Association between suicide attempts and homelessness in a population-based sample of US veterans and non-veterans

Jack Tsai,[1,2] Xing Cao[3,4]

[1]U.S. Department of Veterans Affairs New England Mental Illness Research, Education, and Clinical Center, West Haven, Connecticut, USA
[2]Department of Psychiatry, Yale University School of Medicine, West Haven, Connecticut, USA
[3]CAS Key Laboratory of Mental Health, Institute of Psychology, Chinese Academy of Sciences, Beijing, China
[4]Department of Psychology, University of Chinese Academy of Sciences, Beijing, China

Correspondence to
Dr Jack Tsai, U.S. Department of Veterans Affairs New England Mental Illness Research, Education, and Clinical Center, West Haven, CT 06516, USA; Jack.Tsai@yale.edu

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ABSTRACT

Background Suicide and homelessness share many of the same risk factors, but there is little understanding of how they are related to each other.

Methods Data on 36 155 US adults (3101 veterans and 33 024 non-veterans) in the National Epidemiological Survey of Alcohol and Related Conditions-III were analysed to examine the association between lifetime homelessness and suicide, net of other factors, in a nationally representative US sample.

Results US veterans with homeless histories were 7.8 times more likely to have attempted suicide than veterans with no homeless histories (24.5% vs 2.8%). Non-veterans with homeless histories were 4.1 times more likely to have attempted suicide than those with no homeless histories (23.1% vs 4.5%). Lifetime homelessness was independently associated with lifetime suicide attempts in veterans (AOR=3.75, 95% CI 3.72 to 3.77) and non-veterans (AOR=1.83, 95% CI 1.83 to 1.84).

Conclusion The findings suggest a unique link between homelessness and suicide, especially among US veterans. Strategies to synergise homeless and suicide prevention services, particularly in the Veterans Health Administration, may benefit high-risk individuals.

In the past two decades, suicide has consistently been one of the 10 leading causes of death overall in the USA.[1 2] The large body of literature on suicide has found that risk factors for suicide include low socioeconomic status; low social support; mental illness especially depressive disorders and bipolar disorder; substance use disorders; chronic medical conditions and personal or family history of suicide.[3–7] Risk factors for suicidal *attempts* versus *completed* suicides are similar with the notable exception that women are more likely to attempt suicide and men are more likely to complete suicide.[6 7]

To address the devastating problem of suicide, various suicide prevention interventions have been developed, including public education, screening programmes, safety planning and psychosocial programmes.[8–10] Since suicide is intimately related to mental illness, substance use, physical health and social integration, various healthcare and social services designed to target these issues can also reduce suicide risk.[11 12] However, a recent systematic review of a decade of research concluded that while there is some evidence for specific suicide prevention interventions like restricting access to lethal means, school-based awareness programmes and the use of medications like clozapine and lithium in preventing suicide, no single strategy appears to stand out above the others and more research is needed.[10] Thus, suicide remains a major clinical challenge to address and new approaches to the problem are needed including recognising important subpopulations at risk and further examining related psychosocial problems that have not received adequate attention.

Homelessness has traditionally not been examined as a factor related to suicide and suicide risk has not been well-studied in homeless populations. This may be due to challenges with reaching and assessing homeless individuals in population-based studies; conflating diagnostic assessments of major depression with specific assessments of suicide risk or the lack of attention on suicide in the context of other serious medical, mental, housing and other psychosocial issues that homeless individuals may experience. Importantly, many of the risk factors for homelessness are similar to the risk factors for suicide which may be of concern as homelessness may have increased in the past decade.[13] Major risk factors for homelessness are male sex, low socioeconomic status, severe mental illness (ie, schizophrenia, bipolar disorder, major depression), substance use disorder, chronic medical conditions and low social support.[14 15] Thus, suicide and homelessness share many of the same risk factors around low socioeconomic status, mood and substance use disorders, low social support and chronic medical conditions. However, suicide prevention and homeless services have traditionally been considered distinct services.

