### It is illegal to post this copyrighted PDF on any website. Association of Recent and Past Suicide Attempts With Health-Related Quality of Life

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#### ABSTRACT

**Background:** Suicide prevention is a major public health priority. The effectiveness of suicide prevention initiatives is typically assessed by reductions in incidents of suicidal behavior. However, the association of suicide attempts with changes in measures of overall health-related quality of life (HRQOL) has been understudied.

**Methods:** Nationally representative data from 36,309 adults from the 2012–2013 National Epidemiologic Survey on Alcohol and Related Conditions Wave III (NESARC-III) were used to compare 3 groups: individuals with any suicide attempt in the past 3 years, individuals with a suicide attempt prior to the past 3 years, and those with no prior attempts. Using the 12-item Short Form (SF-12) items, standard measures of mental component score (MCS) and physical component score (PCS) of HRQOL and of quality-adjusted life-years (QALYs) were constructed and compared across these groups. Multivariable regression analyses adjusted scores for sociodemographic, diagnostic, and behavioral covariates.

**Results:** Overall, 1.0% (n = 355) reported an attempt in the last 3 years, 4.3% (n = 1,569) reported an attempt prior to the past 3 years, and 94.7% (n = 34,385) had no prior attempt. In unadjusted analysis, individuals with recent attempts reported much lower MCS scores compared to individuals with no prior attempts (-13.5 points; 95% confidence interval [CI], -15.4 to -11.6) as well as those with past attempts (-7.7 points; 95% CI, -8.5 to -7.0). QALYs were also much lower (-0.13; 95% CI, -0.14 to -0.11 for those with recent attempts and -0.09; 95% CI, -0.10 to -0.08 for those with past attempts, respectively). Adjustment for correlated factors, especially psychiatric disorders and substance use disorders, accounted for 75%-86% of the association of recent and past suicide attempts with MCS-HRQOL and 89%-91% of QALYs; ie, these factors were largely incorporated in these measures of HRQOL.

**Conclusions:** Individuals with relatively recent suicide attempts report significantly lower MCS-HRQOL and QALYs compared to both individuals with no prior attempts and individuals with more remote attempts. Psychiatric and substance use comorbidities account for most but not all of the group differences in these measures and thus provide a brief approach to assessing suicide prevention initiatives encompassing multiple aspects of well-being and providing a basis for future cost-benefit analysis.

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he number of deaths by suicide in the US has increased by over 60% in recent decades from 29,199 in 1999 to 48,344 in 2018.<sup>1</sup> Suicide attempts are the single most important predictor of suicide and have also increased in recent decades.<sup>2-5</sup> The rate of suicide in the year after a nonfatal attempt has been estimated to be up to 100 times higher than the death rate among community controls.<sup>6–9</sup> In view of this risk, much attention has been focused on the development of interventions to prevent post-attempt, future suicidal behavior. These interventions include simple phone calls and supportive messages sent by mail, intensive case management, enhanced screening programs, and intensive psychotherapies and pharmacologic interventions.<sup>10,11</sup> These interventions range widely in costs due to their substantial differences in resource requirements but there has been little study of differences in their cost-effectiveness, an important consideration for policy makers.

An essential feature of the evaluation of any intervention is the measure of outcomes. Simply evaluating the likelihood of further suicide attempts may be the simplest outcome to measure, but broader indicators of quality of life are needed for comprehensive evaluation of well-being. The critical measure for cost-effectiveness analysis is quality of life. While there are several useful measures of physicaland mental health-related quality of life (HRQOL), the measure recommended for cost-effectiveness analysis is quality-adjusted life-years (QALYs), which was developed to quantify the impact of disease states on well-being.<sup>12-15</sup> While a large number of studies have investigated the impact of chronic medical and mental health conditions on HRQOL or QALYs,16-21 few have attempted to quantify the association of suicide attempts with HRQOL and QALYs and specifically how the indicators may worsen, improve, or remain constant over the years after a suicide attempt.

One study of individuals enrolled in a clinical trial in Australia<sup>22</sup> found that those who reported prior suicide attempts had significantly poorer physical and mental HRQOL compared to the general population. However, a second community-based study in Australia<sup>23</sup> found no significant difference in mental or physical HRQOL between 60 individuals with past-year suicide attempts and individuals with no prior suicide attempts, but this null result emerged after adjusting for differences in demographic factors and diagnoses of depression

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#### **Clinical Points**

- The association of suicide attempts with changes in measures of overall health-related quality of life (HRQOL) has been understudied.
- Individuals with relatively recent suicide attempts report significantly lower mental component summary of HRQOL scores and quality-adjusted life-years (QALYs) compared to those with no prior attempts or with more remote attempts.
- Significant impairment in HRQOL highlights the importance and continuing need for suicide prevention and underscores the value of measuring patient-centered outcomes in suicide research.

and anxiety. Of note, neither of these studies attempted to quantify the burden of suicide attempts in QALYs.

