

Nutrition Education Issues for Older Adults

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Abstract

The aging of the U.S. population has increased the number of older people with nutrition-related chronic disorders. This review provides a foundation for those who provide services to this

population by summarizing dietary and nutritional recommendations for older adults, describing the need and value of nutrition education, and emphasizing its potential to delay morbidity and improve quality of life. Topics addressed include decreasing sodium; increasing the intakes of fruits, vegetables, whole grains, low-fat milk products, vitamins B12 and D from fortified foods or dietary supplements; and understanding the importance of physical activity and weight management.

Keywords: Elderly, dietary recommendations, nutrition education, counseling

Introduction

Both the aging of the baby boomers and the increased life expectancy of older adults are leading to large increases in the number and percentage of older adults in the U.S. population, as well as the number of people with nutrition-related chronic disorders. Thus, this review summarizes dietary and nutritional recommendations, as well as the need for and value of nutrition education for older adults.

The 2005 Dietary Guidelines for Americans has several recommendations for this population. Areas in which nutrition education efforts are needed include helping older adults to decrease their intake of sodium and increase their intake of fruits, vegetables, whole grain foods, low-fat milk products, and the intakes of vitamin B12 and vitamin D from fortified foods or dietary supplements. Physical activity and weight management will also need to be integrated into nutrition education efforts. Nutrition education has great potential to delay morbidity and mortality and to improve the quality of life for older adults and their caregivers (Amarantos et al. 2001; Sahyoun et al. 2004; Silver and Wellman 2002).

This paper provides inclusive background information on nutrition, health, and quality of life issues for older adults. It is intended to provide a foundation for nutrition educators who provide service to this population, as well as those who may work with older adults in the future, and for nutrition professionals who advocate for public policies in support of nutrition services and nutrition education for older adults.

Demographics of aging

The population aged 65 and older will increase by an average of about 1 million per year for the next 50 years (U.S. Census Bureau 2004). Sources of information about demographics of aging for each state are shown in Table 1. The number of people 65 and older will increase from 37.3 million in 2006 to nearly 54.6 million in 2020 and 86.7 million in 2050 (Federal Interagency Forum on Aging and Related Statistics 2008). About 86.5 percent of the older adult population are aged 65 to 84, and 13.5 percent are aged 85 and older (Figure 1). The majority is white (61

percent) and the other predominant ethnic/racial groups are black (12 percent) and Hispanic (18 percent) (Figure 2). More than 95 percent of older adults live in the community rather than in long-term care facilities (Federal Interagency Forum on Aging and Related Statistics 2008). Older adults want to remain independent and living in their own homes rather than long-term care facilities (McNulty 2005). The 65-year-old of today can expect to live more than 18.7 additional years, and the 85-year-old, more than 6.6 additional years (Federal Interagency Forum on Aging and Related Statistics 2008). However, their quality of life may be compromised as chronic health problems are prevalent. Moderate or severe memory impairment was reported among 6 percent of people aged 65 to 69, and among 33 percent of those aged 85 and older (Federal Interagency Forum on Aging and Related Statistics 2006). Depressive symptoms occur in 11 percent of men and 16.8 percent of women aged 65 and older. Functional limitations decreased from 49 percent in 1992 to 42 percent in 2005 among older adults. However, the overall number of older adults with a disability has increased due to the aging of the population. Hearing impairment (48 percent in men and 35.1 percent in women) and visual impairment, even with glasses or contact lenses (16.1 percent in men and 18.4 percent in women), are common. Chronic health conditions are prevalent in adults aged 65 and older (Table 2). Nutrition is an important ingredient in the prevention and management of most of these health conditions (American Diabetes Association 2005). Rising health care costs and increasing numbers of older adults are driving the need and interest in prevention, and nutrition education plays a critical role.

Poverty rates are high among older adults (9 percent, Federal Interagency Forum on Aging and Related Statistics 2008). Poverty increases the risk of having inadequate income for food, housing, health care, and other needs. In 2004, older adults who were poor or near poor spent 29 percent of their household income on out-of-pocket health care expenditures compared to 8 percent of those with higher incomes. Average prescription drug costs were \$1,987 in 2004 for older adults (Federal Interagency Forum on Aging and Related Statistics 2008). Some older adults may have difficulty obtaining transportation (AARP Public Policy Institute 2004), which could impair access to food and to information and health care. Overall, the majority of older adults live in the community without chronic disabilities or memory impairments. The high prevalence of nutrition-related chronic illnesses suggests that nutrition education needs to be a priority for the 37 million older adults in the United States and that nutrition educators must be knowledgeable about diet and disease relationships specific to the older adult population. Advanced age alone is unlikely to interfere with the benefits of nutrition education (Sahyoun et al. 2004). On the other hand, issues such as transportation, income, and sensory deficits may make it difficult for some elders to reap the full benefits of community-based nutrition education programs. Therefore, attending to transportation needs, to food budget limitations, and to physical limitations should be a part of every nutrition education program. Using stage of change models that are applicable to older adults also may be helpful in tailoring education to the needs and interests of the targeted group (Greene et al. 2004; Tucker et al. 2002).

2005 Dietary Guidelines for older Americans

The 2005 Dietary Guidelines for Americans provides primary evidence-based recommendations for Americans over two years of age (USDHHS and USDA 2005a; 2005b; 2005c). Several recommendations have special implications for older adults (Table 3). Weight management, weight loss, and physical activity recommendations are made specifically for older adults. There are large differences among older adults, based primarily on age, gender, and activity level. The overall recommended eating plans are based on the USDA Food Guide and the Dietary Approaches to Stop Hypertension Eating Plan. This USDA Food Guide is shown in Table 4. Additional eating plans for other calorie levels are available.

Fruits and vegetables

It is recommended that sedentary men (2,000 calories) and women (1,600 calories) aged 51 and older consume three to four servings (2 cups) of fruits and four to five servings (2½ cups) of vegetables daily. There are numerous healthful substances in fruits and vegetables that protect against chronic diseases, including fibers, vitamins, and other compounds such as carotenoids (beta-carotene, Cooper et al. 2004). Since fiber intakes are low among older adults (Table 3), the fiber in fruits and vegetables is especially valuable in their diets.

Although the health benefits of fruits and vegetables are widely acknowledged, these new recommendations are a substantial increase over the previously recommended five servings daily. Older adults were more likely than younger adults to consume five or more servings daily, e.g., 33 percent of those 65 years and older consume five or more servings compared to 26 percent or less for those 64 years old and younger (CDC 2005). Sources of information about fruit and vegetable intakes for each state are shown in Table 1.

Some health conditions and medications should be considered when making recommendations for fruits and vegetables for older adults. People taking blood-thinners such as warfarin are frequently advised to avoid dark green vegetables, even though the evidence is not strong that moderate intakes of green vegetables and vitamin K interfere with these medications (Johnson 2005). Although grapefruit, and potentially orange and apple juices, may interfere with some medications, there is variability among the medications, so older adults should consult their physicians. Harmful effects associated with grapefruit juice and statin use are not believed to occur unless consumption is excessive, e.g., more than one quart per day (Pasternak et al. 2002). The Dietary Guidelines recommendations for fruit are acceptable for people with diabetes, provided they adhere to their energy and carbohydrate guidelines (American Diabetes Association 2004).

One strategy to increase fruit and vegetable consumption among low-income older adults is through governmental programs such as the Senior Farmers' Market Nutrition Program (SFMNP), which provides coupons for purchase of locally grown fruits, vegetables, and herbs at farmers' markets, roadside stands, and community-support agriculture programs (Wellman and Kamp 2004; USDA 2006). USDA initiated the SFMNP as a pilot program in 2001 to improve the dietary patterns and health of low-income seniors, as well as to increase domestic consumption of agricultural commodities. The program is available to all states and is a permanent program rather than a competitive grant (USDA 2006). The average coupon benefit is \$17.50 per year (range from \$20 to \$50 annually, USDA 2006). In an evaluation of the SFMNP in South Carolina, 89 percent of the participants reported the intention to eat more fruits and vegetables year round because of the program (Kunkel et al. 2003). Home delivery of educational materials and fruits and vegetables from the SFMNP, in those states where it is available, appears to be an effective way to increase fruit and vegetable intake in homebound seniors (Johnson et al. 2004). Another strategy to improve fruit and vegetable consumption is to provide nutrition education. Successful programs have shown increases in some fruit and vegetable categories after nutrition intervention in older adults participating in congregate meal programs (MaCamey et al. 2003; Hendrix et al. 2008; Speer et al. 2008)

Whole grain foods

Whole grain foods contribute fiber and other healthful substances such as phytochemicals to the diet. All adults should consume three servings of whole grain foods daily, but the average actual intake is closer to one serving daily (USDHHS and USDA 2005a). Whole grains may be particularly helpful to older adults seeking to control blood sugar, lower blood cholesterol, and improve laxation. The major food sources of whole grains are breads and breakfast cereals.

