International Journal of Environmental Research and Public Health

MDPI

*Article*

# Addressing Fall-Related Risk through a Brief Intervention for Malnutrition among Older Adults: *Stepping Up Your Nutrition*

**Matthew Lee Smith [1,2,3*], Caroline D. Bergeron [4,1], Sue Lachenmayr [5], Leigh Ann Eagle [5], and Judy R. Simon [6]**

[1] Center for Population Health and Aging, Texas A&M University, College Station, TX, USA; matthew.smith@tamu.edu (MLS)
[2] School of Public Health, Texas A&M University, College Station, TX, USA
[3] College of Public Health, The University of Georgia, Athens, GA, USA
[4] Institut national de santé publique du Québec, Québec, Canada; caroline.bergeron@inspq.qc.ca (CDB)
[5] Maryland Living Well Center of Excellence, Salisbury, MD, USA; bslach@earthlink.net (SL); lae2@macinc.org (LAE)
[6] Maryland Department of Aging, Baltimore, MD, USA; judy.simon@maryland.gov

* Correspondence: matthew.smith@tamu.edu; Tel.:+019794369518 (MLS)

Received: date; Accepted: date; Published: date

**Abstract:** Despite a multitude of nutritional risk factors among older adults, there is a lack of community-based programs and activities that screen for malnutrition and address modifiable risk among this vulnerable population. Given the known association of protein and fluid consumption with fall-related risk among older adults, and the high prevalence of falls among Americans age 65 years and older each year, a brief intervention was created. *Stepping Up Your Nutrition* (SUYN) is a 2-1/2 hour workshop developed through a public/private partnership to motivate older adults to reduce their malnutrition risk. The purposes of this naturalistic workshop dissemination using a pragmatic research design were to: (1) describe SUYN; (2) identify baseline risk among participants who attended SUYN and subsequent fall prevention programming; and (3) examine the role of SUYN on intervention dose and risk changes among those who subsequently attended a fall prevention program. Of a total of 1,427 participants included in this study, 922 attended Stepping On (SO), an evidence-based fall prevention program only (64.6%), 322 attended SUYN only (22.6%), and 183 attended both SUYN and SO (12.8%). High and moderate malnutrition risk scores were reported among approximately 71% and 20% of SUYN participants, respectively. A larger proportion of SUYN participants with higher nutritional risk attended a subsequent SO workshop. On average, participants who attended SUYN attended significantly more SO workshop sessions compared to those who did not attend SUYN. Significant changes in fall-related risk and confidence were reported from baseline to seven-week follow-up among those who attended SO (i.e., participants who did and did not attend SUYN). Findings suggest the utility of SUYN to identify malnutrition risk among community-dwelling older adults and link them to needed services like evidence-based programs. Efforts are needed to expand the delivery infrastructure of this brief intervention to reach more older adults, whether delivered in group settings or in a one-on-one basis.

**Keywords:** malnutrition; nutrition risk; falls; fall prevention; intervention; older adults

## 1. Introduction

Nearly 50% older adults are at risk for malnutrition,[1] yet routine screening for malnutrition in the community is rare.[2] Malnutrition and dehydration are risk factors for falls and other serious health conditions, such as frailty among older adults.[3,4] Malnutrition refers to imbalances in a person's nutritional intake and/or their body's capacity to utilize nutrients, which in turn reduces their ability to maintain or repair tissue.[5,6] Malnourished individuals may be underweight or overweight.[5,6] Adequate protein intake may reduce muscle loss due to aging and impact risk for falls.[7,8] Dehydration status has also been linked to increased falls risk.[7,8]

Malnutrition and dehydration are associated with declines in health status,[9] increased risk of falls,[10,11] higher rates of hospitalization,[12] and increased mortality risk.[12–15] Considering that between 25% and 33% of older adults age 65 years and older falls every year,[16,17] the relationship between malnutrition, dehydration, and falls among older people is important to consider.[11,15] It is well documented that protein intake can prevent the loss of lean muscle mass as people age.[18,19] Therefore, increasing protein intake may be a modifiable behavior to prevent muscle loss, loss of balance, and falls.[11,18] Moreover, hydration helps to regulate blood pressure[12] and helps to prevent weakness and dizziness,[20] which is also a modifiable behavior to prevent falls.[21]

A multitude of physical, psychological, social, and economic factors contribute to older adults' increased risk of malnutrition and dehydration.[22] Loss of muscle mass as a person ages contributes to having less body water, which increases a person's dehydration.[23] Muscle atrophy also leads to muscle weakness, which can limit a person's mobility to buy and prepare food[24] and result in a higher likelihood of falling. Having dental problems including periodontal disease, bleeding gums, or a dry mouth can reduce an older person's ability to swallow or eat certain foods, which restricts their food choices and consumption.[25,26] Quandt and colleagues found that older adults with oral health issues most commonly avoid eating whole fruits, raw vegetables, and meats.[26] Not eating these foods also limits intake of their high water content. Older adults experience a decreased sense of appetite and thirst,[27,28] as well as changes in taste, smell, and vision, which can make eating less enjoyable.[27,29] Having one or more chronic conditions and taking medications to manage these diseases can also reduce appetite.[27,30]