In the absence of large, costly longitudinal studies, we propose that an initial step toward examining the relationship between suicide attempts and both HRQOL and QALYs is by examining cross-sectional survey data that include extensive information on a large number of individuals who either reported suicide attempts over diverse time intervals or report no past suicide attempts. Quantifying the broader burden of suicide attempts as associated with HRQOL not only may help provide a foundation for evaluating the cost-effectiveness of prevention efforts, but also would allow comparison with the HRQOL of other disease states. In addition, understanding how broad indicators of wellbeing change after a suicide attempt may help to identify individuals at greater risk of future suicidal behavior, since greater HRQOL has been proposed as a protective factor for future suicidal behavior.<sup>24,25</sup>

In this study, we used nationally representative survey data from the National Epidemiologic Survey on Alcohol and Related Conditions Wave III (NESARC-III) to compare the HRQOL, QALYs, and other sociodemographic and clinical characteristics of 3 groups: adults with suicide attempts in the past 3 years, adults with attempts prior to the past 3 years, and adults with no prior suicide attempts. We then adjusted for differences between the groups on sociodemographic and clinical characteristics to determine the magnitude of differences in HRQOL and QALYs. We thus hoped to identify substantive differences in quality of life between groups defined by their presumed level of suicidality and to provide data that may inform clinical assessment of individuals after a suicide attempt and the planning of future cost-effectiveness studies of suicide prevention programs.

#### **METHODS**

#### **Data Source and Study Sample**

We used restricted data from the NESARC-III, sponsored by the National Institute on Alcohol Abuse and Alcoholism (NIAAA).<sup>26</sup> The NESARC-III is a nationally representative cross-sectional survey, conducted from April 2012 through June 2013, of physical and mental health diagnoses,

civilian adults aged 18 years or older. Respondents were selected through multistage probability sampling techniques. Racial/ethnic minorities (eg, Black, Asian, and Hispanic individuals) were oversampled to ensure reliable estimates of these groups. In-person structured interviews were conducted by trained lay interviewers and excluded individuals who were institutionalized (eg, those in nursing homes, prisons, hospitals, or shelters). Lay interviewers were trained through a combination of individual study materials, dyad role playing, and practice exercises. With an overall response rate of 60.1%, the total original sample of NESARC-III included 36,309 US adults.<sup>26</sup> The current study was approved by the Institutional Review Boards of the VA Connecticut Healthcare System and Yale School of Medicine. Further details of the survey, including descriptions, questionnaires, sampling methodology, and datasets, are available on the NESARC-III website.<sup>26</sup>

#### Measures

Suicide attempts. People who had made suicide attempts in the past were identified through a series of questions that asked if the respondent had ever attempted suicide and their age at the most recent attempt. The number of years since their most recent attempt was calculated by subtracting the age at their most recent attempt from their current age. Respondents were then classified into 3 groups: those reporting their most recent suicide attempt in the past 3 years, those reporting their most recent suicide attempt in greater than 3 years, or those who reported no prior suicide attempts. While some prior studies have used the median as a cutoff point for comparison,<sup>27,28</sup> which was 5 years since last attempt in the current study, 3 years was chosen as the time frame for recent attempts because it afforded a substantially large analytic group and we sought to minimize potential recall bias.

HRQOL. Health-related quality of life is a patientreported indicator of health status and assesses subjective evaluation of the impact of disease on biopsychosocial wellbeing from both physical and mental health perspectives. Developed as part of the Medical Outcomes Study (MOS), the 12-item Short Form (SF-12) survey is a standardized questionnaire asking patients about their health states such as physical functioning, social functioning, role limitations, emotions, and general health vitality.<sup>12</sup> On the basis of these 12 items, we constructed the two standard continuous summary variables, mental component summary (MCS) and physical component summary (PCS), using standard scoring algorithms that score the national averages for these measures as 50 and each standard deviation as a difference of 10 points above or below this average.<sup>29,30</sup>

QALYs. Quality-adjusted life-years, on the other hand, represent a patient-reported, preference-based indicator of health state desirability on a cardinal scale for which 0 indicates a state worse than or equal to death and 1 indicates perfect health.<sup>14</sup> Using a published algorithm,<sup>13</sup> we constructed a continuous QALYs variable that is also

# in line with the widely used EuroQOL-5D approach using responses to items in the SF-12.<sup>13</sup>

**Sociodemographic variables.** Sociodemographic variables addressed include age, gender, race/ethnicity, marital status, family income, employment, education, health insurance, veteran status, and rurality.

**Psychiatric disorders.** Psychiatric disorders were based on the Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5),<sup>31</sup> which is based on criteria from the *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition (*DSM-5*),<sup>32</sup> for any of the following past-year psychiatric disorders: major depressive disorder, dysthymia, bipolar I disorder, generalized anxiety disorder, posttraumatic stress disorder, and panic disorder. The AUDADIS-5 was administered to all NESARC-III participants and is a fully structured, computer-assisted diagnostic interview that is designed for trained lay interviewers.

*Substance use disorders.* Substance use disorders (SUDs) were also based on the AUDADIS-5 and included past-year alcohol use disorder (AUD) and other SUDs (including past-year and lifetime heroin, club drug, inhalants/solvent, cocaine, stimulant, hallucinogen, cannabis, opioid, and sedative use disorders).

*Multimorbidity for past-year psychiatric and SUD diagnoses.* Multimorbidity for past-year psychiatric and SUD diagnoses was represented by one dichotomous variable indicating the presence of only one such diagnosis and another indicating two or more such diagnoses.

*Medical comorbidities.* Medical comorbidities were assessed by asking about the presence of 17 chronic medical conditions (eg, arthritis and diabetes) in the past 12 months. If respondents answered "yes," they were further asked whether this diagnosis was confirmed by a doctor or other health professional. Those responding "yes" to both questions were categorized as having the medical condition in question.<sup>33</sup> We used these responses to create a categorical variable for 0, 1, 2–4, or 5 or more chronic medical conditions. In addition, self-reported pain symptoms in the past 4 weeks were assessed using a 5-point Likert scale (never or a little versus moderately, quite a bit, or extremely).

