of the U.S. adult population. Panel members who endorsed military service were eligible to participate in the NHRVS. To permit generalizability of results to the entire U.S. veteran population, the Ipsos statistical team computed post-stratification weights using benchmark distributions of U.S. military veterans from the most recent (August, 2019) Current Veteran Population Supplemental Survey of the U.S. Census Bureau's American Community Survey: age, gender, race/ethnicity, Census Region, metropolitan status, education, household income, branch of service, and years in service.³⁴ Veterans who completed the loneliness measure were included in the study sample (n=4,050). All participants provided informed consent and the VA Connecticut Healthcare System Human Subjects Subcommittee approved this study.

Measures

Loneliness was assessed using a three-item measure³⁵ adapted from the Revised UCLA Loneliness Scale.¹ The scale assesses three aspects of loneliness: the degree to which one feels left out, isolated, and experiences a lack of companionship. Response options are "1" (hardly ever), "2" (some of the time), or "3" (often). Items are summed to obtain a summary loneliness measure. Loneliness levels were operationalized as "Hardly Ever Lonely" (i.e., score of 1 on all items); "Sometimes Lonely" (i.e., score of 2 on at least one item); or "Often Lonely" (i.e., score of 3 on at least one item). [Table 1](#) displays variables that were assessed in relation to these loneliness categories.

TABLE 1. Loneliness, Health, and Functioning Measures

Measures

Loneliness

Score on three-item measure adapted from the Revised UCLA Loneliness Scale: 1) How often do you feel that you lack companionship? 2) How often do you feel left out? 3) How often do you feel isolated from others? (Response options 1 = Hardly ever, 2 = Some of the time, and 3 = Often. In this study, loneliness levels were operationalized as "none" (i.e., score of 1 on all 3 items), "some" (i.e., score of 2 on at least one item), or "often" (i.e., score of 3 on at least one item)

Current Psychiatric History

Current PTSD assessed by the PTSD Checklist for DSM-5 (PCL-5)³⁷
 Current MDD assessed by the Patient Health Questionnaire-2 (PHQ-2)³⁸
 Current GAD assessed by the Generalized Anxiety Disorder-2 (GAD-2)³⁹
 Current AUD assessed by the Alcohol Use Disorder Identification Test (AUDIT)⁴⁰
 Current DUD assessed by the Screen of Drug Use⁴¹

Lifetime Psychiatric History

Lifetime PTSD assessed by the PTSD Checklist for DSM-5 (PCL-5)³⁷
 Lifetime MDD, AUD, and DUD were assessed by the Mini-International Neuropsychiatric Interview⁴²

Suicidality

Current SI: Endorsement of "several days or more" in response to item 9 ("How often have you been bothered by thoughts that you would be better off dead; and/or thoughts of hurting yourself in some way over the past 2 weeks") on the Patient Health Questionnaire-9 (PHQ-9)⁴³
 Lifetime SI: Response of "yes" to the item: "Have you ever tried to kill yourself?"

Physical Health History

Total of 18 different medical conditions assessed using questions querying the following: "Has a doctor or healthcare professional ever told you that you have any of the following medical conditions?" (e.g., arthritis, cancer, diabetes, kidney disease).
 Activities of daily living (ADL) disability assessed by the item: "At the present time do you need help from another person to do the following (e.g., bathe, walk around home or apartment)?"⁴⁴
 Instrumental activities of daily living (IADL) disability assessed by the item: "At the present time do you need help from another person to do the following (e.g., pay bills or manage money)?"⁴⁴

Functioning

Mental and physical health-related functioning were assessed by the Short Form 8 Health Survey (SF-8)⁴⁵
 Cognitive functioning was assessed by the Medical Outcomes Study Cognitive Functioning Scale⁴⁶
 Psychosocial functioning was assessed by the Brief Inventory of Psychosocial Functioning (B-IPF)⁴⁷

Data Analysis

Data analysis proceeded in four steps. First, descriptive analyses were conducted to summarize demographic characteristics and the prevalence of current loneliness. Second, univariate analyses of

variance (ANOVA) and chi-square analyses were conducted to evaluate sociodemographic, military, and psychiatric characteristics that differed by loneliness level; pairwise contrasts were Bonferroni-adjusted. Third, multiple logistic regression analyses adjusted for sociodemographic (i.e., age, gender, race/ethnicity, education, marital status, household income) and military characteristics (i.e., enlistment status and combat veteran status) that differed between groups at the $p < 0.05$ level in bivariate analyses were conducted to determine whether loneliness was independently associated with psychiatric, physical health, and functioning variables. Lifetime psychiatric disorders (i.e., MDD, PTSD, alcohol and drug use disorders, and nicotine dependence) were additionally controlled for when examining current psychiatric disorders, physical health conditions, ADL and IADL disability, and SI/SAs. Fourth, a series of multivariate analyses of covariance (MANCOVAs) were conducted to compare the loneliness groups on measures of functioning. Raw frequencies are unweighted and all inferential statistics are weighted using benchmark distributions of U.S. military veterans from the most recent (August, 2019) Current Veteran Population Supplemental Survey of the U.S. Census Bureau's American Community Survey.³⁴

RESULTS

The final sample included 4,050 veterans (mean age = 62.2, SD = 15.7, range = 22–99; 90.2% male). Over half (56.9%, 95% confidence interval [CI]=55.4–58.4%) of the sample endorsed feeling lonely some of the time (37.2%, 95%CI=35.7–38.7%) or often (19.7%, 95%CI=18.5–21.0%) on one or more of the items on the loneliness measure.

Table 2 shows results of chi-square and analysis of variance (ANOVA) analyses of sociodemographic and military characteristics of the sample as a function of loneliness severity. Relative to the Hardly Ever and Sometimes Lonely groups, the Often Lonely group was less likely to be married/partnered, and more likely to be younger, identify as Other (versus Non-Hispanic White) with regard to race/ethnicity, have a household income <\$60,000 a year, and to have enlisted in the military ($ps < 0.005$).

