

Dietary Supplement Users: Demographics, Product Use, and Medical System Interaction

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Background: Dietary supplements—defined as vitamins and minerals, herbal products, tissue extracts, proteins and amino acids, and other products—are purchased to improve health and prevent disease. Little has been published, however, about the characteristics of either the products or the people who use them.

Methods: Consecutive customers visiting two health food stores during a 15-day period were interviewed by telephone. They were asked about their use of dietary supplements, demographics, and their use of the established health care system.

Results: Of the 194 customers contacted, 136 (70.1 percent) completed the survey. Respondents took a total of 805 supplements, most often to prevent a health problem (84.3 percent). Herbal products were most commonly used. Garlic, ginseng, and *Ginkgo biloba* were the herbs most frequently used. Fifty products were found to have previously reported toxicities, including vitamin A, which 9 customers were taking in megadoses. Most customers were white (94.1 percent), female (75.7 percent), had at least 1 year of college education (70.6 percent), had health insurance (95.6 percent), and had a regular physician (85.3 percent).

Conclusion: Most of the dietary supplements consumed appear to be safe, but 50 of 805 had previously reported toxicities including megadoses of vitamin A. Garlic, ginseng, and *Ginkgo biloba* were the most commonly ingested herbs, and the medical literature supports their effectiveness for some conditions in humans. Customers of two health food stores had average to above-average education and took dietary supplements to stay healthy. They used the conventional health care system but did not typically consult their physician about dietary supplements. The pattern of use suggests that physicians might not be adequately addressing preventive and wellness issues in discussions with their patients. Furthermore, physicians might need to learn about dietary supplements so they can communicate with patients about them. (J Am Board Fam Pract 1997;10:265-71.)

Dietary supplements include vitamins (at recommended daily allowances and megadoses exceeding 10 times the recommended daily allowance) and minerals,¹ herbal products, tissue extracts, proteins and amino acids, and a variety of other products. The frequency with which health food stores appear in shopping malls and communities and the availability of dietary supplements in pharmacies, mail-order catalogs, and small home-

based businesses selling supplements all attest to the widespread use of supplements and their growth into a multibillion-dollar industry.² Several studies have confirmed widespread consumption of dietary supplements, with about 50 percent of the adult population taking a supplement during a given year.³⁻⁵

Because of the widespread sale and use of dietary supplements and the apparent limited scientific information available to physicians in the United States regarding dietary supplements, we wanted to track the supplements purchased at health stores and survey the customers purchasing the products to find out which products are used most commonly, the doses consumed, and the reason for taking these products. We also wanted to describe the customers, determine whether they use dietary products exclusive of conventional medicine, and find out what other

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Table 1. Demographics of the Study Population.

Characteristics	Number	Percent
Age (years)		
Less than 40	32	23.5
40-49	42	30.9
50-59	28	20.6
60-69	19	14.0
70 and older	15	11.0
Sex		
Male	33	24.3
Female	103	75.7
Race		
White	128	94.1
Black	5	3.7
Hispanic	1	0.7
Other	1	0.7
Education		
Less than high school	6	4.4
High school	31	22.8
Technical school	3	2.2
Some college	48	35.3
College graduate	26	19.1
Postgraduate	22	16.2

association customers might have with the conventional medical health care system.

Methods

Two health food stores in the metropolitan Milwaukee area were used in this study. The stores were selected based upon the proprietors' willingness to solicit customers to participate in this study. All customers purchasing products at these stores during a 3-week period during the summer of 1995 were asked whether they would participate in a telephone survey regarding their use of dietary supplements. Those customers who agreed were subsequently contacted by a research assistant.

Topics addressed in this survey included (1) the name of each supplement and the ingredients it included, (2) the number and dosage of each supplement the participant used each day, (3) a brief description of the perceived benefit of the supplement, (4) whether the participant also saw a medical physician for the same condition, (5) who recommended the dietary supplement, (6) a list of current prescribed medications, (7) the participant's personal perception of his or her overall health, (8) whether the participant had a regular physician, (9) whether the participant's physician was aware of dietary supplement use, and (10) basic sociodemographic information of participants, including age, sex, health insurance status, and education.

Responses to the survey were read and coded with respect to the participant's sociodemographic characteristics, the number and type of dietary supplements used, the rationale for taking dietary supplements, and the relation of dietary supplement use to other health care services.

Results

Two of seven health food stores contacted agreed to participate in the study. Of the 194 customers who were asked to be interviewed, 136 (70.1 percent) completed the interview process. The demographics and educational level of the customers are listed in Table 1. Participants reported taking a total of 805 supplements for an average of 5.9 supplements per client. The products were grouped into 28 categories and are listed from the most to least frequently named products in Table 2. The most common herbal products consumed are listed in Table 3.

