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Health care expenditures associated with pediatric pain-related conditions in the United States

Cornelius B. Groenewald[a,b,*], **Davene R. Wright**[b], and **Tonya M. Palermo**[a,b]

[a] Department of Anesthesiology and Pain Medicine, Seattle Children's Hospital, University of Washington School of Medicine, Seattle, WA, USA

[b] Center for Child Health, Behavior and Development, Seattle Children's Research Institute, Seattle, WA, USA

Abstract

The primary objective of this study was to assess the impact of pediatric pain-related conditions on health care expenditures. We analyzed data from a nationally representative sample of 6- to 17-year-old children captured in the 2007 National Health Interview Survey and 2008 Medical Expenditure Panel Survey. Health care expenditures of children with pain-related conditions were compared with those of children without pain-related conditions. Pain-related conditions were associated with incremental health care expenditures of $1339 (95% confidence interval [CI], $248-$2447) per capita. Extrapolated to the nation, pediatric pain-related conditions were associated with $11.8 billion (95% CI, $2.18-$21.5 billion) in total incremental health care expenditures. The incremental health care expenditures associated with pediatric pain-related conditions were similar to those of attention deficit and hyperactivity disorder ($9.23 billion; 95% CI, $1.89-$18.1 billion), but more than those associated with asthma ($5.35 billion; 95% CI, $0-$12.3 billion) and obesity ($0.73 billion; 95% CI, $6.28-$8.81 billion). Health care expenditures for pediatric pain-related conditions exert a considerable economic burden on society. Efforts to prevent and treat pediatric pain-related conditions are urgently needed.

Keywords

Health care expenditures; Health economics; Child and adolescent; Chronic pain

[*]Corresponding author. Address: Department of Anesthesiology and Pain Medicine, Seattle Children's Hospital, M/S MB.11.500.3, 4800 Sand Point Way NE, Seattle, WA 98105, USA. Tel.: 11 206 987 2518. cornelius.groenewald@seattlechildrens.org (C. B. Groenewald)..

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Conflict of interest statement

The authors have no conflicts of interest to declare.

Appendix A. Supplemental Digital Content

Supplemental Digital Content associated with this article can be found online at http://links.lww.com/PAIN/A56.

1. Introduction

Chronic and recurrent pain is increasingly being recognized as a major cause of morbidity among children and adolescents.[22] Epidemiological studies estimate that 15% to 25% of youth have pain-related conditions such as migraine, abdominal pain, and other types of chronic pain. Pediatric pain is associated with increased risk for physical and psychological symptoms such as fatigue, sleep disorders, depression, and anxiety.[20,25] While the health consequences of pediatric pain have been well described, few studies have quantified associated health care expenditures.

Internationally, researchers from the Netherlands, Malaysia, and the United States have previously identified increased health service use due to pediatric pain-related conditions, however did not compute associated expenditures.[7,31,36] To date, only 3 published studies, one from the United Kingdom and 2 from the United States, provide estimates of associated health care expenditures in clinical samples of youth with chronic pain-related conditions. In a small cohort of 52 youth with both noninflammatory- and inflammatory-type chronic pain, Sleed et al. estimated the mean annual health care expenditure per child with chronic pain for the United Kingdom's National Health System at approximately £7114 ($15,986 in 2013 U.S. dollars [USDs]).[34,28] In a small cohort study performed in the United States, Ho et al. reported that children treated for chronic pain in 1 interdisciplinary clinic incurred health care charges of $2055 for outpatient visits and $8198 for inpatient admissions over a 3-month period (2013 USD). Groenewald et al. estimated health care expenditures of 149 adolescents presenting to multidisciplinary pain treatment centers across the United States. Estimated mean costs per adolescent were $8019 (2013 USD). Although these studies suggest that chronic pain-related conditions in childhood are associated with increased health care expenditures, they are limited by their inclusion of youth with pain from tertiary pain centers only and therefore have limited generalizability to predict expenditures of pediatric pain-related conditions on the national level.

