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Factors Associated with Insomnia and Complementary Medicine Use in Children: Results of a National Survey

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Abstract

Objectives—Sleep difficulties are a serious health problem in children, and interest in using complementary and alternative medicine (CAM) therapies to treat sleep is growing. We aimed to identify: a) the prevalence of sleep difficulties in children, and b) the prevalence and patterns of CAM use among children with trouble sleeping.

Methods—We used the 2012 National Health Interview Survey (NHIS) dataset to estimate the prevalence of sleep difficulties and CAM use in children ages 6 to 17 years. Prevalence estimates were weighted to reflect the survey's sampling design. We used logistic regression to explore associations between sleep difficulties, psychosocial factors, comorbidities and CAM use.

Results—6.4% of children in the 2012 NHIS dataset reported regular difficulty sleeping in the last year, corresponding to an estimated 1.5 million children in the US. Older age, poorer health status, more school days missed, and multiple comorbidities were all associated with sleep difficulties ($p < 0.001$). Among children with sleep difficulties, 29% used at least one CAM therapy. Of the CAM therapies surveyed, non-vitamin, non-mineral supplements were the most commonly used (14.6%), followed by manipulation therapies (9.2%) and mind-body techniques (8.8%). Parental education and CAM use were most strongly associated with child CAM use ($p < 0.001$).

Conclusions—CAM therapies, particularly non-vitamin, non-mineral supplements, are commonly used among children with sleeping problems. More research is needed to characterize the safety and efficacy of CAM therapies for sleep in this population.

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Keywords

complementary and alternative medicine; integrative medicine; pediatrics; sleep medicine; insomnia

Introduction

The revised International Classification of Sleep Disorders published by the American Academy of Sleep Medicine defines insomnia as “an almost nightly complaint of an insufficient amount of sleep or not feeling rested after the habitual sleep episode” [1]. While a separate definition for pediatric insomnia is not provided, insomnia in children is unique in causing widespread disruptions in the family environment. Prevalence estimates range from 10–40%, depending on the definition of sleep difficulties used and the age of children surveyed [2–5].

Difficulty sleeping in children is associated with many other health problems, particularly behavioral problems. In one cross-sectional study of 4,351 children between 8 and 11 years, sleep disorders were associated with emotional difficulties, hyperactivity, conduct problems, peer problems and social difficulties [4]. Another study of children 5–12 years reported associations between sleep-onset delays and psychiatric and medical comorbidities [6]. A longitudinal study of 943 children found that sleep difficulties in school-age children were associated with anxiety in early adulthood with an odds ratio of 1.60, controlling for a number of covariates including childhood internalizing problems [7].

Treatments for sleep difficulties in children range from medication use, behavioral methods, and complementary therapies [8,9]. One survey study of 671 pediatricians reported that approximately 3% of primary care visits in a typical 6-month practice period were for sleep concerns in young children [10]. For patients with sleep problems, 75% of these practitioners recommended nonprescription medications, and >50% prescribed a sleep medication. Many of these providers recommended both. Melatonin and herbs were recommended by 15%. 54% of those surveyed raised concerns about the side effects of the medications prescribed. While the results of this retrospective survey may be affected by recall bias, it appears that sleep problems in children are commonly treated with medications despite practitioners’ concerns about their safety.

Complementary and alternative medicine (CAM) describes a set of practices and treatments which people choose in addition or as alternatives to Western medical practices [11]. Current figures from the National Center for Complementary and Integrative Health, whose data are derived from the National Health Interview Survey (NHIS), estimate that about 30% of adults and 12% of children utilize CAM therapies [12]. A global survey study of pediatric CAM prescriptions in many countries suggests that up to 17% of all prescription are herbal therapies, and 15% of all prescription are homeopathic remedies [13]. An analysis of the 2002 NHIS data in adults found a 12-month prevalence rate of insomnia or trouble sleeping of 17.4% [14]. Of those with insomnia or trouble sleeping, 4.5% used some form of CAM therapy to treat insomnia.

