

Dietary Supplement Use in Children and Adolescents Aged ≤ 19 Years — United States, 2017–2018

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Dietary supplement use is common among children and adolescents. During 2013–2014, approximately one third of children and adolescents (persons aged ≤ 19 years) in the United States were reported to use a dietary supplement in the past 30 days, and use varied by demographic characteristics (1,2). Dietary supplements can contribute substantially to overall nutrient intake, having the potential to both mitigate nutrient shortfalls as well as to lead to nutrient intake above recommended upper limits (3). However, because nutritional needs should generally be met through food consumption according to the 2015–2020 Dietary Guidelines for Americans, only a few dietary supplements are specifically recommended for use among children and adolescents and only under particular conditions (4). The most recently released data from the National Health and Nutrition Examination Survey (NHANES) during 2017–2018 were used to estimate the prevalence of use among U.S. children and adolescents of any dietary supplement, two or more dietary supplements, and specific dietary supplement product types. Trends were calculated for dietary supplement use from 2009–2010 to 2017–2018. During 2017–2018, 34.0% of children and adolescents used any dietary supplement in the past 30 days, with no significant change since 2009–2010. Use of two or more dietary supplements increased from 4.3% during 2009–2010 to 7.1% during 2017–2018. Multivitamin-mineral products were used by 23.8% of children and adolescents, making these the products most commonly used. Because dietary supplement use is common, surveillance of dietary supplement use, combined with nutrient intake from diet, will remain an important component of monitoring nutritional intake in children and adolescents to inform clinical practice and dietary recommendations.

NHANES is a cross-sectional survey designed to monitor the health and nutrition of the civilian noninstitutionalized resident U.S. population (<https://www.cdc.gov/nchs/nhanes/index.htm>).

The survey was approved by the National Center for Health Statistics Research Ethics Review Board. Signed consent from parents/guardians or participants aged ≥ 18 years, as well as documented assent from minor participants aged 7–17 years,

INSIDE

- 1563 Progress Toward Global Eradication of Dracunculiasis, January 2019–June 2020
- 1569 COVID-19 in a Correctional Facility Employee Following Multiple Brief Exposures to Persons with COVID-19 — Vermont, July–August 2020
- 1571 Adoption of Strategies to Mitigate Transmission of COVID-19 During a Statewide Primary Election — Delaware, September 2020
- 1576 COVID-19–Associated Hospitalizations Among Health Care Personnel — COVID-NET, 13 States, March 1–May 31, 2020
- 1584 COVID-19 Mitigation Behaviors by Age Group — United States, April–June 2020
- 1591 COVID-19 Outbreak Among a University’s Men’s and Women’s Soccer Teams — Chicago, Illinois, July–August 2020
- 1595 Trends in the Use of Telehealth During the Emergence of the COVID-19 Pandemic — United States, January–March 2020
- 1600 COVID-19 Outbreak at an Overnight Summer School Retreat — Wisconsin, July–August 2020
- 1605 SARS-CoV-2 Exposure and Infection Among Health Care Personnel — Minnesota, March 6–July 11, 2020
- 1612 QuickStats

Continuing Education examination available at https://www.cdc.gov/mmw/mmw_continuingEducation.html



were obtained. Information on dietary supplement use was obtained during an in-home interview. Participants aged ≥ 16 years and emancipated minors were interviewed directly. An adult proxy provided information for participants aged < 16 years. Participants were asked to show product containers for all dietary supplements taken in the past 30 days. The interviewer recorded information from the product labels. The NHANES interview response rate for children and adolescents during 2017–2018 was 59.3%.

