Multivitamin-mineral Intakes in the United States, 2007-2010

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Abstract

Multivitamin/mineral supplements are the most common dietary supplements consumed in the United States; however, intake data specific to how multivitamin/mineral supplement use contributes to micronutrient intakes among Americans are absent from the current scientific literature. This analysis aimed to assess contributions of micronutrients to usual intakes derived from multivitamin/mineral supplements and to compare those intakes to the Dietary Reference Intakes for U.S. residents aged ≥4 y according to NHANES 2007–2010 (*n* = 16,444). We used the National Cancer Institute method to assess usual intakes of 21 micronutrients. Our results showed that 51% of Americans consumed multivitamin/mineral supplements containing ≥9 micronutrients. Large portions of the population had total usual intakes (food and multivitamin/mineral supplement use) below the estimated average requirement for vitamins A (35%), C (31%), D (74%), E (67%), calcium (39%), and magnesium (46%). Only 0, 8%, and 33% of the population had total usual intakes of potassium, choline, and vitamin K above the adequate intake when food and multivitamin/mineral supplement use was considered. The percentage of the population with total intakes greater than the tolerable upper intake level (UL) was very low for all nutrients; excess intakes of zinc were the highest (3.5%) across the population of all the nutrients assessed in NHANES. In large proportions of the population, micronutrient sufficiency is currently not being achieved through food solutions for several essential vitamins and minerals. Use of age- and gender-specific MVMM supplements may serve as a practical means to increase the micronutrient status in subpopulations of Americans while not increasing intakes above the UL.

Background

Multivitamin/mineral (MVMM) supplements have been previously reported to be the most common dietary supplement, regularly taken by roughly 40% of adults in the National Health and Nutrition Examination Survey (NHANES) and 31% of children in the National Health Interview Survey [1–3]. Approximately 71% of dietary supplement users reported taking a MVMM supplement in a recent series of nationally representative surveys of adults from 2007–2011 [4]. The definition of a MVMM supplement is fluid and no standard of identity currently exists as many specialized, innovative, and unique formulations are present on the market for subpopulations including but not limited to children, older men, pregnant women, and those with a family history of age-related eye disease. The lack of standard terminology and composition among products makes it difficult to study the effects of MVMM supplements in a non-clinical setting (e.g., inferences from epidemiological studies). Dietary supplements have been shown to decrease the percentage of the U.S. population consuming less than the estimated average requirement (EAR) for all nutrients. However, intake data specific to mainstream MVMM use are absent from the current scientific literature. Since a large portion of American's report use of MVMM supplements for various reasons, and since dietary supplements in general are associated with higher nutrient intakes among Americans, our study sought to determine the contribution of these popular dietary supplement products to micronutrient intakes of Americans.

Methods

Study Population
The National Center for Health Statistics (NCHS) of the U.S. Centers for Disease Control and Prevention administers and collects the NHANES, a nationally representative, cross-sectional survey of non-institutionalized, civilian U.S. residents [5]. Data from NHANES 2007–2008 and 2009–2010 were combined for these analyses. The combined sample included 16,444 participants who had completed and provided 24-h dietary intake data.

Micronutrient Intake from Food
Subjects aged <4 y and pregnant and/or lactating women were excluded from these analyses. Questionnaires, datasets, and related documentation from each NHANES analysis can be found on the NCHS NHANES website [6]. Various USDA food composition databases were utilized to determine the micronutrient contribution of specific foods consumed by NHANES participants.

Micronutrient Intakes from MVMM Supplements
Information on the use of MVMM supplements over the previous 30 d prior to the dietary recall interview was collected as part of the dietary supplement questionnaire [4]. Detailed information was obtained for each reported MVMM supplement, including frequency of consumption (i.e., number of days the product was taken in the past 30 d), duration of use (i.e., how many days, weeks, months, or years the product was taken), and amount normally taken per day on days it was taken over the 30-d period.

Definitions
To be included in the study, any given dietary supplement had to include at least 100% of the recommended dietary allowance (RDA) or adequate intake (AI) for nine vitamins and minerals with defined dietary reference intake (DRI) values for which NHANES 2007–2008 and 2009–2010 collected intake data. The prevalence of inadequate dietary intakes was determined using the EAR cut-point method (except for iron, which was assessed using the probability method) as described previously [7] for micronutrients and was reported as the percentage of the population with usual intakes below the EAR. The prevalence (reported as a percentage of the population) of dietary intakes above the UL was also determined.

Statistical Analysis
The National Cancer Institute (NCI) method as previously described [8] was used to determine estimates of usual intakes from the diet for non-users and users of MVMM supplements. Mean dietary intakes between users and non-users of MVMM supplements, as well as the portion of the population that failed to meet the EAR and exceeded the UL, were compared by computing a *z*-statistic. Significance was set at <0.01.

