Letters

RESEARCH LETTER

Prevalence of Dietary Supplement Use in US Children and Adolescents, 2003-2014

Dietary supplements are often implicated in preventable adverse drug events in children and adolescents,[1] yet current data on their use in this population are lacking. We used nationally representative data from the National Health and Nutrition Examination Surveys (NHANES) to estimate the prevalence of dietary supplement use, including the use of both nutritional products and alternative medicines, among children and adolescents in the United States.

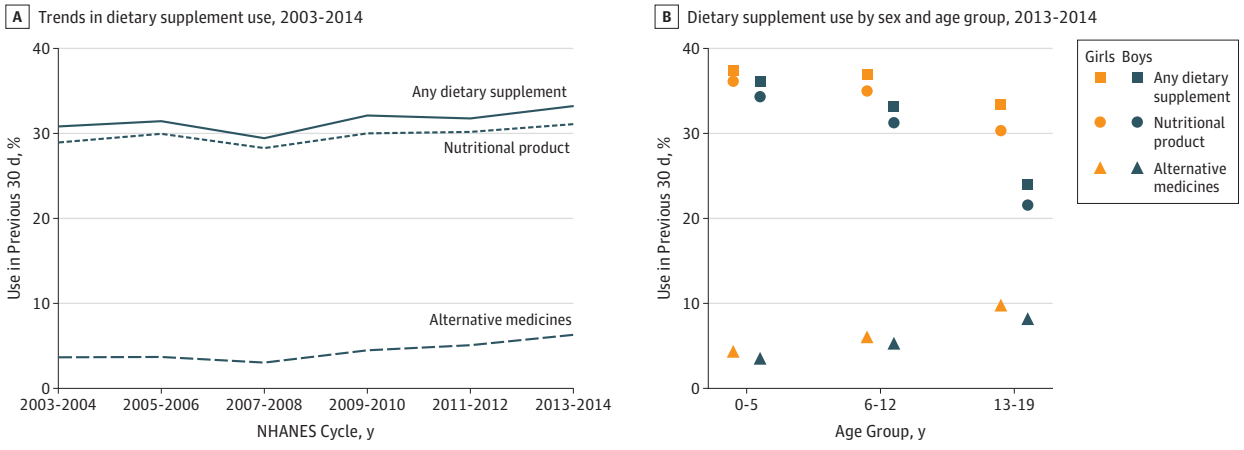
Author Audio Interview

Methods | We reviewed 6 recent 2-year cycles (2003-2004 through 2013-2014) of NHANES data and restricted our sample to children and adolescents (aged 0-19 years) who responded to the dietary supplement questionnaire. A parent or caregiver provided information for survey participants who were younger than 16 years and for those who could not answer the questionnaire for themselves. Dietary supplement data were collected during the household interview. Participants were asked whether they had "used or taken any vitamins, minerals, herbals, or other dietary supplements in the past 30 days." Those participants who answered yes were asked to show the interviewer the containers for all the dietary supplements used.[2] *Nutritional products* were defined as all products that primarily contain vitamins or minerals. *Alternative medicines* were defined as herbal, nonvitamin, or nonmineral supplements. Each supplement was further classified by its primary use (eg, bodybuilding) or its primary ingredient (eg, ω-3 fatty acids). The study was considered exempt by a University of Illinois at Chicago institutional review board.

We used descriptive statistics to estimate the prevalence of dietary supplement use for each of the 6 cycles of NHANES data examined. All prevalence estimates and CIs use Taylor linearization methods[3] to incorporate sample weights that adjust for the complex sampling methods in NHANES. We used Stata, version 14 (StataCorp) to perform all analyses. All P values reported are 2-sided; $P < .05$ denotes statistical significance. All analyses were performed from November 1, 2017, to February 28, 2018.

