School absence associated with childhood pain in the United States

Cornelius B. Groenewald, MB,ChB[*], **Marian Giles, MBBS**[*], and **Tonya M. Palermo, PhD**[*,†,¶]

[*]Department of Anesthesiology and Pain Medicine, University of Washington School of Medicine, Seattle, Washington

[†]Department of Pediatrics, University of Washington School of Medicine, Seattle, Washington

[¶]Department of Psychiatry, University of Washington School of Medicine, Seattle, Washington

Abstract

Objective: To estimate the national burden of school absenteeism associated with pain among 6–17 year old children in the United States.

Methods: Data were analyzed from a large, nationally representative sample from the 2012 National Health Interview Survey. Associations between pain and school absence were analyzed using multivariate negative binomial models controlling for sociodemographic and clinical characteristics.

Results: The sample contained 8641 participants, of whom 30.3% reported pain over the preceding 12 months. Mean number of parent-reported school days missed across the entire sample was 3 per child, however pain was associated with an additional 1.5 reported missed school days per child. Furthermore, pain was associated with higher rates of chronic absenteeism (missing >15 days of school): 6.1% of children with pain was chronically absent as compared to 1.3% of children without pain. Extrapolated to the nation, childhood pain in the United States was associated with 22.2 million additional days of missed school, while childhood asthma, in comparison, was associated with 8 million additional days of school missed.

Discussion: Associations between pain and school absenteeism highlight the need for interventions aimed at improving school attendance among children with pain.

Keywords

Children and adolescents; Pain; School absence

Introduction

Pain is common in childhood[1,2], and significantly impacts children's functional activities[3]. Indeed, children with pain frequently miss school[4,5]. School absenteeism increases their risk of school dropout, behavioral, and social problems that may persist throughout life[6].

Address correspondence to: Cornelius B. Groenewald, MB, ChB, Anesthesiology and Pain Medicine, Seattle Children's Hospital, M/S MB.11.500.3, 4800 Sand Point Way NE, Seattle, WA 98105, cornelius.groenewald@seattlechildrens.org.

However, while it is well known that children with pain miss school, the national burden of school absenteeism associated with pediatric pain in the United States is unknown.

Increased school absenteeism has been primarily described in clinical samples of children with abdominal pain[5,7,8], juvenile arthritis[9], juvenile fibromyalgia[10], widespread musculoskeletal pain[11], lower back pain[12] and in mixed chronic pediatric pain conditions[5,13–18]. One study at a tertiary pediatric pain clinic in the US found almost half of all patients had missed more than 6 days, and 13% missed more than 35 days in the previous 3 months[19]. Chronic pain is associated with decreased academic performance among children presenting to pain clinics[15]. In addition, school absences in youth with pain have been linked with higher rates of adjustment difficulties[15] and lower school-related quality of life[16]. Children with pain may also be at risk of chronic absenteeism[19] which is commonly defined as missing >10% of the school year[20]. Chronic absenteeism is strongly associated with lower school performance such as standardized testing scores in reading and with higher school dropout rates[21].

Yet, there are no large studies describing the national burden of school absenteeism associated with childhood pain in the United States. This is a major gap in our understanding on how pain impacts society that may crucially influence national health policies aimed at reducing childhood pain. Therefore, our primary objective was to measure the association between pain and school absenteeism in a nationally representative sample of school aged children in the United States. We hypothesized that parents of children with pain would report significantly more missed school as compared to parents of children without pain. We also determined the national burden of school absenteeism associated with childhood pain. Furthermore, in order to place the impact of pain in context, our secondary aim was to compare missed school associated with pain to missed school associated with two other common childhood conditions: asthma and attention deficit and hyperactivity disorder (ADHD). We chose asthma and ADHD as comparators because they are highly prevalent among children and have a known impact on school absenteeism[22,23]. We hypothesized that childhood pain would be associated with more missed school days as compared to asthma and ADHD.

Materials and Methods:

Participants

This study was a secondary cross-sectional analysis of data from the 2012 National Health Interview Survey (NHIS). The NHIS is an annual cross-sectional survey, conducted via in-person interviews of sampled households, and selected via a multistage process to represent the entire civilian, non-institutionalized population of the United States. The primary purpose of NHIS is to provide national estimates of the health status of the U.S. population. For each family included in the NHIS, one child (aged 17 or younger) and one adult (18 or older) were randomly selected for additional, more extensive questionnaires collecting information on the presence or absence of health conditions and health behaviors. We chose to use the 2012 sample because it is the most recent NHIS survey including questions on the prevalence of pain-related conditions among children. The total sample for 2012 included 13,275 children from 42,366 households. After excluding children <6 years of age, our final

sample contained all 8641 school-aged children (6–17 years). The data are publicly available and de-identified, and was deemed exempt from review by our institutional review board.

