

# National trends of suicidal ideation and mental health services use among US adults with opioid use disorder, 2009–2020

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## Summary

**Background** The substantial increase in deaths by overdose and potential underlying suicidal intent in such deaths suggest the importance of understanding trends of suicidal ideation in individuals with opioid use disorder (OUD). This study aimed to examine the trends and correlates of past-year suicidal ideation (SI) and mental health service use among US adults with past-year OUD from 2009 to 2020.

**Methods** We used data from the National Survey on Drug Use and Health. Participants included non-institutionalized US civilians aged  $\geq 18$  with past-year OUD ( $n=5386$ ). SI was measured by self-reported thoughts of killing oneself. Mental health service utilization was assessed with questions concerning receipt of any past-year outpatient or inpatient mental health services or prescription medications. We examined the prevalence and correlates of SI and adjusted odds ratios (aORs) for changes over time adjusting for potentially confounding sociodemographic and clinical characteristics. Further, trends in utilization of mental health services were explored.

**Findings** From 2009 to 2020, the prevalence of SI increased from 22.8% to 29.8% (average annual percent change, 3.64% [95% CI, 1.01–2.10%]) in adults with OUD. Subgroups including individuals aged 18–25 (aOR, 1.72 [95% CI, 1.09–2.71];  $P=0.020$ ), residing in non-metropolitan areas (aOR, 1.43 [95% CI, 1.04–1.97];  $P=0.029$ ), with co-occurring past-year major depressive episode (aOR, 5.28 [95% CI, 4.27–6.53];  $P < 0.001$ ) and alcohol (aOR, 1.55 [95% CI, 1.23–1.97];  $P < 0.001$ ), cocaine (aOR, 1.42 [95% CI, 1.03–1.97];  $P=0.034$ ), and sedative use disorders (aOR, 1.48 [95% CI, 1.11–1.98];  $P=0.008$ ) were associated with SI after adjusting for covariates. No significant change in mental health service use was observed. Individuals with SI were 2.5 times more likely to report an unmet need for treatment compared to individuals without SI (53.6% vs 21.4%;  $P < 0.001$ ).

**Interpretation** The prevalence of SI in adults with OUD increased substantially without a corresponding change in mental health service use. These results underscore the potential benefit of routine screening for suicidality and improved access to care for individuals with OUD, especially those with co-occurring depression and/or polysubstance use.

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## Introduction

The opioid epidemic has been a national public health concern over the past two decades.<sup>1</sup> In the United States (US), the number of drug overdose deaths has risen rapidly, and increased by four-fold from 1999 to 2019.<sup>2</sup>

The most alarming increase happened last year in the midst of the COVID-19 pandemic, with a staggering 100,306 deaths by drug overdose during a 12-month period ending in April 2021, which is a 28.5% increase from the same period the year prior. Among the 100,306 deaths by drug overdose in 2020, over 75% involved an opioid.<sup>3</sup>

Suicide is another serious public health problem with the number of deaths by suicide increasing by

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### Research in context

#### *Evidence before this study*

Recently, there has been increasing recognition that a sizable percentage of opioid overdose deaths in the US, typically assumed to be unintentional, may have a suicidal component. The substantial increase in deaths by overdose and potential underlying suicidal intent in such deaths suggest the importance of understanding trends of suicidal behavior in individuals with opioid use disorder (OUD).

#### *Added value of this study*

Prevalence of suicidal ideation has substantially increased among US adults with past-year OUD from 2009 to 2020. Of these individuals with past-year OUD, over half of those with suicidal ideation reported needing mental health treatment but did not receive it in the past 12 months.

#### *Implications of all the available evidence*

Despite the increasing trends of suicidal ideation among US adults with OUD, trends of their mental health service use have not changed over a decade. These findings underscore the potential benefit of routine screening for suicidality and improved access to care for individuals with OUD, especially those with co-occurring depression and/or polysubstance use.

60% in the last two decades.<sup>4</sup> Previous studies have supported a strong association between substance use disorders and suicidal behaviors.<sup>5,6</sup> Among substance use disorders, opioid use disorder (OUD) is reported to have one of the strongest associations with suicidal behaviors.<sup>7</sup> While exact reasons are not known, for example, the suicide rate among those with OUD is six times higher than the rate of the general US population.<sup>8</sup> Further, those who use any opioids are twice as likely to make a suicide attempt.<sup>8</sup>

Recently, there has been increasing recognition that a sizable percentage of opioid overdose deaths, typically assumed to be unintentional, may have a suicidal component.<sup>8–10</sup> Recent data indicates that at least 20–30% of unintentional overdose deaths may actually have suicidal intent although challenges in ascertaining the manner of death in these cases likely result in an under-reporting of opioid-overdose deaths as suicides.<sup>8,11</sup> One potential hypothesis is that motivation to live among individuals with OUD may be eroded by addiction, resulting in engagement in extreme risk-taking behaviors (e.g., using larger quantities of opioids and other substances) both with or without a conscious suicidal intent.<sup>8</sup> Such behavior may lead to overdoses, although the distinction between intentional and unintentional overdoses may be difficult to determine.

