Total Usual Intake of Shortfall Nutrients Varies With Poverty Among US Adults

Regan L. Bailey, PhD, MPH, RD¹; Sharon R. Akabas, PhD²; Erin E. Paxson, MS²; Sowmyanarayanan V. Thuppal, MD, PhD¹; Shilpa Saklani, MS³; Katherine L. Tucker, PhD³

ABSTRACT

Objective: To examine shortfall nutrient intakes (ie, calcium, folate, potassium, magnesium, and vitamins A, C, D, and E) by poverty-to-income ratio (PIR).

Design: National Health and Nutrition Examination Survey 2011–2012, a nationally representative, cross-sectional survey.

Participants: US adults with complete data on poverty status and diet were included (n = 4,524).

Analysis: The National Cancer Institute method was used to estimate total usual micronutrient intakes from foods, beverages, medications, and dietary supplements reported on 2 24-hour dietary recalls using measurement error correction.

Main Outcome Measures: Calcium, folate, potassium, magnesium, and vitamins A, C, D, and E across 3 PIR categories: <130%, 130% to 350%, and ≥350%.

Results: Mean intakes of folate, vitamin C, and vitamin D were significantly greater in men, and magnesium in women, across all PIR categories. Except for calcium in men and vitamin C in women, the highest PIR category had significantly higher mean total usual intakes of all remaining shortfall micronutrients. Importantly, men and women in the highest PIR category (≥350%) were significantly less likely to have intakes below the Estimated Average Requirement across all micronutrients compared with those in the lower PIR categories.

Conclusions and Implications: Even with dietary supplements, large proportions of US adults have micronutrient intakes below the Estimated Average Requirement. Adults at the highest adjusted income have higher micronutrient intakes and lower risk of inadequacy than those with lower incomes.

Key Words: micronutrients, vitamins, minerals, diet quality, NHANES, dietary supplements, poverty, shortfall nutrients (*J Nutr Educ Behav.* 2017;49:639–646.)

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INTRODUCTION

The National Health and Nutrition Examination Survey (NHANES) monitored indicators of nutrition and health for the past 50 years, and trends have been identified using the multitude of sequential, cross-sectional reports. First, the quantity and variety of food available to Americans has

increased over time, leading to considerable changes in dietary intakes.¹ Second, total energy consumption, portion size, and foods consumed away from the home have increased over time.^{2–4} Third, a substantial proportion of the US population does not meet federal nutrition standards for most nutrient-dense food groups although it overconsumes energy-dense and empty

calories.^{5,6} Fourth, dietary supplement use has increased over time.⁷ Finally, prevalence of food-related poverty and food insecurity has increased.⁸ Although no causal inferences can be drawn from cross-sectional monitoring data, these food and economic trends have occurred concurrently with higher rates of obesity and deserve careful evaluation.^{9–12}

It is well established that nutrient-rich foods tend to be more expensive than lower-quality foods.^{13–15} Although the cost of food in the US is less than that in other similarly developed countries,¹⁶ people with lower incomes are more likely to have lower nutrient-dense diets¹⁷ and to devote a larger proportion of the family income toward food purchases than are individuals with higher incomes.¹⁸ The proportion of Americans living in poverty in the US increased from 12.2% in 2000 to 14.8% in 2014.^{19,20} Dietary supplement use has been shown to be highest among the most affluent population^{21,22};

¹Department of Nutrition Science, Purdue University, West Lafayette, IN

²Institute of Human Nutrition, Columbia University, New York, NY

³Department of Clinical Laboratory and Nutritional Sciences, University of Massachusetts–Lowell, Lowell, MA

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Address for correspondence: Regan L. Bailey, PhD, MPH, RD, Department of Nutrition Science, Purdue University, 700 West State St, West Lafayette, IN 47906; Phone: (765) 494-2829; E-mail: regan.bailey@gmail.com

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paradoxically, adult supplement users have better micronutrient intakes from the diet.^{23,24} However, little is known about how poverty affects diet quality in terms of micronutrient intakes with the inclusion of dietary supplements at the national level. Therefore, the purpose of this study was to examine micronutrient intakes by poverty-to-income ratio (PIR) among US adults, using data from the most recent 2011–2012 NHANES.