**Behavioral factors.** Behavioral factors included 5 dichotomous questions concerning parental experiences of problem drinking, drug use, incarceration, psychiatric hospitalization, or a suicide attempt.<sup>34–36</sup>

#### **Analytic Plan**

First, we tested proportional differences in sociodemographic characteristics among the 3 comparison groups (never suicide attempts, past attempts, and recent attempts). We also investigated how each sociodemographic factor was associated with (1) recent attempts versus never attempts, (2) past attempts versus never attempts, and (3) recent attempts versus past attempts using bivariate logistic regression models. We reported bivariate odds ratios and 95% confidence intervals (CIs) to compare risk relationship between each sociodemographic factor and suicide attempt **ighted PDF on any website** status. For clinical factors (ie, co-occurring psychiatric disorders and SUDs), we repeated the same analyses.

Second, we investigated whether HRQOL and QALYs differed significantly between the 3 suicide attempt comparison groups. We reported mean and standard deviation for each suicide attempt comparison group. Because bivariate significance testing (eg, *t* tests) can be less meaningful in studies with a large sample size and our central interest is in the magnitude of differences, we report Cohen d,<sup>25</sup> an indicator of effect size (ie, difference in means divided by the pooled standard deviation) to compare the same 3 pairs of groups on continuous variables. In the bivariate analyses, we checked for collinearity before building multivariable models.

Third, in a series of multivariable analyses, we sought to understand the independent association of past and recent suicide attempts with MCS-HRQOL, PCS-HRQOL, and QALYs, controlling for sociodemographic or clinical factors in 4 models, and reciprocally the proportion of difference in HRQOL measures between groups that was explained by other health status measures. Model 1 was adjusted for age only. Model 2 was identical to Model 1 but with adjustment for additional sociodemographic factors. Model 3 was adjusted for sociodemographic factors and medical comorbidities. Finally, model 4 was adjusted for the previous covariates plus comorbid psychiatric and SUD diagnoses.

We used Stata MP/6-Core 15.1 for all analyses (StataCorp LP, 2017) and employed the svy commands in Stata to account for the complex survey sampling design of the NESARC-III (eg, unequal probability of selection, clustering, and stratification).

#### RESULTS

#### Sociodemographic Characteristics of the Sample

In the total study sample of 36,309 individuals, 1.0% reported an attempt in the last 3 years (n = 355 respondents, representing 2,145,949 individuals), 4.3% reported an attempt prior to the past 3 years (n = 1,569 respondents, representing 9,579,038 individuals), and 94.7% (n = 34,385) reported no prior attempt. Among the 1,924 individuals who reported lifetime suicide attempts, the mean time since the most recent attempt was  $16.2 \pm 13.5$  years, the median was 5 years, and the interquartile range was 13-25 years.

Adults with recent suicide attempts in the past 3 years, compared to adults with no prior attempts, were significantly younger; more likely to be female, be never married, be widowed or divorced, make less than \$20,000 per year, be unemployed, and be on Medicaid; and less likely to have graduated from high school or college (Table 1).

Very similar sociodemographic characteristics differentiated adults with attempts prior to the past 3 years and adults with no prior attempts, although the magnitude of the difference was smaller (Table 1). Similarly, adults with recent attempts, compared to adults with attempts prior to the past 3 years, were younger; less likely to be female more likely to be non-Hispanic Black, be never married, be