Table 3 shows results of chi-square analyses examining the prevalence of mental and physical health

variables as a function of loneliness severity. Relative to the Hardly Ever and Sometimes Lonely groups, the Often Lonely group was more likely to endorse all lifetime and current psychiatric disorders, SI and SAs ($ps < 0.001$). The Sometimes Lonely group was also more likely than the Hardly Ever Lonely group to endorse all lifetime and current psychiatric disorders, SI, and SAs ($ps < 0.001$). Physical health status also differed between groups, with the Often Lonely group more likely than the Hardly Ever and Sometimes Lonely groups to report having been diagnosed with range of physical health conditions (e.g., chronic pain), as well as having an ADL and IADL disability.

Loneliness and Mental and Physical Health Status

Table 4 provides multiple logistic regression results of associations between loneliness status and mental and physical health conditions.

Often Lonely versus Hardly Ever Lonely. Relative to the Hardly Ever Lonely group, the Often Lonely group had increased odds of positive screens for all lifetime and current psychiatric disorders ($ps < 0.05$) except current drug use disorder, as well as several physical health conditions (e.g., chronic pain, arthritis, stroke). They also had more than 12-fold greater odds of current SI ($p < 0.001$) and two-fold greater odds of lifetime SAs ($p < 0.01$).

Sometimes Lonely versus Hardly Ever Lonely. Relative to the Hardly Ever Lonely group, the Sometimes Lonely group had increased odds of positive screens for all lifetime psychiatric disorders and current MDD ($ps < 0.001$), as well as several physical health conditions (e.g., chronic pain, heart disease, migraine), and more than three-fold greater odds of current SI ($p < 0.001$).

Often Lonely versus Sometimes Lonely. Relative to the Sometimes Loneliness group, the Often Lonely group had increased odds of all lifetime and current psychiatric disorders ($p < 0.01$) except drug use disorder, multiple physical health diagnoses (e.g., arthritis, chronic pain, sleep disorder), and nearly four-fold greater odds of current SI ($p < 0.001$).

Association Between Loneliness and Functioning Measures

Table 5 displays results of MANCOVAs of mental, physical, cognitive, and psychosocial functioning measures as a function of loneliness severity; higher

Behavioral Epidemic of Loneliness in Older U.S. Military Veterans: Results From

TABLE 2. Demographic and Military Characteristics by Level of Loneliness in U.S. Military Veterans

	Loneliness Level			Test of difference (F or X ²)	p	Pairwise Contrasts
	Hardly Ever N = 1,813 Weighted 43.1% 1	Sometimes N = 1,483 Weighted 37.2% 2	Often N = 754 Weighted 19.7% 3			
<i>Sociodemographic Characteristics</i>						
Age (years)	66.7 (14.1)	61.1 (16.1)	53.7 (15.1)	204.10	<0.001	3>2>1
Sex				81.99	<0.001	
Male	1,664 (93.9%)	1,294 (90.0%)	588 (82.4%)			3>2>1
Female	149 (6.1%)	189 (10.0%)	166 (17.6%)			
Race/ethnicity				15.04	0.005	
Non-Hispanic white	1,506 (79.9%)	1,230 (78.5%)	565 (73.1%)			
Other	306 (20.1%)	253 (21.5%)	189 (26.9%)			3>1,2
Education				7.99	0.018	
Some college or less	955 (65.0%)	823 (68.5%)	454 (70.1%)			
College graduate or more	858 (35.0%)	660 (31.5%)	300 (29.9%)			1>3
Marital status				326.91	<0.001	
Married/partnered	1,505 (83.6%)	1,029 (71.8%)	339 (49.1%)			1>2>3
Never married/divorced/separated	308 (16.4%)	454 (28.2%)	415 (50.9%)			
Annual household income				78.69	<0.001	
> \$60k	1,163 (63.9%)	863 (59.6%)	324 (45.3%)			
≤ \$60k	650 (36.1%)	620 (40.4%)	430 (54.7%)			3>2>1
Structural social support	11.2 (13.8)	6.9 (8.5)	3.9 (5.4)	139.87	<.001	1>2>3
<i>Military Characteristics</i>						
Enlistment status				55.24	<0.001	
Enlisted	1,336 (76.0%)	1,132 (79.9%)	649 (88.1%)			3>2>1
Drafted	237 (13.1%)	187 (11.3%)	49 (4.8%)			3>1,2
Commissioned	239 (10.9%)	161 (8.8%)	55 (7.1%)			1>3
Combat veteran				9.91	0.007	
Combat veteran	598 (32.2%)	504 (37.1%)	241(36.6%)			2>1
Non-combat veteran	1,213 (67.8%)	975 (62.9%)	510 (63.4%)			
Years spent in military				3.40	0.18	-
< 10 y	1,161 (65.1%)	939 (62.6%)	478 (61.8%)			
10 or more y	652 (34.9%)	544 (37.4%)	276 (38.2%)			

Note. Analyses of variance and chi-square tests were used to compare groups.

Degrees of freedom for analyses of age and structural social support = 2, 3,983.

Degrees of freedom for analyses of sex, race/ethnicity, education, marital status, annual household income, combat veteran status, and years spent in military = 2; degrees of freedom for analysis of enlistment status = 4.

Structural social support was assessed using the item, "About how many close friends and relatives do you have (people you feel at ease with and can talk to about what is on your mind)?"

scores on measures of mental, physical, and cognitive functioning, and lower scores on psychosocial difficulties, reflect better functioning. After adjusting for sociodemographic and military factors, MANCOVA results revealed significant differences between the three groups on all of the functional domains assessed.

