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Exposure to Hurricane Sandy and Risk of Opioid Abuse

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ABSTRACT

Background: Given both the increased prevalence of natural disasters in recent years and the crippling opioid epidemic, identifying at-risk groups for substance abuse post-disaster is imperative to survivor mental health. The objective of this study was to examine the association between exposure to Hurricane Sandy and risk of opioid abusive behavior. **Methods:** We conducted a retrospective analysis using data from two cross-sectional studies that examined the impact of Hurricane Sandy on mental health from October 2013– August 2016. Patient demographics, hurricane exposure and mental health history were obtained *via* self-report questionnaires. Opioid abuse risk was determined and categorized using adaptations from the Opioid Risk Tool (ORT). Multinomial logistic regression was used to examine the relationship between hurricane exposure and opioid abuse risk. **Results:** Data was available on 1,687 Hurricane Sandy survivors, the majority being female (59.3%), white (52.0%) and an average age of 46.1 years (std. 19.2). Approximately 9.0% of survivors were classified as being ‘High’ risk for opioid abuse. For every increase in total exposure reported, the odds of being classified as high risk was 1.09 greater (95% CI 1.05, 1.14) compared to low risk, after adjusting for covariates. Among personal exposures only (i.e. injury to self or family member), for every increase in reported exposure the adjusted odds of being classified as high risk was 1.25 times greater (95% CI 1.15, 1.37) compared to low risk. **Conclusions:** These findings suggest that exposure to a natural disaster, specifically personal exposures, are associated with increased risk for opioid abusive behavior.

KEYWORDS



Natural disasters; disaster planning; substance abuse; opioids; opioid abuse; opioid epidemic

Introduction

There is an established body of evidence indicating that exposure to natural and man-made disasters can have a profound impact on the mental health of those who are affected. Studies have shown that survivors of such traumatic events have elevated risk for developing anxiety/depression, Posttraumatic Stress Disorder (PTSD), and substance abuse, of which may persist well beyond the aftermath of such event (Boscarino, 2015; Caramanica et al., 2015; Cepeda et al., 2010; Galea et al., 2005; Lowe et al., 2015; Pouget et al., 2015; Rhodes et al., 2010; Schwartz et al., 2017). Hurricane Sandy, which made landfall in October of 2012, is of no exception, and has been deemed one of the most destructive natural disasters to hit the eastern seaboard, resulting in over \$70 billion in damages and 117 deaths (Casey-Lockyer et al., 2013; NOAA, 2014). Recent evidence has shown that exposure to Hurricane Sandy, specifically experiencing personal and property loss, is associated with increased PTSD symptoms, which persist years after landfall (Abramson et al., 2015; Schwartz et al., 2017). Similarly,

increased exposure to the hurricane among New York residents was also associated with anxiety and depression (Schwartz et al., 2015).

Unlike the established associations among the aforementioned mental health outcomes, current evidence on substance use following Hurricane Sandy are varied. Much of the available studies investigating substance use post landfall primarily focus on cigarette and alcohol use, and not on other substances of misuse/abuse, such as opioids (Abramson et al., 2015; Schwartz et al., 2016). Other studies that do assess opioid use following a disaster are specific to the provisions and access to substance use services during and after the emergency (Dewart et al., 2006; Elliott et al., 2017; Griffin et al., 2018; McArthur et al., 2005; McClure et al., 2014; Pouget et al., 2015; Sandy, 2012; Weiss et al., 2002). Increases in overall opioid misuse, increases in relapse episodes, and increases in drop out of outpatient methadone treatment programs have been reported following disastrous events (Cepeda et al., 2010; Dewart et al., 2006; Frank et al., 2006; Pouget et al., 2015; Weiss et al., 2002). Moreover, the accessibility of medications used to

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treat opioid use disorders (OUD), such as methadone and buprenorphine, has been historically complicated during the aforementioned disasters, with many patients seeking immediate care from Emergency Departments (EDs), which is increasingly problematic for healthcare systems that become inundated following a disaster (Elliott et al., 2017; Griffin et al., 2018; McArthur et al., 2005; McClure et al., 2014; Sandy, 2012).

