

ORIGINAL RESEARCH

# Increasing Fruit and Vegetable Intake in Homebound Elders: The Seattle Senior Farmers' Market Nutrition Pilot Program

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## Abstract

### Introduction

Diets that are high in fruits and vegetables lower an individual's risk of chronic disease and contribute to healthy aging. Homebound seniors often have low intake of fruits and vegetables and limited access to fruits and vegetables with the most protective nutrients and phytochemicals. From June through October 2001, the Seattle Senior Farmers' Market Nutrition Pilot Program delivered bi-weekly market baskets that included a variety of fresh, locally grown produce to 480 low-income Meals on Wheels participants. The purpose of this study was to determine if the program increased fruit and vegetable intake in individuals who received the baskets.

### Methods

One hundred basket recipients were recruited to complete a telephone survey before and at the end of the farmers' market basket season. Fifty-two low-income homebound seniors who lived outside the project service area were recruited to serve as control respondents. Fruit and vegetable intake was determined with modified versions of the 6 fruits and vegetables questions in the Behavior Risk Factor Surveillance System.

### Results

Seniors who received the baskets reported consuming an increase of 1.04 servings of fruits and vegetables. The difference between the mean servings in the seniors who received the baskets compared to the controls was 1.31 (95% CI, 0.68-1.95,  $P < .001$ ). At baseline, 22% of the basket recipients were consuming 5 or more servings of fruits and vegetables per day, but by the end of the season, 39% reported consuming 5 or more per day.

### Conclusion

Home delivery of fruits and vegetables is an effective way to increase fruit and vegetable intake in homebound seniors.

### Introduction

Evidence for the importance of fruit and vegetable intake to health and quality of life with aging is widely recognized (1-3). Consuming fruits and vegetables can reduce an individual's risk of cardiovascular disease (4) and many cancers (5,6). Furthermore, fruits and vegetables are important components of diets for the secondary prevention of diabetes (7) and hypertension (8,9). Diets rich in nutrients and phytochemicals found in fruits and vegetables have also been associated with delay or decreased risk of conditions associated with aging such as cataracts (10), diverticulosis (11), degeneration in neurological and cognitive performance (12-14), decline in bone mass (15), and chronic obstructive pulmonary disease (16).

In the 2000 edition of *Dietary Guidelines for Americans* (17), consistent with *Healthy People 2010* objectives (18), adults are advised to choose a variety of fruits and vegetables and to consume at least 2 servings of fruits and 3 serv-

ings of vegetables each day. In those individuals older than 60 years of age, 35% of women and 39% of men meet the objective for fruit (18), and only 6% of both women and men older than 60 meet the objective for vegetables. Data on homebound elders are limited. Posner and colleagues reported that 22% to 40% of homebound elders eat 4 or more servings of fruit and vegetables per day (19), and low fruit and vegetable intakes are common findings in nutritional screenings (20,21).

A recent systematic review (22) of community-based interventions (23-25) to increase fruit and vegetable consumption found that most interventions have had very modest effects. Ciliska et al recommend that priority be given to fruit and vegetable interventions that are "multi-pronged, flexible, open to input from target groups, and theoretically based" (22). One such program, conducted in a Michigan county, provided fresh farmers' market produce to young women and children (26). A factorial design was used to evaluate, alone and in combination, an education program on fruits and vegetables and distribution of farmers' market coupons. More than 80% of the low-income women in this study responded to both the pre-test and post-test. Results demonstrated that coupons had a direct effect on fruit and vegetable consumption, independent of education, but the strongest intervention effects on attitudes and behavior were achieved through a combination of both education and coupons.

Large population-based surveys have been able to identify several factors associated with fruit and vegetable intake on the individual level, but most of the variance in fruit and vegetable intake remains unexplained (27). Common theoretical constructs that are thought to contribute to decisions about fruit and vegetable intake include self efficacy, social/intrapersonal influence, demographic factors, attitudes, awareness, and perceived benefits, barriers, and threats (27-29). Food choices in the elderly are influenced by quality and freshness, efforts to eat healthily, price, and financial difficulties (29,30). For homebound elders, barriers to fruit and vegetable intake are likely to include difficulties with shopping, food preparation, chewing, and swallowing (20,31,32).

