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Use of Dietary Supplements in the United States, 1988–94

June 1999

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

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Use of Dietary Supplements in the United States, 1988–94

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No. 244

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

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Objectives

This report presents estimates of the prevalence of use of dietary supplements among the U.S. population by various demographic and descriptive characteristics, the number of products taken, and types of supplements taken by broad product-type categories.

Methods

The third National Health and Nutrition Examination Survey (NHANES III) is a nationally representative survey of the civilian, noninstitutionalized U.S. population, 2 months of age or over. Participants were asked about their use of vitamin and/or mineral supplements in the past month. Many also reported use of other dietary supplements.

Results

Approximately 40 percent of the population took dietary supplements during the month prior to the interview. Females (44 percent) were more likely to take a supplement than males (35 percent). Non-Hispanic white persons (43 percent) were more likely to take supplements than non-Hispanic black persons (30 percent) and Mexican American persons (29 percent). Children 1–5 years of age were major users of supplements. Among adults 20 years of age and older, there was a trend toward increasing use of dietary supplements with age. Higher levels of education, income, and self-reported health status were all positively related to supplement use. Sixty-seven percent of supplement users took only one supplement, with the majority of them taking a combination vitamin/mineral product (46 percent).

Conclusions

A substantial proportion of the U.S. population takes vitamins, minerals, and/or other dietary supplements.

Keywords: *Dietary supplements • vitamin and mineral supplements • herbal and botanical products • NHANES • national surveys.*

Use of dietary supplements in the United States, 1988–94

by R. Bethene Ervin, Ph.D., R.D.; Jacqueline D. Wright, M.P.H., and Jocelyn Kennedy-Stephenson, M.S.

Introduction

Interest in the use of dietary or nutritional supplements appears to be growing in the United States. It is not clear whether this interest is fueled by recommendations from family and friends, the print and television media, advertising, health professionals, or scientific literature. Some of the reasons people give for taking supplements include: to improve nutrition, to make up for nutrients missing in the food supply, to decrease susceptibility to or severity of disease, or to increase energy or improve performance (1–7). Herbs and other dietary supplements may be taken as an alternative to conventional medical therapies (7–10). Another factor that may contribute to increased interest in use of supplements is scientific evidence linking diets high in some nutrients (for example, vitamins A, C, and E; folate; beta carotene; and calcium) with a lower risk for certain diseases or other conditions (for example, certain cancers, heart disease, osteoporosis, or neural tube defects) (11–17).

The third National Health and Nutrition Examination Survey (NHANES III), conducted by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC), was designed to provide nationally representative data on the health and nutritional status of the U.S. population 2 months of age and older. As part of this survey, data were collected on the use of vitamin and/or mineral supplements. Many of the survey participants reported their use of other dietary supplements such as herbs or other botanical products, fiber, sports drinks, amino acids, or other biologic extracts as well. This report presents estimates of the prevalence of use of dietary supplements among the U.S. population by various demographic and descriptive characteristics, the number of products taken, and types of supplements taken by broad product-type categories.

Methods

NHANES III was a cross-sectional survey conducted between October 1988 and October 1994 of people living in the United States. This survey used a stratified multistage probability design to select a sample representative of the civilian, noninstitutionalized population, 2 months of age or older, residing in the 50 contiguous States in the United States. A detailed description of the NHANES III plan and operation and sample design is reported elsewhere (18). Children 5 years of age and younger, older adults 60 years of age and older, and black and Mexican American persons were over sampled in order to improve the precision of their estimates. Among 33,994 infants, children, adolescents, and adults that received the household interview in NHANES III, 33,905 (99.7 percent) provided valid yes or no responses to the supplement use question. All analyses were based on this sample. Responses from the remaining 89 respondents were either missing or unknown, and were not included in the calculations.

Definitions of Demographic and Descriptive Variables

Age was defined as the respondent's age in years at the time of the household interview. Age-adjusted values were calculated by the direct method to the total population for 1980 (19). Self-reported race and ethnicities, recorded during the household interview, were recoded to one of four race-ethnic categories: non-Hispanic white, non-Hispanic black, Mexican American, and other. Females were defined as pregnant either if they said they were pregnant or the urine pregnancy test was positive, and were defined as lactating if they said they were currently breast-feeding a child. All analyses included pregnant and lactating females. Supplement use among pregnant and lactating females was also analyzed and reported separately.

Two variables were used to examine education. The first variable dealt with the highest grade the respondent had completed. However, the highest grade completed was only examined in adults 20 years of age and older since children and adolescents had not completed their educations. A second variable, based on the highest grade the head of the household completed, was used to examine supplement use by education for all age groups.

Total family income was based on the family income during the previous 12 months. Poverty income ratio (PIR) was based on family income and family size using tables published annually by the Bureau of the Census (20). Reports were used for each of the calendar years during which the survey occurred (1988–94) to calculate the PIR. This ratio has been adjusted to account for inflation and other factors; however, the manner in which it is calculated has changed slightly over time. For these analyses, PIR was categorized as low (PIR less than 1.300), middle (PIR between 1.301 and 3.500), and high (PIR of 3.501 or more).

Supplement use was also examined relative to the regions of the country where people lived and to their self-reported health status. The regions of the country were based on four broad geographic regions defined by the Bureau of the Census. Respondents rated their health status based on a 5-point Likert scale from poor to excellent. For this report, the categories were collapsed to three categories: excellent and very good, good, and fair and poor.

Supplement Questions

The household interview included a series of questions about respondents' use of vitamin and/or mineral supplements in the past month. A proxy respondent provided this information for children 2 months–16 years of age. If participants reported taking a supplement, they were asked to indicate the number of supplements they took. For each supplement reported, the interviewer asked to see the container in order to record the name of the supplement and the manufacturer or distributor. If the container was not available, the interviewer probed for this information. Participants were also asked how often they took each supplement in the past month, the dosage, and their long-term duration of use of the supplement. Interviewers did not collect nutrient content information from the supplement label during the interview, but obtained this information after the survey was completed for the products that were reported. When the reported supplement name and other information were not sufficient to match to a specific brand name or private label product, default supplements were created and used. The documentation accompanying the NHANES III public release files contains a detailed description of how the default products were created (21).