METHODS

Study Design, Participants, and Setting

Collected by the Centers for Disease Control and Prevention, National Center for Health Statistics, NHANES is a cross-sectional survey using a stratified, multistage probability design to obtain a nationally representative sample of the civilian, noninstitutionalized US population.²⁵ Data from the 2011–2012 NHANES were used for these analyses. The analytic sample included nonpregnant, adult participants (aged ≥ 19 years) who had complete PIR ($n = 4,524$) and 24-hour dietary intake data. Written, informed consent was obtained for all participants or proxies. Review by the institutional review board was not required for this study because the survey protocol was approved by the Research Ethics Review Board at the National Center for Health Statistics and the data are public access.

The NHANES protocol includes an in-home interview, a health examination in a mobile examination center, and a follow-up telephone call about 3–10 days after the examination. Demographic data, including age, gender, education, and race/ethnicity, were collected via computer-assisted software in the home interview. The PIR is a measure that represents the ratio of household income to the poverty threshold after adjusting for geographic location and family size, developed by the Department of Health and Human Services. Three PIR categories were constructed: $<130\%$, 130% to 350% , and $\geq 350\%$. A PIR $<130\%$ is the income eligibility criterion for participation in the *Supplemental Nutrition Assistance Program* (SNAP) (the former *Food Stamps Program*), and these cutoff points

were previously used in NHANES analyses because they were shown to differentiate among health, dietary supplement use, and nutrition indicators.^{10,21,26,27}

Dietary data in NHANES came from the US Department of Agriculture,²⁸ Agricultural Research Service, What We Eat in America survey and were collected using the automated multiple-pass method.^{29,30} Two 24-hour dietary recalls were collected, including the use of dietary supplements. The first recall was collected in person at the household interview; the second recall was collected via telephone. Both week and weekend days were obtained to ensure representativeness. The US Department of Agriculture, Food and Nutrient Database for Dietary Studies was used to convert foods and beverages, as reported, to their respective nutrient values.³¹ The researchers examined selected shortfall micronutrients for adults identified by the Dietary Guidelines for Americans: calcium (milligrams), folate (dietary folate equivalents), magnesium (milligrams), potassium (milligrams), vitamin A (retinol activity equivalents), vitamin C (milligrams), vitamin D (micrograms), and vitamin E (α -tocopherol equivalents).

A dietary supplement questionnaire was administered during the household interview, including showing containers to the trained interviewers to enhance accuracy.²⁵ The time frame for the questionnaire was over the previous 30 days. For each dietary supplement the respondent reported, she or he was asked to report the consumption frequency, the dose, and the duration of use. The National Center for Health Statistics provided the average daily intake of nutrients from all dietary supplements and medications that may contain nutrients (eg, antacids) as calculated for individuals using the number of days supplement use was reported, the reported amount taken per day, and the serving size unit from the product label. Vitamins A and E from dietary supplements were not available in this survey cycle. Potassium is rarely an ingredient in dietary supplements; if it present, it is found only in very small amounts (<15 mg).^{32,33}