Adequate fruit and vegetable intake is an important part of healthy aging and an important component of treatment for health conditions that are associated with aging. Eighty-seven percent of Medicaid beneficiaries over the age of 65 have diabetes, hypertension, or dyslipidemia

(33). A recent Institute of Medicine report, *The Role of Nutrition in Maintaining Health in the Nation's Elderly: Evaluating Coverage of Nutrition Services in the Medicare Population*, established the clear need, efficacy, and cost-effectiveness of providing nutrition services for seniors (33).

Congregate and home-delivered meals are provided to seniors through the Elderly Nutrition Program, authorized by Congress under Title III of the Older Americans Act. Program services leverage a wide range of supportive resources that help to optimize health and maintain elders in their homes. The Elderly Nutrition Program contributes to efforts to meet the Healthy People 2010 developmental goal to increase the proportion of persons with long-term care needs who have access to the continuum of long-term care services (18). Congregate and home-delivered meal participants are better nourished than matched nonparticipants (34). However, these meals provide only 30% to 50% of participants' daily nutrient intake, and participants must obtain at least half of their food through other sources.

Federal food assistance programs have had mixed effects on fruit and vegetable consumption by low-income participants, and there is interest in increasing promotional efforts for fruits and vegetables in federally funded programs (3). One such effort is the Senior Farmers' Market Nutrition Program that is administered by the Food and Nutrition Service of the United States Department of Agriculture (<http://www.fns.usda.gov/wic/SeniorFMNP/SFMNPmenu.htm>). Grants are awarded to states, territories, and tribal governments to provide low-income seniors with foods from farmers' markets, roadside stands, and community-supported agriculture programs. The purpose of the Senior Farmers' Market Nutrition Program is to provide fresh, nutritious, unprepared, locally grown fruits and vegetables to seniors, and to increase consumption of agricultural commodities by developing and expanding markets. Most grantees choose to use a coupon distribution system to meet these goals. This system usually requires travel to a senior center to pick up coupons and an additional trip to the market to obtain produce. Seniors report increased fruit and vegetable consumption when they are provided with coupons to use at farmers' markets, although most seniors do not report that they try fruits or vegetables that they have never tried before (35,36).

## Methods

In the summer and fall of 2001 the Seattle Senior Farmers' Market Nutrition Pilot Program provided an opportunity for 480 homebound seniors to have increased access to fresh fruits and vegetables as part of the national Senior Farmers' Market Nutrition Program. The Seattle market basket program approach was unique. In Seattle, the program provided homebound elders with home delivery of a market basket that contained a variety of seasonal local produce. The program was a collaborative effort among 5 organizations: King County Area Agency on Aging, Public Health-Seattle & King County, Pike Place Market Community Supported Agriculture, Senior Services of Seattle/King County, and the University of Washington Health Promotion Research Center. The King County Area Agency on Aging administered the funding for the program and organized service delivery. Local farmers were contracted by Pike Place Community Supported Agriculture to provide fruits and vegetables in season. Volunteers were used to pack the baskets each week. Market baskets were delivered to the homes of 480 low-income seniors every 2 weeks from June through October by Meals on Wheels drivers. Meals on Wheels participants were eligible for the baskets if they lived within a specific catchment area in the city of Seattle, met income guidelines, and requested basket delivery.

Over the 5-month basket delivery period, an average of 1.6 servings of vegetables and 0.67 servings of fruit were provided per day. Each basket included dark green or orange fruits and vegetables. The average daily nutrients that were provided per day by the baskets over the 5 months of delivery included 30% of the U.S. Recommended Dietary Allowance for vitamin C, 40% for vitamin A, and 8% for folate. A newsletter that described the produce, provided recipes for less common seasonal foods, and promoted eating fruits and vegetables accompanied each basket.