Although the survey questions did not specifically ask about use of other types of dietary supplements such as herbs and botanical products, sports drinks, amino acids, metabolites, and biologic extracts, some respondents voluntarily reported taking these types of products. Interviewers recorded the information about respondents' use of these types of supplements along with their use of vitamin and/or mineral supplements. The estimates presented in this report are based on all the types of supplements reported. However, since the original question did not directly ask about use of these other types of dietary supplements, the estimates presented in this report are likely to underestimate use of these products.

In addition, some prescription medicines and laxatives, originally reported elsewhere in the interview, were recoded as dietary supplements in order to keep track of other sources of nutrients and important compounds that respondents ingested. These nutrients and compounds were calciferol, niacin, calcitriol, potassium, and psyllium-containing laxatives. The estimates reported in this report include these products. Nevertheless, the respondents main purpose in taking these products may not have been as a dietary supplement.

Each supplement reported was coded with a product-type code. Each dietary supplement was classified into one of seven broad, product-type classes based on their general nutrient/ ingredient composition. The first five classes were reserved for vitamin and/or mineral supplements as well as cod liver oil, dolomite, bone meal, liver, and supplements where the primary ingredient was a vitamin or mineral but the product may also have contained a botanical or other nonvitamin or nonmineral (for example, vitamin C with rose hips). These latter products were classified in the category corresponding to their primary ingredient(s). Classes six and seven were assigned to other dietary supplements, which included herbs or other botanical products, fiber, sports drinks, amino acids, or other biologic extracts. The seven classes were:

1. Single vitamin—a product that contained only one vitamin.

2. Multiple vitamin—a product that contained more than one vitamin.

3. Single mineral—a product that contained only one mineral.

4. Multiple mineral—a product that contained more than one mineral.

5. Vitamin/mineral combination—a product that contained one or more vitamins and one or more minerals.

6. Other dietary supplements that also contained 2 percent or more of any of the nutrients listed in the National Research Council's Recommended Dietary Allowances (RDA's) or the Estimated Safe and Adequate Daily Dietary Intake (ESADDI) list (22).

7. Other dietary supplements that either did not contain any of the RDA or ESADDI nutrients, or they were present in amounts less than 2 percent of the recommended levels.

The final class was unknown product types, and consisted of those supplements for which coders could not identify a product-type category. The estimates shown in all of the tables in this report were based on analyses of supplements from all product types, including unknown product types.

Statistical Analysis

SAS (23) and SUDAAN (24) were used to perform statistical analysis. Survey sampling weights were used in all the analyses reported to produce estimates that were representative of the civilian, noninstitutionalized U.S. population. The SUDAAN program incorporates the sample weights and adjusts for the survey's complex sample design in calculating the appropriate standard errors (SEs). A test for trends in proportions was used to test for increasing or decreasing trends in the prevalence of use of supplements (25).

Statistical inference was based on the two-tailed t-test. A critical value of 0.05 was used for all tests of statistical significance. A Bonferroni method of multiple comparisons was used to adjust for the family of pairwise comparisons for the factor level of interest (26). The critical value was adjusted so that the family of all comparisons of interest were all true with 95 percent confidence. Unless otherwise indicated (for example, ''a trend toward a significant difference''), all differences reported in this report were statistically significant.

Results

Profile of Dietary Supplement Users

Approximately 40 percent of the population 2 months of age and older reported taking vitamin, mineral, or other types of dietary supplements at some point during the month prior to the household interview (table 1). Females, as a group, were more likely to take a supplement than males (44 vs. 35 percent, respectively). These same differences between females and males were seen when looking at total values within each race-ethnic group and also at total values within each age group for adults 20 years and older.

Overall, non-Hispanic white persons were more likely to take supplements than non-Hispanic blacks and Mexican American persons (43 percent vs. 30 and 29 percent, respectively) (table 1). The same pattern was true for men as a whole and women as a whole (figure 1). But the pattern varied within each of the age groups. Non-Hispanic white men 1–29 years of age were more likely to take supplements than either of the other two race-ethnic groups, and non-Hispanic white persons 50–69 years of age were more likely to take supplements than non-Hispanic black persons (table 1). In general, non-Hispanic white women were more likely to take supplements than non-Hispanic black women in all age groups except infancy, and were more likely to take supplements than Mexican American women 1–69 years of age.

Young children 1–5 years of age were major users of supplements, with anywhere from 42 to 51 percent of toddler and preschool-aged boys and girls taking supplements (figures 2, 3 and table 1). Compared with toddlers and preschool-aged children, supplement use declined among grade-school-aged boys and girls and adolescents 6–19 years of age. Between 24 and 35 percent of school-aged children and adolescents took supplements. A test for trends indicated a significant decline in supplement use over these age intervals for males and females as a whole, and when the data were stratified by race-ethnicity.

Among adults 20 years of age and older, there was a trend for increasing use of dietary supplements with age, in both males and females (figures 2, 3 and table 1). This trend also held when the data for each sex and race-ethnic combination were examined. However, for non-Hispanic black males, the increase in supplement use seems just to occur between the 20's and 30's and remains fairly stable at around 30 percent thereafter.

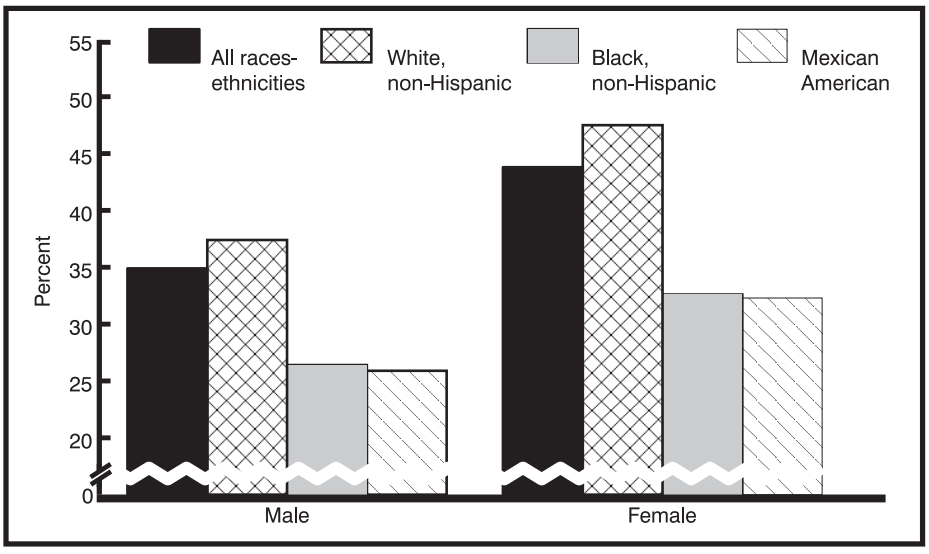

Figure 1. Prevalence of supplement use by sex and race-ethnicity, NHANES III, 1988–94