Data Analysis

All data analyses were performed using SAS software (version 9.4; SAS Institute,

Inc, Cary, NC, 2016). Sample weights were used to account for differential nonresponse and/or no coverage and to adjust for planned oversampling of some groups. Prevalence of dietary supplement use was estimated overall and by sex using *proc surveymeans*. Estimates of usual intake for each micronutrient were determined using the National Cancer Institute (NCI) method^{34,35} macros that produce means and percentiles of intake and probabilities of meeting the Estimated Average Requirement (EAR) for all adults with data from the 24-hour recalls ($n = 4,524$). The macros used in this analysis were specifically developed to address how dietary supplement use affects usual intake estimates incorporating information about dietary supplements from both the 24-hour and 30-day frequency questionnaires; these macros were previously used to estimate total nutrient intakes.^{36,37} The probability approach was used to estimate compliance with the EAR for all nutrients with an established value (ie, all shortfall nutrients except potassium). Covariates in the usual intake models included PIR (dummy coded), day of the week of dietary recall (weekend/weekday), interview sequence of the dietary recall, and dietary supplement use. To estimate total usual nutrient intake, nutrient intakes from dietary supplements were added to the adjusted usual nutrient intake from foods, as recommended.³⁸ Percent contributions of dietary supplements to total intakes were calculated by sex and PIR. Users and nonusers of dietary supplements were also examined independently. The researchers used multiple *t* tests to compare mean intakes and EAR compliance within sex by PIR group, with a Bonferroni-corrected significant *P* set at $\leq .005$.

RESULTS

The PIR category was classified as $<130\%$ (A = lowest), 130% to 350% (B = middle), and $\geq 350\%$ (C = highest). The prevalence of dietary supplement use increased significantly in a stepwise fashion with PIR category for all adults and for both men and women (Table 1). Women had higher reported use of a dietary supplement than did men across all PIR categories.

Total usual mean intakes of several micronutrients varied by PIR category

Table 1. Sample Size and Prevalence (% [SE]) of Dietary Supplement Use^a by Poverty Income Ratio (PIR) Group of Adults (Aged ≥19 Y), by Sex, in US, 2011–2012

					<i>P</i> PIR ^b		
PIR Group (% [SE])		A (<130%)	B (130% to 350%)	C (≥350%)	A Vs B	A Vs C	B Vs C
All adults, N	52 (1) 4,524	38 (2) 1,635	49 (1) 1,545	63 (2) 1,344	<.001	<.001	<.001
Men, n	46 (2) 2,273	31 (2) 781	41 (2) 788	57 (3) 704	<.001	<.001	<.001
Women, n	58 (2) 2,251	38 (1.9) 854	49 (1.1) 757	63 (1.9) 640	<.001	<.001	<.001
<i>P</i>	<.001	<.001	<.001	<.001			

^aDietary supplement use is presented based on the Dietary Supplement Questionnaire assessing overall supplement use. For micronutrient intake estimates a user is considered if the specific micronutrient is consumed in dietary supplements; ^bStatistical significance between PIR categories was assessed with multiple *t* tests with Bonferroni-corrected significant *P* set at ≤.005. Notes: The analytic sample includes all individuals aged ≥19 years who were not pregnant, and who had complete information for PIR and 24-hour dietary recall data.

between men and women (Table 2). Among men, total usual mean intakes of folate, vitamin C, and vitamin D differed across all 3 PIR groups; calcium intake was lower in the middle than either the highest or the lowest PIR groups. For all other shortfall micronutrients (ie, magnesium, potassium, vitamin A, and vitamin E), among men, those in the highest PIR group had signifi-

cantly higher intakes than either the middle or the lowest categories, which did not differ. With the exception of calcium and vitamin D, the same trend was observed in the prevalence of risk of dietary inadequacy for all micronutrients, with significantly lower proportions with inadequate intakes among those in the highest PIR group vs the lower 2 (Table 3). Among women, total

mean usual intake of magnesium differed significantly across PIR categories in the expected direction (Table 2). Mean intakes of most micronutrients (ie, calcium, folate, potassium, vitamin A, vitamin D, vitamin E) were significantly higher in the highest PIR compared with either the lowest or middle PIR groups. Risk of inadequate intake of folate and vitamin D differed significantly

Table 2. Mean (SE) Total Usual Micronutrient Intakes, by Poverty Income Ratio (PIR) Category Among Adults (≥19 y) in US, 2011–2012