Today, the opioid epidemic continues to claim the lives of many, with over 46,700 deaths reported in 2018 alone (Hedegaard et al., 2017; Wilson et al., 2020). And, with two million Americans suffering with an Opioid Use Disorder (OUD), the epidemic continues to place an alarming burden on our healthcare systems (Wilson et al., 2020). We have seen in previous studies that access and maintenance of substance abuse and addiction services following Hurricane Sandy was not sufficient to meet the needs of those affected (Pouget et al., 2015). Situations such as these create the opportunity for increases in substance abusive behavior and, therefore, need to be mitigated to prevent morbidity and mortality. Although Hurricane Sandy occurred prior to the declaration of the opioid epidemic, it is imperative that we identify those who are most at risk for substance use behaviors, particularly opioid use, following a disaster. Given the increased prevalence of natural disasters in recent years, in combination of the ongoing opioid epidemic, it is critical to understand those who are most vulnerable to the effects of disaster exposures as it relates to substance use behavior. Information gained can inform emergency preparedness plans for those in need of new and existing substance use services, specifically for OUDs, and enable for proper resource allocations, especially in the face of new disasters. Therefore, the objective of this study was to examine the association between exposure to Hurricane Sandy and risk for opioid abusive behavior.

Methods

Study population

We conducted a retrospective analysis using data from two cross-sectional studies that examined the impact of Hurricane Sandy on mental health from October 2013 to August 2016. The first study, Project LIGHT (Leaders in Gathering Hope Together), assessed the lasting impact of Hurricane Sandy on community residents who were exposed to Hurricane Sandy although that exposure was variable depending on geographic residence. The second study, Project Restoration, used similar methodology to Project LIGHT, but focused its sampling in the Rockaways area of NYC which was an area that was extremely impacted by Hurricane Sandy. Project Restoration also involved a potential linkage into mental health care for those for whom it was indicated and were interested (Schwartz et al., 2015, 2017). Participants in the two studies were conveniently sampled and given a self-report questionnaire that assessed demographics, hurricane exposure, and mental health symptoms including

symptoms of stress, depression, anxiety, PTSD, alcohol misuse and substance misuse, utilizing validated measures.

Measures

Hurricane exposure was assessed as a total score, and as subscales that contain items regarding personal and property exposure, separately (Schwartz et al., 2015). Personal exposures included those that directly affected the individual or their family, such as injury or death. Property exposures assessed the level of personal property impacted by the hurricane, and the financial hardships that may have been experienced as a direct result. Opioid abuse risk was determined and categorized as 'low', 'moderate' or 'high', using adaptations from the Opioid Risk Tool (ORT), a widely implemented screening tool to assess risk of abuse among chronic pain patients (Webster & Webster, 2005). Although the ORT has not been currently validated for use in community samples, 24.4% of the original sample population endorsed having at least one chronic medical condition where pain is often reported (Schwartz et al., 2015, 2017). Factors that contribute to the ORT score include: personal and family history of substance abuse, age, history of preadolescent sexual abuse, and for the presence of depression, and other psychological disorders others than depression. ORT variables used in total risk calculation for this study were obtained from participant questionnaires and specifically included: age, negative impact of familial alcohol or drug use (family history); National Institute on Alcohol Abuse and Alcoholism (NIAAA) assessment guidelines for problem drinking, and health care provider diagnosed alcohol substance use disorder (personal history-alcohol); recreational or prescription use for non-medical reasons and provider diagnosed substance use disorder, recreational or prescription (personal history-substance use); health care provider diagnosed depression, PTSD, schizophrenia, bipolar disorder (psychological disease). We were unable to obtain preadolescent sexual abuse history, however, this item is only weighted among females. A similar methodology in retrospective ORT score calculation has been conducted previously (Barclay et al., 2014).

Specific details regarding original methodology and data collection are discussed elsewhere (Schwartz et al., 2015, 2016).

Statistical analysis

Descriptive statistics were used to characterize the study sample, hurricane exposures and opioid abuse risk. Bivariate analyses were conducted to determine if opioid risk varied by patient demographics, hurricane exposure and other variables identified as potential confounders or predictors of our outcome, such as location of recruitment. Multinomial logistic regression was used to examine the relationship between hurricane exposure and level of opioid abuse risk. All statistical analyses were completed using SAS version 9.4 (SAS Institute, Inc., Cary, NC).

Table 1. Study sample characteristics by level of opioid abuse risk (N = 1687).

