

## Current Research

# Improvements in Nutritional Intake and Quality of Life among Frail Homebound Older Adults Receiving Home-Delivered Breakfast and Lunch

ELIZABETH A. GOLLUB, PhD, MPH, RD; DIAN O. WEDDLE, PhD, RD, FADA

**ABSTRACT**

**Objective** This study evaluated the influence that expanding a home-delivered meals service to include breakfast and lunch would have on the nutritional status and quality of life of at-risk older adults.

**Design** This cross-sectional field study compared two groups. The breakfast group (n=167) received a home-delivered breakfast and lunch, 5 days per week. The comparison group (n=214) received a home-delivered lunch 5 days per week. Participants' 24-hour food recall, demographics, malnutrition risk, functional status, and surveys of quality of life as health, loneliness, food enjoyment, food security, and depression were obtained.

**Participants** Study participants were recruited from five Elderly Nutrition Programs involved in the Morning Meals on Wheels breakfast service demonstration project. They formed a geographically and racially/ethnically diverse sample. Participants ranged in age from 60 to 100 years, were functionally limited, and at high nutritional risk. Most were low income, lived alone, and had difficulty shopping or preparing food.

**Statistical Analysis** Descriptive statistics were used to assess group comparability. Independent sample *t* tests were used to examine group differences, with Bonferroni's method used to control for familywise Type I error.

**Results** Breakfast group participants had greater energy/nutrient intakes ( $P<.05$ ), greater levels of food security ( $P<.05$ ), and fewer depressive symptoms ( $P<.05$ ) than comparison group participants.

**Conclusions** The addition of a breakfast service to traditional home-delivered meals services can improve the

lives of frail, homebound older adults. Agencies should be encouraged to expand meals programs to include a breakfast service to a targeted population.

*J Am Diet Assoc.* 2004;104:1227-1235.

Most older Americans are healthy, economically secure, and independent (1). Today there are more than 35 million persons aged  $\geq 65$  years and this number is expected to more than double by 2030 (2), so it is crucial to note that a substantial number of these older adults are at risk for loss of independence and rely on community policies and programs. Among the most basic of these is food and nutrition service.

For older adults, the health-promoting, restorative nature of food and nutrition complement psychological aspects of eating such that nutritional status is related to quality of life (3,4). Recently, intake recommendations for many nutrients for older adults have increased (5-9). Energy needs, however, tend to decrease with age, resulting in reduced food intake (10). Thus, it is particularly challenging for older adults to maintain optimal nutritional status, health, and well-being.

Characteristically, older adults at nutritional risk include the older-old, the poor, the functionally impaired, minorities, women, and those with little or no outside support (11,12). Title III-C of the Older Americans Act established the Elderly Nutrition Program, which provides grants to states for congregate and home-delivered nutrition projects and services, frequently targeting these at-risk populations (13). Traditionally, home-delivered meals programs provide a hot, nutrient-dense lunch 5 days per week. However, many Elderly Nutrition Program clients remain at nutritional risk and would benefit further from additional meal services (14).

In 1997 to 1998, a breakfast service, the Morning Meals on Wheels demonstration project, expanded the Elderly Nutrition Program's home-delivered meals service to include breakfast 5 days per week (15). Among the project's findings were that participants demonstrated reduced malnutrition risk and improved appetite, perceived health, and outlook on life.

This article describes a portion of a cross-sectional field study designed to determine if the addition of breakfast as a second home-delivered meal can improve the well-being of at-risk older adults. It was conducted in conjunction with five Elderly Nutrition Programs that participated in the Morning Meals on Wheels pilot study and continued to provide a home-delivered breakfast and lunch service to some clients, but, due to resource limita-

*E. A. Gollub is an independent contractor in Gainesville, FL; at the time the study was completed, she was with the National Policy and Resource Center on Nutrition and Aging, Department of Dietetics and Nutrition, Florida International University, Miami. D. O. Weddle is an associate professor and co-director, National Policy and Resource Center on Nutrition and Aging, College of Health and Urban Affairs, Florida International University, Miami.*

*Address correspondence to: Elizabeth A. Gollub, PhD, MPH, RD, 6126 NW 18th Ave, Gainesville, FL 32605. E-mail: gollubdatnoff@bellsouth.net*

*Copyright © 2004 by the American Dietetic Association.*

*0002-8223/04/10408-0003\$30.00/0*

*doi: 10.1016/j.jada.2004.05.204*

**Table 1.** Means and standard deviations (SD) of responses to food enjoyment scale<sup>a</sup> items by group of frail, homebound older adults receiving home-delivered meals

Scale item	Breakfast Group		Comparison Group		P
	n <sup>b</sup>	Mean±SD	n <sup>b</sup>	Mean±SD	
Do you enjoy the taste of food now as much as you used to?	167	3.37±1.18	213	3.12±1.11	.035
Does your special diet keep you from eating the food you would like to eat?	167	2.41±1.16	213	2.59±0.97	.002*
Do mouth or teeth problems keep you from eating the foods you would like to eat?	167	2.41±1.16	213	2.31±0.93	<.001*
Do money problems keep you from eating the foods you would like to eat?	167	2.42±1.21	208	2.56±1.00	.002*
Does eating alone most of the time keep you from enjoying your meal?	166	2.22±1.09	209	2.41±0.96	.049
Do cooking problems keep you from enjoying the foods you would like to eat?	167	2.63±1.23	213	2.76±1.04	.002*

<sup>a</sup>Scale ranges from 1 (no, never) to 5 (yes, always).