Surprisingly, there have been very few studies conducted on suicide among homeless populations, although available evidence suggests suicide rates are much higher among those who are homeless or have been homeless. One study of 330 homeless adults in Toronto found that 61% reported lifetime suicidal ideation and 34% reported they had attempt suicide in their lifetime.[16] These rates are much higher than the 5.6%–14.3% rate of lifetime suicidal ideation[17] and 0.7%–8.7% rate of lifetime suicidal attempts[17 18] reported in the general population. Another study that analysed a national sample of over 10 000 US homeless veterans in transitional housing found that 12% reported a suicidal ideation and 3% reported a suicide attempt in the month prior to programme admission.[19] Interestingly, although poor mental health was associated with suicidal behaviour, recent suicidal

history did not predict programme, housing or employment outcomes. A more recent study using a nationally representative sample of US veterans in 2015 showed that veterans with a history of homelessness had rates of past 2 year suicide attempts more than five times as much (6.9% vs 1.2%) and rates of 2 week suicidal ideation more than 2.5 times as much (19.8% vs 7.4%) as veterans with a history of homelessness than veterans without such history.[20]

The problem of suicide is particularly pertinent to the veteran population since there are higher rates of completed suicides in veterans compared with the general adult population[21] and because it is currently the top clinical priority of the Veterans Health Administration (VHA).[22 23] The VHA's latest National Suicide Data Report found that in 2015, veterans accounted for 14.3% of all suicide deaths among US adults although constituted only 8.3% of the US adult population with 67% of suicide deaths involving firearms.[24] VHA-using veterans were found to have higher rates of suicide deaths compared with other veterans and non-veterans.

Suicide and homelessness remain important problems for US veterans. Considerable progress has been made by the US Department of Veterans Affairs (VA) in its federal campaign to end veteran homelessness which began in 2009 and so national attention and support has begun to shift to addressing veteran suicide. However, there has been little examination of how homelessness and suicide may be linked in veterans and non-veterans despite many shared risk factors.

In the current study, we sought to replicate previous findings[16 20] with a larger population sample and to examine the association between homeless and suicide both with US veterans and other adults in the general population. We examined rates of suicidal attempts among homeless adults as in previous studies and hypothesised that homelessness is a factor that is independently associated with suicide, adjusting for other known associated factors such as demographics, mental illness, substance use disorders and other psychosocial characteristics.

METHOD

The National Epidemiological Survey of Alcohol and Related Conditions-III (NESARC-III)[25] is a cross-sectional survey of a nationally representative sample of the civilian non-institutionalised population of the USA aged 18 years or older. The sample included residents living in a variety of housing settings but did not include residents in institutions such as prisons, hospitals and shelters. Data for the NESARC-III were collected between April 2012 and June 2013. Multistage probability sampling was employed to select respondents randomly at the county, Census and household levels. Interviewers conducted in-person structured interviews with respondents. Other details about the methodology of the NESARC-III have been detailed elsewhere.[25] Protocols were approved by the institutional review boards at the National Institutes of Health and Westat; data use was approved by Yale University School of Medicine.

With an overall response rate of 60.1%, the total original sample included 36 309 US adults. This study focused on the 36 155 (99.6% of original sample) who responded to a question about lifetime homelessness, which included 3101 veterans and 33 024 non-veterans. The data were weighted through poststratification analyses to represent the US civilian population based on the 2012 American Community Survey.[26]

Measures

Personal background information about respondents were collected in various domains, including demographic characteristics, finances, geographic region, military history, immigration status, incarceration history, public benefits and health insurance.

Lifetime suicidal attempts were assessed with one question that asked: 'In your entire life, did you ever attempt suicide?'

Lifetime homelessness was assessed with one question that asked: 'Since you were 15, did you have a time that lasted at least 1 month when you had no regular place to live-like living on the street or in a car?'

Physical and mental health of respondents were assessed with several measures. Respondents were asked whether they had any of 30 medical conditions in the past 12 months, including HIV/AIDS, cirrhosis, heart disease, cancer, stroke, arthritis, diabetes and tuberculosis. The number of medical conditions for each respondent was summed for a total score.

The Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS-5) is a structured diagnostic interview developed by the National Institute of Alcohol Abuse and Alcoholism. The AUDADIS-5 was used to assess alcohol use disorder, specific drug use disorders, nicotine use disorder and selected mood, anxiety, trauma-related and personality disorders according to criteria as outlined in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5).[27] The AUDADIS-5 has been extensively tested and shown to have good validity and reliability.[28–30] In this study, we examined lifetime mental health and substance use disorder diagnoses.

