Short communication

Investigating extra-medical opioid use and social networks among people with post-traumatic stress disorder

Whitney S. Córdoba-Grueso [a], Kelly R. Peck [b], Kate S. Eddens [a], Maria A. Parker [a,*]

[a] Department of Epidemiology & Biostatistics, School of Public Health, Indiana University, Bloomington, IN
[b] Vermont Center on Behavior & Health, University of Vermont, Burlington, VT

ARTICLE INFO

ABSTRACT

Introduction: Post-traumatic stress disorder (PTSD) and extra-medical opioid Use (EMOU) frequently co-occur. Few studies have examined the relationship between EMOU and social networks among people with PTSD. Accordingly, this study examined social networks in a sample of people with PTSD in the United States by assessing the association between social network size/diversity and lifetime EMOU status.

Methods: Data came from a cross-sectional, nationally representative sample of adults who participated in the National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III) from 2012 to 2013. For people with past-year PTSD (unweighted $n = 1,764$), social network size and diversity were estimated by lifetime EMOU status. Multivariable logistic regression models examined the association between social network size, diversity, and EMOU adjusting for sociodemographics, cigarette use, major depression, and anxiety disorder.

Results: Between 2012–2013, 24% of people with PTSD had lifetime EMOU. Those with EMOU had a lower social network size and diversity than individuals without EMOU (14 vs. 17 persons, 4 vs. 5 groups, p-values < 0.05). In adjusted models, EMOU was significantly associated with social network diversity (AOR = 0.91; 95% CI: 0.82, 0.99), but not with social network size (AOR = 1.00; 95% CI: 0.98, 1.01).

Conclusions: Less diverse social networks were associated with lifetime EMOU among people with PTSD. Future research should examine associations between the quality of social networks and EMOU, ideally from longitudinal studies.

1. Introduction

Extra-medical opioid use (EMOU) is the use of prescription opioids without a doctor's prescription; in greater amounts, more often, longer than prescribed, or for a reason other than a doctor said you should use them (Parker, 2016). EMOU remains a public health challenge both in the United States and more globally (Cicero et al., 2015; Krausz et al., 2021; Belzak and Halverson, 2018). People with post-traumatic stress disorder (PTSD) have a higher prevalence of opioid use than people without PTSD (Bilevicius et al., 2018; López-Martínez et al., 2019). A feeling of detachment and estrangement from others is a core symptom of PTSD (American Psychiatric Association, 2013), which may make people with PTSD particularly vulnerable to social isolation. Indeed, low perceived social support is strongly associated with PTSD (Platt et al., 2014). Thus, social networks may be particularly relevant to the co-occurrence of opioid use and PTSD.

Social network diversity is defined as the number of different types of social connections an individual has and plays a key role in substance use. Behaviors are determined by thoughts and attitudes (Ajzen, 1985), which tend to be similar and reinforced in close social network ties such as partners, family, and close friends (Granovetter, 1973). However, distant network ties, such as neighbors, colleagues, or acquaintances, tend to be more sociodemographically diverse and espouse different values, therefore providing access to resources, attitudes, and ideas that may differ from those of close ties (Granovetter, 1973). Among nationally representative samples, people with larger and more diverse social networks are less likely to engage in substance use and less likely to avoid seeking treatment than people with smaller and less diverse social networks (Mowbray, 2014; Chou et al., 2011).

Social networks are particularly important in the context of EMOU because opioids are often accessed through networks of friends or family members (Lankenau et al., 2012; Kelley-Quon et al., 2019), who are typically characterized as close ties. Increasing the diversity of the social network by accessing resources and opportunities through diverse social network ties or by engaging significant others in group therapies could influence behaviors such as EMOU and may be potentially protective against PTSD (Platt et al., 2014; Polenick et al., 2019). This study aimed to assess the association between social network size/diversity and lifetime EMOU among US adults with past-year PTSD. We

hypothesized that people with larger and more diverse social networks would be less likely to engage in EMOU than people with smaller and less diverse social networks.