Table 1. Sociodemographic Characteristics of US Adults by Recency of Suicide Attempt <sup>a</sup>									
	Never	Attempted but not	Attempted in the	Bivariate Odds Ratio (95% CI)					
Characteristic	Attempted (1)	in the Past 3 Years (2)	Past 3 Years (3)	(2) vs (1)	(3) vs (1)	(3) vs (2)			
Sample size									
Unweighted sample, n	34,385	1,569	355						
Weighted population, n	223,686,971	9,579,038	2,145,949						
Row %	95.0	4.1	0.9						
Age, y									
18–44	47.0	50.1	76.3	Reference	Reference	Reference			
45–64	34.9	41.5	21.2	1.11 (0.98 to 1.26)	0.37 (0.29 to 0.49)***	0.34 (0.25 to 0.45)***			
65+	18.1	8.4	2.6	0.43 (0.35 to 0.54)***	0.09 (0.05 to 0.15)***	0.20 (0.10 to 0.37)***			
Gender				. ,	. ,	. ,			
Male	48.9	31.4	40.6	Reference	Reference	Reference			
Female	51.1	68.6	59.5	2.09 (1.81 to 2.42)***	1.40 (1.06 to 1.85)*	0.67 (0.49 to 0.92)*			
Race/ethnicity				. ,		. ,			
Non-Hispanic White	65.9	72.6	65.2	Reference	Reference	Reference			
Non-Hispanic Black	11.9	9.1	11.9	0.69 (0.59 to 0.82)***	1.01 (0.71 to 1.43)	1.45 (1.04 to 2.04)*			
Hispanic	14.8	13.5	16.8	0.83 (0.68 to 1.00)	1.15 (0.86 to 1.55)	1.39 (0.99 to 1.95)			
Other <sup>b</sup>	7.4	4.8	6.1	0.59 (0.43 to 0.80)**	0.83 (0.46 to 1.50)	1.42 (0.70 to 2.90)			
Marital status						·····,			
Married	51.9	40.8	22.5	Reference	Reference	Reference			
Never married	22.4	21.0	43.5	1.20 (1.03 to 1.39)*	4.48 (3.09 to 6.49)***	3.75 (2.57 to 5.47)***			
Other <sup>c</sup>	25.7	38.2	34.0	1.89 (1.62 to 2.20)***	3.05 (2.01 to 4.64)***	1.62 (1.03 to 2.54)*			
Family income. \$									
< 20.000	22.1	34.8	48.1	Reference	Reference	Reference			
20.000-39.999	24.0	28.0	23.2	0.74 (0.64 to 0.86)***	0.44 (0.32 to 0.62)***	0.60 (0.42 to 0.85)**			
≥40.000	54.0	37.2	28.7	0.44 (0.38 to 0.50)***	0.24 (0.17 to 0.35)***	0.56 (0.39 to 0.81)**			
Employment	00	<i></i>	2017						
No	29.6	36.0	38.5	Reference	Reference	Reference			
Yes	70.4	64.0	61.5	0.75 (0.67 to 0.84)***	0.67 (0.52 to 0.87)**	0.90 (0.69 to 1.17)			
Education		0.10	0.10		(0.02 00 0.07)				
< High school	12.8	14.3	25.4	Reference	Reference	Reference			
High school or	25.6	29.7	28.7	1.04 (0.85 to 1.27)	0.57 (0.40 to 0.81)**	0.54 (0.36 to 0.83)**			
equivalent	20.0	22.7	2017			0.0 . (0.00 to 0.00)			
Some college	32.8	39.2	36.2	1.07 (0.89 to 1.29)	0.56 (0.40 to 0.77)**	0.52 (0.36 to 0.769)**			
> Bachelor's degree	28.8	16.8	97	0.52 (0.42  to  0.65) ***	0.17 (0.10  to  0.28)***	0 32 (0 19 to 0 57)***			
Insurance coverage <sup>d</sup>	20.0	10.0	2.1	0.52 (0.72 (0 0.03)	0.17 (0.10 (0 0.20)	0.52 (0.15 (0.057)			
Private	58 5	45.6	39.4	0.60 (0.53 to 0.67)***	0.46 (0.34 to 0.62)***	0 78 (0 56 to 1 08)			
Medicare	21.4	21.7	17.6	1.02(0.86  to  1.20)	0.78 (0.54 to 1.00)	0.77 (0.53  to  1.00)			
Medicaid	97	20.3	26.6	2 37 (2 04 to 2 76)***	336(255 to 443)***	1 42 (1 03 to 1 96)*			
Other <sup>e</sup>	Δ5 1	20.5 40 A	20.0	0.82 (0.73 to 0.02)**	0.57 (0.43 to 0.74) ***	$0.60(0.51 \pm 0.02)$			
Votoran status	45.1	40.4	0.1C	0.02 (0.75 (0.95)	0.57 (0.45 (0.0.74)	0.07 (0.31 (0.0.92)			
No	90.3	92.8	01 1	Reference	Reference	Reference			
Voc	90.5	7 C	۱.۱۶ ۵۵	0.72 (0.56 to 0.02)**	$0.00(0.54 \pm 0.1.51)$	1 26 (0 75 to 2 11)			
IIrban residence	9.0	1.2	0.7	0.72 (0.30 to 0.92)	0.50 (0.54 (0 1.51)	1.20 (0.75 t0 2.11)			
Pural	21.2	21.7	22.2	Poforonco	Poforonco	Poforonco			
nuidi Urban	Z1.Z	ZI./ 70 0	23.3 76 7	0.07 (0.70 + 0.1.20)		$\frac{1}{10000000000000000000000000000000000$			
UIDdll	/0.0	/0.5	/0./	0.97 (0.79 to 1.20)	0.09 (0.02 (0 1.28)	0.91 (0.39 (0 1.40)			

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<sup>a</sup>Data are from National Epidemiologic Survey on Alcohol and Related Conditions III.<sup>26</sup> Values are shown as weighted column % unless otherwise noted. <sup>b</sup>Includes Asian and other racial/ethnic groups.

<sup>c</sup>Includes divorced, separated, widowed, partnered, or other.

<sup>d</sup>Each insurance type has a response of yes or no.

<sup>e</sup>Includes other government or state-sponsored health insurance plans or programs.

\*P<.05. \*\*P<.01. \*P<.001.

widowed or divorced, make less than \$20,000 per year, and be on Medicaid; and less likely to have graduated from high school or college.

#### Psychiatric, Substance Use, and Medical Comorbidities

In regard to clinical characteristics, approximately 78% and 49% of individuals with recent attempts in the past 3 years had at least 1 psychiatric disorder and SUD, respectively (Table 2). Compared to individuals with no prior suicide attempts, individuals with recent attempts had much greater likelihood of having a psychiatric diagnosis or SUD, with odds ratios ranging from 4.3 for AUD to 37.6 for psychiatric multimorbidity. Individuals with recent attempts were also significantly more likely than individuals with no prior attempts to have greater medical comorbidities, pain, parental adverse events, especially of a suicide attempt, and histories or incarceration or homelessness (Table 2).

Individuals with past suicide attempts greater than 3 years ago were also significantly more likely than individuals with no prior attempts to have psychiatric disorders and SUDs, although the magnitude of the differences between the two groups was smaller (Table 2).

