



Suicidal ideation, plan, and attempts and nonmedical prescription opioid use among U.S. adults

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ABSTRACT

Objective: The increase of nonmedical prescription opioid use (NMPOU) in the United States has become a public health concern. The purpose of this study was to examine the relationship between nonmedical prescription opioid misuse and past-year suicidality (suicide ideation-SI, suicide plan-SP, and suicide attempts-SA) among U.S. adults.

Method: Secondary data analysis was conducted using the 2016 National Survey on Drug Use and Health with 42,625 respondents. NMPOU was grouped in 4 categories: (1) never used, (2) current user, (3) recent user, and (4) past user. The outcome variables were SI, SP and SA and they were predicted in multivariable logistic regression.

Results: Compared to the never-use of NMPO groups, the current, recent, and past users of NMPO showed significantly higher likelihoods of SI, SP, and SA models adjusting for sociodemographic and mental health-related factors. Presence of a major depressive episode had the significantly highest Odds Ratio of SI, SP, and SA. Suicidality among NMPO users is high, and there are multiple, sociodemographic and mental health related factors associated with this finding.

Conclusion: Policy and prevention efforts to improve screening and treatment should focus on the at-risk populations identified in this study.

Suicide is a major public health concern, particularly for people who misuse opioids. Suicide (intentional self-harm) was the 10th leading cause of death, resulting in 44,193 deaths in the United States in 2017 (Center for Disease Control and Prevention [CDC], 2017), and the annual rate of completed suicides has increased by 24% between 1999 and 2014 (Curtin, Warner, & Hedegaard, 2016). The dramatic increase in opioid prescriptions and misuse of nonmedical prescription opioids heightens concerns about their contribution to unintentional overdose and suicide (Ling, 2017; Saha et al., 2016). Opioids could potentially be a risk factor for suicide because opioids have a higher potential for lethality. The 1999–2015 National Vital Statistics Data Report indicated opioid-related suicides have quadrupled in middle-aged Americans (Braden, Edlund, & Sullivan, 2017). An analysis of 20,917 deaths from opioid poisoning in the U.S. suggests increased involvement of opioids in intentional overdose and suicide (Braden et al., 2017).

Most opioid misuse involves prescription pain relievers. Even though opioids are effective pain relievers of acute pain, the benefit/risk ratio of opioids decreases with prolonged use as side effects increase (Ling, 2017). Taking prescription opioids is associated with both

the onset and the recurrence of depression (Scherrer et al., 2016b; Scherrer, Salas, Copeland, Stock, Ahmedani, et al., 2016), which may increase suicide risk. Prescription opioid misuse is associated with other independent risk factors for suicide, including anxiety and depression, higher pain intensity, poor physical health, sedative/hypnotic/tranquilizer use, and physical abuse during childhood (Braden et al., 2017; Campbell et al., 2016; Cheatle, 2014; Kecojevic, Wong, Corliss, & Lankenau, 2015). In addition, opioid abusers have found greater suicidality risk in individuals with co-occurring depression and other mental health conditions (Garland, Hanley, Thomas, Knoll, & Ferraro, 2015; Marchand et al., 2017), heavy substance use (Hallgren, Ries, Atkins, Bumgardner, & Roy-Byrne, 2017; Martins et al., 2012), a history of suicide attempts (Martins et al., 2012), and chronic pain (Garland, Riquino, Priddy, & Bryan, 2017).

Prescription opioid misuse and addiction disproportionately affect U.S. residents, who consume 80% of the world's manufactured opioid analgesics (Ling, 2017). According to data from the 2016 National Survey on Drug Use and Health (NSDUH), in the general U.S. population, the most commonly reported reason for a last misuse of a pain

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reliever was for relief of physical pain (62.3%). Another 37.7% used it for reasons other than pain, for example to get high (12.9%), to relax, or to relieve tension (10.8%) (Substance Abuse and Mental Health Service Agency [SAMHSA], 2017). Persons who misuse opioids to control pain might differ from people who take opioids simply for the experience or sensation caused by the drug. Previous research suggests there are both pain-specific risk factors (i.e., pain severity), and an increased comorbidity of traditional risk factors (i.e., depression) that contribute to higher rates of suicidal behavior in chronic pain patients (Cheatle, 2014). Campbell et al. (2016) analyzed a cohort of 1514 community-based individuals who were prescribed opioids for chronic non-cancer pain and found 16.4% had made a suicide attempt in the last 12 months after the onset of their pain. A more recent study by Garland et al. (2017) indicated self-medication significantly mediated the association between suicidal ideation and opioid craving. Results indicated chronic pain patients with higher levels of suicidal ideation reported more intense cravings for opioids and exhibited heightened opioid-related experiences, compared to patients with low levels of suicidal ideation (Garland et al., 2017).