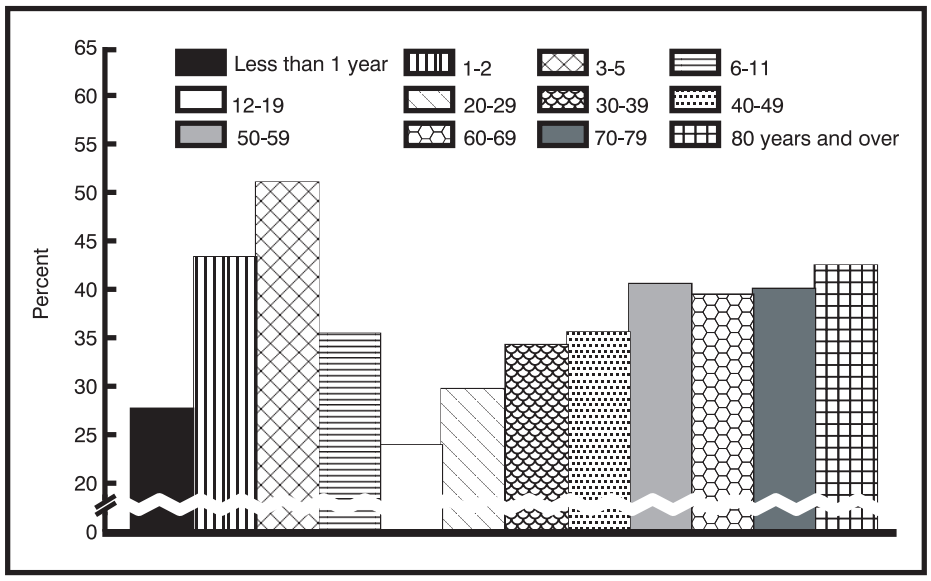

Figure 2. Prevalence of supplement use among males by age, NHANES III, 1988–94

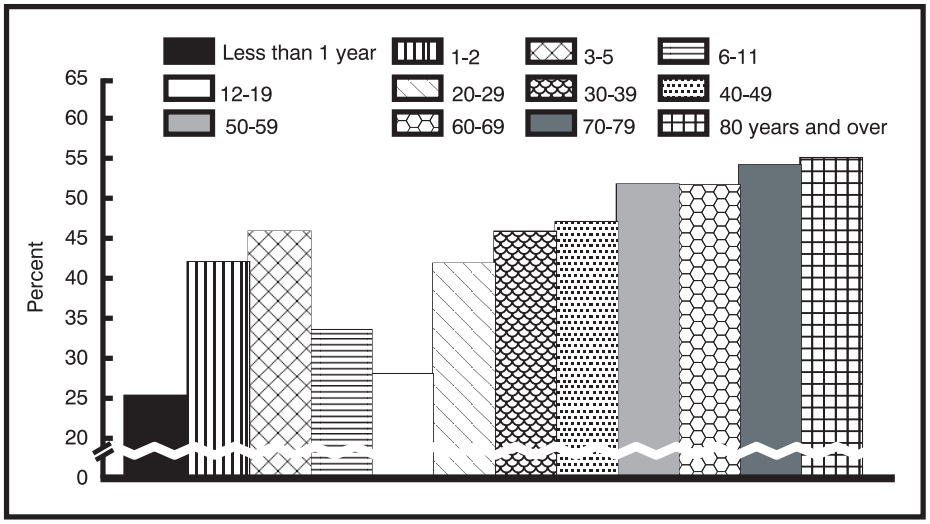

Figure 3. Prevalence of supplement use among females by age, NHANES III, 1988–94

The estimates for females shown in table 1 include pregnant and lactating females. When this group was examined separately, 76 percent of pregnant and lactating females reported taking one or more dietary supplements (data not shown). Most of these women were taking a prenatal vitamin and/or iron.

Educational levels and family incomes were each positively related to supplement use. There was an increasing trend in supplement use as the head of the household completed more years of education (table 2). Nearly one-half (46.9 percent) of individuals where the head of the household had an advanced education (13 or more years of education) took a dietary supplement compared with less than one-third of individuals (27.8 and 31.0 percent, respectively) where the head of the household had less than a high school diploma. These differences persisted after stratifying by sex. Supplement use among adult respondents 20 years of age and older, based on their highest grade of school completed, was also examined (data not shown). The results were similar to those for the head of household's education. That is, individuals with more years of education were more likely to take supplements.

Total family income was also positively related to supplement use. There is an increasing trend in supplement use with increasing family income during the previous 12 months (table 2). Nearly one-half (48.6 percent) of the population with incomes of $50,000 or more took supplements compared with 36.8 percent of the people with incomes between $10,000 and $29,999, and 31.3 percent of the people with incomes under $10,000. One sees the same trend when the data are stratified by sex (table 2).

The same pattern appeared when the data were analyzed by PIR. Only 29 percent of individuals with a low PIR took supplements compared with 39 percent with a middle PIR and 49 percent with a high PIR (table 2).

Although NHANES III is a national survey and is not designed to produce regional estimates, respondents were classified according to the geographic regions defined by the Bureau of the Census in order to compare differences in supplement use by region of the country. As a whole, people living in the West were more likely to take supplements (48 percent) than people living in any other region of the country (ranging from 36 to 38 percent) (table 2). This same pattern occurred when men and women were examined separately (table 2). After stratifying by race-ethnicity, only non-Hispanic white persons living in the West continued to exhibit a greater use of supplements compared with all the other regions of the country, for the group as a whole and when men and women were examined separately (data not shown). For non-Hispanic Black persons all the differences were significant except for the differences between the West and the Northeast, for males, females, and the group as a whole, and between the West and the Midwest for males (data not shown). For Mexican American persons all the differences were significant except for the one between the West and the South for males, and between the West and the Midwest for females (data not shown).

