Effectiveness of Community Intervention in Improving Bone Health Behaviors in Older Adults

**To cite this article:**

**Foreword:**
The partnership of the Academy’s Healthy Aging Dietetic Practice Group with the Journal of Nutrition in Gerontology and Geriatrics (formerly the Journal of Nutrition for the Elderly) is responsible for our feature article. This partnership provides our members with quality CPE opportunities.

**ABSTRACT:**
An 8-week, bone-health community program addressed risks/lifestyle changes within the Health Belief Model and Theory of Reasoned Action frameworks in a randomized format (treatment group n=35; control group n=34). Median week 1 values for calcium (control, 963 mg; treatment, 1,023 mg) and vitamin D (81 IU both groups) were below recommendations, increasing throughout the program for both control (1,023 mg calcium, 128 IU vitamin D) and treatment (1,005 mg calcium, 122 IU vitamin D) groups. There was limited response to the exercise outcome variables, with many not participating in that section of the program. Psychosocial variables were positive for both control and treatment groups at week 1, with no significant difference at postintervention. Regression analysis indicated that those with a positive attitude about calcium intake and belief that they could choose calcium-fortified foods were more likely to have higher calcium intake. Intention to exercise was modified by peer and family support. Community-based programs can translate and use clinical-trial key topics and outcomes, but participation bias makes impact results difficult to interpret the effectiveness of the program.

**Learning Objectives**
At the completion of this self-study article, the learner will be able to:
- Describe factors that impact bone health.
- Describe the incidence of osteoporosis seen with older adults, as well as the associated costs of this disease.
- Characterize the tenets of the Health Belief Model and the Theory of Reasoned Action.
- Evaluate the effectiveness of a community-implemented educational intervention for older adults.
- Identify techniques and variables used to measure differences between control and treatment groups.
- Review the statistical measures used to assess data collected in this study.

**INTRODUCTION:**
Osteoporosis is a systemic skeletal disease portrayed by low bone mass and structural weakening of the bone material that leads to reduced bone strength and increased susceptibility to fracture. While 10 million individuals have osteoporosis, it is likely that another 34 million suffer from low bone density. An estimated 61 million individuals will have osteoporosis or low bone density by 2020.1 Approximately one in two women and one in four men aged 50 years or older in the United States will experience an osteoporotic-related fracture sometime during the remainder of their lives.2 In 2005 dollars, annual direct-care expenditures for osteoporotic fractures reached almost $19 billion, with an estimated cost of $25.3 billion per year by 2025.1 Beyond costs, there is the physical burden of living with osteoporosis and its impact on daily living. Osteoporosis is a debilitating chronic disease that is a public health problem.

Key lifestyle habits can be utilized to strengthen bone health and reduce fracture risk. The National Osteoporosis Foundation developed five steps to optimize bone health. These include:
1. Get the daily recommended amounts of calcium and vitamin D.
2. Engage in regular weight-bearing and muscle-strengthening exercise.

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While adopting new lifestyles geared toward bone health has been shown to be beneficial, there are many influences that can determine if knowledge will translate into behavior change. Knowledge of the disease and its risk factors play a role in altering behavior. For instance, when 203 healthy postmenopausal women were given their dual-energy X-ray absorptiometry (DXA) results, there were increases in calcium intake, but not in exercise, especially if a DXA result was scored at the osteopenia or osteoporosis range. One study evaluated osteoporosis knowledge as well as calcium intake and weight-bearing physical activity in three different age groups of women. These researchers found that knowledge about osteoporosis was limited, while average calcium intake met recommendations and weight-bearing activity was included most days. These findings were in part due to fortified juice or supplements in terms of calcium; and housework, standing, or walking in terms of weight-bearing activity. Johnson and colleagues used the Osteoporosis Health Belief Scale (OHBS), focusing on health-belief model and self-efficacy constructs, to assess beliefs of different age groups for both men and women. Women were more susceptible to osteoporosis versus men. Similar results were shown with older adults scoring higher on susceptibility to osteoporosis.

As with the OHBS, theoretical framework models are used to measure aspects or constructs that impact or influence behavior change. The Health Belief Model (HBM) is one in particular that has been used as a component in osteoporosis-prevention research. One study that used the HBM as the basis of the intervention with peri- and postmenopausal women found that osteoporosis was believed to be a severe disease, but few felt susceptible to the condition. Manios and colleagues used HBM in conjunction with the Social Cognitive Theory in a nutrition education program for postmenopausal women, which resulted in improvement in calcium and vitamin D intakes.

Few studies have combined diet and exercise approaches to a theory-based intervention. The current study was a randomized educational intervention targeting bone-health behaviors for older adults within the context of a community education program. Primary objectives of the study were to determine how well results and recommendations from clinical control trials translate into the “real world” of community and public health education in terms of bone health, and to determine the effectiveness of a theory-based lifestyle intervention to enhance physical activity and nutritional behaviors in community-dwelling older adults over an 8-week period.

METHODS: Program Design
The bone-health program was based on two behavioral change theories: the Health Belief Model (HBM) and the Theory of Reasoned Action (TRA). The HBM includes the severity and susceptibility to a disease or condition; perceived barriers and benefits related to behavior change; and self-efficacy, or belief in oneself to be able to change this behavior. The TRA addresses individual motivational factors as determinants of the likelihood of performing a specific behavior. Variables measured by TRA include attitudes about the behavior, subjective norms, perceived attitudes about the behavior and the weight given to these attitudes, and intention to perform the behavior. Previous work in our lab has shown that both HBM and TRA constructs are useful instruments in measuring behaviors related to bone health.

Session topics, activities, and behavior constructs are listed in Table 1. The educational program included lectures and hands-on active learning that targeted key knowledge, nutritional behavior, physical-activity recommendations, and/or attitude/self-efficacy aspects. Supplemental handouts reinforced the main points, and participants had a binder of resource materials for bone health. The program was reviewed by an expert panel that included professors with clinical, community, and research experience in kinesiology, nutrition, and community health. Their minor editorial changes were incorporated before implementation. Each class lasted approximately one hour/week, or a total of eight hours.

The randomized controlled study design included a delayed treatment for the control group. The treatment group was surveyed for dietary intake at week 1 and weeks 4 and 8 to determine any immediate effects at week 4 from the program topics targeting dietary change in particular. The control group was evaluated at only week 1 and week 8, as no intermediary influences were delivered and additional testing may unintentionally promote overestimation of calcium and vitamin D intake.
This research protocol was approved by the University’s Institutional Review Board, and all participants provided informed consent.

**EVALUATION AND OUTCOMES:**

**Knowledge/Attitudes**

A 16-item form for demographics and health included information on bone-health history and supplement use, which was collected at week 1. A 66-item survey measuring attitudes, beliefs, and intentions about osteoporosis, calcium, vitamin D, and exercise was completed pre- and postintervention. The survey incorporated both HBM and TRA constructs, including susceptibility, severity, barriers to change, benefits to change, self-efficacy, subjective norms, and intentions; as well as attitudes related to calcium, vitamin D, and exercise. The survey was based on the OHBS, modified to incorporate TRA constructs with vitamin D questions added to better reflect current research in nutrient needs for bone health. Participants rated their responses to questions using a 5-point Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree). An option rating of 6 was given if the statement did not apply. Cronbach alpha coefficients between 0.70 and 0.80 were considered acceptable to merge constructs.

**Dietary Intake**

The Calcium-Focused Food Frequency Questionnaire (CFFFQ) was used, which includes both natural and fortified sources of calcium, to capture usual calcium intake. Twenty-four-hour recalls captured daily intake. Both measures were completed at weeks 1, 4, and 8 for the treatment group and weeks 1 and 8 for the control group, using the U.S. Department of Agriculture multipass system of diet recall and analyzed with nutrient analysis software (Nutritionist V, 2000). The software was updated for new food items according to the product’s Nutrition Facts label when needed. The CFFFQ was analyzed using an ACCESS program (Microsoft Office 2007) specifically developed for this questionnaire during a previous research project. Total calcium was measured for both food records (24-hour recall and CFFFQ), and calcium from the dairy, fruit, and grain groups was also measured.

**Activity**

An activity log was used for participants to record the number of steps recorded by their pedometers (weeks 3, 5, 6, and 8); the number of heel drops (to measure ground-force activity) during weeks 5, 6, and 8; and time devoted to balance activity (including minutes of resistance-band use) during weeks 6 and 8 for the treatment group. Resistance bands were used in part to improve balance as well as provide a joint-force activity. Pedometers were distributed the third week of the course. Because keeping these measures was considered part of the intervention, with personal feedback, activity data were not collected in the control group.

**Subjects**

Participants, men and women older than 50 years, were recruited through a variety of campus and community routes, including a campus e-mail announcement, posters in community locations, the Osher Lifelong Learning Institute course offering promotions, and the University’s Lifetime Fitness Program. Participants attended the bone-health program at the Osher Lifelong Learning Institute facilities in the Research Park of the University of Illinois, Champaign.

The number of participants needed was based on a power analysis using calcium intake as the outcome variable. Alpha=0.05, power=0.87 indicated 15 people would be needed.
per group (medium effect size), for a total of 60 (treatment, control, men, women). Considering a 30% attrition rate as seen in other similar studies, each group was increased by \( \frac{1}{3} \) for an n=20 per group, for a total of 80. Randomization was to either the treatment (n=35) or control group (n=34), blocked on gender and availability. Couples were assigned the same section. The control group received the class, but after the treatment group completed the program (delayed treatment), as has been used in other osteoporosis management studies.\(^1\)\(^9\)

Reasons for those not finishing the program included medical (n=3 in treatment group) and unknown reason (n=4, 1 in the treatment group and 3 in control group) following orientation.

**Statistical Methods**

Data normalcy was assessed via P-P plots and Kolmogorov-Smirnov tests. Nonparametric tests and descriptive statistics were used for data not normally distributed. Week 1 data for the delayed-treatment (control) group and the randomized (test) group were not significantly different, and these data were combined and reported as treatment-group data. The General Linear Model procedure provided repeated measures analysis, regression analysis, and analysis of variance for each dependent variable (calcium intake, vitamin D, weight bearing, and balance exercises) by grouping factor (treatment) (SPSS, version 17). Related two-sample nonparametric tests were used to measure behavioral constructs changes pre- and postintervention. Stepwise regression analysis for the TRA constructs pertaining to calcium, vitamin D, and exercise intention (regarding specific calcium, vitamin D, and exercise statements) was the dependent variable, and the attitude and subjective norm constructs were the independent variables. Nonparametric independent two-sample tests were used to measure differences between control and treatment groups.

Measurement and evaluation of the program itself was assessed by analyzing the descriptive values for each and comparing how each topic, activity, and tool was ranked.

**RESULTS:**

Mean age was 65.5 ±9.6 years. Most were female (83%), White (90%), retired (53%), and with some college education (77%). Although most had no history of osteoporosis (67%), almost all previously had a bone scan (81%).