2. Methods

2.1. Sample

This cross-sectional study used nationally representative data from the National Epidemiologic Survey on Alcohol-Related Conditions-III (NESARC-III), which was conducted between April 2012 and June 2013 and used multistage sampling of non-institutionalized civilian adults who resided in the United States (Grant et al., 2016). A total of 36,309 adults participated in NESARC-III (The National Institute on Alcohol Abuse and Alcoholism, 2013). This study focuses on people with past-year PTSD with measures of lifetime EMOU (unweighted $n = 1,764$). PTSD was assessed through the Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV) (Grant et al., 2015). The Indiana University Institutional Review Board determined this study was exempt.

2.2. Measures

The main outcome of this study was EMOU, which was assessed through the question "Did you use painkillers in the last 12 months only, prior to the last 12 months only, or during both time periods?" Here, we focus on lifetime EMOU use, which included: "methadone, codeine, Demerol, Vicodin, Oxycontin, opium, oxy, Percocet, Dilaudid, Percodan, or morphine."

The exposure of interest in this study was the Social Network Index, which is a measure of both the size and diversity of an individual's social connections. Social Network Size was defined as the number of people they contacted at least once every two weeks among 12 different social groups (Perry, 2011; Brown et al., 2020). The NESARC-III asked "How many of your [relatives/grown children/close friends/etc.] do you contact at least once every 2 weeks?" (range: 0–140). Social Network Diversity was defined as the sum of the number of social groups in which an individual participated at least once every 2 weeks (Perry, 2011). A value of one was assigned for respondents who reported interaction with at least one person in each social group using the survey questions used to assess social network size (range: 0–12). Social Network Diversity was divided into three categories: "Few Social Networks" (1 standard deviation below the mean) (Mowbray, 2014), "Average Social Networks" (mean +/- the standard deviation) and "Many Social Networks" (1 standard deviation above the mean) (Mowbray, 2014).

2.2.1. Sociodemographic characteristics

Covariates included sex (male/female), age (continuous), race/ethnicity (Non-Hispanic White/Non-Hispanic Black/Hispanic/Other), education level (<High School/General Educational Development (HS/GED), [equal to] HS/GED, or > HS/GED) as well as Household income (Low <$20,000, Middle-Low $20,000-$34,999, Middle-High $35,000-$69,999, High $70,000+) (Brown et al., 2020). We included these covariates because previous research using the NESARC-III shows that people with PTSD have been primarily white females, with some college education, married, and low income (Isralowitz et al., 2018). Also, because middle-aged individuals, non-Hispanic white women, and persons with an education higher than High School and a low household income have been more likely to experience EMOU and PTSD (Kulis et al., 2012; Nasim et al., 2011). Additionally, past 30-day cigarette use and mental health disorders were included given their high prevalence among US adults with substance use (Hasin et al., 2015). Past-year history of major depressive episode and generalized anxiety disorder were included as dichotomous covariates of interest.

2.3. Statistical analysis

First, we estimated the sociodemographic and mental health characteristics of the sample with weights by EMOU status and the prevalence of lifetime EMOU among individuals with past-year PTSD. Next, a bivariate comparison was conducted between the Social Network Index (i.e., social network size and diversity score) and EMOU status (i.e., lifetime use vs. no lifetime use). A two-tailed Wald test was used to evaluate differences by EMOU status for continuous variables, and a chi-square test was used for categorical variables. Then, a weighted multivariable logistic regression model was conducted to examine the association between EMOU and the Social Network Index, adjusting for sociodemographic and mental health covariates. We present 95% confidence intervals for precision of the results with p-values presented as an aid to interpretation. Stata (Stata, 2019), version 16, was used for weighted analysis of the data, given the complexities in the sampling design of the NESARC-III.