<sup>b</sup>Where breakfast group n<167 and/or comparison group n<214, information could not be obtained from all participants.

\*P<.05 (Bonferroni P<.008).

tions, a lunch-only service to other, similarly at-risk clients. The objective of this research was to compare outcomes of these two groups by examining differences in participant nutrient intake and aspects of quality of life that might be affected by home-delivered meals services.

## METHODS

### Recruitment

Participating agencies were located in south Texas, south Florida, western Montana, southwestern Virginia, and eastern Maine. The Elderly Nutrition Program administrator at each site assisted with study coordination. This involved participant recruitment, assembly of participant and program background information, and facilitation of client interviews.

Agencies recruited meal clients for both study groups. The breakfast group consisted of older adults who received a home-delivered breakfast in addition to the lunch meal 5 days per week. The comparison group consisted of older adults who received a home-delivered lunch meal 5 days per week. Within each Elderly Nutrition Program, lunch was the same for both groups and provided a minimum of one third the Dietary Reference Intakes (DRIs). The lunch plus breakfast combination provided a minimum of two thirds the DRI. Clients were not required to increase monthly donations to receive breakfast.

Clients were eligible to participate in the study if they had been receiving home-delivered meals continuously for at least 6 months, were at least 60 years old, had at least two functional limitations, lived on limited or low income, and were at risk for malnutrition based on their Nutrition Screening Initiative (NSI) score, which refers to the score on the NSI's Determine Your Nutritional Risk Checklist (16). Most lived alone. Participation was voluntary and did not influence receipt of services. All participants signed an informed consent from.

### Data Collection

A set of three questionnaires was developed to collect study data from clients and agency records. The Partici-

pant Background Survey was used to collect information on demographics, length of time on meals program, nutritional risk, and functional status. The Meal Program Survey was used to collect menu, meal composition, and cost information. The Participant Interview Questionnaire was used to collect 24-hour food intake and quality-of-life information. In-home interviews (telephone interviews during inclement weather) were conducted by the investigator or local agent trained by the investigator (17). Training consisted of a workshop during which recording standards for each item on each survey were reviewed and discussed, and each trainee was given an instruction manual complete with sample responses. Before implementation, questionnaires were tested in the target population. Florida International University Research Council's Institutional Review Board approved the study.

The quality-of-life measure developed for this study was modeled after an instrument developed by Vilais and colleagues (3). It consisted of six distinct surveys representing global quality of life, health, loneliness, food enjoyment, food security, and depression—relevant quality-of-life factors that may be affected by home-delivered meals programs (3,18,19). The surveys used to measure these factors were validated for use with a diverse, elderly population (17,20-22):

- The Global Quality of Life Uniscale is an 11-point scale ranging from 0 to 10. It asks how the participant feels about the quality of his/her life during the past 6 months.
- The Global Quality of Health Uniscale is an 11-point scale ranging from 0 to 10. It asks how the participant feels about the quality of his/her health during the past 6 months to measure perceived quality of health (3).
- The Single Item Self-Rating of Loneliness Measure was developed for this study as an 11-point uniscale ranging from 0 to 10. It asks how lonely the participant has been feeling during the past 6 months.
- The Food Enjoyment Scale (23) was modified for this study to a six-item instrument with a five-point response scale. It examines issues expected to affect food enjoyment in older adults (Table 1). Cronbach's  $\alpha$  = .66 for the current study sample.

**Table 2.** Means and standard deviations (SD) of responses to food insecurity scale<sup>a</sup> items by group of frail, homebound older adults receiving home-delivered meals

Scale items	Breakfast Group		Comparison Group		P
	n <sup>b</sup>	Mean±SD	n <sup>b</sup>	Mean±SD	
Do you worry about whether your food will run out before you get money to buy more?	167	2.19±1.14	211	2.43±1.03	.187
Do you worry about whether the food you can afford to buy will be enough?	167	2.37±1.15	211	2.51±1.02	.031
Do you worry about whether you will eat a good meal because you need help with grocery shopping?	167	2.43±1.25	211	2.68±1.01	<.001*
Do you worry about whether you will eat a good meal because you need help preparing food or feeding yourself?	167	2.31±1.22	211	2.65±1.04	.002*
Do you eat the same thing for several days in a row because you only have a few different kinds of food on hand and don't have the money to buy more?	167	2.04±1.08	211	2.25±1.09	.469
Do you run out of the foods you need to put together a meal and don't have money to get more food?	167	2.04±1.07	210	2.40±0.97	.306
Would you say that the food you buy doesn't last and you don't have money to get more?	166	2.07±1.09	211	2.39±0.97	.092
Would you say you are often hungry but don't eat because you don't have enough food?	166	1.71±0.88	211	2.18±0.94	.885

<sup>a</sup>Scale ranges from 1 (no, never) to 5 (yes, always).