Further, the emerging concept of “deaths of despair” (deaths by suicide, overdose, and alcohol-related liver disease)<sup>12</sup> raised an important question that common factors, such as hopelessness and despair may be underlying contributors to both deaths by suicide and overdose, and has re-emphasized the importance of understanding the trends in suicidal behaviors in patients with OUD.

Despite the national attention on increasing deaths by opioid overdose and rising interest in its possible link with suicidal intent, relatively little is known about what percent of individuals with OUD experience SI and if suicidality among individuals with OUD has changed in recent years, in the context of increasing deaths by overdose and suicide. Given that suicidality in individuals with substance use disorders (SUDs) has been shown to be a risk factor for both suicide and unintentional overdose,<sup>13–15</sup> individuals with OUD experiencing SI represent a critical high-risk group for prevention of morbidity and mortality from both suicide and unintentional overdose.

In particular, prevention efforts rely on identification of suicidality and referral to appropriate mental health and substance use treatment to prevent future adverse outcomes. Yet, interventions to prevent unintentional overdoses rarely involve suicide screening or other suicide prevention strategies and relatively little is known about what percent of individuals with co-occurring OUD and suicidality receive mental health or substance use treatment. Previous studies tend to focus on service utilization in those with OUD or in individuals who report suicidal behaviors, but no studies, to our knowledge, have examined service utilization in the high-risk population of individuals with co-occurring OUD and suicidality. This line of research may help inform suicide prevention strategies in individuals at high risk of both suicide and unintentional overdose.

To address this gap in knowledge, we used the National Survey on Drug Use and Health (NSDUH) to examine trends in suicidal ideation (SI) between 2009 and 2020 among adults aged 18 or older with OUD. We sought to answer four questions: 1) What is the prevalence and temporal trends of past-year SI among adults with past-year OUD between 2009 and 2020? 2) Which sociodemographic and clinical characteristics were associated with SI in individuals with OUD? 3) Were there changes in trends in mental health service use among adults with past-year OUD who reported past-year SI? 4) What were the main reasons provided for not receiving mental health care among individuals with past-year OUD with SI? We hypothesized that the prevalence of SI would have increased significantly in adults with OUD during the study period even after adjusting for known risk and protective factors for suicidal behaviors, however, the trends in mental health services use would have not substantially changed.

## Methods

### Data source and study sample

Data were derived from the 2009–2020 NSDUH, which are annually compiled by the Substance Abuse and Mental Health Services Administration (SAMHSA). NSDUH provides nationally representative information on sociodemographic and clinical characteristics (alcohol, tobacco, and drug use, mental health, and health-related issues) and includes questions based on the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) (different versions depending on the survey years; e.g., DSM-5 since 2020) of people aged 18 years or older.<sup>16</sup> The sample used for analysis included adults aged 18 or older who met diagnostic criteria for OUD in the past year ( $n=5386$ , unweighted). Survey participants completed interviews in their residence in English or Spanish using a combination of computer-assisted self-interview or in-person questionnaires where responses were recorded by an interviewer. Participants received \$30.00 for completion of the survey. The annual mean weighted response rate in 2009–2020 ranged from 60.4% to 75.6%.<sup>17,18</sup>

Details of the survey including questionnaires, methodology, and description of the dataset are available on the NSDUH website.<sup>17</sup> This study was deemed exempt by the Institutional Review Board at Yale School of Medicine, as we used publicly available, de-identified data. Study procedures followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

### Measures

*Suicidal ideation* was assessed using a single question asking whether the respondent had seriously thought about killing themselves in the past 12 months before the survey interview.

*Sociodemographic characteristics* included: age, sex, race and ethnicity, marital status, education, employment, annual family income, health insurance coverage, and urbanicity (based on metropolitan statistical areas).<sup>19</sup>

*Past-year substance use disorders* were derived from questions that addressed formal diagnostic criteria for substance abuse and dependence as defined in the DSM-IV,<sup>20</sup> and that addressed past-year alcohol, tobacco, cannabis, cocaine/crack, hallucinogen, stimulant, sedative, and an aggregate indicator of any SUD (excluding alcohol and tobacco).

*Past-year mental health service use* was assessed by questions concerning receipt of any outpatient or inpatient mental health services in the past 12 months. Receipt of any prescription medications for mental health problems in the past-year was also assessed.