3. Results

3.1. Sociodemographic characteristics

Overall, individuals with past-year PTSD were on average 42 years old, primarily female (68%), non-Hispanic white (68%), had an education higher than HS/GED (58%), and had a middle-high income (27%). Cigarette use (38%), generalized anxiety disorder (28%), and major depressive disorder (45%) were prevalent in the sample. Among people with past-year PTSD, 24% had lifetime EMOU. When comparing those with and without lifetime EMOU, those with lifetime EMOU were significantly younger, more likely to smoke cigarettes, and more likely to have experienced a major depressive episode in the past year than those without lifetime EMOU (age: F $(1, 113) = 32.39$, $p < 0.001$; cigarettes use: $\chi^2(1) = 1867.28$, $p < 0.001$; major depressive episode: $\chi^2(1) = 182.54$, $p = 0.022$). There were also significant differences for race/ethnicity and income for those with PTSD and EMOU compared to individuals with PTSD without EMOU (race/ethnicity: $\chi^2(3) = 373.77$, $p = 0.008$; income: $\chi^2(3) = 270.73$, $p = 0.046$).

3.2. Social network size

The average social network size of the sample of individuals with PTSD was 16 people. The highest social network size scores were those for volunteering and religious groups. Table 1 depicts that overall, people with PTSD and EMOU had lower social networks than people with PTSD without EMOU. Those with PTSD and EMOU had an average social network size of 14, while those with PTSD without EMOU had a social network size of 17 (F $(1, 113) = 4.99$, p-value = 0.028). Among individuals with PTSD and few social networks, 35% engaged in EMOU. For individuals with PTSD and average social networks, 25% engaged in EMOU; and among individuals with PTSD but many social networks, 17% engaged in EMOU ($\chi^2(2) = 440.67$, $p = 0.001$).

Table 1 also shows that there were significant differences in the social network size of relatives and the prevalence of being partnered. Those with PTSD and EMOU contacted an average of 2 relatives, compared to 3 relatives among those with PTSD without EMOU (F $(1, 113) = 10.04$, p-value = 0.002). Likewise, 46% of individuals with PTSD were partnered overall, 9% were partnered and engaged in EMOU, and 37% were partnered but did not engage in EMOU ($\chi^2(1) = 360.25$, $p = 0.004$).

3.3. Social network diversity

Overall, people with PTSD interacted with individuals in almost 5 different social network categories (Table 1). People with PTSD and EMOU had lower social network diversity than people with PTSD without EMOU. Those with PTSD and EMOU had connections in 4 social

Table 1

Bivariate comparison of Social Network Size and Diversity among people with past-year PTSD. Data from the National Epidemiologic Survey on Alcohol and Related Conditions-III.

Social Network Index	Total (% or mean)	EMOU (% or mean)	No EMOU (% or mean)	p-value
Social Network Size				
Partner[a,b]	46.22	9.29	36.94	**0.004**
Parents[a,c]	85.64	22.64	63.00	0.880
Spouse's parents[a,d]	64.52	12.28	52.23	0.138
Grown children	1.99	1.87	2.02	0.252
Relatives	3.05	2.48	3.24	**0.002**
Close friends	3.60	3.32	3.70	0.225
Fellow students/teachers	3.80	4.02	3.70	0.843
Coworkers	2.90	2.84	2.92	0.837
Neighbors	1.27	1.16	1.30	0.345
Volunteers	4.44	3.57	4.68	0.318
Members of own's religious group	4.41	5.36	4.21	0.340
Other group members	4.99	4.37	5.18	0.456
Few Social Networks[a]	10.29	34.92	65.08	**0.001**
Average Social Networks[a]	69.66	25.41	74.59	
Many Social Networks[a]	20.06	17.13	82.87	
Social Network Size (Total)	15.90	14.01	16.52	**0.028**
Social Network Diversity				
Social Network Diversity (Total)	4.81	4.43	4.94	**<0.001**

NOTE: Few Social Networks (<mean-SD), Average Social Networks (between mean-SD and mean+SD), and Many Social Networks (>mean+SD), where mean=4.81, SD=1.99. Bolding denotes statistical significance at the alpha=0.05 level from Wald or Chi-square tests.