		PIR Group, Mean (SE)			<i>P</i>		
Micronutrient Intake by Sex		A (<130%)	B (130% to 350%)	C (≥350%)	A Vs B	A Vs C	B Vs C
Men, n		781	788	704			
Calcium, mg		1,246 (70)	1,153 (45)	1,298 (34)	.08	.39	<.001
Folate, DFE		705 (30)	800 (31)	931 (29)	<.001	<.001	<.001
Magnesium, mg		355 (10)	354 (11)	432 (14)	.82	<.001	<.001
Potassium, mg		3,136 (107)	3,006 (85)	3,537 (85)	.06	<.001	<.001
Vitamin A, μg, RAE ^a		621 (41)	638 (35)	883 (70)	.42	<.001	<.001
Vitamin C, mg		126 (6)	147 (15)	227 (19)	<.001	<.001	<.001
Vitamin D, μg		8.3 (0.7)	11.5 (0.8)	17.1 (2)	<.001	<.001	.003
Vitamin E, mg, ATE ^a		10.1 (0.5)	9.5 (0.5)	11.5 (0.4)	.02	<.001	<.001
Women, n		854	757	640			
Calcium, mg		997 (36)	1,011 (35)	1,203 (51)	.09	<.001	<.001
Folate, DFE		650 (21)	651 (17)	843 (20)	.93	<.001	<.001
Magnesium, mg		271 (7)	286 (8)	347 (12)	.001	<.001	<.001
Potassium, mg		2,301 (56)	2,247 (52)	2,640 (75)	.02	<.001	<.001
Vitamin A, μg, RAE ^a		537 (25)	553 (29)	706 (32)	.27	<.001	<.001
Vitamin C, mg		115 (8)	176 (17)	186 (23)	<.001	.005	.51
Vitamin D, μg		11.7 (1.8)	15.2 (1.2)	22.9 (3)	.009	<.001	.001
Vitamin E, mg, ATE ^a		7.2 (0.2)	6.8 (.02)	9.3 (0.3)	.06	<.001	<.001

DFE indicates dietary folate equivalents; RAE, retinol activity equivalents; ATE, α-tocopherol equivalents.

^aStatistical significance between PIR categories was assessed with multiple *t* tests with Bonferroni-corrected significant *P* set at ≤.005.

Notes: The analytic sample includes all individuals aged ≥19 years who were not pregnant, and who had with complete information for PIR and 24-hour dietary recall data. Estimates for vitamins A and E and potassium are based on food sources alone.

Table 3. Prevalence (% [SE]) of Total Usual Micronutrient Intakes Less Than Estimated Average Requirement (EAR), by Poverty Income Ratio (PIR) Groups, Among Adults in US, 2011–2012

Micronutrient Intake by Sex	PIR Group, % (SE) < EAR			P		
	A (<130%)	B (130% to 350%)	C (≥350%)	A Vs B	A Vs C	B Vs C
Men, n	781	788	704			
Calcium, mg	17 (3)	27 (4)	13 (2)	<.001	.03	<.001
Folate, DFE	5 (1)	6 (2)	1 (0.6)	.38	<.001	<.001
Magnesium, mg	50 (4)	53 (4)	30 (3)	.23	<.001	<.001
Vitamin A, mg, RAE ^a	58 (6)	55 (6)	35 (4)	.23	<.001	<.001
Vitamin C, mg	43 (5)	44 (2)	30 (3)	.68	<.001	<.001
Vitamin D, μg	79 (3)	69 (2)	57 (2)	<.001	<.001	<.001
Vitamin E, mg, ATE ^a	75 (5)	78 (4)	60 (4)	.33	<.001	<.001
Women, n	854	757	640			
Calcium, mg	44 (3)	48 (4)	29 (3)	.11	<.001	<.001
Folate, DFE	12 (5)	21 (2)	3 (1)	<.001	<.001	<.001
Magnesium, mg	51 (4)	49 (3)	26 (3)	.42	<.001	<.001
Vitamin A, mg, RAE ^a	49 (4)	48 (4)	20 (6)	.68	<.001	<.001
Vitamin C, mg	41 (5)	37 (3)	18 (3)	.10	<.001	<.001
Vitamin D, μg	75 (2)	62 (2)	48 (3)	<.001	<.001	<.001
Vitamin E, mg, ATE ^a	94 (2)	97 (1)	84 (4)	.10	0.01	0.004