*Reasons for not receiving treatment:* Finally, NSDUH asks all adult respondents, regardless of mental health status, whether there was a time in the past 12 months

when they needed mental health treatment or counseling but did not receive it. (Please see individual items on Table 4.) Among respondents with perceived unmet mental health treatment needs, respondents were asked to identify reasons for not receiving mental health treatment from a list of eleven potential reasons. Responses to mental health service use and reasons for not receiving treatment were not mutually exclusive; in other words, some survey respondents can report receiving mental health care but still had unmet mental health treatment needs in the past year.

### Statistical analysis

First, descriptive data were presented on prevalence of SI in individuals with a past-year OUD diagnosis from 2009–2010 to 2019–2020, and estimated an average annual percent change of SI from 2009 to 2020 using a modified Poisson model<sup>21</sup> after adjusting for sociodemographic factors. We then repeated these calculations to evaluate the change in SI among each sociodemographic subgroup of individuals with past-year OUD.

Second, we conducted multivariable-adjusted logistic regression analyses to determine which sociodemographic and clinical factors are associated with past-year SI by OUD status between 2009 and 2020. We included all relevant sociodemographic and clinical factors available in our data set.<sup>22</sup>

Next, we examined the change in past-year mental health service use among individuals with past-year OUD who reported past-year SI in each year from 2009 to 2020. Again, we reported prevalence ratios and the average annual percent changes.<sup>21</sup> Finally, we examined the percentage of individuals with past-year OUD who perceived a need for treatment but did not receive treatment and the reported reasons for not receiving treatment.

In separate analyses (Appendix Tables 1–3), we compared the percent of individuals with past-year OUD reporting SI and their corresponding mental health service use from 2019 to 2020 alone, (1) to identify any potential anomaly due to changes in sampling designs and data collections in 2020, (2) to test any difference due to changes in diagnostic criteria (i.e., DSM-5 criteria since 2020), and (3) to examine possible associations between these factors and the onset of the COVID-19 pandemic.

We used the statistical software, Stata version 16.1 MP/4-Core, for all analyses. We accounted for NSDUH complex survey design using `svy` commands to account for multi-stage, complex survey sampling techniques (i.e., unequal probability of selection, clustering, and stratification) used in the data collection. We set  $p$ -value  $< 0.05$  as the test of statistical significance.

### Patient and public involvement

This is a secondary data analysis using publicly available, existing data.<sup>16</sup> Patients or the public were not

directly involved in the design, or conduct, or reporting, or dissemination plans of our research.

### Role of funding source

There is no obtained funding for the conduct of this study. The corresponding author (Dr. Rhee) had access to the dataset and all authors supported the decision to submit for publication.

## Results

In the entire NSDUH sample of individuals aged 18 or older ( $n=470,906$ , representing 238.8 million US adults), 5386 (0.83%, representing 1,929,723 US adults) met criteria for a past-year OUD between 2009 and 2020. Among individuals with past-year OUD, 1372 (23.8% representing 459,887 US adults) reported SI in the past-year.

### Trends of prevalence of SI in adults with past-year OUD

From 2009 to 2020, the prevalence of individuals with OUD who reported SI increased significantly from 22.8% to 29.8%, with an average annual percent change (AAPC) of 3.64% (95% CI, 1.01–2.10%; Table 1). Several subgroups with OUD demonstrated significant increases in SI between 2009 and 2020 including young adults (AAPC, 4.91% [95% CI, 2.10–7.81%]), females (AAPC, 6.86% [95% CI, 3.20–10.66%]), non-Hispanic Whites (AAPC, 3.27% [95% CI, 0.28–6.34%]), working full-time (AAPC, 4.75% [95% CI, 0.48–9.20%]), individuals with Medicaid (AAPC, 5.42% [95% CI, 0.96–10.07%]), living in large metropolitan areas (AAPC, 4.47% [95% CI, 0.62–8.48%]), and individuals with other SUDs, especially alcohol (AAPC, 2.98% [95% CI, 20.22–6.28%]), tobacco (AAPC, 4.52% [1.19–7.96%]), and cannabis (AAPC, 4.58% [95% CI, 0.16–9.20%]). There was no significant change in SI among individuals with co-occurring major depressive episode and OUD.

In a multivariable model evaluating whether controlling for significant sociodemographic and clinical factors could account for the increase in SI among individuals with OUD from 2009 to 2020 (Table 2), we found the temporal trend for increasing SI remained significant (aOR, 1.58 [95% CI, 1.01–2.46];  $P=0.045$ ). Subgroups of individuals with OUD who were found to be associated with past-year SI included individuals aged 18–25 (aOR, 1.72 [95% CI, 1.09–2.71];  $P=0.020$ ), residing in non-metropolitan areas (aOR, 1.43 [95% CI, 1.04–1.97];  $P=0.029$ ), with co-occurring past-year major depressive episode (aOR, 5.28 [95% CI, 4.27–6.53];  $P<0.001$ ) and alcohol (aOR, 1.55 [95% CI, 1.23–1.97];  $P<0.001$ ), cocaine (aOR, 1.42 [95% CI, 1.03–1.97];  $P=0.034$ ), and sedative use disorders (aOR, 1.48 [95% CI, 1.11–1.98];  $P=0.008$ ) after controlling for covariates. We found similar patterns of

sociodemographic and clinical factors associated with SI in those without OUD (Table 2).