[a] Categorical, presented as percentages.

[b] Individuals that are married or living with someone as if married.

[c] Individuals who see or talk on the phone or Internet to any of their parents or people who raised them at least once every 2 weeks.

[d] Individuals who see or talk on the phone to their spouse's/partner's parents or other people who raised their spouse/partner at least once every 2 weeks.

groups, compared to people with PTSD without EMOU who had connections in 5 social groups (F (1, 113) = 15.75, $p < 0.001$).

3.4. Multivariable model

Table 2 shows that after adjusting for social network size as well as sociodemographic and mental health covariates, there was an inverse association between social network diversity and lifetime EMOU (AOR=0.91; 95% CI: 0.82, 0.99). Cigarette use was the strongest variable associated with EMOU among individuals with PTSD, as the odds of EMOU for those with past 30-day cigarette use were more than two times higher than those with no cigarette use (AOR=2.57; 95% CI:1.94, 3.39). Males were also 57% more likely to have lifetime EMOU use compared to females (AOR=1.57; 95% CI: 1.09, 2.25). Persons who identified as non-Hispanic Black were about 50% less likely to have lifetime EMOU vs. those who identified as non-Hispanic White (AOR=0.48; 95% CI: 0.30, 0.74).

4. Discussion

While people with PTSD and lifetime EMOU had a lower social network size and diversity than those without EMOU (Chou et al., 2011; Mowbray et al., 2014), the diversity, not the size, of social networks was significantly associated with EMOU after adjusting for background characteristics. Consistent with our hypothesis, findings showed that a more diverse social network was inversely associated with EMOU (i.e., OR < 1).

The social networks of people with PTSD and EMOU might be smaller and less diverse because they remain connected primarily to people in their close networks, who may reinforce attitudes and beliefs that promote EMOU (Ajzen, 1985; Lankenau et al., 2012; Kelley-Quon et al., 2019). They might also grow smaller because their network members get burnt out and subject them to social exclusion (Perry et al., 2020; Perry, 2011). Race/ethnicity, education, and income may also influence the social network dynamics (Brown et al., 2020). Diversifying social

Table 2

Multivariable Logistic Regression evaluating the association between social network size/diversity and lifetime use of EMOU. Data from the National Epidemiologic Survey on Alcohol and Related Conditions-III.

Background characteristic	Adjusted Odds Ratio	95% Confidence Interval
Social Network Size	1	0.98, 1.01
Social Network Diversity	0.91	**0.82, 0.99**
Sex		
Female	1	
Male	1.57	**1.09, 2.25**
Age	0.98	**0.97, 0.99**
Race/Ethnicity		
Non-Hispanic White	1	
Non-Hispanic Black	0.48	**0.30, 0.74**
Other	0.48	0.23, 1.01
Hispanic	0.74	0.48, 1.13
Cigarette Use		
No	1	
Yes	2.57	**1.94, 3.39**
Household Income		
Low ($0–19,999)	1	
Middle-Low ($20,000–34,999)	0.72	0.49, 1.07
Middle-High ($35,000–69,999)	0.79	0.55, 1.14
High ($70,000 or more)	0.81	0.51, 1.31
Education		
<High School/GED*	1	
High School/GED	0.87	0.57, 1.32
>High School/GED	1.12	0.77, 1.64
Major Depressive Episode		
No	1	
Yes	1.22	0.89, 1.67
Generalized Anxiety Disorder		
No	1	
Yes	0.80	0.58, 1.10

Bolding denotes statistical significance at the alpha=0.05 level.

* GED: General Educational Developments, a test that shows an individual has United States high school-level academic skills.

networks through expanding connections to colleagues, neighbors, or faith-based groups could provide access to resources, beliefs and attitudes that prevent EMOU and social-support for quitting substance use (Isralowitz et al., 2018; Kulis et al., 2012; Nasim et al., 2011).

