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Original Article

Opioid use disorder-related emergency department visits among deaf or hard of hearing adults in the United States

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ABSTRACT

Background: Despite the devastating consequences of the opioid epidemic, little is known about its impact on the deaf and hard of hearing (DHH) community.
Objective: To determine risk of OUD-related ED visits, ED visits involving a prescription or non-prescription opioid overdose, and mortality during OUD-related ED visits among DHH adults, compared to non-DHH adults.
Methods: We analyzed the combined 2016–2017 National Emergency Department Sample (NEDS). We identified DHH adults using ICD-10-CM codes, extracting 63,865 case records of ED visits among DHH adults ages 18–64. The control group of non-DHH adult ED visits was age-, sex-, and admission year-matched in a 1:3 case-control ratio. We conducted multi-level logistic regression models for the binary dependent variables. Covariates included sociodemographic, hospital, and clinical characteristics.
Results: In our unadjusted models, compared to non-DHH adults, DHH adults had significantly higher risk for OUD-related ED visits (OR = 1.69, 95%CI: 1.59–1.80, $p < 0.001$), ED visits involving prescription (OR = 1.80, 95%CI: 1.47–2.20, $p < 0.001$) and non-prescription opioid overdose (OR = 1.31, 95%CI: 1.05–1.63, $p < 0.05$), and mortality during OUD-related ED visits (OR = 2.22, 95%CI: 1.21–4.08, $p < 0.05$). However, after adjustment for confounding variables, including comorbid chronic pain and psychiatric conditions, except OUD-related ED visits, the risk for ED visits involving prescription and non-prescription opioid overdose, and OUD-related mortality became non-significant.
Conclusions: Compared to adults without hearing loss, DHH non-elderly adults are at a higher risk of OUD-related ED visits. Future research is needed to understand the interplay between chronic pain, psychiatric conditions, and OUD among DHH adults.

The opioid epidemic has had devastating consequences in the U.S., including dramatic increases in incidence of opioid use disorder (OUD) and opioid overdose deaths.[1,2] Between 1999 and 2019 almost 841,000 people have died from a drug overdose.[3] In 2020 alone, 92,452 drug overdose deaths occurred in the U.S., a 31% increase from 70,630 in 2019.[4] OUD-related emergency department (ED) visits have also been increasing in the past decade; according to the Centers of Disease Control and Prevention (CDC), OUD-related ED visits increased by 30% between 2016 and 2017.[5] A more recent study[6] across six U.S. health care systems suggest that opioid overdose-related ED visits increased by 29% from 2018 to 2019 to 2020.

To date, little is known how the opioid epidemic has impacted the deaf and hard of hearing community.[7] Approximately 15% of U.S. adults are affected by hearing loss.[8] Previous research has shown that people who are deaf or hard of hearing (DHH) regularly face significant communication and linguistic barriers.[9–11] They are often denied access to healthcare because of the lack of communication access in health care settings.[10,12] DHH individuals, as a

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result of inaccessible health care communication, were 32% more likely to be readmitted to the hospital within 30 days[13] after the initial all-cause admission to acute care hospital and exhibit higher ED use when compared to their hearing peers.[14,15] In addition, DHH individuals often struggle with inadequate health literacy,[9,16] likely due to a lack of available accessible health information that lowers their knowledge of healthy behaviors, including warning signs of adverse medication interactions or side effects.[17] Also, even with older onset of hearing loss or non-congenital, studies demonstrate poorer communication and even lower health literacy.[13,16]

There is a paucity of studies about the burden of OUD and associated mortality among DHH people. We found only three studies[18-20] in the U.S. that used a nationally representative sample of adults and assessed substance use disorder prevalence among DHH individuals. The study by McKee and colleagues[18] showed a higher incidence rate of substance use disorder among DHH individuals aged 18–49 but not for the older age group (50+), compared to their hearing peers. They also found that DHH adults had more than two-fold higher risk of experiencing prescription OUD. The second study, by Anderson and colleagues[19] found that DHH individuals were more likely to be heavy cannabis users and heavy alcohol users than their hearing peers. Chronic pain is also related to both OUD and ED visits, and is increased among DHH individuals.[18,21] As part of a larger study on prescription OUD among people with and without disabilities, Reif et al. [20] found that compared to those with other disabilities, adults with hearing disabilities were most likely to not use prescription opioids. However, there are no studies examining the risk of OUD-related ED visits and related mortality among DHH people in the U.S.