Often Lonely versus Hardly Ever Lonely

The Often Lonely group scored significantly lower than the Hardly Ever Lonely group on all measures of mental, physical health, and cognitive functioning, and higher on psychosocial difficulties. Effect sizes

were small-to-moderate (*d*'s = 0.21–0.59), with the largest differences evident on measures of overall mental health-related functioning, mental health, and psychosocial difficulties.

Sometimes Lonely versus Hardly Ever Lonely

The Sometimes Lonely group scored significantly lower than the Hardly Ever Lonely group on all measures of mental, physical health, and cognitive functioning, and higher on psychosocial difficulties. Effect sizes were small (*d*'s = 0.07–0.18), with the largest differences evident on measures of vitality, overall

TABLE 3. Mental and Physical Health Variables by Level of Loneliness in U.S. Military Veterans

	Loneliness Level			Test of difference (X ²)	p	Pairwise Contrasts
	Hardly Ever N =1,813 Weighted 43.1% 1 N (%)	Sometimes N =1,483 Weighted 37.2% 2 N (%)	Often N=754 Weighted 19.7% 3 N (%)			
<i>Lifetime</i>						
Major depressive disorder	102 (5.1%)	227 (17.0%)	282 (42.1%)	531.73	<0.001	3>2>1
Posttraumatic stress disorder	66 (4.8%)	161 (13.3%)	268 (40.6%)	502.49	<0.001	3>2>1
Alcohol use disorder	547 (30.2%)	635 (44.3%)	396 (57.6%)	180.03	<0.001	3>2>1
Drug use disorder	110 (7.4%)	172 (12.4%)	170 (25.9%)	167.72	<0.001	3>2>1
Suicide attempt	17 (1.0%)	50 (3.9%)	69 (10.4%)	126.18	<0.001	3>2>1
<i>Current</i>						
Major depressive disorder	15 (1.1%)	73 (6.1%)	204 (30.6%)	611.23	<0.001	3>2>1
Posttraumatic stress disorder	17 (1.5%)	65 (5.0%)	155 (25.0%)	415.90	<0.001	3>2>1
Generalized anxiety disorder	26 (2.4%)	65 (6.4%)	141 (22.8%)	319.10	<0.001	3>2>1
Alcohol use disorder	125 (7.2%)	124 (10.0%)	111 (18.8%)	77.97	<0.001	3>2>1
Drug use disorder	84 (5.6%)	118 (9.9%)	111 (17.1%)	81.32	<0.001	3>2>1
Suicidal ideation	25 (1.5%)	97 (7.3%)	190 (29.0%)	506.51	<0.001	3>2>1
<i>Lifetime</i>						
Arthritis	673 (34.5%)	573 (33.8%)	328 (38.7%)	5.84	0.054	-
Asthma, chronic bronchitis, or COPD	176 (8.7%)	185 (11.0%)	141 (16.1%)	31.39	<0.001	3>1,2
Cancer	410 (20.0%)	295 (15.9%)	124 (12.1%)	25.95	<0.001	1>2>3
Chronic pain	321 (17.5%)	384 (25.3%)	291 (38.8%)	134.30	<0.001	3>2>1
Liver disease	20 (1.1%)	33 (2.1%)	22 (2.4%)	7.25	0.027	3>1
Diabetes	369 (20.6%)	339 (19.0%)	164 (16.8%)	5.19	0.075	-
Heart disease	260 (12.9%)	260 (14.7%)	104 (10.3%)	9.02	0.011	2>3
Heart attack	136 (6.9%)	118 (6.8%)	56 (6.5%)	0.12	0.94	-
High cholesterol	889 (46.8%)	760 (46.4%)	337 (36.9%)	24.44	<0.001	1,2>3
High blood pressure	990 (53.0%)	807 (51.2%)	374 (42.7%)	23.99	<0.001	1,2>3
Kidney disease	100 (4.8%)	94 (5.7%)	39 (3.5%)	5.57	0.062	-
Sleep disorder	350 (20.1%)	391 (26.2%)	288 (38.4%)	95.57	<0.001	3>2>1
Migraine	92 (4.8%)	124 (9.6%)	111 (15.6%)	84.17	<0.001	3>2>1
Osteoporosis or osteopenia	93 (3.2%)	89 (4.0%)	56 (5.5%)	7.65	0.022	3>1
Rheumatoid arthritis	93 (5.0%)	86 (5.4%)	48 (5.6%)	0.47	0.79	-
Stroke	64 (3.0%)	54 (3.1%)	35 (3.5%)	0.45	0.80	-
Concussion or traumatic brain injury	67 (3.4%)	73 (5.3%)	89 (12.0%)	75.86	<0.001	3>2>1
MCI, dementia or Alzheimer's disease	18 (1.1%)	28 (1.6%)	30 (3.9%)	24.53	<0.001	3>1,2
Any ADL disability	66 (3.8%)	76 (4.3%)	69 (10.1%)	48.48	<0.001	3>1,2
Any IADL disability	171 (10.0%)	186 (13.2%)	189 (25.2%)	105.09	<0.001	3>2>1

Note. COPD: chronic obstructive pulmonary disease; MCI:mild cognitive impairment; ADL:activities of daily living; IADL:instrumental activities of daily living.

Pairwise contrasts: 1 = Hardly Ever, 2 = Sometimes, 3 = Often

Chi-square analyses were conducted to compare groups; degrees of freedom for all analyses = 2.

mental health-related functioning, and psychosocial difficulties.

Often Lonely versus Sometimes Lonely

The Often Lonely group scored significantly lower than the Sometimes Lonely group on all measures of mental, physical health, and cognitive functioning and higher on psychosocial difficulties. Effect sizes were

small (*d*'s = 0.13–0.46), with the largest differences evident on measures of overall mental health-related functioning, mental health, and psychosocial difficulties.