Fifty of the products mentioned have been reported in the literature as previously causing toxic

Table 2. Types of Supplements Consumed.

Product Category	Number of Products
Herbal products	170
Multivitamin and mineral	83
Vitamin E megadose	51
B vitamins	46
Vitamin C megadose	45
Calcium	44
Other products, combinations*	41
Garlic	33
Vitamin C, bioflavonoids	33
Proteins, amino acids	31
Other minerals, mineral combination	27
Other vitamins, vitamin combination	22
Vitamin A, beta carotene	21
Chromium, chromium picolinate	18
Lecithin	15
Magnesium	15
Ginseng	14
Lactobacillus acidophilus	13
Tissue, glandular extract	12
Enzymes	11
Vitamin A megadose (> 20,000 IU/d)	9
Selenium	9
Zinc	9
Pycnogenol	8
Iron	8
Vitamin E	8
Other vitamins, mineral megadose	5
Melatonin	4

*Other products, combinations included various combinations of vitamin, herbal products, tissue extracts and other chemicals.

Table 3. Herbs Most Commonly Consumed.

Herb	Number
Garlic	33
Ginseng	14
<i>Ginkgo biloba</i>	14
Evening primrose oil	9
Alfalfa	9
Echinacea	6

reactions. Fourteen participants were taking the herb ginseng.⁶ Nine participants reported a daily intake of vitamin A greater than 20,000 IU, 3 were taking in excess of 50,000 IU/d,⁷ 9 were taking an alfalfa product,⁸⁻¹⁰ 5 were taking megadoses of vitamin B₆,¹¹ 2 were taking ma huang,^{12,13} and 2 others were taking thyroid extract.¹⁴ One participant each was taking lobelia,¹⁵ valerian,¹⁶ Kombucha mushroom tea,¹⁷ yohimbe,^{15,16} guarana,¹⁸ burdock root,^{19,20} chromium picolinate,²¹ kelp,²²⁻²⁴ and licorice root.²⁵⁻²⁷

Table 4 lists the perceived benefits of the supplements. Of the 805 supplements, 679 (84.3 percent) were taken for disease prevention and wellness purposes, and 126 (15.7 percent) were taken to treat perceived health problems.

The respondents took 687 (85.3 percent) supplements for a benefit for which they did not consult a physician. Generally the respondents took the supplements based on their own information or investigation and not upon the recommendation of a physician or health professional (Table 5).

Most of the respondents (130, 95.6 percent) had health insurance, and 116 (85.3 percent) said they had a personal physician. Most of the customers (121, 89.0 percent) considered their health to be good to excellent, and only 15 (11.0 percent) thought that their health was poor or very poor. Seventy-one (52.2 percent) were taking a prescription medication.

Discussion

This survey is the first to quantify the use of dietary supplements purchased from two suburban health food stores during a specified period, and the first to describe some of the demographic, educational, and health care system access characteristics of the customers who made the purchases. A wide variety of products are designated now by the Food and Drug Administration (FDA) as dietary supplements. Previous research has focused primarily on the consumption of vita-

Table 4. Perceived Benefit of Dietary Supplements.

Benefit From Taking Product	Number*
Good health, general illness prevention, diet supplement	262
Cardiovascular benefits	68
Gastrointestinal benefits (digestion, intestinal flora, yeast infection)	65
Musculoskeletal—prevention	45
Energy, metabolism	40
Central nervous system benefits (mind, brain, memory, vision, etc)	39
Antioxidant benefits	38
Immune system benefits	34
Women's health (pregnancy, premenstrual syndrome, menopause, etc.)	33
Other, unsure	29
Musculoskeletal—treatment	27
Dermatologic benefits (skin, hair, nails)	20
Stress relief, calming, sleep aid, pain	20
Gland and endocrine function supplement (thyroid, liver)	19
Cancer prevention	18
Weight loss	11
Hematologic benefits (anemia)	9
Respiratory tract benefits	9
Weight gain and body building	8
Headache, migraine prevention	6
Allergy treatment	4

*Total = 804. Not all respondents answered questions.

mins and minerals or only herbal products and megadoses of vitamins. Our survey included all dietary supplements as designated by the FDA.

Limitations

Our study was limited by the use of two suburban health food stores that serve principally a white middle-class population. Supplement use by other ethnic groups and in other cultures might differ. The health food stores that chose not to participate in our study could have differed somewhat from the two study health food stores. We did not find any notable differences between the customers of the two stores, and these customers appeared to be representative of the white, Eng-

Table 5. Sources of Knowledge of Dietary Supplements.

