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Emergency Department Visits Involving Opioid Overdoses, U.S., 2010–2014

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INTRODUCTION

In 2015, opioid-involved overdoses accounted for 33,091 deaths in the U.S., 12,989 of which involved heroin.[1] In addition to overdose deaths, many more individuals suffer nonfatal overdoses.[2] No recent study has examined trends in opioid overdoses treated in hospital emergency departments (ED) separately for non-heroin opioids and heroin. This study analyzes trends and the associated direct medical costs for such ED visits.

METHODS

Data from the 2010–2014 Nationwide Emergency Department Sample (NEDS), a component of the Healthcare Cost and Utilization Project, was used. NEDS is the largest all-payer ED database in the U.S., yielding national estimates of hospital-based ED visits from a sample of approximately 20% of U.S. hospital-based EDs.[3] ED visits were examined, and stratified by gender, age, and region. The ICD-9-CM was used to identify overdoses. Non-heroin opioid overdoses were identified as those with a first-listed diagnosis of 965.00, 965.02, or 965.09, or a first-listed external cause of injury code of E850.1 or E850.2. Heroin overdoses were identified using 965.01 and E850.0.[4] The first-listed diagnosis in ED data is considered to be the diagnosis or condition in the medical record chiefly responsible for the services provided.[5]

Direct medical costs associated with ED visits in 2014 were estimated by the expected primary payer. Often, charges reported in NEDS are greater than the amount reimbursed by payers. Charges were converted to costs using cost-to-charge ratios from the National Inpatient Sample.[6] Average cost-to-charge ratios from opioid overdoses in the National Inpatient Sample based on hospital region, urban/rural location, and teaching status were applied. Total direct medical costs were estimated by multiplying the number of visits by the mean cost per visit.

Average annual percent change from 2010 to 2014 was calculated using Joinpoint analysis. Multivariable logistic regression was used to assess linear trends controlling for age, sex,

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and region. Data were weighted to provide nationally representative estimates and analyzed with Stata, version 14.2 and Joinpoint, version 4.4.0.0. Data were analyzed in 2017.

RESULTS

Downward trends were observed for non-heroin opioid overdose visit rates (average annual percent change= −1.6%, $p<0.001$ for linear trend), particularly among younger populations and in the West (Table 1). The rate of heroin overdose visits increased (average annual percent change=33.3%, $p<0.001$ for linear trend), with increases observed across all demographic groups and regions.

In 2014, there were an estimated 81,631 ED visits for non-heroin opioid overdoses and 66,023 visits for heroin, with estimated direct medical costs of $95.2 million and $57.5 million, respectively (data not shown). Among non-heroin opioid overdoses, Medicare was the largest payer ($33.6 million), followed by Medicaid ($25.5 million). Meanwhile, Medicaid ($20.9 million) and uninsured patients ($18.7 million) were the largest payers of heroin overdoses.

DISCUSSION

From 2010 to 2014, ED visit rates for non-heroin opioid overdoses declined 4.0%, while visit rates for heroin overdoses increased 222.2%, consistent with increases in heroin use and overdose deaths.[5] In 2014, the 147,654 ED visits for opioid overdoses resulted in $152.8 million in direct medical costs. Over half of these costs ($83.7 million) were borne by the public sector. These findings suggest there were 5.2 ED visits for every opioid-related overdose death in 2014.[1]

This analysis has limitations. First, non-heroin opioid overdoses cannot be separated by those resulting from prescription opioids or illicit synthetic opioids. For example, overdoses attributable to prescription fentanyl cannot be distinguished from those attributable to illicitly manufactured fentanyl.[7] Second, NEDS includes hospital charges, and cost-to-charge ratios were used to estimate costs. Lastly, costs are underestimated because NEDS only captures hospital facility charges and excludes physician and professional fees.

Although the costs reported in this study only represent a portion of the economic burden of opioid overdose, abuse, and dependence, estimated at $78.5 billion,[8] these findings shed important insight on the opioid overdose epidemic and highlight the importance of continued attention and action. Given the strong association between prescription opioid misuse and heroin use,[9] a comprehensive approach to reducing opioid misuse is needed. Opioid prescribing guidelines, such as the *CDC Guideline for Prescribing Opioids for Chronic Pain*, including an increased use of non-opioid pain therapy, could help reduce the number of people exposed to opioids.[10] In addition, states can apply policies that can reduce opioid overdose, including mandated prescription drug monitoring program use and pain clinic laws.[11] Additional actions are needed, such as increasing access to and use of naloxone; increasing access to evidence-based treatment for opioid use disorder, such as medication-assisted treatment; and reducing the supply of illicit opioids.

