

Research and Professional Briefs

Vitamin, Fluoride, and Iron Use among US Children Younger than 12 Years of Age: Results from the Slone Survey 1998-2007

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ABSTRACT

Pediatric vitamin and mineral supplements are thought to be used commonly in the United States, but details of their use are lacking. Using data from the Slone Survey (a cross-sectional national random-digit-dial medication use survey), this study sought to define the prevalence and patterns of use of supplemental vitamins, fluoride, and iron among US children younger than 12 years of age. Primary statistical analyses involved descriptive statistics and calculation of weighted prevalence of use estimates with 95% confidence intervals. Between February 1998 and April 2007, there were 2,857 children 0 to 11 years of age enrolled from the 48 contiguous United States with weighted prevalence of use of vitamins, iron, and fluoride as the primary outcome. The response rate to the survey was 61%. Overall, 23.1% of children had used a vitamin, fluoride, or iron supplement in the 7 days before the interview, with use being highest among 2- to 5-year-olds. Almost all vitamins and most fluoride and iron were taken in the form of multicomponent products. The most commonly taken specific vitamins were C, D, B-12, B-6, and B-2, each by >20% of children. Overall, 3.3% of study participants took supplemental fluoride and 9.7% took supplemental iron. In conclusion, this study found that almost one-quarter of US children younger than 12 years of age, and 30% of 2-year-olds, use supplemental vitamins, fluoride, and iron in a given week. These data should be combined with what is known

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about the need for pediatric supplementation with vitamins, fluoride, and iron to help clinicians and policy makers counsel parents about the optimal use of these products.

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With the exceptions of vitamin D supplementation for children with inadequate dietary vitamin D intake (1), and fluoride for children living in communities without fluoridated water (2), the American Academy of Pediatrics (AAP) does not recommend routine vitamin/mineral supplementation for healthy children (3). Yet, vitamin/mineral supplements are a multibillion dollar industry in the United States and such supplements are widely marketed to parents (4). Several recent studies have shown that approximately one-third to one-half of US children take vitamin/mineral supplements, but these studies often considered only a limited age range (5,6), generally lacked specificity as to which supplements were taken (5,7-9), and lacked information on adherence.

In order to better describe the precise patterns of vitamin, fluoride, and iron supplementation among US children, this study reports on data from the Slone Survey, a nationally representative survey of medication use among the US population. The study considers use of supplemental fluoride, iron, and the commonly accepted essential human vitamins (ie, A [retinol], B-1 [thiamine], B-2 [riboflavin], B-3 [niacin], B-5 [pantothenic acid], B-6 [pyridoxine], B-7 [biotin], B-9 [folic acid], B-12 [cobalamin], C [ascorbic acid], D [calciferol], E [tocopherol], and K [naphthoquinones]) by participants younger than 12 years of age, taken in the form of prescription and over-the-counter medications; it does not include vitamins, fluoride, or iron contained in foods or dental products (eg, vitamins or iron in cereals; fluoride in water, toothpaste, or dental rinses).

METHODS

The Slone Survey was a medication use telephone survey fielded continuously between February 1998 and April 2007 (10). The study was approved by the Boston University Medical Center Institutional Review Board. Residents of households in the 48 contiguous states and District of Columbia were eligible; not eligible were those without telephones; individuals residing in vacation homes, nursing homes, rehabilitation hospitals, or group homes; and individuals in prisons, military barracks, or dormitories. Households were identified by random-digit

dialing. At least 20 attempts were made to contact targeted numbers during a 1- to 2-month period. At each contacted household, one resident was randomly selected for interview. For children younger than 14 years (ie, all participants in the current study), a parent/guardian was interviewed. Interviews were conducted in English or Spanish. Information was recorded on prescription and nonprescription drugs, vitamins/minerals, and herbals/supplements.

The interviewer explained that information was being sought on all medications taken during the preceding 7 days and asked the interviewee to gather the relevant bottles or packages. A list of reasons for use (eg, pain, headache, depression) was then read to elicit recall of medications not covered by the bottles. In addition, a short list of trade names of selected drugs was read. The following information was obtained for each drug: reason for use, route of administration, number of days taken in the week before the interview, and total duration of use. All study interviewers received rigorous and standardized training in the survey methodology, with ongoing monitoring of random interviews by supervisors and retraining as necessary. All completed interviews were reviewed by study supervisors for quality control purposes before being released for analysis. Any errors or inconsistencies were resolved with individual interviewers. The survey could not be formally validated because of a lack of gold standard data on ambulatory medication use, but results were compared with publicly available pharmaceutical sales data to confirm face validity.