Repeated measures analysis of the 24-hour recall and CFFFQ data for the treatment group (Table 2) indicated a positive increase in total calcium from week 1 (\( p=0.005 \) for 24-hour recall; \( p=0.027 \) for CFFFQ), with a significant increase for calcium from the fruit group (\( p=0.005 \)) for the 24-hour recall and for calcium from grains for the CFFFQ (\( p=0.042 \)). Those meeting or exceeding the Recommended Dietary Allowance (RDA)\(^2\)\(^0\) of calcium as measured by 24-hour recall were: 26% at week 1, 44% at week 4, and 35% at week 8 (\( p=0.039 \)). Mean intake immediately following the nutrition sections (week 4) was 1,159 mg and at the end of the program was 1,080 mg. Comparison of week 1 to week 8 data was significantly improved for the treatment group for 24-hour recall calcium, CFFFQ calcium, and vitamin D (Table 3). Data from the control group at week 1 was not significantly different from week 8 for 24-hour recall calcium, CFFFQ calcium, and vitamin D (Table 3).

Unlike findings derived from 24-hour recalls, the percent of those that met or exceeded the RDA as measured by the CFFFQ steadily increased (i.e., week 1 [47%], week 4 [54%], and week 8 [56%] \( p=0.368 \)). However, 24-hour recall is usually lower than food-frequency calcium intake, as the first reflects daily intake and the...
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latter usual intake. 17 Sedlak and colleagues 25 also found increased calcium intake in both the treatment and control groups, with no significant difference between the groups. It is difficult to interpret these findings, but being enrolled in a study may have a bias on the participants. Indeed, significant effects were also found in the current study for the control group for the benefits of diet and exercise and diet self-efficacy. Certainly those volunteering for a bone-health study would have an interest in the topic, whether they were assigned to the treatment or control group. The only way to blind for this potential bias would be to enroll participants in a larger study in which health, and bone health in particular, was nested within a different topical framework.

In comparing the control group versus the treatment group at 8 weeks (Table 3), there was no significant difference (p=0.70) in total calcium intake per the 24-hour recall or CFFFQ (p=0.072).

Mean vitamin D intake at all points was below the RDA (600 IU for 51–70 years, 800 IU for those older than 70 years). 20 However, dietary vitamin D significantly increased (p<0.015) at each time point during the intervention for the treatment group. No significant difference was found comparing control to treatment for postdata (Table 3).

ACTIVITY:
No significant differences, increases, or decreases were noted in steps, heel drops, or balance activities. Several participants reported not being able to do heel drops. Reasons for not doing heel drops included osteoporosis, physician order, osteoarthritis in knees, back pain, and back problems.

Those providing data for exercise were fewer than for other outcome measures: n=40 for step data, n=29 for heel-drop data, and n=45 for balance data.

KNOWLEDGE/ATTITUDE/BELIEF CONSTRUCTS: DISEASE, DIET, ACTIVITY
Susceptibility to osteoporosis, benefits of diet, dietary self-efficacy, and benefits of exercise were significantly improved pre-to postintervention for the treatment group. Significant differences for the control group were found for the same variables as for the treatment group, with the exception of susceptibility to osteoporosis and barriers to dietary change. Comparison between control and treatment groups for week 8 data was not significant (Table 3).

THEORY OF REASONED ACTION CONSTRUCTS: INTENTION TO CHANGE VS. ATTITUDES AND SUBJECTIVE NORMS
Six intention statements were measured, with three addressing calcium (supplement, foods, and promote to family/friends), one measuring reducing risk, and two addressing activity (exercise with family/friends and increase daily activity). Stepwise regression in measuring promotion of calcium-intake intention with attitudes and subjective norms can be found in Table 4. Three significant equations (p<0.001) were found to explain the variance in behavior of dietary calcium intake. The response to the statement reflecting attitude of adequate diet calcium being important (p<0.001) explained 23% of the variance. The response to the statement reflecting the attitude of dietary calcium being important and self-efficacy of...

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choosing calcium-fortified foods over nonfortified versions accounted for 33.5% variance in intention of consuming more calcium-rich foods (p<0.001). Knowing someone with osteoporosis explained 9% variance for those intending to take a calcium supplement (p<0.048).

In measuring intention to include exercise with friends/family, two equations were found to be significant (Table 4). The subjective norms of “family/friends encouraging activity” and “daily activities being enough” account for 38.7% of the variance (p<0.008) with the intention to include exercise with family/friends in the next three months. With the dependent variable being the intention to increase daily activity within the next three months, a person’s daily activities, family, and work are enough account for 26.3% of the variance (p<0.012).

A statistically significant equation was found for the intention to lower osteoporosis risk (p<0.021) (Table 4). The attitude of vitamin D dietary intake being important explained 13.6% of the variance for lowering disease risk. No significant equations occurred with exercise-based attitudes and subjective norms.

DISCUSSION:
Osteoporosis is a major public-health issue annually costing billions as well as negatively impacting quality of life. While several risk factors cannot be modified, nutrition, primarily calcium and vitamin D, and activity, including weight-bearing and fall prevention, play a key role in bone health and the prevention and treatment of osteoporosis. However, more robust research is needed to determine the impact of educational programs on key determinants because the costs of providing these programs are not insubstantial. The current intervention is relatively unique in being bone-health programs based on behavioral theory and geared toward a community population, and covering a comprehensive bone-health approach over eight sessions. Other programs either measured influence of DXA values on health-belief-model constructs, were one-day instructions, or used a person’s health beliefs and bone-health behaviors to tailor an intervention that was given via the telephone.

The favorable response to recruitment, high retention rate, and content review by an expert panel provided positive evidence that these elements of a clinical control trial translated into the “real world” of community and public health education. However, the community recruitment occurred through existing programs for older adults. Another possible failing in translation of the rigor of a clinical trial to a community program was the low response to exercise outcome indicators.

The current intervention showed positive effects in calcium intake, vitamin D intake, and knowledge/behavior constructs for the treatment group, although there were no significant differences between control and treatment groups at eight weeks. While Tussing and Chapman-Novakofski reported improved calcium intake, they had no control group. Manios and colleagues studied changes in bone mineral density in those on calcium supplements versus fortified dairy versus control groups over a 12-month period. Those given fortified dairy or a supplement did have greater calcium intake than the control group. This differs from our study.

Table 4: Stepwise Regression Analysis for the Theory of Reasoned Action Constructs Related to Diet and Exercise (Postintervention, Treatment Group).

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Regression Equation</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am taking or intend to take a calcium supplement within the next 3 months</td>
<td>1.197 + 0.32(#36)</td>
<td>4.170</td>
<td>0.048</td>
</tr>
<tr>
<td>I intend to consume more dairy products and calcium-rich foods in the next 3 months</td>
<td>0.58 + 0.75(#30)</td>
<td>13.123</td>
<td>0.001</td>
</tr>
<tr>
<td>I intend to promote calcium-rich foods and dairy products to my friends and family in the next 3 months</td>
<td>0.105 + 0.611(#30) + 0.332(#33)</td>
<td>11.096</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>I intend to lower my risk for osteoporosis</td>
<td>0.957 + 0.322(#31)</td>
<td>5.804</td>
<td>0.021</td>
</tr>
<tr>
<td>I intend to include exercise in my activities with friends/family in the next 3 months</td>
<td>2.105 + 0.540(#57) – 0.354(#56)</td>
<td>6.307</td>
<td>0.008</td>
</tr>
<tr>
<td>I intend to increase my daily activity in the next 3 months</td>
<td>3.226 – 0.350(#56)</td>
<td>7.506</td>
<td>0.012</td>
</tr>
</tbody>
</table>

Note:
#30: Adequate calcium intake from my diet is important to me.
#31: Adequate vitamin D intake from my diet is important to me.
#33: I choose calcium-fortified foods vs. foods not fortified in calcium.
#36: I know someone with osteoporosis.
#56: My daily activities, family, and work are enough exercise for me.
#57: My family/friends encourage me to exercise.
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by providing food or supplements, whereas our study provided education about food choices. Gaines and associates reported increased calcium intake after the treatment and as compared to the control group, but calcium intake was assessed by asking if the participant was taking a calcium supplement, without regard to dietary calcium. Sedlak and colleagues also found increased calcium intake in both the treatment and control groups, with no significant difference between the groups. It is difficult to interpret these findings, but being enrolled in a study may have a bias on the participants. Indeed, significant effects were also found in the current study for the control group for the benefits of diet and exercise and diet self-efficacy. Certainly those volunteering for a bone-health study would have an interest in the topic, whether they were assigned to the treatment or control group. The only way to blind for this potential bias would be to enroll participants in a larger study in which health, and bone health in particular, was nested within a different topical framework.

Other studies have not evaluated vitamin D intake, which is difficult because of limitations of food composition in the databases of analysis software. However, both the control and treatment groups in the current study increased vitamin D intake, with no significant difference between groups at postintervention. There are no studies that we know of that have evaluated dietary vitamin D in this regard, or without relying on self-report of vitamin D from supplements. As in other studies, vitamin D intake was below recommended levels.27

Besides improvements in calcium intake, others have reported improvement in knowledge of osteoporosis and risks.22,24 However, both the control and treatment groups had good beginning responses to HBM variables; they experienced some improvement, but there was no significant difference between treatment groups. This is surprising, but more positive than the findings of Sedlak and colleagues who reported increased perceptions of barriers in their intervention group as opposed to their control group at the conclusion of the intervention, as well as decreased minutes of exercise. Finding that a positive attitude toward the importance of calcium intake is similar to the findings of an earlier study.14 Although a significant equation was found, only 9% of the variance in deciding to take a calcium supplement was explained by knowing someone with osteoporosis, perhaps because most were already taking a calcium supplement. In terms of exercise, this study reflected the findings of other research that peers and family are important motivators to exercise. Indeed, participants reported intending to increase activity, both at the beginning and at the end of the intervention. However, limited reporting by participants may have reduced the power of achieving a significant difference. This is not uncommon in unsupervised programs to have low participation rates or low compliance with reporting.14,28 However, while no significance was seen in the current study, a multicomponent exercise program has been seen to be beneficial in maintaining functional capacity and preventing skeletal fragility.29 In this study, elderly women improved physical functioning and balance via a combined resistance and balance/jumping training program in three weekly sessions for a year.

A possible reason there was no increase in activity in our study could be that there was not enough time devoted to physical activity and balance training within our 8-session program (i.e., session #5 included physical activity and session #6 included balance). A comprehensive bone-health program lasting 16 weeks with 8 focusing on fall prevention showed an improvement in minutes of physical activity and fall/fracture-related risk factors as per participant surveys.30 In addition to Karinkanta colleagues’ study,27 a study by Tolomio looked at similar activities including walking, balance activities, small jumps, and then aerobics and strength training over 20 weeks in supervised sessions meeting three times per week. While this study showed an increase in bone quality (via hand phalanges) and leg strength, it was an organized program with supervision versus measuring a person’s day-to-day activity level. Carter and associates22 studied the effect of an exercise program (twice weekly, 20 weeks) in a community-based program setting. In this study, women with osteoporosis showed improvement in strength and balance. A similar finding occurred in women with osteopenia who participated in a 20-week exercise program.33 In a balance-related study that measured the effect of a 4-week aerobics program, the researchers found that there was a significant improvement in balance scores after 4 weeks. Another balance study evaluated the effect of a “Balance Training Program” (12 months long with weekly sessions and a prescribed home exercise program) on women with osteoporosis and found improvement in balance and fall prevention.