<sup>b</sup>Where breakfast group n<167 and/or comparison group n<214, information could not be obtained from all participants.

\*P<.05 (Bonferroni P<.006).

**Table 3.** Yes responses to geriatric depression scale items by group of frail, homebound older adults receiving home-delivered meals

Scale items	% Breakfast group (n=160)	% Comparison group (n=212)	P
Are you basically satisfied with your life?	88	85	.371
Do you think it is wonderful to be alive now?	87	80	.062
Are you in good spirits most of the time?	81	66	.001*
Do you enjoy getting up in the morning?	81	71	.030
Do you prefer to stay at home rather than going out doing new things?	80	81	.874
Have you dropped many of your activities and interests?	79	81	.649
Do you feel happy most of the time?	73	57	.001*
Do you think that most people are better off than you are?	50	52	.719
Do you often feel helpless?	44	53	.106
Do you feel you have more problems with your memory than most?	44	41	.600
Do you often get bored?	39	52	.009
Do you feel pretty worthless the way you are now?	38	50	.021
Do you feel full of energy?	34	31	.509
Do you feel that your situation is hopeless?	34	46	.021
Do you feel that your life is empty?	31	34	.581
Are you afraid something bad is going to happen to you?	28	31	.530

\*P<.05 (Bonferroni P<.003).

- The Radimer/Cornell Measure of Hunger and Food Insecurity was modified for this study to an eight-item instrument with a five-point response scale. It examines several aspects of food access and anxiety over food access (Table 2). Cronbach's  $\alpha$  = .94 in the current study.
- The Geriatric Depression Scale (Short Form) was modified for this study to a 16-item yes/no scale. It addresses common symptoms of depression among older adults (Table 3). Cronbach's  $\alpha$  = .84 in the current study.

### Statistical Analysis

Descriptive statistics were applied to the study sample to summarize participant characteristics. Before testing for group differences, distributional requirements for each of the participant-dependent measures were evaluated. Analysis of variance was used to examine site/group effects of interactions.

Independent sample *t* tests or  $\chi^2$  tests were used to examine group differences. All tests were considered significant at *P* < .05. Bonferroni's method was used to con-

**Table 4.** Profile and group comparison of selected characteristics of the sample of frail, homebound older adults receiving home-delivered meals

Total study sample (N=381)	Breakfast Group (n=167) <sup>a</sup>		Comparison Group (n=214) <sup>a</sup>		P		
	n	Mean±SD <sup>b</sup>	n	Mean±SD			
<b>Age</b>	163		186				
Years		79.8±8.1		77.7±9.1	.024		
Range		63-100		60-100			
<b>Years in program</b>	167	2.4±0.9	212	2.5±1.0	.309		
<b>Functional status</b>	137		128				
No. ADL <sup>c</sup>		4.0±1.9		4.1±2.0	.793		
No. IADL <sup>d</sup>		5.6±1.6		5.5±2.0	.582		
<b>Nutritional risk</b>	137		130				
NSI <sup>e</sup> score		9.3±4.0		9.2±3.8	.750		
<b>Sex</b>	167		214				
Male		47	28.1	63	29.4	.782	
Female		120	71.9	151	70.6		
<b>Race/ethnicity</b>	158		184		<.001*		
African American		10	6.3	14	7.6		
White		77	48.7	48	26.1		
Hispanic		68	43.0	118	64.1		
Native American		3	1.9	4	2.2		
<b>Low income</b>	141	119	84.4	182	148	81.3	.469
<b>Rural</b>	157	49	31.2	185	54	29.2	.685
<b>Lives alone</b>	156	129	82.7	185	133	71.9	.057

<sup>a</sup>Where breakfast group n<167 and/or comparison group n<214, specific information was not available for all participants. However, participants were labeled as high risk by nutrition program directors and reported that they did not have enough money for food and/or were physically unable to shop/cook for themselves (17).

<sup>b</sup>SD=standard deviation.

<sup>c</sup>ADL=activities of daily living. Number ranges from 0 (no self-care limitations) to 6 (assistance required for all aspects of self-care).

<sup>d</sup>IADL=instrumental activities of daily living. Number ranges from 0 (no household management limitations) to 8 (assistance required for all household management tasks).

<sup>e</sup>NSI=Nutrition Screening Initiative. NSI score describes nutritional risk, ranging from 0 to 21, where 0-2=no risk, 3-5=moderate risk, and ≥6=high risk.

\*P<.05 (Bonferroni P<.005).

trol for familywise Type I error. Each individual test was considered significant if  $P < [.05/\text{number of comparisons}]$ . As such, the overall probability of Type I error for each issue was 0.05. Analyses were completed using SPSS (base 9.0, SPSS Inc, Chicago, IL) and Nutritionist V (version 1.7, First DataBank, Inc, San Bruno, CA).