It is believed that older adults have low intakes of whole grains because of taste, preparation times, and lack of knowledge about the health benefits of whole grains and which foods are whole grains. Lack of knowledge about the recommended number of servings of whole grains and difficulties in identifying whole grain foods were associated with low intakes of whole grain foods in older adults receiving congregate meals in Georgia (Ellis et al. 2005). A nutrition and health education program that emphasized the health benefits of whole grains, ways to identify whole grain foods, and the health message "Three are Key," (i.e., at least three of the recommended daily servings of grains should be whole grain foods) led to improved knowledge, attitudes, and consumption of whole grain foods in participating older adults. Following the intervention, participants were more likely to report a significantly increased intake of selected whole grain foods (5.8 vs. 6.9 times/week, Ellis et al. 2005).

Milk and other dairy foods

Milk product consumption has been positively associated with overall dietary quality, adequacy of nutrient intake, and bone health throughout the lifecycle (USDHHS and USDA 2005a). Milk and dairy products provide the majority of calcium consumed by Americans. It is recommended that adults consume three cups per day of fat-free or low-fat milk or equivalent milk products (USDHHS and USDA 2005a). Fewer than 20 percent of older Americans drink milk even twice daily, and nearly 50 percent drink milk less than once daily (Elbon et al. 1998), despite decades of promotion and education about the health benefits of these foods. In NHANES 1999-2000 the average daily consumption of milk was about one-half cup in African Americans and about one cup in almost all races (Fulgoni et al. 2007). Dietary calcium falls short of recommendations (Table 3). Those who avoid milk products need to choose other calcium-rich foods such as calcium-rich vegetables (range from 77 to 178 mg per serving) and fortified foods (range from 236 to 1,043 mg per serving) (USDHHS and USDA 2005a). Lactose-intolerant individuals can use lactose-reduced or low-lactose milk products, consume small servings of milk several times a day, take the enzyme lactase before consuming milk products, or eat other calcium-rich foods. Supplements as a source of calcium will be discussed later. Nutrition education interventions have led to small increases in the intake of dairy and other calcium-rich foods in older adults (Cheong et al. 2003; Manios et al. 2006). The number of participants who consumed three or more servings of calcium-rich foods daily or used a calcium supplement more than doubled after a nutrition and health education intervention (Cheong et al. 2003).

Sodium and potassium

The Dietary Guidelines recommends that individuals with hypertension, blacks, and middle-aged and older adults consume no more than 1,500 mg of sodium per day and meet the potassium recommendation of 4,700 mg per day with food (USDHHS and USDA, 2005a). For the general population, no more than 2,300 mg of sodium per day is recommended. Older adults have high intakes of sodium on average – more than 2,700 mg per day by women and more than 3,400 mg per day by men (Table 3). About 77 percent of dietary sodium is derived from salt added by food manufacturers (Mattes et al. 1991). Thus, identification of the sodium content of processed foods should be a critical part of nutrition education about sodium.

A potassium-rich diet may help blunt the effects of salt on blood pressure, may reduce the risk of developing kidney stones, and possibly decrease bone loss with age (USDHHS and USDA 2005a). Average intakes of potassium by older adults are far below the recommended 4,700 mg per day (Table 3). Increases in consumption of plant-based foods would improve potassium intakes. While salt substitutes containing potassium chloride may be useful for some individuals, they can be harmful to people with certain medical conditions (USDHHS and USDA 2005a). A study has shown an improvement in decreasing sodium and increasing potassium intakes after an

intensive counseling intervention. In that study, as a part of a lifestyle modification intervention, 810 adults with a mean age of 50 received the recommendation to consume no more than 2,300 mg sodium and at least nine to twelve servings of fruits and vegetables per day (Svetkey et al. 2005). Participants were randomly assigned to one of three intervention groups. The first group received only one counseling session at the time of randomization (referred to as Advice). The second group received traditional lifestyle recommendations and was scheduled to attend 18 counseling sessions (referred to as EST). The third group received traditional lifestyle recommendations plus the Dietary Approaches to Stop Hypertension diet (DASH), and was scheduled to attend 18 counseling sessions (referred to as EST + DASH). After six months of intervention, participants in the EST (38 percent) and EST + DASH (24 percent) groups were more likely than the Advice group (18 percent) to consume the recommended daily amount of sodium. About 34 percent of adults in the EST + DASH group consumed at least nine servings of fruits and vegetables daily, compared to 7.8 percent in the Advice group and 6.3 percent in the EST group. Increased fruit and vegetable intakes in the EST + DASH group were reflected in elevated potassium excretion in urine (Svetkey et al. 2005).

Hydration

Adequate fluid intake has been found to decrease the number of falls, lower rates of constipation, and improve rehabilitation outcomes in orthopedic patients (reviewed by Mentes 2006). Older adults are at higher risk of dehydration due to age-related changes such as diminished thirst response, decrease in total body water, and declined kidney function (Mentes 2006). Dehydration can have detrimental effects in the older adult population, and it is recommended that older adults consume fruit juices, low-sodium soups, decaffeinated coffee and tea, and water-rich fruits and vegetables in addition to water (Mentes 2006).

Dietary supplements

Dietary supplements include vitamins, minerals, herbs and other botanicals, amino acids, and other substances. Dietary supplement use is high among older adults – about 40 percent in women and 52 percent in men (National Health and Nutrition Examination Survey 1999-2000; Radimer et al. 2004). Non-Hispanic black and Mexican Americans are less likely to use dietary supplements than non-Hispanic whites (Radimer et al. 2004). Non-nutrient supplements that might be beneficial for older adults are discussed later in this document (Johnson 2004).

The evidence base for the appropriate use of vitamin and mineral supplements has been reviewed (Park et al. 2008). In the 2006 reauthorization of the Older American Act, Congress stated that “nutrition service providers under the Older Americans Act of 1965 should consider whether individuals participating in congregate and home-delivered meal programs would benefit from a single, daily multivitamin-mineral supplement that is in compliance with all applicable

government quality standards and provides at least ? of the essential vitamins and minerals at 100 percent of the daily value levels as determined by the Commissioner of Food and Drugs” (Older Americans Act Amendments 2006). Because many programs at the state and local levels do not have registered dietitians on staff to make this assessment, these nutrition service providers need guidance on supplements and educational programs appropriate for older adults. Well-designed supplement education programs have been shown to improve several aspects of dietary supplement use in older adults (Mitchell et al. 2006; Cheong et al. 2003). Low-income older adults who received a five-session nutrition education program on use of dietary supplements were significantly more likely to increase multivitamin and calcium supplement use, to read labels, to carry a supplement or medicine list, and to talk with their health care providers regarding supplement use than those who did not receive specific education on dietary supplement use (Mitchell et al. 2006).

Some specific nutrient-containing dietary supplements are recommended for older adults by the Dietary Guidelines and other reliable sources (USDHHS 2004). Recommended supplements include vitamin B12 (USDHHS and USDA 2005a) and vitamin D (USDHHS and USDA 2005a; USDHHS 2004) from fortified foods and/or supplements, and calcium supplements for those not consuming adequate calcium from dietary sources (USDHHS 2004). While typical foods can be consumed to meet the dietary requirements for vitamin B12 and calcium, it is unlikely that typical foods will be fortified to the high levels needed to meet the recommendation of 1,000 International Unit (IU) of vitamin D daily (Johnson and Kimlin 2006). It has been recognized for several years that older adults are particularly vulnerable to deficiencies of vitamin B12, vitamin D, and calcium (Russell et al. 1999), so these three nutrients will be discussed in more detail below.

Vitamin B12. Vitamin B12 is essential for cognition, the nervous system, vascular health, and building red blood cells (Baik and Russell 1999). Poor vitamin B12 status has been linked to depression in some, but not all, studies (Coppens and Bolander-Gouaille 2005). Poor vitamin B12 status is prevalent among older adults (Baik and Russell 1999) and may be particularly high among recipients of home-delivered and congregate meals (Johnson et al. 2003). Vitamin B12 deficiency and related disorders among these vulnerable elders has been associated with poor cognition (Johnson et al. 2003; Lewis et al. 2005). The prevalence of vitamin B12 deficiency increases with age, mainly because of decreased ability to digest the natural chemical form of vitamin B12 found in meat, poultry, fish, and dairy foods (Baik and Russell 1999; Park and Johnson 2006). About 10 percent to 30 percent of older adults have atrophic gastritis, which is caused by infection of the stomach with *Helicobacter pylori* and subsequent atrophy of the cells in the stomach that secrete acid and digestive enzymes needed for the digestion and absorption of vitamin B12 (Baik and Russell 1999). Protein-bound vitamin B12 from animal foods, but not the crystalline form (added), requires these digestive enzymes. Added vitamin B12 from fortified foods and dietary supplements is believed to be normally absorbed in those with atrophic

gastritis. About 1 percent to 2 percent of older adults have pernicious anemia, which results from a loss of the intrinsic factor needed for intestinal absorption of vitamin B12. Under medical supervision, vitamin B12 status in these individuals is maintained by monthly injections of vitamin B12 or daily oral doses (500 to 2,000 µg daily, Kuzminski et al. 1998).