DISCUSSION

This study provides the most up-to-date characterization of the prevalence and associated burden of

*Behavioral Epidemic of Loneliness in Older U.S. Military Veterans: Results From***TABLE 4. Multivariable Analyses of Mental and Physical Health Variables by Level of Loneliness in U.S. Military Veterans**

	Loneliness Level		
	Some versus Hardly Ever OR (95%CI)	Often versus Hardly Ever OR (95%CI)	Often versus Some OR (95%CI)
<i>Lifetime</i>			
Major depressive disorder	3.12 (2.41–4.05) ^c	8.97 (6.81–11.82) ^c	2.90 (2.35–3.57) ^c
Posttraumatic stress disorder	2.54 (1.90–3.40) ^c	10.29 (7.62–13.91) ^c	3.94 (3.01–5.16) ^c
Alcohol use disorder	1.78 (1.53–2.07) ^c	2.88 (2.38–3.49) ^c	1.61 (1.34–1.93) ^c
Drug use disorder	1.55 (1.21–1.98) ^c	3.17 (2.43–4.14) ^c	2.03 (1.60–2.56) ^c
Suicide attempt	1.66 (0.93–2.94)	2.21 (1.22–4.02) ^b	1.29 (0.85–1.94)
<i>Current</i>			
Major depressive disorder	4.66 (2.60–8.35) ^c	19.99 (11.19–35.70) ^c	4.49 (3.30–6.11) ^c
Posttraumatic stress disorder	1.16 (0.63–2.13)	3.00 (1.65–5.45) ^c	2.61 (1.74–3.90) ^c
Generalized anxiety disorder	1.43 (0.94–2.16)	3.22 (2.10–4.93) ^c	2.46 (1.78–3.40) ^c
Alcohol use disorder	0.92 (0.70–1.22)	1.41 (1.01–1.98) ^a	1.56 (1.16–2.11) ^b
Drug use disorder	1.20 (0.88–1.62)	0.88 (0.60–1.28)	0.77 (0.55–1.08)
Suicidal ideation	3.27 (2.09–5.12) ^c	12.49 (7.91–19.70) ^c	3.67 (2.76–4.88) ^c
<i>Lifetime</i>			
Arthritis	1.03 (0.88–1.22)	1.46 (1.17–1.82) ^b	1.41 (1.15–1.73) ^b
Asthma, chronic bronchitis, or COPD	1.26 (0.98–1.62)	1.66 (1.21–2.28) ^b	1.32 (0.99–1.75)
Cancer	0.87 (0.70–1.07)	0.93 (0.68–1.26)	1.07 (0.79–1.43)
Chronic pain	1.31 (1.09–1.59) ^b	1.86 (1.47–2.35) ^c	1.41 (1.14–1.74) ^b
Liver disease	1.77 (0.98–3.20)	1.68 (0.79–3.55)	0.95 (0.50–1.79)
Diabetes	1.14 (0.94–1.39)	1.21 (0.92–1.59)	1.06 (0.82–1.37)
Heart disease	1.45 (1.15–1.83) ^b	1.41 (1.01–1.97) ^a	0.97 (0.71–1.32)
Heart attack	1.22 (0.90–1.66)	1.57 (1.02–2.41) ^a	1.28 (0.86–1.92)
High cholesterol	1.16 (0.99–1.36)	1.01 (0.81–1.26)	0.87 (0.71–1.07)
High blood pressure	1.09 (0.93–1.29)	0.98 (0.78–1.22)	0.89 (0.72–1.10)
Kidney disease	1.39 (0.99–1.96)	1.11 (0.66–1.85)	0.80 (0.49–1.28)
Sleep disorder	1.21 (1.01–1.46) ^a	1.84 (1.46–2.33) ^c	1.52 (1.23–1.88) ^c
Migraine	1.70 (1.23–2.33) ^b	1.64 (1.13–2.38) ^b	0.97 (0.72–1.30)
Osteoporosis or osteopenia	1.19 (0.79–1.80)	1.38 (0.83–2.29)	1.15 (0.73–1.82)
Rheumatoid arthritis	1.01 (0.72–1.41)	0.89 (0.56–1.40)	0.88 (0.58–1.34)
Stroke	1.28 (0.80–2.05)	2.24 (1.23–4.06) ^b	1.75 (1.01–3.03) ^a
Concussion or traumatic brain injury	1.32 (0.91–1.93)	2.18 (1.43–3.33) ^c	1.65 (1.16–2.34) ^b
MCI, dementia or Alzheimer's disease	3.16 (1.40–7.16) ^b	6.80 (2.81–16.42) ^c	2.15 (1.16–3.97) ^a
Any ADL disability	1.48 (0.99–2.22)	3.15 (2.00–4.97) ^c	2.13 (1.45–3.13) ^c
Any IADL disability	1.36 (1.06–1.74) ^a	2.21 (1.65–2.96) ^c	1.62 (1.26–2.09) ^c

Note. OR: odds ratio; 95%CI : 95% confidence interval; COPD: chronic obstructive pulmonary disease; MCI: mild cognitive impairment; ADL: activities of daily living; IADL: instrumental activities of daily living.

Multiple logistic regression analyses were conducted to compare groups; degrees of freedom for analyses of lifetime mental disorders=9; degrees of freedom for current psychiatric disorders, suicide attempt and suicidal ideation, physical health conditions, and ADL and IADL disability =14.

Odds ratios are adjusted for age, gender, race/ethnicity, education, marital status, household income, enlistment status, and combat veteran status; analyses of current psychiatric disorders, suicide attempt and suicidal ideation, physical health conditions, and ADL and IADL disability are additionally adjusted for lifetime MDD, PTSD, AUD, DUD, and nicotine dependence.

^a p <0.05.

^b p <0.01.