While opioid overuse and suicidality among pain patients have been well researched, the nonmedical use of prescription opioids and suicide has received less attention (Dowell, Haegerich, & Chou, 2016). Little is known about the incidence and predictors of suicidality in opioid misusers (Hallgren et al., 2017). In 2016, 97.4% of opioid users were pain reliever misusers, and 2.6% heroin users (SAMHSA, 2017). Despite evidence that prescription opioids are the major driver of adverse opioid outcomes in the U.S, research has focused more on heroin than prescription opioids (Rudd, Aleshire, Zibbell, & Gladden, 2016).

Previous studies examined the relationship between suicidality and prescription opioid misuse in the general U.S. population using NSDUH data. For example, Kuramoto, Chilcoat, Ko, and Martins (2012) examined the suicidal attempts and the suicidal ideation using the 2009 NSDUH, and reported presence of “prescription opioid disorders” among past-year prescription opioid users was associated with suicide ideation but not suicide attempt (p.178). The recent analysis of the 2014 NSDUH reported prescription opioid misuse was significantly associated with suicidal ideation, suicide planning, and suicide attempts compared to persons who did not use prescription opioid misuse in the past year (Ashrafioun, Bishop, Conner, & Pigeon, 2017). The present study analyzed the 2016 NSDUH data with a sample of 42,625 respondents age 18 or older. The NSDUH questionnaire underwent a partial redesign in 2015 to improve the quality of data and to address the changing needs of policymakers and researchers regarding substance use and mental health (Center for Behavioral Health Statistics and Quality, 2016). The prescription drug questions were redesigned to shift focus from lifetime misuse to past year misuse. Additionally, questions were added about any past year prescription drug use, rather than just misuse.

Method

This was a secondary data analysis study of the 2016 NSDUH public use files (SAMHSA, 2017). The sample size of the current study was 42,625 adults age 18 or older. The purpose of NSDUH is to provide estimates of the prevalence of nonmedical use of legal and illegal drugs in the United States population. To conduct the survey, interviewers visited a random sample of households across the United States to increase generalizability to non-institutionalized, civilian residents ages 12 and older. The survey sample employed a 50-state design with an independent, multistage area probability sample for each state and District of Columbia. The overall weighted response rate for 2016 was 71.2% based on weighted computer-assisted interviews. Detailed methods and information about the sampling and survey methods are described elsewhere (SAMHSA, 2017).

Purpose

The overall purpose of this study was to examine the relationship between nonmedical prescription opioid misuse (NMPOU) and past-year suicidality. An additional aim of the study was to examine sources and purposes of the use of pain relievers and the suicidality in current and recent NMPO users. We compared the likelihoods of suicidal ideation (SI), plan (SP), and attempts (SA) between NMPOU groups and covariates. The outcome variables were suicidality (SI, SP, & SA); and covariates were NMPOU, socio-demographics, overall health, substance use disorder, and major depressive episodes. The prevalence of NMPOU was grouped into four categories: (a) never used, (b) current user (within 30 days), (c) recent user (> 30 days but in the past 12 months), and (d) past user (longer than 12 months ago).

Measurement

Nonmedical prescription opioid use

Participants were asked if they had ever used a pain reliever that was not prescribed or if they had used a pain reliever for the experience it caused. If the participants indicated they had used pain relievers nonmedically, an additional set of questions about the prescription opioid misuse were asked. Past year NMPOU was assessed based on the response to the question: “How long has it been since you last used any prescription pain reliever that a doctor did not direct you to use them?” (SAMHSA, 2017). Using this item, we classified respondents into never used, current user, recent user, or past user.

Opioid-related variables

Seven opioid related variables were included for additional analysis: a source of pain reliever for last misuse; used last pain reliever (not directed) to relieve pain; used pain reliever without prescription; used pain reliever in greater amounts than prescription; used pain reliever more often than prescription; used pain reliever longer than prescription; and used pain reliever other way not directed. All variables were categorized in groups by *yes* or *no* answers in current and recent NMPO users based on past 12-month period except for source of pain reliever.