Finally, compared to individuals with past attempts greater than 3 years ago, individuals with recent attempts had significantly greater odds of having psychiatric disorders and SUDs, with odds ratios of 2.6 for both any psychiatric disorder and 1 SUD. They were also significantly more likely to have a history of incarceration or homelessness. There were no differences in medical comorbidities or parental adverse events between these two groups (Table 2).

## Table 2. Clinical and Behavioral Comorbidities of US Adults by Recency of Suicide Attempt<sup>a</sup>

		Attempted					
	Never	but not in	Attempted	Bivariate Odds Ratio (95% Cl)			
Variable	Attempted (1)	Years (2)	3 Years (3)	(2) vs (1)	(3) vs (1)	(3) vs (2)	
Sample size							
Unweighted sample, n	34,385	1,569	355				
weighted population, h (row %)	(95.0)	9,579,038 (4 1)	2,145,949				
Past-Year Psychiatric Disorder	(55.6)	()	(0.5)				
Any psychiatric disorder	16.2	57.5	77.9	7.00 (6.10 to 8.03)***	18.19 (13.27 to 24.94)***	2.60 (1.87 to 3.62)***	
Major depressive disorder (hierarchical)	9.1	32.1	50.2	4.74 (4.07 to 5.51)***	10.09 (7.92 to 12.87)***	2.13 (1.58 to 2.88)***	
Dysthymia (hierarchical)	2.4	14.6	24.3	6.88 (5.53 to 8.41)***	12.90 (8.80 to 18.91)***	1.88 (1.24 to 2.85)**	
Bipolar disorder	1.1	8.8	13.8	8.62 (6.69 to 11.12)***	14.19 (9.83 to 20.48)***	1.65 (1.11 to 2.44)*	
Posttraumatic stress disorder	3.7	21.0	33.2	6.94 (5.80 to 8.31)***	12.97 (9.32 to 18.06)***	1.87 (1.36 to 2.58)***	
Panic disorder	2.5	12.0	21.3	5.29 (4.32 to 6.48)***	10.53 (7.87 to 14.10)***	1.99 (1.47 to 2.70)***	
No. of psychiatric disorders							
None	83.8	42.5	22.2	Reference	Reference	Reference	
>2	5.0	27.0	20.0 49.3	4.65 (4.16 to 5.64)	37.60 (26.45 to 53.47)***	3.16 (2.17 to 4.62)***	
Lifetime Personality Disorder	510	2000	1710		57100 (20110 to 50117)	5110 (211) to 1102)	
Antisocial personality disorder	3.6	17.7	22.8	5.78 (4.73 to 7.05)***	7.96 (5.62 to 11.27)***	1.38 (1.00 to 1.89)*	
Borderline personality disorder	8.2	43.1	60.8	8.47 (7.35 to 9.75)***	17.39 (13.50 to 22.40)***	2.05 (1.51 to 2.80)***	
Schizotypal personality disorder	5.2	16.2	33.5	6.44 (5.56 to 7.45)***	9.17 (6.80 to 12.38)***	1.42 (1.01 to 2.02)*	
Past-Year Substance Use Disorder							
Alcohol use disorder	13.3	21.3	39.6	1.76 (1.53 to 2.03)***	4.27 (3.21 to 5.66)***	2.43 (1.76 to 3.34)***	
Any substance use disorder	2.2	65	145	2 02 (2 27 to 2 05)***	7 22 (1 90 to 11 16)***	2 /2 /1 /7 to 2 09)**	
Sedative use disorder	0.3	1.6	5.5	6.04 (3.26 to 11.19)***	21.55 (12.72 to 36.51)***	3.57 (1.51 to 8.42)**	
Opioid use disorder	0.8	3.1	10.7	3.99 (2.81 to 5.66)***	15.05 (10.24 to 22.12)***	3.78 (2.11 to 6.74)***	
Cocaine use disorder	0.3	1.5	3.4	5.70 (3.23 to 10.04)***	12.85 (6.14 to 26.87)***	2.26 (1.00 to 5.10)	
Hallucinogen, stimulant, inhalant/solvent_or_club_drug	0.4	1.4	4.2	3.77 (1.94 to 7.33)***	11.95 (6.22 to 22.95)***	3.17 (1.31 to 7.64)*	
use disorder							
No. of alcohol and substance							
use disorders				5.6	D (	D (	
None 1	85.I 13.0	/4.2 18.0	51.0 34.2	1 68 (1 44 to 1 95)***	Keterence 4 40 (3 20 to 6 06)***	Reference	
≥2	1.9	7.0	14.9	4.11 (3.12 to 5.41)***	12.76 (8.75 to 18.62)***	3.10 (1.88 to 5.12)***	
Tobacco use disorder	18.8	42.8	47.5	3.23 (2.81 to 3.71)***	3.90 (3.00 to 5.08)***	1.21 (0.92 to 1.59)	
Medical Comorbidity and Pain							
Any medical comorbidity No. of chronic conditions	59.8	74.3	73.6	1.95 (1.68 to 2.26)***	1.88 (1.37 to 2.56)***	0.96 (0.69 to 1.34)	
None	40.2	25.7	26.4	Reference	Reference	Reference	
1	25.5	25.6	24.7	1.57 (1.33 to 1.86)*** 1.82 (1.54 to 2.15)***	1.48 (1.04 to 2.10)* 1.93 (1.35 to 2.77)***	0.94 (0.65 to 1.36)	
≥5	5.4	15.2	12.2	4.37 (3.47 to 5.50)***	3.41 (2.15 to 5.41)***	0.78 (0.49 to 1.25)	
Pain (in the past 4 weeks)				(	··· ( · · · · · · )		
Never, or a little bit	81.0	60.4	57.5	Reference	Reference	Reference	
Moderately, quite a bit, or	19.0	39.6	42.5	2.80 (2.42 to 3.25)***	3.16 (2.49 to 4.01)***	1.13 (0.87 to 1.46)	
Rehavioral History							
Parental adverse events							
Alcohol/problem drinker	22.1	47.6	43.5	3.19 (2.81 to 3.62)***	2.71 (2.15 to 3.42)***	0.85 (0.65 to 1.12)	
Drug user	5.1	18.8	24.4	4.34 (3.64 to 5.18)***	6.04 (4.53 to 8.06)***	1.39 (0.98 to 1.97)	
Incarceration	7.0	20.2	25.3	3.37 (2.86 to 3.97)***	4.50 (3.50 to 5.77)***	1.33 (0.99 to 1.79)	
illness	4.8	10.5	15.9	3.88 (3.25 to 4.63)***	3.73 (2.63 to 5.30)***	0.96 (0.65 to 1.42)	
Suicide attempt No. of parental adverse events	2.0	13.3	18.3	J.08 (4.54 t0 /.11)***	0.23 (0.00 to 11.36)***	1.45 (0.99 (0 2.14)	
Never	72.5	40.8	42.0	Reference	Reference	Reference	
1	18.6	28.7	27.1	2.74 (2.35 to 3.20)***	2.51 (1.85 to 3.41)***	0.92 (0.65 to 1.28)	
$\geq 2$	8.9	30.5	31.0	6.12 (5.24 to 7.13)***	6.03 (4.41 to 7.88)***	0.99 (0.71 to 1.36)	
Homelessness history	11.4 4.4	28.2 21 7	37.0 27.7	5.04 (2.04 to 3.51)*** 6.07 (5.22 to 7.06)***	4.00 (3.38 t0 6.08)*** 8.40 (6.20 to 11 39)***	1.33 (1.17 (0 2.02)** 1.38 (1.01 to 1 90)*	
<sup>a</sup> Data are from National Enidemiolog		cohol and Pol		ns III <sup>26</sup> Values are shown as	weighted column % unloss	otherwise noted	

