

# Prescription opioid use among children and adolescents with asthma in the United States: National estimates from 2011 to 2015

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## BACKGROUND

- Prescription opioid pain relievers have been among the most commonly misused medicines in the United States (US), and they pose a major public health concern along with significant economic burden on society.<sup>1</sup>
  - Deaths due to prescription opioid overdose increased by an age-adjusted rate of 10.6% from 2015 to 2016.<sup>2</sup>
- Among adolescents with non-cancer pain conditions, prescription opioids were administered to 21.0% of privately insured adolescents and 40.2% of Medicaid (Arkansas)–covered adolescents in 2005.<sup>3</sup>
  - Opioids are reported to be the leading cause of serious injury or death resulting from unintentional drug poisoning among children and adolescents in the US.<sup>1</sup>
- Among patients with asthma, opioid binding to the opioid receptors leads to histamine release and thereby activation of allergen-reactive T cells, which could lead to anaphylactoid reactions.<sup>4</sup>
- To the best of our knowledge, no study has previously evaluated prescription opioid use among patients with asthma in the US.

## OBJECTIVE

- To assess prescription opioid use and associated cost burden among children and adolescents with asthma in the US by using a nationally representative database.

## METHODS

### Study Design, Data Source, and Patient Population

- This study utilized a cross-sectional, retrospective study design, using pooled data from multiple years (2011-2015) of the Medical Expenditure Panel Survey (MEPS) and was conducted among children and adolescents (0 to 17 years) with asthma.
  - MEPS is a nationally representative survey of the US civilian noninstitutionalized population that collects personal and household-level information on respondents' sociodemographic characteristics, health status, access to care, clinical diagnosis, and related charges and payments.
  - Asthma was defined as any diagnosis with a Clinical Classification Software condition code of 128 (i.e., International Classification of Diseases, Ninth Revision, Clinical Modification–493.xx).

### Data Analyses

- Key background characteristics that were assessed included patient demographics, type of opioid prescription, and medical diagnosis (grouped by cardiorespiratory, dental, ear-nose-throat, gastrointestinal, hematologic/oncologic, infection, neurologic and migraine, nontraumatic orthopedic, skin/dermatological, urogenital, and trauma) associated with opioid prescription.
- Survey design methods were used to generate national estimates of prescription opioid use and all-cause total health care and pharmacy-related expenditures.
- A multivariate logistic regression model was used to assess determinants of prescription opioid use among children and adolescents.
- All analyses were descriptive and entailed the tabular display of mean values, medians, ranges, and standard deviations for continuous variables and frequency distributions for categorical variables.
- All cost data were adjusted to 2017 US dollars using the medical care component of the US Consumer Price Index.

## RESULTS

- Among the total of 73.9 million children and adolescents, an estimated 254,110 with asthma received at least one prescription opioid from 2011 to 2015.
  - Prescription opioids were received by an estimated 4.2% (95% confidence interval [CI], 3.2%–5.2%) of children and adolescents with asthma compared with 2.4% (95% CI, 2.2%–2.7%) of patients without asthma (*P* value, < 0.0001).
  - Characteristics of patients who received prescription opioids, by asthma status, are presented in Table 1.
  - After adjusting for covariates, children and adolescents with asthma had 58% higher odds (odds ratio, 1.58; CI, 1.21-2.06) of receiving prescription opioids compared with those without asthma (Table 2).
- The average number of opioid prescriptions among patients with asthma was 1.3 (95% CI, 1.2-1.5) compared with 1.2 (95% CI, 1.1-1.3) among patients without asthma.
- Among patients with asthma, the most common opioids prescribed were hydrocodone (36.7%), tramadol (10.5%), codeine (10.2%), and oxycodone (9.7%) (Figure 1).
- The most common diagnoses associated with opioid prescriptions among patients with asthma were trauma (35.5%) and cardiorespiratory conditions (15.6%); among patients without asthma, they were trauma (29.1%) and dental conditions (15.0%) (Figure 2).
- The average total per-patient health care expenditure was \$9,761 (95% CI, \$4,740-\$14,781) for opioid users with asthma versus \$7,183 (95% CI, \$5,912-\$8,453) for opioid users without asthma (Figure 3); the average expenditure was \$4,762 (95% CI, \$3,222-\$6,302) for non-opioid users with asthma.