Similar to the Dietary Reference Intakes, the Dietary Guidelines recommends that the Recommended Dietary Allowance (RDA) for vitamin B12 (2.4 µg/day) be met from the added form such as vitamin B12-containing fortified foods or dietary supplements. Added vitamin B12 is in many, but not all, fortified breakfast cereals and multivitamin supplements. The Daily Value (the standard used for labeling of foods and dietary supplements) for vitamin B12 is 6 µg (Code of Federal Regulations 2003); therefore, a single serving of a vitamin B12-containing food and supplement with at least 40 percent of the Daily Value would meet the RDA for vitamin B12. Several studies show that older adults consuming between 9 µg and 50 µg of vitamin B12 daily, the amount often found in multivitamins marketed to older adults, have improved vitamin B12 status (Johnson 2004). There is no Upper Level for vitamin B12, that is, overconsumption does not result in an intake level of the nutrient high enough to pose a risk of adverse health effects, and it is generally considered non-toxic. Nutrition education intervention in older adults has been shown to increase the use of multivitamins, which are an important source of vitamin B12 (Mitchell et al. 2006).

Vitamin D. The 2005 Dietary Guidelines for Americans recommends that older adults consume 1,000 IU (25 µg) daily of vitamin D, which is a substantial increase above the Adequate Intake (50 to 70 years: 400 IU; > 70 years: 600 IU, IOM 1997). There is considerable interest in vitamin D, which was the subject of two symposia (Calvo and Whiting 2005; Raiten and Picciano 2004). Adequate vitamin D status is needed for optimal calcium absorption (USDHHS and USDA 2005a), while poor vitamin D status has been linked to numerous health conditions (Calvo and Whiting 2005; Raiten and Picciano 2004). There is evidence from randomized control trials that vitamin D and/or calcium supplements decrease the risk of bone fractures from falls (Chapuy et al. 1992; Bischoff-Ferrari et al. 2004, 2005; Dawson-Hughes et al. 1997; Papadimitropoulos et al. 2002; Shea et al. 2002; Fosnight et al. 2008).

Vitamin D comes from diet, supplements, and skin synthesis (Johnson and Kimlin 2006). Older adults, as well as people with dark pigmented skin or people who use sunscreen properly, have low synthesis of vitamin D precursors in the skin, even in sunny areas of the United States, such as southern Florida (Levis et al. 2005; Park and Johnson 2005). People living at higher latitudes in the United States are particularly at risk for vitamin D deficiency as well. Other factors putting darker skinned ethnic/racial groups at increased risk of poor vitamin D status include lower intakes of dairy foods and vitamin D-containing supplements, as well as being obese, which may lead to less time spent in the sun or sequestration of vitamin D in the fat mass (Park and Johnson 2005). The best marker of vitamin D status from oral intake and skin synthesis is serum 25-

hydroxyvitamin D. Optimal serum 25-hydroxyvitamin D may be as high as 80 nmol/L based on randomized control trials of vitamin D supplementation and bone fractures and minimization of parathyroid hormone (Dawson-Hughes 2004). Those exposed to little sunlight, such as homebound individuals, also have increased risk of low serum concentrations of 25-hydroxyvitamin D.

Various ways to meet the vitamin D recommendation with foods and supplements are shown in Table 5. It is very difficult to meet vitamin D recommendations from foods, so most older people need to take supplements. As shown in the table, the amount of supplement needed will depend on the dietary intake of vitamin D from the servings of milk or yogurt consumed, as well as the individual's level of consumption of other foods rich in vitamin D such as fortified orange juice, fortified cereal, fish, shellfish, and eggs. According to Weihrauch and Tamaki (1991), fish such as salmon has about 324 to 624 IU vitamin D per 100 grams and canned tuna has 236 IU vitamin D per 100 grams, while the average among the 26 commonly eaten fish products is about 300 IU per 100 grams. The Upper Level of vitamin D is 2,000 IU daily, so older adults who eat a lot of fish or other foods high in vitamin D should carefully read the labels on supplements to ensure staying below the Upper Level. This will be particularly important if the supplement industry markets higher potency vitamin D supplements than those currently available. Nutrition education intervention in older adults has led to small increases in the use of vitamin D-containing supplements (Cheong et al. 2003; Mitchell et al. 2006).

Calcium. Diet provides only 56 percent to 68 percent of the recommended amounts of calcium (Table 3). The Dietary Guidelines recommends food sources of calcium, but does not mention calcium supplements. The Surgeon General's report on bone health and osteoporosis provides an algorithm to calculate calcium intake from the diet (USDHHS 2004), which can then be used to determine the amount of calcium, if any, needed from supplements. For older adults, the report suggests starting with a baseline amount of calcium of 290 mg, which is the average of amount of calcium from non-calcium rich foods, then adding 300 mg for each 8-ounce serving of milk or equivalent serving of other calcium-rich foods (e.g., yogurt, cheese, and calcium-fortified juice). The shortfall can be obtained from supplements. Low calcium intake and reduced absorption are associated with accelerated age-related bone loss, increased risk of bone fractures, and loss of teeth in older individuals (Lane 2006; Faine 1995). There is also data relating low calcium intake to an increased risk of colon cancer and elevated blood pressure (NIH Office of Dietary Supplements 2005). Very high levels of calcium intake have been associated with impaired kidney function and decreased absorption of other minerals, such as iron, zinc, magnesium, and phosphorus, and in certain instances high calcium intake has been associated with hypercalcemia (NIH Office of Dietary Supplements 2005). Label reading should ensure that the Upper Level for calcium 2,500 mg daily is not exceeded. Nutrition education intervention in older adults has led to an increase in the use of calcium supplements (Cheong et al. 2003; Mitchell et al. 2006), which helps to increase overall calcium intake.

Antioxidant supplements. The United States Preventive Services Task Force (USPSTF 2003) concluded that there is insufficient evidence to recommend for or against the use of vitamin A, C, or E supplements, multivitamins with folic acid, or antioxidant combinations for prevention of cancer or cardiovascular disease. The USPSTF recommended against using supplements of beta-carotene for prevention of cancer or cardiovascular disease because of adverse outcomes in some people (such as heavy smokers). Therefore, nutrition education interventions may be useful in increasing intakes of antioxidant containing foods for disease prevention.

Non-nutrient dietary supplements. In the National Health Interview Survey in 2002, about 36 percent of adult respondents used complimentary and alternative medicines, but this number increased to 62 percent when prayer was included (National Center for Complementary and Alternative Medicine 2004). The top ten non-nutrient supplements in order of use are echinacea, ginseng, ginkgo biloba, garlic supplements, glucosamine, St. John's wort, peppermint, fish oils/omega-3 fatty acids, ginger supplements, and soy supplements (National Center for Complementary and Alternative Medicine 2004). Very few of these supplements have been systematically reviewed for safety and efficacy, such as by the Agency for Healthcare Research and Quality or the Cochrane Review system. Reviews that have been done show that glucosamine is both effective and safe for relieving some symptoms of osteoarthritis (Towheed et al. 2005). St. John's wort may be effective for short-term treatment of mild to moderately severe depressive disorders (Linde and Mulrow 2004). Some, but not all, studies show that ginkgo biloba modestly improves cognition and function in those with cognitive impairment or dementia (Birks et al. 2006).

Other dietary supplements. Garlic modestly improves blood lipid profiles, but has little effect on other indices of cardiovascular health or cancer (Agency for Healthcare Research and Quality 2000). Fish or fish oils containing omega-3 fatty acids reduce all cause mortality and some cardiovascular disease outcomes (Agency for Healthcare Research and Quality 2004).

Cautions about dietary supplements

Older adults must ask important questions about their need for and use of supplements (Table 6, USFDA 2003). Dietary supplements should be treated like any other medication, and individuals must inform their physicians about the products they are using. This is important for people taking prescription and over-the-counter medications, because supplements can contain active ingredients that may interfere with medications making them stronger or weaker. For example, garlic, ginkgo, echinacea, ginseng, St. John's wort, and kava are all suspected of interacting with medications, especially anticancer drugs and blood thinners (Ernst 2002; Sparreboom et al. 2004; Memorial Sloan-Kettering Cancer Center 2008). It is vitally important that people undergoing surgery inform their physicians because some supplements promote bleeding or interfere with other aspects of surgery and recovery.