Medication names were coded for analysis using the Slone Epidemiology Center Drug Dictionary (11), a computerized system linking individual drugs and multicomponent products to their individual components. Up-to-date information for the dictionary is obtained from a variety of drug information sources and the dictionary is updated on an ongoing basis by the Center's professional pharmacy staff.

To estimate exposure to specific components from multivitamins of unknown composition (ie, multivitamins not otherwise specified), the constituent makeup of all multivitamins of known composition taken by participants was analyzed and these distributions were extrapolated to multivitamins of unknown composition. For example, vitamin A was present in 91.1% of multivitamins of known composition taken by study participants; therefore it was estimated that 91.1% of multivitamins of unknown composition contained vitamin A. An analogous process was repeated for each of the vitamins, as well as for fluoride and iron.

Statistical Analyses

The current analysis included data from all enrolled participants younger than 12 years of age. Prevalence estimates were weighted by household size to adjust for the probability of selection. Comparisons of prevalence over time were performed by Mantel-Haenszel χ^2 analysis. Statistical analyses were performed with SAS (version 9.1, 2002, SAS Institute Inc, Cary, NC). Examples of the precision of prevalence estimates are as follows: for a sample size of 500: 20% \pm 3.5%, 5% \pm 1.9%, 1% \pm 0.9%; for a sample size of 1,000: 20% \pm 2.5%, 5% \pm 1.4%, 1% \pm 0.6%; for a sample size of 1,500: 20% \pm 2.0%, 5% \pm 1.1%, 1% \pm 0.5%.

RESULTS AND DISCUSSION

Overall response rate was 61%; 2,857 participants 0 to 11 years of age were enrolled. Participant characteristics are shown in the Table; all are comparable with 2000 US Census data (12), except that the study population was more highly educated than the US population, and the West was somewhat over-represented in the survey and the South was somewhat under-represented. Enrollment did not vary appreciably by season (data not shown).

Overall, 23.1% of children (95% confidence interval [CI]: 21.5 to 24.7) had used any supplemental vitamin, fluoride, or iron in the week before the interview. Use did not differ appreciably by sex: 22.6% among boys (95% CI: 20.4 to 24.8), 23.5% among girls (95% CI: 21.2 to 25.8). Children younger than 1 year had the lowest use (8.8%), which increased to 15.8% among 1-year-olds and 30.4% among 2-year-olds. For children older than 2 years, use ranged between 25% and 30%, although somewhat lower rates were observed for children ages 8 (20.0%), 9 (17.9%), and 11 (20.7%) years.

A multivitamin (defined as a product containing two or more vitamins, with or without fluoride or iron) was taken by 21.4% of participants (95% CI: 19.8 to 22.9); 7.9% used a multivitamin that did not contain fluoride or iron, 5.5% used a multivitamin with iron, 2.1% used a multivitamin with fluoride, 0.1% used a multivitamin with fluoride and iron, and 5.8% used an unknown type of multivitamin.

Just over 50% of participants using a multivitamin took it daily, while 30% took it for fewer than 4 days per week. Sixty-one percent of multivitamin users had been taking the medication continuously for >4 weeks, 10.9% had used it for 1 to 4 weeks, and 24.5% had used it for \leq 1 week (3.7% did not know the duration of use).

These results corroborate those from other sources that a substantial minority of American children take vitamin/mineral supplements. Picciano and colleagues reported a monthly prevalence of 31.8% for the use of any dietary supplement among US children up to 18 years of age from the National Health and Nutrition Examination Survey 1999-2002 (8) and Shaikh and colleagues reported a monthly prevalence of any vitamin/mineral supplement of 34% for children 2 to 17 years of age from the National Health and Nutrition Examination Survey 1999-2004 (7). The current study's somewhat lower estimate is likely a result of the fact that it measured the weekly prevalence of use (compared with monthly prevalence in other studies) and because it only considered vitamins, fluoride, and iron, while the others included additional minerals and supplements, such as calcium, botanicals, and various mineral supplements. The finding that use is particularly high in the 2- to 5-year-old age range is also similar to that reported from the National Health and Nutrition Examination Survey (7-9) and the Longitudinal Follow-Up to the 1988 National Maternal and Infant Health Survey (5). The current study also demonstrates that nearly half of participants using a supplement took it less frequently than daily, and about one-third had been using a given supplement for <4 weeks. These results suggest that children stop and start supplements frequently and take them somewhat irregularly, which may have important implications when recommendations are made for supplement intake.

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