Table 1. Baseline demographics of children and adolescents in the US, 2011-2015

	Patients receiving prescription opioids			
	Asthma		Non-asthma	
Total patients	254,110	100.0%	1,660,809	100.0%
Age categories (years)				
0-7	43,045	16.9%	416,031	25.0%
8-12	64,598	25.4%	317,140	19.1%
13-17	146,468	57.6%	927,639	55.9%
Sex				
Male	123,090	48.4%	862,362	51.9%
Female	131,021	51.6%	798,447	48.1%
Race/ethnicity				
White	207,500	81.7%	1,464,240	88.2%
African American	32,273	12.7%	136,389	8.2%
Other	14,338	5.6%	60,181	3.6%
Region*				
Northeast	50,265	19.8%	201,771	12.1%
Midwest	84,421	33.2%	353,212	21.3%
South	70,578	27.8%	705,696	42.5%
West	48,845	19.2%	400,131	24.1%
Family income				
Poor, near poor, or low income	97,227	38.3%	570,448	34.3%
Middle or high income	156,884	61.7%	1,090,361	65.7%
Health insurance status				
Private	158,449	62.4%	1,073,792	64.7%
Public	91,515	36.0%	558,592	33.6%
Uninsured	4,147	1.6%	28,425	1.7%
Usual source of health care				
No	5,036	2.0%	90,371	5.4%
Yes	249,075	98.0%	1,551,139	93.4%
General health status*				
Fair/poor	46,545	18.3%	151,364	9.1%
Excellent/very good/good	207,566	81.7%	1,509,445	90.9%
ADL limitation				
No	242,199	95.3%	1,627,041	98.0%
Yes	11,911	4.7%	33,768	2.0%
IADL limitation				
No	246,908	97.2%	1,642,900	98.9%
Yes	7,203	2.8%	17,909	1.1%

\*Significant at *P* < 0.05.

ADL = activities of daily living; IADL = instrumental activities of daily living.

Figure 1. Most commonly prescribed opioids among children and adolescents in the US, 2011-2015

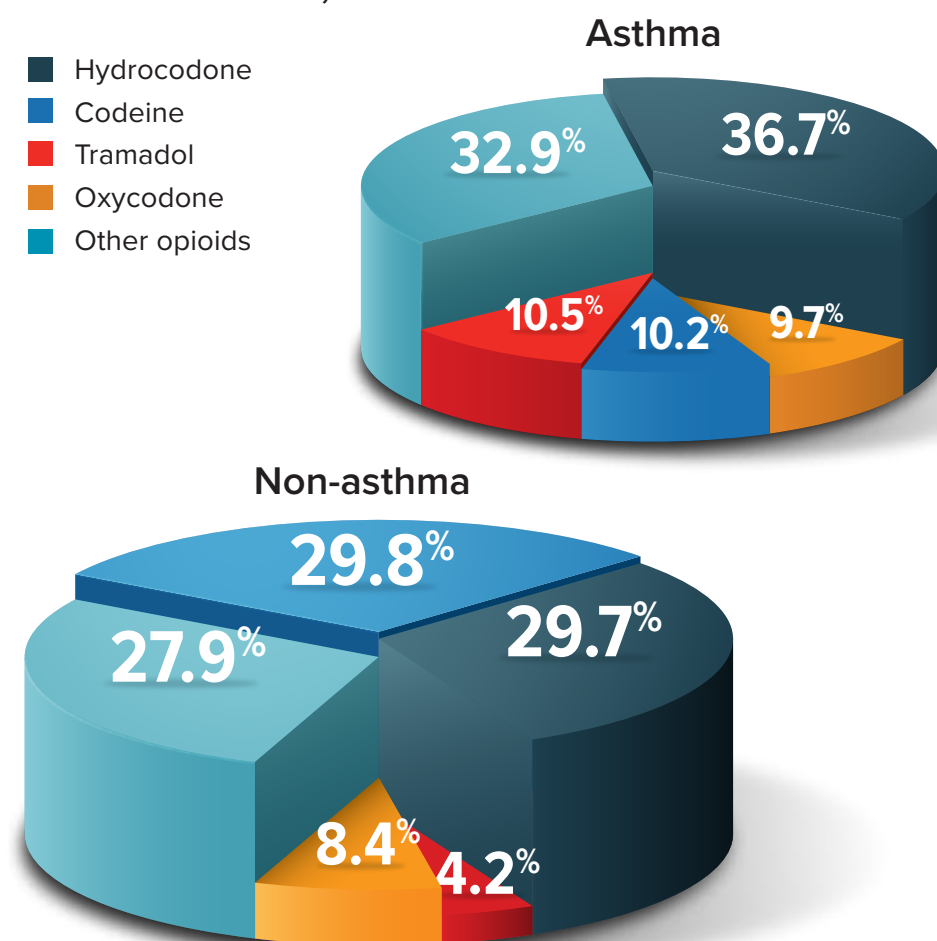


Table 2. Logistic regression\* for determinants of prescription opioid use among children and adolescents in the US, 2011-2015