To address this gap in knowledge, we examined the burden of OUD-related ED visits and associated mortality among non-elderly (18–64 years) DHH adults compared to non-DHH peers. We hypothesized that DHH individuals would have a higher risk of OUD-related ED visits and a higher risk of mortality during OUD-related ED visits.

Methods

Data

We conducted a retrospective study using combined 2016–2017 Healthcare Cost and Utilization Project Nationwide Emergency Department Sample (HCUP-NEDS) data.[22] HCUP-NEDS is the largest all-payer ED visits database in the U.S. and contains data on approximately 33 million ED visits annually, yielding national estimates from a sample of approximately 20% of ED visits. The HCUP-NEDS systematic sample is a self-weighted sample design similar to simple random sampling and is representative of the population on hospital and patient factors such as the urban–rural location of hospital and hospital teaching status.[22] In addition to patient demographics and provider-related data, HCUP-NEDS collects up to 35 and 15 standardized *International Classification of Diseases, 10*th *Revision, Clinical Modification (*ICD-10-CM) diagnosis and procedure codes, respectively.[23] More information about the design of the survey and data elements is provided elsewhere.[22]

Study population

We identified adults from the ED visit discharge records with a diagnosis of DHH using validated DHH-related ICD-10-CM codes H90xx and or H91xx.[24,25] The code suffix "x" represents all possible codes that follow the stated code prefix. Records of people aged 18–64 years were included in the study. This procedure yielded a total of 63,865 ED visits records for DHH adults during the 2016-17 study period. The control group with no record of DHH (n = 191,595) was age-matched, sex-matched, and year-matched, similar to previous research[26] and study design recommendations,[27] in a 1:3 case-control ratio using the greedy matching algorithm.[28]

Measures

Independent variable

The main independent variable was whether or not the ED visits were by an individual with a DHH diagnosis (yes/no).

Outcome variables

The study outcome variables included OUD-related ED visits and mortality during OUD-related ED visits. Prescription and non-prescription opioid overdose-related ED visits were included as additional outcomes. OUD-related ED visits were measured based on the method described by Kim et al.[29] by extracting ICD-10-CM codes for any type of OUD from the CDC ICD-10-CM browser tool, available at https://icd10cmtool.cdc.gov/. Prescription opioid overdose-related ED visits were measured based on ICD-10-CM codes described in Tadros et al.[30] Non-prescription opioid overdose-related ED visits involving heroin and non-heroin opioids were measured based on ICD-10-CM codes described in Guy et al.[31] and by excluding prescription opioid overdose-related ED visits. Mortality during OUD-related ED visits was determined using the OUD-related ED visit variable and the information from ED discharge records regarding whether the patient died during the ED visit. All study outcome variables were measured as binary variables (yes/no).

Covariates

Covariates for all adjusted models were age, sex, the primary payer (Medicare, Medicaid, private, or uninsured), quartile of median household income based on the patient's zip code (1st quartile, 2nd quartile, 3rd quartile, or 4th quartile), type of hospital (non-metropolitan, metropolitan non-teaching, or metropolitan teaching), and hospital region (Northeast, Midwest, South, or West). Clinical characteristics included mood/anxiety disorders (F39xx, F41xx), alcohol related disorders (F10xx), serious mental illnesses (SMI). SMI included schizophrenia, schizotypal, delusional, and other non-mood psychotic disorders (F20xx-F29xx), manic episode (F30xx), and bipolar disorder (F31xx). We also included chronic pain (G89.21, G89.22, G89.28, and G89.29)[32] because it could potentially act as pathways in the associations between DHH diagnosis and the study outcomes. All clinical characteristics were measured by extracting related ICD-10-CM codes from the CDC ICD-10-CM browser tool. All study clinical characteristics were measured as binary variables (yes/no). Finally, given the use of combined 2016–2017 HCUP-NEDS, a variable indicating the year of ED visit was included.

Statistical analyses

Demographic, socioeconomic, clinical, and hospital characteristics were compared for DHH adults and the matched control group. Differences across categorical variables and continuous variables between the two clinical populations were evaluated using chi-square tests and t-tests, respectively. Hospital discharge weights were applied to the sample data for all bivariate statistics to create national estimates. In all analyses, we accounted for clustering of ED visits (level 1) within hospitals (level 2) using a multi-level modeling approach. Multi-level logistic regression models were used to compare the risk of OUD-related ED visits (overall and for prescription and non-prescription opioid overdose) and associated mortality during OUD-related ED visits between

DHH individuals and the control group (referent). Because several model covariates had missing values (e.g., insurance (0.2%) and income (2.2%)), consistent with best practices,[33] we conducted multiple imputations by chained equations to impute values for the variables with missing data.