Socio-demographics

We assessed the following sociodemographic characteristics: age (18–25, 26–34, and 35 ≥), gender, race/ethnicity, education, current employment status, marital status, income, and overall health.

Mental health-related variables

Mental health status variables included 12-month substance use disorders (SUD, illicit drug, or alcohol dependence or abuse-yes/no), and the presence of Major Depressive Episodes (MDEs). A MDE was based on assessment of individual diagnostic criteria during the past 12 months regarding the clinical features of depression from the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*. SAMHSA assesses past year MDE in two step procedures. Adults were first asked about having an MDE in their lifetime, including whether they had at least five of nine symptoms based on the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* in the same 2-week period in their lifetime; “at least one of the symptoms needed to be having a depressed mood or loss of interest or pleasure in daily activities. Those who had lifetime MDE were asked if they had a period of time in the past 12 months when they felt depressed or lost interest or pleasure in daily activities for 2 weeks or longer and they reported that they had some of their other lifetime MDE symptoms in the past 12 months.” (Piscopo & Lipari, 2016, p.10).

Suicidality

The suicide-related variables were assessed based on items that recorded respondents' past year experiences of suicidal ideation, plan or attempts. Respondents were asked *yes* or *no* questions regarding whether they had seriously thought about killing themselves in the past 12 months. Respondents who had serious thoughts of suicide were then asked whether they planned to kill themselves or tried to kill themselves in the past 12 months.

Data analysis

Data analysis was conducted using Stata 15 (StataCorp, 2017). Our analyses accounted for the complex survey design of NSDUH. Because the dataset included data from a multistage sampling, all analyses performed in this study were based on weighted statistics. First, we examined the prevalence of sociodemographic characteristics, mental health status, and NMPOU. Descriptive statistics using Chi-square test and logistic regression were conducted based on weighted prevalence. Second, unadjusted logistic regression was conducted to assess bivariate relationships between frequency of prescription opioid misuse and each of the outcomes including SI, SP, and SA separately. Multivariable logistic regression analyses were conducted to compare the OR of SI, SP, and SA between NMPOU groups and identify associated variables on SI, SP, and in adults in the United States. Finally, Chi-square tests were conducted to identify the opioid-related variables on SI, SA, and SA in current and recent NMPOU who used opioids in the previous year ($n = 2299$).

The study was reviewed by the Institutional Review Board of the University of North Carolina Wilmington which granted a waiver of Institutional Review Board approval.

Results

Based on results from our analysis using 2016 SAMHSA data, of the 42,625 respondents age 18 or older, using the weighted measure, 89.36% reported never using NMPO; 12.8% were current users (within 30 days); 3.1% were recent users (longer than 30 days, but in the past 12 months); and 6.26% were past users (longer than 12 months ago).

Table 1 presents weighted prevalence of each variable on suicidality. Most variables between *yes* and *no* groups for the SI, SP, and SA variables were significantly different except gender in SI and SA as well as race in SP and SA. Of current users, 5.61% reported SI, 6.18% reported SP, and 5.47% SA. Recent users reported 10.44% of SI, 14.64% of SP, and 17.36% of SA. Past users had 12.15% of SI, 14.25% of SP and 11.27% of SA.

Of the group that reported SI, about half was young adults aged 18 to 34 years (51.01%), the group was mostly White (69.12%), and about half (48%) experienced a MDE. In the SP group, 56.78% was young adults, more female (58.01%), mostly White (66.26%), and over half (56.30%) experienced a MDE. Similarly, the SA group, was mostly young adults (61.87%), mostly White (60.49%), and 42.72% had a MDE.

Unadjusted and adjusted associations between suicidality and NMPOU

In unadjusted analyses, the NMPOU groups were significantly associated with greater odds of SI, SP, and SA compared to respondents reporting no prescription opioid use (see Table 2). For respondents having SI, OR were 6.45 for current users (95% CI [4.50, 9.24], $p < .001$), 4.70 for recent users (95% CI [3.78, 5.86], $p < .001$), and 2.54 (95% CI [2.09, 3.09], $p < .001$) for past users, while 7.05 (95% CI [4.81, 10.35], $p < .001$), 6.81 (95% CI [5.04, 9.20], $p < .001$), and 3.19 (95% CI [2.35, 4.34], $p < .001$), respectively for respondents having planned suicide. For suicide attempt, 5.95 (95% CI [3.54,

10.00], $p < .001$), 7.81 (95% CI [4.94, 12.35], $p < .001$) and 2.46 (95% CI [1.44, 4.19], $p < .001$) ORs were reported respectively.