In a system where multiple players compete for limited resources, information on excess expenditures attributable to health conditions can inform decision makers on how to allocate resources to minimize the economic impact of pediatric health conditions. The primary objective of this study was to address this gap in knowledge by quantifying the impact of pediatric pain-related conditions on the annual health care expenditures in the U.S. health care system. We studied a nationally representative sample of 6- to 17-year old-children from 2 databases, the 2007 National Health Interview Survey (NHIS) and 2008 Medical Expenditure Panel Survey (MEPS). Our primary hypothesis was that the health care expenditures associated with pediatric pain-related conditions would be significantly higher relative to the general pediatric population without pain-related conditions. The secondary objective was to compare incremental health care expenditures associated with pediatric pain-related conditions relative to other chronic childhood conditions. We chose pediatric attention deficit and hyperactivity disorder (ADHD), pediatric asthma, and pediatric obesity as comparators because according to the Center for Disease Control and Prevention (CDC), they are highly prevalent among youth and have an enormous economic impact on society.[11–13] We expected that health care expenditures associated with pediatric pain-

related conditions would be similar to those associated with pediatric ADHD, asthma, and obesity.

2. Methods

2.1. Data sources

We analyzed linked data from 2 large nationally representative probability surveys, the 2007 NHIS and 2008 MEPS. The NHIS is a household survey conducted annually by the CDC's National Center for Health Statistics. National Health Interview Survey is the principal source of information on the health status, behaviors, and outcomes of the noninstitutionalized civilian population of the United States. For this analysis, we linked four 2007 NHIS data files (Family, Person, Imputed Income, and Sample Child) to create a single NHIS file containing 9417 children sampled in 2007. Details on sampling design and data collection are provided elsewhere in the literature.[35,1] The MEPS, cosponsored by the National Center for Health Statistics and the Agency for Healthcare Research and Quality, provides comprehensive estimates of health care use and expenditures by the noninstitutionalized civilian population of the United States. The sample for MEPS is selected from the responding participants of the previous year's NHIS allowing linkage of the surveys at the person level, to expand the surveys' analytic capacity.[15] Therefore participants who reported health conditions in the 2007 NHIS had their health care utilization and costs measured over the course of 2008, which was then captured in the 2008 MEPS. For this analysis, we used the 2008 MEPS Household Component Full Year Consolidated file. Our 2007 NHIS file linked to the 2008 MEPS file to create a combined database containing data for 1544 study participants aged 6 to 17 years. The survey years we chose to analyze, 2007 NHIS and 2008 MEPS, are the most recent available data that specifically ask about the presence of pain-related conditions in children. This analysis involved publically available de-identified data and was deemed exempt from review by the institutional review board at our institution.

2.2. Case identification

Children and adolescents with pain-related conditions (n = 261) were identified by parental responses to 5 questions in the NHIS Sample Child file. Parents were asked whether their child in the last 12 months had (1) frequent or severe headaches including migraines, (2) recurring headaches other than migraine, (3) abdominal pain, (4) back or neck pain, or (5) other chronic pain.[6] Because the 2012 NHIS did not specify pain intensity, frequency, duration, or interference, we were unable to classify these pain-related conditions as either recurrent or chronic according to the International Association for the Study of Pain (IASP) taxonomy.

2.3. Health care expenditures

The primary dependent variable for this analysis was total direct health care expenditures captured in MEPS. Total direct health care expenditures represent all expenditures paid by private or public insurance and out of pocket by patients and their families but do not include health insurance premiums. Total health care expenditures consisted of expenditures on office-based visits, hospital outpatient visits, emergency department visits, prescription

medications, and a residual group (including home health care, hospital inpatient stays, zero night stay hospital admissions, dental, vision, and other medical supplies and equipment) for each study participant. Office-based visits consisted of medical encounters, with both physicians and nonphysicians, that took place in office-based settings and clinics. Hospital outpatient visits consisted of medical encounters, both physicians and nonphysicians, that took place in hospital-based outpatient departments. Over-the-counter medication costs are not captured by MEPS and therefore not included.