	Opioid Abuse Risk						P-value*
	Low (n = 1279)		Moderate (n = 269)		High (n = 139)		
	N	%	N	%	N	%	
Sex ‡							
Female	807	63.1	125	46.5	69	49.6	
Male	472	36.9	144	53.5	70	50.4	
Race (n = 1661)							
White	677	53.8	124	46.6	63	46.0	0.1
Black	480	39.2	121	45.5	62	45.3	
Other	101	8.0	21	7.9	12	8.8	
Education (n = 1632)							<0.0001
<High School	167	13.5	51	19.5	43	32.1	
≥High School	1069	86.5	211	80.5	91	67.9	
Insurance (n = 1671)							0.01
Yes	1143	90.1	222	83.8	123	89.1	
No	125	9.9	43	16.2	15	10.9	
Current Smoker (n = 1675)							<0.0001
Yes	193	15.2	118	43.9	81	41.3	
No	1075	84.8	151	56.1	57	58.7	
Location of recruitment							<0.0001
Project LIGHT	586	45.8	70	26.0	12	8.6	
Project Restoration	693	54.2	199	74.0	127	91.4	
	Mean	Std. Dev	Median	Range			
Age (years) ‡	46.1	19.2	47	18–104			
Total Exposures	5.1	4.4	4	0–30			<0.0001
Personal Exposures	1.4	2	1	0–16			<0.0001
Property Exposures	3.7	3	3	0–14			0.001

*P-value corresponds to Chi-Square or ANOVA test, where appropriate.

‡Bivariate analysis was not performed for gender due to the covariate being a component of the opioid abuse risk calculation.

Table 2. Unadjusted and adjusted odds ratios estimating the association between hurricane sandy exposure and opioid abuse risk.

	Crude (OR, 95% CI)			Adjusted* (OR, 95% CI)		
	Low	Moderate	High	Low	Moderate	High
Total Exposures	Ref.	1.08 (1.05, 1.11)	1.12 (1.08, 1.17)	Ref.	1.06 (1.03, 1.10)	1.09 (1.05, 1.14)
Personal	Ref.	1.29 (1.20, 1.38)	1.43 (1.32, 1.55)	Ref.	1.23 (1.14, 1.32)	1.33 (1.22, 1.45)
Property	Ref.	1.06 (1.01, 1.11)	1.10 (1.04, 1.16)	Ref.	1.04 (0.99, 1.10)	1.07 (1.00, 1.14)

*Adjusted for insurance status, location of recruitment, and smoking status.

Results

Data was available on 1,687 Hurricane Sandy survivors, with the majority being female (59.3%), and white (52.0%) and an average age of 46.1 years (std. 19.2) (Table 1). Median number of reported total exposures was 4, with an IQR of 2 to 8. Approximately 8% of participants were classified as being ‘High’ risk for substance abuse, 16.0% were of ‘Moderate’ risk and 75.8% were of ‘Low’ risk. Level of opioid risk significantly differed by education, insurance, smoking status and location of study recruitment (p-values < 0.05), but not by race (p-value = 0.1).

Overall, we observed an increase in risk of opioid abuse as the number of hurricane exposures increased. For every increase in total exposure reported, the odds of being classified as high risk was 1.09 greater (95% CI 1.05, 1.14) compared to low risk, after adjusting for covariates (Table 2). Among personal exposures only, for every increase in reported exposure the adjusted odds of being classified as high risk was 1.33 times greater (95% CI 1.22, 1.45)

compared to low risk. Further, the adjusted odds of being classified as moderate risk, relative to low risk, was 1.23 times greater (95% CI 1.14, 1.32) for every increase in reported personal exposure. The odds of being classified as high or moderate risk among property exposures only was attenuated toward the null after adjusting for covariates.

Discussion

Through previous studies, we understand that exposure to traumatic events, such as natural disasters, can have profound impacts on mental and behavioral health outcomes. It is therefore, unsurprising that increases in reported Hurricane Sandy exposures are associated with increased risk for opioid abuse risk. Personal exposures, which include physical harm to self or others as a result of the hurricane, are undoubtedly traumatic, which could explain the elevated risk of substance abusive behavior. Interestingly, property exposures, which Schwartz et al. (2017) found to be

significantly associated with various mental health outcomes, was not associated with similar results in this study. Despite this, it is important to further understand how these associations occur within the same context of a social crisis, such as the opioid epidemic. Identifying those who are most susceptible to substance abusive behavior following a disastrous event can inform appropriate resource allocations and emergency response, such as access to addiction treatments and services. Historically, we have seen the complications of maintaining access to such services during and after disasters, particularly among those who are under treatment for opioid use disorders (Elliott et al., 2017; Griffin et al., 2018; McArthur et al., 2005; McClure et al., 2014). Learning from previous shortfalls in the delivery of emergency substance abuse healthcare is critical as we not only continue through this epidemic, but as we face new disasters, such as the novel coronavirus ('COVID-19') pandemic of 2019–2020. By understanding the individuals who are most at risk, such as those who are among the highest risk category, provisions can be put in place to ensure that they not only have access to appropriate care, but that it is maintained across the event timeline. Substance use treatment centers, such as Opioid Therapy Programs and organizations alike could utilize this information for community outreach and treatment access post-disaster.