Measures

School absenteeism.

Our main outcome of interest was school absenteeism, defined as the number of days of school days missed due to illness or injury as reported by parents over the preceding 12 months (continuous variable, range 0–240 days). Specifically, parents were asked "*During the past 12 months, about how many days did (name of their child) miss school because of illness or injury?*" We excluded children whose parents reported "don't know" or "refused to answer" (n=70; 0.85%). A small group answered "child does not go to school" and these were also excluded as the numbers were too small for meaningful analysis (n=25). Chronic absenteeism was defined as missing greater than 15 days of school during the past 12 months, which is consistent with the definition used by the United States Department of Education[20].

Pain.

Our main predictor variable was childhood pain. Childhood pain was identified by parental responses to 10 questions in the 2012 NHIS Sample Child file, consistent with previous studies[24,25]. Specifically, parents were asked *"During the past 12 months, has (name of their child) had any of the following conditions…1) frequent headaches or migraines; 2) recurrent headaches other than migraines; 3) abdominal pain; 4) pain in/around a joint over the past 30 days; 5) neck pain; 6) lower back pain; 7) other muscle or bone pain; 8) severe sprains or strains; 9) dental pain; or 10) other chronic pain"*. 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.

Sociodemographic variables.

Sociodemographic information captured included age group (6–10, 11–13, 14–17 years), sex (male/female), race and ethnicity (white non-Hispanic, black non-Hispanic, Hispanic, American Indian/Native Alaskan, Asian, and other/multiracial group), family income (< $34,999, $35,000 - $74,999, $75,000 - $99,999, $100,000 and over), insurance status (uninsured, some private, public only), parent educational status (bachelor's or higher, some college, high school or less) and United States census region (Northeast, Midwest, South, West).

Comorbid conditions.

NHIS gathers data on several priority chronic child health conditions including: depression, anxiety, asthma, attention deficit and hyperactivity disorder (ADHD), allergies, infections, autism, muscular dystrophy, diabetes mellitus, neurodevelopmental delay, Down's syndrome, cystic fibrosis, seizures, and hypertension. We decided a priori to control for the comorbid conditions by assigning participants to one of four categories representing number of comorbidities (0, 1, 2–3, and 4+ comorbid conditions) excluding pain, asthma, and

ADHD. Asthma and ADHD were included as separate comorbid conditions in order to directly compare school absenteeism associated with each to school absenteeism associated with childhood pain.

Statistical Analyses:

Analyses were conducted with Stata version 14.2 (StataCorp, College Station, TX)[26] α level was set at .05. We adjusted for the complex survey design of NHIS using sampling weights, stratification, and clustering to provide nationally representative estimates. We first examined the prevalence of pain according to each sociodemographic and clinical characteristic of participants in our sample. We then used multivariate logistic regression models to present adjusted odds ratios of the association of each characteristic with pain. To address our primary aim, we performed multivariate negative binomial regression analysis to determine the association between pain and missed school days, controlling for sociodemographic and clinical characteristics. These associations are presented as incidence rate ratios and incremental missed school days. Incidence rate-ratios correspond to the relative difference in missed school days for each characteristic (as compared to the reference category) in our multivariate model. Incremental missed school days associated with each health condition (the difference between a reference category and other categories) and mean school days missed associated with each condition were estimated using the *margins-dydx*, and *margins-post* commands following the negative binomial regression command in Stata v14.2 respectively. Negative binomial regression analysis were chosen for analysis, because the missed school days variable is a count outcome and linear regression is associated with substantial problems using count data[27,28]. Furthermore negative binomial regression was chosen over Poisson regression because data was over dispersed (p <0.001)[29]. To estimate the total national number of school days missed associated with each specific health conditions (pain, asthma, ADHD), we multiplied the weighted average of school days missed per child by the estimated number of children affected.