2.4. Covariates specification

To specify covariates for inclusion in regression analysis, we used a modified version of the Anderson Behavioral Model of Health Service Use.[2] The Andersen model is a conceptual model aimed at identifying factors that influence health care expenditures. The model has been used extensively in studies investigating health service use and expenditures, including estimating national health care costs for adults with chronic pain in a study commissioned by the Institute of Medicine Committee on Advancing Pain Research, Care, and Education.[21,17] According to the conceptual model, health care expenditures are determined by 3 sets of factors: predisposing characteristics, enabling resources, and need factors. Predisposing factors are individual social and demographic characteristics that influence health care use. We included age, gender, race/ethnicity, mother's educational status, and number of parents present in the family to represent predisposing factors. Enabling resources are those that facilitate or impede health care use. We included insurance status, poverty level, the United States census region, degree of urbanization, and whether the study participant had a usual source of health care to represent enabling resources. Need factors refer to comorbid conditions influencing the actual or perceived need for health care. We a priori decided to control for 3 chronic childhood conditions: ADHD, asthma, and obesity because they are highly prevalent among children and are associated with high societal health care costs.[3,8,37] Children with asthma were identified by responses to 2 questions in the NHIS Sample Child file indicating whether children had (1) ever been told they had asthma and if so whether, (2) they still currently had asthma. Children with ADHD were identified by a question indicating whether parents were ever told that their child had ADHD. Children in the sample with a body mass index percentile at or above the 95th percentile for their age and sex according to the 2000 CDC growth charts were classified as obese.[10] As age in the publicly available data set was only reported in full years, as opposed to in months, we were only able to approximate the body mass index percentile.

2.5. Statistical analysis

All analyses were conducted with Stata version 12.1 (StataCorp, College Station, TX). We adjusted for the complex probability survey design of MEPS using sampling weights, stratification, and clustering to provide national estimates, standard errors (SE), and confidence intervals (CI). All data were weighted to represent the total U.S. population of children aged 6 to 17 years at the time of the 2007 NHIS. Weights for the NHIS/MEPS linked file were constructed according to the steps published by Bethell et al.[6] In summary, weights were constructed by adjusting MEPS weights to reflect the NHIS probabilities of selection of children. Finally, the linked file adjusted weights were raked by age, sex, race/

ethnicity, and U.S. region using the 2007 NHIS population controls as estimates of marginal totals.[4]

As is typical with expenditure data, a large proportion (16.4%) of children sampled had no expenditures during the MEPS survey period. Also, as expected, the distribution of expenditures of those participants with nonzero expenditures was nonnormal with a large left skew. In this situation, use of ordinary least squares regression models, which are based on assumptions of normality, may provide inaccurate estimates.[26,27] Therefore, as recommended, we conducted our analysis using a 2-part model.[9] The first part of the model used logistic regression to predict the probability of incurring any positive expenditures in a given year. The second part of the model used a generalized linear model with a log-link and gamma family distribution to predict expenditures for only those children with positive expenditures from the first part of the model. Regression analysis in both parts of the model controlled for predisposing, enabling, and need factors as specified by the Andersen Behavioral Model of Health Service Use. Mean expenditure estimates for each child were then calculated by multiplying the probability of incurring expenditures from the first part of the model by the expected expenditures from the second part of the model.

We estimated the mean annual expenditures attributable to pain-related conditions using an incremental method, first estimating health care expenditures of children with pain-related conditions and then estimating health care expenditures of children without pain-related conditions.[17] By adjusting for observed covariates, expenditures related to nonpain conditions should theoretically be comparable between the 2 groups, and incremental expenditures were estimated as the difference in expenditures between the 2 groups (children with pain-related conditions vs children without pain-related conditions). The same model and methods were used to calculate mean annual expenditures associated with pediatric asthma, ADHD, and obesity. To calculate total national annual health care expenditures, the incremental costs per capita were multiplied by the number of participants with each health condition (pain-related conditions, ADHD, asthma, and obesity). We also calculated the health care expenditures associated with source of payment: private health insurance, Medicaid, other public insurance programs, and out-of-pocket expenses among children with pain-related conditions. For each category, we calculated its proportion of total health care expenditures. We multiplied our estimates of incremental costs by these proportions to estimate the proportion of expenditures borne by each payer category.