The Short-Form 12-item health survey, version 2 (SF-12v2)[31] is a widely used measure used to assess health-related quality of life, which generates physical and mental component summary scores. These component summary scores are normed to range from 0 to 100 with a score of 50 representing the average level of functioning in the general population with each 10-point interval representing one SD. Higher scores reflect greater health-related quality of life and the SF-12 has been validated as an outcome measure in various populations.[32–34]

In addition to these health measures, several additional questions were used to assess psychosocial characteristics. The Interpersonal Support Evaluation List shortened 12-item version was used to measure social support.[35] Respondents were asked to rate a series of statements about emotional support (eg, feel that there is no one to share worries and fears with) and instrumental support (eg, would be able to find someone to help with chores if sick) on a 4-point scale from 1 (Definitely false) to 4 (Definitely true). The mean rating of these items was calculated for a social support score.

Data analysis

First, binomial logistic regressions were conducted to compare lifetime suicidal attempts among respondents with and without lifetime homelessness in the total NESARC sample and in subgroups of veterans and non-veterans. Given the large sample sizes, almost all differences were statistically significant. ORs along with 95% CIs were calculated to provide measures of the effect size difference. Then, multivariable logistic regression analyses were conducted to examine associations between lifetime homelessness and suicidal attempts controlling for background characteristics, mental illness, substance use disorders and other psychosocial characteristics among veterans and non-veterans separately. For all analyses, poststratification weights were applied and SPSS V.20.0 was used.

Table 1 Lifetime suicide attempts in subsamples of US veterans and non-veterans with and without a lifetime history of homelessness

	Any lifetime homelessness (n=225)		No lifetime homelessness (n=2876)		Comparison test		
	Raw N	weighted%	Raw N	weighted%	χ^2 (df)	P value	Effect size (φ)
Veterans							
Any lifetime suicide attempts	51	24.5%	101	2.8%	164.25 (1)	<0.011	0.23
	Any lifetime homelessness (n=1455)		**No lifetime homelessness (n=31 569)**		**Comparison test**		
	Raw N	**Weighted %**	**Raw N**	**Weighted %**	**χ^2 (df)**	**P value**	**Effect size (φ)**
Non- v eterans							
Any lifetime suicide attempts	361	23.1%	1479	4.5%	1070.83 (1)	<0.001	0.18

RESULTS

In the total NESARC-III sample, bivariate analyses revealed that 23.3% of respondents with any lifetime homelessness reported lifetime suicide attempts compared to 4.4% of respondents without any lifetime homelessness (OR=6.65, 95% CI 6.64 to 6.6; χ^2=1221.19, p<0.001, φ=0.18). As shown in table 1, these differences were even larger among the subsample of US veterans. Among only veterans, 24.5% of respondents with any lifetime homelessness reported lifetime suicide attempts compared to 2.8% of respondents without any lifetime homelessness (OR=11.10, 95% CI 11.05 to 11.15). Among only non-veterans, 23.1% of respondents with any lifetime homelessness reported lifetime suicide attempts compared to 4.5% of respondents without any lifetime homelessness (OR=6.35, 95% CI 6.33 to 6.36).

Logistic regression analyses were then conducted to examine the association between lifetime homelessness and lifetime suicide attempts controlling for various sociodemographic and

Table 2 Logistic regression analysis estimating the additional variance explained in lifetime suicide attempts by lifetime homelessness net of other variables in the nationally representative sample of adults