Results:

We included data on 8,641 children 6–17 years of age captured in the 2012 National Health Interview Survey who represented 48.8 million individuals nationwide. Mean age of children in the sample was 11.5 years. The sample contained slightly more males (52%) than females (48%). More than half the sample identified as white non-Hispanic children (54%), followed by Hispanic children (23%), black non-Hispanic children (14%), Asian children (4.4%), Other/multiple race children (4.2%), and American Indian/Alaskan Native children (0.7%). In the overall sample 2,698 children were identified with pain (30.3%).

Characteristics associated with pain status are presented in Table 1. Pain was more common among girls (32.7%) as compared to boys (28%), adjusted odds ratio (AOR) = 1.4; 95% confidence interval (CI): 1.2–1.6; p<0.0001. Pain was also more common among adolescents (14–17 years old) as compared to younger children (6–10 years), and among white non-Hispanic children and American Indian/Alaskan Native children as compared to other minority children. We also found a strong association between number of comorbid

conditions and pain status: 74.8% of children with 4 or more comorbidities had pain, while 34.9% of children with 1 other co-morbid conditions had pain; 19.5% of children only reported having pain (but no other priority chronic childhood conditions captured in the 2012 NHIS).

Data from our multivariate negative binomial regression analysis are presented in Table 2. Our estimated mean number of school days missed for all children in the sample was 3. We found that, as compared to children without pain, parents of children with pain reported an additional 1.5 days (95% CI 1.1–1.9 days, p<0.0001) of missed school annually after controlling for other sociodemographic and clinical covariates (on average children with pain missed 4.0 days of school while children without pain missed 2.5 days of school). This translates to an additional 61% sick days annually (incidence rate ratio = 1.61, 95% CI 1.45–1.78, p<0.001). Other characteristics associated with increased school absenteeism included female sex and lower parental incomes. Adolescents missed more school as compared to younger children. White, non-Hispanic children and American Indian/Alaskan Native children missed more school as compared to other minority children. We also found regional differences in school absenteeism with Midwestern children less like to miss school as compared to children from the Northeast region. Insurance status and parental education was not associated with school absenteeism.

Asthma was associated with an additional 35% sick days as compared to children without asthma, which translated into 1 extra day of missed school for children with asthma (p<0.001) (children with asthma missed 3.8 days of school versus 2.8 days for children without asthma). Children with ADHD missed the same amount of school as children without ADHD. We found that number of comorbid conditions was also strongly associated with school absenteeism: children with 4 or more comorbidities missed significantly more school as children without any comorbidities.

Chronic absenteeism was reported in 2.75% (n=247) of children (not presented in tables). However, the percentage of children with pain who were chronically absent were almost five times that of children without pain (6.1% vs 1.3%). Amongst children who were chronically absent, 68% had pain (p < 0.0001).

After applying the incremental missed school days estimated from our negative binomial regression to nationally representative weights, we estimated that children with pain missed an additional 22 million days of school each year (95% CI 16.9–27.6 million missed school days)(Table 3). The total number of school days missed by children with pain was 59 million days; 95% CI 53.2 – 63.5 million days. Pain was associated with significantly greater additional missed school days as compared to asthma (8.1 million, 95% CI 4.1–12.0 million missed school days). ADHD was not associated with additional missed school days in our sample.

Discussion:

The primary aim of this study was to determine whether childhood pain was associated with increased number of parent-report missed school days in the United States using a large,

nationally representative sample from the National Health Interview Survey. We found that 30.3% of school-aged children had pain-related conditions. As hypothesized, childhood pain was associated with increased school absenteeism, even after controlling for sociodemographic and other health conditions. On an individual level pain was associated with an additional 1.5 days of missed school per child with pain. However, pain was also associated with an increased rate of chronic absenteeism. On a societal level, partly due to the large number of children affected, childhood pain was associated with an additional 22 million days of missed school across the United States.

Our results on pain prevalence are similar to other epidemiological studies showing childhood pain prevalence of between 25 and 45.5% among community samples of school-aged children[2,13,30]. However, our measured pain prevalence is lower than some other studies, and may be related to parents underreporting minor pains[2,17,31].