Age groups were categorized as < 2 , 2–5, 6–11, and 12–19 years. Self-reported race and Hispanic origin were divided into five categories: non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, Hispanic, and “other.” The “other” category included non-Hispanic persons reporting other races or more than one race and was included in total estimates but not shown separately. Family income was categorized as $\leq 130\%$, $> 130\%$ to $\leq 350\%$, and $> 350\%$ of the federal poverty level (FPL) which accounts for inflation, family size, and geographic location. Highest educational attainment of the household head was divided into three categories: less than high school, high school graduate or equivalent or some college or an associate degree, and college graduate or above. All products were classified using mutually exclusive categories in the following order: 1) multivitamin-mineral products containing ≥ 3 vitamins and ≥ 1 mineral; 2) products containing primarily calcium with or without other ingredients; 3) products containing primarily omega-3 fatty acids with or without other

ingredients; 4) products containing primarily probiotics with or without other ingredients; 5) products containing primarily fiber with or without other ingredients; 6) products containing primarily melatonin with or without other ingredients; 7) botanical products containing ≥ 1 botanical ingredient and no vitamins or minerals; 8) multivitamins containing ≥ 2 vitamins with no minerals; 9) amino acid products containing ≥ 1 amino acid; and 10) single nutrient supplements, categorized separately, such as single vitamins (e.g., vitamin D, vitamin C) and single minerals (e.g., iron). Results are presented for the product types most frequently used by children and adolescents, i.e., those with $\geq 1\%$ prevalence of use.

Two participants with missing dietary supplement use data were excluded from analysis. All other 2017–2018 NHANES participants aged ≤ 19 years comprised the sample ($n = 3,683$). Analyses used 2-year interview weights and accounted for the survey’s complex, multistage probability design. Standard errors for proportions were calculated using Taylor series linearization, and 95% confidence intervals were constructed using the Korn and Graubard method (5). Reliability of estimates was assessed using the National Center for Health Statistics Data Presentation Standards for Proportions (6). Differences in dietary supplement use by sex, age group, and race and Hispanic origin were evaluated using pairwise comparisons with univariate two-sided t-statistics. Trends across income and education of household head were tested using linear regression including categories as continuous variables. Recent

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trends over the last 10 years from 2009–2010 to 2017–2018 were tested using orthogonal polynomial regression with 2-year NHANES cycles. Differences in product use by age group were tested using F-based second-order Rao-Scott tests. All reported differences are statistically significant ($p < 0.05$). All analyses were performed using R (version 3.6.0; R Foundation for Statistical Computing), SAS (version 9.4; SAS Institute), and SUDAAN (version 11; RTI International).

During 2017–2018, overall prevalence of dietary supplement use among children and adolescents in the preceding 30 days was 34.0% (Table 1). Supplement use among females (37.3%) was higher than that among males (30.8%), and use prevalence was highest among those aged 2–5 years (43.3%) followed by those aged 6–11 years (37.5%), 12–19 years (29.7%), and <2 years (21.8%). Prevalence was higher among non-Hispanic Asian (41.1%) and non-Hispanic White children and adolescents (39.9%) compared with that among non-Hispanic Black (20.8%) and Hispanic (26.9%) children and adolescents. Dietary supplement use increased with increasing income and

education of the head of household. Prevalence of use of two or more dietary supplements was 7.1% and varied by age, race and Hispanic origin, income, and education of the head of household.

Among persons aged 12–19 years, use of any dietary supplement increased significantly in a linear fashion from 2009–2010 (22.1%) to 2017–2018 (29.7%) (Figure). Use of two or more dietary supplements increased significantly from 2009–2010 to 2017–2018 among all children and adolescents (from 4.3% to 7.1%) as well as among those aged 2–5 years (from 6.8% to 8.3%) and 12–19 years (from 3.2% to 8.5%).