In multivariate regressions, to avoid over-adjustment bias,[34] we first adjusted for sociodemographic and hospital characteristics (Model 1). Next, we adjusted for the clinical characteristics (Model 2). In the final model (Model 3) we additionally adjusted for chronic pain as the pathway variable. Based on the Agency for Healthcare Research and Quality (AHRQ) recommendations,[35] sampling weights for the multi-level analysis were not used. The logistic regression coefficients and the 95% confidence interval (CI) were estimated as unadjusted and adjusted odds ratios (OR). All analyses were performed using STATA 16 MP.[36]

This study was exempt from review by our institutional review board because the data are publicly available and de-identified.

Results

A description of the sample and weighted statistics comparing DHH adults with the sex-, age-, and admission-year matched control group are presented in Table 1. Compared to the matched control group, DHH adults were more likely to have public health insurance such as Medicare (30.8% vs. 15.0%), less likely to be uninsured (11.8% vs. 20.4%), and less likely to live in a low-income area (see Table 1). DHH adults were more likely to have chronic pain diagnoses (7.0% vs. 3.6%), serious mental illnesses (7.7% vs. 3.4%), mood/anxiety disorders (24.3% vs. 11.0%), and alcohol related disorders (5.8% vs. 4.7%) compared to their non-DHH peers.

OUD-related ED visits

There were a total of 2677 per 100,000 ED visits involved OUD among DHH adults compared to 1538 per 100,000 OUD-related ED visits in the matched controls (Table 2). DHH adults had a 69% higher risk of OUD-related ED visits (OR = 1.69, 95% CI: 1.59–1.80, $p < 0.001$) compared with the matched control group. The risk of having OUD-related ED visits among DHH adults decreased after adjustment for sociodemographic, hospital and characteristics, yet was still greater compared to the matched controls (OR = 1.26, 95% CI: 1.18–1.34, $p < 0.001$). After further adjustment for the potential pathway variable, chronic pain, the risk was reduced further but remained robust (OR = 1.22, 95% CI: 1.14–1.30, $p < 0.001$).

Table 1
Sample characteristics in the DHH adult and matched control groups, United States, 2016–2017, N = 255,460.

Characteristics	DHH N = 63,865		Non-DHH N = 191,595		P-value
	n	Weighted %	n	Weighted %	
Sociodemographic					
Age at admission[a]					0.994
18–24	5490	8.6	16,470	8.6	
25–35	10,238	16.0	30,714	16.0	
36–49	15,610	24.4	46,830	24.4	
50–64	32,527	50.9	97,581	50.9	
Mean age (SD)	46.42	0.14	46.41	0.06	
Sex[a]					0.947
Male	32,347	50.6	97,041	50.6	
Female	31,518	49.4	94,554	49.4	
Insurance payer type					< 0.001
Medicare	19,644	30.8	28,693	15.0	
Medicaid	18,060	28.3	54,358	28.4	
Private insurance	18,555	29.1	69,168	36.1	
Uninsured	7538	11.8	39,025	20.4	
Missing	68	0.1	351	0.2	
Median household income for patient's ZIP code					< 0.001
First quartile	21,358	33.4	67,339	35.1	
Second quartile	16,714	26.2	49,858	26.0	
Third quartile	13,682	21.4	39,498	20.6	
Fourth quartile	10,804	16.9	30,756	16.1	
Missing	1307	2.0	4144	2.2	
Clinical characteristics					
Chronic pain	4452	7.0	6983	3.6	< 0.001
Severe mental illness	4932	7.7	6593	3.4	< 0.001
Mood/Anxiety disorders	15,526	24.3	21,038	11.0	< 0.001
Alcohol related disorders	3734	5.8	9058	4.7	< 0.001
Hospital characteristics					
Teaching status of hospital					< 0.001
Metropolitan non-teaching	16,723	26.2	57,501	30.0	
Metropolitan teaching	40,949	64.1	107,499	56.1	
Non-metropolitan hospital	6193	9.7	26,595	13.9	
Region of hospital					< 0.001
Northeast	10,574	16.6	34,428	18.0	
Midwest	15,821	24.8	39,053	20.4	
South	23,727	37.2	81,014	42.3	
West	13,743	21.5	37,100	19.4	
Calendar year[a]					0.635
2016	29,377	46.0	88,131	46.0	
2017	34,488	54.0	103,464	54.0	

Source: Healthcare Cost and Utilization Project, National Emergency Department Sample (HCUP-NEDS) data, 2016–2017.
Acronyms: DHH = Deaf or Hard of Hearing
[a] No difference between age and gender since these variables were used for matching.