	Model 1: Known factors related to suicide			Model 2: Model 1+homeless history		
Variables	Coefficient	OR (95% CI)	P value	Coefficient	OR (95% CI)	P value
Age	−0.02	0.98 (0.98 to 0.98)	<0.001	−0.02	0.98 (0.98 to 0.98)	<0.001
Sex: male	−0.53	0.59 (0.59 to 0.59)	<0.001	−0.56	0.57 (0.57 to 0.57)	<0.001
Marital status: never married	−0.24	0.79 (0.79 to 0.79)	<0.001	−0.23	0.79 (0.79 to 0.80)	<0.001
Annual personal income	−0.05	0.96 (0.96 to 0.96)	<0.001	−0.04	0.96 (0.96 to 0.96)	<0.001
Social support	−0.43	0.65 (0.65 to 0.65)	<0.001	−0.40	0.67 (0.67 to 0.67)	<0.001
Number of medical conditions	0.11	1.11 (1.11 to 1.11)	<0.001	0.10	1.11 (1.11 to 1.11)	<0.001
Lifetime mental health disorders						
Major depressive disorder	1.36	3.89 (3.53 to 3.55)	<0.001	1.36	3.89 (3.88 to 3.90)	<0.001
Bipolar disorder	1.27	3.54 (3.53 to 3.55)	<0.001	1.25	3.49 (3.48 to 3.50)	<0.001
Post-traumatic stress disorder	0.50	1.64 (1.64 to 1.64)	<0.001	0.50	1.64 (1.64 to 1.64)	<0.001
Generalised anxiety disorder	0.03	1.03 (1.03 to 1.03)	<0.001	0.01	1.01 (1.01 to 1.01)	<0.001
Borderline PD	0.90	2.46 (2.46 to 2.47)	<0.001	0.88	2.41 (2.41 to 2.42)	<0.001
Schizotypal PD	0.07	1.07 (1.07 to 1.07)	<0.001	0.05	1.05 (1.05 to 1.05)	<0.001
Antisocial PD	0.59	1.80 (1.79 to 1.80)	<0.001	0.45	1.57 (1.57 to 1.58)	<0.001
Any psychosis	1.09	2.97 (2.96 to 2.98)	<0.001	1.07	2.90 (2.89 to 2.91)	<0.001
Lifetime substance use disorders						
Tobacco	0.43	1.53 (1.53 to 1.54)	<0.001	0.39	1.48 (1.48 to 1.48)	<0.001
Alcohol	0.36	1.43 (1.43 to 1.44)	<0.001	0.33	1.40 (1.39 to 1.40)	<0.001
Cannabis	−0.04	0.96 (0.96 to 0.96)	<0.001	−0.06	0.95 (0.94 to 0.95)	<0.001
Sedatives	0.38	1.46 (1.46 to 1.47)	<0.001	0.38	1.46 (1.45 to 1.46)	<0.001
Heroin	0.27	1.31 (1.30 to 1.32)	<0.001	0.21	1.23 (1.23 to 1.24)	<0.001
Other opioids	0.10	1.10 (1.10 to 1.11)	<0.001	0.08	1.09 (1.08 to 1.09)	<0.001
Cocaine	0.35	1.41 (1.41 to 1.42)	<0.001	0.29	1.34 (1.33 to 1.35)	<0.001
Other stimulants	0.14	1.15 (1.15 to 1.15)	<0.001	0.08	1.08 (1.08 to 1.09)	<0.001
Club drugs	−0.41	0.66 (0.66 to 0.67)	<0.001	−0.37	0.69 (0.69 to 0.69)	<0.001
Hallucinogens	0.32	1.38 (1.37 to 1.39)	<0.001	0.36	1.43 (1.43 to 1.44)	<0.001
Any lifetime homelessness	/			0.67	1.96 (1.95 to 1.96)	<0.001

PD, personality disorder.

psychosocial characteristics. As shown in table 2, in the total NESARC-III sample, lifetime homelessness was significantly and independently associated with lifetime suicide attempts (OR=1.96, 95%CI 1.95 to 1.96). Major depressive disorder, bipolar disorder and borderline personality disorder were also strongly associated with lifetime suicide attempts (OR>2.40). With other variables controlled for, lifetime homelessness accounted for an additional 0.4% of the variance in lifetime suicide attempts.

As shown in table 3, in the subsample of veterans, logistic regression analyses revealed that lifetime homelessness was significantly and independently associated with lifetime suicide attempts (OR=3.75, 95%CI 3.72 to 3.77). Bipolar disorder, borderline personality disorder, antisocial personality disorder and heroin use disorder were also strongly associated with lifetime suicide attempts (OR>2.10). With other variables controlled for, lifetime homelessness accounted for an additional 2% of the variance in lifetime suicide attempts.

As shown in table 4, in the subsample of non-veterans, lifetime homelessness was significantly and independently associated with lifetime suicide attempts (OR=1.83, 95% CI 1.83 to 1.84). Major depressive disorder, bipolar disorder and borderline personality were also strongly associated with lifetime suicide attempts (OR>2.20). Lifetime homelessness accounted for an additional 0.4% of the variance in lifetime suicide attempts after controlling for other variables.