Overweight and obesity

The prevalence of overweight and obesity is increasing in the older adult population and is likely to become an even greater problem in the future if not stemmed (McTigue et al. 2006; Villareal et al. 2005; Callahan and Jensen 2004; Center on an Aging Society 2003; Ogden et al. 2006; Kennedy et al. 2004; NIH 1998, 2000). Sources of information about overweight and obesity for each state are shown in Table 1. The body mass index (BMI) is used to determine prevalence of overweight and obesity (weight in kilograms divided by square of height in meters, kg/m²). Overweight is defined as a BMI of 25 to 29.9, while obesity is defined as BMI of 30 or higher. The prevalence of overweight among those aged 65 and older is 64.6 percent in women and 73.9 percent in men. The prevalence of obesity is 36.1 percent in women and 29.7 percent in men (Federal Interagency Forum on Aging and Related Statistics 2008). There is some concern that the BMI associated with optimal health and prevention of mortality has not been clearly established in older adults (Bales et al. 2008; Cunningham 2007; Kennedy et al. 2004), however, evidence that obesity is associated with health problems in older adults will be discussed below. Also, the National Institutes of Health has made recommendations about weight loss in obese older adults (NIH 1998, 2000; Table 7).

In addition to weight gain, aging is associated with marked increases in total body fat and visceral fat and with decreases in skeletal muscle (Villareal et al. 2005; Evans 2004). This loss of skeletal muscle, called sarcopenia, may be caused by low physical activity, changes in hormone function, resistance to insulin, and perhaps increased dietary protein needs (Evans 2004). The process of sarcopenia is accelerated by low physical activity, weight loss, and low protein intake. When low muscle mass and high fat mass coexist, a condition known as “sarcopenic obesity,” it amplifies the disabling effects for the elderly as weaker muscles attempt to carry greater body weight (Roubenoff 2004). High fat mass promotes a biochemical imbalance that promotes insulin resistance and further muscle loss, eventually leading to disability and obesity related disorders (Roubenoff 2004).

Overweight and obesity are associated with increased health care costs and numerous chronic disorders in older adults including hypertension, diabetes mellitus, metabolic syndrome, dyslipidemia, coronary artery disease, respiratory disease, some types of cancer, and depression here.

(McTigue et al. 2006; Villareal et al. 2005; Center on an Aging Society 2003; Finkelstein et al. 2003, 2004; Callahan and Jensen 2004). Of particular significance are the physical disabilities associated with overweight and obesity, such as impaired walking, traveling, shopping, and preparing food. Obesity may cause premature aging. For example, the prevalence of severe disability (having three or more impairments in activities of daily living) was 6 percent in obese people aged 51 to 60 years versus only 7 percent in non-obese people aged 70 and older (Center

on an Aging Society 2003). These disabling effects may result in admission to health care facilities at an earlier age because of the individual's need for assistance (Elkins et al. 2006).

Although genetic predisposition is related to obesity, there are several modifiable risk factors for obesity such as environment, lifestyle, and behavioral issues. Callahan and Jensen (2004) suggest that weight gain and a sedentary lifestyle might be accepted as a normal part of the aging process, which might cause older adults to make few efforts toward prevention.

In the older adult, obesity appears to be associated with poor food choices, high intakes of fat and saturated fat, low intakes of fiber and micronutrients, and low blood concentrations of micronutrients (Ledikwe et al. 2003, 2004). Ledikwe et al. (2004) reported that rural older adults who consumed a low-nutrient-dense dietary pattern rather than a high-nutrient-dense dietary pattern were twice as likely to be obese and three to seventeen times more likely to have low plasma vitamin B12 and inadequate intakes of folate, vitamin B6, vitamin E, magnesium, and zinc. Obesity has also been associated with poor vitamin D status, perhaps because of low vitamin D intakes or redistribution of vitamin D into the fat mass (Jacques et al. 1997). Thus, obese older adults are at risk for nutrient excesses (energy, fat, and carbohydrate) as well as nutrient deficiencies (protein, vitamins, and minerals, Jacques et al. 1997; Ledikwe et al. 2003, 2004).

Overweight or obese older adults should not gain additional weight, but weight loss cannot be broadly recommended or attempted without medical evaluation and supervision (Jensen et al., 2004; Callahan and Jensen 2004; NIH 1998, 2000). The 2005 Dietary Guidelines makes no specific weight loss recommendations or goals for overweight or obese people aged 60 and older (USDHHS and USDA 2005a). NIH has considered the evidence for weight loss in older adults, and their recommendations are shown in Table 7 (NIH 1998, 2000). Their evidence statement and recommendation are "Category D" because there is too little research available to make evidence-based recommendations (NIH 1998). Only a few research studies have been conducted to identify appropriate interventions and treatments for obesity in older adults (Jensen et al. 2004; Callahan and Jensen 2004; NIH 1998, 2000). In agreement with NIH (1998, 2000), Jensen et al. (2004) emphasized that management of weight loss in older adults should be guided by an evaluation of the potential risks and benefits for each individual. It was also emphasized that the preservation of strength and flexibility, rather than weight loss, might be a better goal than weight reduction in obese and frail older adults.

In summary, dietitians should be involved with medically supervised weight loss programs for overweight and obese older adults. However, without medical and clinical support, because of the unknown effectiveness of weight reduction in this population and the potential harmful effects weight loss may have on muscular and bone mass, it is not appropriate to initiate weight loss programs in older adults. It is critical, though, that dietitians and other nutrition educators

encourage overweight and obese older adults to seek medical evaluation for potential weight problems. They can also recommend healthy food choices, help overweight individuals build the skills necessary to select, prepare, store, and consume foods for a healthy diet, and encourage physical activity.

Physical activity

Physical activity can extend years of active life, help maintain healthy body weight, decrease risk of cardiovascular disease and other chronic diseases, reduce disability, relieve symptoms of depression, help maintain independent living, and enhance overall quality of life. It is therapeutic for many chronic conditions (Hui and Rubenstein 2006; Cress et al. 2005; Kennedy et al. 2004; USDHHS and USDA 2005a). At a time when the importance of regular physical activity to health is being promoted for all ages, it appears that older adults are not following the recommendation of at least 30 minutes of moderate-intensity physical activity on most, preferably all, days of the week (USDHHS and USDA 2005a). Sources of information about physical activity for each state are shown in Table 1.

An alarming 61 percent of older Americans do not engage in at least 30 minutes of moderate physical activity five or more days a week (CDC/BRFSS 2005). According to the Best Practices Statement prepared by an expert panel on physical activity in older adults, a well-rounded physical activity program encompassing strength, endurance, balance, and flexibility should be used for overall health, fitness, and well being (Cress 2005).

The strength training component of a physical activity program helps slow the development of sarcopenia. An increase in muscle strength and mass in older adults is a realistic strategy for maintaining functional status and independence (Evans 2004). Strength training using progressive resistance training has been shown to increase muscle size in older adults where muscle mass loss and weakness are prevalent (Evans 2004). Only 13 percent of older people reported engaging in strengthening exercises from 2005 to 2006 (Schoenborn et al. 2006). Other physical activity components are also used to promote well being. Flexibility training increases the range of motion around the joint. Endurance training may provide the greatest protection against the deleterious effects of chronic diseases associated with aging. Balance is vital to older adults because it helps to control the body over the base of support to avoid falling. Balance training, static or dynamic, improves the ability to maintain standing balance and balance while moving.

Older people who were provided with and participated in physical activity lessons as part of a nutrition education program demonstrated an improvement in physical function and level of physical activity (Fitzpatrick et al. 2008). All physical activity sessions should include warm-up and cool-down sessions that include stretching (Cress et al. 2005). In contrast to common belief,

the expert panel mentioned above recommends that older adults should not be required to have a pre-exercise screening by a physician before engaging in low-intensity physical activity. However, those with chronic conditions or disabilities should develop an individualized activity plan with their health care provider (Cress et al. 2005).

Nutrition educators should encourage older adults to include physical activities that foster strength, flexibility, endurance, and balance and to consult their health care provider as needed to ensure an appropriate physical activity plan. Evidence-based information about appropriate physical activity for older adults should be provided. Nutrition educators can use and recommend the use of credible, evidence-based books and programs on physical activity (e.g., Fitzpatrick et al. 2008; McClelland 2005; Seguin et al. 2002).