<sup>a</sup>Data are from National Epidemiologic Survey on Alcohol and Related Conditions III.<sup>26</sup> Values are shown as weighted column % unless otherwise noted. \*P<.05. \*\*P<.01. \*\*\*P<.001. 

Table 3. Health-Related	Quality of Life a	Attempted but	Attempted	ears of US Adults by	Recency of Suicide F	Attempt	
	Never Attempted	not in the Past	in the Past	Cohen <i>d</i> (95% Cl)			
Variable	(1)	3 Years (2)	3 Years (3)	(3) vs (1)	(2) vs (1)	(3) vs (2)	
Health-related quality of life							
MCS	50.9±9.8	42.9±12.7	37.3±12.9	-1.37 (-1.48 to -1.27)	-0.80 (-0.85 to -0.74)	-0.44 (-0.56 to -0.32)	
PCS	49.5±10.5	45.3±12.8	46.1±12.5	-0.33 (-0.43 to 0.22)	-0.40 (-0.45 to -0.35)	0.06 (-0.06 to 0.18)	
Quality-adjusted life-years							
EQ-5D	$0.89 \pm 0.12$	$0.81 \pm 0.15$	$0.77 \pm 0.14$	-1.00 (-1.11 to -0.90)	-0.74 (-0.79 to -0.68)	-0.21 (-0.32 to -0.09)	

DDE

<sup>a</sup>Data are from National Epidemiologic Survey on Alcohol and Related Conditions III.<sup>26</sup> Values are shown as mean ± SD unless otherwise noted. Abbreviations: EQ-5D=EuroQOL-5D, MCS=SF-12 mental component summary, PCS=SF-12 physical component summary, SF-12=12-item Short Form.

## Table 4. Multivariable Analyses of Association Between Recency of Suicide Attempt and Health-Related Quality of Life (QOL) and Quality-Adjusted Life-Years (QALYs) Among US Adults<sup>a</sup>

	QOL-MCS		QOL-PCS		QALYs			
Model (reference group)	b	95% Cl; P	b	95% Cl; P	b	95% CI; P		
Model 1: Suicide Attempt and Age								
Recency of suicide attempt (Never attempted) Attempted in the past 3 years Attempted but not in the past 3 years	-13.49 -7.74	-15.35 to -11.63; < .001 -8.49 to -6.98; < .001	-4.73 -5.12	-5.99 to -3.46; < .001 -6.01 to -4.24; < .001	-0.13 -0.09	-0.14 to -0.11; < .001 -0.10 to -0.08; < .001		
Model 2: Suicide Attempt and Demographic Factors								
Recency of suicide attempt (Never attempted) Attempted in the past 3 years Attempted but not in the past 3 years	-11.79 -6.53	-13.61 to -9.97; < .001 -7.28 to -5.78; < .001	-2.13 -3.51	-3.30 to -0.97; < .001 -4.34 to -2.67; < .001	-0.09 -0.07	-0.11 to -0.08; <.001 -0.08 to -0.06; <.001		
Model 3: Suicide Attempt, Demographic Factors, and Medical Comorbidities								
Recency of suicide attempt (Never attempted) Attempted in the past 3 years Attempted but not in the past 3 years	-10.01 -5.10	-11.73 to -8.29; < .001 -5.88 to -4.33; < .001	2.23 -0.03	1.01 to 3.46; < .001 -0.60 to 0.55; .922	-0.05 -0.03	-0.06 to -0.03; < .001 -0.04 to -0.03; < .001		
Model 4: Suicide Attempt; Demographic Factors; Medical, Psychiatric, and SUD Comorbidities								
Recency of suicide attempt (Never attempted) Attempted in the past 3 years Attempted but not in the past 3 years	-3.41 -1.08	-4.87 to -1.95; <.001 -1.79 to -0.38; .003	1.64 -0.30	0.40 to 2.88; .010 -0.88 to 0.29; .318	-0.01 -0.01	-0.02 to 0.01; .219 -0.01 to -0.00; .005		
		L. LC 11.1 111.26						