After adjusting for all covariates in Table 2, the final multivariable logistic regression models for 12-month SI, SP, and SA are presented in Table 3. Although the OR were attenuated, opioid use was still significantly associated with SI, SP and SA. The OR of NMPOU for current user in SI was 2.19 (95% CI [1.44, 3.33], $p < .001$), recent users was 2.18 (95% CI [1.70–2.80], $p < .001$) and 1.53 for past users (95% CI [1.21, 1.95], $p < .01$). Also, the OR of NMPOU for current user in SP was 1.98 (95% CI [1.14, 3.45], $p < .001$), recent users was 2.71 (95% CI [1.88, 3.92], $p < .001$) and 1.91 for the NMPOU for past users (95% CI [1.36, 2.69], $p < .001$). However, current and past users of NMPOU in SA were not significantly associated with SA, but recent users had significantly higher likelihoods (OR = 2.76, 95% CI [1.66, 4.60], $p < .001$).

Sociodemographic variables were slightly differed between SI, SP and SAs. For example, marital status was significantly associated with SI, but not with SP and SA. However, both general health and mental health status (presence of MDE and SUD) were significantly associated with SI, SP, and SA. The presence of a MDE was most strongly associated with SI (OR = 12.09, 95% CI [10.57, 13.82], $p < .001$), SP (OR = 11.24, 95% CI [8.80, 14.35], $p < .001$) and SAs (OR = 5.34, 95% CI [4.16, 6.87], $p < .001$). The OR of MDE in SA was sharply decreased after adjusting for all covariates. The OR of SUD (OR = 3.23, 95% CI [2.23, 4.68], $p < .001$) was fairly increased in SA compared to SI and SA.

Opioid-related variables and suicidality

Table 4 shows correlates of opioid-related variables on SI, SP, and SA in the sample of current and recent users of NMPO ($n = 2299$). The source of pain reliever for last misuse were not significantly different between *yes* and *no* groups. However, for both SI (51.08%) and SP groups (52.17%), a friend or relative was shown the most common source. However, a health care provider (45.39%) was the most common source of pain reliever for last misuse in SA. Over 60% in SI (62.48%), and more than half in SP (56.76%) and SA (58.48%) used pain reliever for pain, but not as directed. The amount of pain reliever misuse was associated with SI only and the frequency of pain reliever misuse was associated with all SI, SA, and SP.

Discussion

This secondary data analysis examined the relationship between NMPOU and past-year suicidality. Although the ORs were relatively attenuated in an adjusted analysis, the results clearly found differences in suicidal outcomes for each sub-NMPOU groups, even after adjusting for socio-demographic and mental health-related variables. First, the findings suggest NMPO users are at risk for suicide. The current, recent, and past users in NMPO showed significant associations on all suicidality variables in both unadjusted and adjusted models, compared to non-NMPO users. These findings are consistent with the 2014 NSDUH results that prescription opioid misuse was significantly associated with SI, SP, and SA (Ashrafioun et al., 2017).

Second, the findings of the current analyses using the adjusted models indicate suicide is a multifaceted phenomenon involving psychological, social, biological, cultural, and environmental factors (Poorolajal, Haghtalab, Farhadi, & Darvishi, 2016). The findings indicated the age group 18–25 had significantly higher OR in SI, SP, and SA, compared to age groups 26–34 and 35 or older. The age group 26–34 had also significantly higher OR in SI and SP, compared to age group of 35 or older. Never-married group also had significantly higher OR in SI. It is interesting that females had significantly lower OR in SI, but higher OR is SA. Although income level was not associated with the suicidal outcomes, unemployed group showed significantly higher OR in SI, and people who had college degree had significantly lower OR in

Table 1
Prevalence of variables on 12 month suicide ideation, plan and attempts among U.S Adult (n = 42,625).