Source	Number*	Percent
Other (self-research, books, magazines, word of mouth, etc.)	636	79.0
Nutritionist	70	8.7
Physician	49	6.1
Other health care professionals	47	5.8

*Total = 802. Not all respondents answered questions.

lish-speaking clients who frequent health food stores in this area. The 70.1 percent participation rate supports the representative nature of this sample. The preponderance of women customers might be partly attributable to their role as family shoppers, although whether women actually use more health food store products and why will need to be answered by further research.

Regulatory Influences

Both the laws governing the FDA and patent laws have considerable impact on the way in which dietary supplements are produced and marketed in the United States. Currently the law restricts the FDA's oversight of dietary supplements.^{28,29} Almost any substance can be sold as a dietary supplement, and none is required to demonstrate either safety or efficacy. The producers are required only to label the products properly and are told to use clean methods for product preparation. Should a product give any indication of not being safe, the burden of proof lies with the FDA rather than with the company producing the product.²⁹ Consequently, producers have almost unlimited access to sell their products to the public.^{30,31} If a drug effect is claimed, however, then the FDA regulations become very strict and cumbersome, and prolonged and costly testing for safety and efficacy is required.^{30,31} These regulations can be bypassed if no direct drug effect is claimed.

Herbal products are of particular interest because they cannot be patented by pharmaceutical companies. Corporate pharmaceutical companies have little incentive, therefore, to develop and market herbal products as drugs in the United States. Instead, they sell these products as dietary supplements and are restricted by the FDA from making direct therapeutic drug claims. Research, mainly from Europe and Asia, however, has shown evidence of the therapeutic effectiveness of many herbs. Germany has a registry of safe and effective herbs called Commission E, which assists both the patient and physician in making informed choices about herbals.³² In the United States both patients and health care providers must do their own literature research into the efficacy and safety of herbal products. This process is difficult because of having to sort through the many misleading claims in the popular press as well as doing legitimate scientific research, and

the information available in the US medical literature concerning the effectiveness of herbal and dietary supplements is limited.

The American Botanical Council and its publication *HerbalGram* are reliable sources of information regarding herbal products in the United States. The society has an extensive publication list and can be contacted by e-mail at abc@herbalgram.org, on its website at www.herbalgram.org, or by calling 1-800-373-7105.

Supplements Purchased

Safety, efficacy, and possible drug interactions are three principle concerns associated with the use of dietary supplements. Because approximately 50 percent of the adult population^{4,5} use dietary supplements, and because the industry is not required to meet standards for safety, efficacy, or possible drug interaction before marketing, the physician caring for patients should always inquire about the use of supplements. Many supplements can be considered safe based on some previous testing and centuries-long experience without any reports of adverse reactions. Such supplements include nonmegadoses of vitamins and minerals, lecithin, garlic, *Lactobacillus acidophilus*, zinc, enzymes, and low-dose iron. Megadosing of vitamin E and vitamin C has been widely studied, and these vitamins appear to be safe.³³

In 30 years of the medical literature (1966 to 1996) we reviewed by MEDLINE, only 50 (6.2 percent) of the 805 products that appeared in our survey have been reported as causing any adverse reactions in humans, supporting the general overall contention by the supplement industry that dietary supplements are safe.² Nevertheless, MEDLINE had either no or very little information about many of the products. This finding is consistent with that of Philen et al,³⁴ who found that 59 percent of the products advertised in health and body-building magazines had not been tested in humans.

Of the 50 products that had reports of toxicity in the literature, only 22 products were associated with toxic reactions that could clearly be attributed to them. Nine participants reported a daily intake of vitamin A greater than 20,000 IU. Three were taking in excess of 50,000 IU/d, which is toxic to the liver and teratogenic.^{7,35,36} Four clients were taking megadoses of vitamin B₆, which can produce a neuropathy.¹¹ Two parti-

participants were taking ma huang, which contains ephedrine and, together with other stimulants, has become known as causing a legal high. Several deaths have occurred in patients taking these stimulants. Two other participants were taking thyroid extract, which contains active thyroid hormone in excess doses.¹⁴ One customer each was taking lobelia,¹⁵ Kombucha mushroom tea,¹⁷ yohimbe,^{15,16} kelp,²²⁻²⁴ and licorice root,²⁵⁻²⁷ all of which have been documented as producing toxic reactions.