Nutrition and quality of life

The term “quality of life” has many social and biomedical meanings (Amarantos et al. 2001). Dimensions of quality of life include behavioral competence (e.g., health, cognition, time use, and social activities), perceived quality of life (subjective view of mental and physical status), psychological well-being (mental and/or emotional status), physical status (e.g., pain, mobility, and appetite), and physical environment (where a person lives and whom they live with). The American Dietetic Association recommends including a nutrition quality of life assessment in the nutrition care process. A Nutrition Quality of Life Survey provides a tool for assessing quality of life issues, identifying problems, selecting nutrition interventions, and monitoring the affect of interventions on the individual’s quality of life (ADA 2002). Undernutrition and overnutrition can impair many aspects of the quality of life (Amarantos et al. 2001).

Health-related quality of life is a specific dimension of quality of life that encompasses the physical or mental health of individuals and communities (Amarantos et al. 2001; Healthy People 2010 1998). It includes the perceptions of individuals regarding their health status. Also, older adults want to remain independent and living in their own homes rather than long-term care facilities (McNulty 2005). Health-related quality of life may be particularly important for older adults because of the high prevalence of chronic health problems, many of which are preventable or treatable with appropriate nutritional, psychological, and medical interventions (Amarantos et al. 2001). The impact of nutrition interventions is often quantified in terms of reducing health care costs, morbidity or mortality from various nutrition-related disorders (e.g., diabetes, hypertension, and heart disease), while what may be most important to an individual is maintaining or improving his or her health-related quality of life. Thus, an appropriate goal for nutrition interventions is to maintain or improve health-related quality of life.

Nutrition education interventions have been shown to decrease the intakes of fat and sodium and increase the intakes of calcium, fruits, and vegetables (Sahyoun et al. 2004). Given the role that

these foods and nutrients play in risk for chronic disease (USDHHS and USDA 2005a), it would be expected that these dietary changes would improve quality of life. It has also been suggested that nutrition education may ease caregiver burden and improve quality of life for the caregiver and the care-recipient (Silver and Wellman 2002).

One way in which nutritional interventions can improve the quality of life for older adults is by providing additional food to homebound elders (Gollub and Weddle 2004). Gollub and Weddle (2004) examined the effects of expanding a home-delivered meals program to include both breakfast and lunch. All participants were homebound and had been receiving home-delivered meals for at least six months, were 60 years or older, had two or more functional limitations, had a limited or low-income, and were at risk for malnutrition. Compared to those who received five home-delivered lunches per week, those who received home-delivered breakfast and lunch five days per week had significantly higher intakes of energy, protein, fiber, and several vitamins and minerals, as well as higher food enjoyment, higher food security, fewer money- and cooking-related food problems, and fewer depressive symptoms. Although the specific “quality of life” measures were not improved, the breakfast participants showed higher food enjoyment and fewer depressive symptoms, which are important dimensions of quality of life.

Undernutrition, poor appetite, and weight loss

A physiological decrease in food intake called “anorexia of aging” occurs even in healthy older adults (McDonald and Ruhe 2004; Morley 2007; Wilson and Morley 2003; Hays and Roberts 2006). Weight loss is common and is associated with frailty, functional impairment, immune disorders, pressure ulcers, hip fractures, cognitive impairment, low quality of life, and increased mortality. Weight loss results in loss of muscle mass, which decreases energy needs. Physical activity helps maintain muscle mass, so physically active older people experience fewer declines in muscle mass and food intake. With aging, the stomach releases food more slowly into the intestine, which leads to earlier feelings of satiety and lower food intake. Also, changes in some hormones that sense satiety and energy expenditure contribute to decreased food intake. The ability to adjust subsequent food intake after under- or overeating is impaired with advancing age. Sensing and responding to thirst is impaired, which increases the risk of dehydration.

Some chronic diseases are associated with negative energy balance (e.g., more energy is expended than is taken in) and weight loss (Wilson and Morley 2003). Weight loss associated with low food intake is common in Alzheimer’s disease (Johnson et al. 2006). Energy needs are increased with congestive heart failure, chronic obstructive pulmonary disease, Parkinson’s disease, and infections. Infectious diseases can increase energy needs and at the same time interfere with appetite. Low incomes (Food Security Institute 2003; Sahyoun and Basiotis 2000), several medications (Fick et al. 2003), poor oral health and dysphagia (swallowing difficulties, Bailey et al. 2004; Wilson and Morley 2003; Sahyoun 2002), alcoholism (Morley 2001; Knauer

2003), eating alone, loneliness, social isolation, bereavement, depression, and cognitive impairment (Elsner 2002; McDonald and Ruhe 2004; Morley 2001) are also risk factors for poor appetite, low food intake, malnutrition, and weight loss. Changes in taste and smell associated with aging, chronic health problems, and medications can interfere with appetite and the ability to enjoy food (Wilson and Morley 2003; Hays and Roberts 2006).

Treatment for poor appetite, weight loss, and undernutrition is guided by a medical evaluation and recommendations and should involve the older adult, as well as his or her family members and caregivers (Elsner 2002; Callahan and Jensen 2004; Johnson and Fischer 2004; Morley 2001). Some families and caregivers may be unaware that poor appetite is not a normal part of aging. The first goal is to improve oral intake, which can be facilitated by honoring food preferences at meals and snacks, using stronger flavorings and seasonings, and/or substituting higher calorie versions of familiar foods. Taste tests by the older individual can help identify nutritional supplements, such as liquids and bars that are most palatable and best tolerated in addressing poor appetite, weight loss, and undernutrition. Nutrition education may assist older adults in stimulating interest and abilities in increasing food intake.

Families, caregivers, and the health care team need to find a balance between the benefits and risks of therapeutic diets for older people experiencing poor appetite and weight loss. When medically appropriate, therapeutic diets should be liberalized for the undernourished older adult. Overly restrictive diets, such as those low in cholesterol, fat, salt, and sugar, may take much of the enjoyment out of eating, so these restrictions should be used with caution in those with poor appetite and unintentional weight loss. To maintain muscle mass and energy levels, it is still vitally important that those with poor appetite and weight loss ingest adequate proteins, vitamins, and minerals from a variety of foods in so far as is possible. Failure to consume protein will result in further deterioration of muscle mass, loss of strength, and poor recovery from illness. Nutrition education can help with these important issues.

Liberalized diets

The American Dietetics Association's (ADA) position is that the quality of life and nutritional status of older residents in long-term care facilities may be enhanced by a liberalized diet (ADA 2005). They recommend prioritization of nutritional problems, as well as nutrition interventions that balance both medical and quality of life needs. The risks versus the benefits of medical nutrition therapy and therapeutic diets must be assessed. For example, restrictive dietary prescriptions may not be helpful to frail older adults who are malnourished, have poor appetite or unintentional weight loss. Dietetics professionals should be involved with the health care team and the older adult in assessing nutritional status and making dietary recommendations. ADA recommends caution in implementing "no concentrated sweets" or "no sugar added" diets for glucose control, low-cholesterol diets for cardiac disease, and low-sodium diets for hypertension

because of concerns about lack of efficacy, taste, and overall appeal of some restrictive diets. Increasing satisfaction with meals and reducing the risks of malnutrition and weight loss may be the preferred goals for some frail elders. ADA's position is also instructive for meal planning for frail older adults residing in their homes or in assisted living facilities. Long-term care facilities and meal providers for assisted living and Older Americans Act Nutrition Programs are required to follow the dietary recommendations including the 2005 Dietary Guidelines and the Dietary Reference Intakes (Wellman and Kamp 2004). These recommendations emphasize whole grain foods, vegetables, fruits, dairy foods, moderation in sodium and fat, and consuming recommended amounts of energy, protein, vitamins, minerals, and other essential nutrients. Thus, additional restrictions beyond these may not be needed for many older people.

Hunger and food insecurity

Incomes below poverty increase the risk of food insecurity, food insufficiency, hunger, low intakes of calories, vitamins, and minerals, and low body weight (Food Security Institute 2003; Frongillo and Horan 2004; Johnson 2004; Lee and Frongillo 2001; Sahyoun and Basiotis 2000). For example, compared to older adults with sufficient food, those experiencing food insufficiency were four times more likely to have a low body weight; ate nearly 300 fewer calories each day; and ate less protein, meat, and vegetables (Sahyoun and Basiotis 2000). One in nine seniors are at risk for hunger. The marginally food insecure are more likely to have activity of daily living (ADL) limitations, and the effects are roughly equivalent to being 14 years older (Ziliak J 2008). The position of the ADA is to bring an end to domestic food insecurity and hunger that results in food and nutrition security for all Americans (ADA 2006). Older adults have low participation rates in food stamp programs and other federal, state, and local assistance programs because of lack of awareness of the programs, perception that the benefits are not worth the effort of applying, reluctance to accept food assistance because of stigma associated with receiving public assistance, and a lack of transportation or physical mobility to reach the site of the program (Food Security Institute 2003). Sources of information about food insecurity for each state are shown in Table 1. Residence in rural and urban areas can present problems related to food access. Grocery stores may be far away in rural areas, while safety concerns associated with walking or taking public transportation to the grocery store may be problems in urban areas. Older adults may not have transportation to the grocery store or have physical impairments in their ability to shop, cook, or eat. Elder abuse or neglect also can interfere with the ability to obtain adequate food.