We aimed to describe the prevalence of insomnia in children in the U.S. and to understand the psychosocial factors and comorbidities associated with insomnia. In addition, given the high rate of medications prescribed for insomnia in children and practitioner concerns about side effects, we aimed to evaluate the prevalence of, and factors associated with, CAM use in children with insomnia. The clinical impact of this analysis would be to identify those children at high-risk for sleep difficulties and understand what CAM treatments are most commonly used in this population.

Methods

Study population

We analyzed data from the 2012 NHIS Household, Family, Person, Adult, and Child Core surveys, as well as the CAM supplements. This cross-sectional, in-person survey disproportionately includes underrepresented minorities and uses a complex sampling design to provide estimates for the U.S. civilian, non-institutionalized population. The NHIS 2012 survey interviewed 42,366 households, yielding 108,131 persons from 43,345 families. Overall, there were 8,738 children ages 6 to 17 years. We restricted all analyses to this age group, because the question about insomnia was only asked of this group.

Definition of sleep difficulties and CAM use

We defined sleep difficulties as affirming the statement “Regularly had insomnia or trouble sleeping, past 12 months” or using one’s first, second, or third top CAM therapy for treating insomnia or trouble sleeping. There were only eight subjects who used CAM for sleep but did not report regular insomnia or trouble sleeping. When these 8 of 593 were excluded, odds ratios and confidence intervals did not change significantly, so they were included in the analysis.

The 2012 NHIS CAM supplement collected information on the use (yes, no, refused, don’t know) of specific CAM therapies within the 12 months prior to being surveyed. We categorized the CAM practices included in the survey into six groups: 1) mind-body therapies (hypnosis, biofeedback, meditation, guided imagery, progressive relaxation, yoga, tai chi, and qi gong), 2) manipulation therapies (chiropractic, massage, craniosacral therapy), 3) movement therapies (Feldenkrais, Alexander, Pilates, Trager), 4) dietary therapies (such as vegetarian diet), 5) non-vitamin and non-mineral supplements, and 6) other CAM therapies (acupuncture, energy healing, naturopathy, ayurveda, chelation, homeopathy, traditional healer). Non-vitamin, non-mineral supplements were classified as “pills, capsules, tablets, or liquids that have been labeled as a dietary supplement,” excluding vitamins, minerals, and teas. Examples include Echinacea, fish oil/omega3/DHA, combination herb pills and flaxseed oil or pills. We did not include vitamins and mineral supplements in this analysis because their use is widespread among children in this dataset and could almost be considered “mainstream.” Given the high frequency of use, the likelihood is low that use would be specifically for the treatment of insomnia, and previous studies of children in NHIS have also excluded vitamins and minerals from analyses of CAM treatments[15,16]. Melatonin and valerian root were included in this category. We defined use of any CAM therapy in the past year as use of any of the aforementioned

modalities in that time span. The use of CAM for specific medical conditions was only asked in relation to the interviewee's top three CAM modalities. Thus, if an interviewee used more than three CAM modalities, the reasons for use of the additional CAM modalities were not captured. Data regarding sleep therapies that are a part of standard medical care, including prescription medications, were not available in the 2012 NHIS survey.

Comorbidities

Comorbidities were chosen for inclusion in the analyses based on their frequency in the pediatric population. Categories of comorbidities were created from similar conditions with a Jaccard similarity coefficient of greater than 0.3 (a natural cut-point based upon the data; a value of 1 implies identical categories)[17]. The Jaccard similarity coefficient is derived by taking the intersection of two groups and dividing by the union of these groups. The final categories included in the analyses were: asthma or respiratory allergy, recurring headache or migraines, anxiety or stress, and eczema. We also included "had problems with being overweight, last 12 months," because being overweight is a significant known comorbidity in children [18].

Statistical analyses

NHIS design and survey weighting procedures were used to provide statistically accurate estimates for the U.S. civilian, non-institutionalized population [19]. Wald Chi-squared tests were used in unadjusted analyses to examine the frequency of covariates within subgroups of children with and without sleep difficulties. We constructed a multivariable logistic regression model with sleep difficulties in the past year as the outcome variable and the following exposures: age, sex, race, Hispanic ethnicity, region, highest education of one parent, school days missed, ratio of poverty threshold based upon household income, insurance category, self-reported health status, and the five aforementioned comorbidities. Among the subgroup of children with sleeping difficulties, we also constructed a multivariable logistic regression to examine the association between any CAM use in the last year as the outcome and the same above exposures plus parental CAM use. Collinearity was assessed by evaluating percent change in standard errors with the presence or absence of a given variable. A total of 13 subjects in the first logistic regression model were dropped because of missing data. No subjects were dropped because of missing data in the second regression model. Associations between these variables and CAM use were described as odds ratios (OR) with 95% confidence intervals. The level of significance was set as a two-tailed $p < 0.05$. All statistical analyses were performed using Stata version 14.0. This study was deemed exempt by the Partners Institutional Review Board.