Table 2
Rates and Odds Ratios of OUD-related ED visits, prescription opioid overdose-related ED visits, mortality during OUD-related ED visits for DHH adult and matched control groups, United States, 2016–2017, N = 255,460.

Outcomes	DHH	Non-DHH	Unadjusted		Model 1[a]		Model 2[b]		Model 3[c]	
	N = 63,865	N = 191,595								
	rate per 100,000 ED visits	rate per 100,000 ED visits	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
OUD-related ED visits	2677	1538	**1.69*** **	**1.59–1.80**	**1.53*** **	**1.43–1.63**	**1.26** **	**1.18–1.34**	**1.22*** **	**1.14–1.30**
Prescription opioid overdose-related ED visits	239	133	**1.80*** **	**1.47–2.20**	**1.56*** **	**1.27–1.92**	**1.27***	**1.03–1.57**	**1.21**	**0.98–1.50**
Non-prescription opioid overdose-related ED visits	182	148	**1.31***	**1.05–1.63**	**1.37** **	**1.09–1.72**	**1.27***	**1.01–1.60**	**1.21**	**0.98–1.50**
Mortality during OUD-related ED visits	30	13	**2.22***	**1.21–4.08**	**2.15***	**1.14–4.07**	**2.16***	**1.19–3.90**	**1.78**	**0.94–3.37**

Acronyms: DHH = Deaf or Hard of Hearing; OR = Odds Ratio; CI = Confidence Interval.
***p < 0.001, **p < 0.01, *p < 0.05.
Source: Healthcare Cost and Utilization Project National Inpatient Sample (HCUP–NIS) data, 2016–2017
[a] Adjusted for age, sex, primary payer, median income quartile for patient's zip code, hospital region, hospital type, and admission year.
[b] Adjusted for covariates in Model 1 plus severe mental illness, mood/anxiety disorders, and alcohol related disorders.
[c] Adjusted for covariates in Model 2 plus chronic pain.

Prescription opioid overdose-related ED visits

There were a total of 239 per 100,000 ED prescription opioid overdose involved ED visits among DHH adults compared to 133 per 100,000 ED visits in the matched controls (Table 2). DHH adults had an 80% higher risk of having prescription opioid overdose-related ED visits (OR = 1.80, 95% CI: 1.47–2.20, p < 0.001) compared with the matched control group. The risk of prescription opioid overdose-related ED visits among DHH adults decreased to 27% after adjustment for sociodemographic, hospital, and clinical characteristics (OR = 1.27, 95% CI: 1.03–1.57, p < 0.001). After further adjustment for chronic pain, the risk decreased to 21% and became non-significant (OR = 1.21, 95% CI: 0.98–1.50, p = 0.076).

Non-prescription opioid overdose-related ED visits

There were a total of 182 per 100,000 ED visits involved non-prescription opioid overdoses (e.g., heroin, fentanyl, etc.) among DHH adults compared to 148 per 100,000 ED visits in the matched controls (Table 2). DHH adults had a 31% higher risk of having non-prescription opioid overdose-related ED visits (OR = 1.31, 95% CI: 1.05–1.63, p < 0.05) compared with the matched control group. The risk of non-prescription opioid overdose-related ED visits among DHH adults decreased after adjustment for sociodemographic, hospital, and clinical characteristics (OR = 1.27, 95% CI: 1.01–1.60, p < 0.05). However, after further adjustment for chronic pain, the risk decreased to 21% and became non-significant (OR = 1.21, 95% CI: 0.98–1.50, p = 0.083).