	Suicide Ideation			Suicide Plan			Suicide Attempts		
	No (%)	Yes (%)	P	No (%)	Yes (%)	P	No (%)	Yes (%)	P
NMPOU									
Never	90.12	71.81	< 0.001	89.66	64.93	< 0.001	89.51	65.90	< 0.001
Current users	1.09	5.61		1.21	6.18		1.25	5.47	
Recent users	2.78	10.44		2.97	14.64		3.02	17.36	
Past users	6.00	12.15		6.16	14.25		6.22	11.27	
Age									
18–25	13.42	30.04	< 0.001	13.85	35.95	< 0.001	13.93	44.64	< 0.001
26–34	15.62	20.97		15.78	20.83		15.83	17.23	
35 or older	70.96	48.99		70.37	43.23		70.24	38.13	
Sex									
Male	48.13	48.74	NS	48.23	41.99	< 0.05	48.19	41.56	NS
Female	51.87	51.26		51.77	58.01		51.81	58.44	
Education									
Less than high school	12.74	13.80	< 0.001	12.76	14.17	< 0.001	12.75	18.45	< 0.001
High school grad	25.27	24.49		25.22	27.48		25.19	34.52	
Some college/Associate Degree	30.53	41.01		30.84	41.08		30.91	39.33	
College graduate	31.47	20.71		31.19	17.27		31.16	7.70	
Marital status									
Married	52.66	31.69	< 0.001	51.11	25.72	< 0.001	51.95	25.37	< 0.001
Widowed/Divorced/Separated	19.79	19.61		19.78	20.05		19.81	15.38	
Never been married	27.54	48.70		28.11	54.23		28.23	59.25	
Employment									
Full time	49.66	40.76	< 0.001	49.43	38.33	< 0.001	49.35	40.18	< 0.001
Part time	12.86	18.53		13.01	20.93		13.06	19.24	
Unemployed	4.35	8.33		4.46	8.95		4.48	11.65	
Other	33.12	32.37		33.10	31.79		33.11	28.93	
Race									
White	64.31	69.12	< 0.01	64.48	66.26	NS	64.53	60.49	NS
Black/African American	11.79	10.48		11.73	12.66		11.72	14.60	
Hispanic	8.10	7.22		8.07	8.21		8.05	10.68	
Other	15.80	13.18		15.72	12.87		15.70	14.23	
Income									
Less than \$20,000	16.45	26.76	< 0.001	16.72	29.36	< 0.001	16.79	32.26	< 0.001
\$20,000–\$49,999	29.86	33.14		29.95	34.64		29.95	37.66	
\$50,000–\$74,999	16.07	13.52		16.00	13.14		15.99	10.89	
\$75,000 or more	37.61	26.58		37.33	22.86		37.26	19.19	
Overall Health									
Excellent	21.44	12.93	< 0.001	21.17	14.23	< 0.001	21.14	12.82	< 0.001
Very good	36.17	28.42		35.94	28.94		35.91	27.76	
Good	28.95	33.96		29.15	28.90		29.13	33.94	
Fair/Poor	13.43	24.69		13.73	27.93		13.83	25.48	
MDE (Yes)	4.92	48.00	< 0.001	6.09	56.30	< 0.001	6.46	42.72	< 0.001
SUD (Yes)	7.09	27.25	< 0.001	7.61	35.14	< 0.001	7.74	39.88	< 0.001

Note: P = P value, NS = Non Significant, NMPOU = Nonmedical prescription opioid use, MDE = Major Depression Episode, and SUD = substance use disorders.

SA. Overall health status was also significantly associated with suicide outcomes. People who considered their health status as excellent had a significantly lower OR in all suicide outcome variables, compared to people who rated their health as fair/poor. In particular, a presence of a major depressive episode was found to be the strongest risk factor for suicidal outcomes (SI [OR = 12.09, 95% CI: 10.57, 13.82], *p* < .001, SP [OR = 11.24, 95% CI: 8.80, 14.35], *p* < .001 & SA [OR = 5.34, 95% CI: 4.16, 6.87], *p* < .001). These findings confirm results of previous studies that found depression is the traditional risk factor contributing suicidal outcomes (Marchand et al., 2017; Piscopo & Lipari, 2016), suggesting the importance of screening depression to prevent suicidal outcomes. Substance use disorder (SUD) was also associated with all suicidal outcomes, indicating substance use is a risk factor related to SI, SP, and SA. These findings confirm the association with SUD and suicide outcomes from previous reports. The findings of a meta-analysis of 43 studies with 870, 967 participants, indicated SUD is associated with an increased risk of suicide outcomes despite considerable heterogeneity across studies (Poorolajal et al., 2016).