Results

Patient characteristics

Children with insomnia or regular trouble sleeping in the last year comprised 6.4% of all children (Table 1). Compared with children without sleep difficulties, children with sleep difficulties were predominantly white (78.3% vs. 74.4%; $p = 0.01$) and were more likely to have public insurance (42.7% vs. 33.0%, $p < 0.001$). Among those with sleep difficulties, there was a greater proportion close to the poverty line, with poor health, and with more

school days missed ($p = 0.004$, $p < 0.001$, $p < 0.001$). Those with sleep difficulties reported asthma/respiratory allergy, eczema, headaches/migraines, anxiety/stress or being overweight in greater proportions than those without sleep problems (all p 's < 0.001). Child CAM use was 29% in those with sleep difficulties versus 11.5% in those without ($p < 0.001$).

Factors associated with sleep difficulties among children 6–17 years old

Older age ($p < 0.001$), being insured ($p = 0.006$), highly educated parents ($p = 0.04$) and poor health status ($p < 0.001$) were associated with having sleep problems (Table 2). Missed school days ($p < 0.001$) were more common in this group, as were comorbidities such as asthma/respiratory allergy (aOR 1.65, $p < 0.001$), eczema (aOR 1.74, $p < 0.001$), headaches/migraines (aOR 1.84, $p < 0.001$), and anxiety/stress (aOR 6.19, $p < 0.001$). Gender, race, ethnicity, region, ratio to poverty line, and overweight status were not significantly associated with sleep difficulties.

Prevalence of CAM use by category in children with sleep difficulties

Unadjusted analyses examining the prevalence of specific types of CAM use in both populations are shown in Table 3. Children with sleep difficulties reported significantly more use of non-vitamin, non-mineral supplements (14.6% vs. 4.3%), manipulation therapies (9.2% vs. 4.3%), mind-body therapies (8.8% vs. 3.8%), special diets (2.0% vs. 0.7%), movement therapies (1.7% vs. 0.4%), and other therapies (6.4% vs. 1.9%) than those without sleep difficulties. All of these differences were statistically significant. Among children with sleeping difficulties, 10.1% reported melatonin use, compared to 1.3% in the overall population of children ages 4–17 years, and 1.1% reported use of valerian root, compared to 0.1% of the overall population of children ages 4–17 years. In children with sleeping difficulties who reported use of at least one non-vitamin, non-mineral supplement in the last 12 months, 69% used of melatonin and 7.3% used valerian root.

Factors associated with CAM use among children 6–17 years old with sleep difficulties

Multiple parental, demographic and clinical factors were significantly associated with CAM use in the last year (Table 4). Having a parent who had more than a high school education (aOR 10.68, global $p = 0.001$) or used CAM (aOR 3.33, $p < 0.001$) was associated significantly with CAM use in the child. Children living in the West (aOR 3.55, global $p = 0.01$) or Midwest (aOR 2.41, global $p = 0.01$) had a higher likelihood of CAM use than those living in the Northeast. Finally, children with asthma and respiratory allergies had a greater likelihood (aOR 1.8, $p = 0.05$) of using CAM than those without these conditions. Having both public and private insurance was associated with a decreased odds of CAM use, though this result was marginally significant. Gender, age, race, ethnicity, ratio to poverty line, health status, school days missed, and other included comorbidities were not significantly associated with sleep difficulties.