^c p <0.001

current loneliness on mental and physical health, and functioning measures in a predominantly older nationally representative sample of U.S. military veterans (mean age = 62.2). Results revealed that over half of U.S. veterans (56.9%) endorsed feeling lonely at least some of the time, with nearly one in five

(19.7%) reporting feeling lonely often. This prevalence is greater than that observed in an independent national sample of veterans aged 60 and older who were surveyed in 2011 (mean age = 71.0).⁹ In this older sample, just under half (44.0%) of the sample endorsed at least a moderate level of loneliness (i.e.,

Behavioral Epidemic of Loneliness in Older U.S. Military Veterans: Results From

experiencing loneliness sometimes), and approximately one in ten (10.4%) endorsed experiencing a severe level of loneliness (i.e., experiencing loneliness often). The prevalence of loneliness observed in the current study is also greater than that what has been observed in a nationally representative sample of older U.S. adults who completed the same loneliness measure, in which 43.0% were categorized as lonely, with 13.0% endorsing loneliness often.²⁴ Thus, current data suggest that U.S. military veterans may be at greater risk of experiencing moderate (i.e., experiencing loneliness sometimes) to severe (i.e., experiencing loneliness often) loneliness relative to the general older adult and older veteran population. One explanation for this finding is that the current sample included younger veterans who reported higher levels of loneliness, and that veterans have higher rates of psychiatric disorders than their non-veteran counterparts,³⁶ although further research is needed to better understand specific mechanisms underlying the relationship between veteran status and loneliness. It is also important to note that the ability to compare between these studies may be limited by different sample characteristics, given that average age was lower in our study (62 versus 71) and our sample had a greater proportion of males (90.2% versus 40.6% male) relative to Perissinotto and colleagues' study.²⁴ Nevertheless, the finding that over half of veterans in the current study endorsed at least some level of loneliness suggests that loneliness may indeed represent a "behavioral epidemic,"¹⁴ as it is markedly more prevalent than major psychiatric disorders and suicidal thoughts and behaviors in both veteran and non-veteran samples.^{48,49}

Loneliness severity was found to be associated with a broad range of psychiatric, physical health, and functioning difficulties in U.S. veterans. Even after conservative adjustment for sociodemographic, military characteristics, and lifetime psychiatric disorders, veterans who reported being lonely often had elevated prevalence of nearly all of the psychiatric disorders assessed, several physical health conditions, and poorer functioning relative to veterans who reported being hardly ever or sometimes lonely. These findings are consistent with several studies in representative samples of U.S. and European adults, which similarly observed a strong association between loneliness and psychiatric disorders (e.g., anxiety disorders),^{22,28} physical health conditions (e.

g., high blood pressure),^{11,26} and functional difficulties (e.g., reduced physical health functioning).²⁴ Although causality cannot be inferred from our cross-sectional data, these results suggest that loneliness may be a robust and shared risk factor for a broad range of adverse mental, physical health, and functional outcomes in the veteran population. Of note, however, effect size differences on measures of functioning between loneliness groups ranged from small-to-moderate, which is largely attributable to conservative adjustment for a broad range of variables, including psychiatric disorders.

Results of this study also suggest that feeling lonely often or sometimes is associated with a substantially elevated likelihood of suicidality. Specifically, even after controlling for sociodemographic and military characteristics and lifetime psychiatric disorders, veterans who reported feeling lonely often or sometimes were 12- and 3-times more likely than those who were hardly ever lonely to report SI, and the often lonely group was more than twice as likely to have attempted suicide. Although cross-sectional and prospective studies have implicated loneliness as a possible risk factor for suicide,^{29,50} no known study has examined the association between different levels of loneliness and suicidality in a nationally representative sample of U.S. veterans. These findings may be interpreted in the context of the interpersonal psychological theory of suicide,^{51,52} which posits that perceived burdensomeness and thwarted belongingness, the latter of which includes loneliness and the absence of reciprocal care, play a key role in suicidal behaviors.⁵² Indeed, studies in veterans have found that both factors are associated with SI.^{53,54} Taken together, these findings underscore the importance of targeting loneliness and related factors (e.g., low perceived social support) in suicide assessment and prevention efforts in veterans and other at-risk populations.

To our knowledge, this study is the first to demonstrate that even a moderate level of loneliness (i.e., feeling lonely sometimes) was associated with greater psychiatric, health, and functional difficulties in U.S. veterans. These findings are consistent with findings in a representative community-based sample of older adults, which similarly found that a moderate level of loneliness was associated with worse health and functioning.⁷ The prevalence of psychiatric morbidities in veterans who endorsed moderate-to-severe levels of loneliness in our sample is also markedly higher than

that observed in a meta-analytic study that examined the prevalence of psychiatric disorders in older U.S. military veterans, but did not specifically focus on loneliness.¹⁵ Collectively, these results suggest that loneliness may be an important transdiagnostic target for prevention and treatment efforts in the veteran population, particularly for those who endorse moderate-to-severe levels of loneliness. Of note, given that the association between loneliness and psychiatric disorders may be bidirectional, further research is needed to examine whether effective psychiatric treatment may also help mitigate the severity of loneliness.

Efforts aimed at reducing loneliness at the individual (e.g., addressing problematic social cognitions)⁵⁵ and societal level (e.g., establishing community outreach to help promote social connectedness)¹⁴ or enhancing potentially modifiable protective factors associated with lower loneliness levels (e.g., wisdom)^{7,56} may be critical targets in at-risk populations. For example, newer technologies (e.g., videoconferencing)⁵⁷ have the potential to reduce loneliness, especially in older adults who may at times face barriers to receiving in-person care; however, their benefit may depend on how certain platforms are used (e.g., frequent social media use may exacerbate loneliness). In addition to reaching older adults, these technologies have the potential to reach veterans of all ages who are lonely, but who do not access services. Peer support^{58,59} and social prescribing⁶⁰ may also help increase access to care and engagement in veterans experiencing loneliness, though more research is needed to evaluate such interventions. Given that many VA mental health providers are well trained in cognitive-behavioral treatments and promising evidence supporting the use of such treatments that focus on maladaptive social cognitions to reduce loneliness,^{61,62} such interventions may be readily implemented in VA health-care and other settings that serve veterans. However, further research is needed to examine the efficacy of such approaches in this population. It is also important to recognize, however, that not all determinants of loneliness (e.g., living alone, marital status), may be modified by psychological interventions, and that both modifiable and non-modifiable factors may contribute to it.