We used nonparametric bootstrapping techniques to construct CIs around predicted expenditures. One thousand bootstrap samples from the data in memory were drawn using the repeated half-sample bootstrap algorithm proposed by Saigo, Shao, and Sitter, which is suitable for bootstrapping complex survey data.[24,33,40] All reported expenditures were inflated to 2013 dollars using the 2013 medical care component of the U.S. consumer price index.[39]

3. Results

31. Sociodemographic and clinical characteristics

Table 1 presents the characteristics of study participants. In 2008, there were 1544 children aged 6 to 17 years in the combined NHIS/MEPS database, who after weighting represent approximately 48.7 million children nationwide. This is similar to the estimated U.S. childhood population of 49 million (ages, 6-17 years) in 2008 according to the U.S. Census Bureau.[38] Consistent with recent population prevalence data from the CDC,[11–13] around 9.9% of children had asthma, 8.9% had ADHD, and 20.4% were obese. Consistent with previous epidemiological studies finding prevalence rates of pediatric chronic and recurrent pain around 15% to 25%, we estimated that 18% of child and adolescent participants had pain-related conditions over the previous 12 months.[22]

3.2. Health care expenditures

Model coefficients for both parts of the 2-part model are presented in supplementary appendix A (available online as Supplemental Digital Content at http://links.lww.com/PAIN/A56). Findings from the first part of the model indicated that children with pain-related conditions had higher odds of having positive expenditures as compared with children without pain-related conditions (odds ratio 5 1.57), but this finding was not statistically significant (95% CI, 0.93-2.65). Findings from the second part of the model indicated that among those participants with positive expenditures, spending for those with pain-related conditions was 63% higher than for participants without pain-related conditions (coefficient 5 1.63; $P < 0.001$). Low maternal education, not being insured, and having ADHD were significant drivers of higher expenditures in both parts of the model (appendix A, available online as Supplemental Digital Content at http://links.lww.com/PAIN/A56).

The mean per capita health care expenditure associated with pain-related conditions was $3271 (95% CI, $2238-$4421), which consisted of expenditures on office-based visits ($865), hospital outpatient visits ($431), emergency department visits ($183), prescription medications ($681), and a residual group ($1197). The residual group contained a wide variety of health services, including home health care visits, hospital inpatient stays, zero night (short-term) hospital stays, dental and vision care, and other nonspecified medical supplies and equipment. The mean per capita health care expenditure for those children without pain-related conditions was $1932 (95% CI, $1570-$2370) (**Table 2**). The incremental difference (subtracting expenditures associated with pain from those with no pain) ($1339 [95% CI, $248-$2447]) was statistically significant. Incremental costs for office-based visits ($329 [95% CI, $61-$717]) and prescription medications ($437 [95% CI, $18-$928]) were significantly higher for children with pain-related conditions as compared with children without pain-related conditions. There were no significant differences in incremental costs for hospital outpatient visits, emergency department visits, or residual costs. In aggregate, the total incremental health care costs associated with childhood pain-related conditions amounted to $11.8 billion (95% CI, 2.18-21.5) (**Table 3**).

3.3. Source of payment

Table 3 shows the distribution of total aggregated health care costs by source of payment. Private insurers paid the majority of incremental costs, $5.19 billion. Medicaid paid the second largest share of costs, $4.01 billion. Families paid $1.89 billion out of pocket. Other sources of costs (other federal, other state and local, other private, other public, and other unclassified sources) contributed $0.71 billion.

3.4. Costs of childhood pain-related conditions compared with asthma, attention deficit and hyperactivity disorder, and obesity

Data on incremental health care expenditures associated with childhood pain-related conditions, ADHD, asthma, and obesity are presented in **Table 4**. The mean per capita incremental health care expenditure associated with pain-related conditions was higher than for either asthma or obesity, however not as high as those associated with ADHD. The total national incremental health care costs associated with childhood pain were higher than those for asthma, ADHD, and obesity.

4. Discussion

The primary objective of this study was to assess the impact of pediatric pain-related conditions on health care expenditures among a nationally representative sample in the United States. We found that 18% of 6- to 17-year-olds in the United States had pain-related conditions, similar to estimates of pediatric pain-related conditions from epidemiological studies ranging between 15% and 25%.[22] On average, presence of pediatric pain-related conditions was associated with significantly increased per capita ($1339) and aggregated ($11.8 billion) health care expenditures as compared with the absence of pain-related conditions in children.