Among the various psychological and social factors, memory impairment may result in older adults forgetting or refusing to eat or stay hydrated because of dysphagia.[31–33] Older adults who suffer from depression, who are lonely, or socially isolated may have greater risks of eating alone, not staying hydrated, or not being able to prepare healthy foods.[9] Economic and transportation issues can also reduce older people's food accessibility and their ability to maintain a nutrient-dense diet.[20-22]

To date, there are no health promotion and disease prevention programs that specifically address older adult malnutrition and meet the Administration for Community Living's criteria for an evidence-based program[37]. While some of these programs incorporate nutrition or dietary selection issues, these are often in the context of disease self-management (e.g., specifically for diabetes) or general wellness.[38] Moreover, few evidence-based nutritional interventions specifically aim to reduce falls and fall-related risk,[39] which is true even among the few that target malnutrition and dehydration among older adults.[40]

Therefore, until a specific intervention is developed, evaluated, and documented to address malnutrition among older adults, brief interventions have great potential to raise awareness about

malnutrition, modify risk behaviors, and offset possible falls older adult populations. Such brief interventions can be offered independently or as introductory workshops – also termed a "Session Zero" – for an evidence-based program (e.g., fall prevention, disease self-management).[41] As documented in the aging services network, offering a Session Zero to complement evidence-based workshops can be helpful to orient participants to the topic and process, alleviate time restrictions associated with data collection, provide additional content not covered in the evidence-based program, and assist in the attendance and retention rates of program participants.[41]

Taking this into account, the purposes of this study were to: (1) describe a brief intervention for malnutrition, *Stepping Up Your Nutrition* (SUYN); (2) identify baseline risk among participants who attended SUYN and subsequent fall prevention programming; and (3) examine the role of SUYN on intervention dose and risk changes among those who subsequently attended a fall prevention program.

## 2. Materials and Methods

### *2.1. Workshops*

*Stepping Up Your Nutrition* (SUYN) is an interactive group-based workshop developed to help older adults remain independent, increase awareness about the link between malnutrition and falls risk, and prevent falls-related admissions. Developed by a team of registered dietitians and experts on health and aging, the key messages introduced in SUYN include: (1) how nutrition and muscle strength impact falls risk; (2) exercise, fluids, and protein maintain and build strong muscles; and (3) nutrition-focused actions to reduce falls risk. SUYN utilizes strategies to de-stigmatize malnutrition, underscore muscle strength loss with age, and provides solutions to lessen muscle loss by increasing fluids and protein. Workshops are led by certified lay leaders who have undergone a formal training (face-to-face or online) and utilize a standardized leader manual. The leader training is ideal for peers training in evidence-based programs (EBP), community health workers, and community-based organization staff. During the 2.5-hour workshop, participants engage in roll play and problem-solving activities, complete planning tools to increase liquids and proteins, learn to read food labels and make an action plan. At the beginning of the workshop, participants complete a nutrition assessment as well as a baseline questionnaire. Mid-way through the workshop, a break is given where participants are introduced to (and taste) protein-rich foods and drinks (e.g., nutritional supplements). Collectively, SUYN content and activities were designed to give participants the skills and confidence to make changes regarding their nutrition and fall-related risk. Because nutrition is strongly linked to fall prevention and chronic disease self-management, SUYN was initially designed as a Session Zero to be held in conjunction with other evidence-based programs. However, based on the unique content of SUYN, the brief intervention is suitable for stand-alone delivery in group or one-on-one formats. A brief outline of the SUYN brief intervention is provided in Table 1.

In this naturalistic workshop dissemination, SUYN participants may have elected to attend *Stepping On* (SO), an evidence-based fall prevention program.[42,43] SO is a group-based intervention originally developed in Australia[44] and adapted by the Wisconsin Institute for Healthy Aging for use in the United States.[45,46] Through a randomized-controlled trial, SO has been shown to reduce falls among older adults at risk for falling.[44] The 7-week intervention is led by trained leaders and invited health professionals as 'guest experts'.[45] Workshop sessions are two hours in duration and held once a week for seven consecutive weeks.

**Table 1. Stepping Up Your Nutrition (SUYN) Brief Intervention Overview**

| Components | Description |
|---|---|
| Introduction | Overview of the workshop and expectations; introduction of faciliators and participants |
| Baseline Data Collection | Consents (if needed); Pre-Test (knowledge, risk) |
| Nutrition Affects Falls | Discuss and share beliefs about why food is important |
| Muscle Matters | Overview of muscles and changes at different life stages; participants share why less muscle increases risk of falls |
| Nutrients to Know | Identify which food has most protein and how much protein is needed; discuss strategies about how to get more protein throughout the day; label reading activity; discuss the importance of hydration and impact of dehydration; brainstorm how to drink more fluid |
| Measuring Hand Grip Strength (Optional) | Measure participant grip strength following specific protocol (if resources exist) |
| Break | Offer food and protein drink tasting (dispel myths and encourage diversifying existing food/drink consumption) |
| Personalized Nutrition Risk Score | Conduct role-play so participants can participants share strengths and risks in the example and rate their nutrition habits; score personalized risk score and obtain interpretation of their risk (stoplight); identify community and clincial resources based on risk level |
| Action Planning | Facilitator identifies the components of an action plan and demonstrates how to create one action plan; participants make action plan and document it; participants share action plan with the group' participants write nutrition risk score, handgrip strength score (if collected), and action plan on Doctor Letter |