The purpose of this study was to determine if the Seattle Senior Farmers' Market Nutrition Pilot Program increased fruit and vegetable intake of homebound seniors. This evaluation process began after the agency had determined which Meals on Wheels recipients would receive the market baskets. The study employed a quasi-experimental design to compare fruit and vegetable intake in a subset of the 480 seniors who received the baskets with a concurrent comparison group of low-income homebound seniors who lived outside the project service area.

Subjects for both the intervention and control groups were recruited via flyers that were delivered by Meals on Wheels drivers. Regulations protecting the rights of human subjects precluded recruitment through direct contact with potential subjects by program or evaluation staff. Seniors who wished to participate in the study could either return a postage-paid postcard or call the Health Promotion Research Center. Participation in the study segment of the program was voluntary. Power calculations indicated that a sample size of 98 intervention subjects and 98 control subjects would detect an estimated effect size of 1 serving at a  $\alpha = 0.05$  and  $\beta = 0.80$ . We attempted to recruit 100 of the 480 basket recipients and 100 low-income homebound seniors who were not receiving the baskets as control subjects. More than 500 recruitment flyers were distributed to potential control group participants, but many replied that they did not understand why they should join the study if they were not going to receive fresh fruits and vegetables themselves.

Both the basket recipients and control respondents were interviewed by telephone before basket deliveries started and again at the end of the market season. All respondents were required to be at least 60 years old, have access to a phone, and be able to hear and comprehend the survey questions. The Institutional Review Board of the University of Washington approved this study.

The telephone survey included the following 6 fruit and vegetable questions from the Behavioral Risk Factor Surveillance System (BRFSS) as modified by Wolfe and colleagues (37). For each question, participants were given a choice of responses. They could provide answers in number of times per day, per week, or per month; they could respond with "never" or "don't know/not sure"; or they could refuse to answer the question altogether. The 6 questions were:

- How often did you drink 100% juices such as orange juice, apple juice, or tomato juice?
- Not counting juices, how often did you eat fruit, including fresh, canned, frozen, or dried?
- How often did you eat green salad?
- How often did you eat white potatoes such as baked, boiled, mashed, or in potato salad or mixed dishes? Do not include French fries, fried potatoes, or potato chips.
- How often did you eat carrots? Include fresh, canned and frozen, and carrots in mixed vegetables.
- Not counting carrots, white potatoes, or green salad,

how often did you eat other vegetables? Include fresh, canned, and frozen vegetables and vegetables in casseroles and other mixed dishes, but do not include legume-type beans such as pinto and kidney.

All participants were mailed a serving-size guide with pictures of representative foods. Participants were required to have the guide with them at the time of the telephone survey. At the end of the season, seniors who received baskets were asked if they would like to participate in future market basket programs.

An independent sample t-test was used to compare differences between means, and paired sample t-tests were used to compare changes in means. ANOVA analyses were used to measure relationships between demographic variables and fruit and vegetable intake. Differences between the intervention and control groups for gender, age, ethnic group, and races were tested using chi-square analysis.

In addition, data on fruit and vegetable consumption by intervention and control participants were compared to BRFSS data from seniors in Washington State as a whole (38).

## Results

At baseline, 100 market basket recipients and 52 control respondents completed surveys. After the 6-month market basket season, 87 basket recipients and 44 control respondents completed the follow-up survey. One intervention respondent and 2 control respondents died during the intervention. Three intervention and 4 control group respondents could not be reached. Three intervention and 2 control respondents either refused or were unable to answer the questions at follow-up because of impaired cognition, and 6 of the initial intervention respondents were screened out as ineligible after further investigation of demographic data. Data are presented only for those participants for whom there are both pre- and post-data. Table 1 provides demographic data for those who completed surveys in both the spring and fall.