Discussion

We found that 6.4% of children aged 6–17 years, corresponding to an estimated 1.5 million children in the US, reported regular difficulty sleeping in the past year. Factors most strongly associated with insomnia were older age, poorer health status, more school days missed and

specific comorbidities (e.g., anxiety/stress, migraines/headaches, asthma/respiratory allergies, eczema). In addition, we found that 29% of children with sleep difficulties reported use of at least one CAM therapy, nearly three-fold more than those without sleep difficulties. Increased use of CAM therapies has also been found in those with mood symptoms. In a study by Moschen et al., adult breast cancer patients using > 3 CAM therapies were more likely to adopt a depressive coping style than those using less than or equal to 3 [20]. Parental CAM use and parental education level were most significantly associated with CAM use, consistent with prior data [16,21]. Among the CAM modalities, non-vitamin, non-mineral supplements were most commonly used in this population, with melatonin used at nearly 10-fold the rate of the general population.

The results of the adult NHIS 2002 sleep data by Pearson et al. diverge from ours in interesting ways [14]. Overall, the 12-month prevalence rate for insomnia in adults was 17.4%, nearly three-times the rate of sleep difficulties in children. The proportion of adults (4.5%) with sleep difficulties using CAM was less than one-sixth the proportion in children. This difference may be partially due to changes in CAM use over time, as the adult data is from 2002, while our data was gathered in 2012. In addition, CAM is perceived by some as safer than pharmaceuticals, which may also account for its higher relative prevalence in children [22].

Within our population of children, older age was associated with sleep difficulties, with the greatest magnitude of association in the adolescent population. It is well-known that delayed sleep phase syndrome is most prevalent in adolescence, and it is worsened by progressively earlier starting times for the school day, as a child ages [23,24]. It is important to note that children less than 6 years of age are excluded from answering these NHIS questions, as the inclusion of infants and toddlers might affect this trend [25].

In our dataset, poorer health status, more school days missed and several comorbidities were associated with difficulty sleeping. It is of note that the adjusted odds ratio (aOR) for anxiety or stress (aOR = 6.12) was significantly higher than the aOR for other factors. The association between anxiety/stress and sleeping problems has been suggested and explored in other studies in children, and the aOR for anxiety or depression in the adult data is of a similar magnitude, although the variable is not identically defined across studies [14,26,27]. Difficulties with sleep are extremely prevalent in children with anxiety, up to 88% in one study, and may exacerbate insomnia by interfering with initiation and maintenance of sleep [28].

Sleep disorders are thought by some to be both a contributor to and effect of mood disorders, and some have emphasized the importance of addressing sleep problems in these conditions [27]. A number of small studies have investigated the efficacy of mindfulness-based intervention for sleep and anxiety in children. A study by Bei et al. found that a mindfulness-based sleep intervention was feasible in an in-school setting and may improve sleep quality [29]. Another small study by Semple et al. reported that a mindfulness-based intervention may improve anxiety in school-age children [30]. Overall, there is a paucity of data although mindfulness-based therapies appear to have benefit, and cognitive-behavioral

therapy, which often incorporates mindfulness techniques, has an emerging base of evidence [31].

One surprising finding was that although overweight status was significantly associated with sleep difficulties in unadjusted analyses, this result became non-significant when other factors and comorbidities were included in the model. We were unable to use BMI as a continuous variable because it was only obtained in children ages 12–17 years. It is possible that if continuous BMI data were gathered on all children ages 6–17 years, we might have had more power to detect an association, as was found in the adult data [14].

Parental education and CAM use were most highly associated with child CAM use, a result which is consistent with data from all pediatric CAM users [16,21]. Non-vitamin, non-mineral supplements were most commonly used, a fact likely driven by the high prevalence of melatonin use in children [10]. Positive outcomes have been reported for melatonin use in children, although there are theoretical concerns about delayed onset of puberty [32]. The common use of non-vitamin, non-mineral supplements, combined with concerns about regulation of supplements and potential for supplement-drug interactions, underscores the importance of formulating and disseminating evidence-based guidelines for CAM use to parents [33].

Our study has many strengths, including the use of a rigorously conducted national survey, NHIS, with a wide age range of children. This dataset sampled 8,737 children, of whom 532 had sleep difficulties. With this large sample size, we were able to evaluate the association between multiple psychosocial factors and comorbidities with sleep difficulties.