Of the 28 other products with reports of toxicity in the literature, serious toxicity of the supplement has not been proved, and at times the toxicity appears to have been caused by contamination.^{6,16,19,20} Within this group of products, 14 participants were taking ginseng,^{6,37,38} and 9 were taking alfalfa.^{9,10} One participant each was taking valerian,^{16,39} guarana,¹⁸ burdock root,^{19,20} and chromium picolinate.²¹ These products are widely used and appear to be safe; however, further studies are needed to clarify safety issues in some instances.

The scope of this report does not include an exhaustive medical literature review on the six herbs most commonly consumed (Table 3). Garlic⁴⁰⁻⁴³ and *Ginkgo biloba*^{44,45} have been studied extensively, including double-blind studies showing convincing medical effectiveness. Many other herbal products have also been studied but less thoroughly. Most studies of herbal effectiveness are from European and Asian countries, where herbal products are more widely used. US physicians are not generally aware of these studies and the possible application of the substances in the treatment of a variety of conditions. Furthermore, it seems unlikely that there will be serious research on herbal products in the United States, because they cannot be patented.

Many other supplements have not been adequately tested; therefore, safety, efficacy, and possible drug interactions are largely unknown. The inadequately tested supplements include many herbal products, vitamin C-bioflavonoid combinations, proteins and amino acids, chromium and chromium picolinate, tissue and glandular extract, selenium, pycnogenal, melatonin, and other vitamin and mineral combinations in megadoses. Some studies support a cardioprotective effect of vitamin E, although its use for this purpose remains unclear and controversial.⁴⁶ The cancer-prevention effects of the antioxidants vitamin E,

vitamin C, selenium, pycnogenal, and zinc also are subject to controversy.⁴⁷

More than one half of the participants in this survey were taking a prescription medication along with multiple dietary supplements. Very little is known about the interaction of dietary supplements, either with each other or with prescription medications. With about 50 percent of adults taking dietary supplements, many possibilities exist for an interaction between supplements and prescription medications.

Dietary Supplement Users

The typical customer purchasing dietary supplements at these two health food stores was white, female, middle-aged, and educated beyond high school (Table 1). Our findings were consistent with those of previous studies that showed a positive correlation between the education level of the participant and the use of dietary supplements, that is, those with more education used more supplements.^{4,48}

Customers surveyed used an average of 5.9 products, suggesting considerable belief in their efficacy. Most customers had health insurance and stated that they had a regular physician. This finding runs counter to the impression that those who use nutritional supplements avoid mainstream medicine and might be more exclusive in their use of alternative medical care. Instead, we found they seek regular health care as well as alternative medicine. In an inquiry into supplement use limited to herbal products and megadose vitamins, Eisenberg et al³ found that those who used alternative health care also sought conventional medical care.

Most of the participants considered themselves healthy and were not taking supplements to treat an existing problem but took supplements to prevent a health problem (84.3 percent). This finding reflects a strong desire by these respondents to prevent illness and to be healthy. The participants also tended to take the products based on their own reading information from various sources. They typically had not consulted their physician about taking the supplement even though most had a physician and had generally informed their physician about taking supplements. This finding is consistent with their own observations that their health was good to excellent (more than 89.0 percent), that they were taking supplements to stay

healthy, and that they were confident in their abilities to manage their own health care.

This pattern of supplement use suggests some patients might consider their physicians not to be knowledgeable about supplements and their benefits, so their physicians' opinions on supplements are not apparently sought. The results also suggest inadequate discussion of prevention and health maintenance practices in the physician's office, which could lead patients to seek this information elsewhere. Further research is needed to clarify these important issues.

Summary

Current US laws allow unrestricted sales of dietary supplements and provide few incentives for research, especially into herbal compounds. Our study shows self-informed customers consuming dietary supplements without consulting their physicians. The supplements were purchased mainly for preventive health purposes and include a few potentially toxic products. For many of the products data were insufficient to make any conclusions about safety or effectiveness. For a few of the commonly ingested herbal products, such as garlic and *Ginkgo biloba*, there are considerable published data, mainly from sources outside the United States, to support their effectiveness for some conditions. Physicians should engage their patients in a dialogue about supplements and become more knowledgeable about clinical safety and effectiveness of these products.

Additional research is needed to clarify further many issues pertaining to dietary supplements. The effectiveness of herbs and many supplements can be easily studied using double-blind, randomized controlled studies to treat specific conditions. Cross-sectional and descriptive studies among a variety of populations would help determine the use of dietary supplements and their relation to disease and health. Case-controlled and cohort studies would help clarify supplement use and the ability of supplements to prevent illness.

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