Table 2 examines the change in fruit and vegetable intake between the intervention and control groups. At baseline, the intervention group had a lower fruit and vegetable intake than the control group, but by the end of the market basket season, intake in the control group

decreased from baseline while those of the intervention group increased. The difference between the change in mean daily servings was 1.31 (95% CI, 0.68-1.95,  $P < .001$ ).

At baseline, age was associated with mean daily intake ( $P < .05$ ), with the oldest participants having the highest fruit and vegetable intake (Table 3). Race, gender, and living situation were not significantly associated with fruit and vegetable intake at baseline or with the magnitude of increased intake in the intervention group.

Table 4 provides categorical information about servings of fruits and vegetables consumed. Compared to seniors in Washington State as a whole, fewer homebound seniors from either the intervention or the control group reported consuming at least 5 fruits and vegetables at baseline. The proportion of program participants who consumed 5 or more servings of fruits and vegetables increased from 22% in the spring to 39% in the fall while the proportion of seniors in the control group who consumed recommended levels fell from 30% to 23%.

Eighty-two market basket participants stated that they would like to receive market baskets in future seasons. One participant was unsure, and 4 said that they would not like to participate again because they had been unable to use all the produce.

## Discussion

At baseline, homebound seniors in this study had lower mean fruit and vegetable intake than other seniors in Washington State, and most failed to meet the recommendations for at least 5 servings of fruits and vegetables each day. By the end of the season, participation in the market basket program was associated with increased mean fruit and vegetable intake and increased numbers of seniors meeting the recommendations for at least 5 servings of fruits and vegetables daily. Despite limitations in food preparation and eating abilities, these homebound elders found ways to add the produce to their diets and were eager to participate in the program for another season. There were no significant differences in the impact of the program based on gender, ethnicity, age, or living situation.

Measuring the impact of government food assistance programs is challenging because it is seldom ethical or legal to randomly assign individuals to receive assistance

or join a control group that does not receive assistance (39). Nevertheless, monitoring the effectiveness of food assistance programs, especially pilot programs, is essential. In this study, the control group was as similar as possible to the study group, but the study was limited because group assignment was not random. It was not possible to recruit the desired number of participants from the control group, so control group numbers were low. These results may not be generalizable to all homebound seniors. Market basket recipients were required to request basket delivery, and survey respondents for both the intervention and control survey respondents were volunteers. The fruit and vegetable intake of the control subjects decreased between the baseline and follow-up surveys. The study design does not allow us to explore the reasons for this, but decreased consumption in the control group may be due to decreased produce availability in late fall.

Interventions that focus on education and environmental changes at worksites have had modest success in increasing fruit and vegetable intake by approximately one quarter of a serving each day. Most food assistance programs that simply provide foods or money for food have also had limited success, with only 0.3-0.7 of a serving increase (3,23-25,40). The Seattle Senior Farmers' Market Nutrition Pilot Program increased intake by more than one serving per day. This program worked because it addressed the need for increased fruits and vegetables for homebound seniors through innovative partnerships and concurrent efforts at the individual, interpersonal, institutional, community, and policy levels.

The results of this pilot program have implications for policy development. Although the program was built on existing federal nutrition programs, it was possible only through the combined efforts of several organizations and volunteers. The program found an innovative way to remove barriers to fruit and vegetable consumption for a targeted population. Kaplan and colleagues, writing for the Institute of Medicine, state that the interaction between biology, behavior, and the environment plays out over the life course of individuals, families, and communities to determine health and well-being (41). The fruit and vegetable consumption of homebound low-income seniors is an example of this model. Many of the participants in the market basket program were homebound because of longstanding disabilities. Their access to fruits and vegetables was limited over several years. If adequate intake of fruits and vegetables can decrease disease risk of aging

individuals, market basket programs can improve long-term quality of life and reduce the need for medical treatment that is associated with chronic diseases.