Results | In 2013-2014, of 4404 individuals whose NHANES data were reviewed, 1603 (36.4%) were children aged 0 to 5 years, 1563 (35.5%) were aged 6 to 12 years, and 1238 (28.1%) were adolescents aged 13 to 19 years; 2243 (50.9%) were boys. Similar to 2003-2004, 33.2% (95% CI, 30.4%-36.2%) of children and adolescents used dietary supplements from

Figure. Weighted Prevalence Estimates of Dietary Supplement Use by Sex and Age Group Among US Children and Adolescents



Graphs are based on data from the National Health and Nutrition Examination Surveys (NHANES), 2003-2004 to 2013-2014. All data are weighted to account for differential probabilities of selection and differential nonresponse.
A, Significance of trends across all 6 NHANES 2-year cycles was tested using survey-weighted logistic regression. Use of alternative medicines nearly doubled from 2003-2004 vs 2013-2014 (3.7%; 95% CI, 2.8%-4.7% vs 6.3%; 95% CI, 4.8%-8.3%; $P < .001$). B, Survey-weighted logistic regression was used to compare prevalence between boys and girls. Among adolescents (13-19 years), girls reported higher use of any dietary supplements in the preceding 30 days (adolescent girls, 33.4%; 95% CI, 27.0%-40.3% vs adolescent boys, 23.9%; 95% CI, 19.0%-29.7%; $P = .06$), specifically nutritional products (adolescent girls, 30.3%; 95% CI, 24.8%-36.4% vs adolescent boys, 21.5%; 95% CI, 16.8%-27.1%; $P = .04$). P values for differences in prevalence between boys and girls are based on a Wald test using design-based estimates of variance.

Table. Weighted Prevalence of Dietary Supplement Use in the Previous 30 Days Among US Children and Adolescents—Overall, by Sex, and by Age Group From NHANES, 2013-2014[a]

Dietary Supplement[b]	Prevalence of Use by Age Group, % (95% CI)						
	Overall (N = 4404)	0-5 y (n = 1603)		6-12 y (n = 1563)		13-19 y (n = 1238)	
		Girls (n = 775)	Boys (n = 828)	Girls (n = 746)	Boys (n = 817)	Girls (n = 640)	Boys (n = 598)
Multivitamins	25.1 (22.3-28.1)	30.7 (25.8-36.0)	31.0 (23.5-39.6)	31.7 (26.1-37.8)	27.6 (23.0-32.7)	18.2 (14.8-22.1)	13.5 (9.7-18.4)[c]
Immunity (eg, vitamin C)	3.8 (2.8-5.2)	1.1 (0.4-3.1)	1.6 (0.7-3.7)	2.3 (1.2-4.4)	4.0 (2.2-7.4)	6.3 (3.8-10.3)	6.5 (4.2-10.0)
ω-3 Fatty acids	2.3 (1.4-3.6)	2.5 (1.0-6.1)	1.1 (0.4-3.1)	2.4 (1.1-5.0)	2.3 (1.4-3.9)	1.8 (0.9-3.8)	3.5 (1.7-6.8)[c]
Antacid	2.2 (1.5-3.2)	0.1 (0.0-0.8)	0.4 (0.1-1.2)	2.1 (1.5-2.8)	1.6 (0.6-3.8)	3.3 (1.7-6.2)	5.2 (2.9-9.4)
Vitamin D	1.6 (0.9-2.8)	1.7 (0.9-3.2)	0.9 (0.5-1.8)	0.4 (0.1-1.2)	1.1 (0.5-2.5)	2.1 (1.0-4.6)	3.3 (1.4-7.7)
Sleep (eg, melatonin)	1.1 (0.6-1.9)	0.1 (0.0-1.3)	0.6 (0.2-1.7)	0.7 (0.2-2.5)	1.3 (0.6-2.8)[d]	1.8 (0.8-4.3)	1.4 (0.7-2.9)
Calcium	1.0 (0.5-2.0)	0.4 (0.1-2.1)	0.9 (0.3-2.8)	0.8 (0.2-4.0)	0.3 (0.1-1.1)	2.3 (0.7-6.6)	1.3 (0.5-3.2)[d]
Vitamin B (eg, B_6, B_{12})	1.0 (0.6-1.4)	0	0	0	0.2 (0.1-1.0)	3.5 (2.2-5.6)	1.6 (0.7-3.6)
Bodybuilding	0.8 (0.5-1.2)	0	0	0	0.1 (0.0-0.8)	1.3 (0.4-4.4)	3.0 (1.3-6.6)[c]
Iron	0.7 (0.4-1.5)	0.6 (0.2-1.3)	0.4 (0.2-0.9)	0.5 (0.1-2.8)	0.3 (0.1-1.2)	2.7 (1.1-6.2)	0.0
Fluoride	0.6 (0.2-2.0)	1.2 (0.3-4.4)	1.2 (0.4-4.1)	0.6 (0.1-5.0)	0.6 (0.1-2.6)	0.0	0.1 (0-0.8)
Other alternative medicines[e]	3.1 (2.1-4.4)	1.9 (0.9-4.0)	1.7 (0.7-4.3)	2.1 (0.9-5.0)	2.5 (1.5-4.1)	5.3 (3.1-8.7)	4.5 (2.7-7.4)