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LIMITATIONS:
While the current study showed improvements in calcium and vitamin D dietary intakes, addressing the limitations can strengthen the cost-effectiveness of the program.

Participants
There was a small sample of men, which fell below the power sample needed for evaluating statistical significance. Difficulty in recruiting men for the study could be due to osteoporosis being considered a woman’s disease. Being that the program was set up as a community program targeting those older than 50 years, this could have led to a more motivated and/or knowledgeable group of participants. This may have minimized the level of behavior change.

Nutrition
Supplement use was measured as a demographic but not measured as an outcome. It is unclear if supplement intake changed. Since soymilk does not have a separate category in the CFFQ, it was classified with dairy as nutritionally comparable to milk, especially regarding calcium and vitamin D levels. By being with dairy, the contribution from soymilk could not be quantified.

An increase in calcium-fortified foods was reported. It is unclear if this was due to actual increase or if the participants were more aware that they were already consuming a fortified food.

Vitamin D–fortified yogurt was new to the market during the intervention and is only available with certain brands. On 24-hour recalls, yogurt was commonly consumed by participants, but it was not reported as fortified with vitamin D. This may have led to an underestimation of dietary vitamin D. Also, no measure was made of UV exposure to quantify this source of vitamin D.

Activity
There was trouble in collecting activity records from week to week. This led to difficulty in tracking progress or changes being made. While the pedometers were a favorite of the participants, no other daily physical activity was measured. Several participants could not manage the heel drops, which impacted the power of the sample. However, no participant did heel drops prior to the program.

Overall, the current intervention did show the feasibility of translating clinical-trial recommendations for use with a community-based program. Framing the community program in behavior theories provides insight into factors affecting behavior change. When bone density data are available within longer-term community-based interventions, this data may add to the intervention itself by providing cues to action for the participants for motivation in cases of low bone density. However, this may have a negative effect toward healthy behaviors in those with normal bone density.

TAKE-AWAY POINTS:
• A community setting is a viable option in promoting and improving bone-health behaviors. The 8-week program length and format, including passive and active learning, can be effective in improving calcium and vitamin D intake. However, just having bone-health programs available may enhance awareness enough to have positive impact.
• The biggest increase in calcium intake via fruit and fortified grain products suggests that additional dietary calcium from dairy may not be probable. This has food marketing, product development, and nutrition-education implications.
• Framing results within either TRA or HBM provided insight into whether changes were made. Results of the TRA constructs helped to identify key attitudes and subjective norms to address in future interventions. Specific attitudes on which to focus: dietary adequacy for calcium and vitamin D, and adequate daily activity levels. Subjective norms to address include choosing fortified foods and activity at work. HBM showed that knowledge about susceptibility to osteoporosis was strongly recognized by the participants. Participants also readily agreed with the benefits of diet and activity and stated that barriers can be overcome. This is helpful in program planning to optimize the group’s time in strengthening self-efficacy to lead to positive diet and activity behaviors.

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Chair’s Message
Mary Herrstrom, RDN, LDN

WELCOME, NEW AND CONTINUING HEALTHY AGING DPG MEMBERS!
I hope all of you are having a delightful summer. This is my favorite time of year, spending time outdoors, watching my garden grow, and patiently waiting for the tomatoes to ripen. I hope you have made some time to enjoy your favorite things, too. Summer is also a great time for me to reflect on the many good things in my life, and envision all the good times yet to come. As chair of Healthy Aging’s Executive Committee, I am honored to lead such a diverse group of professionals, and I look forward to the rest of my year as chair.

Healthy Aging DPG is committed to supporting its members through education. Our DPG brings the latest food, nutrition, and wellness information to our members so they can apply this knowledge to their practices. Members can learn about important nutrition topics while earning CPE credit: Participate in our webinars and take advantage of the CPE articles offered by The Spectrum. Follow us on Facebook to keep up with all the latest news and events. Visit our website for additional information and resources. Here you will find a robust event calendar with national information, upcoming HA DPG events, and resource information.

Healthy Aging DPG has also re-launched our awards program, with a focus on professional development. If you are seeking opportunities to support your professional development, including the Board Certified Specialist in Gerontological Nutrition (CSG) credential, you can find helpful information on our website.

I hope you will join us in Houston this October at FNCE® (Academy of Nutrition and Dietetics Food & Nutrition Conference & Expo™). We are hosting special events for our DPG members. In addition to our annual HA DPG member breakfast, join us for our spotlight session, “Making Things Work: Tools, Resources, and Support for Caregivers and Workers” (HA DPG events are listed on page 10). After the spotlight session, meet us at The Grove restaurant for networking and refreshments; it’s a short walk from the conference center. Registration for our events has begun; you can find complete information on our website, under FNCE® 2013.

It’s going to be an exciting year. I hope you will make the most of all that HA DPG has to offer.
Call for Nominations: Healthy Aging DPG’s 2013–2014 Election

**Mission:** Leading the future of dietetics in healthy aging.

**Vision:** HA DPG members are the most valued source of food, nutrition and wellness information and services for all older adults.

The members of the Healthy Aging Dietetics Practice Group (HA DPG) make a positive difference in the lives of older adults. As an officeholder, you would be part of the HA DPG Executive Committee, whose goal is to guide our practice group toward its mission and vision.

**Officemembers of the HA DPG Executive Committee:**

- **Positively influence** the future of nutrition care for older adults.
- ** Develop** lasting friendships with a group of dedicated HA DPG members who make a difference in the aging community.
- **Share** your expertise and ideas with the rest of the Executive Committee.
- **Grow** and develop your leadership skills.
- **Mentor** members new to HA, developing your own mentoring skills as you do so.
- **Attend** planned/budgeted Executive Committee meetings.

**Elections will be held during the month of February, 2014.**
- **The term of office begins June 1, 2014.**
- **The length of office depends on the position.**

**Nominees are needed for the following positions:**

**Term of office begins June 1, 2014.** **HA year runs June 1-May 31. Length of office is dependent on the position.**

**Chair-Elect (3-year commitment as Chair-Elect, Chair, and Past Chair):**

*Requires prior HA Executive Committee (EC) experience.*

**Year-One Activities (as Chair-Elect):**
- Assist the Chair and become familiar with HA DPG procedures and the implementation of the Strategic Plan/Program of Work.
- Help plan the spotlight session and other HA DPG activities for the following year’s FNCE®.
- Prepare to assume the Chair position.
- Prepare the next year’s Strategic Plan/Program of Work and the budget.
- Assume the Chair’s duties if the Chair is absent.

**Year 2 Activities (as Chair):**
- Plan/Conduct EC meetings and conference calls.
- Work with the EC and guide the implementation of the Strategic Plan/Program of Work.
- Communicate verbally and in writing to engage members, strategic partners, and other Academy DPGs to advance and advocate for healthy aging initiatives and issues via meetings, conference calls, eblasts, and reports. Write the Chair’s Message column in four issues of The Spectrum.

**Year 3 Activities (as Past-Chair):**
- Serve the EC in an advisory role.
- Provide leadership on and update the HA Strategic Plan.

**Estimated time required:** As Chair-Elect: 6–8 hours/week. As Chair: 8–10 hours/week. As Past-Chair: 2–3 hours/week.

**Travel expectation:** Spring Executive Committee meeting, Fall Executive Committee meeting.

**Treasurer (2-year commitment):**

**Activities:**
- Maintain fiscal accountability for the HA funds.
- Keep complete and accurate financial records.
- Prepare annual budgets and spreadsheets.
- Prepare end-of-year financial reports.
- Present financial reports at the HA membership meeting.

**Estimated time required:** 2–4 hours/month; some additional time immediately following meetings.

**Travel Expectation:** Spring Executive Committee meeting, Fall Executive Committee meeting.

**Nominating Chair-Elect (2-year commitment as Nominating Chair-Elect and Nominating Chair):**

**Year-1 Activities (as Nominating Chair-Elect):**
- Assist with candidate recruitment.

**Year-2 Activities (as Nominating Chair):**
- Coordinate and direct the recruitment of candidates for HA EC office.
- Provide recommendations to the Chair and the Chair-Elect for candidates for appointed positions.
- Prepare the next-year’s ballot for posting on the HA DPG website.

**Estimated time required:** As Nominating Chair-Elect: 1 hour/month. As Nominating Chair: 2 hours/month for 6 months.

**Travel Expectation:** As Nominating Chair-Elect: Fall Executive Committee meeting. As Nominating Chair: Spring Executive Committee meeting, Fall Executive Committee meeting.

**Nominating Committee Member-at-Large (1-year commitment):**

**Activities:**
- Assist the Chair and Chair-Elect with candidate recruitment.
- Assist the Nominating Committee as needed.

**Estimated time required:** ½–1 hour/month for six months.

**Travel expectation:** None.

**A more-detailed description of these positions is available on the HA DPG website. Self-nominations are encouraged.**

If you would like to recommend a qualified HA DPG member for one of these positions, please [click here](#).

This is your DPG; be active and committed!

THE SPECTRUM • Summer 2013 12
MARK YOUR CALENDAR: UPCOMING CONFERENCES & EVENTS

2013

August 9–12, 2013
Society for Nutrition Education and Behavior Annual Conference
Portland, OR

August 28–30, 2013
Meals on Wheels Association of America Annual Conference
Boston, MA

October 19–22, 2013
Academy of Nutrition and Dietetics Food & Nutrition Conference & Expo™
Houston, TX

October 27–30, 2013
LeadingAge 2013 Annual Meeting and IAHSA Global Aging Conference
Dallas, TX

November 2–6, 2013
American Public Health Association Annual Meeting and Public Health Expo
Boston, MA

November 8–9, 2013
Aging and Society International Advisory Board
Third International Conference on Aging and Society
Chicago, IL

November 20–24, 2013
Gerontological Society of America Annual Scientific Meeting
New Orleans, LA

November 21–23, 2013
International Council on Active Aging Annual Conference
San Diego, CA

2014

February 27–March 2, 2014
Association for Gerontology in Higher Education Annual Meeting
Denver, CO

March 11–14, 2014
American Society on Aging
Aging in America Conference
San Diego, CA

April 3–9, 2014
American College of Health Care Administrators
Annual Convocation and Expo
Las Vegas, NV

May 15–17, 2014
American Geriatrics Society Annual Scientific Meeting
Orlando, FL

May 20–22, 2014
Assisted Living Federation of America Conference and Expo
Phoenix, AZ

May 28–30, 2014
National Association of Nutrition and Aging Services Programs
NANASP 2014 Annual Conference
San Antonio, TX

June 3–6, 2014
Association for Healthcare Foodservice National Conference
Orlando, FL

June 21–24, 2014
Association of Nutrition and Foodservice Professionals (formerly the Dietary Managers Association)
National Leadership Conference
Minneapolis, MN

July 12–16, 2014
National Association of Area Agencies on Aging
Annual Conference and Tradeshow
Dallas, TX

For the most-current list of events Click Here.