<sup>a</sup>Data are from National Epidemiologic Survey on Alcohol and Related Conditions III.<sup>40</sup> Abbreviations: MCS = SF-12 mental health component summary score, PCS = SF-12 physical health component summary score, SF-12 = 12-item Short Form, SUD = substance use disorder.

#### Health-Related Quality of Life

Individuals with recent suicide attempts (ie, in the past 3 years) reported substantially lower unadjusted MCS scores than those with no prior attempts, with an effect size of -1.37 (95% CI, -1.48 to -1.27) (Table 3). Individuals with past suicide attempts greater than 3 years ago also reported lower MCS compared to individuals with no prior attempts, although the effect size difference was smaller but still large in magnitude (-0.80; 95% CI, -0.85 to -0.74). When individuals with recent attempts were compared to individuals with past attempts, the effect size difference was further reduced (-0.44; 95% CI, -0.56 to -0.32).

On the PCS, smaller effect sizes were observed in comparing individuals with recent and past suicide attempts to those with no prior attempts (-0.33; 95% CI, -0.43 to 0.22 and -0.40; 95% CI, -0.45 to -0.35, respectively).

Differences in QALYs between individuals with recent and past suicide attempts as compared to those with no prior attempts were also substantial (-1.00; 95% CI, -1.11 to -0.90 and -0.74; 95% CI, -0.79 to -0.68, respectively; Table 3), but far less so between individuals with recent and past suicide attempts, although still statistically significant (-0.21; 95% CI, -0.32 to -0.09).

Table 4 shows multivariable-adjusted comparisons between the recency of suicide attempt groups and measures

of HRQOL, controlling for demographics and medical comorbidities and then concurrent psychiatric disorders and SUDs. In model 1, controlling for age, individuals with recent and past suicide attempts had an adjusted MCS score that was 13.49 and 7.74 points lower (P<.001), respectively, than adults with no prior suicide attempts. In models 2 and 3, with additional adjustment for other sociodemographic factors and medical comorbidities, individuals with past and recent suicide attempts still had substantially lower MCS scores, albeit of modestly smaller magnitude than those with no prior attempts (P<.001).

In model 4, with additional adjustment for psychiatric disorders and SUDs, individuals with recent and prior suicide attempts still had significantly lower MCS scores than individuals with no prior attempts although the magnitude of differences was much smaller (-3.41; 95% CI, -4.87 to -1.95; *P* < .001 and -1.08; 95% CI, -1.79 to -0.38; *P* < .001, respectively). These scores are 75%–86% of the magnitude of the unadjusted association of recent and past suicide attempts. Those with recent attempts had a better PCS score on average when compared to those with no prior attempts (1.64; 95% CI, 0.40 to 2.88; *P* < .010).

Adjusted differences in QALYs were small at -0.01 and significant only for the comparison of those with attempts prior to 3 years ago and those with no past attempts

(P = .005). In magnitude, they were 89%-91% smaller than

the unadjusted differences. Adjusted differences were not significantly different among those with attempts in the past 3 years as compared to before the last 3 years (P=.220).

#### DISCUSSION

In this nationally representative sample, adults with relatively recent suicide attempts reported substantially lower MCS-HRQOL and QALYs compared to individuals with no history of suicide attempts and also had statistically significantly lower scores when compared to those with attempts more than 3 years ago. Individuals with suicide attempts more than 3 years ago, however, still reported significantly lower MCS-HRQOL and QALYs than individuals with no prior attempts, suggesting lasting impairments in mental health in those who have presumably recovered from suicidality.

In multivariate analyses adjusted for correlated factors, especially psychiatric disorders and SUDs, these factors accounted for most but not all of the diminished MCS-HRQOL in individuals with recent and more remote suicide attempts as compared to those with no past attempts. These factors accounted for virtually all of the difference in PCS-HRQOL and QALYs. HRQOL impairment in individuals experiencing suicidality is thus largely accounted for by the burden of multiple comorbid psychiatric disorders and SUDs, although suicide attempts appear to attenuate MCS-HRQOL to a modest degree independent of the impact of psychiatric disorders and SUDs. Put somewhat differently, differences in measures of MCS-HRQOL and especially QALYs between adults with histories of suicide attempts and those without past attempts largely incorporate, in single measures, a broad array of psychiatric disorders and SUDs associated with suicide attempts, as well as suicide attempts themselves. These measures thus provide a broad indication of mental and general health status and give a more complete picture of clinical changes, with a brief measure, than a simple history of a recurrent suicide attempt by itself.

This study using nationally representative US data extends the findings of two prior studies<sup>22,23</sup> that were based on smaller convenience samples of adults in Australia. Those studies found similar reductions on MCS-HRQOL of approximately 15–16 points among individuals with recent suicide attempts as compared to those with none, a finding comparable to the mean reduction in MCS-HRQOL among individuals with recent attempts of 13.7 points in our study.