While the findings of this study are limited in significance because the Seattle Senior Farmers' Market Nutrition Pilot Program was a pilot program, they deserve further examination as part of a larger study, especially given the positive reactions of the program participants in the qualitative assessment of the program (42).

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## Tables

**Table 1.**  
**Characteristics of Study Respondents, Seattle Senior Farmers' Market Nutrition Pilot Program, 2001**

	Intervention Group		Control Group	
	n	%	n	%
<b>Gender</b>				
Female	62	71	33	75
Male	25	28	11	25
<b>Age (years)</b>				
60-69	33	38	14	32
70-79	29	33	11	25
80-89	19	22	17	38
90+	6	7	2	5
<b>Ethnic Group</b>				
White, non-Hispanic	56	64	34	78
Black, non-Hispanic	24	28	6	13
Hispanic	3	3	0	0
Asian-Pacific Islander	0	0	2	5
Native American-Alaskan Native	0	0	1	2
Unknown	4	5	1	2
<b>Race</b>				
White	56	64	34	78
Non-white	27	31	9	21
Unknown	4	5	1	1
<b>Living Situation</b>				
Alone	65	75	31	70
With spouse	8	9	6	14
With adult children or other relatives	10	11	4	9
With other adult such as caregiver	5	5	3	7

**Table 2.**  
**Mean Intake of Fruits and Vegetables at Baseline and After 5 Months of Basket Deliveries, Seattle Senior Farmers' Market Nutrition Pilot Program, 2001**

	Baseline Mean Daily Intake (SD)*	Follow-Up Mean Daily Intake (SD)	Change in Mean Daily Intake
<b>Basket Recipients</b>	3.51 (1.67)	4.55 (1.98)	+1.04
<b>Control Group</b>	4.02 (2.07)	3.75 (1.55)	-0.27

\*SD indicates standard deviation.

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**Table 3.**  
**Mean Intake of Fruits and Vegetables at Baseline and Change at Follow-up for Basket Participants by Demographic Characteristics, Seattle Senior Farmers' Market Nutrition Pilot Program, 2001**

Demographic Variable	n	Baseline Mean Daily Intake for all Seniors n=131 (SD)*	Change between Baseline and Follow-up for Seniors Who Received Market Baskets n=87 (SD)
<b>Age (years)†</b>			
60-69	47	3.39 (1.78)	+1.02 (1.97)
70-79	40	3.50 (1.81)	+0.91 (1.63)
80-89	36	4.19 (1.74)	+1.04 (1.88)
90+	8	4.05 (2.19)	+1.81 (1.38)
<b>Race</b>			
White	95	3.74 (1.86)	+1.07 (1.74)
Non-white	36	3.65 (1.80)	+0.91 (1.94)
<b>Gender</b>			
Female	95	3.73 (1.93)	+1.18 (1.86)
Male	36	3.55 (1.49)	+0.70 (1.59)
<b>Living Situation</b>			
Living alone	96	3.70 (1.83)	+1.01 (1.78)
Living with adult children	9	3.25 (1.90)	+0.70 ( 2.60)
Living with spouse or partner	14	3.76 (1.69)	+1.43 (1.67)
Living with other relatives	5	3.91 (2.20)	+1.81 (1.41)
Living with adult caregiver	7	3.73 (1.96)	+0.41 (1.67)

\*SD indicates standard deviation.

†This demographic characteristic is associated with baseline fruit and vegetable intake ( $P < .05$ ).

**Table 4.**  
**Proportions of Intervention and Control Respondents Eating Less Than 1 to 5 or More Servings of Fruits and Vegetables per Day Compared to Washington State Seniors (%)**

Total Daily Servings	Intervention Group at Baseline	Intervention Group Post-Intervention	Control Group at Baseline	Control Group Post-Intervention	Washington BRFS Results: Adults 65+ years*
5+	22	39	30	23	33
3-4	36	40	32	45	46
1-2	38	20	36	30	19
<1	5	1	2	2	2
Total	100	100	100	100	100

\* Centers for Disease Control and Prevention (38).

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