DFE indicates dietary folate equivalents; RAE, retinol activity equivalents; ATE, α-tocopherol equivalents.

^aEstimates for vitamins A and E are based on food sources alone. Potassium does not have an EAR.

Notes: Statistical significance between the PIR categories was assessed with multiple *t* tests with Bonferroni-corrected significant *P* set at ≤.005. The analytic sample includes all individuals aged ≥19 years and who were not pregnant, with complete information for PIR, and who had 24-hour dietary recall data.

across PIR groups for women (Table 3). For most micronutrients (ie, calcium, magnesium, vitamin A, vitamin C, vitamin D) the highest PIR category of women had a lower prevalence of inadequate intake compared with the middle or lowest group.

Women had higher percentages of intake from supplements compared with men for all micronutrients at all PIR levels (Figure). Across all adults, <25% of calcium or magnesium intake came from supplements regardless of sex or PIR. In contrast, large proportions of total intake of vitamins C and D came from supplements relative to diet. Given that prevalence of use of supplements differed by each PIR category, it is not surprising that the percentage of nutrients contributed by supplements was greater across PIR categories. More than half of the vitamin D intake in US adults was from dietary supplements across all sex-PIR groups, except men, <130%.

Compared with supplement users, the prevalence of total intakes less than the EAR was substantially higher among adults not using dietary supplements, particularly for women (Supplemental Materials 1 and 2). Among both supplement users and non-supplement

users (dietary intake only), total intakes for most nutrients tended to be highest among those in the highest PIR category relative to the 2 lower categories. Among non-supplement users, the proportions of men with intakes of calcium or magnesium below the EAR were lowest in the middle PIR category relative to the lowest or highest income groups.

Although the proportions with low intake were substantially lower among supplement users than the total sample, the patterns of relative intakes across PIR categories remained, with those in the highest PIR group showing higher total mean intakes and lower proportions with inadequate intakes than those in lower income groups. Exceptions, for women only, included folate, with highest mean intake in the lowest income group; vitamin D, which did not differ across PIR groups; and magnesium, in which the middle income group was most likely to have intake less than the EAR.

Importantly, the prevalence of intakes below the EAR for these shortfall nutrients was high among non-supplement users, ranging from 91% to 99% for vitamin D, 40% to 61% for magnesium, 32% to 57% for vitamin

C, 18% to 68% for calcium, and to 2% to 31% for folate, across sex and PIR groups. Even among supplement users, shortfalls persisted. Proportions not meeting the EAR among those using supplements ranged from 9% to 33% for magnesium, 13% to 24% for vitamin D, 5% to 23% for calcium, 3% to 10% for vitamin C, and to 0% to 8% for folate (Supplemental Materials 1 and 2).

DISCUSSION

This study adds key information about how the use of dietary supplements contributes substantially to the diets of adults who use these products, and suggests that micronutrient intakes vary considerably by poverty status among US adults. A major finding of this work was that those at the highest PIR category had nutrient intakes that were higher than those in the lowest PIR category but were also higher than those in the middle PIR category. These findings point to major limitations in dietary quality among large proportions of the US adults, which suggest that food choices contribute to nutrient inadequacy in the population beyond

Figure. Relative contribution of foods/beverages and dietary supplements toward total usual mean intake for selected shortfall nutrients by sex and poverty income ratio group among US adults, 2011–2012. Note: The analytic sample includes all individuals aged ≥ 19 years who were not pregnant, with complete information for poverty-to-income ratio and 24-hour dietary recall data. Percentages above each bar represent the relative contribution from dietary supplements.

those who are considered food insecure.