Supplement use relative to self-reported health status in adults 20 years of age and older was also examined. Adults who rated their health status as very good or excellent were more likely to take supplements (45 percent) than adults who rated their health as good (39 percent) or fair or

poor (39 percent) (data not shown). This same basic pattern also occurred when the analyses were stratified by sex (data not shown).

Number and Types of Supplements Taken

The estimates shown on table 3 are only for respondents who reported taking supplements. These data are reported for both sexes, males, and females. The first part of each section shows the number of supplements respondents reported taking; and the second part shows the types of supplements taken stratified by the number of products taken.

To simplify this analysis, the 12 age categories shown in table 1 were collapsed into four broad age categories based on supplement use patterns. These age categories were: children under 12 years of age, adolescents 12–19 years of age, young adults 20–39 years of age, and middle-aged and older adults 40 years of age and older. These four groups differed from each other with respect to the number of supplements used.

Looking at the number of supplements taken for both sexes combined, slightly more than two-thirds of the supplement users took only one supplement (table 3). Overall, males were slightly more likely than females to take only one supplement (70 vs. 65 percent, respectively), while females were more likely than males to take two or more supplements (35 vs. 30 percent, respectively) (table 3). After stratifying by age, though, there were no significant differences between men and women.

Children were more likely to take only one supplement. Nearly 90 percent of children took only one supplement compared with 76 percent of adolescents, 67 percent of young adults, and 56 percent of middle-aged and older adults. On the other hand, one-third or more of adults in both of the adult age categories took two or more supplements.

The second part of each section of table 3 shows the types of supplements taken according to their product-type categories stratified by the number of supplements the respondent reported taking. For these analyses, the two original other dietary supplement categories were collapsed into one category. Unknown product types are not shown separately in these tables.

For those respondents that took only one supplement, one product-type category was coded and the categories were mutually exclusive. In contrast, for those respondents that took two or more supplements, more than one product-type category may have been coded and the categories were not mutually exclusive. For example, if a person took three different supplements—such as a multiple vitamin, iron, and vitamin C— which represent three different product-type categories (multiple vitamin, single nutrient mineral, and single nutrient vitamin, respectively), each of these three categories was coded with a count of one. On the other hand, if a person took two supplements, both of which were single nutrient vitamins (for example, vitamin A and vitamin C), the single nutrient vitamin category was only coded with a count of one, indicating the person consumed at least one supplement from this category. The rationale behind counting products in this manner was to present a profile of the types of supplements users were taking for various levels of supplement use, rather than the total number of supplements taken per product-type category per person.

Among individuals who only took one supplement, the majority took a combination vitamin/mineral product. Forty-six percent of all supplement users who took only one product took a vitamin/mineral combination and 30 percent took a multiple vitamin (table 3). When these data were stratified by age, there was a significant effect of age on the product types taken. As with the overall pattern, adults were most likely to take a vitamin/mineral combination product (58 percent among persons 20–39 years of age, and 44 percent among persons 40 years of age and older). The next most popular supplement for adults was multiple vitamins (22 and 23 percent, respectively, for each age group). In contrast, children were most likely to take a multiple vitamin (52 percent) followed in popularity by a vitamin/mineral combination (38 percent). Adolescents were equally likely to take a multiple vitamin (30 percent) as a vitamin/mineral combination (36 percent).

The same pattern found for both sexes continued when men and women were examined separately. Children of both sexes were more likely to take a multiple vitamin, and adolescent males and females showed no strong preference for one of these product types over the other. Among adolescent males, approximately the same percentage took single nutrient vitamins (29 percent), multiple vitamins (28 percent), or vitamin/mineral combinations (32 percent). While 44 percent of middle-aged and older females took a combination vitamin/mineral, the next most popular supplements were closely clustered together and included single nutrient vitamins (15 percent), minerals (17 percent), or multiple vitamins (20 percent).

Among people that reported taking two or more supplements, the proportion that reported taking at least one single nutrient vitamin or mineral, multiple vitamin or mineral, and other dietary supplement increased, often dramatically, compared with those that only took one supplement. For example, among those that took two supplements there was a fourfold increase in use of single nutrient minerals and a 4½-fold increase in use of single nutrient vitamins compared with those that only took one supplement (table 3). Among those that took three or more supplements, there was nearly a sevenfold increase in use of single nutrient minerals and a 7½-fold increase in use of single nutrient vitamins compared with those that only took one supplement. There was a substantial increase in the use of other dietary supplements among people that took two or more supplements. There was more than a 7½-fold increase in use of other dietary supplements among those taking two supplements, and more than a 25½-fold increase in use of these types of products among those taking three or more supplements. Notably, a

little more than one-third of the people taking 3 or more supplements reported taking products from the other dietary supplements category.

Regardless of the number of products taken, the proportion of supplement users that took at least one vitamin/mineral combination product remained about the same. If respondents took one supplement, 46 percent reported taking a combination vitamin/mineral product; if they took two supplements, 48 percent took a combination vitamin/mineral; and if they took three or more supplements, 52 percent took a combination vitamin/mineral (table 3).

When men and women were examined separately one still sees the increasing use of single nutrient vitamins or minerals, multiple vitamins or minerals, and other dietary supplements as the number of supplements taken increased. Interestingly, regardless of the number of supplements taken, women were significantly more likely to take single nutrient minerals than men (1 supplement, 9 vs. 5 percent; 2 supplements, 39 vs. 19 percent; and 3 or more supplements, 58 vs. 40 percent, respectively).

Although not shown in table 3, the data were also analyzed for the types of products taken regardless of the number of supplements taken. Nearly one-half of all supplement users (47 percent) took one or more vitamin/mineral combination products. Twenty-nine percent of supplement users took one or more single nutrient vitamins, 34 percent of supplement users took one or more multiple vitamins, 18 percent took one or more single nutrient minerals, but only 2 percent took one or more multiple mineral supplements. Eight percent of the population took other dietary supplements, although this prevalence is likely to be an underestimate.