Limitations

This study has a number of limitations. The retrospective ascertainment of not only the original study data, but now the assignment of opioid abuse risk are vulnerable to inherent bias. There is the potential for misclassification, however we believe this would be non-differential with respect to our outcome, and thus attenuate our results toward the null. Our second limitation exists in specificity of the survey questions that were included the calculation of opioid abuse risk. Based on the availability, we were only able to ascertain familial history of substance abuse (yes vs. no), and unable to specify substance used (i.e. alcohol vs. prescription vs. illicit). We aimed to circumvent this limitation by assigning the lowest value specified by the ORT, and believe that this in actuality underestimated true risk for opioid abusive behavior. Further, we were also unable to obtain information regarding pre-teen sexual abuse history, a variable within the ORT overall scoring, however, this variable only contributes to risk among females. Therefore, our results may underestimate the true risk of opioid abusive behavior among females. Lastly, the ORT is not currently validated for use in community samples, nor disaster populations, and therefore our results should be interpreted with caution.

Conclusion

These findings suggest that exposure to a natural disaster, specifically personal exposures, are associated with increased risk for opioid abusive behavior. The ability to identify and

locate individuals who are known to be at risk, can be invaluable to ensure that they do not engage in opioid use during and following a disaster.

Declaration of interest

The authors declare that they have no conflict of interest. The authors alone are responsible for the content and writing of the article.

References

- Abramson, D. M., Van Alst, D., Merdjanoff, A., Piltch-Loeb, R., Beedasy, J., Findley, P., Peek, L. A., Mordy, M., Moroso, S., Ocasio, K., & Park, Y. S. (2015). The Hurricane Sandy place report: Evacuation decisions, housing issues and sense of community. The Sandy Child and Family Health Study. Rutgers University School of Social Work, New York University College of Global Public Health, Columbia University National Center for Disaster Preparedness, Colorado State University Center for Disaster and Risk Analysis, Briefing Report 2015_1. 1–22.
- Barclay, J. S., Owens, J. E., & Blackhall, L. J. (2014). Screening for substance abuse risk in cancer patients using the Opioid Risk Tool and urine drug screen. *Supportive Care in Cancer: Official Journal of the Multinational Association of Supportive Care in Cancer*, 22(7), 1883–1888. <https://doi.org/10.1007/s00520-014-2167-6>
- Boscarino, J. A. (2015). Community disasters, psychological trauma, and crisis intervention. *International Journal of Emergency Mental Health*, 17(1), 369–371.
- Caramanica, K., Brackbill, R. M., Stelman, S. D., & Farfel, M. R. (2015). Posttraumatic stress disorder after Hurricane Sandy among persons exposed to the 9/11 disaster. *International Journal of Emergency Mental Health*, 17(1), 356–362. <https://doi.org/10.4172/1522-4821.1000173>
- Casey-Lockyer, M., Heick, R. J., Mertzluft, C. E., Yard, E. E., Wolkin, A. F., Noe, R. S., & Murti, M. (2013). Deaths associated with hurricane sandy—October–November. *MMWR. Morbidity and Mortality Weekly Report*, 62(20), 393.
- Cepeda, A., Valdez, A., Kaplan, C., & Hill, L. E. (2010). Patterns of substance use among hurricane Katrina evacuees in Houston, Texas. *Disasters*, 34(2), 426–446. <https://doi.org/10.1111/j.1467-7717.2009.01136.x>
- Dewart, T., Frank, B., & Schmeidler, J. (2006). The impact of 9/11 on patients in New York City's substance abuse treatment programs. *The American Journal of Drug and Alcohol Abuse*, 32(4), 665–672. <https://doi.org/10.1080/00952990600919435>
- Elliott, L., Benoit, E., Matusow, H., & Rosenblum, A. (2017). Disaster preparedness among opioid treatment programs: Policy recommendations from state opioid treatment authorities. *International Journal of Disaster Risk Reduction*, 23, 152–159. <https://doi.org/10.1016/j.ijdrr.2017.05.001>
- Frank, B., Dewart, T., Schmeidler, J., & Demirjian, A. (2006). The impact of 9/11 on New York City's substance abuse treatment programs: A study of program administrators. *Journal of Addictive Diseases*, 25(1), 5–14. https://doi.org/10.1300/J069v25n01_03
- Galea, S., Nandi, A., & Vlahov, D. (2005). The epidemiology of post-traumatic stress disorder after disasters. *Epidemiologic Reviews*, 27(1), 78–91. <https://doi.org/10.1093/epirev/mxi003>
- Griffin, A. R., Der-Martirosian, C., Gable, A., Wyte-Lake, T., & Dobalian, A. (2018). A crisis within a crisis: The extended closure of an opioid treatment program after hurricane sandy. *Journal of Drug Issues*, 48(4), 536–545. <https://doi.org/10.1177/0022042618779541>
- Hedegaard, H., Warner, M., & Miniño, A. M. (2017). *Drug overdose deaths in the United States, 1999–2015*. NCHS data brief (no. 273). National Center for Health Statistics.