## RESULTS

### Participant Characteristics

There was a total of 381 study participants, 167 in the breakfast group and 214 in the comparison group. Most of the participant characteristics (age, sex, socioeconomic status, functional status, nutritional risk, environment, and length of time receiving home-delivered meal services) were equally distributed between both study groups except the breakfast group had significantly more white participants whereas the comparison group had significantly more Hispanic participants ( $P < .001$ ) (Table 4).

Both study groups were composed of frail individuals with poor functional status as demonstrated by the number of limitations of activities of daily living and instrumental activities of daily living. Activities of daily living measures include basic self-care activities like bathing. Instrumental activities of daily living measures include

home-management activities such as shopping and food preparation (24). Based on NSI score, the study sample was also at high nutritional risk (Table 4).

### Nutrient Intake

Group differences in intake of energy, protein, carbohydrate, fat, fiber, and 12 key vitamins/minerals determined from 24-hour food recalls are summarized in Table 5. Each reported intake was compared to food items and quantities from meal program menus and to other participant intakes for the same day and location. Intake reports determined by the investigator to be incomplete, overreported, or suspect were found in both study groups and removed from analysis.

Breakfast group participants consumed approximately 300 kcal, 14 g protein, 36 g carbohydrate, 12 g fat, and 4 g fiber more than the comparison group. These differences were all significant at  $P \leq .001$ . The breakfast group also consumed significantly greater amounts of potassium ( $P < .001$ ), folate ( $P = .003$ ), calcium ( $P = .001$ ), iron ( $P < .001$ ), magnesium ( $P < .001$ ), and zinc ( $P = .002$ ). In addition, the breakfast group showed a tendency toward greater consumption of vitamins A, B-6, B-12, and D. There were no significant

**Table 5.** Means and standard deviations (SD) of energy/nutrient intake reported by study participants from south Florida, western Montana, southwestern Virginia, and eastern Maine among frail, homebound older adults receiving home-delivered meals

Energy/nutrient	Breakfast Group		Comparison Group		P	Goal/day <sup>b</sup>
	n <sup>a</sup>	Mean±SD	n <sup>a</sup>	Mean±SD		
Kilocalories	58	1,252±327	36	951±253	<.001*	1,900
Protein, g	59	57±19	36	43±11	<.001*	50
Carbohydrate, g	59	168±54	34	132±35	<.001*	238
Fat, g	58	40±14	35	30±12	<.001*	63
Dietary fiber, g	59	13±7	36	9±4	.001*	21
Potassium, mg	57	2,016±608	35	1,435±555	<.001*	2,000
Vitamin A, RE <sup>c</sup>	57	668±502	31	451±405	.043	700
Vitamin B-6, mg	59	1.1±0.6	35	0.8±0.5	.027	1.5
Vitamin B-12, μg	59	2.9±1.8	35	2.1±1.4	.023	2.4
Folate, μg	57	198±69	34	150±76	.003*	400
Vitamin C, mg	59	79.0±53.2	35	75.6±65.4	.794	75
Vitamin D, μg	60	4.1±2.6	35	2.7±2.4	.009	15
Vitamin E, mg α-tocopherol	55	0.4±0.5	32	0.2±0.2	.069	15
Calcium, mg	58	770±333	35	525±292	.001*	1,200
Iron, mg	57	9.0±3.4	34	6.4±2.5	<.001*	8
Magnesium, mg	60	191±75	35	136±51	<.001*	320
Zinc, mg	57	6.7±3.7	34	4.8±2.0	.002*	8

<sup>a</sup>Only intakes from participants who accurately reported their home-delivered meal(s) are presented.

<sup>b</sup>Refers to a composite figure of the most current Dietary Reference Intakes calculated for women aged >70 years (5-9,38,47).

<sup>c</sup>RE=retinol equivalent.

\*P<.05 (Bonferroni P<.003).

**Table 6.** Means and standard deviations (SD) of quality-of-life scales by group of frail, homebound older adults receiving home-delivered meals

Scale	Breakfast Group		Comparison Group		P
	n <sup>a</sup>	Mean±SD	n <sup>a</sup>	Mean±SD	
Global quality of life uniscale <sup>b</sup>	167	5.78±2.41	213	5.92±0.98	.543
Quality of health uniscale <sup>c</sup>	167	5.22±2.46	213	5.77±1.87	.019
Loneliness uniscale <sup>d</sup>	167	5.71±2.76	213	5.52±2.44	.480
Food enjoyment scale <sup>e</sup>	166	2.45±0.71	208	2.59±0.61	.045
Food insecurity scale <sup>f</sup>	166	2.14±0.93	210	2.44±0.87	.002*
Geriatric depression scale <sup>g</sup>	160	6.26±3.52	212	7.45±4.16	.003*

<sup>a</sup>Where breakfast group n<167 and/or comparison group n<214, a scale response could not be obtained from all participants.