Other events, conferences, programs, and webinars:

The DHHS Administration on Aging
(now within the Administration for Community Living)

American Society on Aging

The National Council on Aging

Calendar Service Available

Food and nutrition professionals can call, fax, or write the Commission on Dietetic Registration office for information on prior approved continuing professional education activities by topic, program provider, location, and/or date.

Call: (800) 877-1600, ext. 5500
Fax: (312) 899-4772

Or visit the searchable database

Write attention: Commission on Dietetic Registration, 120 South Riverside Plaza, Ste. 2000, Chicago, IL 60606-6995
HA DPG’S MEMBERSHIP TEAM recently chatted with Staci Shell, RD, the developer and principal instructor of Conquering the Kitchen, a program for older male caregivers sponsored by the Area Agency on Aging of Western Michigan (AAAWM). HA DPG has recognized Staci for her Best Practice submission, Conquering the Kitchen, and this issue of The Spectrum includes an article about this consumer-oriented, educational program on page 16.

Since 2009, Staci has been the Nutrition Contract Coordinator for AAAWM and its nine counties, which are primarily rural. As Coordinator, she monitors adherence to Older Americans Act (OAA) nutrient and menu standards and oversees congregate and home-delivered meal-provider contracts. She provides nutrition education in community-based settings upon request, and is a ServSafe Instructor for providers in the region.

HA DPG was particularly interested in her many community interactions and those opportunities available to her for expanding nutrition services to a broader community-residing senior audience. AAAWM provides outreach and service to seniors, and many of these activities are not overtly related to nutrition. This has provided opportunities for Staci to collaborate with community partners on outreach strategies to better address the nutrition needs of older adults. For example, the Conquering the Kitchen program was developed to fill a service need identified through a survey of male caregivers conducted by AAAWM’s Caregiver Resource Network. AAAWM supports several healthy-aging programs using OAA Title IIIID: Disease Prevention and Health Promotion Services. The AAAWM is a certified provider for the evidence-based Stanford University Chronic Disease Self-Management Program and the Stanford University Diabetes Self-Management Program. Staci is a Master Trainer for these programs, instructing community service providers as well as layleaders. These providers are excited to learn the role of nutrition in disease management. She is also a Master Trainer for Healthy Eating for Successful Living in Older Adults, a six-week program designed to promote healthy lifestyle changes for heart and bone health. She has taught this program to older adults by taking them to the supermarket and also teaching meal planning and food preparation. Staci credits the AAAWM’s strong support for nutrition-related healthy-aging endeavors; as well as her supervisor, who is also an RD. Staci participates in several community groups, such as the Kent County Emergency Food and Shelter Board, the Kent County Food & Nutrition Coalition, and the Heart of West Michigan United Way’s Health Investment Council. By participating in a variety of different groups, she covers the diverse needs of older adults. For example, with the United Way Health Investment Council, her voice supports seniors as funding decisions are made. Staci precepted a dietetic intern in the spring for an aging-specific, community-based rotation.

By: Dian Weddle, PhD, RDN, FADA, Membership Director

Staci is a graduate of Purdue University and its Coordinated Program in Dietetics. In April she was named the 2013 Michigan Young Dietitian of the Year. Staci is a member of the Michigan Academy of Nutrition and Dietetics and the local Dietitians of West Michigan chapter, for which she recently finished a two-year term as treasurer. In addition to her membership with the HA DPG, she is a member of the Public Health/Community Nutrition DPG. In her leisure time, Staci enjoys cooking, working on craft projects, and visiting with friends and family.

We asked Staci if she had a recipe to share with our readers. She responded, “We found that many of the men participating in the Conquering the Kitchen program aren’t preparing enough vegetables for themselves and their wives. We share this Chicken and Peppers recipe with participants; it’s healthy, colorful, and easy to make. This dish also tastes great, especially with angel-hair pasta or steamed carrots!”

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Ingredients:
• Chicken breasts or tenderloins, 1 pound
• Peppers, any color, 2 or 3, chopped into large chunks
• Lemon, ½
• Feta cheese, 4–6 ounces
• Optional: Black pepper

Instructions:
1. Preheat oven to 350° F.
2. Place the chicken in the center of a pan.
3. Squeeze the juice from the lemon half over chicken.
4. Sprinkle with black pepper if desired.
5. Place chopped peppers around the edges of the pan.
6. Sprinkle the feta cheese over the chicken.
7. Bake for 20–30 minutes or until chicken reaches 165° F (cooking time depends on the size of the chicken).

The New, Optional Credential for Registered Dietitians:
RDN (Registered Dietitian Nutritionist)

A few months ago, the Academy of Nutrition and Dietetics announced the RDN (registered dietitian nutritionist) credential for registered dietitians. The Academy created this optional credential to show that “all registered dietitians are nutritionists, but not all nutritionists are registered dietitians.” Registered dietitians can choose to keep the RD credential or adopt the RDN credential. For more information, visit the Academy website.
THE AREA AGENCY ON AGING of Western Michigan (AAAWM) conducted a survey of male caregivers in 2010 and found that many of them did not have the basic kitchen skills needed to prepare meals. Many of them were buying frozen meals and eating out on a regular basis, which is not in the best interest of the caregivers or the care recipients.

To address this issue, Staci Shell, RD (Registered Dietitian, Nutrition Contract Coordinator at AAAWM) created the educational program Conquering the Kitchen to help local male caregivers become more comfortable in the kitchen, regardless of their cooking skills. The primary goal of this program is to teach these caregivers how to prepare simple, healthy meals, even if they have no kitchen experience. “My wife is kind of a kitchen princess. I was always told to stay out of the kitchen,” explained one participant when interviewed by the local television station. This changed when his wife could no longer prepare foods.

During the four-week program, participants learn how to plan a menu and grocery list, ways to make mealtime more enjoyable, and how to follow a recipe. Participants also learn about MyPlate and a variety of other topics that are essential for healthy eating. Additional community resources are integrated into the program to support its goals. Respite care is available for the participants’ spouses while classes are in session.

An additional goal of this program is stress reduction. “What we have seen in recent male caregiver classes is that many men were not as involved in meal planning or cooking in the past. Now they are taking care of their spouses and trying to learn how to do all of these tasks, and it can be overwhelming,” says Staci, who is also the instructor of the course. “Our hope is that by helping them conquer the kitchen, we will relieve some of their stress—make meal time a much smoother process. Also, male caregivers can meet others going through the same struggles.” The program is a comfortable, emotionally safe environment where participants can ask each other questions and troubleshoot problems about caregiving issues.

In 2012, two sessions of Conquering the Kitchen were held, and a total of nine men participated. The class size was limited to maximize interaction with the instructor and other class members. Each session had a 100% attendance rate. Participants often arrived early and stayed late, and all said that they now feel more comfortable in the kitchen as a result of the program.

The men were invited back for a luncheon in December to discuss their progress since first taking the class, and there were positive reports. One man even said that he enjoys cooking now, and that cooking is like therapy for him.

Staci explains that most of the participants’ wives have Alzheimer’s or some form of dementia, but that some of them have Parkinson’s, multiple sclerosis, or are blind. Although each participant’s situation is unique, all the husbands in the program share a common bond because they are learning new kitchen skills as an act of love for their wives.

AAAWM also coordinates the Caregiver Resource Network (CRN), which is a collaborative of over 100 agencies who work with older adults in western Michigan. The CRN helped market and get referrals for Conquering the Kitchen. AAAWM plans to run the course more frequently and also offer it in other counties. To achieve these goals, Conquering the Kitchen has recently received a grant from the Nokomis Foundation to help with the expansion of the program. More classes are planned for 2013, including a pilot class of men who are not caregivers but are living alone and/or widowed.

HA DPG is recognizing Staci for her Best Practice submission, “Conquering the Kitchen” program. The Spectrum has also interviewed Staci about her other professional pursuits (see page 14).

By: Dian Weddle, PhD, RDN, FADA, Membership Director; Staci Shell, RD

“Conquering the Kitchen”: A Healthy Aging DPG Best Practice

Conquering the Kitchen participants are hands-on in class.
Each year the Chair-Elect of the HA DPG selects three members to serve on the Executive Committee. This year’s appointees come from different parts of the United States and bring a wealth of skills to their positions. They welcome your comments and suggestions regarding their positions (see page 33 for their email addresses).

**Communications Director:**
Dr. Nancy Munoz, DCN, MHA, RDN, LDN

Paid professional position/role: Clinical Nutrition Manager for Genesis HealthCare, LLC.

Thoughts: I am thrilled to be working with the other dedicated professionals who support the communications department of the organization. I’m looking forward to a great year!

Interesting fact or two about yourself: I auditioned to be a Playboy Bunny for the New York club in 1980.

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**Professional Development Director:**
Katie M. Dodd, MS, RD, GSG, LD

Paid professional position/role: Home Based Primary Care Dietitian, Veterans Health Administration.

Thoughts: I am looking forward to helping HA members meet their professional development needs and goals.

Interesting fact or two about yourself: I am the mom of a sweet little toddler named Gavin, I am an avid rock hound, and I am one of the administrators for the Healthy Aging DPG Facebook page.

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**Public Policy Liaison:**
Dianne Kammerer Polly, JD, RDN, LDN

Paid professional position/role: Vice-President, Compliance and Community Relations, Metropolitan InterFaith Association (MIFA).

Thoughts: I currently serve on the Academy’s Legislative and Public Policy Committee, and I plan to bring the information I glean from those meetings to our members. I strongly believe that all members need to be engaged in advocacy.

Interesting fact or two about yourself: I won the Betty Crocker Soul Food Contest with my recipe for “Sweetie Potato Pancakes.” I also used to have my own motorcycle, and my children recently found a picture of me sitting on it, in a bikini.
THE HOUSE OF DELEGATES (HOD), as the voice of members, governs the dietetics profession and develops Academy policy to address major professional issues.

The HOD’s Activities
To govern the profession of dietetics, the HOD engages in the following activities:

• Monitors and evaluates trends affecting the profession.
• Monitors member issues and mega issues, and the resulting actions.
• Approves standards of education and standards of practice.
• Reviews, debates, and approves professional standards.
• Establishes the size and structure of the HOD.
• Partners with the Commission on Dietetic Registration (CDR) to adopt and revise a code of ethics for dietetics practitioners, disciplinary procedures for unethical conduct, and reinstatement conditions.
• Makes recommendations to the CDR about standards, qualifications, and other issues related to credentialing.
• Makes recommendations to the Accreditation Council for Education in Nutrition and Dietetics (ACEND) about accreditation, approval, and related issues.
• Provides direction for quality management in dietetics practice.
• Identifies and develops position statements.
• Provides oversight concerning Academy bylaws.
• Assists with recruitment and retention efforts related to Academy membership and leadership development.