Discussion

Results from this nationally representative survey indicate that about two out of every five people in the U.S. population were taking supplements between 1988 and 1994. Supplement users were more likely to be children 1–5 years of age, middle-aged or older adults, women, non-Hispanic white persons, those with more education, or those with higher incomes. Although NHANES III is a national survey and is not designed to produce regional estimates, the data were analyzed using the four geographic regions defined by the Census Bureau in order to compare differences in supplement use by region of the country. These results showed that people living in the West were more likely to take supplements, which is consistent with results found in other national surveys (27–30).

It is difficult to make direct comparisons between the results of this survey and those of other surveys because of the wide variation in the criteria used to define supplement users. Other researchers have used different study populations, different frequencies of use (regular daily use vs. all patterns of use), different time frames (past 2 weeks, past month, or past year), and different types of supplements included in the definition. For the same reasons, it is difficult to examine whether use has changed over time.

The unadjusted prevalence of supplement use in black and white persons in NHANES I (1971–74) was 23 percent (27) and in NHANES II (1976–80) was 35 percent (31). However, there were some differences between the two surveys in terms of the populations analyzed. Block et al. (26) examined regular supplement users 25–74 years of age, while Koplan et al. (27) looked at regular and irregular users, 18–74 years of age, who also had completed 24-hour dietary recalls. Koplan et al. also excluded pregnant and lactating females from their analyses. Block et al. stated that if irregular users were included in their analyses, the prevalence of use would be 50 to 100 percent higher, that is 34 to 46 percent. In NHANES III, the unadjusted prevalence of supplement use was 42 percent for black and white persons, 20–74 years of age, who reported any type of supplement use in the past month. This estimate includes pregnant and lactating females. Therefore, despite some differences in the manner in which supplement users were defined, the prevalence of use is quite similar among the three NHANES surveys during the 1970's and early 1990's.

Other national surveys have examined vitamin and mineral supplement use. In a 1980 Food and Drug Administration (FDA) telephone survey, 40 percent of adults were taking vitamin and mineral supplements on a daily basis (28). In the 1986 National Health Interview Survey (NHIS), 36 percent of adults 18 years of age and over, and 43 percent of children 2–6 years of age used vitamin and mineral products (29). When Subar and Block (30) approximated the same reference period that Stewart et al. (28) used in the FDA survey, that is, the previous 14 days, they found that 39 percent of adults 18 years and over in the 1987 NHIS survey were taking vitamin and mineral supplements (30). Bender et al. (32) reported a significant decline in supplement use among adults (42 vs. 38 percent, respectively) between the 1980 FDA survey and the 1986 NHIS survey, and Slesinski et al. (33) found a significant decline in supplement use among adults (51 vs. 46 percent, respectively) between the 1987 and 1992 NHIS surveys when the results were expressed in terms of any use in the past year. Again, although one cannot make direct comparisons across all of these surveys, the results tend to suggest that the prevalence of supplement use among adults on a national level has remained fairly stable over the past 20 years.

One fairly consistent pattern seen across most surveys is that supplement use is more common among older adults, women, white persons, people living in the West, and those with higher incomes and levels of education (27–31). The NHANES III data showed the same pattern. In addition, a substantial proportion of toddler and preschool-aged children used supplements, but the prevalence of use dropped off among school-aged children and adolescents. The higher use among younger children may be a function of physicians prescribing supplements for children and/or a parental response to a child's poor appetite or ''food jags''

(34). Moss et al. (29) found the same type of decline in supplement use among school-aged children in the 1986 NHIS, although they looked at a more restricted age range and the percentage differences were smaller than those observed in NHANES III.

While some researchers have found a positive relationship between supplement use and self-reported health status (29, 35, 36), similar to the NHANES III data, others have found no significant relationship (37) or a negative relationship (3). Interestingly, Bender et al. (32) reported that after controlling for demographics the significant positive relationship between perceived health and supplement use disappeared. It is possible that the relationship between self-reported health status and supplement use is a complex one that is affected by other factors including demographics, number of health conditions, and health locus of control (4,32), which need to be considered in any analysis.

Approximately two-thirds of the supplements users in this survey took only one supplement. However, the pattern varied with age with children being more likely than adolescents and adults to take only one supplement. When people only took one product, adults most frequently took a multiple vitamin with minerals followed by a multiple vitamin; children's patterns were just the opposite. Among people that took two or more supplements, they especially increased their use of single nutrient vitamins or minerals, multiple vitamins or minerals, and other types of dietary supplements.

The NHANES III results are fairly similar to those found by Moss et al. (29) in the 1986 NHIS. Moss et al. found that 60 percent of adults and 85 percent of children 2–6 years of age were taking only one supplement, and that middle-aged and older adults were more likely to take two or more supplements. In addition, while their respondents' use of multivitamins remained fairly constant, their use of vitamin and mineral combinations, and single vitamins and minerals increased as they took more supplements. In both the 1987 and 1992 NHIS, multivitamins were more commonly consumed than the vitamins A, C, or E, or the mineral calcium (30, 33). Unlike other national surveys, the 1980 FDA telephone survey indicated the most widely consumed supplements were single vitamins and what FDA called ''miscellaneous dietary components'' (28). This was followed by vitamin/mineral combinations and multivitamins with and without minerals.

Interestingly, in NHANES III, more women than men took single nutrient minerals. Similar results have been reported by others (29). While a detailed analysis of the types of supplements taken was not conducted, a preliminary examination of the types of single nutrient minerals reported indicates that substantially more women than men were taking calcium and iron. This difference may reflect the advice given for women to consume more calcium to prevent osteoporosis and more iron during their reproductive years. In NHANES I and the three National Health Interview Surveys, women were more likely than men to consume calcium (27, 29, 30, 33) and iron (27) supplements.