The cost of food is clearly a driver for consumption patterns and diet quality.³⁹ In the US there has been an overall decline in the cost of foods, but the cost of unhealthy foods has dropped more considerably than that for fresh produce and sources of animal protein (ie, dairy and meat).⁴⁰ As described by Darmon and Drewnowski,¹⁵ the cost of foods has more of an impact on those at the lowest economic position. Engel's law shows that when income increases, the proportion of income spent on food declines.⁴¹ In the US, approximately 11% of total income is devoted to food purchases¹⁸; however, how the cost of food translates to micronutrient intakes is less well understood. In the US context, many foods

that are intrinsically low in nutrient density (eg, energy drinks) are voluntarily fortified with micronutrients at the discretion of the manufacturer, which adds substantially to overall micronutrient intakes.^{42,43} Voluntary fortification adds a wrinkle to a traditional nutritionist's dogma because key nutrients are being added to the diet, but the vehicle is often seen as a less nutritionally desirable food choice; this phenomenon may benefit micronutrient intakes of those at the lowest incomes more so than those at higher incomes.

A significant linear trend in the prevalence of US adults who understand federal dietary guidance was documented using the same PIR categories in the current analysis.⁴⁴ The current analysis serves to highlight the impact on micronutrient intakes that may

result from the lack of understanding of nutritional guidance and educational efforts geared toward healthy eating. Previous research indicated that compliance with federal nutrition recommendations is especially problematic for those at lower incomes.⁴⁵ The current findings were largely consistent with the Seattle Obesity Study, which suggested that optimal intakes of micronutrients are directly tied to higher-cost foods.⁴⁶ However, because those authors measured diet using a food-frequency questionnaire and did not include dietary supplements, the current researchers cannot extrapolate the findings directly with those in the NHANES.⁴⁶

As with any scientific analysis, one should consider the strengths and limitations of the work in interpreting

the study findings. First, the researchers use large, nationally representative survey data to illustrate the impact of poverty on nutrition at the national level. Although this contributes to a broad understanding of the issues and interactions, it is likely not descriptive of those at the extremes of the income distribution who may have been unwilling or unable to participate in research studies. Furthermore, PIR may not be the most sensitive indicator of socioeconomic status, which is notoriously difficult to classify.⁴⁷ For this analysis the authors purport that PIR measures how a person's disposable income can be used to access food and dietary supplements. Indeed the authors saw that micronutrient intakes are the best in those with the highest income adjusted for family size and geography. Recent reports used geographic location, property values, and access to retail food shopping stores to estimate this construct.^{48,49}

Food insecurity is an evolving area of research and is an important consideration. Studies showed that food insecurity is related to poorer micronutrient intakes from foods alone, with stronger associations seen in Canada than in the US.⁵⁰ Participation in SNAP was associated with lower diet quality and lower intakes of fruit and vegetables, but the micronutrient quality of diets of SNAP participants relative to nonparticipants was not been fully studied. The fact that the current researchers found low intakes among those up to 350% of PIR (representing more than two third of the sample) suggests that although income is important, there is a group between food-insecure people and those with a relatively high income who continue to have inadequate micronutrient intakes despite the ability to afford better-quality foods. It is possible that those in the higher income group not have only the funds but also have greater education, nutrition knowledge, and health-based motivation to consume foods with higher nutrient density and use nutrient supplements to improve the likelihood of adequacy.