Separate comparison of prevalence in SI in the year before and after the emergence of the COVID-19 pandemic (2019 versus 2020) showed no significant difference (27.1% vs 29.8%;  $P=0.502$ ; Supplementary Table 1).

### Service use

With regards to mental health service use, 67.8% of individuals with past-year OUD with SI reported receiving mental health services, including inpatient, outpatient, or prescription medication services, with no significant change from 2009–2010 to 2019–2020 (Table 3).

Among individuals with past-year OUD, over half of those with SI reported needing mental health treatment in the past year but did not receive it (53.6%;  $P<0.001$ ; Table 4). Individuals with SI were approximately 2.5 times more likely to report an unmet need for treatment compared to individuals with OUD without SI. The most common reasons that individuals gave for not receiving services was they could not afford the cost (44.9–47.4%), they did not know where to go for treatment (17.9–20.7%), thought they could handle things without treatment (14.8–15.6%), they had concerns about confidentiality (10.2–15.0%), or they had concerns about opinions of others (10.7–14.4%).

Separate comparison of the rate of mental health service use before and after the onset of the COVID-19 pandemic (2019 vs. 2020) showed no significant change (Supplementary Table 2). However, in 2020, those who reported an unmet need for treatment rose from 46.4% to 78.9% ( $P=0.013$ ); 21.8% reported that the primary reason for not seeking mental health treatment was because they ‘did not want others to find out’ (vs. 5.0% in 2019;  $P=0.044$ , Supplementary Table 3).

## Discussion

In a nationally representative sample of US adults, we found a significant increase in SI among individuals with OUD between 2009 and 2020, even after adjusting for changes in key sociodemographic and clinical factors associated with SI. In 2019–2020, approximately 30% of individuals with OUD reported past-year SI. In the multivariable model, several subgroups of individuals with OUD were associated with past-year SI, including young adults, individuals residing in non-metropolitan area, and those with past-year co-occurring major depressive episode and other SUDs, especially alcohol, cocaine, and sedative use disorders. Despite the significant increase in SI over the past decade, the rate of mental health service use did not change and over half of individuals with co-occurring OUD and SI reported an unmet need for treatment, most commonly

	Sample size	2009–2010	2011–2012	2013–2014	2015–2016	2017–2018	2019–2020	Average annual percent change (95% CI) <sup>a)</sup>
<b>Suicidal ideation, overall</b>	5386	22.8%	21.2%	22.5%	21.8%	26.2%	29.8%	3.64% (0.92 to 6.44%)
Age, y								
18–25	2811	27.1%	20.7%	30.0%	32.5%	35.5%	41.2%	4.91% (2.10 to 7.81%)
26–34	1230	23.5%	16.4%	21.5%	19.5%	25.0%	19.7%	0.61% (–3.70 to 5.11%)
35–49	982	22.4%	26.9%	24.3%	19.2%	22.3%	33.1%	1.02% (–3.34 to 5.57%)
≥50	363	11.2%	24.9%	12.0%	18.6%	24.6%	29.6%	6.02% (–1.61 to 14.24%)
Sex								
Male	2932	20.1%	21.9%	21.2%	19.8%	23.8%	20.8%	0.72% (–2.98 to 4.55%)
Female	2454	27.0%	20.0%	24.4%	24.8%	29.3%	38.9%	6.86% (3.20 to 10.66%)
Race/ethnicity								
Non-Hispanic white	3918	23.9%	23.1%	23.6%	22.0%	26.4%	32.2%	3.27% (0.28 to 6.34%)
Non-Hispanic black	390	29.8%	13.4%	10.1%	15.3%	28.7%	33.8%	5.65% (–2.40 to 14.36%)
Hispanic	639	13.7%	16.2%	30.1%	23.6%	22.6%	20.3%	2.42% (–3.65 to 8.87%)
Non-Hispanic other	439	21.7%	21.3%	16.0%	28.4%	26.1%	16.0%	5.43% (–2.95 to 14.53%)
Marital status								
Married	940	16.1%	21.7%	13.7%	14.4%	20.2%	38.3%	4.93% (–0.09 to 10.21%)
Widowed	78	8.8%	25.0%	19.8%	22.4%	14.9%	10.9%	0.04% (–25.13 to 33.68%)
Divorced/separated	698	27.6%	15.5%	23.6%	27.9%	32.7%	26.2%	2.68% (–2.39 to 8.00%)
Never married	3670	24.7%	22.3%	25.9%	23.1%	27.6%	26.2%	2.60% (–0.30 to 5.59%)
Education								
< High school	1253	18.3%	20.5%	16.9%	23.2%	25.2%	41.6%	4.31% (–0.08 to 8.74%)
High school or equivalent	1960	26.3%	23.7%	27.1%	17.3%	24.7%	25.3%	–0.21% (–4.51 to 4.28%)
Some college	1701	20.6%	21.9%	20.7%	27.0%	26.7%	29.2%	4.70% (0.74 to 8.83%)
≥ Bachelor's degree	472	28.1%	11.1%	24.7%	17.5%	30.2%	31.2%	6.27% (–0.23 to 13.19%)
Employment								
Full-time	2050	18.1%	16.7%	20.0%	17.7%	21.6%	28.3%	4.75% (0.48 to 9.20%)
Part-time	897	24.5%	18.9%	23.4%	29.3%	27.0%	30.3%	5.04% (–0.76 to 11.18%)
Unemployed	957	23.5%	22.8%	17.6%	24.0%	35.1%	28.4%	3.34% (–2.02 to 8.99%)
Other	1482	27.8%	28.3%	28.0%	23.1%	27.4%	31.3%	1.36% (–3.06 to 5.99%)
Family income								
<\$20,000	1847	22.2%	28.3%	23.1%	30.3%	25.8%	21.6%	1.36% (–2.26 to 5.11%)
\$20,000 - \$ 49,999	1848	23.3%	24.8%	25.0%	20.2%	25.6%	36.7%	2.61% (–1.90 to 7.33%)
\$50,000 - \$ 74,999	718	22.6%	16.7%	15.0%	21.3%	29.8%	43.4%	6.58% (0.46 to 13.06%)
≥\$75,000	973	22.7%	6.0%	21.4%	12.9%	25.3%	21.5%	5.52% (–0.43 to 11.83%)