Finally, while NHANES III was only designed to look at vitamin and/or mineral supplement use, many people also reported their use of herbal products and other nonconventional dietary supplements. The NHANES III results for these types of products may be subject to reporting bias, but this survey is one of the first national probability studies to include data on use of these types of products. About 1 in 12 supplement users in NHANES III reported using one or more of these types of supplements. Some of the most frequently reported supplements included lecithin, garlic, ginseng, fiber, amino acids, protein drinks, and other performance-enhancing or body-building formulas.

In conclusion, the results from NHANES III are relatively consistent with those reported in other national surveys over the past 20 years. Approximately 40 percent of the population takes a supplement at least once a month, and the proportion of the population taking supplements has not changed much in two decades. Furthermore, supplement users are more likely to be young children 1–5 years of age, middle-aged and older adults, non-Hispanic white persons, women, people with more education or higher incomes, and people living in the West. While adolescents and adults taking one product tend to take a multiple vitamin and mineral combination, and children take a multiple vitamin, use of single nutrient vitamins and minerals, multiple vitamins, and other nonconventional dietary supplements increases as people take more products. Although the prevalence in supplement use does not appear to have changed in the past two decades, it is possible that there have been shifts in the specific types of supplements. This difference was not investigated in this report.

Researchers collecting information on dietary intakes need to also ask about use of vitamins and/or minerals (38,39), and include the nutrients from these supplements in their calculation of total intakes. The prevalence of supplements used and the profile of the products taken may change with the passage of the Dietary Supplement Health and Education Act of 1994 (DSHEA) (40), which shifted the burden of proof of unsafe products or misleading labeling from the supplement industry to FDA and allowed claims of nutritional support on dietary supplements. As more scientific evidence is reported linking diets high in certain nutrients with lower risk of certain diseases, and as attitudes toward the use of alternative medicines change, more people may be using a wider variety of dietary supplements. In the future, it will be important for all health and nutrition surveys to ask questions not only about the use of vitamin and/or mineral supplements, but also about other nonconventional dietary supplements.

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Table 1. Prevalence of dietary supplement use in the past month by race-ethnicity, sex, and age: United States, 1988–94

Sex and age	Total[1]			Non-Hispanic White			Non-Hispanic Black			Mexican American		
	Sample size	Percent	Standard error	Sample size	Percent	Standard error	Sample size	Percent	Standard error	Sample size	Percent	Standard error
Male												
2–11 months	1,064	27.6	2.09	612	29.6	2.68	170	19.8	4.21	192	23.6	4.75
1–2 years	1,346	43.3	1.59	442	46.9	2.43	384	33.2	2.66	437	36.7	2.01
3–5 years	1,666	51.0	3.34	453	57.6	4.38	535	30.3	2.52	595	36.8	2.72
6–11 years	1,765	35.4	2.15	481	38.6	3.21	604	23.9	1.72	597	27.3	4.30
12–19 years	1,614	23.9	2.33	395	26.7	3.21	578	16.0	1.98	566	17.5	1.57
20–29 years	1,800	29.7	2.12	452	33.3	2.91	523	24.1	1.86	742	18.6	2.41
30–39 years	1,619	34.1	2.09	501	35.6	2.51	533	31.2	2.19	522	27.8	2.60
40–49 years	1,320	35.4	2.62	474	37.3	3.22	400	30.5	2.88	399	28.4	2.46
50–59 years	952	40.4	2.17	472	41.4	2.47	240	31.0	3.06	193	34.7	3.39
60–69 years	1,296	39.3	1.75	571	40.9	1.90	322	29.4	2.66	366	33.8	2.86
70–79 years	990	39.9	2.24	593	39.9	2.44	205	31.0	2.91	175	37.8	6.55
80 years and over	820	42.3	2.47	662	43.0	2.58	69	31.7	6.56	68	40.1	7.48
Total, crude	16,252	34.9	1.01	6,108	37.4	1.24	4,563	26.4	0.80	4,852	25.9	1.42
Total, age adjusted[2]	16,252	34.5	0.98	6,108	37.0	1.23	4,563	26.7	0.83	4,852	27.3	1.23
Female[3]												
2–11 months	1,030	25.3	1.65	597	25.0	2.44	157	15.5	3.81	174	27.9	4.60
1–2 years	1,337	42.0	2.19	471	45.7	2.96	373	30.7	3.10	440	40.4	2.41
3–5 years	1,784	45.8	2.04	495	51.6	3.12	564	32.7	2.25	643	39.8	2.86
6–11 years	1,694	33.5	2.41	462	36.2	3.12	556	24.6	2.18	612	26.1	3.35
12–19 years	1,813	28.0	2.19	519	29.5	3.15	629	19.9	1.96	570	21.9	2.18
20–29 years	1,982	41.8	1.85	546	46.8	2.78	648	31.0	2.57	703	31.5	1.86
30–39 years	1,972	45.8	1.90	648	50.0	2.37	685	36.6	1.84	557	33.3	1.45
40–49 years	1,468	47.0	2.75	527	49.0	3.34	479	38.3	2.68	391	34.1	2.82
50–59 years	1,105	51.7	2.04	548	55.1	2.29	297	41.0	2.66	204	41.7	4.10
60–69 years	1,309	51.6	2.11	570	52.8	2.48	331	42.1	2.61	359	42.1	2.99
70–79 years	1,161	54.1	2.55	768	56.0	2.73	216	43.5	3.20	140	46.3	5.50
80 years and over	998	55.0	2.76	797	56.2	2.92	112	40.2	5.88	69	54.2	10.37
Total, crude	17,653	43.8	0.86	6,948	47.5	1.14	5,047	32.6	0.91	4,862	32.3	1.17
Total, age-adjusted[2]	17,653	42.9	0.89	6,948	45.9	1.22	5,047	33.0	0.92	4,862	33.9	1.05
Total across sex	33,905	39.5	0.81	13,056	42.6	1.02	9,610	29.8	0.71	9,714	29.0	1.08

[1]Includes data for race-ethnic groups not shown separately.
[2]Prevalence estimates are age-adjusted, using 12 age groups, based on the direct method of adjustment to the total U.S. resident population estimated by the U.S. Bureau of the Census in 1980.
[3]Includes pregnant and lactating females.