The finding that feeling lonely sometimes or often was associated with reduction in health and functioning may be understood in the context of an

evolutionary theory of loneliness.^{63,64} This theory posits that experiencing loneliness is equivalent to feeling physically unsafe; this perceived lack of safety results in hypervigilance for social threats that produce cognitive biases that are, in turn, confirmed through negative social interactions. This maladaptive loop sets off a series of processes meant to ensure short-term survival, but are detrimental to health in the long run, such as shifts in sleep (e.g., sleep fragmentation), neuroendocrine (e.g., hypothalamic-pituitary-adrenal axis activation) and immune functioning (e.g., upregulation of proinflammatory genes), and behavior (e.g., engagement in unhealthy behaviors). Indeed, these biobehavioral abnormalities have been implicated in a range of health and functioning impairments.^{65,66} Studies have also revealed that these associations may be bidirectional, with loneliness and health conditions (e.g., depression, reduced cognitive functioning) exerting reciprocal effects.^{67,68} Longitudinal studies are needed to disentangle temporal associations and biopsychosocial mechanisms underlying the relationship between loneliness and psychiatric, health, and functional impairments in U.S. veterans and the general population.

Limitations of this study must be noted. First, the sample consisted of predominantly older, male, non-combat veterans, so findings may not generalize to more sociodemographically diverse samples. The majority of the sample served in the military for <10 years, and thus results may differ for veterans with lengthier service records. Second, because the study is cross-sectional, we are not able to draw conclusions about whether loneliness causes health and functional difficulties, whether health and functional difficulties cause loneliness, or whether these relationships are bidirectional. Third, while the use of screening measures for psychiatric disorders allowed us to assess for a broad range of disorders, future studies should also attempt to replicate our findings using clinician-administered interviews. Fourth, given the non-normal distribution of loneliness scores in our sample, we divided these scores into three, face-valid groups that reflect loneliness severity; further research is needed to identify optimal cut scores on commonly used measures of loneliness and to determine clinically meaningful thresholds. Fifth, to evaluate the independent association between loneliness severity and measures of psychiatric disorders and functional difficulties, we

Behavioral Epidemic of Loneliness in Older U.S. Military Veterans: Results From

conservatively adjusted for a broad range of sociodemographic, military, and mental and physical health variables; less conservative approaches may have yielded larger magnitude associations, as well as additional correlates of loneliness severity.

This study also has several notable strengths, including the use of a validated multi-item measure of loneliness, and examining how loneliness severity is linked to a broad range of psychiatric, physical health, and functioning outcomes in a large, contemporary, and nationally representative sample of U.S. veterans. The strikingly high prevalence of loneliness (56.9%) and its unique association with a range of negative health and functional outcomes underscores the importance of loneliness as a target for transdiagnostic prevention and treatment efforts. Further research is needed to examine the longitudinal and potentially reciprocal relationship between loneliness and health, suicidality, and functional measures; prevalence and correlates of loneliness in more socio-demographically diverse samples; and efficacy of individual- and societal-level prevention strategies and interventions for loneliness in mitigating its effect

on adverse health and functional outcomes in veterans and other at-risk populations.

AUTHOR CONTRIBUTIONS

ES drafted primary manuscript, conceived of study aims, and contributed to interpretation of findings. SBN contributed to conceptualization of study, interpreted study findings, and provided editing of manuscript. RHP acquired the data, conceived of study aims, conducted the statistical analyses, interpreted the data, and edited the manuscript. All authors contributed and approved of the final manuscript.

The National Health and Resilience in Veterans Study is funded by the U.S. Department of Veterans Affairs National Center for PTSD, which had no role in the design, analysis, or interpretation of this study. The data has not been previously presented orally or by poster at scientific meetings.

Dr. Southwick receives royalties from Cambridge University Press for the book, "Resilience: The Science of Mastering Life's Greatest Challenges" (2018). The other authors have no disclosures to report.

REFERENCES

- Russell D, Peplau LA, Cutrona CE: The revised UCLA loneliness scale: concurrent and discriminant validity evidence. *J Pers Soc Psychol* 1980; 39:472-480
- Hawkley LC, Cacioppo JT: Loneliness matters: a theoretical and empirical review of consequences and mechanisms. *Ann Behav Med* 2010; 40:218-227
- National Academies of Sciences, Engineering: Medicine: Social isolation and Loneliness in Older Adults: Opportunities for the Health Care System. Washington, DC: The National Academies Press, 2020
- Holt-Lunstad J, Smith TB, Baker M, et al: Loneliness and social isolation as risk factors for mortality: a meta-analytic review. *Perspect Psychol Sci* 2015; 10:227-237
- Sutin AR, Stephan Y, Luchetti M, et al: Loneliness and risk of dementia. *J Gerontol B Psychol Sci Soc Sci* 2018; 75:1414-1422
- Wilson C, Moulton B: Loneliness Among Older Adults: A National Survey Of Adults 45+. Washington, DC: AARP, 2010
- Lee EE, Depp C, Palmer BW, et al: High prevalence and adverse health effects of loneliness in community-dwelling adults across the lifespan: role of wisdom as a protective factor. *Int Psychogeriatr* 2019; 31:1447-1462
- Killgore WDS, Cloonan SA, Taylor EC, et al: Loneliness: A signature mental health concern in the era of COVID-19. *Psychiatry Res* 2020; 290:113117
- Kuwert P, Knaevelsrud C, Pietrzak RH: Loneliness among older veterans in the United States: results from the National Health and Resilience in Veterans Study. *Am J Geriatr Psychiatry* 2014; 22:564-569
- Cacioppo JT, Hughes ME, Waite LJ, et al: Loneliness as a specific risk factor for depressive symptoms: cross-sectional and longitudinal analyses. *Psychol Aging* 2006; 21:140-151
- Hawkley LC, Thisted RA, Masi CM, et al: Loneliness predicts increased blood pressure: 5-year cross-lagged analyses in middle-aged and older adults. *Psychol Aging* 2010; 25:132-141
- Nguyen T, Lee EE, Daly R, et al: Predictors of loneliness by age decade: study of psychological and environmental factors in 2,843 community-dwelling Americans aged 20-69. *J Clin Psychiatry* 2020; 81
- D Scheimer and M Chakrabarti, Former surgeon general Vivek Murthy: Loneliness is a public health crisis [Transcript], 2020. Boston: WBUR.
- Jeste DV, Lee EE, Cacioppo S: Battling the modern behavioral epidemic of loneliness: suggestions for research and interventions. *JAMA Psychiatry* 2020; 77:553-554
- Williamson V, Stevelink SAM, Greenberg K, et al: Prevalence of mental health disorders in elderly U.S. military veterans: a meta-analysis and systematic review. *Am J Geriatr Psychiatry* 2018; 26:534-545
- Department of Veterans Affairs: Profile of Veterans. National Center for Veterans Analysis and Statistics 2019, 2017
- Jordan BK, Schlenger WE, Hough R, et al: Lifetime and current prevalence of specific psychiatric disorders among Vietnam veterans and controls. *Arch Gen Psychiatry* 1991; 48:207-215
- U.S. Department of Veterans Affairs: National veteran suicide prevention annual report, 2019