Table 1 (Continued)

	Sample size	2009–2010	2011–2012	2013–2014	2015–2016	2017–2018	2019–2020	Average annual percent change (95% CI) <sup>a)</sup>
Insurance coverage								
Private plan	1830	22.4%	17.0%	21.1%	16.4%	23.3%	30.2%	3.02% (−0.88 to 7.07%)
Medicaid	1386	16.9%	21.4%	17.6%	21.4%	23.3%	27.5%	5.42% (0.96 to 10.07%)
Medicare	294	32.7%	28.1%	23.5%	29.1%	30.9%	30.1%	2.73% (−5.05 to 11.14%)
Other	239	39.5%	28.2%	24.0%	27.9%	25.9%	38.7%	1.62% (−5.30 to 9.04%)
Uninsured	1586	23.1%	23.3%	26.6%	26.6%	31.4%	31.1%	2.59% (−1.56 to 6.91%)
Urban residence								
Non-metropolitan	1150	27.8%	14.8%	26.9%	28.4%	29.0%	44.7%	5.15% (0.08 to 10.47%)
Small metropolitan	1969	23.8%	28.6%	26.6%	20.1%	26.9%	24.5%	−0.27% (−4.15 to 3.78%)
Large metropolitan	2267	20.2%	18.8%	19.5%	21.0%	24.8%	29.0%	4.47% (0.62 to 8.48%)
Past-year major depressive episode	1598	47.3%	43.4%	51.1%	45.9%	49.8%	47.7%	1.48% (−0.78 to 3.79%)
Past-year substance use disorder								
Alcohol	1878	28.0%	27.5%	30.8%	34.0%	36.2%	36.1%	2.98% (0.22 to 6.28%)
Tobacco	2573	25.4%	19.8%	25.2%	24.1%	25.8%	37.3%	4.52% (1.19 to 7.96%)
Cannabis	1090	26.3%	26.6%	35.1%	41.0%	38.1%	28.6%	4.58% (0.16 to 9.20%)
Cocaine	671	32.9%	31.5%	37.2%	34.5%	41.9%	21.1%	2.11% (−1.94 to 6.34%)
Hallucinogen	222	44.5%	26.0%	52.4%	65.2%	46.0%	28.7%	4.37% (−2.37 to 11.58%)
Stimulant	417	36.8%	40.6%	25.8%	35.1%	35.3%	27.8%	1.59% (−4.05 to 7.56%)
Sedative	795	38.5%	38.9%	33.3%	31.7%	38.0%	37.5%	−0.38% (−4.01 to 3.39%)
Any SUD, excluding alcohol and tobacco	5386	22.8%	21.2%	22.5%	21.8%	26.2%	29.8%	3.64% (0.92 to 6.43%)

**Table 1: National trends of suicidal ideation in US adults with past-year opioid use disorder by selected characteristics, 2009–2020.**

Note: Data are from National Survey on Drug Use and Health. a) Adjusted for age, sex, race/ethnicity, marital status, educational attainment, employment, family income, insurance coverage, and urban residence. SUD stands for substance use disorder.