As of June 1, 2013, the HOD includes 105 delegates:
• 66 Affiliate Delegates are elected by members of the 53 affiliate dietetic associations (consisting of the 50 states, Puerto Rico, and the Overseas Dietetic Association).
• 26 Dietetic Practice Group Delegates are elected or appointed by each DPG’s membership. Each delegate represents the specific DPG that elected this delegate.
• 7 At-Large Delegates: 1 delegate appointed by and representing ACEND, 1 delegate appointed by and representing CDR, 1 delegate appointed by and representing NDEP (Nutrition and Dietetic Educators and Preceptors), 1 delegate elected by the Student Advisory Committee to represent student members, 1 nationally-elected delegate who represents DTRs, 1 delegate elected by the HOD to represent retired members, and 1 delegate elected by the HOD to represent members under 30 years of age.
• 6 HOD Directors comprise the House Leadership Team (HLT), including the Speaker, Speaker-Elect, and immediate Past-Speaker, elected by the membership. They are members of the Academy Board of Directors (BOD).

Delegate Responsibilities
A delegate has these responsibilities:
• Interacts with members to identify issues important to the membership.
• Identifies professional issues affecting dietetics practice and is knowledgeable about these issues.
• Participates in HOD discussions to provide direction on member and professional issues.
• Communicates member and professional issues to the HOD Leadership Team.
• Contributes to trend identification and strategic planning.
• Informs members about the Academy’s activities, programs, services, and HOD initiatives.

What Members Receive from Delegates
Healthy Aging DPG members can expect their delegate to:
• Provide regular updates on HOD and Academy activities.
• Request input on issues being discussed by the HOD.
• Request identification of trends and issues affecting the dietetics profession.
• Identify potential members for leadership roles with the Academy.
• Support the Academy’s membership recruitment and retention efforts.
• Assist with keeping HA DPG members informed about HOD-related issues.
• Assist with submitting to the Academy any issues or concerns that HA DPG members have about the profession or Academy.

How HA DPG Members Can Support Their Delegate
Academy members can support the delegate by:
• Reviewing electronic and/or written information about the Academy and HOD.
• Providing input to issues being discussed by HOD.
• Identifying trends and issues affecting the profession.
• Sharing knowledge of HOD and Academy activities with others.

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Communicating with Your Delegate

The HA DPG’s delegate:
• Wants to hear from members.
• Shares key Academy and HOD information with members.
• Wants to know your ideas, concerns, and issues.
• Needs to know the best method(s) for communicating with members.

You can find information regarding the House of Delegates on the Academy website. You will be required to log in. Information is also regularly posted on the HA DPG delegate website.

Submitted By: Sharon Leppert, RDN, LD, Healthy Aging DPG Delegate

Healthy Aging Dietetic Practice Group

Our Mission
Leading the future of dietetics in healthy aging.

Our Vision
Healthy Aging DPG members are the most valued source of food, nutrition and wellness information and services for older adults.

Author Opportunities

The Spectrum’s editorial board is searching for authors to write articles on the following topics:

1. Issues of nutrient supplementation
2. Protein and aging
3. Nutrients and cognition
4. Nutrition status as a risk factor for falls among older adults
5. Malnutrition and older adults

If you are interested in becoming an author, or if you would like to suggest a possible author, please submit your name and contact information to Robin Dahm, RDN, LDN.
According to recent surveys, older Americans often eat a nutrient-poor and sometimes energy-deficient diet. We as nutrition professionals can strive to identify the multi-factorial causes of nutritionally inadequate diets in the older American population. An individual’s diet, health, nutritional and medical history, nutritional status, and socioeconomic factors all play an important role in how supplementation or diet—or the combination of the two—can optimize nutrient status. Given the importance that nutrition plays in the lives of older adults, through its effect not only on morbidity and mortality, but on quality of life, examining the evidence surrounding supplementation in this population is imperative.

**Government-Assistance Programs**

The “graying” of America is an often-discussed topic in the media and politics, and raises concerns regarding current policies that provide aid to older Americans. Policies are focused on shifting older-adult care away from facilities—including assisted living, skilled nursing, and other specialized, centered locations—in order to reduce health care costs. Instead, care will be provided in the home and/or within the community, through home-delivered meals, adult community centers, and other strategies. This population is physiologically vulnerable and at additional risk of financial insecurity and negative social atmospheres, including loneliness, depression, social isolation, and the inability to acquire and/or prepare nutritionally adequate foods due to functional limitations or insufficient financial resources. Addressing these risks and altering the environment of older adults is where federal assistance programs come in. These programs have the potential to provide both adequate nutrition and energy, and address food insecurity among older adults. Those older adults who are physically limited, depressed, and/or functionally dependent can find it challenging to shop for or prepare nutrient-dense meals. These government programs can also provide nutrition screening and assessment to better direct care.

The National Aging Network is comprised of “nutrition and supportive home and community based services” to various states, area agencies, and tribal organizations for older Americans, with funding awarded by the Administration on Aging (AoA). Title III of the Older Americans Act of 1965 delineates funding for congregate and home-delivered nutrition services. Unfortunately, fewer than 5% of older adults are reached. Contrast these numbers with WIC, a model nutrition intervention program, where 60% of needy women and children and 98% of eligible infants are being served. Possible reasons for low participation in Title III nutrition programs include:

- Limited funding that leads the AoA to target only those older adults in extreme economic and social need, and
- A lack of knowledge on the part of the older adults and caregivers that these programs are not based on income.

Congregate meals provide a social dining atmosphere as well as hot meals, while home-delivered meals are often a crucial support to home-bound adults with impaired functional ability. As policy shifts to provide care for older adults in their homes and communities, program improvements become increasingly crucial.

The focus of this article is not to provide detailed information regarding the different government assistance programs; however, their policies and success (or lack thereof) is important to have a general understanding of when discussing nutritional status in older adults. For more detailed information, please refer to the position paper, “Position of the American Dietetic Association, American Society for Nutrition, and Society for Nutrition Education: Food and Nutrition Programs for Community-Residing Adults.”

**Dietary Intake of Older Americans**

Many older Americans either exceed or fall short of their energy needs. The majority of older adults who fall into either of these categories consume diets insufficient in the necessary micronutrients. A registered dietitian nutritionist (RDN), registered dietitian (RD), or Dietetic Technician, Registered (DTR) who has counseled clients about weight loss is likely familiar with the challenges of reducing energy intake (often by decreasing solid fats and added sugars) by replacing these with nutrient-dense foods, or foods in their most natural and whole forms. Dietary needs of older adults are similar: reduced energy requirements with important micronutrient needs.

Older adults who are exceeding their energy needs without meeting adequate nutrient intakes do so through excessive consumption of

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To achieve lower energy requirements as well as adequate nutrient intake, encouraging dietary variety including better food choices and increased fiber for satiety can be a successful strategy. Research studies looking at food consumption and institutionalized older adults found that increased dietary variety improved nutrient status and blood lipids, and that feeding assistance improved dietary variety.\(^7\)

When older adults are not meeting their energy needs, it may be due to a number of reasons. These can be physiological, social, functional, or a combination. Some examples include medical conditions or medications (see Table 1) that affect appetite, the digestive and absorptive process, or sensory functions such as taste and smell; changes in digestion, absorption, metabolism and excretion with age that increase needs; lack of functional ability to shop or prepare food; difficulty chewing and/or swallowing; financial considerations for buying food; and social aspects such as loneliness and depression which serve as strong demotivators for nutritious meal prep or even food consumption.\(^4\)

To address inadequate energy consumption, nutrition practitioners should analyze each situation on a case-by-case basis, as there are a number of possible causes. For independent older adults, consider social causes and economic considerations. Explore having volunteers or family and friends eat with the person, or have meals delivered through a food assistance program. In institutionalized older adults, a research study found that increased dietary variety can increase energy intake,\(^9\)\(^47\) as can feeding assistance.\(^7\) In assisted living and nursing homes, it is also imperative to consider medications and other supplements being provided. Wilson et al. conducted a study examining the effects of liquid dietary supplements on satiety in both younger and older adults and found that older adults sustain a longer satiety period.\(^2\) When given a supplement 5 minutes before a meal (pairing supplements with meals) versus 60 minutes before a meal (spacing supplements between meals), energy intake at the meal was reduced when pairing the supplements with meals. The investigators hypothesized that the reason for the increased satiety period could be due to a decrease in taste and olfactory senses, which negate the hedonic experience of eating that may keep younger adults eating in the first 15–20 minutes. In summary, older adults are more aware of the satiety effect of food during a meal because they may have reduced hedonic enjoyment of the food itself. Additionally, a decline in the rate of gastric emptying leads to an earlier, persistent distension of the antrum (the lower portion of the stomach) that has an increased duration, contributing to feelings of satiety in older adults.

### The Status Quo

Therapeutic diets are often prescribed with the intention of improving health, but they are restrictive, and recent data points us in a different direction, where the decline in food intake as a result can lead to unintended weight loss,\(^10\) which can then have

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**Table 1: Drugs with potential effects on food intake.\(^8\)**

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>General Function</th>
<th>Example of Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Drugs that increase appetite</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antidiabetic</td>
<td>Control blood glucose</td>
<td>Insulin</td>
</tr>
<tr>
<td>Antiemetic</td>
<td>Control nausea/vomiting</td>
<td>Chlorpromazine</td>
</tr>
<tr>
<td>Antipsychotic</td>
<td>Management of</td>
<td>Chlorpromazine</td>
</tr>
<tr>
<td>Antimanic</td>
<td>Management of</td>
<td>Lithium</td>
</tr>
<tr>
<td>Antidepressant</td>
<td>Control of depression</td>
<td>Zoloft</td>
</tr>
<tr>
<td><strong>Drugs that decrease appetite</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-inflammatory</td>
<td>Control of inflammation</td>
<td>Sulfasalazine</td>
</tr>
<tr>
<td>Antigout</td>
<td></td>
<td>Colchicine</td>
</tr>
<tr>
<td>Antiarrhythmic</td>
<td>Control of gout</td>
<td>Digitalis</td>
</tr>
<tr>
<td>Antidepressant</td>
<td>Control of abnormal heart rhythms</td>
<td>Paxil</td>
</tr>
<tr>
<td>Diuretic</td>
<td>Control of depression</td>
<td>Furosemide</td>
</tr>
<tr>
<td>(Loop, potassium depleting)</td>
<td>Control of blood pressure and excess body fluid</td>
<td></td>
</tr>
<tr>
<td>Non-steroidal anti-inflammatory drugs (NSAIDs)</td>
<td>Control of inflammation</td>
<td>Indomethacin</td>
</tr>
<tr>
<td><strong>Drugs that cause hypoguesia (a decreased taste sensation) and/or dysguesia (an altered ability to taste food)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antihypertensive</td>
<td>Control of high blood pressure</td>
<td>Captopril</td>
</tr>
<tr>
<td>Antibiotic</td>
<td>Control of infections</td>
<td>Penicillin</td>
</tr>
<tr>
<td>Antineoplastic</td>
<td>Management of cancer</td>
<td>Fluorouracil</td>
</tr>
<tr>
<td>Antimanic</td>
<td>Management of bipolar disorder</td>
<td>Lithium</td>
</tr>
</tbody>
</table>
serious consequences. However, despite the growing evidence over the past decade, therapeutic diets are still widely prescribed in some facilities.10,11,12 The Academy’s position paper, “Position of the American Dietetic Association: Liberalization of the Diet Prescription Improves Quality of Life for Older Adults in Long-Term Care,” reflects the current evidence that diets liberalized on a case-by-case basis can improve function through improved nutritional status,13 in contrast to the advice typically given to younger adults with the same chronic diseases.10 When objectively analyzing nutrient intakes against references, it should be noted that the Dietary Reference Intakes (DRIs) are meant for healthy individuals, not those who are malnourished. Thus, defining and recognizing malnutrition in the older-adult population is important when considering how best to address malnutrition as it affects the individual.6