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Table 1

Trends in the Rate[a] of Emergency Department Visits Involving Non-Heroin Opioid and Heroin Overdoses, U.S., 2010–2014

	Non-heroin opioid overdoses[b]							Heroin overdoses						
Characteristics	**2010**	**2011**	**2012**	**2013**	**2014**	**AAPC[c] (95% CI)**	***p*-value[d]**	**2010**	**2011**	**2012**	**2013**	**2014**	**AAPC[c] (95% CI)**	***p*-value[d]**
Overall	81,142 (25.5)	85,367 (26.6)	82,728 (25.5)	80,522 (24.4)	81,631 (24.5)	−1.6 (−4.3, 1.1)	<**0.001**	20,123 (6.6)	26,794 (8.7)	36,873 (12.0)	46,065 (14.9)	66,023 (21.2)	33.3 (29.0, 37.7)	<**0.001**
Age, years														
<18	4,455 (6.0)	4,707 (6.4)	4,490 (6.1)	3,955 (5.4)	4,372 (5.9)	−2.0 (−7.9, 4.9)	**0.045**	229 (0.3)	244 (0.3)	309 (0.4)	254 (0.3)	413 (0.6)	14.9 (−10.1, 46.8)	**0.02**
18–29	16,608 (32.0)	16,719 (31.9)	15,313 (29.0)	13,183 (24.8)	14,075 (26.3)	−6.2 (−11.7, −0.5)	<**0.001**	10,187 (19.6)	13,926 (26.6)	19,196 (36.4)	23,553 (44.3)	31,719 (59.3)	31.3 (26.6, 36.2)	<**0.001**
30–39	11,797 (29.4)	12,901 (32.1)	12,006 (29.7)	11,669 (28.5)	11,853 (28.6)	−1.7 (−6.1, 2.9)	**0.003**	4,389 (10.9)	5,881 (14.6)	8,233 (20.4)	11,293 (27.6)	17,637 (42.5)	39.9 (33.8, 46.3)	<**0.001**
40–49	14,819 (34.0)	14,992 (34.7)	14,475 (33.8)	13,559 (32.2)	12,665 (30.5)	−2.9 (−5.5, −0.2)	<**0.001**	2,881 (6.6)	3,629 (8.4)	4,871 (11.4)	5,743 (13.6)	8,455 (20.4)	31.5 (24.1, 39.3)	<**0.001**
50–64	22,716 (38.4)	24,488 (40.4)	24,727 (40.4)	25,247 (40.8)	25,489 (40.7)	1.3 (−0.5, 3.1)	0.10	2,250 (3.8)	2,946 (4.9)	3,988 (6.5)	4,882 (7.9)	7,146 (11.4)	30.7 (25.2, 36.4)	<**0.001**
≥65	10,386 (25.7)	11,194 (27.1)	11,713 (27.1)	12,903 (28.9)	13,167 (28.5)	2.7 (0.6, 5.0)	0.42	177 (0.4)	160 (0.4)	277 (0.6)	340 (0.8)	648 (1.4)	37.7 (16.2, 63.2)	<**0.001**
Sex														
Male	39,168 (25.2)	40,629 (25.8)	38,829 (24.5)	37,538 (23.4)	38,683 (23.9)	−2.0 (−4.5, 0.6)	<**0.001**	14,455 (9.4)	19,472 (12.6)	26,172 (16.9)	32,270 (20.7)	46,428 (29.7)	32.3 (27.3, 37.4)	<**0.001**
Female	41,969 (25.7)	44,728 (27.2)	43,899 (26.3)	42,974 (25.3)	42,934 (25.0)	−1.3 (−4.3, 1.8)	**0.001**	5,667 (3.8)	7,322 (4.8)	10,702 (7.0)	13,791 (9.0)	19,595 (12.7)	35.6 (30.5, 40.8)	<**0.001**
Region														
Northeast	12,466 (21.6)	12,898 (22.4)	13,709 (23.5)	13,779 (23.4)	14,029 (23.8)	2.4 (0.7, 4.2)	0.24	5,533 (10.2)	7,250 (13.5)	12,712 (23.6)	14,975 (27.5)	24,491 (45.4)	44.7 (30.9, 60.1)	<**0.001**
Midwest	16,357 (24.2)	16,700 (24.5)	17,412 (25.5)	16,691 (24.1)	17,942 (26.0)	1.3 (−1.9, 4.5)	0.60	7,857 (12.1)	10,073 (15.4)	11,643 (17.9)	15,657 (24.3)	19,855 (30.8)	26.2 (21.2, 31.3)	<**0.001**
South	31,830 (27.0)	35,078 (29.5)	33,309 (27.5)	32,684 (26.4)	32,104 (25.6)	−2.2 (−6.7, 2.6)	**0.002**	2,847 (2.5)	4,064 (3.6)	6,987 (6.1)	9,882 (8.5)	15,123 (12.9)	51.3 (44.1, 58.8)	<**0.001**
West	20,489 (27.7)	20,692 (27.6)	18,298 (24.0)	17,367 (22.5)	17,556 (22.2)	−6.3 (−9.9, −2.5)	<**0.001**	3,886 (5.3)	5,407 (7.3)	5,532 (7.4)	5,550 (7.4)	6,554 (8.6)	10.3 (−0.3, 22.0)	<**0.001**

Note: Boldface indicates statistical significance ($p<0.05$). Annual data are shown as *n* (rate). Visits are included regardless of disposition. Visits with a first-listed diagnosis and a first-listed external cause of injury code indicating a non-heroin opioid overdose and a heroin overdose were classified using the first-listed diagnosis.

[a] Age-adjusted rate per 100,000.

[b] Includes poisoning by opium, methadone, and other opiates and related narcotics (excluding heroin).

[c] Average annual percent change estimated from Joinpoint regression using age-adjusted rates.

[d] Significance of linear trend was tested using the F-statistic from a multivariable logistic regression controlling for age, sex, and region.

AAPC, average annual percent change.