Third, our findings indicated that misuse of pain relievers is common in NMPO users. It is alarming that over 50% of NMPO users get pain relievers from friends or relatives. Health care providers need

to be aware of the major source of pain relievers is friends or family. This may need to be considered when prescribing. Because opioids alleviate emotional and physical pain, they provide powerful negative reinforcement (Koob, 2013). Our study findings also reported that there were associations between the misuse of pain medication and suicide outcome variables (see Table 4). Because opioids relieve the emotional pain linked with suicidal thoughts, chronic pain patients with higher levels of suicidal ideation may experience more intense opioid craving and exhibit heightened physiological cue-reactivity compared to patients with low levels of suicidal ideation (Garland et al., 2017). Furthermore, health care providers need to be aware that a large proportion of clients use opioids for non-pain purposes or use them incorrectly and these misuse behaviors may be associated with suicidal thoughts and behaviors. Therefore, health care providers should pay attention to the adverse effects of opioids on suicidal thoughts and behaviors and consider a broader approach such as use of non-pharmacological strategies for pain management.

This is a secondary data analysis of the 2016 NSDUH. There are inherent limitations with secondary data. In NSDUH, the suicide-related variables are limited to only three variables including suicidal ideation, plan and attempts and the questions are arranged so individuals

Table 2
Unadjusted models examining associations between suicidality and opioid related.

	Suicide Ideation		Suicide Plan		Suicide Attempt	
	OR	95% CI	OR	95% CI	OR	95% CI
NMPOU (REF: Never Used)						
Current user	6.45***	4.50, 9.24	7.05***	4.81, 10.35	5.95***	3.54, 10.00
Recent user	4.70***	3.78, 5.86	6.81***	5.04, 9.20	7.81***	4.94, 12.35
Past user	2.54***	2.09, 3.09	3.19***	2.35, 4.34	2.46**	1.44, 4.19
Age (REF: 35 or older)						
18–25	3.24***	2.86, 3.67	4.23***	3.33, 5.36	5.91***	4.00, 8.73
26–34	1.94***	1.69, 2.24	2.15***	1.61, 2.86	2.01**	1.22, 3.29
Sex (REF: Male)						
Female	0.98	0.84, 1.14	1.29*	0.02, 1.62	1.31	0.97, 1.76
Education (REF: Less than high school)						
High school grad	0.89	0.71, 1.13	0.98	0.69, 1.39	0.95	0.62, 1.45
Some college/Associate Degree	1.24	0.96, 1.60	1.20	0.87, 1.65	0.88	0.55, 1.39
College graduate	0.61***	0.47, 0.78	0.50***	0.36, 0.69	0.17***	0.09, 0.32
Marital Status (REF: Married)						
Widowed/Divorced/Separated	1.65***	1.35, 2.01	2.05***	1.44, 2.93	1.59	0.92, 2.75
Never been married	2.94***	2.59, 3.34	3.91***	2.97, 5.15	4.30***	2.80, 6.58
Employment (REF: Full time)						
Part time	1.75***	1.49, 2.07	2.08***	1.57, 2.74	1.81*	1.09, 3.01
Unemployed	2.33***	1.94, 2.80	2.58***	1.81, 3.69	3.20***	2.02, 5.06
Other	1.19**	1.05, 1.35	1.24*	0.97, 1.59	1.07	0.68, 1.69
Race (REF: White)						
Black	0.83	0.67, 1.03	1.05	0.74, 1.49	1.33	0.83, 2.13
Hispanic	0.78**	0.66, 0.91	0.80	0.62, 1.03	0.97	0.67, 1.39
Other	0.83	0.66, 1.04	0.99	0.70, 1.40	1.42	0.70, 2.86
Income (REF: Less than \$20,000)						
\$20,000–\$49,999	0.68***	0.58, 0.81	0.66**	0.51, 0.86	0.65*	0.46, 0.93
\$50,000–\$74,999	0.52***	0.41, 0.65	0.47***	0.31, 0.70	0.35***	0.21, 0.59
\$75,000 or more	0.43***	0.37, 0.51	0.35***	0.26, 0.46	0.27***	0.18, 0.39
Overall Health (REF: Excellent)						
Very good	1.30*	1.06, 1.60	1.20	0.83, 1.74	1.27	0.79, 2.05
Good	1.95***	1.62, 2.34	1.47**	1.13, 1.93	1.92**	1.22, 3.03
Fair/Poor	3.05***	2.47, 3.76	3.03***	2.02, 4.54	3.04***	1.94, 4.77
MDE (REF: No)	17.85***	15.67, 20.34	19.86***	15.94, 24.73	10.79***	8.12, 14.34
SUD (REF: No)	4.91***	4.31, 5.58	6.58***	5.5, 7.79	7.91***	5.73, 10.90

Characteristics, sociodemographics, and mental health related variables (n = 42,625).