**Needs Versus Intake**
The aging body has reduced energy needs, though micronutrient requirements often stay the same or increase (as shown in Table 2).4,8 Lean body mass is the primary determinant of the body’s metabolic rate.4 As we age, physical activity tends to decline, as does lean body mass. Body composition shifts toward increased body fat. These changes result in a decreased metabolic rate and a decrease in energy needs.4 When these reduced needs are not reflected in the diet, increased adiposity and general weight gain can occur, which can lead to functional decline and even sarcopenic obesity. Conversely, anorexia of aging can lead to unintended weight loss, which also has functional implications and can lead to sarcopenia and malnutrition.4 These changes in lean body mass have implications for micronutrient needs. Changes in bone mineral density, immune function, nutrient digestion and absorption, and general metabolic processes also alter micronutrient needs. The overall implication of reduced energy needs with stagnant or increased micronutrient needs warrants a nutrient-dense diet, which may be rather restrictive, reducing quality of life as it relates to dining.4,11

**The Difference between PEM and Sarcopenia**
Protein-energy malnutrition (PEM) is an imbalance of nutrients with negative effects on the body,14 as described in the sidebar, “Protein-Energy Malnutrition.” PEM is often screened for through assessment of dietary intake, body weight changes, and laboratory values.14 In this assessment, lean body mass (LBM) is typically not assessed.14,15 LBM plays a critical role in overall metabolism, strength, mobility, balance, and quality of life in older adults living with chronic disease.14,16 Sarcopenia is defined as an age-related loss in lean body mass; and a loss of strength, functionality, or both17 (see the sidebar, “Sarcopenia“). The delineation between how these two syndromes are assessed points to their differences, but it is important to note the existence of Malnutrition-Sarcopenia Syndrome (MSS) in older adults, where both conditions co-exist.14 Reductions in handgrip strength are common in older adults who have sarcopenia, as well as in those who are malnourished.14,17,18 The resulting loss of lean body mass is a major contributor to decreased functionality.14 A major risk factor for rapid development of sarcopenia is injury, where older adults can lose 5–6% of their total body weight, mostly muscle mass, and gain anywhere from 4–11% in fat mass a year after that injury.14,19

**Fluid Needs and Intake**
Dehydration is also a form of malnutrition.1 Older adults have an increased risk of dehydration for a number of reasons, including:

- Reduced kidney function leading to diluted urine and decreased thirst sensations
- Endocrine changes
- Cognitive changes
- Side effects from medication such as diuretics that increase excretion, compelling the individual to limit fluid intake
- Mobility disorders such as arthritis and sarcopenic obesity, where it can be difficult and painful to go to the bathroom
- Fear of incontinence that may contribute to an older adult’s limited fluid intake.1

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**Table 2: Age-related changes in the body that may affect nutrient status.**

<table>
<thead>
<tr>
<th>Type of Change</th>
<th>Specific Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body composition</td>
<td>• Increased fat tissue</td>
</tr>
<tr>
<td></td>
<td>• Decreased muscle mass</td>
</tr>
<tr>
<td></td>
<td>• Decreased total body water</td>
</tr>
<tr>
<td>Blood flow</td>
<td>• Decreased blood flow through gastrointestinal tract, liver, and kidneys</td>
</tr>
<tr>
<td>Organ and tissue mass</td>
<td>• Decreased gastrointestinal surface area for absorption</td>
</tr>
<tr>
<td></td>
<td>• Decreased liver and kidney mass</td>
</tr>
<tr>
<td>Body function</td>
<td>• Decreased gastric acid secretion</td>
</tr>
<tr>
<td></td>
<td>• Decreased gastrointestinal motility</td>
</tr>
</tbody>
</table>
Consequences of dehydration in older adults include constipation and fecal impaction, cognitive impairment, functional decline, and even death. Cognitive impairment should not be overlooked as a symptom of aging, and any changes in mental status should be explored to rule out dehydration. All members of the care team should work together to ensure that older adults are consuming adequate fluids. This may mean offering beverages between meals, offering a different type of beverage, or cup and bottle holders that attach to walkers and wheelchairs.

**Fiber Needs and Intake**
This excessive discretionary intake prevalent among older Americans typically includes processed carbohydrates that lack significant fiber. Increasing dietary variety will often increase fiber intake through the consumption of fruits, vegetables, and whole grains; while lowering discretionary calories. It is important to note that fiber found in cereal grains has been associated with a decreased risk of cardiovascular disease in older adults, an association not found with fruit and vegetable fiber.

Increased dietary variety not only adds fiber, but also provides additional vitamins, minerals, antioxidants, and similar beneficial nutrients whose effects seem to be greatest in whole-food form instead of isolated supplements. Consumption of fiber may also increase gut motility, reduce cholesterol levels, and reduce the risk of malnutrition and obesity through the consumption of nutrient-dense foods. High-fiber foods are generally less energy-dense than high-fat foods. They can therefore displace energy when substituted for high-fat foods, while maintaining satiety, a key demotivator in weight loss diets.

Fiber acts as an obstacle to energy intake, by displacing available energy, increasing mastication and satiety, and reducing absorption efficiency. These aspects of fiber are important when looking at energy intake, but must also be taken into account in older adults with chewing and swallowing difficulties and, to a lesser extent, the effect of fiber on nutrient absorption. Most importantly, when increasing fiber intake, it should be done gradually and always with a simultaneous increase in fluid intake.

For older adults who are not consuming adequate energy, it is important to balance the benefits of fiber with the detriment of increased satiety in an individual with poor appetite. When treating constipation,
fecal impaction, and diarrhea in older adults, especially those with poor energy intakes, it is important to weigh all possibilities.24 More information on fiber supplementation is found in the later supplementation section.

Both older adults and children have a daily fiber AI (adequate intake) of 14 g per 1,000 kcal consumed. The decreased need when compared to the general adult population reflects both limited clinical data on these populations and decreased energy requirement.24

The Protein Debate
With age, total body protein (skeletal muscle) decreases, as does organ tissue, blood proteins and immune bodies.25 These decreases are linked to a reduction in total body potassium and water,25 which can in turn result in impaired wound healing, decreased skin elasticity, and compromised infection-fighting capacity.25 In other words, this decrease in total body protein with age can exacerbate pre-existing frailty, wound healing, and immune dysfunction. Protein intake often decreases with age because these food sources can be more expensive.26 Additionally, aging is associated with early satiety, decreased gastric emptying, difficulty with chewing and swallowing, and changes in digestion.26

The importance of protein in this population is universally agreed upon; however, the recommended amount is under debate.26 Research by Campbell et al. concludes that older adults do not require any more protein than younger adults,27 reflecting the RDA of 0.8 grams of protein per kilogram of body weight for all adults over the age of 19. The investigators compared adults aged 21 to 46 years and 63 to 81 years on various protein diets (0.5, 0.75, and 1 gram of protein per kilogram of body weight, respectively) and assessed nitrogen balance to determine ideal protein requirement. The data suggested there was no difference in the dietary protein requirement by age, or from the RDA of 0.8 grams of protein per kilogram of body weight. Campbell et al. concluded that aging does not impair the body’s ability to synthesize protein from high biological value dietary protein sources, and that decreases in body protein with aging are due to factors such as decreased physical activity, changes in the endocrine system, and the presence of chronic disease and inflammation.1,27

However, 15% to 38% of adult men and 27% to 41% of adult women have dietary protein intakes below 0.8 grams of protein per kilogram of body weight.26 Certain confounding medical conditions such as pressure ulcers and other wounds, as well as medical treatments such as dialysis, can increase protein requirements in older adults above 0.8 g protein/kg body weight.26 The dietetics practitioner should examine the big picture when it comes to both protein and micronutrient needs, especially in cases of PEM (protein-energy malnutrition) and/or sarcopenia, as concurrent medical conditions may exist. In summary, the RDA of 0.8 g protein/kg body weight is an adequate minimum recommendation for the healthy older-adult population, but needs may be increased due to medical conditions.

Other studies point to a situation where healthy ambulatory adults warrant an increased intake of 1.0 g protein/kg to compensate for the decrease in skeletal muscle, with some

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Sarcopenia is the age-associated loss of skeletal muscle mass and strength1,21 and is a common geriatric syndrome but unfortunately seldom recognized by physicians.21 Sarcopenia is complex, and can be associated with loss of muscle mass only or exist in conjunction with increased fat mass, or sarcopenic obesity.

Multi-factorial causes of sarcopenia are numerous and include muscular disuse, changing endocrine function, chronic diseases such as type 2 diabetes mellitus, chronic heart failure, COPD, chronic kidney disease, rheumatoid arthritis, and malignancy.21 Additionally, inflammation and nutritional deficiency (especially deficiencies in protein, energy, and vitamin D) can cause sarcopenia.21 In contrast to PEM, sarcopenia can be classified to some extent as a possible manifestation of PEM and is more notably defined as a loss of LBM, strength, and ultimately functional abilities; sarcopenia can therefore be a key precursor to an older adult becoming frail.1 Measures to reduce the prevalence and severity of sarcopenia should focus on target populations, including older adults experiencing a decline in physical functioning, strength, and health; are bed-ridden; cannot independently rise from a chair; and have a measured gait speed of less than 1.0 m/sec and/or an objectively measured low muscle mass.21 Body-composition assessment using DXA (based on lower whole-body or appendicular LBM), in combination with existing poor physical functioning, can be used to diagnose this condition accurately.21 Sarcopenic obesity results from chronic consumption of excessive energy and insufficient nutrients, leading to a coexisting decrease in LBM and an increase in fat mass. The decline in physical activity that occurs with age magnifies the decline in functional limitation and exacerbates nutrient deficiencies, both of which independently predict the risk of disability.1 Physiologically, sarcopenic obesity is characterized by low-grade inflammation, insulin resistance, degeneration of muscle, increased deposition of adipose tissue, and a change in the hormones and peptides generated by the adipose tissue.1 With the rise in obesity, sarcopenic obesity and general malnutrition in overweight and obese older Americans is becoming more prevalent, and malnutrition should not be overlooked in these cases.22,23

Sarcopenia
conclusions pointing to an intake up to 1.6 g protein/kg to prevent sarcopenia. This increased amount of protein intake may enhance protein anabolism and reduce the age-related loss of skeletal muscle mass. Studies suggesting higher intakes (1.0–1.3 g protein/kg body weight) reflect lower energy intakes, decreased protein-synthesis efficiency, and impaired insulin action in older adults. While the data supporting the ability of dietary protein to support muscle protein synthesis despite the aging process is in agreement with these results, the ideal amount of protein remains under debate.