Our results further extend results of prior studies by comparing MCS-HRQOL and QALYs among those with recent suicide attempts to those with attempts before the past 3 years, demonstrating that both MCS-HRQOL and QALYs appear to improve significantly as individuals recover from a mental health crisis, although they remain lower than among people with no past suicide attempts, demonstrating lasting impairments more than 3 years after a suicide attempt. On the one hand, these results contrast with abrementioned data from a smaller convenience sample,<sup>23</sup> which found no change in MCS-HRQOL over an 8-year follow up after a suicide attempt. On the other hand, it must be acknowledged that the difference of 0.02 QALYs may not represent a clinically meaningful difference, which has been reported to require an improvement of at least 0.04 QALYs.<sup>37</sup>

It is notable that the unadjusted assessment of MCS-HRQOL of 37.3 among those with attempts in the past 3 years is lower, in spite of the extended 3-year time span that leaves ample opportunity for recovery, than the impairments reported for other psychiatric disorders and SUD, including alcohol dependence (MCS-HRQOL = 46.4), generalized anxiety disorder (43.8), panic disorder (41.5), major depression (39.8), and bipolar disorder, but larger than the impairment found in schizophrenia (32).<sup>20,21,38</sup>

Quantifying the reduction in QALYs associated with suicide attempts also allows comparison with other behavioral and somatic disorders. For example, the 0.77 and 0.81 QALY impairment for recent and more remote suicide attempts in this study are lower than that of contemporaneous assessments of other psychiatric disorders, including major depression (0.84), bipolar disorder (0.85), alcohol dependence (0.87),<sup>39</sup> and chronic medical conditions, including diabetes (0.89), chronic pain (0.89), cancer (0.93), and cardiovascular disease (0.83),<sup>39</sup> and similar to or higher than QALY estimates in schizophrenia (0.65–0.75).<sup>40</sup>

The use of QALYs to assess differences between adults who have made recent attempts, less recent attempts, and no attempts potentially allows monetization of these benefits, although recent estimates of the value of a QALY range widely from a low of \$183,000<sup>41</sup> to as much as \$400,000.<sup>42</sup> Roughly applying these estimates in a sensitivity analysis suggests that 3-year recovery from a suicide attempt (involving a gain of 0.02 QALYs) may be equal to a monetized value of \$3,660 to \$8,000, without specific suicide prevention efforts and, in about half of cases, no mental health treatment at all.<sup>5</sup> Such savings could readily fund vigorous interventions. If an intervention were to help someone with a recent suicide attempt to full recovery, the monetized benefits of an increase of 0.11 QALYs could be as much as \$20,130 to \$44,000, representing considerable gains in societal wellbeing. These rough estimates, of course, need to be validated in randomized clinical trials of prevention efforts, but they demonstrate the potential value of the measures used in this study in evaluating such efforts.

Our findings demonstrating significant impairment in HRQOL, even after recovery from suicide attempts, reinforce the importance and continuing need for prevention and early intervention and underscore the value of measuring patientcentered outcomes in suicide research. As stated previously, while most suicide studies attempt to measure the incidence of future attempts, broader, patient-reported outcomes may better assess the gains with recovery. While our results demonstrate how changes in HRQOL after a suicide attempt are highly correlated with symptoms of psychiatric disorders and SUDs, a focus on acute symptomatology often ignores changes in broader dimensions of functional recovery. In **It is illegal to post this copyr** a prior study<sup>4</sup> that sought to determine factors that were associated with recovery from suicide attempts, we found that while improvements in psychiatric symptoms appear to be associated with not attempting suicide for a short period of time, long-term recovery is most correlated with improvements in broader measures of psychosocial functioning, including socioeconomic status, social connectedness, and subjective well-being. Thus, effective suicide prevention interventions should be considered to be those that not only improve acute symptomatology but also improve a patient's subjective sense of well-being and functioning over extended periods of time.<sup>44</sup> Measures of HRQOL can provide an empirical assessment of such outcomes.

The results of this study should be considered in the context of a number of potential limitations. Most notably, the cross-sectional, retrospective, and self-report nature of the data introduces the possibility of recall bias impacting the validity of our results. In addition, the cross-sectional design does not allow for a determination of causality between suicide attempts, other correlates of improvement, and diminished HRQOL. For example, the relationship between suicide attempts and HRQOL may **be** bidirectional, and longitudinal studies are needed to further elucidate this relationship. Additionally, the 3-year cutoff for recent suicide attempts may have been too long of a period to capture individuals experiencing acute suicidality. However, we used this 3-year cutoff because it afforded a substantially large analytic group. Finally, it should be noted that NESARC-III was conducted in 2012–2013, and while suicide attempts have increased since that time,<sup>5</sup> it is unlikely that the relationships between suicide attempts and HRQOL would be changed by the increases.

In spite of these limitations, this study of a nationally representative sample demonstrates that individuals with relatively recent suicide attempts report significant impairments in MCS-HRQOL and QALYs compared to both individuals with more remote attempts and those with no prior attempts. The results showing that most of the group differences in these measures can be attributed to associated differences in psychiatric disorders and SUDs demonstrates that measures of HRQOL and QALYs encompass multiple aspects of subjective well-being and can provide a brief approach to assessing the effectiveness of suicide prevention interventions as well as a foundation for cost-effectiveness and cost-benefit analyses.

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