There are no current population-based studies describing health care expenditures associated with pediatric pain-related conditions in nontertiary care samples, making comparison to our study challenging. Previous studies by Sleed et al., Ho et al., and Groenewald et al., estimated health care costs associated with clinical pain-related conditions treated in tertiary care and found ranges of $8019 to $15,986 annually. However, these prior studies only included children and adolescents presenting for clinical evaluation and treatment to interdisciplinary tertiary care pain clinics, which typically provide care to youth with severe disabling pain problems.[20] Therefore, the much lower expenditures estimated for children in our study likely reflect lower pain intensity, frequency, and interference as compared with the participants in studies involving clinical tertiary pain clinic samples. Furthermore, while it is estimated that between 15% and 25% of children and adolescents experience some form of chronic or recurrent pain-related conditions, very few, around 5%, have symptoms in the moderate-to-severe range resulting in functional impairment.[20]

Our estimates of direct medical expenditures are similar to those available for pediatric conditions associated with chronic or recurrent pain: juvenile arthritis and migraine. Bernatsky et al. estimated direct medical expenditures associated with juvenile idiopathic arthritis in a small sample of 155 children presenting for evaluation in specialty clinic at

$3394 (2013 USD), which is comparable with our total annual estimated direct medical expenditures of $3273.[5] Pesa et al, using population-based data from 890 children, estimated direct medical expenditures associated with childhood migraine at $5782 annually.[32] However, neither of these studies extrapolated costs to national estimates nor separated expenditures due to pain-related conditions from those specifically aimed at treating the underlying disease (eg, disease-modifying drugs for arthritis).

We found that the per capita incremental health care expenditures associated with pediatric pain-related conditions were more than for obesity, similar to asthma, and slightly lower than ADHD. Overall, after multiplying per capita expenditures by population estimates, pediatric pain-related conditions were associated with higher health care expenditures than for pediatric ADHD, asthma, or obesity. Although there are no published reports on national expenditures associated with pediatric pain-related conditions, several studies have reported on expenditures associated with these other pediatric conditions. These data are readily available from the CDC's website. For example, the CDC using nationally representative data from the NHIS estimates that one in 10 children in the United States had asthma in 2009, with incremental (additional) health care expenditures ranging from $453 to $1358 (2013 USD) per child with asthma.[11,41] The source of these data was also from the MEPS, albeit from the 1996 survey. For ADHD, the CDC reported the incremental mean annual health care costs around $2125 to $3615 (nationally representative data from beneficiaries of a large Fortune 100 company).[29,12] The CDC also reports that around 18% to 21% of U.S. children and adolescents are obese. Our finding that obesity was not associated with significantly increased health care expenditures adds to other published studies that are equivocal concerning whether increased health care costs are associated with obesity.[42]

Although important, our analysis should be interpreted in light of several limitations. First, only prevalence data for the presence of pain-related conditions over the prior 12 months were available in the data set. Ideally, future studies should include data on pain frequency, duration, and intensity to allow for a more comprehensive assessment and gradation of children's pain experience. Second, because of the observational nature of our cross-sectional analysis, we are not able to draw conclusions based on causation. We therefore do not know whether pain-related conditions were the main driver of health care expenditures or whether participants with high health care expenditures simply had more pain-related conditions. Future prospective longitudinal studies may give a more precise estimation of the expenditures attributable to pediatric pain by examining health care use over time. A third limitation was the inability to separate the costs of pain from conditions associated with pain, which may have contributed to high expenditures; for example, juvenile idiopathic arthritis is associated with chronic and recurrent pain, but also requires costly management. To limit confounding as much as possible, we controlled for covariates using a standard model of health care use, the Andersen Behavioral Model of Health Service Use. However, we were only able to include a limited number of sociodemographic and clinical covariates into our models, based on our sample size. Therefore, there may have been several unobserved and uncontrolled covariates that may influence expenditures. Future studies should use larger sample sizes to better estimate pain-related costs by controlling for additional relevant covariates. A fourth limitation is that children with pain-related conditions were identified by parental report rather than by their self-report. Previous studies

suggest that parents may underreport their child's pain, potentially biasing our findings towards the null hypothesis.[14] Finally, our study evaluated the health care expenditures associated with pain-related conditions, which only partially explain the true economic burden of pain to society. We could not quantify indirect costs, such as over-the-counter medication costs or lost school or work days, because these are not captured in MEPS. Because previous studies have found that these costs significantly contribute to the overall economic burden of children's pain, our analysis may severely underestimate economic costs of pain-related conditions, asthma, ADHD, and obesity.[34,19]