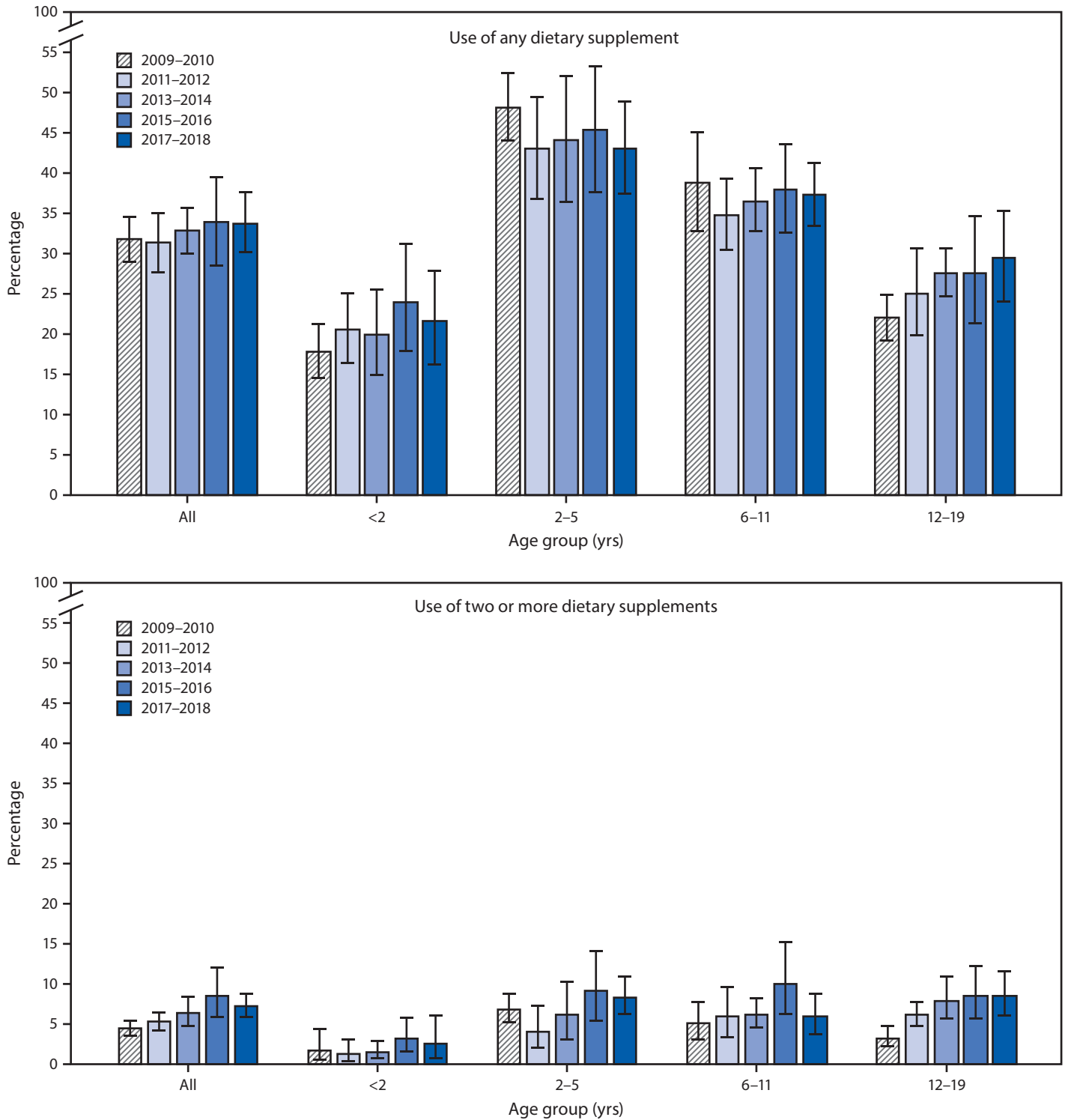
Multivitamin-minerals were the most used product type (23.8% of children and adolescents) (Table 2). Prevalence of use of single ingredient vitamin D (3.6%), single ingredient vitamin C (3.0%), probiotic (1.8%), melatonin (1.3%), omega-3 fatty acid (1.3%), botanical (1.1%), and multivitamin (1.0%) products all met or exceeded 1.0%. Multivitamin-mineral, single ingredient vitamin D, probiotic, and botanical product use differed by age group.