The use of the NCI method to correct for measurement error permitted the researchers to compare population subgroup intakes relative to the Dietary Reference Intake, EAR. Thus, this work extends the data tables of

mean micronutrient intakes produced by the US Department of Agriculture, which also documented, with sex combined, an association with PIR.³³ Despite correction for measurement error, a known limitation of self-reported diet is energy underreporting.⁵¹ It is less well known how selective energy underreporting influences estimates of micronutrients.⁵² In this analysis, the authors combined 2 methods to measure dietary supplements, leveraging the different measurement error structures of short- and long-term dietary assessment methods.³⁶

IMPLICATIONS FOR RESEARCH AND PRACTICE

The current study serves to highlight the impact of both food and supplement choices on micronutrient intakes of US adults and how these interact with PIR. From these data it is clear that supplement use increases with socioeconomic status, and that such use is associated with higher micronutrient density of the diet. Consistent with this report, dietary supplement users were documented to have higher intakes of micronutrients from food sources alone.^{23,24} Thus, increasing access to affordable sources of micronutrients should be a public health priority to reduce social inequities in nutrition.^{15,40} This report suggests that income improves nutrient intake significantly only among the top third of the population. Greater efforts in availability and affordability of nutrient-dense foods as well as appropriate nutrition education are needed not only for the lowest income groups, but for the majority of Americans. Given that adults in the lowest PIR category are more likely to be overweight or obese, simply adding more food to increase micronutrient intakes is not an ideal public health strategy.⁵³ Although they are controversial in terms of their impact on chronic disease prevention, and although most agree that improving dietary quality through foods is the best way to improve micronutrient intake, dietary supplements can add key micronutrients to the diet without increasing energy intakes. Therefore, increasing access to dietary supplements among those most at risk for micronutrient deficiency may be warranted for some shortfall

nutrients and nutrients of public health concern in US adults.

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CONFLICT OF INTEREST

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Supplemental Material 1. Mean (SE) Total Usual Micronutrient Intakes and Prevalence (% [SE]) Less Than Estimated Average Requirement (EAR), by Poverty Income Ratio (PIR) Group and Sex Among Adult (Aged ≥ 19 y) Dietary Supplement Users in US, 2011–2012

Micronutrient Intake by Sex	PIR Group, % (SE) < EAR			P		
	A (<130%)	B (130%–350%)	C ($\geq 350\%$)	A Vs B	A Vs C	B Vs C
Men, n (mean [SE])	261	322	396			
Folate, DFE	1143 (60)	1275 (79)	1340 (49)	.01	<.001	.29
Calcium, mg	1385 (104)	1368 (78)	1489 (52)	.80	.80	.03
Magnesium, mg	428 (18)	425 (20)	516 (22)	.73	<.001	<.001
Vitamin C, mg	273 (28)	311 (49)	414 (54)	.34	.002	<.001
Vitamin D, μg	20.9 (2)	25.7 (2)	32.2 (5)	<.001	.01	.16
Women, n (mean [SE])	378	427	424			
Folate, DFE	1214 (39)	1130 (43)	1200 (32)	<.001	.53	.015
Calcium, mg	1325 (46)	1297 (50)	1434 (79)	.15	.08	.02
Magnesium, mg	350 (12)	364 (17)	426 (21)	.24	<.001	<.001
Vitamin C, mg	255 (18)	363 (48)	297 (42)	.01	.26	.004
Vitamin D, μg	29.0 (6)	29.6 (2)	36.2 (4)	.86	.12	.08
Men, n (% < EAR [SE])						
Folate, DFE	7 (2)	8 (2)	0	.16	.01	.003
Calcium, mg	12 (5)	15 (5)	5 (1)	.22	.17	.05
Magnesium, mg	29 (5)	33 (5)	12 (3)	.13	<.001	<.001
Vitamin C, mg	9 (3)	10 (1)	3 (1)	.70	.05	<.001
Vitamin D, μg	24 (7)	14 (3)	13 (2)	.13	.12	.66
Women, n (% < EAR [SE])						
Folate, DFE	0	1 (0.3)	0	.004	1	.004
Calcium, mg	18 (3)	23 (4)	12 (3)	.07	<.001	.003
Magnesium, mg	19 (5)	26 (5)	9 (2)	<.001	.02	.001
Vitamin C, mg	4 (1)	4 (1)	4 (1)	1	1	1
Vitamin D, μg	19 (3)	16 (2)	13 (3)	.14	<.001	.08

DFE indicates dietary folate equivalents; RAE, retinol activity equivalents; ATE, α -tocopherol equivalents.