Despite these limitations, there are important implications of our findings. Although data from our study cannot form the basis of clinical recommendations about how to prevent or manage pain, it does highlight the enormous costs associated with medical care for pediatric pain-related conditions. Efforts to decrease the impact of pediatric pain-related conditions are urgently needed. A recent study by Hechler et al. demonstrated that intensive multudisciplinary treatment for children with moderate-to-severe chronic pain was both clinically effective and reduced economic impacts. Currently, there exists a shortage of multidisciplinary pain treatment centers dedicated to pediatric care.[30] Data from this study may help focus the attention of decision and policy makers on approving resources for research, prevention, and treatment of pediatric chronic and recurrent pain-related conditions. Another implication of our study is that the high prevalence and cost of pain-related conditions necessitate changes in the health care models for pediatric care. While intensive management in specialized pain centers is effective in reducing health care use, the high prevalence of chronic pain and significant barriers to attending multidisciplinary pain clinics require that most children will be managed in the primary care setting.[30,18] Recent studies have demonstrated that receiving patient-centered primary medical care in a medical home environment improved both clinically important and economic outcomes among children with asthma and ADHD.[16,23] These effects may also be found for children with pain-related conditions, however have not been studied.

In conclusion, this is the first study to quantify health care expenditures associated with pediatric pain-related conditions using a nationally representative sample in the United States. We used a 2-part model to calculate and compare predicted incremental health care expenditures associated with pediatric pain-related conditions, ADHD, asthma, and obesity. Pediatric pain-related conditions were associated with significantly increased per capita ($1339) and total national ($11.8 billion) expenditures. Pediatric pain-related conditions were also associated with higher health care expenditures than pediatric ADHD, asthma, or obesity. Our results indicate that health care for children with pain-related conditions has an enormous economic impact on society. Efforts to prevent and treat pediatric pain-related conditions are urgently needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Table 1

Sociodemographic and clinical characteristics of 6- to 17-year-old children (n = 1544).

Characteristic	Frequency	Weighted frequency	Weighted percentage	SE, %
Pain-related conditions	261	8,799,372	18.04	1.21
Migraine*	101	3,350,953	6.87	0.90
Nonmigraine frequent headache*	94	3,400,680	6.97	0.96
Abdominal pain*	108	3,348,682	6.87	0.77
Back or neck pain*	75	2,234,283	4.58	0.50
Other chronic pain*	29	971,849	1.99	0.37
Asthma	172	4,836,685	9.92	0.83
ADHD	132	4,326,540	8.87	0.96
Obese	335	9,922,966	20.35	1.22
Age group				
6-11 y	699	23,626,864	48.44	1.57
12-17 y	845	25,145,361	51.56	1.57
Female gender	753	23,318,028	47.81	1.47
Race/ethnicity				
White, non-Hispanic	531	28,422,283	58.28	1.50
Hispanic	532	9,675,970	19.84	0.96
Black, non-Hispanic	382	7,829,966	16.05	1.05
Asian, non-Hispanic	84	1,900,289	3.9	0.50
Other race/ethnicity	15	943,716	1.93	0.48
Mother's education				
Some college or more	711	25,833,710	57.4	1.66
High school or less	699	19,168,851	42.6	1.66
Income category				
Poor/negative (<100% FPL)	348	9,065,840	18.59	1.13
Near poor (100%-124% FPL)	115	2,359,627	4.84	0.47
Low (125%-200% FPL)	313	7,698,105	15.78	0.94
Middle (201%-399% FPL)	467	17,355,567	35.58	1.60
High (>400% FPL)	301	12,293,086	25.21	1.42
Insurance				
Any private	796	29,521,020	60.53	1.60
Public only	568	13,980,686	28.67	1.46
Uninsured	180	5,270,519	10.81	1.13
Parent(s) present in family				
Two parents	958	34,146,083	70.01	1.50
One or no parents	586	14,626,142	29.99	1.50
Geographical region of the United States				
Northeast	253	8,617,760	17.67	1.43
Midwest	313	11,750,655	24.09	1.54

Characteristic	Frequency	Weighted frequency	Weighted percentage	SE, %
South	592	17,767,267	36.43	1.70
West	386	10,636,544	21.81	1.70
MSA				
Non-MSA	214	8,193,821	16.97	1.47
MSA	1324	40,103,401	83.03	1.47
Child has usual source of care	1405	44,806,977	91.87	0.90

ADHD, attention deficit and hyperactivity disorder; FPL, federal poverty level; MEPS, Medical Expenditure Panel Survey; MSA, metropolitan statistical area; NHIS, National Health Interview Survey.