There are several ways that nutrition educators and other concerned citizens can address the problem of food insecurity in older adults (Frongillo and Horan 2004). Educators must acknowledge that the beliefs, attitudes, and values of some older adults will make them reluctant to accept food assistance. Screening for food insecurity with tools that assess all the dimensions of food insecurity in older adults will improve identification of those in need. Nutrition educators

can improve quality of life for older adults by providing education about food and nutrition in a comprehensive manner (ADA 2006), disseminating information about local food resources, and assisting older adults with food budgeting. Community-based nutrition educators are uniquely positioned to identify individuals at risk for food insufficiency and the community resources available to improve food access.

Food safety

The overall food safety recommendations in the 2005 Dietary Guidelines are based on the FightBAC principles of clean, separate, cook, and chill, as well as avoiding raw animal products, unpasteurized juices, and raw sprouts (USDHHS and USDA 2005a, Table 8). Although the most important food safety problem is microbial foodborne illness from bacteria and viruses, there are also food safety risks from parasites, toxins, and chemical and physical contaminants in foods. The 2005 Dietary Guidelines makes two key recommendations regarding food safety for specific population groups, including older adults. The first recommendation emphasizes avoiding raw animal products, as well as raw sprouts and unpasteurized juices, while the second is to reheat to steaming certain deli meats and frankfurters. Food safety practices for consumers are described in both the consumer publication (USDHHS and USDA 2005b) and the publication for educators (USDHHS and USDA 2005a), while the scientific rationale is described in the advisory committee report (USDHHS and USDA 2005c). Other good sources of information on food safety and foodborne illness are available from the FightBAC Partnership for Food Safety Education (www.fightbac.org), publications from the American Dietetic Association (Kendall et al. 2003; McCabe-Sellers and Beattie 2004), and the medical profession (Mao et al. 2003). Foodborne illness caused by bacteria and viruses in the food supply is usually the result of unsafe food handling practices and can cause mild to fatal reactions involving diarrhea, vomiting, and other symptoms. In their national surveillance system, the Centers for Disease Control and Prevention reports that compared to younger people, older adults have safer food handling and food consumption behaviors and lower rates of infection from several foodborne illnesses (Buzby 2002). However, along with children and immune-compromised people, older adults are among those at the highest risk for severe complications from foodborne illness (e.g., death from gastroenteritis). Reasons for high complication rates include poor nutritional status and food consumption; age-related decreases in the immune system; age-related decreases in stomach acid, which allow more microorganisms to survive in the gastrointestinal tract; dehydration related to impaired sense of thirst; decreased intestinal transit time, which increases the amount of time a microorganism stays in the intestinal tract; and surgery or other illness, which leaves people with short periods of poor immunity.

People in nursing homes may be particularly vulnerable to foodborne illness, with fatality rates ten to 100 times higher than the general population (Buzby 2002). Illness, impaired immunity, and close confinement with others are some of the risk factors. Nursing homes are proactive in

preventing foodborne illness (e.g., by thoroughly cooking eggs and meat). Pasteurized eggs and irradiated meats, with decreased bacterial loads, can help decrease the risk of foodborne illness in residents of nursing homes. Older adults living in assisted living facilities, receiving home-delivered meals, or receiving meals at congregate meal sites may also be at higher risk for foodborne illness than other older adults, because of their advanced age and higher prevalence of frailty.

Food safety education directed toward older adults and their caregivers, as well as foodservice staff in nursing homes, cafeterias, restaurants, assisted living facilities, congregate meal sites, and home delivered meals programs may help improve food safety practices and decreasing the risk of foodborne illness (Buzby 2002; McCabe-Sellers and Beattie 2004; Mao et al. 2003). Sellers et al. showed that older adults changed food safety practices, as illustrated in a program conducted at congregate meal sites (Sellers et al. 2006). Sellers and colleagues examined the effects of an educational intervention on improving home food safety practices in 136 older adults (mean age 79 years). Following the intervention, participants were more likely to wash their hands with warm water and soap for 20 seconds before eating and preparing food ($P \leq 0.01$). Thus, educational interventions can lead to improvements in some home food safety practices.

Nutrition education

The benefits of nutrition education interventions for older adults have been summarized (Sahyoun et al. 2004). The recommendations for successful nutrition intervention include limiting the number and complexity of messages; making the messages targeted, practical, and reinforced; and using incentives. Intervention participants should be encouraged to maintain regular contact with health professionals; to actively participate in setting personal goals; and to participate in hands-on activities. Educators should make proper use of theories of behavior change. For the long-term success of an intervention program, an interactive process is essential (Sahyoun et al. 2004). Most of these interventions were developed and evaluated prior to the release of the 2005 Dietary Guidelines for Americans. Thus, there is a need to incorporate the updated guidelines and recommendations, as well as to continue to improve the overall design of interventions based on appropriate theoretical models.

Conclusion

It is well accepted that nutrition plays a key role in health and well-being throughout the life cycle – yet many older adults do not follow the dietary guidelines. Nutrition education can improve dietary habits and has immense potential to maintain health and independence, delay or prevent institutionalization, delay morbidity and mortality, improve the quality of life for individuals and their caregivers, and reduce health care costs associated with aging and chronic

disease. Thus, nutrition education should be integrated into all aspects of health promotion, disease prevention, disease management, and food assistance (e.g., food stamp program) and should be evidence-based. Promotion of physical activity along with nutrition education will also be helpful, since physical activity and dietary choices both influence health and independence.

Dissemination of information about nutrition education and aging can be improved in several ways, including presentations at the annual meeting of the Society for Nutrition Education and other professional food and nutrition societies, feature articles about aging in the *Journal of Nutrition Education and Behavior*, more emphasis in the Farm Bill regarding nutrition education for older adults under the newly named Supplemental Nutrition Assistance Program-Ed (SNAP-Ed, formerly the Food Stamp Nutrition Education program), and reduction in the state match requirements for the SNAP-Ed. In community settings, funding for nutrition education programs comes from the SNAP-Ed (USDA) and Older Americans Act nutrition programs (Administration on Aging, AoA), and state and local funding. Partnerships between USDA programs and AoA programs will be complementary because USDA's expertise is in the areas of food systems and dietary recommendations, while AoA's expertise involves providing programs such as congregate and home delivered meals, nutrition screening, nutrition education, and nutrition counseling supporting older adults from a sociological and community perspective. Finally, needs assessments must be done to ensure that nutrition education programs are culturally appropriate and tailored to the various subgroups of older adults based on functional status, presence of chronic diseases, cognitive status, living situation, socioeconomic status, ethnic/racial group, and culture.

Table 1. Information about aging, health, nutrition, and food insecurity for each state

Information by States	References
Percent of older adults in poverty; economic status, labor force, mortality, vaccinations, and air quality	Federal Interagency Forum on Aging-Related Statistics. Older Americans Update 2008: Key Indicators of Well-Being. http://agingstats.gov/agingstatsdotnet/main_site/default.aspx , http://agingstats.gov/agingstatsdotnet/Main_Site/Data/Data_2008.aspx
Prevalence data on a wide variety of physical activity,	The State of Aging and Health in America. http://www.agingsociety.org/agingsociety/pdf/state_of_aging_report.pdf

<p>overweight, eating \geq 5 fruits and vegetables, smoking, vaccination, mammograms, colorectal cancer screening, and fall-related deaths</p>	
<p>Prevalence data (demographics, nutrition, health status, diabetes, arthritis, cardiovascular disease, disability, fruits and vegetables intake, physical activity, etc.)</p>	<p>Behavioral Risk Factor Surveillance System: Prevalence Data. http://apps.nccd.cdc.gov/brfss/ Behavioral Risk Factor Surveillance System Maps. http://apps.nccd.cdc.gov/gisbrfss/default.aspx</p>
<p>Trends data (not enough fruits and vegetables, obesity, diabetes awareness, no leisure time physical activity, etc.)</p>	<p>Behavioral Risk Factor Surveillance System: Trends Data. http://apps.nccd.cdc.gov/brfss/Trends/TrendData.asp</p>
<p>Overweight and obesity</p>	<p>Center for Disease Control and Prevention. http://www.cdc.gov/nccdphp/dnpa/obesity/state_programs/index.htm</p>
<p>Food insecurity</p>	<p>Household Food Security in the United States 2003. FANRR42 October 2004. http://www.ers.usda.gov/publications/fanrr42/fanrr42.pdf Household Food Security in the United States 2005. ERR-29,</p>

	November 2006. http://www.ers.usda.gov/Publications/ERR29/ERR29.pdf
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Table 2. Selected chronic health conditions in adults 65 and older (2005-2006)¹

Condition	Men (percent)	Women (percent)
Hypertension	52	54
Heart disease	37	26
Arthritis	43	54
Any cancer	24	19
Diabetes	19	17
Stroke	10	8
Asthma	10	12
Chronic bronchitis or emphysema	11	10

¹ Federal Interagency Forum on Aging and Related Statistics. Older Americans Update 2008: Key Indicators of Well-being.