DISCUSSION

In a nationally representative sample of US adults, lifetime rates of attempted suicide were 5.3 times as much among individuals who had been homeless than individuals who had never been homeless (23.3% vs 4.4%). Importantly, this association was even stronger among US veterans as lifetime rates of suicide attempts were 8.8 times as much among veterans with homeless histories compared with veterans with no homeless histories (24.5% vs 2.8%). In general, the strong association between homelessness and suicide is at least partly due to shared common risk factors, such as low income, unemployment, mood and substance use disorders, social isolation and chronic medical conditions.[3–7 14 15] Not surprisingly, we found that serious mental illness was strongly related to suicide attempts and in particular, individuals with mood disorders and/or borderline personality disorder were most likely to have attempted suicide sometime in their lifetime relative to other factors, which is consistent with previous research.[3–7] However, even after controlling for these factors, we found that lifetime homelessness was independently associated with lifetime suicide attempts among both US veterans

Table 3 Logistic regression analysis estimating the additional variance explained in lifetime suicide attempts by lifetime homelessness net of other variables in the subsample of veterans

	Model 1: Known factors related to suicide			Model 2: Model 1+homeless history		
Variables	Coefficient	OR (95% CI)	P value	Coefficient	OR (95% CI)	P value
Age	−0.03	0.97 (0.97 to 0.97)	<0.001	−0.03	0.97 (0.97 to 0.97)	<0.001
Sex: male	−0.87	0.42 (0.42 to 0.42)	<0.001	−0.89	0.41 (0.41 to 0.41)	<0.001
Marital status: never married	−0.53	0.59 (0.58 to 0.59)	<0.001	−0.69	0.50 (0.50 to 0.51)	<0.001
Annual personal income	−0.07	0.94 (0.94 to 0.94)	<0.001	−0.05	0.96 (0.95 to 0.96)	<0.001
Social support	−0.68	0.51 (0.50 to 0.51)	<0.001	−0.65	0.52 (0.52 to 0.52)	<0.001
Number of medical conditions	−0.05	0.97 (0.97 to 0.97)	<0.001	−0.07	0.93 (0.93 to 0.93)	<0.001
Lifetime mental health disorders						
Major depressive disorder	0.55	1.72 (1.72 to 1.73)	<0.001	0.56	1.76 (1.75 to 1.77)	<0.001
Bipolar disorder	0.76	2.14 (2.12 to 2.16)	<0.001	0.79	2.20 (2.17 to 2.22)	<0.001
Post-traumatic stress disorder	0.50	1.64 (1.63 to 1.65)	<0.001	0.51	1.66 (1.65 to 1.67)	<0.001
Generalised anxiety disorder	0.60	1.82 (1.81 to 1.83)	<0.001	0.53	1.69 (1.68 to 1.70)	<0.001
Borderline PD	1.52	4.59 (4.56 to 4.62)	<0.001	1.61	5.01 (4.98 to 5.04)	<0.001
Schizotypal PD	−0.05	0.96 (0.95 to 0.96)	<0.001	−0.11	0.90 (0.90 to 0.91)	<0.001
Antisocial PD	1.11	3.04 (3.02 to 3.06)	<0.001	0.85	2.33 (2.31 to 2.35)	<0.001
Any psychosis	0.92	2.52 (2.50 to 2.55)	<0.001	0.63	1.87 (1.85 to 1.89)	<0.001
Lifetime substance use disorders						
Tobacco	0.19	1.21 (1.20 to 1.22)	<0.001	0.09	1.10 (1.09 to 1.10)	<0.001
Alcohol	0.14	1.15 (1.15 to 1.16)	<0.001	0.04	1.04 (1.04 to 1.05)	<0.001
Cannabis	0.54	1.72 (1.71 to 1.73)	<0.001	0.57	1.77 (1.76 to 1.78)	<0.001
Sedatives	−0.01	0.99 (0.97 to 1.00)	>0.05	0.03	1.03 (1.02 to 1.05)	<0.001
Heroin	1.34	3.81 (3.74 to 3.88)	<0.001	1.11	3.03 (2.97 to 3.09)	<0.001
Other opioids	0.07	1.07 (1.06 to 1.09)	<0.001	−0.01	0.99 (0.97 to 1.00)	>0.05
Cocaine	−0.13	0.88 (0.87 to 0.89)	<0.001	−0.13	0.88 (0.87 to 0.89)	<0.001
Other stimulants	0.38	1.46 (1.44 to 1.48)	<0.001	0.42	1.53 (1.51 to 1.54)	<0.001
Club drugs	−0.40	0.67 (0.66 to 0.69)	<0.001	−0.62	0.54 (0.53 to 0.55)	<0.001
Hallucinogens	0.34	1.41 (1.38 to 1.44)	<0.001	0.14	1.15 (1.12 to 1.17)	<0.001
Any lifetime homelessness	/			1.32	3.75 (3.72 to 3.77)	<0.001