Note: The analytic sample includes all individuals aged ≥ 19 years and who were not pregnant with complete information for PIR and 24-hour dietary recall data. Vitamins A and E, and potassium are not included in these estimates. Statistical significance between PIR categories was assessed with multiple *t* tests using Bonferroni-corrected significant $P \leq .005$.

Supplemental Material 2. Mean (SE) Total Usual Micronutrient Intakes and Prevalence (% [SE]) Less Than Estimated Average Requirement (EAR), by Poverty Income Ratio (PIR) Group and Sex Among Adults (Aged ≥ 19 y) Who Did Not Use Dietary Supplements in US, 2011–2012

Micronutrient Intake by Sex	PIR Group, % (SE) < EAR			P		
	A (<130%)	B (130%–350%)	C ($\geq 350\%$)	A Vs B	A Vs C	B Vs C
Men, n (mean [SE])						
Folate, DFE	624 (31)	635 (26)	681 (26)	.51	<.001	<.001
Calcium, mg	1210 (71)	1036 (40)	1135 (37)	.003	.21	<.001
Magnesium, mg	343 (9)	327 (10)	385 (16)	<.001	.001	<.001
Vitamin C, mg	91 (9)	82 (5)	89 (6)	.22	.76	.03
Vitamin D, μg	5.6 (0.5)	5.2 (0.3)	5.5 (0.2)	.33	.83	.19
Women, n (mean [SE])						
Folate, DFE	476	330	216			
Folate, DFE	484 (21)	424 (12)	536 (18)	<.001	<.001	<.001
Calcium, mg	838 (23)	772 (32)	895 (36)	.003	.03	<.001
Magnesium, mg	250 (6)	251 (7)	291 (8)	.78	<.001	<.001
Vitamin C, mg	68 (7)	65 (4)	84 (7)	.60	<.001	<.001
Vitamin D, μg	4.0 (0.2)	3.5 (0.1)	4.0 (0.3)	.01	1	.09
Men, n (% < EAR [SE])						
Folate, DFE	6 (1)	8 (3)	2 (1)	.45	.65	.48
Calcium, mg	18 (3)	34 (4)	20 (3)	<.001	.16	<.001
Magnesium, mg	54 (4)	61 (4)	41 (5)	<.001	<.001	<.001
Vitamin C, mg	50 (6)	57 (3)	49 (4)	.23	.84	.008
Vitamin D, μg	91 (3)	94 (2)	91 (2)	.24	1	.01
Women, n (% < EAR [SE])						
Folate, DFE	15 (7)	31 (3)	6 (2)	.02	.19	<.001
Calcium, mg	57 (3)	68 (5)	50 (5)	.01	.09	<.001
Magnesium, mg	60 (4)	60 (3)	40 (4)	.99	<.001	<.001
Vitamin C, mg	54 (6)	56 (3)	32 (5)	.70	<.001	<.001
Vitamin D, μg	99 (0.7)	99 (0.3)	99 (1)	1	1	1

DFE indicates dietary folate equivalents; RAE, retinol activity equivalents; ATE, α -tocopherol equivalents.

Note: The analytic sample includes all individuals aged ≥ 19 y who were not pregnant, and who had complete information for PIR and 24-hour dietary recall data. Vitamins A and E and potassium are not included in these estimates. Statistical significance between PIR categories was assessed with multiple *t* tests with Bonferroni-corrected significant $P \leq .005$.