Abbreviation: NHANES, National Health and Nutrition Examination Survey.

[a] All data and values are weighted to account for differential probabilities of selection and differential nonresponse. Survey-weighted logistic regression was used to compare prevalence between boys and girls. *P* value for difference in prevalence between boys and girls are based on a Wald test using design-based estimates of variance.

[b] All categories were nonmutually exclusive because of the multiuse/multiple ingredients of many supplements.

[c] $P < .01$

[d] $P < .05$

[e] Includes digestive aids (overall, 0.7%), probiotics (0.5%), joint (0.2%), energy (0.2%), cognitive function (0.2%), and other (1.2%) alternative medicines.

2013 through 2014 (**Figure**, A). While the use of nutritional products did not change between 2003 to 2004 and 2013 to 2014, the use of alternative medicines nearly doubled (3.7%; 95% CI, 2.8%-4.7% vs 6.7%; 95% CI, 4.8%-8.3%; $P < .001$). The higher rate in the use of alternative medicines was primarily because of increases in the use of ω-3 fatty acid supplements (0.4%; 95% CI, 0.2%-0.9% vs 2.3%; 95% CI, 1.4%-3.5%; $P < .001$) and melatonin supplements (0% vs 0.9%; 95% CI, 0.5%-1.7%; $P < .001$). In both boys and girls, the use of any dietary supplements, specifically nutritional products, was lowest and of alternative medicines was highest during adolescence (aged 13-19 years) (Figure, B).

From 2013 to 2014, multivitamins were the most commonly used dietary supplement (25.1%; 95% CI, 22.3%-28.1%) followed by supplements for immunity (3.8%; 95% CI, 2.8%-5.2%), ω-3 fatty acids (2.3%; 95% CI, 1.4%-3.6%), and sleep aids (1.1%; 95% CI, 0.6%-1.9%) (**Table**). Significant sex differences were only observed during adolescence: iron, calcium, multivitamins, and single vitamins, particularly vitamin B products, were more commonly used among adolescent girls, whereas adolescent boys were more likely to use ω-3 fatty acid supplements and bodybuilding supplements.

Discussion | Using nationally representative data from NHANES, we found that 33.2% of children and adolescents in the United States use dietary supplements. Many of the most commonly used supplements, including multivitamins, are implicated in preventable adverse drug events among this population.[1] In addition, commonly used nutritional products (eg, iron, calcium, and vitamin D) and alternative medicines (eg, bodybuilding supplements), are also increasingly associated with adverse cardiovascular effects, including arrhythmias,[4] that can lead to sudden cardiac death, a serious yet underreported problem in children and adolescents.[5] The growing use of alternative medicines, specifically melatonin and ω-3 fatty acid supplements, which are promoted as having cognitive and sleep benefits for patients with attention-deficit/hyperactivity disorder,[6] is particularly noteworthy given that attention-deficit/hyperactivity disorder drugs, which are frequently used in older children and adolescents, are also associated with serious cardiovascular effects.[7]

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Critical revision of the manuscript for important intellectual content: Qato, Alexander, Lindau.
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