Reference group in a parenthesis	With OUD		Without OUD <sup>§</sup>	
	AOR	95% CI; p	AOR	95% CI; p
Age, y (≥50)				
18–25	1.72	1.09–2.71; 0.020	2.15	1.97–2.34; <0.001
26–34	1.13	0.74–1.74; 0.564	1.50	1.37–1.65; <0.001
35–49	1.21	0.82–1.77; 0.332	1.34	1.23–1.46; <0.001
Sex (Female)				
Male	0.81	0.62–1.06; 0.122	1.12	1.06–1.18; <0.001
Race/ethnicity (Non-Hispanic white)				
Non-Hispanic black	0.96	0.66–1.39; 0.822	0.77	0.72–0.82; <0.001
Hispanic	0.81	0.54–1.21; 0.301	0.74	0.69–0.79; <0.001
Non-Hispanic other	0.72	0.44–1.16; 0.173	0.99	0.91–1.08; 0.872
Marital status (Married)				
Widowed	0.63	0.27–1.46; 0.281	0.92	0.77–1.11; 0.387
Divorced/separated	1.08	0.73–1.60; 0.691	1.38	1.28–1.49; <0.001
Never married	1.01	0.74–1.39; 0.927	1.37	1.27–1.47; <0.001
Education (< High school)				
High school or equivalent	1.07	0.76–1.49; 0.702	0.98	0.91–1.07; 0.684
Some college	1.01	0.73–1.39; 0.960	1.08	1.00–1.17; 0.052
≥ Bachelor's degree	1.17	0.75–1.84; 0.483	0.94	0.85–1.03; 0.159
Employment (Full-time)				
Part-time	1.06	0.76–1.47; 0.728	1.13	1.05–1.21; 0.001
Unemployed	1.30	0.93–1.83; 0.124	1.38	1.27–1.50; <0.001
Other	1.28	0.97–1.70; 0.084	1.19	1.12–1.26; <0.001
Family income (<\$20,000)				
\$20,000 - \$ 49,999	1.09	0.83–1.44; 0.535	0.94	0.88–1.01; 0.097
\$50,000 - \$ 74,999	1.15	0.80–1.67; 0.451	0.84	0.77–0.91; <0.001
≥\$75,000	0.79	0.55–1.15; 0.219	0.81	0.75–0.88; <0.001
Insurance coverage (Private plan)				
Medicaid	0.77	0.56–1.05; 0.100	1.18	1.08–1.28; <0.001
Medicare	1.90	1.09–3.33; 0.024	1.05	0.995–1.16; 0.328
Other	1.46	0.85–2.50; 0.173	1.28	1.14–1.44; <0.001
Uninsured	1.28	0.95–1.73; 0.106	1.08	1.01–1.15; 0.023
Urban residence (Large metropolitan)				
Non-metropolitan	1.43	1.04–1.97; 0.029	1.02	0.94–1.09; 0.679
Small metropolitan	1.20	0.95–1.52; 0.128	1.05	0.99–1.11; 0.128
Past-year major depressive episode	5.28	4.27–6.53; <0.001	14.09	13.38–14.83; <0.001
Past-year substance use disorder				
Alcohol	1.55	1.23–1.97; <0.001	1.85	1.73–1.99; <0.001
Tobacco	1.12	0.89–1.41; 0.344	1.31	1.22–1.40; <0.001
Cannabis	1.22	0.89–1.68; 0.214	1.72	1.56–1.89; <0.001
Cocaine	1.42	1.03–1.97; 0.034	1.75	1.35–2.26; <0.001
Hallucinogen	1.61	0.95–2.70; 0.075	1.40	0.99–1.98; 0.055
Stimulant	0.83	0.55–1.26; 0.384	1.25	0.95–1.64; 0.116
Sedative	1.48	1.11–1.98; 0.008	2.49	1.89–3.28; <0.001
Calendar year (2009–2010)				
2011–2012	1.01	0.69–1.48; 0.944	1.00	0.90–1.11; 0.976
2013–2014	1.13	0.80–1.59; 0.480	1.09	0.98–1.20; 0.113
2015–2016	1.21	0.86–1.70; 0.268	1.10	1.00–1.20; 0.046
2017–2018	1.44	1.02–2.02; 0.038	1.17	1.06–1.29; 0.001
2019–2020	1.58	1.01–2.46; 0.045	1.25	1.13–1.37; <0.001

**Table 2: Multivariable-adjusted analysis of factors associated with suicidal ideation in US adults with opioid use disorder (OUD), 2009–2020.**