<sup>b</sup>Range=0 (low) to 10 (high).

<sup>c</sup>Range=0 (low) to 10 (high).

<sup>d</sup>Range=0 (total) to 10 (none).

<sup>e</sup>Range=1 (more) to 5 (less).

<sup>f</sup>Range=1 (less) to 5 (more).

<sup>g</sup>Range=0 (less) to 16 (more).

\*P<.05 (Bonferroni P<.008).

group differences in consumption of vitamins C or E (Table 5).

### Quality of Life

Group response comparisons between each of the three uniscales (global quality of life, quality of health, and loneliness) and each of the three multi-item scales (food enjoyment, food insecurity, and depression) mea-

suring nutrition-related quality of life are provided in Table 6.

Breakfast group participants had significantly greater levels of food security and significantly fewer depressive symptoms than comparison group participants. On a five-point Likert scale, the comparison group was found to be more food insecure than the breakfast group (P=.002) with means of 2.44±0.87 and

2.14±0.93, respectively. Similarly, across a range of 16 items, the comparison group had a greater number of depressive symptoms, 7.45±4.16, than the breakfast group, 6.26±3.52 ( $P=.003$ ).

In this analysis, both study groups rated global quality of life and loneliness at average or moderate levels, with no group differences. No group differences were found for quality of health or food enjoyment either. However, the effect size for these factors were  $d=0.25$  and  $d=0.21$ , respectively. This is small but not trivial, indicating that in a larger sample size, a significant difference would be observed.

### The Multi-Item Scales

Group responses to the six individual food enjoyment scale items are presented in Table 1. Breakfast group participants were significantly less bothered than comparison group participants by dietary restrictions ( $P=.002$ ), money problems ( $P=.002$ ), or problems with cooking ( $P=.002$ ). There was also a tendency for more breakfast group than comparison group participants to maintain their sense of taste. However, the effect of oral/dental problems on food choice was a significantly greater issue for participants in the breakfast group than the comparison group ( $P<.001$ ).

Group responses to the eight individual food insecurity scale items are presented in Table 2. The comparison group worried more than the breakfast group about whether they would eat well because they needed help with grocery shopping ( $P<.001$ ) and food preparation ( $P=.002$ ). The data suggest that they also worried more about whether they could afford enough food.

Group responses to each of the Geriatric Depression Scale items are given in Table 3. Significantly more breakfast group participants were in good spirits most of the time ( $P=.001$ ) and were happy most of the time ( $P=.001$ ). There was also a tendency for more breakfast group participants to enjoy getting up in the morning. The data suggested that fewer breakfast group participants got bored often, felt worthless, and believed their situation was hopeless.

## DISCUSSION

This study appears to be the first to measure nutrition-related quality-of-life factors that could be influenced by participation in a home-delivered breakfast and lunch program. It provided evidence of the breakfast program's potential to improve well-being among frail, homebound older adults.

### Sampling/Participants

Study participants were at risk for malnutrition by virtue of sociodemographic factors, functional limitations, and poor health. The breakfast program targets this particularly vulnerable group of Elderly Nutrition Program home-delivered meals clients (15).

Participants were similar in age and sex to typical Title-III home-delivered meals clients (25). However, a greater percentage of study participants lived alone, in rural areas, and at or below 100% of poverty guidelines

(25). Participant race/ethnicity reflected local populations.

Study participants were also more functionally limited than the average home-delivered meals client (25). Several investigators reported on the relationship between functional status and malnutrition risk (26-30). In the current study, 92% of breakfast group and 83% of comparison group participants were unable to shop, cook, or feed themselves due to physical disability. Some participants from either group indicated that arthritis rendered them unable to walk, lift, or grasp. Others mentioned that blindness prevented them from preparing/cooking food because they were concerned for their safety in the kitchen. Difficulty with walking and shopping were also reported by study participants.

The percentage of older adults is projected to increase over the next 25 years, as is the percentage of the non-white older adult population (2). It is estimated that older adults will be living longer, that women will be outliving men, and that the likelihood of living in poverty or developing chronic health conditions or disabilities will increase with age (2). The demographics of the current study sample reflect this trend.

### Nutrient Intake

In our study, breakfast group participants consumed greater levels of key nutrients, which brought them more in line with the DRIs, and better reflect recommendations to reduce the risk of chronic disease (31). Home-delivered meals appeared to supply a major portion of daily food intake for most study participants. Other researchers found this as well (15,32).

Home-delivered meals provided acceptable percentages of DRIs for key nutrients except vitamins D and E. Vitamin D inadequacies are of particular concern in older adults especially for the homebound (33). Each program provided meals that fit the recommendations of the Dietary Guidelines and Food Guide Pyramid (34,35). However, obtaining adequate amounts of vitamin D from home-delivered meals alone is difficult and supplementation has been suggested as an additional step (33).