Table 2. Prevalence of dietary supplement use in the past month by sex and selected demographic characteristics: United States, 1988–94

Characteristic	Both sexes			Male			Female		
	Sample size	Percent	Standard error	Sample size	Percent	Standard error	Sample size	Percent	Standard error
Education:[1]									
0–8 years	7,842	27.8	1.04	3,881	21.5	1.39	3,961	33.5	1.30
9–11 years	5,782	31.0	1.69	2,751	25.4	2.12	3,031	35.9	1.80
12 years	10,089	37.8	1.16	4,720	32.5	1.48	5,369	42.6	1.27
13 or more years	9,682	46.9	1.12	4,658	43.0	1.46	5,024	50.6	1.20
Total	33,395	39.5	0.82	16,010	34.8	1.00	17,385	43.9	0.87
Income:									
Less than $10,000	6,430	31.3	1.33	2,840	25.3	1.56	3,590	35.4	1.70
$10,000–29,999	13,698	36.8	0.91	6,672	32.2	1.22	7,026	41.1	1.04
$30,000–49,999	6,227	40.7	1.20	3,090	36.1	1.64	3,137	45.6	1.75
$50,000 and above	4,165	48.6	1.47	2,094	43.0	1.67	2,071	54.5	1.69
Total	30,520	39.9	0.78	14,696	35.3	0.99	15,824	44.4	0.82
Poverty income ratio:[2]									
Low	12,050	28.6	1.24	5,533	24.7	1.66	6,517	31.6	1.38
Middle	12,924	38.9	0.95	6,366	34.1	1.32	6,558	43.8	1.14
High	5,551	49.4	1.02	2,800	43.4	1.25	2,751	55.5	1.25
Total	30,525	39.9	0.79	14,699	35.3	1.00	15,826	44.4	0.82
Region:									
Northeast	4,623	37.8	2.02	2,188	32.2	2.50	2,435	43.1	1.98
Midwest	6,423	38.0	0.56	3,048	33.2	1.28	3,375	42.7	1.22
South	14,353	36.2	1.05	6,893	32.1	1.34	7,460	40.0	1.13
West	8,506	47.8	1.36	4,123	43.6	1.94	4,383	51.9	1.32
Total	33,905	39.5	0.81	16,252	34.9	1.01	17,653	43.8	0.86

[1]Education is based on the highest grade completed by the head of the household.
[2]The poverty income ratio (PIR) is defined as follows: low (0.000–1.300); middle (1.301–3.500); and high (3.501 and above).

Table 3. Prevalence of number and type of supplements taken, by sex and age: United States, 1988–94

Number and type of supplements taken	All ages		2 months–11 years		12–19 years		20–39 years		40 years and over	
	Percent	Standard error	Percent	Standard error	Percent	Standard error	Percent	Standard error	Percent	Standard error
Both sexes[1]										
Total:	100.0	. . .	100.0	. . .	100.0	. . .	100.0	. . .	100.0	. . .
1 supplement	67.0	0.89	90.5	0.84	76.2	2.72	66.7	1.31	55.9	1.39
2 supplements	18.6	0.70	8.5	0.84	13.9	2.00	20.7	1.32	22.1	1.12
3 or more supplements	14.4	0.70	1.0	0.25	9.9	2.11	12.7	1.30	22.0	1.17
1 supplement taken:[2]										
Single vitamin	11.3	0.72	*4.1	1.31	23.0	3.39	10.5	1.31	14.2	0.87
Multiple vitamin	30.3	1.08	51.7	2.14	29.5	3.29	22.4	1.54	23.0	1.37
Single mineral	7.5	0.48	3.4	0.45	5.7	1.32	4.4	0.84	13.5	0.90
Multiple mineral	*0.3	0.08	*0.0	0.01	*0.1	0.06	*0.1	0.04	*0.7	0.21
Vitamin/mineral combination	46.3	1.26	37.7	1.98	36.2	3.51	57.8	2.09	44.5	1.59
Other dietary supplements	1.4	0.12	*0.5	0.30	*2.0	0.69	1.5	0.23	1.8	0.29
2 supplements taken:[3]										
Single vitamin	51.1	2.28	46.8	7.32	58.0	7.56	52.5	3.39	50.1	2.87
Multiple vitamin	38.3	1.96	71.1	5.22	45.7	8.16	36.0	3.51	33.8	2.58
Single mineral	30.6	1.88	27.7	6.28	23.5	4.98	20.5	2.98	38.7	2.70
Multiple mineral	*1.7	0.42	*1.3	1.27	*2.0	1.60	*1.1	0.60	*2.2	0.64
Vitamin/mineral combination	48.1	1.87	39.2	4.63	54.9	7.41	50.5	3.63	47.2	2.59
Other dietary supplements	10.6	1.28	*2.6	1.34	*5.6	2.90	16.5	3.10	8.4	1.24
3 or more supplements taken:[3]										
Single vitamin	85.0	1.62	85.7	5.24	86.2	6.07	80.1	3.09	86.9	1.86
Multiple vitamin	48.4	2.37	70.7	9.24	57.1	8.77	51.2	4.59	46.2	2.73
Single mineral	51.1	2.47	*49.5	13.87	54.4	9.47	41.6	4.46	54.8	2.54
Multiple mineral	12.8	1.51	*5.7	5.63	*7.0	6.35	12.3	2.44	13.5	1.65
Vitamin/mineral combination	51.6	2.34	*35.0	10.86	*42.1	11.54	55.5	4.08	51.0	2.50
Other dietary supplements	35.9	2.30	*20.2	9.85	*39.5	9.88	37.2	3.61	35.3	2.67
Male										
Total:	100.0	. . .	100.0	. . .	100.0	. . .	100.0	. . .	100.0	. . .
1 supplement	70.0	1.18	90.2	1.24	74.4	4.48	69.1	2.28	58.6	2.04
2 supplements	17.7	0.97	9.2	1.26	*13.0	3.63	19.9	2.50	21.8	1.68
3 or more supplements	12.2	1.01	*0.6	0.21	*12.6	3.57	11.0	2.18	19.6	1.77
1 supplement taken:[2]										
Single vitamin	12.4	1.23	*4.2	1.63	28.7	5.03	14.4	2.13	13.3	1.68
Multiple vitamin	33.0	1.51	50.3	2.50	28.5	4.42	23.7	2.26	27.9	2.64
Single mineral	5.3	0.48	3.8	0.60	*4.6	1.22	*2.9	0.94	8.9	1.02
Multiple mineral	*0.2	0.06	*0.0	0.01	*0.1	0.14	*0.0	0.03	*0.4	0.18
Vitamin/mineral combination	44.4	1.88	38.6	2.54	31.9	6.06	52.7	2.99	45.2	2.95
Other dietary supplements	1.8	0.28	*0.2	0.07	*2.1	1.02	2.3	0.47	2.5	0.59
2 supplements taken:[3]										
Single vitamin	58.4	2.97	47.8	7.05	61.4	13.80	59.9	5.55	59.6	3.99
Multiple vitamin	42.2	3.47	75.7	5.92	*56.4	14.33	35.3	6.67	37.5	4.48
Single mineral	19.1	2.46	*27.5	7.85	*11.3	7.20	*4.3	1.61	28.4	3.93
Multiple mineral	*0.6	0.42	*–	–	*0.3	0.36	*1.4	1.21	*0.1	0.09
Vitamin/mineral combination	44.9	2.98	39.4	5.35	*57.5	15.15	42.8	6.25	46.1	3.94
Other dietary supplements	13.5	2.66	*1.9	1.37	*2.9	1.74	*24.8	7.03	9.7	2.30