Mortality during OUD-related ED visits

DHH adults experienced mortality during OUD-related ED visits at a total rate of 30 per 100,000 ED visits compared to 13 per 100,000 ED visits in the matched controls (Table 2). DHH adults had more than a two-fold higher risk of mortality during OUD-related ED visits (OR = 2.22, 95% CI: 1.21–4.08, p < 0.05) compared with the matched control group. The risk of mortality during OUD-related ED visits among DHH adults only slightly decreased after adjustment for sociodemographic, hospital, and clinical characteristics (OR = 2.16, 95% CI: 1.19–3.90, p < 0.05). After further adjustment for chronic pain, the potential pathways variable, although the risk remained high at almost two-fold it became non-significant (OR = 1.78, 95% CI: 0.94–3.37, p = 0.078).

Discussion

This study provides the first comprehensive account of the burden of OUD-related ED visits, prescription and non-prescription opioid overdose-related ED visits, and risk of mortality during OUD-related ED visits among DHH adults aged 18–64 in the U.S., using nationally-representative ED discharge records data. Our analysis was designed to address the dearth of literature on the impact of the opioid crisis among DHH people, and provides additional evidence to the greater vulnerability to OUD among DHH people in the U.S.

Our study builds on two earlier publications[18,19] that assessed the risk of substance use disorders among DHH individuals, both of which found higher risk for substance use disorder compared to non-DHH adults. We extend these studies in several ways. First, our study focuses on the risk of OUD during ED visits among non-elderly DHH adults using the largest all-payer ED database in the U.S. Our findings of a higher risk of OUD-related ED visits among DHH adults compared to sex-, age-, and admission-year matched control group support and extend findings from the earlier studies which identified risk of substance use disorders among DHH adults.

Our finding of a two-fold increase in mortality risk for DHH individuals during an OUD-related ED visit after adjusting for sociodemographic and hospital characteristics is an alarming finding, although the prevalence of mortality is rare overall. After adjusting our multivariate regression models for psychiatric conditions including SMI, anxiety/mood disorders, and alcohol-related disorders, the risk for mortality during OUD-related ED visits for DHH adults remained almost twice as high, but once accounting for chronic pain, the risk became statistically non-significant. These findings, in addition to those for OUD-related ED visits and prescription opioid overdose-related ED visits, suggest that comorbid chronic pain and psychiatric conditions are potential mechanisms explaining the association between DHH status and these outcomes.

Using a socioecological perspective, health inequities faced by DHH individuals are largely determined by the complex interplay between individual, interpersonal, communal and social barriers.[37] Social isolation, hearing loss stigma, health miscommunication, and inadequate health literacy are all possible contributors for these findings. Communication barriers in health care settings due to hearing loss are demonstrated to be significant contributors to hospital readmissions, higher use of ED, increased hospitalizations, and poorer health outcomes.[14] DHH individuals struggle with

inadequate health literacy as a result of inaccessible health information and inconsistent use of accommodations (e.g. sign language interpreters or captioning), each placing them at risk for insufficient knowledge and information to adhere to health care providers' recommendations and effectively manage their health conditions.[9,12,38] The health miscommunication and inadequate health literacy barriers that DHH people face[10,13] may result in reduced ability for DHH people to appropriately use prescription opioids[18] or non-pharmacologic treatments (e.g., physical therapy) to manage their chronic pain.[18] Further, DHH individuals experience higher rates of mental health problems, psychological distress, and interpersonal violence and abuse.[39–42,21] These are all factors that are associated with risk for OUD yet few mental health or addiction treatment programs exist to effectively care for DHH individuals.[37,39,43]

The U.S. government identified reducing drug addiction, misuse of drugs, and drug overdose deaths in the Healthy People 2030 objectives to address the opioid epidemic through surveillance, prevention, and treatment.[44] The Healthy People 2030 framework also identified improving quality of life and overall well-being for people with disabilities, including DHH individuals, as one of the overarching goals to reduce inequity in health and healthcare outcomes.[45] This evidence of elevated risk for OUD-related ED visits, prescription opioid overdose-related ED visits, and mortality during OUD-related ED visits among DHH people suggests a critical need to improve and tailor health care, public health, and social support service interventions aimed at reducing these disparities and addressing comorbid chronic pain and mental health-related disorders that can potentially be linked to these risks. Namely, trainings and programs are needed to support health care systems' and providers' ability to use best practices in managing chronic pain and mental-health-related comorbidities, use of prescription opioids, and most importantly communication challenges faced by the DHH community. Additionally, public health programs and service announcements are needed to ensure inclusive and accessible messages around chronic pain management, mental health, and OUD, including the use of both captioned and sign language-based videos.