* Datasource: linked 2007 NHIS and 2008 MEPS file.Total frequency of migraine, nonmigraine headache, abdominal pain, backor neck pain, and other chronic pain adds up to more than 261 because several parents reported that their children had more than 1 pain-related condition.

Table 2

Annual mean and incremental per capita health care costs (all in 2013 USD) for U.S. children (6-17 y of age) with pain-related conditions as compared with children without pain.

Category	Children with chronic pain	95% CI	Children without chronic pain	95% CI	Incremental difference in costs	95% CI
Total medical care costs	3271	2238-4421	1932	1570-2370	1339	248 to 2447
Office-based visits	865	579-1278	536	396-683	329	61 to 717
Hospital outpatient visits	431	198-28,296	104	76-3731	328	–330 to 25,359
Emergency department visits	183	91-468	140	83-265	42	–92 to 284
Prescription medications	681	303-1158	244	192-348	437	18 to 928
Residual*	1197	692-1953	855	632-1126	341	–204 to 1221

Dollar amounts were adjusted for inflation to reflect 2013 dollar costs using the consumer price index medical care inflation component.

Costs were adjusted for age group, sex, race/ethnicity, mother's education, income category, insurance, parent(s) present in family, geographical region of the United States, metropolitan statistical area, and usual source of health care.

Source: 2008 MEPS.

CI, confidence interval; MEPS, Medical Expenditure Panel Survey.

* Residual group includes costs for home health care, inpatient hospital stays (including zero night stays), dental, vision, and other medical supplies and equipment.

Table 3

Distribution of total incremental health care costs by source of payment among U.S. children (6-17 y of age) with pain-related conditions (in billions of USD, 2014) as compared with children without pain-related conditions.

Source of payment	Percent of total health care costs	Total incremental health care costs (in billions of USD)	95% CI, billion USD
Total costs	100	11.8	2.18-21.5
Private insurance	44	5.19	0.96-9.48
Medicaid	34	4.01	0.66-7.35
Out of pocket	16	1.89	0.35-3.45
Other sources	6	0.71	0.13-1.29

Dollar amounts were adjusted for Inflation to reflect 2013 dollar costs using the medical care component of the consumer price index.

Other sources of costs include other federal, other state and local, other private, other public, and other unclassified sources.

Source: 2008 MEPS.

CI, confidence interval; MEPS, Medical Expenditure Panel Survey; USD, U.S. dollar.

Table 4

Prevalence, population estimates, total per capita, and total aggregated incremental health care costs associated with selected childhood health conditions among U.S. children (6-17 y of age).

Health condition	Prevalence, %	Population (in million)	Per capita incremental costs, USD	95% CI	Aggregated incremental costs (in billions of USD)	95% CI
Pain-related conditions	18.04	8799	1339	248 to 2447	11.8	2.18 to 21.5
ADHD	8.87	4327	2132	437 to 4181	9.23	1.89 to 18.1
Asthma	9.92	4837	1107	0 to 2537	5.35	0 to 12.3
Obesity	20.35	9923	74	–632 to 888	0.73	–6.28 to 8.81

Incremental health care costs for specific health conditions are relative to children without the specific conditions. For example, Incremental health care costs for children with ADHD are relative to children without ADHD.

Dollar amounts were adjusted for inflation to reflect 2014 dollar costs using the consumer price index medical care inflation component.

Health conditions were identified by parent response to the 2007 NHIS.

Source: 2007 NHIS and 2008 MEPS.

ADHD, attention deficit and hyperactivity disorder; CI, confidence interval; MEPS, Medical Expenditure Panel Survey; NHIS, National Health Interview Survey.