Results

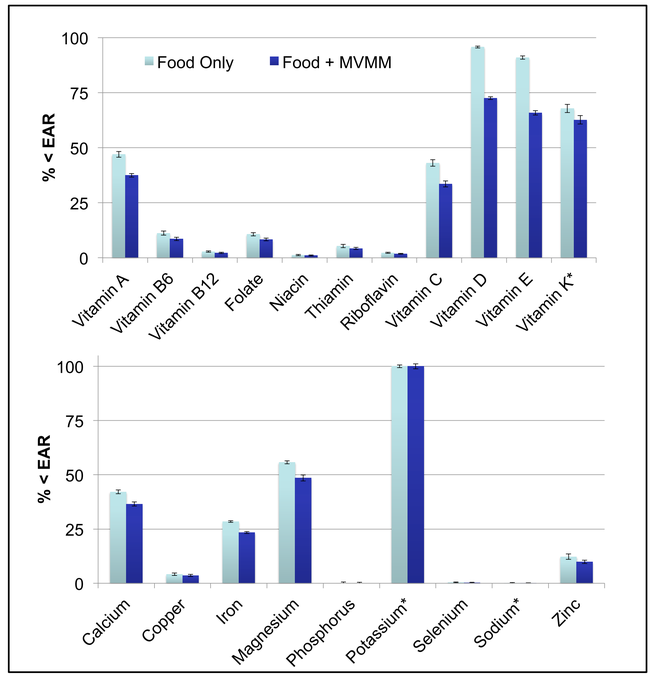

Fig. 1 Percentage of U.S. adults aged ≥ 19 years with vitamin (top) and mineral (bottom) intakes below the EAR. The asterisk represents nutrients with an Adequate Intake (AI) (n = 11,227).

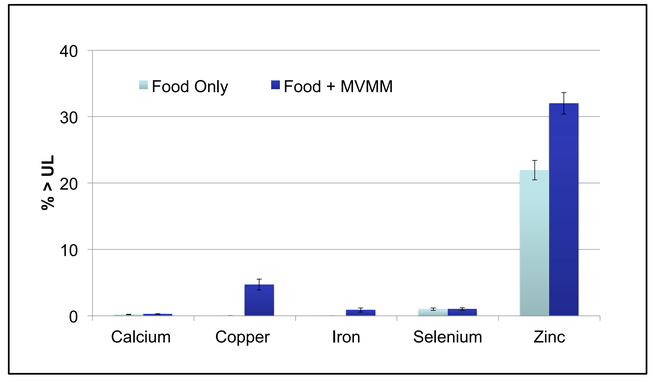

Fig. 3 Prevalence of children aged 4-8 years with micronutrient intakes exceeding the UL from food only and MVMM use (n = 1,895).

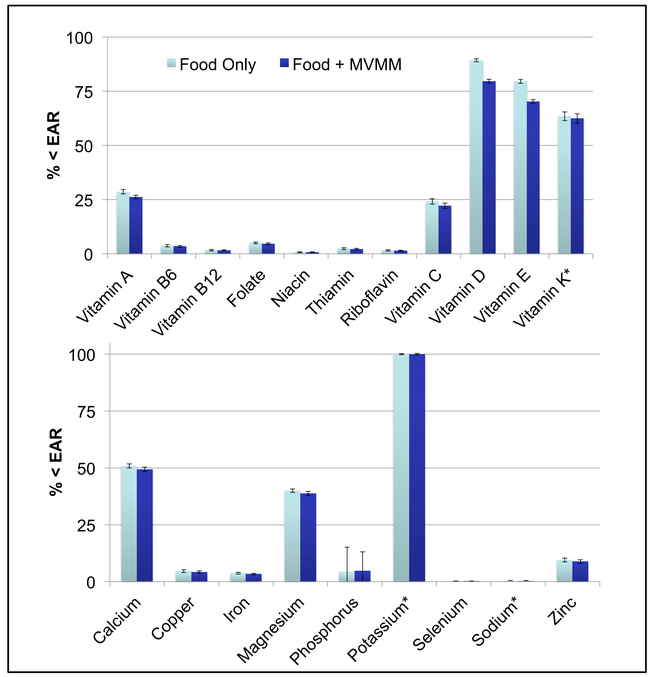

Fig. 2 Percentage of U.S. children aged 4-18 years with vitamin (top) and mineral (bottom) intakes below the EAR. The asterisk represents nutrients with an Adequate Intake (AI) (n = 2,659).

Conclusions

- **51%** of Americans use multivitamin/mineral supplements containing 100% of the RDA (or AI) of at least 9 vitamins and/or minerals with a defined dietary reference intake.
- In large proportions of the U.S. population, micronutrient sufficiency is currently not being achieved through food solutions for several essential vitamins and minerals.
- Use of age- and gender-specific multivitamin/mineral supplements may serve as a practical means to increase the micronutrient status in subpopulations of American's, while not increasing intakes above the UL.

References

1. J Nutr. 2011; 141:261-266.
2. NCHS Data Brief 2011; 61:1-8.
3. Am J Clin Nutr. 2013; 97:1331-1337.
4. J Am Coll Nutr. 2013; 33:178-184.
5. NCHS. About the NHANES. Accessed at: http://wwwcdc.gov/nchs/nhanes/about_nhanes.htm.
6. NHANES Dietary Supplement Questionnaire Data. Accessed at: http://www.cdc.gov/nchs/nhanes/nhanes_questionnaires.htm
7. J Nutr. 2010; 140:817-822.
8. J Acad Nutr Diet. 2006; 106:1575-87.

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