Beyond understanding the lived experiences of DHH persons with OUD and adapting the treatment environment and screening toolbox, the development of targeted interventions to prevent OUD and reduce prescription opioid overdoses and OUD-related deaths among DHH people should be implemented.

The findings of this study call attention to relationship between pain management and prescription and non-prescription opioid use among DHH adults suggesting that pain management is likely inadequate for DHH adults with OUD. Notably a recent study by Reif and colleagues[20] found that people with disabilities were more likely to misuse prescription opioids to relieve pain compared to non-disabled adults and less likely to misuse to feel good or get high compared to non-disabled adults. Therefore, future research is needed to gain greater understanding of the interplay between risk factors such chronic pain, select psychiatric conditions, including their underlying risk factors and comorbidities, and OUD-related ED visits for DHH individuals, as well as to inform potential prevention strategies with qualitative community-based studies. Interventions that target modifiable upstream factors, including inaccessible mental health programs, lack of screening tools and treatment guidelines that meet the unique needs of DHH people, and primary care services, potentially could improve quality of life and prevent morbidity and mortality stemming from OUD.

Limitations

Our study has several limitations that should be kept in mind when interpreting these findings. First, it is possible that some DHH adults admitted to the ED were not coded by the ICD-10-CM as having a DHH diagnosis, since the main reasons for the ED visit would be the primary diagnosis and not that the person is DHH. The researchers could not verify the accuracy of the coded outcomes. Therefore, these claims only represent people who have been identified as having a DHH diagnosis and may miss those who have not been coded as being DHH for example for non-DHH diagnosis related admissions. Nevertheless, the process for extracting DHH codes from discharge records has been validated and widely used.[24,25] Second, the unit of analysis was ED visits rather than the individual; therefore, an individual might be represented multiple times in the data if they were admitted to an ED more than once over the study period. Furthermore, previous research shows that DHH individuals are more likely to utilize the ED more often than the general population,[14,15] due to communication difficulties,[10,12] and lack of support network.[37]

Third, lack of precision in income measures within the large units of geography limits our ability to assess socioeconomic status on an individual or household level. The household income included in this article is based on the median household income for the patient's five-digit ZIP code. Fourth, this data source contains missing data; however, multiple imputations were employed for variables with missing data, consistent with best practices.[33,46] Fifth, causality cannot be established due to the cross-sectional nature of the data. Given the emphasis in health services research on reducing preventable ED visits, future studies need to use longitudinal data to examine OUD-related ED visit outcomes to shed light on potentially modifiable factors of the said risks. In addition, we were working with an ED-based denominator; future epidemiological research should examine risk for OUD-related ED visits, prescription and non-prescription opioid overdose-related ED visits, and mortality during OUD-related ED visits using community-based denominators (e.g. the total number of DHH people in the U.S.), although these are difficult to define. Sixth, the matched control group or non-DHH adults are not representatives of the general population and are skewed towards older adults. Therefore, the study findings should be interpreted relative to -age and -sex matched adults than the general population. Finally, we were unable to distinguish the severity of OUD-related ED visits, limiting the depth of our analysis. Despite these limitations, to our knowledge this study is the first study to investigate differences between DHH and non-DHH adults in ED visits involving OUD and resulting mortality during OUD-related ED using a robust, nationally-representative sample of ED discharges.

Conclusion

Nearly 1 in 6 U.S. adults are DHH, yet this population has largely been ignored by the addiction medicine and public health opioid prevention efforts. Epidemiological data on OUD, OUD-related ED visits, and associated mortality in DHH people are essential to identify, develop, and monitor priorities and strategies for health care and social services interventions. Lack of access to appropriate healthcare services, difficulty communicating with healthcare providers, greater burden of chronic pain, psychiatric comorbidity, and lack of a healthy social support network are among the potential mechanisms in the associations between DHH, OUD, and related ED visits and associated mortalities.[10,37,39] The study's findings underscore the need for more research to understanding OUD among DHH adults, the importance of improving the awareness of health care teams on DHH individuals' associated risk for OUD, and lastly, efforts to address upstream factors related to OUD through more appropriate community-based behavioral healthcare prevention services.

Presentation

A podium presentation of this article was presented at the 2020 Annual Disability Statistics Compendium in Washington, D.C. and 2020 the American Public Health Association's (APHA) Virtual Annual Meeting.

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Conflicts of interest

The authors report no conflict of interest.

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