See footnotes at end of table.

Table 3. Prevalence of number and type of supplements taken, by sex and age: United States, 1988–94—Con.

Number and type of supplements taken	All ages		2 months–11 years		12–19 years		20–39 years		40 years and over	
	Percent	Standard error	Percent	Standard error	Percent	Standard error	Percent	Standard error	Percent	Standard error
Male—Con.										
3 or more supplements taken:[3]										
Single vitamin	86.0	2.59	86.9	9.28	80.4	9.61	77.5	6.08	90.3	2.83
Multiple vitamin	51.0	3.98	87.7	9.18	57.3	13.31	57.3	8.82	46.8	4.16
Single mineral	39.9	4.11	78.0	12.62	*47.5	13.89	*26.8	8.31	43.8	4.06
Multiple mineral	*12.4	3.27	*–	–	*11.0	10.36	*11.0	5.13	13.3	3.26
Vitamin/mineral combination	47.9	3.94	*22.4	12.78	*51.5	16.58	48.4	7.44	47.6	4.02
Other dietary supplements	42.2	3.90	*21.0	14.89	*48.1	16.38	47.5	5.75	39.5	4.69
Female[1]										
Total:	100.0	. . .	100.0	. . .	100.0	. . .	100.0	. . .	100.0	. . .
1 supplement	64.7	1.08	90.8	1.05	77.9	2.76	64.9	2.22	54.1	1.62
2 supplements	19.3	0.80	7.8	1.01	14.6	1.93	21.2	1.61	22.3	1.19
3 or more supplements	16.1	0.81	*1.4	0.44	*7.5	2.04	13.9	1.49	23.6	1.41
1 supplement taken:[2]										
Single vitamin	10.5	0.68	*4.0	1.82	*18.3	4.77	7.5	1.16	14.8	1.14
Multiple vitamin	28.0	1.05	53.2	2.58	30.3	4.91	21.4	1.82	19.6	1.49
Single mineral	9.3	0.61	2.8	0.60	*6.6	1.94	5.5	1.02	16.7	1.17
Multiple mineral	*0.4	0.13	*0.0	0.01	*–	–	*0.1	0.07	*0.9	0.34
Vitamin/mineral combination	47.9	1.15	36.8	2.50	39.8	4.49	61.6	2.30	44.0	1.68
Other dietary supplements	1.1	0.20	*0.8	0.63	*1.9	0.90	*0.8	0.28	1.3	0.29
2 supplements taken:[3]										
Single vitamin	46.0	2.73	45.6	9.72	55.4	9.48	47.6	4.04	44.1	3.29
Multiple vitamin	35.6	1.61	65.1	5.66	37.3	8.72	36.5	3.62	31.5	2.35
Single mineral	38.6	2.20	28.1	6.27	33.0	6.48	31.2	4.23	45.2	2.87
Multiple mineral	*2.5	0.65	*3.0	2.88	*3.3	2.80	*0.8	0.57	*3.5	1.03
Vitamin/mineral combination	50.4	2.10	39.0	8.50	52.8	8.44	55.6	3.50	48.0	2.71
Other dietary supplements	8.5	1.54	*3.4	2.38	*7.8	4.91	11.0	2.54	7.6	1.54
3 or more supplements taken:[3]										
Single vitamin	84.4	1.89	85.2	7.09	94.9	3.11	81.5	3.56	85.1	2.42
Multiple vitamin	47.0	2.73	62.9	14.68	56.9	11.47	47.7	5.24	45.9	3.26
Single mineral	57.5	2.77	*36.4	14.33	64.6	9.17	50.0	5.48	60.6	3.17
Multiple mineral	13.0	1.65	*8.4	8.12	*1.2	1.22	*13.0	3.62	13.7	1.87
Vitamin/mineral combination	53.7	2.59	*40.9	16.19	*28.1	12.59	59.4	4.67	52.8	2.96
Other dietary supplements	32.2	2.62	*19.8	12.13	*26.7	8.16	31.4	5.44	33.1	2.83

. . . Category not applicable.
0.0 Quantity more than zero but less than 0.05.
* Figure does not meet standard of reliability or precision.
*– Figure does not meet standard of reliability or precision and quantity zero.
[1]Figures include values for pregnant and lactating females.
[2]Figures do not add to 100 percent since supplements of unknown product type are not shown separately.
[3]Figures do not add to 100 percent because more than one product-type category may have been coded if the respondent took two or more supplements. If the respondent took two or more supplements in the same product-type category, only one of these supplements was counted. Also, supplements of unknown product type are not shown separately.

Table 4. Sample sizes for table 3 by sex and age: United States, 1988–94

Sample size	All ages	2 months–11 years	12–19 years	20–39 years	40 years and over
Both sexes	11,664	3,857	735	2,357	4,715
Male	5,022	1,929	300	919	1,874
Female	6,642	1,928	435	1,438	2,841

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