Current Research

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

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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

Most older Americans are healthy, economically secure, and independent (1). Today there are more than 35 million persons aged ≥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-
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.

### 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 form.

#### Data Collection

A set of three questionnaires was developed to collect study data from clients and agency records. The Participant 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 Vailas 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 1. Means and standard deviations (SD) of responses to food enjoyment scale items by group of frail, homebound older adults receiving home-delivered meals

<table>
<thead>
<tr>
<th>Scale item</th>
<th>Breakfast Group Mean±SD</th>
<th>Comparison Group Mean±SD</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you enjoy the taste of food now as much as you used to?</td>
<td>167 3.37±1.18</td>
<td>213 3.12±1.11</td>
<td>.035</td>
</tr>
<tr>
<td>Does your special diet keep you from eating the food you would like to eat?</td>
<td>167 2.41±1.16</td>
<td>213 2.59±0.97</td>
<td>.002</td>
</tr>
<tr>
<td>Do mouth or teeth problems keep you from eating the foods you would like to eat?</td>
<td>167 2.41±1.16</td>
<td>213 3.51±0.93</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Do money problems keep you from eating the foods you would like to eat?</td>
<td>167 2.42±1.21</td>
<td>208 2.56±1.00</td>
<td>.002</td>
</tr>
<tr>
<td>Does eating alone most of the time keep you from enjoying your meal?</td>
<td>166 2.22±1.09</td>
<td>209 2.41±0.96</td>
<td>.049</td>
</tr>
<tr>
<td>Do cooking problems keep you from enjoying the foods you would like to eat?</td>
<td>167 2.63±1.23</td>
<td>213 2.76±1.04</td>
<td>.002</td>
</tr>
</tbody>
</table>

*Scale ranges from 1 (no, never) to 5 (yes, always).
*Where breakfast group n<167 and/or comparison group n<214, information could not be obtained from all participants.
*P<.05 (Bonferroni P<.008).
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-
considered control for familywise Type I error. Each individual test was considered significant if \( P < \frac{0.05}{\text{number of comparisons}} \). 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 differences in intake of other nutrients.

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

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

*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).

SD = standard deviation.

1. ADL = activities of daily living. Number ranges from 0 (no self-care limitations) to 6 (assistance required for all aspects of self-care).
2. IADL = instrumental activities of daily living. Number ranges from 0 (no household management limitations) to 8 (assistance required for all household management tasks).
3. NSI = Nutrition Screening Initiative. NSI score describes nutritional risk, ranging from 0 to 21, where 0-2 = no risk, 3-5 = moderate risk, and 6-21 = high risk.

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

### 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

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

*Only intakes from participants who accurately reported their home-delivered meal(s) are presented.

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

*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

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

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

*Range = 0 (low) to 10 (high).

*Range = 0 (total) to 10 (none).

*Range = 0 (less) to 5 (more).

*Range = 0 (less) to 16 (more).

*P<.05 (Bonferroni P<.008).
effect size for these factors were no group differences. No group differences were found for of life and loneliness at average or moderate levels, with depressive symptoms, \(7.45 \pm 4.16\), than the breakfast group, \(6.26 \pm 3.52\) (\(P = .003\)).

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 among 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.

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