Characteristics	Adjusted Odds Ratio	<i>P</i> Value
Asthma (yes vs. no)	1.58 (1.21-2.06)	0.0008
Race/ethnicity		
White	Reference	
Black	0.70 (0.54-0.89)	0.005
Other	0.53 (0.35-0.80)	0.0003
Age categories (years)		
0-7	Reference	
8-12	1.22 (0.95-1.60)	0.123
13-17	3.45 (2.76 (4.33))	< 0.0001
Usual source of health care (yes vs. no)	1.69 (1.25-2.27)	0.0006
General health status		
Fair/poor	Reference	
Excellent/very good/good	0.55 (0.40-0.76)	0.0003
ADL limitation (yes vs. no)	3.10 (1.53-6.19)	0.002
Income		
Poor/near poor/low income	Reference	
Middle or high income	1.39 (1.08-1.79)	0.011
Health insurance coverage		
Uninsured	Reference	
Private	0.36 (0.20-0.66)	0.001
Public	0.98 (0.58-1.64)	0.933

\* Controlled for other covariates that were not significant at *P* < 0.05; gender, prescription drug coverage, region, mental health status, and IADL limitation.

Figure 2. General diagnostic categories associated with opioid prescriptions to children and adolescents in the US, 2011-2015

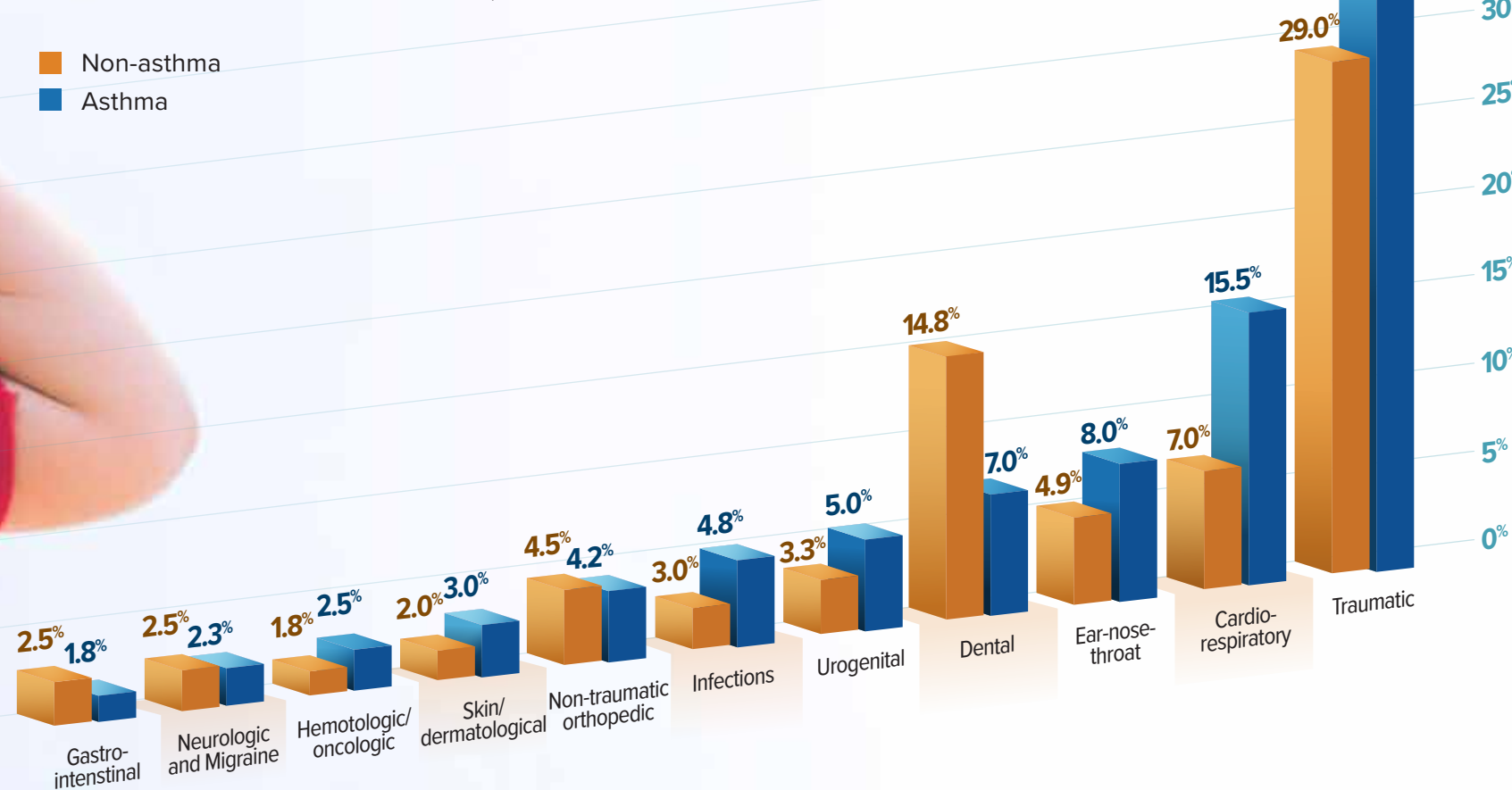
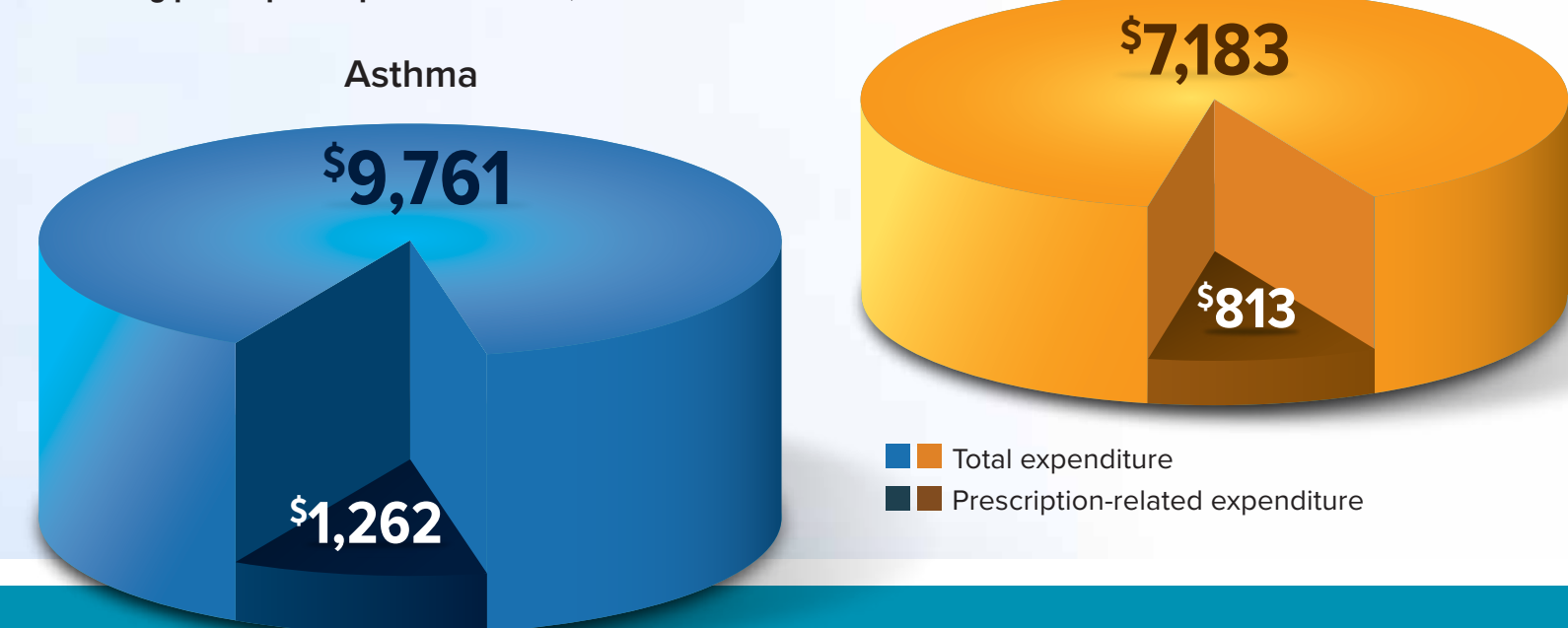


Figure 3. All-cause expenditures among children and adolescents receiving prescription opioids in the US, 2011-2015



## CONCLUSIONS

- From 2011 to 2015, a significantly greater proportion of children and adolescents with asthma were prescribed opioids compared with those without asthma.
- These findings may indicate yet another area and special population of potential concern in the ongoing opioid crisis in the US that requires urgent attention by policy makers, providers, patients, and other health care stakeholders. In the light of findings from the current study, additional factors such as lack of access to medical care and poor health status might be associated with receipt of prescription opioids.

## LIMITATIONS

- The diagnoses in MEPS are self-reported or parent-reported, which may not be accurate.
- Recall problems by respondents and unwillingness to report conditions could limit the study findings.
- The study design is cross-sectional in nature and provides only plausible association and not a causal relationship between asthma and opioid use.
- Some inherent problems with secondary data such as inaccuracy, missing data, and sampling errors including nonresponse bias and interviewer effect may impact the study findings.

## REFERENCES

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