**Note:** Data are from National Survey on Drug Use and Health. AOR, adjusted odds ratio. §Consists of 443,336 US adults (nationally representative of 228.9 million non-institutionalized US adults); socio-demographic and clinical characteristics (e.g., age, sex, race/ethnicity, education, income, and multiple chronic conditions) of this cohort is similar to those of the general adult population in the US. More information can also be found in reference Rhee and Rosenheck (2019).<sup>40</sup>

	Sample size	2009–2010	2011–2012	2013–2014	2015–2016	2017–2018	2019–2020	Average annual percent change (95% CI)
Any mental health treatment use	1367	60.5%	55.1%	67.0%	57.1%	65.9%	67.8%	-0.88% (-2.70 to 0.97%)
Type of mental health services								
Inpatient, any	243	19.4%	15.4%	20.7%	24.7%	15.7%	16.0%	-2.89% (-7.16 to 1.57%)
Outpatient only	70	7.6%	3.7%	3.1%	3.6%	6.2%	4.6%	-0.10% (-12.16 to 13.62%)
Prescription medication only	241	16.6%	24.8%	18.0%	18.8%	18.0%	32.1%	0.43% (-3.90 to 4.96%)
Outpatient and prescription medication	241	16.7%	11.4%	23.8%	10.0%	26.1%	15.0%	-1.20% (-5.46 to 3.26%)
Did not receive mental health treatment	564	39.6%	44.9%	34.4%	43.0%	34.1%	32.3%	0.79% (-2.18 to 3.84%)

**Table 3: National trends of mental health services use in US adults with opioid use disorder and suicidal ideation, 2009–2020.**

Note: Data are from National Survey on Drug Use and Health. a) Adjusted for age, sex, race/ethnicity, marital status, educational attainment, employment, family income, insurance coverage, and urban residence.

due to concerns about cost and stigma. Further, while SAMHSA<sup>23</sup> warns about potential non-comparability issues due to changes in sampling designs and data collections in 2020 (as compared to previous years), we did not find any substantial issues in our sensitivity analyses.

In the context of growing epidemics of deaths by opioid-related overdose and suicide, such high rates of suicidality and a large unmet need for mental health treatment among this high-risk population is concerning. In addition, the World Health Organization reported that the COVID-19 pandemic has further exacerbated these rates,<sup>24</sup> with the unmet need for treatment among this population increasing to nearly 4-in-5 individuals in 2020. These trends suggest immediate efforts are needed to understand and target risk factors for SI among this vulnerable population.

The results of our multivariate analysis point to subgroups on individuals with OUD that were associated with SI including individuals aged 18–25, residing in non-metropolitan area and with past-year major depressive episode. These findings are consistent with previous literature that showed higher suicidal thinking in younger adults, and those with major depressive disorder.<sup>25–27</sup> It also parallels Case and Deaton’s findings of “deaths of despair” which showed a dramatic increase in non-metropolitan areas.<sup>12</sup> Taken together with recent reports that demonstrated younger adults being more negatively impacted by the COVID-19,<sup>28</sup> younger adults with OUD, especially those who reside in rural areas, may require further immediate attention in an effort to mitigate future suicidal behavior and overdose. For individuals in rural areas, recent expansion of telehealth for both mental health and substance use services, including medications for OUD, has the potential to reduce geographic disparities in access and the results of this study underscore the importance of such efforts although some challenges (e.g., low rates of referral to telemedicine, digital device and internet access)<sup>29</sup> need to be addressed in the future.

Another notable subpopulation of individuals with OUD who demonstrated independent association with SI during the study period were those with co-occurring alcohol, cocaine and sedative use disorders. This finding is consistent with previous research that showed increased risk of suicidal behavior in individuals with polysubstance use.<sup>30</sup> The result is also concerning given that recent mortality data shows increased co-administration of alcohol, cocaine, and sedatives found in opioid overdose deaths.<sup>31</sup> Another possible mechanism is that co-occurring SUDs could worsen the severity of depression in individuals with OUD, which lead to an increased risk of suicidal ideation. Given our cross-sectional nature of findings, this mechanism needs to be further examined using longitudinal data. Collectively, this finding suggests that individuals with co-occurring alcohol, cocaine, and sedative use may not only require



	No suicidal ideation n = 3985	Suicidal ideation n = 1369	P
Needed mental health treatment but did not get it	21.4%	53.6%	<0.001
Couldn't afford cost	47.4%	44.9%	0.549
Concern about effect on job	10.0%	13.6%	0.120
Insurance did not cover mental health care	6.4%	7.1%	0.724
Concern about confidentiality	10.2%	15.0%	0.148
Didn't think treatment would help	6.4%	7.7%	0.503
Thought could handle without treatment	14.8%	15.6%	0.753
Didn't know where to go for treatment	20.7%	17.8%	0.414
Didn't have time	10.8%	10.3%	0.849
Didn't want others to find out	6.4%	7.6%	0.526
Lack of transportation or services too far away	5.2%	4.4%	0.555
Concern about opinions of others	10.7%	14.4%	0.149

**Table 4: Reasons for not seeking mental health care in US adults with opioid use disorder by suicidal ideation, 2009–2020.**

Note: Data are from National Survey on Drug Use and Health.

more targeted efforts to reduce overdose risk but may benefit from regular screening for suicide.