19. Hoerster KD, Lehavot K, Simpson T, et al: Health and health behavior differences: U.S. military, veteran, and civilian men. *Am J Prev Med* 2012; 43:483–489
20. Blais RK, Tsai J, Southwick SM, et al: Barriers and facilitators related to mental health care use among older veterans in the United States. *Psychiatr Serv* 2015; 66:500–506
21. Bagalman E: The number of veterans that use VA healthcare services: a fact sheet. Congressional Research Service 2014
22. Cacioppo JT, Hawkley LC, Thisted RA: Perceived social isolation makes me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago health, aging, and social relations study. *Psychol Aging* 2010; 25:453–463
23. Boehlen FH, Herzog W, Schellberg D, et al: Gender-specific predictors of generalized anxiety disorder symptoms in older adults: results of a large population-based study. *J Affect Disord* 2020; 262:174–181
24. Perissinotto CM, Stijacic Cenzer I, Covinsky KE: Loneliness in older persons: a predictor of functional decline and death. *Arch Intern Med* 2012; 172:1078–1083
25. Donovan NJ, Wu Q, Rentz DM, et al: Loneliness, depression and cognitive function in older U.S. adults. *Int J Geriatr Psychiatry* 2017; 32:564–573
26. Valtorta NK, Kanaan M, Gilbody S, et al: Loneliness and social isolation as risk factors for coronary heart disease and stroke: systematic review and meta-analysis of longitudinal observational studies. *Heart* 2016; 102:1009–1016
27. Allen SF, Gilbody S, Atkin K, et al: The associations between loneliness, social exclusion and pain in the general population: A N=502,528 cross-sectional UK Biobank study. *J Psychiatr Res* 2020; 130:68–76
28. Beutel ME, Klein EM, Brähler E, et al: Loneliness in the general population: prevalence, determinants and relations to mental health. *BMC Psychiatry* 2017; 17:97
29. McClelland H, Evans JJ, Nowland R, et al: Loneliness as a predictor of suicidal ideation and behaviour: a systematic review and meta-analysis of prospective studies. *J Affect Disord* 2020; 274:880–896
30. Solmi M, Veronese N, Galvano D, et al: Factors associated with loneliness: an umbrella review of observational studies. *J Affect Disord* 2020; 271:131–138
31. Stravynski A, Boyer R: Loneliness in relation to suicide ideation and parasuicide: a population-wide study. *Suicide Life Threat Behav* 2001; 31:32–40
32. Trivedi RB, Post EP, Sun H, et al: Prevalence, comorbidity, and prognosis of mental health among US veterans. *Am J Public Health* 2015; 105:2564–2569
33. Agha Z, Lofgren RP, VanRuiswyk JV, et al: Are patients at veterans affairs medical centers sicker?: a comparative analysis of health status and medical resource use. *Arch Intern Med* 2000; 160:3252–3257
34. United States Census Bureau: American Community Survey website. Available at: <https://www.census.gov/cps/data/cpstablecreator.html>. Accessed on March 5, 2021
35. Hughes ME, Waite LJ, Hawkley LC, et al: A short scale for measuring loneliness in large surveys: results from two population-based studies. *Res Aging* 2004; 26:655–672
36. Kessler RC, Heeringa SG, Stein MB, et al: Thirty-day prevalence of DSM-IV mental disorders among nondeployed soldiers in the US Army: results from the Army Study to assess risk and resilience in servicemembers (Army STARRS). *JAMA Psychiatry* 2014; 71:504–513
37. Weathers FW, Litz BT, Keane TM, et al: The PTSD Checklist for DSM-5 (PCL-5) Retrieved from: The National Center for PTSD at www.ptsd.va.gov, 2013
38. Kroenke K, Spitzer RL, Williams JB: The Patient Health Questionnaire-2: Validity of a two-item depression screener. *Med. Care* 2003; 41:1284–1292
39. Kroenke K, Spitzer RL, Williams JB, et al: Anxiety disorders in primary care: Prevalence, impairment, comorbidity, and detection. *Ann. Intern. Med.* 2007; 146:317–325
40. Babor TF, Biddle-Higgins JC, Saunders JB, et al: AUDIT: The alcohol use disorders identification test: Guidelines for use in primary health care. Geneva, Switzerland: World Health Organization, 2001
41. Tiet QQ, Leyva YE, Moos RH, et al: Screen of Drug Use: Diagnostic accuracy of a new brief tool for primary care. *JAMA Intern Med* 2015; 175:1371–1377
42. Sheehan DV: Mini Neuropsychiatric Interview. English Version 7.0.2 for DSM-5, Copyright 1992-2016
43. Kroenke K, Spitzer RL, Williams JB: The PHQ-9: Validity of a brief depression severity measure. *J. Gen. Intern. Med.* 2001; 16:606–613
44. Hardy SE, Gill TM: Recovery from disability among community-dwelling older persons. *JAMA* 2004; 291:1596–1602
45. Ware JE, Kosinski M, Dewey JE, et al: How to score and interpret single-item health status measures: A manual for users of the SF-8 Health Survey. Boston: QualityMetric Incorporated, 2001
46. Stewart AL, Ware JE, Sherbourne CD, et al: Psychological distress/well-being and cognitive functioning measures, in *Measuring Functioning and Well-Being: The Medical Outcomes Study Approach*. Edited by Stewart AL, Ware JE. Durham, Duke University Press, 1992, pp 102-142
47. Marx BP, Schnurr PP, Lunney C, et al: The Brief Inventory of Psychosocial Functioning (B-IPF). [Measurement instrument], <https://www.ptsd.va.gov>, 2019
48. Pemberton RM, Forman-Hoffman VL, Lipari RN, et al: Prevalence of Past-Year Substance Use and Mental Illness by Veteran Status in a Nationally Representative Sample. Rockville, MD: Substance Abuse and Mental Health Services Administration, 2016
49. Lehavot K, Katon JG, Chen JA, et al: Post-traumatic stress disorder by gender and veteran status. *Am J Prev Med* 2018; 54:e1–e9
50. Teo AR, Marsh HE, Forsberg CW, et al: Loneliness is closely associated with depression outcomes and suicidal ideation among military veterans in primary care. *J Affect Disord* 2018; 230:42–49
51. Joiner TE: *Why People Die by Suicide*. Cambridge: Harvard University Press, 2005
52. Van Orden KA, Witte TK, Cukrowicz KC, et al: The interpersonal theory of suicide. *Psychol Rev* 2010; 117:575–600
53. Monteith LL, Menefee DS, Pettit JW, et al: Examining the interpersonal-psychological theory of suicide in an inpatient veteran sample. *Suicide Life Threat Behav* 2013; 43:418–428
54. Monteith LL, Bahraini NH, Menefee DS: Perceived burdensomeness, thwarted belongingness, and fearlessness about death: associations with suicidal ideation among female veterans exposed to military sexual trauma. *J Clin Psychol* 2017; 73:1655–1669
55. Perissinotto C, Holt-Lunstad J, Periyakoil VS, et al: A practical approach to assessing and mitigating loneliness and isolation in older adults. *J Am Geriatr Soc* 2019; 67:657–662
56. Lee EE, Bangen KJ, Avanzino JA, et al: Outcomes of randomized clinical trials of interventions to enhance social, emotional, and spiritual components of wisdom: a systematic review and meta-analysis. *JAMA Psychiatry* 2020; 77:925–935
57. Shapira S, Yeshua-Katz D, Cohn-Schwartz E, et al: A pilot randomized controlled trial of a group intervention via Zoom to relieve