Note: $p^* < 0.05$, $p^{**} < 0.01$, $p^{***} < 0.001$, OR = Odds Ratio, CI = Confidence Interval.

NMPOU = Nonmedical prescription opioid use, REF = reference group, MDE = Major Depression Episode, and SUD = substance use disorder.

Bolded responses represent those odds ratios (OR) significant at $p < .05$.

planning suicide had to be suicidal ideators, and attempters had to be both ideators and planners. This is relevant as prior studies have reported suicide attempters without a plan differ from attempts with a plan (Nock, Hwang, Sampson, & Kessler, 2010). In addition, the data were cross-sectional, and self-reported, so temporal associations between variables cannot be made and are susceptible to bias. Therefore, it is impossible to draw causal relationships between variables. Future studies with a longitudinal design are needed to investigate factors affecting suicide in NMPOU and to follow recent and past users. In addition, because the target population was defined as the civilian, non-institutionalized population of the United States, a small proportion of subpopulations (about 3%) were excluded, including members of the active duty military and individuals in institutions such as residents in long term care facilities. Therefore, NSDUH may provide slightly inaccurate estimates of drug use in the larger population, considering prevalence estimates for less commonly-used drugs, such as heroin in the civilian, noninstitutionalized population. Additionally, as reported by SAMHSA (2017), a significant percentage (28.8%) of potential respondents opted out of the survey.

However, the use of a large, national sample guarantees external generalizability and the current study analyzed newly-added items. Until 2015, the NSDUH data did not collect information regarding the amount of prescription opioids used. The 2015 NSDUH took this into consideration and an item was added to assess overuse of prescription opioids (Hughes et al., 2016). Examples of behaviors that were presented to respondents for misuse were: (a) use without a prescription;

(b) use in greater amounts, more often, or longer than prescribed; or (c) use in any other way a doctor did not tell respondents to take a drug (SAMHSA, 2017). Additionally, the definition of the misuse of prescription drugs was changed. The revised definition of misuse referred to the use of prescription drugs in any way a doctor did not direct respondents to use them and focused specifically on behaviors that constitute misuse (SAMHSA, 2017).

In conclusion, the findings of the current secondary data analysis provide valuable insights regarding NMPOU in relation to suicide-related outcomes and supporting enhanced access to suicide prevention and non-pharmacological pain management across settings. Suicide among the NMPO users is high, and there are multiple covariates associated with suicide. Specifically, characteristics associated with suicidality in nonmedical opioid users reveal populations with depression and co-occurring substance use. Policy and prevention efforts to improve screening and treatment could focus on at-risk populations identified in this study. It would be beneficial for nurses who are working with NMPO users to apply the evidence-based research findings in practice. Clinics where opioids are prescribed, such as pain clinics or primary care offices, may provide unique and timely settings to assess for suicidal thoughts and depression, and screen for substance use. In addition, health care providers should consider interprofessional collaboration such as behavioral health consultation for any patient with a history of a suicide attempt or psychiatric disorder (CDC, 2016).

Table 3
Adjusted models examining associations between suicidality and opioid related characteristics, sociodemographics, and mental health related variables (n = 42,625).