Table 3. 2005 Dietary Guidelines with special implications for older adults

		2005 Dietary Guidelines	Current practice (Mean intake from food unless otherwise noted)	Source of current practice
Fruits and vegetables (servings/day)	Men, sedentary, 2,000	> 9	5.7	Produce for Better Health Foundation (accessed 2007)

	calories/day			
	Women, sedentary, 1,600 calories/day	> 7	4.7	
Whole grains (daily)		3	1	USDHHS and USDA, 2005a; Cleveland et al. 2000
Saturated fat (percent calories)	Men	10	11.5	*USDA, Agricultural Research Service 2007
	Women	10	11.1	
Sodium (mg/day)	Men	< 1,500	3,447	*USDA, Agricultural Research Service 2007
	Women	< 1,500	2,753	
Potassium (mg/day)	Men	4,700	2,911	*USDA, Agricultural Research Service 2007
	Women	4,700	2,372	
Vitamin B₁₂(mg/day), (mg of added/day)	Men	2.4	5.4, (0.87)	*USDA, Agricultural Research Service 2007
	Women	2.4	4.1, (0.69)	
Vitamin D (IU/day)	Men	1,000	212	Moore et al., 2005 (NHANES III 1988-94)
	Women	1,000	188	
Milk as a source of calcium and other key nutrients (cups of milk/day), ≥ 1,600 calories/day		3	~1	†Fulgoni et al, 2007 (NHANES 1999 – 2000)
Calcium (mg/day)	Men	1,200	821	*USDA, Agricultural Research Service 2007
	Women	1,200	724	
Fiber (g/day)	Men	30	16.2	*USDA, Agricultural Research Service 2007
	Women	21	14.0	

*Nutrient intakes of older adults aged 60–69 years of age.

†Milk intake of adults aged 51 years and older.

Table 4. The USDA food guide by the 2005 Dietary Guidelines for Americans¹

Food Groups	1,600	1,800	2,000	2,200	Quantity equivalents
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		Calories	Calories	Calories	Calories	for each food group
Fruits		3 srv (1.5 c)	3 srv (1.5 c)	4 srv (2 c)	4 srv (2 c)	Each of these counts as 2 servings (1 cup) of fruits and vegetables: 1 cup cut-up raw or cooked fruit or vegetable 1 cup fruit or vegetable juice 2 cups leafy salad greens
Vegetables	All	4 srv (2 c)	5 srv (2.5 c)	5 srv (2.5 c)	6 srv (3 c)	
	Dark green	2 c/wk	3 c/wk	3 c/wk	3 c/wk	
	Orange	1.5 c/wk	2 c/wk	2 c/wk	2 c/wk	
	Legumes	2.5 c/wk	3 c/wk	3 c/wk	3 c/wk	
	Starchy	2.5 c/wk	3 c/wk	3 c/wk	6 c/wk	
Other	5.5 c/wk	6.5 c/wk	6.5 c/wk	7 c/wk		
Grains	All	5 oz-eq	6 oz-eq	6 oz-eq	7 oz-eq	Each of these counts as 1 ounce-equivalent (1 serving): ½ cup cooked rice, pasta, or cooked cereal 1 ounce dry pasta or rice 1 slice bread 1 small muffin (1 ounce) 1 cup ready-to-eat cereal flakes
	Whole	3	3	3	3.5	
	Other	2	3	3	3.5	
Lean meat and beans		5 oz-eq	5 oz-eq	5.5 oz-eq	6 oz-eq	Each of these counts as 1 ounce-equivalent: 1 ounce lean meat, poultry, or fish; 1 egg; ¼ cup cooked dry beans or tofu; 1 Tbsp peanut butter; ½ ounce nuts or seeds.
Milk		3 c	3 c	3 c	3 c	Each of these counts as 1 serving (1 cup): 1 cup milk or yogurt; 1½ ounces natural cheese such as Cheddar cheese; 2 ounces processed cheese.

Oils	22 g	24 g	27 g	29 g	
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¹ United States Department of Health and Human Services and United States Department of Agriculture. 2005a. Dietary Guidelines for Americans.

Table 5. Meeting the vitamin D recommendation with fortified foods and dietary supplements¹

(1) The amount of vitamin D obtained from up to three servings of milk or yogurt plus (2) vitamin D that may be obtained from the other natural or fortified food sources must be supplemented by (3) vitamin D containing supplements in order to achieve 1,000 IU recommended amount.

Source of vitamin D, serving size	IU	Servings of milk and/or yogurt fortified with vitamin D							
		0 Servings		1 Serving		2 Servings		3 Servings	
		Milk	Yogurt	Milk	Yogurt	Milk	Yogurt	Milk	Yogurt
(1) Milk and/or yogurt fortified with vitamin D (not all yogurts are fortified with vitamin D and the fortification level is variable), 1 cup.	100	0	0	100	100	200	200	300	300
(2) Other food sources of vitamin D									
Orange juice fortified with vitamin D and calcium (not all orange juice is fortified with vitamin D), ¾ cup.	75	75	0	75	0	75	0	75	0
Cereal fortified with vitamin D (not all cereals are fortified with vitamin D), ½ to 1 cup (~1 ounce).	40	40	0	40	0	40	0	40	0
Fish and shellfish are	100	100	0	100	0	100	0	100	0

variable (the average of 26 fish products in the USDA data base was about 370 IU per 4 ounces), 8 ounces per week.									
Eggs (34 IU/1 medium egg), 3 medium per week	100	100	0	100	0	100	0	100	0
(3) Vitamin D containing supplements with or without calcium (do not take more than one multivitamin/mineral daily), pills or tablets.	100 to 1000	700	1000	600	900	500	800	400	700
Total		1015	1000	1015	1000	1015	1000	1015	1000

¹ Based on the 2005 Dietary Guidelines that older adults consume 1,000 IU per day. To convert vitamin D in IU to µg, divide by 40. Few margarines are believed to be fortified with vitamin D (Calvo et al 2004); typical fortification levels are about 10 to 20 IU per teaspoon (Calvo et al. 2004; Weihrauch and Tamaki 1999).

Table 6. Questions to ask when using dietary supplements¹

Question	Yes	No	Comments
1. Is taking a dietary supplement an important part of my total diet?			Vitamin B ₁₂ , vitamin D, and calcium supplements may be useful for some adults. Added vitamin B ₁₂ from foods or supplements is recommended. Most older adults don't consume enough dairy foods to meet their calcium needs, so calcium supplements may be needed. Because requirements are so high, most older adults will need a supplemental source of vitamin D, such as from a multivitamin and a calcium supplement with vitamin D. It is highly recommended that people take calcium and vitamin D supplements with osteoporosis medications.

2. Are there any precautions or warnings I should know about (e.g. is there an amount or "Upper Limit" I should not go above)?			This information will guide consumers towards general multivitamins and help avoid “mega” doses of single supplements or taking multiple supplements.
3. Are there any known side effects (e.g., loss of appetite, nausea, headaches, etc.)? Do they apply to me?			Occurrence of these side effects shortly after beginning a new supplement indicates that the new supplement might be the cause.
4. Are there any foods, medicines (prescription or over-the-counter), or other supplements I should avoid while taking this product?			This is of particular concern, because many herbal products interact with medications. Prescription medications of concern are blood thinners and chemotherapeutic agents.
5. If I am scheduled for surgery, should I be concerned about the dietary supplements I am taking?			Physicians must be informed about any and all supplements prior to surgery. Many herbal supplements need to be discontinued several weeks prior to surgery.

¹ United States Food and Drug Administration, Center for Food Safety and Applied Nutrition, Office of Nutritional Products, Labeling, and Dietary Supplements. 2003. Dietary Supplements. Tips for Older Dietary Supplement Users.