Our findings on school absences are best compared to other studies estimating school absenteeism in large community-based samples. Vervoort et al. examined school absenteeism and functioning in a large school-based study of Flemish children in Europe. They found that, on average, children in their sample missed 2.67 days of school over the preceding 6 months. However, children without pain missed an average of 0.21 days in the previous 6 months, compared to 1.88 days for children with mild grade I pain and 14.11 days for children with the highest severity grade IV pain[32]. Huguet et al. studied pain epidemiology and school absenteeism in a sample of 561 children in Catalonia. They found that, on average, children missed 0.77 days of school per month, while children with pain missed 0.99 days. For children with pain the mean number of school days absent also increased with an increasing severity of their pain[13]. Our findings on school absenteeism associated with pain are presented slightly differently from Vervoort and Huguet's studies. Specifically, we isolate and present the incremental missed school days associated with childhood pain after controlling for other characteristics in our sample. However, unlike Vervoort and Huguet we could not estimate increased school absenteeism based on pain grade, because the 2012 NHIS did not survey participants about pain severity to allow for use of pain grades.

In our sample, childhood pain was associated with greater school absenteeism as compared to either asthma or ADHD. Furthermore, pain affected more children as compared to either asthma or ADHD. Our rates of school absenteeism associated with asthma are similar to other studies, including a US based survey that estimated an additional 7 million school days missed per year due to asthma[23]. While other population studies have found an increased rate of school absenteeism due to ADHD[22] we did not find that ADHD was associated with an increased number of school absences in our sample. Furthermore, the association between pain and childhood attendance was greater than for almost all of the other measured covariates in this study. The only factor associated with more missed school was presence of 2 or more comorbid conditions. To our knowledge there are no recent studies comparing the effect of pain on school absenteeism to other childhood chronic medical conditions.

We also found that childhood pain was associated with an increased risk for chronic absenteeism. Other studies have suggested a link between chronic pain and chronic

absenteeism. For example, children with chronic pain presenting for evaluation and treatment report, on average, 2–3 missed days of school per month[19,33]. We extend these findings to a large nationally representative sample, which highlights the important problem of pain and chronic absenteeism. Implications of this findings include that chronic absenteeism is a strong risk factor for school dropout[34,35] lower academic performance, and post-secondary enrollment[21].

Childhood pain may affect school attendance by several hypothesized pathways. Childhood pain may result from illness, injury, or surgery, yet for a significant number of children there are no identifiable cause of pain. Regardless, children with pain may experience significant functional impairment secondary to their pain[4]. Since school is central to children's lives, functional impairment due to pain may manifest as difficulty coping with the demands of attending class and refusal to attend school[36]. Indeed, parents are often uncertain about how to negotiate school attendance in children with pain and may therefore report that their child missed school because of illness related to pain. Second, children with pain are more likely to have psychological and physiological co-morbid conditions. Indeed co-morbid depressive symptoms[4,33], and anxiety symptoms[37] are key drivers of school absenteeism among children with chronic pain. Third, parents may have maladaptive cognitive (e.g. catastrophizing) and behavioral (e.g. protective behaviors) response to their children's pain. These parental responses are associated with increased functional disability in their children and both of these factors are associated with increased school absenteeism among children with pain[4]. Further studies are needed to explore these possible mechanisms on a national level to understand how pain affects school attendance for youth with chronic pain. Such studies would help to guide targeted interventions[38].

Limitations include the retrospective measurement of school absenteeism, which may be subject to recall bias. Indeed, we only used one source of information on school attendance, although parent and child self-report of school absenteeism are reliably consistent with school records[15]. A limitation related to cross-sectional surveys are that findings are based on correlational data and cannot indicate cause and effect. The majority of pain studies in children are cross-sectional – longitudinal studies are needed to draw conclusions about the trajectories of pain or the causal relationship between pain and subsequent school functioning[1,39,40]. Moreover, readers should keep in mind that parents were not specifically asked about absences due to pain itself, but rather about school absences from illness or injury. Thus, we are unable to directly link pain as the cause of school absenteeism. Yet, this limitation does not diminish our ability to confidently determine the association between pain and school absenteeism, after controlling for other measured factors. The 2012 NHIS did not include questions on the severity, frequency and duration of pain. Thus, the presence of pain-related conditions over the past 12 months was the only inclusion criteria with no ability to further define chronicity, recurrence or the severity of pain. This may mean that children with very different pain conditions are represented in our sample[40].

Despite these limitations, our study has significant strengths. First, we were able to determine associations between pain and school absenteeism after controlling for a wide range of sociodemographic and clinical covariates. Secondly, our findings are nationally representative and therefore generalizable to the entire USA childhood population. Other

strengths include the high response rates, and that the survey was administered in participants' homes and thus may more accurately reflect the prevalence of pain in the community as compared with surveys administered in school or in specialist pain clinics.