TABLE 1. Prevalence of any dietary supplement use and use of two or more dietary supplements in the past 30 days among children and adolescents (persons aged ≤19 years), by selected characteristics — United States, 2017–2018

Characteristic	No.	% (95% CI)	
		Any dietary supplement	≥2 dietary supplements
Total	3,683	34.0 (30.2–37.9)	7.1 (5.6–8.9)
Sex			
Female	1,829	37.3 (33.7–41.0)	7.7 (5.9–9.8)
Male	1,854	30.8 (25.2–36.9)*	6.5 (4.5–9.2)
Age group (yrs)			
<2	591	21.8 (16.3–28.2)	2.4 (0.6–6.1)†
2–5	784	43.3 (37.6–49.2)§	8.3 (6.1–10.9)§
6–11	1,115	37.5 (33.5–41.6)§,¶	5.9 (3.6–8.9)
12–19	1,193	29.7 (24.1–35.7)§,¶,***	8.5 (5.9–11.6)§
Race, Hispanic origin			
White, non-Hispanic	1,214	39.9 (33.5–46.5)††,§§	8.6 (5.9–11.9)††
Black, non-Hispanic	816	20.8 (16.4–25.8)	1.8 (0.7–3.7)
Asian, non-Hispanic	357	41.1 (32.1–50.6)††,§§	9.3 (5.3–14.8)††
Hispanic	935	26.9 (20.9–33.6)	6.0 (3.6–9.2)††
Family income relative to poverty level			
≤130% of FPL	1,328	23.5 (16.6–31.7)	4.0 (1.9–7.2)†
>130% to ≤350% of FPL	1,209	34.5 (29.2–40.2)	7.0 (5.5–8.7)
>350% of FPL	706	45.9 (39.2–52.8)¶¶	11.1 (6.7–17.0)¶¶
Education of household head			
Less than high school graduation or equivalent	638	17.8 (11.9–25.0)	1.8 (0.6–4.2)
High school graduation or equivalent or some college or associate degree	2,030	33.7 (29.0–38.6)	6.9 (5.2–8.8)
College graduate or above	788	46.0 (39.3–52.9)***	10.8 (7.6–14.6)***

Abbreviations: CI = confidence interval; FPL = federal poverty level.
 * Significantly different ($p < 0.05$) from females.
 † Estimate does not meet standards of reliability.
 § Significantly different ($p < 0.05$) from age group <2 years.
 ¶ Significantly different ($p < 0.05$) from age group 2–5 years.
 ** Significantly different ($p < 0.05$) from age group 6–11 years.
 †† Significantly different ($p < 0.05$) from non-Hispanic Black children and adolescents.
 §§ Significantly different ($p < 0.05$) from Hispanic children and adolescents.
 ¶¶ Statistically significant linear trend ($p < 0.05$) for household income.
 *** Statistically significant linear trend ($p < 0.05$) for education of household head.

FIGURE. Prevalence of use of any dietary supplement* and use of two or more dietary supplements*† in the past 30 days among children and adolescents aged ≤19 years, by age group — United States, 2009–2010 to 2017–2018



* Statistically significant linear trend ($p < 0.05$) for any dietary supplement use in age group 12–19 years and use of two or more dietary supplements in all ages and in age groups 2–5 and 12–19 years.

† Estimate does not meet standards of reliability for use of two or more supplements for age group <2 years in 2017–2018 and 2–5 years in 2011–2012.

TABLE 2. Prevalence of use of most frequently used dietary supplement product types in the past 30 days among children and adolescents (persons aged ≤19 years), by age group — United States, 2017–2018

Product type	Age group (years), % (95% CI)					P-value for difference by age*
	All (n = 3,683)	<2 (n = 591)	2–5 (n = 784)	6–11 (n = 1,115)	12–19 (n = 1,193)	
Multivitamin-mineral	23.8 (20.3–27.7)	11.0 (7.3–15.5)	34.6 (28.8–40.7)	29.5 (24.5–34.8)	17.3 (13.7–21.4)	<0.001
Single ingredient vitamin D supplement	3.6 (2.2–5.5)	5.4 (2.8–9.3)	1.7 (0.6–3.9)	1.8 (0.8–3.5)	5.4 (2.9–9.0)	<0.001
Single ingredient vitamin C supplement	3.0 (1.9–4.4)	1.1 (0.1–4.6)	2.0 (0.7–4.4)	2.4 (1.6–3.5)	4.2 (2.1–7.6)	0.083
Probiotic	1.8 (1.1–2.8)	1.9 (0.7–4.3)	3.7 (1.9–6.2)	2.0 (0.7–4.6)	0.8 (0.3–1.7)	0.020
Melatonin	1.3 (0.7–2.2)	0.0 (0.0–0.6)	1.4 (0.5–3.0)	1.3 (0.7–2.3)	1.5 (0.5–3.2)	0.435
Omega-3 fatty acid	1.3 (0.6–2.4)	0.5 (0.1–1.6)	1.4 (0.5–3.0)	1.2 (0.3–3.1)	1.4 (0.3–3.9)	0.707
Botanical	1.1 (0.6–1.9)	0.5 (0.1–1.8)	0.5 (0.1–1.3)	0.3 (0.0–0.9)	2.1 (0.8–4.6)	0.001
Multivitamin	1.0 (0.5–1.6)	1.2 (0.3–3.2)	0.8 (0.2–2.0)	0.6 (0.1–1.6)	1.3 (0.6–2.4)	0.361