PD, personality disorder.

Table 4 Logistic regression analysis estimating the additional variance explained in lifetime suicide attempts by lifetime homelessness net of other variables in the subsample of non-veterans

	Model 1: Known factors related to suicide			Model 2: Model 1+homeless history		
Variables	Coefficient	OR (95% CI)	P value	Coefficient	OR (95% CI)	P value
Age	−0.03	0.97 (0.97 to 0.97)	<0.001	−0.02	0.99 (0.99 to 0.99)	<0.001
Sex: male	−0.87	0.42 (0.42 to 0.42)	<0.001	−0.54	0.59 (0.58 to 0.59)	<0.001
Marital status: never married	−0.21	0.82 (0.81 to 0.82)	<0.001	−0.20	0.82 (0.82 to 0.82)	<0.001
Annual personal income	−0.07	0.94 (0.94 to 0.94)	<0.001	−0.05	0.96 (0.96 to 0.96)	<0.001
Social support	−0.68	0.51 (0.50 to 0.51)	<0.001	−0.40	0.67 (0.67 to 0.68)	<0.001
Number of medical conditions	−0.05	0.97 (0.97 to 0.97)	<0.001	0.11	1.12 (1.12 to 1.12)	<0.001
Lifetime mental health disorders						
Major depressive disorder	1.41	4.10 (4.09 to 4.10)	<0.001	1.41	4.09 (4.09 to 4.10)	<0.001
Bipolar disorder	1.30	3.68 (3.67 to 3.69)	<0.001	1.29	3.63 (3.62 to 3.64)	<0.001
Post-traumatic stress disorder	0.50	1.65 (1.64 to 1.65)	<0.001	0.50	1.65 (1.64 to 1.65)	<0.001
Generalised anxiety disorder	−0.04	0.96 (0.96 to 0.97)	<0.001	−0.05	0.95 (0.95 to 0.96)	<0.001
Borderline PD	0.85	2.33 (2.32 to 2.33)	<0.001	0.82	2.28 (2.27 to 2.28)	<0.001
Schizotypal PD	0.09	1.09 (1.09 to 1.09)	<0.001	0.07	1.08 (1.07 to 1.08)	<0.001
Antisocial PD	0.53	1.70 (1.69 to 1.70)	<0.001	0.41	1.51 (1.51 to 1.51)	<0.001
Any psychosis	1.10	2.98 (2.98 to 3.00)	<0.001	1.08	2.95 (2.94 to 2.96)	<0.001
Lifetime substance use disorders						
Tobacco	0.44	1.56 (1.56 to 1.56)	<0.001	0.41	1.51 (1.51 to 1.51)	<0.001
Alcohol	0.38	1.46 (1.46 to 1.46)	<0.001	0.36	1.43 (1.43 to 1.43)	<0.001
Cannabis	−0.10	0.90 (0.90 to 0.90)	<0.001	−0.12	0.89 (0.89 to 0.89)	<0.001
Sedatives	0.40	1.49 (1.49 to 1.50)	<0.001	0.40	1.49 (1.48 to 1.49)	<0.001
Heroin	0.17	3.81 (3.74 to 3.88)	<0.001	0.14	1.15 (1.14 to 1.15)	<0.001
Other opioids	0.13	1.14 (1.14 to 1.14)	<0.001	0.12	1.12 (1.12 to 1.13)	>0.05
Cocaine	0.39	1.48 (1.48 to 1.49)	<0.001	0.34	1.41 (1.40 to 1.41)	<0.001
Other stimulants	0.11	1.11 (1.11 to 1.12)	<0.001	0.05	1.05 (1.04 to 1.05)	<0.001
Club drugs	−0.48	0.62 (0.62 to 0.62)	<0.001	−0.44	0.64 (0.64 to 0.65)	<0.001
Hallucinogens	0.34	1.41 (1.40 to 1.42)	<0.001	0.39	1.48 (1.47 to 1.49)	<0.001
Any lifetime homelessness	/			0.61	1.83 (1.83 to 1.84)	<0.001