Our findings have significant health policy implications. It is estimated that societal expenditures on childhood pain may be up to $19.5 billion annually in the United States[41]. Our findings underscore the significant societal burden associated with childhood pain by also reporting on parent-reported school absenteeism associated with pain. Indeed, data from our study may help focus the attention of decision and policy makers on approving resources for research, prevention, and treatment of childhood pain on a societal level. Reducing the impact of childhood pain may significantly reduce its societal burden and efforts to decrease the prevalence and impact of pediatric chronic pain are urgently needed. A second implication of our study is that the societal burden associated with childhood pain necessitates changes in healthcare delivery for these patients. While specialized pain centers are effective in reducing the impact of pain, the high prevalence of pain and significant barriers to attending specialized centers requires that most children be managed in the primary care setting[42]. Specifically, future research should investigate the efficacy of less intensive outpatient interdisciplinary pain management interventions as well as remote treatment (e.g., internet and mobile based therapies) on school-related outcomes for children with pain[43]. A third implication is that treatments should be developed to specifically focus on improving school functioning in children with living with pain[44]. Logan and Simons demonstrated feasibility of their "Coping with Pain School" intervention, which is a cognitive behavioral group intervention focused on improving school functioning in treatment-seeking children with chronic pain. This intervention showed feasibility and patients were satisfied with the program[36]. Yet, given our findings, it is important for similar treatment interventions to be developed that can be disseminated to a wider population of children living with pain.

In summary, we found that children with pain missed more school as compared to children without pain, over and above sociodemographic and clinical factors. Indeed, childhood pain was associated with 22 million additional missed school days nationally, which was more missed school days as compared to both childhood asthma and ADHD. Furthermore, children with pain were more likely to be chronically absent from school. Our study extends knowledge of school absenteeism mostly reported among clinical samples of children with pain to a large national sample of children with pain in the United States. Future research should focus on understanding mechanisms by which pain lead to increased school absenteeism.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Funding source:

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Table 1.

Sociodemographic and clinical characteristics of children 6–17 years of age with pain conditions as compared to children without pain conditions in the United States. Datasource: 2012 National Health Interview Survey.

Characteristic	% Pain	Adjusted odds ratio[a]	95% CI	p-value
Age category				
6–10 years	23.6	ref		
11–13 years	30.8	1.4	1.2–1.7	<0.0001
14–17 years	38.4	2.1	1.8–2.4	<0.0001
Sex				
Male	28.0	ref		
Female	32.7	1.4	1.2–1.6	<0.0001
Race/Ethnicity				
White	32.7	ref		
Black	27.2	0.8	0.7–1.0	0.031
Hispanic	27.8	0.9	0.7–1.0	0.136
American Indian/Alaskan Native	34.5	0.8	0.4–1.5	0.492
Asian	22.4	0.7	0.5–1.0	0.043
Other/multiple race	30.6	0.9	0.6–1.3	0.551
Income				
< $34,999	31.3	ref		
$35,000–$74,999	31.4	1.0	0.9–1.2	0.74
$75,000–$99,999	29.4	0.9	0.7–1.2	0.624
$100,000 and over	29.9	1.0	0.8–1.2	0.688
Insurance Status				
Uninsured	31.7	ref		
Any private	29.9	0.9	0.7–1.2	0.433
Public only	30.7	0.9	0.7–1.2	0.52
Parental education				
Bachelor's or higher	29.1	ref		
Some college	32.9	1.1	0.9–1.3	0.343
High school or less	28.8	1.0	0.9–1.3	0.629
Region				
Northeast	26.4	ref		
Midwest	31.9	1.2	1.0–1.5	0.067
South	30.0	1.2	1.0–1.4	0.068
West	32.0	1.4	1.2–1.7	0.001
Comorbid conditions				
None	19.5	ref		
1	34.9	2.2	1.9–2.5	<0.0001
2–3	51.4	4.3	3.6–5.1	<0.0001
4+	74.8	10.4	6.2–17.4	<0.0001
Asthma				

Characteristic	% Pain	Adjusted odds ratio[a]	95% CI	p-value
No	27.9	ref		
Yes	42.3	1.4	1.2–1.7	<0.0001
ADHD				
No	29.0	ref		
Yes	40.1	1.1	0.9–1.3	0.278

[a]Estimated from logistic regression model which included all variables listed in table.