	Suicide Ideation		Suicide Plan		Suicide Attempt	
	OR	95% CI	OR	95% CI	OR	95% CI
NMPOU (REF: Never Used)						
Current user	2.19***	1.44, 3.33	1.98*	1.14, 3.45	1.50	0.91, 2.47
Recent user	2.18***	1.70, 2.80	2.71***	1.88, 3.92	2.76***	1.66, 4.60
Past user	1.53***	1.21, 1.95	1.91***	1.36, 2.69	1.56	0.91, 2.70
Age (REF: 35 or older)						
18–25	2.26***	1.30, 2.03	2.49***	1.08, 2.36	2.99***	0.79, 2.45
26–34	1.63***	1.80, 2.84	1.59*	1.67, 3.72	1.39	1.80, 4.96
Sex (REF: Male)						
Female	0.81*	0.68, 0.97	1.13	0.89, 1.44	1.38**	1.02, 1.88
Education (REF: Less than high school)						
High school grad	0.91	0.71–1.17	1.02	0.72, 1.44	0.97	0.67, 1.42
Some college/Associate degree	1.12	0.86–1.47	1.01	0.73, 1.39	0.74	0.46, 1.18
College graduate	0.83	0.63–1.10	0.73	0.52, 1.04	0.26***	0.14, 0.49
Marital Status (REF: Married)						
Widowed/Divorced/Separated	1.16	0.88, 1.53	1.35	0.91, 2.00	0.95	0.53, 1.69
Never been married	1.25*	1.05, 1.49	1.31	0.90, 1.91	1.17	0.76, 1.80
Employment (REF: Full time)						
Part time	1.21	0.97, 1.52	1.26	0.93, 1.71	0.99	0.58, 1.70
Unemployed	1.39**	1.10, 1.75	1.36	0.94, 1.99	1.37	0.86, 2.20
Other	1.02	0.85, 1.23	0.99	0.72, 1.36	0.76	0.41, 1.40
Race (REF: White)						
Black	0.82	0.63, 1.06	1.11	0.78, 1.58	1.10	0.66, 1.84
Hispanic	0.72***	0.60, 0.87	0.79	0.58, 1.08	0.76	0.51, 1.13
Other	0.87	0.68, 1.11	1.10	0.78, 1.55	1.51	0.74, 3.10
Income (REF: Less than \$20,000)						
\$20,000–\$49,999	0.90	0.73, 1.10	0.94	0.68, 1.30	0.93	0.58, 1.49
\$50,000–\$74,999	0.83	0.65, 1.07	0.88	0.57, 1.35	0.67	0.33, 1.33
\$75,000 or more	0.84	0.65, 1.07	0.78	0.55, 1.11	0.64	0.37, 1.09
Overall Health (REF: Excellent)						
Very good	1.09	0.87, 1.37	0.92	0.63, 1.36	1.03	0.63, 1.68
Good	1.53***	1.22, 1.90	0.98	0.72, 1.35	1.35	0.82, 2.23
Fair/Poor	2.10***	1.64, 2.70	1.73*	1.09, 2.76	1.97*	1.16, 3.36
MDE (REF: No)	12.09***	10.57, 13.82	11.24***	8.80, 14.35	5.34***	4.16, 6.87
SUD (REF: No)	2.03***	1.74, 2.38	2.36***	1.87, 2.98	3.23***	2.23, 4.68

Note: $p^* < 0.05$, $p^{**} < 0.01$, $p^{***} < 0.001$, OR = Odds ratio, CI = Confidence interval.
 NMPOU = Nonmedical prescription opioid use, REF = reference group, MDE = Major Depression Episode, and SUD = substance use disorder.
 Bolded responses represent those odds ratios (OR) significant at $p < .05$.

Table 4
Correlates of opioid related variables on suicide ideation, plan and attempts (n = 2299).

	Suicide Ideation			Suicide Plan			Suicide Attempts		
	No (%)	Yes(%)	P	No(%)	Yes(%)	P	No(%)	Yes(%)	P
Source of pain reliever for last misuse									NS
Health care provider	40.38	32.88	NS	39.37	35.52	NS	39.10	45.39	
Friend or relative	51.08	54.91		51.72	52.17		51.97	40.66	
Dealer or other way	80.54	12.21		8.92	12.31		8.93	13.95	
For pain (not directed)									< 0.05
Yes	74.62	62.48	< 0.01	73.67	56.76	< 0.01	73.29	56.48	
No	25.38	37.52		26.33	43.24		26.71	43.52	
Without prescription									NS
Yes	39.03	35.57	NS	38.66	34.06	NS	38.33	44.95	
No	60.97	64.43		61.34	65.94		61.67	55.05	
Greater amounts than prescribed									NS
Yes	79.23	70.81	< 0.05	78.31	71.20	NS	78.23	68.88	
No	20.77	29.19		21.69	28.80		21.77	31.12	
More frequently than prescribed									< 0.05
Yes	84.66	75.50	< 0.01	84.03	72.79	< 0.01	28.46	71.51	
No	15.34	24.50		15.97	27.21		16.37	83.63	
Longer duration than prescribed									NS
Yes	85.91	87.55	NS	86.06	87.45	NS	86.20	84.98	
No	14.09	12.45		13.94	12.55		13.80	15.02	
For other ways not directed									NS
Yes	76.00	70.89	NS	75.17	75.49	NS	75.37	70.14	
No	24.00	29.11		24.83	24.51		24.63	29.86	

Note: P = P value, NS = Non significant.
 Bolded responses represent those odds ratios (OR) significant at $p < .05$.

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