This study has several strengths and limitations. We used a nationally representative dataset, which has comprehensive and reliable data on DSM-5 PTSD and other disorders (Grant et al., 2015; Hasin et al., 2015), so these findings generalize to people with past-year PTSD in the US. However, the opioid use epidemic has also continued to evolve in the time since data was collected in 2012–2013. We were unable to examine more recent EMOU (e.g., past-year) in this population due to the low prevalence of past-year EMOU in the NESARC-III (unweighted $n = 18$), and the sample includes non-institutionalized persons only, so findings may differ among individuals in institutionalized settings. Lastly, given the cross-sectional nature of the data, we cannot infer causality or the temporal association between EMOU and the social network index.

In conclusion, only the diversity of social networks was significantly associated with EMOU among people with PTSD. Longitudinal studies may provide further insight into the temporality of the relationship between social networks and EMOU. We acknowledge that the difference in the diversity of social networks between people with and without EMOU in our study was small (4 vs. 5 social groups). Future research could address this challenge by exploring which social groups are stronger predictors of EMOU. Social network analyses may also provide insight on the content of social networks of people with PTSD (Platt et al., 2014), how their network ties might influence EMOU, and whether members of their social networks also engage in EMOU.

Role of funding source

Previous presentations

The results of this original work have not been presented elsewhere nor previously accepted for publication in another journal. Preliminary results of this research were presented as a Poster at the 83rd Annual Scientific Virtual Meeting of the College on Problems of Drug Dependence (CPDD), June 21–24, 2021.

Contributors

Authors Córdoba and Parker designed the study, conducted literature searches, and performed data analysis. Authors Peck and Eddens provided meaningful contributions of content and revisions to drafts. All authors have approved the final article.

Conflict of Interest

No conflict declared.

Acknowledgements

References

Ajzen, I., 1985. From Intentions to actions: A theory of Planned Behavior. In: Beckmann, IJ (Ed.), Action Control. SSSP Springer Series in Social Psychology. Springer, Berlin, Heidelberg https://doi.org/10.1007/978-3-642-69746-3_2.

American Psychiatric Association, 2013. Diagnostic and Statistical Manual of Mental Disorders, 5th Edition American Psychiatric Association.

Belzak, L., Halverson, J., 2018. The opioid crisis in Canada: a national perspective. Health Promot. Chronic Dis. Prev. Can. 38 (6), 224–233.

Bilevicius, E., Sommer, J.L., Asmundson, G.J.G., El-Gabalawy, R., 2018. Posttraumatic stress disorder and chronic pain are associated with opioid use disorder: results from a 2012-2013 American nationally representative survey. Drug Alcohol Depend. 188, 119–125.

Brown, S.M., Barman-Adhikari, A., Combs, K.M., Rice, E., 2020. Sociodemographic and substance use characteristics associated with typologies and composition of social support networks among youth experiencing homelessness in Los Angeles, USA. Health Soc. Care Community 28 (2), 533–543.

Chou, K.L., Liang, K., Sareen, J., 2011. The association between social isolation and DSM-IV mood, anxiety, and substance use disorders: wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. J. Clin. Psychiatry 72 (11), 1468–1476.

Cicero, T.J., Ellis, M.S., Harney, J., 2015. Shifting patterns of prescription opioid and heroin abuse in the United States. N. Engl. J. Med. 373 (18), 1789–1790.

Granovetter, M., 1973. The strength of weak ties. Am. J. Sociol. 78 (6).

Grant, B.F., Saha, T.D., Ruan, W.J., Goldstein, R.B., Chou, S.P., Jung, J., et al., 2016. Epidemiology of DSM-5 drug use disorder: results from the national epidemiologic survey on alcohol and related conditions-III. JAMA Psychiatry 73 (1), 39–47.