Table 2.

Results of negative binomial regression analyses estimating associations between selected characteristics and missed school days among U.S. school-aged children (6–17 years). Data source: 2012 National Health Interview Survey.

Characteristic	aIRR[a]	95% CI	Estimated number of missed school days[b]	Incremental missed school days[c]	95% CI	p-value
Pain						
No	ref		2.5	ref		
Yes	1.61	1.45–1.78	4.0	1.5	1.1–1.9	<0.0001
Age category						
6–10 years	ref		2.9			
11–13 years	0.97	0.87–1.09	2.8	−0.1	−0.4–0.3	0.647
14–17 years	1.14	1.03–1.26	3.3	0.4	0.1–0.7	0.017
Sex						
Male	ref		2.9	ref		
Female	1.13	1.04–1.22	3.2	0.4	0.1–0.6	0.005
Race and ethnicity						
White	ref		3.4	ref		
Black	0.73	0.6–0.89	2.5	−0.9	−1.4--0.4	<0.0001
Hispanic	0.7	0.62–0.78	2.4	−1	−1.4--0.7	<0.0001
American Indian/Alaskan Native	1.33	0.94–1.89	4.6	1.2	−0.4–2.7	0.155
Asian	0.64	0.54–0.77	2.2	−1.2	−1.6--0.8	<0.0001
Other/multiple race	0.94	0.78–1.13	3.2	−0.2	−0.8–0.4	0.512
Income						
< $34,999	ref		3.4	ref		
$35,000–$74,999	0.87	0.77–0.99	3.0	−0.4	−0.8–0	0.035
$75,000–$99,999	0.81	0.7–0.94	2.8	−0.6	−1.1--0.2	0.008
$100,000 and over	0.8	0.68–0.95	2.7	−0.7	−1.2--0.2	0.011
Insurance coverage						
Uninsured	ref		2.8	ref		
Any private	1.07	0.93–1.24	3.0	0.2	−0.2–0.6	0.34
Public only	1.13	0.98–1.31	3.2	0.4	−0.1–0.8	0.084
Parent education						
Bachelor's or higher	ref		2.8	Ref		
Some college	1.11	0.98–1.26	3.1	0.3	−0.1–0.7	0.1
High school or less	1.1	0.93–1.29	3.1	0.3	−0.2–0.8	0.253
Region						
Northeast	ref		3.5	ref		
Midwest	0.78	0.67–0.92	2.7	−0.8	−1.3--0.2	0.005
South	0.86	0.73–1.01	3.0	−0.5	−1–0.1	0.086
West	0.86	0.75–1	3.0	−0.5	−1–0	0.063
Comorbid conditions						

Characteristic	aIRR[a]	95% CI	Estimated number of missed school days[b]	Incremental missed school days[c]	95% CI	p-value
None	ref		2.1	ref		
1	1.6	1.44–1.79	3.3	1.2	0.9–1.6	<0.0001
2–3	2.14	1.87–2.45	4.4	2.4	1.8–2.9	<0.0001
4+	2.86	2.17–3.76	5.9	3.9	2.3–5.4	<0.0001
Asthma						
No	ref		2.8	ref		
Yes	1.35	1.18–1.54	3.8	1.0	0.5–1.5	<0.0001
ADHD						
No	ref		3.0	ref		
Yes	1.0	0.87–1.14	3.0	0.0	−0.4–0.4	0.978

[a]Adjusted incidence rate ratios estimated from multivariate negative binomial regression model which included all variables listed in table.

[b]Estimates obtained from multivariate negative binomial regression model using *margins-post* command in Stata

[c]Estimates obtained from multivariate negative binomial regression model using *margins-dydx* command in Stata

Table 3.

School days missed due to pain, asthma, and ADHD among children 6–17 years of age in the United States. Data source: 2012 National Health Interview Survey.

Condition	Weighted %	Mean number of school days missed among children with condition (adjusted)[*]	Estimated population size (million)	Additional missed school days due to condition (million) (adjusted)[*]	95% CI (million)
Pain	30.3	4.0	14.8	22.2	16.9–27.6
Asthma	16.8	3.8	8.2	8.1	4.1–12.0
ADHD	11.3	3.0	5.5	−0.027	−2.2–2.2

[*] Adjusted for age, gender, race, income, education, region, number of comorbidities, pain, asthma, and ADHD using margins command following negative binomial regression analysis in Stata v14.2.