Symons et al. examined the consumption of high-quality dietary protein on skeletal-muscle protein synthesis in both young and older adults. The researchers first gave participants either a small serving of 90% lean beef (113 g food, 220 kcal, 30 g protein) or a large serving (340 g, 660 kcal, 90 g protein). They then took venous blood samples and performed muscle biopsies of the vastus lateralis muscle during primed constant infusion of phenylalanine. The small servings increased skeletal-muscle protein synthesis by 50% in both age groups, but the large servings did not add additional synthesis beyond this mark, despite the tripled protein and energy content. They concluded that consuming more than 30 g of high biological value protein at a single meal does not enhance skeletal muscle growth in either age group.

Foods containing high-biological-value proteins are emphasized for this population, where 25–30 g of these proteins should be consumed per meal in order to maximize the older adult’s ability to synthesize body protein from dietary sources. Unfortunately, it may be difficult for many older adults to even meet the RDA protein, let alone an increased value, due to limited economic resources, decreased appetite, and limited functional and motivational capacity for food shopping and meal preparation. In situations of reduced appetite, high biological value protein becomes increasingly important, in order to maximize the amount and quality of protein.

**Malnutrition**

Malnutrition has been defined in a number of ways, including:

• The cellular imbalance between the supply of nutrients and energy and the body’s demand for them to ensure growth, maintenance, and specific functions.

• A deficiency syndrome caused by inadequate intake or absorption of macronutrients.

• Any disorder of nutrition status, including disorders resulting from deficiency of nutrient intake, impaired nutritional metabolism, or overnutrition; as in the case of obesity.

• A faulty or inadequate nutritional status; undernourishment characterized by insufficient dietary intake, poor appetite, muscle wasting and weight loss.

• A pathological state resulting from a relative, or absolute, deficiency of essential nutrients.

Despite the number of definitions, and the differences between them, the causes and consequences of malnutrition in the older-adult population remain serious. Anorexia of aging is a concept often used to describe the loss of appetite; the poor quality of diet; insufficient energy and essential nutrients; and ultimately the malnutrition, frailty, and disability that can occur in older adults. This progression can have a number of both physiological and sociological causes, and can affect even the healthiest of older adults. Chen et al. describe malnutrition in older adults as “an ominous sign; a multi-dimensional concept encompassing physical and psychosocial elements; [often] precipitated by loss, dependency, loneliness and chronic illness and potentially impacts morbidity, mortality and quality of life.” In addition, those who live alone, have experienced recent weight loss, have a history of lung and/or heart disease, and whose physical activity has decreased are also at risk for malnutrition. Many dietetics practitioners in the long-term-care field already recognize weight loss, loneliness, and isolation as potential red flags for compromised nutritional status. It is essential to delineate between different types of malnutrition (such as protein-energy malnutrition, energy malnutrition, protein malnutrition, vitamin and mineral deficiencies) and their consequences (such as sarcopenia, impaired immune system, and a weakened skeletal system), recognize the importance of the social aspect of food, and be aware of policy goals and government-assistance programs that play a role in providing not only food security but also nutritious meals to our elders.

**Dietary Reference Intakes**

Achieving the dietary reference intake of a particular nutrient may not be sufficient to restore appropriate physiological levels in a malnourished older adult. In fact, these older adults might need a higher level in order to replenish depleted stores, or to overcome increased needs from disease, surgery, infection, or medication. On the other extreme,
some might need lower amounts due to similarly altered requirements and might display signs of toxicity at the DRI.6 DRI Upper Limits (UL) were established because of the widespread prevalence of dietary supplements and fortified foods, particularly for these nutrients:

- Vitamin E, niacin, and folate in synthetic forms found in supplements and fortified foods
- Magnesium in pharmacological agents
- Vitamin A from either pre-formed vitamin A or retinol in supplements

Additionally, there is concern that consumers are not aware of the entire sum of nutrients they consume through fortified foods, whole foods, and supplements. Caution is recommended for nutrient intake above the RDA or AI amount, even when below the UL.6

A few nutrients of particular concern for older adults include vitamin B$_{12}$, vitamin D, and calcium because survey data demonstrates nutrient gaps between intake and the DRIs.6 NHANES 2001–2002 data suggests additional gaps in consumption of vitamins A, E, C, B$_6$ and magnesium and zinc.32 Nutrition educational tools and consumer-friendly materials, such as MyPlate for Older Adults (Figure 1) and the Food Guide Pyramid for Older Adults (Figure 2) emphasize the additional need for vitamin B$_{12}$, vitamin D, and calcium for adults over age 70, reflecting the nutrient gaps found in the food-consumption patterns of older Americans.6

**Vitamin B$_{12}$**

The prevalence of vitamin B$_{12}$ deficiency in older adults is estimated at 6–15% of the older adult population, with 20% having marginal

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**Figure 1:** MyPlate for Older Adults.

*Source: Jean Mayar, USDA Human Nutrition Research Center on Aging at Tufts University, 2011. Accessed April 17, 2013.*

**Figure 2:** Modified MyPyramid for Older Adults.


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vitamin B<sub>12</sub> status. The effects of a national effort to fortify grains with folic acid may manifest in the older adult population by masking a vitamin B<sub>12</sub> deficiency. Additionally, vitamin B<sub>12</sub> deficiency symptoms—motor, sensory, and neurocognitive impairment—may be attributed to the aging process.

Adults over age 50 are advised to consume 2.4 µg/day of vitamin B<sub>12</sub> from fortified foods and supplements (crystalline form). The additional need with age reflects the reduced ability of older adults to digest and absorb food-bound vitamin B<sub>12</sub>, whether from reduced intrinsic factor secretion, or a medical condition called atrophic gastritis, where inflammation of the stomach reduces its ability to secrete intrinsic factor among other substances.

The Academy Evidence Analysis Library has assigned a grade II to the evidence surrounding vitamin B<sub>12</sub> supplementation in older adults, where oral supplements were found to be as effective as intramuscular injections.

**Vitamin D and Calcium**

For older adults, a usual intake of food does not typically meet the DRIs for vitamin D or calcium. The health implications of reduced bone mineral density (BMD) and increased risk of fractures and falls characterize the combination of these deficiencies, as particularly important. While a large percentage of Americans overall are not meeting their calcium needs, older adults make up a significant percentage.

Older adults are at increased risk of vitamin D deficiency resulting from a decreased ability of the aging body to synthesize vitamin D from sunlight, as well as the limited exposure to sunlight common in the older-adult population. Vitamin D supplementation for older adults carries an EAL evidence grade II, where there was a positive association found between supplemental vitamin D and bone mineral density in postmenopausal women and older men. The supplement level used was between 400 and 1400 IU a day.

The combined supplementation of vitamin D3 and calcium (at 400–800 IU vitamin D3/day and 500–1200 mg calcium/day) was found to reduce the incidence of fractures in institutionalized older adults (EAL grade II). The combined supplementation, in addition to a healthy body weight and physical activity, can both prevent and delay osteoporosis and minimize fall risk.

There has been additional research into the relationship between bone health and vitamins A and K, as well as magnesium and phytoestrogens.

**Defining Supplementation**

It is the position of the Academy of Nutrition and Dietetics that the “best nutrient-based strategy for promoting optimal health and reducing the risk of chronic disease is to wisely choose a wide variety of foods. Additional nutrients from supplements can help some people meet their nutrition needs as specified by science-based nutrition standards such as the Dietary Reference Intakes.”

The benefits of consuming whole foods (foods in their most natural forms), instead of supplements, are multi-factorial. Isolating beneficial nutrients from whole foods removes the synergistic interaction between these nutrients—interactions we may not fully understand yet, although we know they have different effects on our bodies than isolated nutrient supplements do. Studies have found that positive health outcomes are more often associated with a healthy overall dietary pattern than individual nutrient consumption. The position statement addresses the key difference between those intending to prevent disease and maintain health, and those who are having difficulty meeting the DRIs for some other reason. However, as mentioned in the introduction, it is key to remember that the DRIs were written for a healthy population, and that they may not be an ideal reference for malnutrition or specific nutrient deficiencies. Additionally, much of the research on specific nutrient needs in older adults is lacking, even in the healthy population.

Despite the lack of evidence for reference intakes, older adults rank among the American population groups that most often take dietary supplements, with 63.3% consuming any type of dietary supplement and 39.8% consuming a multivitamin/mineral supplement (MVM). Across the board of all types of dietary supplements of separate vitamins and minerals, more adults aged 60 or older consume these supplements when compared with adults aged 20 to 59. With these parameters in mind, supplementation can be addressed.

The Federal Drug Administration defines a dietary supplement as: “A product intended to supplement the diet that contains any of the following dietary ingredients: a vitamin; a mineral; an herb or other botanical; an amino acid; a dietary substance for use by humans to supplement the diet by increasing total dietary intake; or a concentrate, metabolite, or constituent extract, or combination of any ingredient mentioned above. Dietary supplements are intended to be taken by mouth and can be in pill, capsule, table, liquid, powder or other form as long as they are not represented for use as a conventional food or as a sole item of a meal or diet.”
Supplement
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By this definition, dietary supplements include:6
• Any vitamin or mineral supplement, whether containing an isolated nutrient or a combination (such as a supplement that combines vitamin D and calcium)
• An enteral or parenteral formula used in conjunction with oral intake (but not the sole source of nutrition)
• Complementary alternative medicines
• Protein and amino acid supplements intended for the retention of lean body mass and growth
• Drinkable supplements

Types of Supplements
After addressing the specific nutritional needs of the older-adult population, the role of supplements themselves should be considered. The care-plan team must consider the types of supplements available, if supplements are appropriate or contraindicated, and the benefits of whole foods versus supplements. In addition, the use of supplements is not an adequate replacement for a healthy, diverse diet.6

Types of supplements include drinkable supplements, isolated micronutrient supplements, MVM supplements, and fiber supplements.6

• Drinkable supplements. Drinkable supplements can contribute toward a number of nutritional-intervention goals, including meal replacement, increased energy intakes, therapeutic treatments, and wound healing. Both full-energy and reduced-energy formulas can meet the DRIs. They also contain water that count toward an individual’s daily intake of fluids.