While suicide screening and risk assessment is routinely integrated into mental health settings, clinicians who work in substance use treatment may receive less formal education on suicide risk assessment.<sup>32</sup> In addition, embedding validated screening instruments such as the Alcohol Use Disorders Identification Test (AUDIT)<sup>33,34</sup> as well as inquiry of other substances used in practice may have utility in identifying those with OUD who may require further evaluation of suicide risk.<sup>35</sup> For example, both the Veterans Health Administration (VHA) and other health agencies frequently administer AUDIT-C in primary care settings,<sup>36</sup> where suicide risk assessment is less commonly conducted.<sup>37</sup> Clinical protocols such as formal suicide risk assessment may be warranted for individuals with OUD who screen positive on AUDIT-C as well as those who endorse use of cocaine or sedatives.

As stated previously, despite the substantial increase in SI among individuals with OUD, mental health service use among this high-risk population did not significantly change from 2009 to 2020. In 2020, 1-in-5 individuals with OUD and SI reported that the primary reason for not seeking mental health treatment was related to stigma (i.e., 'did not want others to find out'). This finding underscores the potential importance of anti-stigma campaigns, integrated behavioral health treatment and other interventions in general medical settings and continued expansion of tele-health treatment, all of which reduce stigma-related barriers to mental health and substance use treatment.<sup>38,39</sup> Further, almost half of individuals with OUD who did not receive mental health care between 2009 and 2020 identified high cost of mental health care as the biggest barrier to accessing treatment, and this is consistent with a recent study.<sup>40</sup> This is of particular concern given that our data contained information about post-

implementation of the Affordable Care Act and demonstrate the importance of continued efforts to reduce cost barriers, including enforcement of mental health and addiction parity, expansion of certified community behavioral health clinics, Medicaid expansion, and efforts to address behavioral health workforce shortages. Given the low rates of services use in individuals with OUD, multi-level interventions (e.g., individual, institutional, and community-based) are needed to improve access to care and motivation for care among these vulnerable populations.<sup>40</sup>

This study has limitations. First and foremost, the retrospective, self-report nature of the data introduces the possibility of social desirability bias or recall bias impacting the validity of our results. Second, we could not determine the temporality of treatment in relation to SI and a diagnosis of OUD. Third, SI was assessed based on a single question rather than using a specific psychometric instrument measuring suicidality; further research using structured clinical interview is needed to replicate the results reported herein.

Fourth, mental health service utilization was measured grossly and does not adequately address the extent of service use (i.e., frequency, intensity, or long-term use), its quality or reliance on effective evidence-based treatments. Fifth, although SI is a one of the key predictors of deaths by suicide, recent theories in ideation-to-action framework stipulates that the development of SI and the progression from SI to an actual attempt are distinct processes.<sup>41</sup> Sixth, the NSDUH does not survey individuals currently hospitalized, homeless, or incarcerated.<sup>42</sup> Thus, it is possible that the prevalence of SI in this study may underestimate the true prevalence. Finally, some potentially confounding sources (e.g., medical co-morbidities) were not controlled for in the study and future research should address this concern.

This study demonstrates, in a nationally representative sample, a significant increase in suicidality among

individuals with OUD and the large unmet need for treatment among this vulnerable group at high-risk for future suicidal behavior and unintentional overdose. Further, the results suggest that the current mental health services offered may not be adequate to address the magnitude of the problem and would need further expansion by offering affordable and accessible mental health care as well as novel methods to deliver mental health treatment (e.g., tele-medicine and integrated behavioral health) to overcome barriers in seeking treatment. The substantial increase in prevalence of SI in individuals with OUD, taken together with studies on the role of suicidal intent in opioid overdoses,<sup>8,43</sup> highlights the potential importance of regular screening for suicidality in individuals with OUD and polysubstance use and expanding mental health services in an effort to combat the opioid overdose epidemic.

#### Contributors

Study concept and design: Na, Bommersbach & Rhee; Data acquisition and statistical analyses: Rhee; Interpretation of data: All authors; Drafting of manuscript: Na, Bommersbach & Rhee; Critical revision of manuscript for important intellectual content: All authors.

#### Data sharing statement

This study used publicly available data, which are available through the Substance Abuse and Mental Health Services Administration (<https://www.samhsa.gov/data/data-we-collect/nsduh-national-survey-drug-use-and-health>), which is administered by the US Department of Health & Human Services.

#### Declaration of interests

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#### Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.eclinm.2022.101696](https://doi.org/10.1016/j.eclinm.2022.101696).

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