Table 7. National Institutes of Health (NIH) recommendations regarding weight loss in older adults^{1,2}

Evidence Statement	Age alone should not preclude treatment for obesity in adult men and women. Evidence Category D. ³
Rationale	There is little evidence at present to indicate that obesity treatment should be withheld from adult men and women on the basis of age alone up to 80 years of age.
Recommendation	A clinical decision to forgo obesity treatment in an older adult should be guided by an evaluation of the potential benefits of weight reduction for day-

	to-day functioning and reduction of the risk of future cardiovascular events, as well as the patient's motivation for weight reduction. Care must be taken to ensure that any weight reduction program minimizes the likelihood of adverse effects on bone health or other aspects of nutritional status. Evidence Category D. ³
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¹ National Institutes of Health. 1998. Clinical Guidelines on the Identification, Evaluation, and Treatment of Obesity in Adults: The Evidence Report. NIH Publication Number 98-4083. September.

² National Institutes of Health. 2000. The Practical Guide: Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. NIH Publication Number 00-4084. October.

³ Category D: Expert judgment is based on the panel's synthesis of evidence from experimental research described in the literature or derived from the consensus of panel members based on clinical experience or knowledge that does not meet the above-listed criteria. This category is used only in cases where the provisions of some guidance was deemed valuable but an adequately compelling clinical literature addressing the subject of the recommendation was deemed insufficient to justify placement in one of the other categories (A through C). Category A: Evidence is from endpoints of well designed RCTs (or trials that depart only minimally from randomization) that provide a consistent pattern of findings in the population for which the recommendation is made. Category A therefore requires substantial numbers of studies involving substantial numbers of participants. Category B: Evidence is from endpoints of intervention studies that include only a limited number of RCTs, post-hoc or subgroup analysis of RCTs, or meta-analysis of RCTs. In general, Category B pertains when few randomized trials exist, they are small in size, and the trial results are somewhat inconsistent, or the trials were undertaken in a population that differs from the target population of the recommendation. Category C: Evidence is from outcomes of uncontrolled or nonrandomized trials or from observation studies. From: National Institutes of Health. 1998. Clinical Guidelines on the Identification, Evaluation, and Treatment of Obesity in Adults: The Evidence Report. NIH Publication Number 98-4083. September.

Table 8. To reduce risks of illness from bacteria in food older adults advised not to eat or drink^{1,2}

Milk	Raw (unpasteurized) milk or any products made from unpasteurized milk Raw or unpasteurized milk or soft cheeses (such as feta, brie, camembert, blue-veined, and Mexican-style cheese) unless they are labeled "made with pasteurized milk"
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Eggs	Raw or partially cooked eggs or foods containing raw eggs such as salad dressings, cookie or cake batter, sauces, and beverages such as egg nog. (Foods made from commercially pasteurized eggs are safe to eat.)
Meat	Raw or undercooked meat and poultry Refrigerated pates or meat spreads. Canned or shelf-stable pates and meat spreads may be eaten. Only eat certain deli meats and frankfurters that have been reheated to steaming hot Hot dogs and luncheon meats, unless they are reheated until steaming hot.
Seafood	Raw or undercooked fish or shellfish Raw fin fish and shellfish, including oysters, clams, mussels, and scallops Refrigerated smoked seafood unless it is contained in a cooked dish, such as a casserole. Refrigerated smoked seafood, such as salmon, trout, whitefish, cod, tuna, or mackerel is often labeled as “nova-style,” “lox,” “kippered,” “smoked,” or “jerky.” These products are found in the refrigerator section or sold at deli counters of grocery stores and delicatessens. Canned or shelf-stable smoked seafood may be eaten.
Juice	Unpasteurized or untreated fruit or vegetable juice. (These juices will carry a warning label.)
Sprouts	Raw sprouts (alfalfa, clover, and radish)

¹ United States Department of Health and Human Services and United States Department of Agriculture. 2005a. Dietary Guidelines for Americans.

² United States Food and Drug Administration/Center for Food Safety and Applied Nutrition and United States Department of Agriculture/Food Safety and Inspection Service. 2004. To Your Health! Food Safety for Seniors.

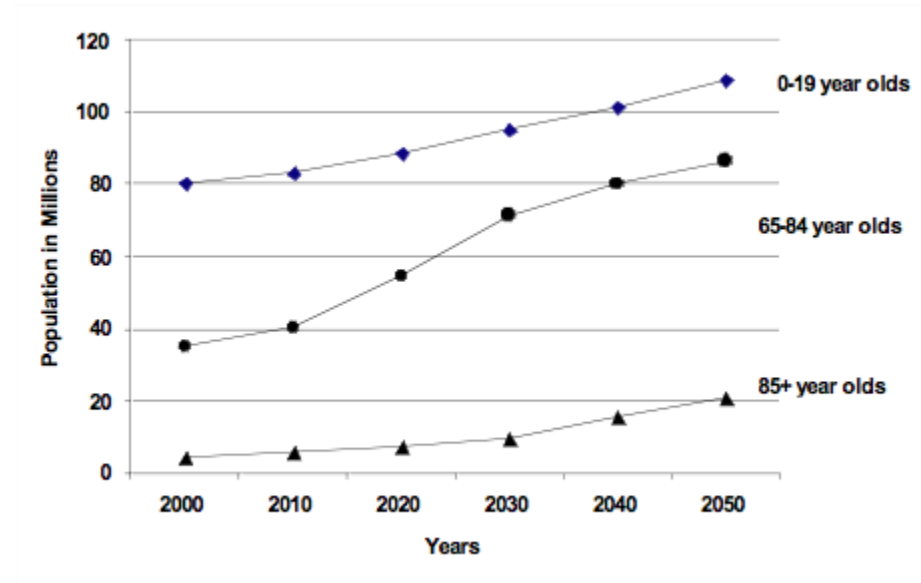


Figure 1. Number of people aged 65 and older versus age 19 and younger in the United States, selected year 2000 and projected 2010 to 2050 [D link content for Figure 1: From Federal Interagency Forum on Aging and Related Statistics. Older Americans Update 2006: Key Indicators of Well-being, 2006, and U.S. Census Bureau, U.S. Interim Projections by Age, Sex, Race, and Hispanic Origin, 2004.]

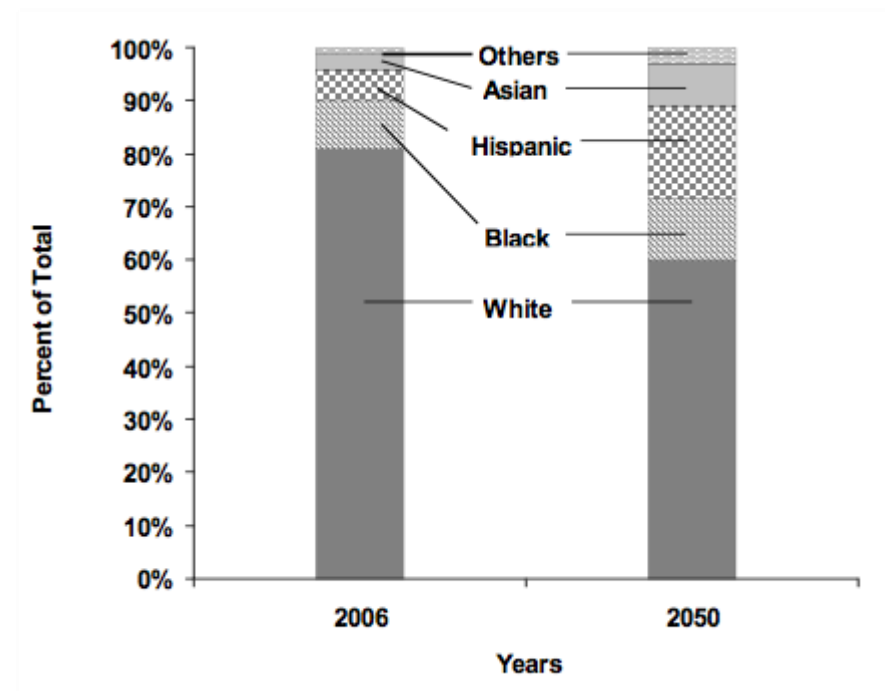


Figure 2. Population age 65 and older in the United States by race: 2006 and projected 2050. [D link content for Figure 1: From Federal Interagency Forum on Aging and Related Statistics. Older Americans Update 2008: Key Indicators of Well-being.]

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Cite this article

Mary Ann Johnson, Sohyun Park, Dawn Penn, Jacquelyn W. McClelland, Katie Brown, and Audrey Adler. 2008. **Nutrition Education Issues for Older Adults**. *The Forum for Family and Consumer Issues*, 13 (3).