PD, personality disorder.

and non-veterans. Adjusting for other factors, veterans with a history of homelessness had more than three times the odds of having attempted suicide sometime in their lifetime than veterans with no history of homelessness. Among non-veterans, there was a similar, although weaker association, as individuals with a history of homelessness had 1.8 times the odds of attempting suicide compared with those with no history of homelessness.

This finding is important because homelessness and suicide have not typically been considered related. In point of fact, most healthcare organisations offer homeless services and suicide prevention services quite separately when there may actually be considerable overlap in the people who needs these services. It should be stated that we cannot determine the direction of the association between homeless history and suicide attempts, but relation can be bidirectional with each influencing the other. For example, housing instability may cause distress and exacerbate underlying mental health conditions which increases one's risk for suicide. Conversely, thoughts and attempts to commit suicide may impair one's functioning and ability to attend to regular responsibilities such as maintaining one's housing.

Further, our finding that homelessness and suicide appear to be strongly linked among US veterans accords with a previous study.[20] It is not clear exactly why this link is stronger among veterans than non-veterans. Certainly, there has been considerable research on the social readjustment difficulties of returning veterans and these challenges may contributed to increased risk for suicide.[36 37] Another speculation is that veterans who are engaged in the VHA's healthcare system, despite being sicker, receive a comprehensive array of service that reduces their homeless and suicide risk whereas veterans who are not in the VHA system may be more vulnerable to both homelessness and suicide.[38] Alternatively, some theorise that veterans are a subpopulation that has faced more early-life adversities than those in the general population[39 40] and these premilitary factors coupled with military-related factors create a vulnerable group of veterans who are at high-risk for both homelessness and suicide.[41–43] Clearly, more research is needed in this area to better elucidate the specific mechanisms underlying the relation between homelessness and suicide.

There are several limitations of the study worth noting. First, the study used a cross-sectional design so the directionality and causal relation between variables cannot be determined. Second, both homelessness and suicide were assessed within a lifetime frame so data on the timing of either event and whether either event occurred multiple times were not available. Third, only lifetime homelessness since the age of 15 was assessed and there is a body of literature showing childhood adverse effects including childhood homelessness is predictive of later adult

homelessness.[15 44] Finally, while psychiatric diagnoses were assessed with structured clinical interviews, medical problems were based on self-report and so their validity is unknown. These limitations are counterbalanced by the strengths of the study including use of a large population-based sample, multivariable analyses adjusting for potential confounds, analysis of veterans and non-veterans separately and the focus on two major public health concerns.

The VHA's current top clinical priority is addressing veteran suicides and there are considerable resources being dedicated to this priority including coordination of VA mental health services, hiring of suicide prevention coordinators and predictive modelling to identify high-risk individuals.[21–23] However, VHA homeless services are not conceptualised as part of suicide prevention despite tens of billions of dollars spent on preventing and ending veteran homelessness.[45] Additionally, it is well-documented that the majority of veterans who commit suicide are not enrolled in VHA services.[21] VHA homeless services are unique because they include outreach to veterans outside of the VHA system who may be at high-risk for homelessness and suicide. The VHA and other healthcare systems may benefit from synergies developed between homeless and suicide prevention services in this era of integrated care.

What is already known on this subject

► Homelessness and suicide are major public health problems that share many common risk factors. In the Veterans Health Administration, there are separate prevention efforts to end homelessness and prevent suicides.

What this study adds

► This study reveals that homelessness and suicide are strongly associated with each other, after controlling for their common risk factors. Synergising suicide prevention and homeless services may better serve high-risk populations.

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