Abbreviation: CI = confidence interval.

* p-values calculated using F-based second-order Rao-Scott test.

Discussion

During 2017–2018, approximately one third of children and adolescents used dietary supplements in the past 30 days. Prevalence among female children and adolescents exceeded that among males. Sex-differences in any dietary supplement use among all children and adolescents combined have not been reported previously; however, a 2013–2014 study found a large, non-significant difference in any dietary supplement use among adolescent females and males (1). As previously reported, dietary supplement use prevalence increased with income and education of household head (2). Patterns of dietary supplement use by age group and race and Hispanic origin also remained similar (2).

Use of two or more dietary supplements varied by age group, race and Hispanic origin, income, and education of household head and increased from 2009–2010 to 2017–2018. Few studies have examined use of multiple dietary supplements in children and adolescents. Dietary supplements may contain 100% or more of daily nutrient intake recommendations (7); therefore, use of two or more dietary supplements could lead to intakes above recommended upper limits if the products contain any of the same ingredients. Future studies could examine common combinations of dietary supplements used and their contribution to overall nutrient intake.

As with previous studies, multivitamin-minerals were the most frequently used dietary supplement products (1,2). Use of some product types varied by age. A recent study found that among U.S. children and adolescents who use dietary supplements, 18% took a dietary supplement under the recommendation of a health care provider (2). Few dietary supplement products are recommended for use among children and adolescents, and these are recommended only under specific circumstances. For example, the American Academy of Pediatrics (AAP) recommends that breastfeeding infants aged >4 months receive iron supplementation until introduction of iron-containing complementary foods and that all exclusively breastfed infants receive vitamin D supplementation (8,9).

Summary

What is already known about this topic?

Approximately one third of U.S. children and adolescents take dietary supplements; use varies by demographic characteristics.

What is added by this report?

The most recently released dietary supplement use estimates from the 2017–2018 National Health and Nutrition Examination Survey (NHANES) demonstrate that dietary supplement use remained stable and prevalent among U.S. children and adolescents aged ≤19 years (34.0%). Use of two or more dietary supplements differed by demographic characteristics and increased from 2009–2010 (4.3%) to 2017–2018 (7.1%).

What are the implications for public health practice?

NHANES will continue to measure dietary supplement use among children and adolescents to inform clinical practice and dietary recommendations.

Other circumstances warranting dietary supplement use in children or adolescents include restrictive diets, pregnancy, and various illnesses. The 2015–2020 Dietary Guidelines for Americans recommend that nutritional needs be met primarily through food consumption; however, it recognizes that dietary supplements might be useful in some cases to compensate for nutrients that would otherwise be underconsumed (4). Dietary supplement use might mitigate nutrient shortfalls but might also lead to intake above recommended upper limits for some nutrients (3). AAP recommends that pediatric health care providers inquire about dietary supplement use among patients (10).

The findings in this report are subject to at least two limitations. First, the low prevalence of use of two or more dietary supplements make these estimates less reliable among some subgroups. Second, the lack of universal definitions for dietary supplement product types limits comparisons across studies.

Dietary supplement use is fairly prevalent among U.S. children and adolescents and contributes to overall total nutrient intake. NHANES will continue to provide information on

dietary supplement use among children and adolescents to help inform clinical practice and policy, such as the Dietary Guidelines for Americans.

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