• Isolated micronutrient supplements. Micronutrient supplements may come in different forms of a single nutrient (calcium citrate, calcium carbonate) that might be absorbed differently based upon feeding state or what the supplement is consumed with. They might come in chewable form, pill form, liquid form, or intramuscular (IM) injection.

• Multi-vitamin and mineral (MVM) supplement. These supplements come with and without iron, an important consideration for men and postmenopausal women who do not need iron supplementation.1,6 Low-dose MVMs can be helpful when there is a limited dietary selection and/or limited dietary variety.7 Micronutrient dosages differ by brand and should always be examined to ensure the levels do not exceed the DRIs. Additionally, MVMs may not be appropriate for older adults taking certain medications (see Tables 2 and 3), as these drugs can increase or decrease certain micronutrient needs that do not match well with the MVM supplements.

• Fiber supplements. Fiber supplementation can include high-fiber whole foods added to the diet, as well as functional fibers added to drinks and food. Fiber intake may affect bone mineral density by increasing calcium absorption, but may negatively influence other nutrient absorptions which are a concern for an individual already consuming a nutrient-poor diet in a vulnerable health state.24 While fiber supplementation has been successful in reducing fecal incontinence, it is a common assumption that fiber can facilitate normal GI health and laxation, though the Academy EAL grade is grade III for limited evidence.24 Before looking at fiber supplementation, other factors for constipation and/or diarrhea in older adults should be examined, such as fluid intake, physical activity, medications, sex hormone status, disease status, and stress. If fiber supplementation is recommended, an increase in fluid is needed to account for an increase in fecal water loss.24 Another consideration before prescribing fiber supplements is to consider whole-food and food-extract options that act as natural laxatives, including: cabbage, Boston brown bread, oatmeal, fruits with rough seeds, vegetables rich in oxalic acid, aloe gel, rhubarb, cascara, senna, castor oil, honey, tamarinds, figs, prunes, raspberries, strawberries, and stewed apples.24 These recommendations should be in line with the individual’s mastication and swallowing abilities. While beverages with added fiber supplements may be easier to accommodate than whole-food alternatives, they have been found to be less effective than whole foods for relieving constipation.24 Applied, this means that applesauce or stewed apples would be preferred over apple juice with added fiber.

Surveys have shown that the aging Baby Boomers also seek functional foods to address medical conditions, such as the prevention or alleviation of heart disease, as well as maintenance or restoration of bone and joint health, eye health, and cognitive function.38 A functional food is defined as a food that:38
• Has a high concentration of beneficial compounds (such as garlic, nuts, and tomatoes)
• Has been modified via fortification, enrichment, or enhancement (such as calcium-fortified orange juice, continued on page 29
iodized salt, folate-enriched grain, prebiotic yogurts)
• Is used as a medical food to address special conditions or is used for special dietary use (such as gluten-free and lactose-free foods, and weight-loss foods.

In discussing the use of supplements versus whole foods, note that dietary supplements can fill nutrient gaps but might increase an individual’s nutrient intake above the UL, which increases risk of toxicity, especially when functional foods are also present in the diet. Sebastian et al. found that older adults receiving a daily MVM had reduced nutrient inadequacy in at least 75% of the older adults studied.39

When providing single-nutrient supplementation, the mechanisms of digestion and absorption should be considered. For example, calcium can inhibit iron absorption, and thus these supplements should be provided at different times during the day. Calcium-fortified orange juice and milk should not be used for swallowing iron supplements.6 Similarly, different forms of a single nutrient, such as calcium carbonate versus calcium citrate, have different considerations for consumption. Calcium carbonate is absorbed best with food, while calcium citrate can be taken on an empty or full stomach, and is more easily absorbed in older adults since they may have a higher-pH stomach acid and/or decreased overall stomach acid production.40 The amount of nutrient in the supplement should also be considered: Calcium is absorbed best 500 mg at a time, and so the dosage should be split throughout the day if necessary.40

In the earlier discussion of reduced energy needs with maintained or increased micronutrient needs, the question of who needs supplementation remains important. Inadequate micronutrient intake is most likely in older adults with restricted energy intake, inadequate energy consumption due to poor appetite or illness, food-group elimination, and nutrient-poor diets despite excessive energy intake.6 Also, some older adults have increased nutrient needs that might not be addressed by their current dietary intakes. This includes older adults in general, and especially those that are food insecure, alcohol dependent, or have increased needs due to medications and/or a medical condition.6

Supplements can also be used to address inadequate energy intake, because research shows that pairing dietary energy supplements with meals reduces energy intake at the meal, supplements should be given between meals instead of pairing them with meals.2 The health-care team should monitor the individual’s response to the supplement to determine if the formula should be changed due to flavor, consistency, or fat content, as it might prolong satiation and still inhibit energy intake at meals.2

### Table 3: Drug-nutrient interactions.6

<table>
<thead>
<tr>
<th>Drug</th>
<th>Resulting Effects on Nutrient Needs/Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticonvulsants</td>
<td>Increased folate requirement. Reduced medication effectiveness with calcium supplements.</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>Reduced medication effectiveness with calcium supplements. Increased calcium and vitamin D requirement.</td>
</tr>
<tr>
<td>Diuretics</td>
<td>Increased magnesium requirement. Note: Antibiotics may reduce medication effectiveness when paired with calcium supplements.</td>
</tr>
<tr>
<td>Antibiotics</td>
<td></td>
</tr>
<tr>
<td>Antineoplastic</td>
<td></td>
</tr>
<tr>
<td>Thiazide diuretics</td>
<td>Increased serum calcium levels through decreased excretion. Decreased calcium requirement.</td>
</tr>
<tr>
<td>Loop diuretics</td>
<td>Increased calcium excretion and lowered serum levels. Increased calcium requirement.</td>
</tr>
<tr>
<td>Magnesium antacids</td>
<td>Increased urinary calcium loss, increased calcium requirement.</td>
</tr>
<tr>
<td>Calcium supplements</td>
<td>Impaired iron absorption. Can reduce effectiveness of anticonvulsants and antibiotics.</td>
</tr>
<tr>
<td>Warfarin</td>
<td>Static vitamin K consumption must be maintained.</td>
</tr>
<tr>
<td>Statins</td>
<td>Reduced effectiveness of statins with beta-carotene, selenium, vitamin C, vitamin E supplements.42</td>
</tr>
<tr>
<td>Niacin to increase</td>
<td>Reduced effectiveness of niacin with beta-carotene, selenium, vitamin C, vitamin E supplements.42</td>
</tr>
<tr>
<td>HDL</td>
<td></td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>Reduced effectiveness with vitamin C and vitamin E supplements.</td>
</tr>
<tr>
<td>Vitamin C supplements</td>
<td>Increased iron absorption to toxic levels is possible.</td>
</tr>
<tr>
<td>St. Johns Wort</td>
<td>Increased metabolism of drugs, which can reduce their effectiveness.41</td>
</tr>
</tbody>
</table>

### Contraindications to Supplementation

Being aware of fortified foods and their consumption in the older-adult population is necessary to ensure that they are not exceeding the DRI for nutrients.41 Supplementation plans should be individualized, and the dietetics practitioner should check for medication interactions, medication effects on nutrient absorption, and the possibility of toxicity and deficiency.41 By examining an individual's current medications and cross-checking with suggested supplementation, potential contraindications can be identified, as well as changes in nutrient absorption and needs. For example, excess folate from consumption of fortified grains (processed foods in an energy-
rich, nutrient-poor diet) may mask a vitamin B12 deficiency that would present as “normal aging.”6

Table 3 lists drug-nutrient interactions.

Iron Supplements
Despite the widespread practice of recommending iron supplementation, healthy older adults likely do not need an iron supplement.6 It is important to be aware of hemochromatosis, a slow-moving disease that, if present, starts to manifest in the later years of life. Hemochromatosis is exacerbated by a high intake of vitamin C with normal iron intake, and by increased iron intake. It is estimated that 8–17% of older adults who take supplements exceed the UL for iron.39 Supplemental iron may be associated with an increased total mortality risk in older women.43 Iron toxicity presents as GI distress, kidney stones, reduced zinc and copper status, black stool, constipation, liver damage, nausea, and vomiting.41

Vitamin A Supplements
Smokers supplemented with beta-carotene can increase their risk of lung cancer and mortality.6 Older adult women should be supplemented with beta-carotene instead of retinol to increase vitamin A status, due to the association of retinol with an increased risk of hip fractures and decreased bone mineral density.6 It is estimated that 4–9% of older adults who take supplements exceed the UL for vitamin A, often due to the use of an MVM supplement.39 Symptoms of toxicity include headaches, liver damage, and reduced bone strength.41 Beta carotene over-supplementation may decrease serum HDL levels, and increase risk of all-cause morbidity.42

Vitamin E Supplements
Vitamin E supplementation should be discontinued one week prior to surgeries, as it acts as a blood thinner. Additionally, health care practitioners should be wary of combining vitamin E and vitamin K supplements with each other or with warfarin, as all three acts as blood thinners.6 Vitamin E supplementation may also reduce the effectiveness of chemotherapy,41 statins, and niacin when used to increase HDL levels.

Zinc Supplements
Excess zinc can reduce copper status and impair an individual’s immune response, as well as reduce HDL levels.39 It is estimated that 4–15% of older adults who take supplements exceed the UL for zinc, which can exacerbate immune deficiencies in an already vulnerable population.6

Vitamin B6 and Folate Supplements
Excess vitamin B6 can result in sensory neuropathy,6 and excess folate can mask a vitamin B12 deficiency, causing anemia but masking the cause.

Calcium Supplements
Excess calcium can cause constipation, inhibit iron and zinc absorption, and increase the risk of kidney stones.40 Risk of cardiovascular events with excess calcium intake has been evaluated scientifically over the past few years. Evidence continues to be insufficient to disregard the current calcium recommendations;44 however, increasing calcium intake through dietary sources may be a safer alternative to calcium supplements, the latter of which might increase myocardial infarction risk45 when taken without vitamin D supplementation.46 Caution should be taken when prescribing iron and zinc supplements, as well as fiber supplements which can increase calcium absorption.

Fiber Supplements
Excess fiber can cause diarrhea, abdominal distention and discomfort, and gas. In severe cases, a fiber bezoar (a hard, indigestible mass of vegetable fibers, seeds, fruit skins, and/or hair that forms in the gastrointestinal tract) has formed in the gut, leading to intestinal obstruction. Fiber in general may inhibit nutrient absorption, though it may increase calcium levels.24

Conclusion
Older adults are a vulnerable population, even those who are healthy and ambulatory. Supplements can be part of an overall care plan that encourages whole foods as the primary intervention. Encourage positivity about healthful, diverse diets and provide the appropriate nutritional guidance and tools to help older adults make better food decisions.27 Focus on what whole foods can achieve to address nutrient gaps before examining supplement options, as whole foods are less likely to have side effects or detrimental interactions with disease states and medication.38 Supplements are no replacement for a healthy, diverse diet36 and are not intended to treat, diagnose, or cure disease—an issue often overlooked by consumers.36

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HA members are urged to share nutrition education masters for future newsletters.

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