Grant, B.F., Goldstein, R.B., Smith, S.M., Jung, J., Zhang, H., Chou, S.P., et al., 2015. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5): reliability of substance use and psychiatric disorder modules in a general population sample. Drug Alcohol Depend. 148, 27–33.

Hasin, D.S., Greenstein, E., Aivadyan, C., Stohl, M., Aharonovich, E., Saha, T., et al., 2015. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5): procedural validity of substance use disorders modules through clinical re-appraisal in a general population sample. Drug Alcohol Depend. 148, 40–46.

Isralowitz, R., Reznik, A., Sarid, O., Dagan, A., Grinstein-Cohen, O., Wishkerman, V.Y., 2018. Religiosity as a Substance Use Protective Factor Among Female College Students. J. Relig. Health 57 (4), 1451–1457.

Kelley-Quon, L.I., Cho, J., Strong, D.R., Miech, R.A., Barrington-Trimis, J.L., Kechter, A., et al., 2019. Association of nonmedical prescription opioid use with subsequent heroin use initiation in adolescents. JAMA Pediatrics 173 (9), e191750 e.

Krausz, R.M., Westenberg, J.N., Ziafat, K., 2021. The opioid overdose crisis as a global health challenge. Current Opin. Psychiatry 34 (4), 405–412.

Kulis, S., Hodge, D.R., Ayers, S.L., Brown, E.F., Marsiglia, F.F., 2012. Spirituality and religion: intertwined protective factors for substance use among urban American Indian youth. Am. J. Drug Alcohol Abuse 38 (5), 444–449.

Lankenau, S.E., Teti, M., Silva, K., Jackson Bloom, J., Harocopos, A., Treese, M, 2012. Initiation into prescription opioid misuse amongst young injection drug users. Int. J. Drug Policy 23 (1), 37–44.

López-Martínez, A.E., Reyes-Pérez, Á., Serrano-Ibáñez, E.R., Esteve, R., Ramírez–Maestre, C., 2019. Chronic pain, posttraumatic stress disorder, and opioid intake: a systematic review. World J. Clin. Cases 7 (24), 4254–4269.

Mowbray, O., 2014. The moderating role of social networks in the relationship between alcohol consumption and treatment utilization for alcohol-related problems. J. Subst. Abuse Treat. 46 (5), 597–601.

Mowbray, O., Quinn, A., Cranford, J.A., 2014. Social networks and alcohol use disorders: findings from a nationally representative sample. Am. J. Drug Alcohol Abuse 40 (3), 181–186.

Nasim, A., Fernander, A., Townsend, T.G., Corona, R., Belgrave, F.Z., 2011. Cultural protective factors for community risks and substance use among rural African American adolescents. J. Ethn. Subst. Abuse 10 (4), 316–336.

Parker, M.A., 2016. Extra-Medical Prescription Pain Reliever Use, Dependence, And Persistence Among Adolescents. Michigan State University.

Perry, B.L., Pescosolido, B.A., Krendl, A.C., 2020. The unique nature of public stigma toward non-medical prescription opioid use and dependence: a national study. Addiction 115 (12), 2317–2326.

Perry, B.L., 2011. The labeling paradox: stigma, the sick role, and social networks in mental illness. J. Health Soc. Behav. 52 (4), 460–477.

Platt, J., Keyes, K.M., Koenen, K.C., 2014. Size of the social network versus quality of social support: which is more protective against PTSD? Soc. Psychiatry Psychiatr. Epidemiol. 49 (8), 1279–1286.

Polenick, C., Cotton, B., Bryson, W., Birditt, K., 2019. Loneliness and illicit opioid use among methadone maintenance treatment patients. Subst. Use Misuse 54, 1–10.

Stata, Corp., 2019. *Stata Statistical Software: Release 16*. Stata Corp LP.

The National Institute on Alcohol Abuse and Alcoholism. National epidemiologic survey on alcohol and related conditions-III (NESARC-III) 2013. Available at https://www.niaaa.nih.gov/research/nesarc-iii.