- Lowe, S. R., Sampson, L., Gruebner, O., & Galea, S. (2015). Psychological resilience after Hurricane Sandy: The influence of individual-and community-level factors on mental health after a large-scale natural disaster. *PLoS One*, *10*(5), e0125761. <https://doi.org/10.1371/journal.pone.0125761>
- McArthur, L., Demirjian, A., Harmon, F., Hayashi, S., & Fogash, M. (2005). Methadone clinics' response to 9/11: A case study. *Journal of Maintenance in the Addictions*, *2*(4), 13–27. https://doi.org/10.1300/J126v02n04_03
- McClure, B., Mendoza, S., Duncan, L., Rotrosen, J., & Hansen, H. (2014). Effects of regulation on methadone and buprenorphine provision in the wake of Hurricane Sandy. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, *91*(5), 999–1008. <https://doi.org/10.1007/s11524-014-9904-5>
- Noaa, H. (2014). *The thirty costliest mainland United States tropical cyclones 1900–2013*. United States National Oceanic and Atmospheric Administrations [NOAA] Hurricane Research Division [HDR].
- Pouget, E. R., Sandoval, M., Nikolopoulos, G. K., & Friedman, S. R. (2015). Immediate impact of Hurricane Sandy on people who inject drugs in New York City. *Substance Use & Misuse*, *50*(7), 878–884. <https://doi.org/10.3109/10826084.2015.978675>
- Rhodes, J., Chan, C., Paxson, C., Rouse, C. E., Waters, M., & Fussell, E. (2010). The impact of Hurricane Katrina on the mental and physical health of low-income parents in New Orleans. *American Journal of Orthopsychiatry*, *80*(2), 237–247. <https://doi.org/10.1111/j.1939-0025.2010.01027.x>
- Sandy, H. (2012). daily doses of methadone: Challenges for NY and NJ. *Alcoholism & Drug Abuse Weekly*, *24*(43), 1–2.
- Schwartz, R. M., Gillezeau, C. N., Liu, B., Lieberman-Cribbin, W., & Taioli, E. (2017). Longitudinal impact of Hurricane Sandy exposure on mental health symptoms. *International Journal of Environmental Research and Public Health*, *14*(9), 957. <https://doi.org/10.3390/ijerph14090957>
- Schwartz, R. M., Rothenberg, P., Kerath, S. M., Liu, B., & Taioli, E. (2016). The lasting mental health effects of Hurricane Sandy on residents of the Rockaways. *Journal of Emergency Management (Weston, Mass.)*, *14*(4), 269–279. <https://doi.org/10.5055/jem.2016.0292>
- Schwartz, R. M., Sison, C., Kerath, S. M., Murphy, L., Breil, T., Sikavi, D., & Taioli, E. (2015). The impact of Hurricane Sandy on the mental health of New York area residents. *American Journal of Disaster Medicine*, *10*(4), 339–346. <https://doi.org/10.5055/ajdm.2015.0216>
- Webster, L. R., & Webster, R. M. (2005). Predicting aberrant behaviors in opioid-treated patients: Preliminary validation of the Opioid Risk Tool. *Pain Medicine (Malden, Mass.)*, *6*(6), 432–442. <https://doi.org/10.1111/j.1526-4637.2005.00072.x>
- Weiss, L., Fabri, A., McCoy, K., Coffin, P., Netherland, J., & Finkelstein, R. (2002). A vulnerable population in a time of crisis: Drug users and the attacks on the World Trade Center. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, *79*(3), 392–403. <https://doi.org/10.1093/jurban/79.3.392>
- Wilson, N., Kariisa, M., Seth, P., Smith, H., & Davis, N. L. (2020). Drug and opioid-involved overdose deaths—United States, 2017–2018. *MMWR. Morbidity and Mortality Weekly Report*, *69*(11), 290–297. <https://doi.org/10.15585/mmwr.mm6911a4>