Nevertheless, there were limitations of the survey. Insomnia/trouble sleeping was defined by one question. Thus, it was not possible to distinguish to identify underlying causes of the reported difficulties. In children, sleep difficulties may be behavioral or due to several other factors including delayed sleep-wake phase disorder, restless legs syndrome, depression, anxiety, stress, medication side-effects, or nocturnal seizures. Parents may report regular trouble sleeping and be in fact describing night terrors, parasomnias or obstructive sleep apnea, all of which have different etiologies and treatments. Though the sample size is large, the dataset is lacking granularity in this area.

No information exists in NHIS regarding use of commonly used medications for insomnia such as dipheniramine, clonidine or other sleep medications. In addition, although screen time is known to have a detrimental impact on the sleep-wake cycle, these data are not a part of the NHIS survey[34]. Our study was cross-sectional, so temporality and causality could not be assessed. It is also important to note that we did not have the power to examine CAM use specifically for sleep difficulties; instead, we examined overall CAM use among children with sleep problems. Due to small sample sizes, we were unable to examine self-reported improvement of specific CAM therapies for sleep difficulties. Finally, because children under 6 years of age were excluded, no conclusions about infants and younger children can be made from these data.

Conclusions

Using the 2012 NHIS, we have reported the prevalence of sleep difficulties in a representative sample of U.S. children and the rate of CAM use in the affected subpopulation. In addition, we demonstrated that older age, poor health status, missed school days and a number of comorbidities were associated with sleep difficulties. Among those with sleep difficulties, parental education and CAM use were most strongly associated with child CAM use, and supplements were the most commonly used therapy. Future investigation should be directed toward the safety and efficacy of commonly used herbs and supplements for sleep in children, as well as assessing the scope of sleep problems in infants and toddlers.

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Table 1

Demographic characteristics of children (6–17 years) with and without sleep difficulties (N=8,737). Values are column percentages (except in first row).^a

	No difficulty with sleep N = 8,205	Any difficulty with sleep N = 532	p-value ^a
Estimated US population size (%)	21,933,959 (93.7%)	1,487,997 (6.4%)	
Gender			0.43
Male	52.1	54.2	
Female	47.9	45.8	
Age (years)			<0.001*
6–9	30.6	18.5	
10–13	33.1	29.1	
14–17	36.3	52.4	
Ethnicity			0.11
Hispanic	20.8	17.9	
Non-Hispanic	79.2	82.1	
Race			0.01
White	74.4	78.3	
Black	14.8	12.8	
Asian	4.9	1.8	
Multiple races	4.6	5.6	
Other	1.3	1.5	
Highest education of parent			0.63*
Less than high school diploma	10.5	9.7	
High school diploma or GED	19.1	18.7	
More than high school	65.8	66.0	
Region			0.02
Northeast	17.8	15.6	
Midwest	22.4	28.2	
South	37.8	33.1	
West	22.0	23.0	
Insurance			<0.001
Public	33.0	42.7	
Private	57.5	45.5	
Both	1.1	4.3	
Not covered	7.9	6.7	
Ratio to Poverty Line			0.003*
<0.50–1.00	16.3	21.5	
1.00–1.99	19.5	21.3	
2.00–3.99	27.1	27.8	

	No difficulty with sleep N = 8,205	Any difficulty with sleep N = 532	p-value ^a
4.00 and above	27.6	22.7	
Health Status			<0.001*
Excellent	56.6	35.2	
Very good	27.2	25.4	
Good	14.4	30.1	
Fair or poor	1.9	9.3	
School days missed			<0.001*
0–5	80.2	54.7	
5–10	12.6	17.2	
10–20	5.1	15.0	
20	1.4	11.6	
Comorbidities			
Asthma/respiratory allergy	14.5	32.3	<0.001
Eczema	10.3	23.6	<0.001
Headaches/migraines	9.4	33.2	<0.001
Anxiety/stress	11.2	57.8	<0.001
Overweight	6.4	15.6	<0.001
Child CAM use in last year	11.5	29.0	<0.001

^aP-values refer to global p-values for categorical variables, and starred p-values refer to p-for-trend for ordinal variables, testing for differences between those with and without difficulty sleeping.