---

## Home-delivered meals provided acceptable percentages of DRIs for key nutrients except vitamins D and E.

A nitrogen balance study designed to determine protein requirements of older women reported that the recommendations for protein might be adequate (36). On the other hand, optimal protein needs may be  $\geq 0.8$  g/kg (37). The acceptable macronutrient distribution ranges for intakes of protein, carbohydrate, and fat are tied to energy intake (38). However, as a person ages energy requirements decrease (10). No single energy level is appropriate for all older adults, so macronutrient target values for home-delivered meals in our study may be misleading.

### Quality of Life

Quality of life is a multidimensional concept encompassing all aspects of life. As an outcome measure in this

study, quality of life was limited to health-related quality-of-life factors refined to include factors that might be affected by the Elderly Nutrition Program.

In this study population there were no group differences in mean scores on the self-rated global quality-of-life or quality-of-health uniscales. Participant outlook may help explain these findings. The contribution of psychological functioning/attitude on self-ratings of health has been previously assessed. Negative affect was found to be inversely correlated with perceived health and positive affect was found to be directly correlated with perceived health. Positive affect was found to have a protective effect longitudinally as well. Over a 5-year period, those who were happier were more likely to continue to assess their health favorably, even as it declined (39).

Loneliness has been related to quality of life and quality of health in older adult populations (18,19). Loneliness may also be influenced by personality characteristics (40), but may be buffered by social support (41). Breakfast and lunch meals were delivered simultaneously; therefore, the breakfast group received no more contact than the comparison group. It was believed that addition of a breakfast service might increase the perception of social support among recipients, and in doing so might reduce feelings of loneliness. However, there was no group difference in ratings of loneliness. The breakfast service may have increased participants' sense of social support, but this possible outcome was not measured.

Food enjoyment as a quality-of-life factor for older adults is a relatively new concept (23). It is rooted in the theory that as one ages, the importance of meal routines, the pleasure of food, and eating for self-esteem and situation awareness gradually increases (42). In this study, breakfast group participants tended to experience more food enjoyment than comparison group participants. Notably, breakfast group participants had fewer food-related money and cooking problems, which could be attributed to a reduced need to purchase and cook food.

Similarly, greater food security among breakfast group participants may be due to an expanded meals service that reduces need for grocery shopping and food preparation. The concept of food security generally focuses on the acquisition of food as a function of household resources. The nature of food insecurity among older adults is more complex. It must also consider the importance that health and functional limitations have on accessing and using food. Lee and Frongillo (43) reported that food insecurity in older adults is associated with functional limitations.

In our study population, physical acquisition of food—transportation, walking, lifting, preparing—was the primary issue. The food insecurity survey includes an item on the ability to shop for groceries. Using this measure, 81% of the breakfast group and 92% of the comparison group had at least one symptom of food insecurity.

Depression is an important issue for older adults because it is associated with poor or declining health, functional and cognitive status, loss of independence, bereavement, and reduced income (44). Depression is also considered an indicator of poor nutritional status (24) and general well-being among older adults (45). In our study, depression was measured as the number of depressive symptoms from 16 Geriatric Depression Scale items. For

practically all items, the tendency was toward less depression in the breakfast group (Table 3). Similarly, Morning Meals on Wheels pilot participants reported that, during the 6-month breakfast program, their outlook on life improved (15).

Program cost information was also collected as part of this study. Although not detailed here, it may be helpful to note that among the five participating programs, the cost of a home-delivered breakfast ranged from \$0.56 to \$1.87, with an average cost of \$1.30. This wide variation was also found in the Morning Meals on Wheels pilot program and tends to reflect regional and operations differences (15).

There are limitations to this study. A randomized sample would have been ideal; however, only a small number of Elderly Nutrition Programs were appropriate for this study, limiting the client pool. A convenience sample was used to obtain enough participants to maintain satisfactory power, but may have created a sample bias. There is also the issue of accumulated Type I error rate across familywise comparisons. This was minimized using Bonferroni's method, but is often very conservative, and may have underrated important group differences (46).

The survey design is frequently used to measure group characteristics and to predict relationships among them. Because funding, and therefore the longevity, of breakfast services is uncertain the survey design was used to enable data collection within a relatively short period of time. A drawback of this design is that it disallows causal conclusions.

---

## **Breakfast group participants had fewer food-related money and cooking problems, which could be attributed to a reduced need to purchase and cook food.**

An additional limitation was that the assessment of nutrient intake was based on 24-hour food intake reports, most of which were excluded from analysis as incomplete, dubious, or apparent outliers. This circumstance was not thought to change the overall outcome. Study participants shared common characteristics/demographics and intake reports were removed across both study groups. The number of usable intake reports was limited, but reflective of the breakfast program's target population. Within this population, the addition of a breakfast program could improve nutritional status and quality of life.

### **CONCLUSIONS**

- Dietetics professionals and their colleagues in local agencies should be encouraged to expand their services to include a daily breakfast and lunch meal.
- A breakfast program could be marketed locally as a low-cost method of improving food security, food and nutrient consumption, and of reducing depressive symptoms among frail, homebound older adults; and as an improvement in nutrition services that may reduce

the anxiety of shopping, food preparation, and food cost, and may improve energy levels and outlook on life.