Behavioral Epidemic of Loneliness in Older U.S. Military Veterans: Results From

- loneliness and depressive symptoms among older persons during the COVID-19 outbreak. *Internet Interventions* 2021; 24:100368
58. Drebing CE, Reilly E, Henze KT, et al: Using peer support groups to enhance community integration of veterans in transition. *Psychol Serv* 2018; 15:135-145
 59. Conwell Y, Van Orden KA, Stone DM, et al: Peer companionship for mental health of older adults in primary care: a pragmatic, nonblinded, parallel-group, randomized controlled trial. *Am J Geriatr Psychiatry* 2021; 29(8):748-757
 60. Reinhardt GY, Vidovic D, Hammerton C: Understanding loneliness: a systematic review of the impact of social prescribing initiatives on loneliness. *Perspect Public Health* 2021; 41(4):204-213
 61. Cacioppo S, Grippo AJ, London S, et al: Loneliness: clinical import and interventions. *Perspect Psychol Sci* 2015; 10:238-249
 62. Donovan NJ, Blazer D: Social isolation and loneliness in older adults: review and commentary of a National Academies Report. *Am J Geriatr Psychiatry* 2020; 28:1233-1244
 63. Cacioppo JT, Hawkley LC: Perceived social isolation and cognition. *Trends Cogn Sci* 2009; 13:447-454
 64. Cacioppo JT, Cacioppo S: Chapter Three - Loneliness in the Modern Age: An Evolutionary Theory of Loneliness (ETL), in *Adv. Exp. Soc. Psychol.* Edited by Olson JM. Academic Press, 2018, pp 127-19
 65. Ehlert U, Gaab J, Heinrichs M: Psychoneuroendocrinological contributions to the etiology of depression, posttraumatic stress disorder, and stress-related bodily disorders: the role of the hypothalamus-pituitary-adrenal axis. *Biol Psychol* 2001; 57:141-152
 66. Kaptoge S, Seshasai SRK, Gao P, et al: Inflammatory cytokines and risk of coronary heart disease: new prospective study and updated meta-analysis. *Eur Heart J* 2013; 35:578-589
 67. Tsur N, Stein JY, Levin Y, et al: Loneliness and subjective physical health among war veterans: long term reciprocal effects. *Soc Sci Med* 2019; 234:112373
 68. Yin J, Lassale C, Steptoe A, et al: Exploring the bidirectional associations between loneliness and cognitive functioning over 10 years: the English Longitudinal Study of Ageing. *Int J Epidemiol* 2019; 48:1937-1948