Table 2Factors associated with sleep difficulties in children 6–17 years of age in a multivariable model (N =8,724).^a

	Unadjusted odds ratio	Adjusted odds ratio	Adjusted p-value
Gender			0.07
Male	REF	REF	
Female	0.92 (0.74–1.14)	0.80 (0.63–1.02)	
Age (years)			<0.001*
6–9	REF	REF	
10–13	1.45 (1.10–1.92)	1.27 (0.94–1.73)	
14–17	2.38 (1.83–3.10)	1.78 (1.32–2.41)	
Ethnicity			0.80
Hispanic	REF	REF	
Non-Hispanic	1.21 (0.96–1.53)	0.96 (0.71–1.31)	
Race			0.27
White	REF	REF	
Black	0.82 (0.64–1.05)	0.82 (0.61 – 1.12)	
Asian	0.35 (0.19–0.65)	0.56 (0.29 – 1.05)	
Multiple races	1.16 (0.71–1.87)	0.71 (0.44 – 1.15)	
Other	1.08 (0.55–2.11)	0.95 (0.44 – 2.07)	
Highest education of at least one parent			0.04*
Less than high school diploma	REF	REF	
High school diploma or GED	1.06 (0.75–1.51)	1.02 (0.67–1.54)	
More than high school	1.09 (0.79–1.50)	1.44 (0.95–2.18)	
Region			0.07
Northeast	REF	REF	
Midwest	1.44 (1.07–1.93)	1.44 (1.00–2.08)	
South	1.00 (0.75–1.33)	0.95 (0.70–1.31)	
West	1.19 (0.89–1.60)	1.17 (0.83–1.66)	
Insurance Category			0.006
Public	REF	REF	
Private	0.61 (0.49–0.76)	0.74 (0.55–0.99)	
Both	2.89 (1.63 – 5.12)	1.77 (0.97–3.24)	
Not covered	0.66 (0.44–0.99)	0.67 (0.41–1.08)	
Ratio to Poverty Line			0.66*
<0.50–1.00	REF	REF	
1.00–1.99	0.83 (0.61–1.14)	0.92 (0.65–1.29)	
2.00–3.99	0.78 (0.58–1.03)	1.00 (0.70–1.42)	
4.00 and above	0.62 (0.46–0.85)	0.89 (0.56–1.40)	
Health Status			<0.001*

	Unadjusted odds ratio	Adjusted odds ratio	Adjusted p-value
Excellent	REF	REF	
Very good	1.50 (1.18–1.91)	1.18 (0.90–1.55)	
Good	3.36 (2.63–4.28)	1.88 (1.41–2.49)	
Fair or poor	7.89 (5.26–11.84)	2.28 (1.34–3.86)	
School days missed			<0.001*
0–5	REF	REF	
5–10	2.00 (1.54–2.59)	1.47 (1.10–1.97)	
10–20	4.33 (3.20–5.86)	1.86 (1.26–2.72)	
20	12.56 (8.47–18.64)	3.74 (2.30–6.08)	
Comorbidities			
Asthma/respiratory allergy	2.82 (2.21–3.60)	1.65 (1.25–2.19)	<0.001
Eczema	2.70 (2.14–3.41)	1.74 (1.32–2.29)	<0.001
Headaches/migraines	4.82 (3.91–5.94)	1.84 (1.42–2.40)	<0.001
Anxiety/stress	10.91 (8.82–13.49)	6.19 (4.88–7.85)	<0.001
Overweight	2.70 (2.02–3.62)	1.22 (0.88–1.70)	0.23

^a95% CI's are in parentheses.

P-values refer to global p-values for categorical variables, and starred p-values refer to p-for-trend for ordinal variables. 13 observations of 8,737 were dropped due to missing data.

Table 3

Percentage prevalence (and 95% confidence intervals) of CAM therapies used in children with sleep difficulties compared to those without sleep difficulties (N=8,737).