- Dietetics professionals can track these measurable outcomes to demonstrate program effectiveness and advocate for the inclusion of a breakfast meal.

---

The research was funded by the Agency for Healthcare Research and Quality (AHRQ) dissertation grant #R03HS10787-01, the Florence Bayuk Foundation, and in part by grant #90AM2390 from the Administration on Aging, USDHHS.

The authors acknowledge the valuable comments and suggestions of Dr Frederick Newman, Dr Paulette Johnson, and Dr Fatma Huffman, all of Florida International University.

---

## References

1. Manton KG, Gu XL. Changes in the prevalence of chronic disability in the United States black and non-black population above age 65 from 1983 to 1999. *Proc Natl Acad Sci USA*. 2001;98:6354-6359.
2. Administration on Aging. A profile of older Americans 2002. Available at: <http://www.aoa.gov/aoa/STATS/profile/default.htm>. Accessed May 5, 2003.
3. Vilas LI, Nitzke SA, Becker M, Gast J. Risk indicators for malnutrition are associated inversely with quality of life for participants in meal programs for older adults. *J Am Diet Assoc*. 1998;98:548-553.
4. Barr JT, Schumacher GE. The need for a nutrition-related quality-of-life measure. *J Am Diet Assoc*. 2003;103:177-179.
5. Institute of Medicine, Food and Nutrition Board. *Dietary Reference Intakes for Energy, Carbohydrates, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids*. Washington DC: National Academy Press; 2002.
6. Institute of Medicine, Food and Nutrition Board. *Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc*. Washington DC: National Academy Press; 2001.
7. Institute of Medicine, Food and Nutrition Board. *Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids*. Washington DC: National Academy Press; 2000.
8. Institute of Medicine, Food and Nutrition Board. *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline*. Washington DC: National Academy Press; 1998.
9. Institute of Medicine, Food and Nutrition Board. *Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride*. Washington DC: National Academy Press; 1997.
10. Roberts SB, Dallal GE. Effects of age on energy balance. *Am J Clin Nutr*. 1998;68:975S-979S.
11. Administration on Aging. Aging in America. Available at: <http://www.aoa.gov/aoa/pages/aoafact.html>. Accessed May 5, 2003.
12. Sharkey JR, Branch LG, Zohoori N, Giuliani C, Busby-Whitehead J, Haines PS. Inadequate nutrient intakes among homebound elderly and their correlation with individual characteristics and health-related factors. *Am J Clin Nutr*. 2002;76:1435-1445.
13. Committee on Education and Labor of the United States House of Representatives. *Compilation of the Older Americans Act of 1965 and the Native American Programs Act of 1974 as Amended Through December 31, 1992. Title III-C, sec. 336*. Washington, DC: US Government Printing Office; 1993.
14. Kretser AJ, Voss T, Kerr WW, Cavadini C, Friedmann J. Effects of two models of nutritional intervention on homebound older adults at nutritional risk. *J Am Diet Assoc*. 2003;103:329-326.
15. Weddle D, Gollub EA, Stacey S, Wellman N. Morning Meals on Wheels pilot program: The benefits to Elderly Nutrition Program participants and nutrition projects final report. Available at: [http://www.fiu.edu/~nutreldr/Center\\_Initiatives/Morning\\_meals\\_on\\_wheels/report/finalreport.pdf](http://www.fiu.edu/~nutreldr/Center_Initiatives/Morning_meals_on_wheels/report/finalreport.pdf). Accessed May 5, 2003.
16. Posner BM, Jette AM, Smith KW, Miller DR. Nutrition and health risks in the elderly: The nutrition screening initiative. *Am J Public Health*. 1993;83:972-978.
17. Gollub EA. *The Effect of a Breakfast Program on Nutritional Status, Quality of Life, and Health Care Use Among Frail Homebound Older Adults [dissertation]*. Miami, FL: Florida International University; 2002.
18. Russell DW, Cutrona CE, Wallace RB, de la Mora A. Loneliness and nursing home admission among rural older adults. *Psychol Aging*. 1997;12:574-589.
19. Prince MJ, Harwood RH, Blizard RA, Thomas A, Mann AH. Social support deficits, loneliness and life events as risk factors for depression in old age. *Psychol Med*. 1997;27:323-332.
20. Spitzer WO, Dobson AJ, Hall J, Chersterman E, Levi J, Shepherd R, Battista RN, Catchlove BR. Measuring the quality of life of cancer patients. *J Chronic Dis*. 1981;34:585-597.
21. Kendall A, Olson CM, Frongillo EA Jr. Validation of the Radimer/Cornell measures of hunger and food insecurity. *J Nutr*. 1995;125:2793-2801.
22. Sheikh JI, Yesavage JA. Geriatric depression scale (GDS) recent evidence and development of a shorter version. *Clin Gerontol*. 1986;5:165-173.
23. Vilas LI, Nitzke SA. Food enjoyment scale for older adults: Development and application in a Wisconsin population. *J Nutr Elder*. 1998;17:59-64.
24. American Academy of Family Physicians, American Dietetic Association, National Council on the Aging. *Nutrition Screening Manual for Professionals Caring for Older Americans*. Washington, DC: National Screening Initiative; 1991.
25. Ponza M, Ohls JC, Millen BE, McCool AM, Needels KE, Rosenberg L, Chu D, Daly C, Quartramon PA. *Elderly Nutrition Program Evaluation Final Report. Volume I: Title III Evaluation Findings*. Washington, DC: Mathematica Policy Research, Inc; 1996.
26. Sharkey JR, Giuliani C, Haines PS, Branch LG, Busby-Whitehead J, Zohoori N. Summary measure of dietary musculoskeletal nutrient (calcium, vitamin D, magnesium, and phosphorus) intakes associated with lower-extremity physical performance in homebound