CAM modality	Children 6 years of age without sleep difficulties (N = 8,205)	Children 6 years of age with sleep difficulties (N = 532)	p-value
Non-vitamin, non-mineral supplements	4.3 (3.8–4.9)	14.6 (11.9–17.8)	<0.001
Manipulation therapies	4.3 (3.7–4.9)	9.2 (6.8–12.3)	<0.001
Mind-body therapies	3.8 (3.3–4.3)	8.8 (6.5–11.8)	<0.001
Special diet	0.7 (0.5–1.0)	2.0 (0.9–4.2)	0.01
Movement therapies	0.4 (0.3–0.6)	1.7 (0.8–3.9)	0.001
Other CAM use	1.9 (1.5–2.3)	6.4 (4.4–9.2)	<0.001

Table 4

Factors associated with CAM use in children ages 6–17 years with sleep difficulties in a multivariable model (N =532).^a

	Unadjusted odds ratio	Adjusted odds ratio	Adjusted p-value
Gender			0.57
Male	REF	REF	
Female	1.13 (0.72–1.77)	1.17 (0.68–2.00)	
Age (years)			0.40*
6–9	REF	REF	
10–13	0.64 (0.36–1.15)	0.50 (0.24–1.04)	
14–17	1.03 (0.61–1.75)	0.78 (0.39–1.56)	
Ethnicity			0.22
Hispanic	REF	REF	
Non-Hispanic	1.71 (0.96–3.06)	1.64 (0.74–3.64)	
Race			0.71
White	REF	REF	
Black	0.37 (0.16–0.84)	0.60 (0.23–1.58)	
Asian	1.33 (0.34–5.23)	2.63 (0.38–18.01)	
Multiple races	1.54 (0.43–5.57)	1.13 (0.37–3.39)	
Other	1.22 (0.50–3.00)	0.90 (0.16–5.09)	
Highest education of at least one parent			0.001*
Less than high school diploma	REF	REF	
High school diploma or GED	6.65 (2.02–21.89)	5.69 (1.54–21.04)	
More than high school	13.70 (4.85–38.65)	10.68 (3.25–35.11)	
Region			0.01
Northeast	REF	REF	
Midwest	2.10 (1.07–4.12)	2.41 (1.11–5.21)	
South	1.02 (0.48–2.17)	1.76 (0.81–3.82)	
West	2.22 (1.15–4.29)	3.55 (1.67–7.55)	
Insurance Category			0.02
Public	REF	REF	
Private	2.70 (1.66–4.39)	1.31 (0.67–2.58)	
Both	0.62 (0.21–1.79)	0.24 (0.08–0.78)	
Not covered	0.72 (0.27–1.94)	0.67 (0.20–2.32)	
Parental CAM use in last year			<0.001
No	REF	REF	
Yes	4.14 (2.59–6.63)	3.33 (1.93–5.72)	
Ratio to Poverty Line			0.19*
<0.50–1.00	REF	REF	
1.00–1.99	0.81 (0.41–1.62)	0.63 (0.26–1.53)	

	Unadjusted odds ratio	Adjusted odds ratio	Adjusted p-value
2.00–3.99	1.96 (1.06–3.63)	0.97 (0.40–2.35)	
4.00 and above	3.44 (1.82–6.50)	1.52 (0.62–3.70)	
Health Status			0.71*
Excellent	REF	REF	
Very good	1.10 (0.66–1.85)	1.31 (0.73–2.34)	
Good	0.71 (0.42–1.21)	1.17 (0.63–2.20)	
Fair or poor	1.00 (0.44–2.27)	1.19 (0.46–3.07)	
School days missed			0.20*
0–5	REF	REF	
5–10	1.78 (1.04–3.04)	1.37 (0.71–2.70)	
10–20	1.81 (1.01–3.24)	1.78 (0.95–3.31)	
20	1.24 (0.64–2.38)	0.93 (0.41–2.07)	
Comorbidities			
Asthma/respiratory allergy	1.82 (1.13–2.92)	1.80 (1.01–3.20)	0.05
Eczema	1.09 (0.66–1.82)	1.24 (0.71–2.18)	0.45
Headaches/migraines	1.27 (0.81–1.99)	1.19 (0.68–2.09)	0.53
Anxiety/stress	1.52 (1.00–2.32)	1.30 (0.74–2.28)	0.35
Overweight	1.01 (0.56–1.84)	1.35 (0.69–2.63)	0.38

^a95% CI's are in parentheses.

CAM use is within a 12 month period prior to survey, rather than ever use. P-values refer to global p-values for categorical variables, and starred p-values refer to p-for-trend for ordinal variables.