- elderly men and women. *Am J Clin Nutr.* 2003;77:847-856.
27. Hoogenboom MS, Spangler AA, Crose R. Functional status and nutrient intake from the council on aging meal and total daily intake of congregate, adult day care and homebound program participants. *J Nutr Elder.* 1998;17:1-18.
  28. Boulton C, Krinke UB, Urdangarin CF, Skarin V. The validity of nutritional status as a marker for future disability and depressive symptoms among high-risk older adults. *J Am Geriatr Soc.* 1999;47:995-999.
  29. Sharkey JR, Haines PS, Zohoori N. Community-based screening: Association between nutritional risk status and severe disability among rural home-delivered nutrition participants. *J Nutr Elder.* 2000;20:1-15.
  30. Keller HH, Ostbye T, Bright-See E, Campbell MK. Activity limitation and food intake in community-living seniors. *Can J Aging.* 1999;18:47-63.
  31. Institute of Medicine, Food and Nutrition Board. *The Role of Nutrition in Maintaining Health in the Nation's Elderly: Evaluating Coverage of Nutrition Services for the Medicare Population.* Washington, DC: National Academy Press; 2000.
  32. MacLellan DL. Contribution of home-delivered meals to the dietary intake of the elderly. *J Nutr Elder.* 1997;16:17-32.
  33. Russell RM, Rasmussen H, Lichtenstein AH. Modified food guide pyramid for people over seventy years of age. *J Nutr.* 1999;129:751-753.
  34. Nutrition and Your Health: Dietary Guidelines for Americans 2000. 5th ed. Washington, DC: US Dept of Agriculture; 2000. Home and Garden Bulletin No. 232.
  35. The Food Guide Pyramid: A Guide to Daily Food Choices. Washington, DC: US Dept of Agriculture; 1992. Home and Garden Bulletin No. 252.
  36. Morse MH, Haub MD, Evans WJ, Campbell WW. Protein requirement of elderly women: Nitrogen balance responses to three levels of protein intake. *J Gerontol A Bio Sci Med Sci.* 2001;56:M724-M730.
  37. Campbell WW, Trappe TA, Wolfe RR, Evans WJ. The recommended dietary allowance for protein may not be adequate for older people to maintain skeletal muscle. *J Gerontol A Bio Sci Med Sci.* 2001;56:M373-M380.
  38. Trumbo P, Schlicker S, Yates AA, Poos M. Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein and amino acids. *J Am Diet Assoc.* 2002;102:1621-1630.
  39. Benyamini Y, Idler EL, Leventhal H, Leventhal EA. Positive affect and function as influences on self-assessments of health: Expanding our view beyond illness and disability. *J Gerontol B Psychol Sci Soc Sci.* 2000;55:P107-P116.
  40. Long MV, Martin P. Personality, relationship closeness, and loneliness of oldest old adults and their children. *J Gerontol B Psychol Sci Soc Sci.* 2000;55:P311-P319.
  41. Bondevik M, Skogstad A. The oldest old, ADL, social network, and loneliness. *West J Nurs Res.* 1998;20:325-343.
  42. Schlettwein-Gsell D. Nutrition and the quality of life: A measure for the outcome of nutritional intervention? *Am J Clin Nutr.* 1992;55(suppl 6):S1263-S1266.
  43. Lee JS, Frongillo EA Jr. Factors associated with food insecurity among US elderly persons: Importance of functional impairments. *J Gerontol B Psychol Sci Soc Sci.* 2001;56(2):S94-S99.
  44. Hybels CF, Blazer DG, Pieper CF. Toward a threshold for subthreshold depression: An analysis of correlates of depression by severity of symptoms using data from an elderly community sample. *Gerontologist.* 2001;41:357-365.
  45. Federal Interagency Forum on Aging-Related Statistics. *Older Americans 2000: Key Indicators of Well-Being.* Washington, DC: US Government Printing Office; 2000.
  46. Meyers JL, Well AD. *Research Design and Statistical Analysis.* New York, NY: HarperCollins; 1991.
  47. Barr SI, Murphy SP, Poos MI. Interpreting and using dietary reference intakes in dietary assessment of individuals and groups. *J Am Diet Assoc.* 2002;102:780-788.