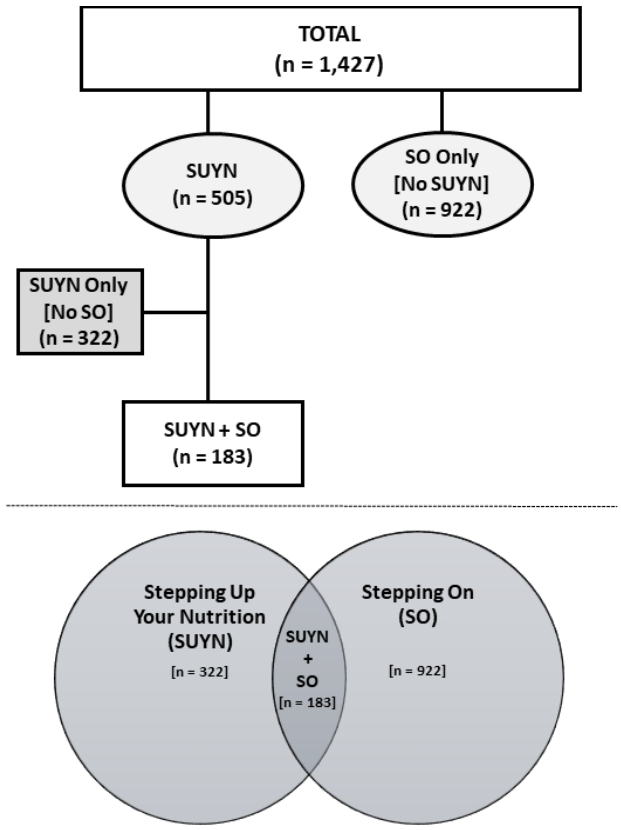
### *2.2. Participants and Procedures*

*SUYN Leader Training*. SUYN is facilitated by one or two trained lay leaders or healthcare professionals who are currently credentialed to lead an evidence-based program (e.g., fall prevention, disease self-management). Training sessions include detailed processes for data collection in terms of consenting participants, collecting nutrition risk assessments, and performing handgrip strength (if possible). Using the SUYN curriculum, facilitators are educated about the brief intervention content and given opportunities to practice their facilitation and role-playing skills. Further, facilitators receive training about how to interact with older adults and linking them to available and needed nutritional services and resources. Quality assurance, program fidelity and adherence to the program curriculum and protocols were monitored through leader observation during at least one onsite visit by a SUYN Master Trainer. A total of 29 possible trained facilitators were asked to deliver at least two SUYN workshops for 10-16 participants annually.

*Recruitment*. For this naturalistic community-based trial with a pragmatic research design, SUYN workshops were delivered in a variety of community and clinical locations across the state of Maryland. Overall, 48 SUYN workshops were delivered across eight cities in 10 distinct ZIP Codes. Based on the trained leader infrastructure described above, SUYN was delivered in 42 unique settings aligned with the national dissemination of evidence-based programs,[47,48] which included Area Agencies on Aging, senior centers, healthcare organizations, recreation facilities, residential facilities, low-income housing facilities, and faith-based organizations. For SO, a total of 16 unique sites in 11 cities (in 15 distinct ZIP Codes) offered workshops.

As shown in Figure 1, a total of 1,427 participants were included in this naturalistic workshop dissemination. Of these, 922 attended SO only (64.6%), 322 attended SUYN only (22.6%), and 183 attended both SUYN + SO (12.8%). Because different data collection instruments are used for SUYN and SO, and only a portion of participants attended both workshops, a series of analyses were performed to account for the non-uniformity of available data across intervention conditions. Given missing data differed across intervention arms and variables, comparisons were made pair-wise to assess differences (counts for each set of analyses are reported to describe the proportion of participants included in each comparison).

## 2.3. Measures




*SUYN: Baseline Characteristics*. Participants enrolled in SUYN were asked to report information about themselves prior to attending the brief intervention. Participants self-reported their age and gender. They also reported whether they had fallen in the past three months and their fear of falling. Participants also reported their dietary behaviors and perceptions by responding to items regarding their weight change over the past month, self-described appetite, eating with others, difficulties getting groceries, skipping meals, and knowing about resources to overcome financial challenges for getting food. (See Table 2).

*SUYN: Baseline Knowledge and Confidence*. Participants enrolled in SUYN were asked to report their knowledge and confidence specifically related to content presented in the brief intervention. Five knowledge-based items asked participants to self-report if they knew how much protein and fluid should be consumed daily, if they understood their nutrition risk and ways to improve it, and if they understood the importance of nutrition and muscular strength to prevent falls. Each of these items were asked on Likert-type scale ranging from 1 to 5, with higher responses indicating higher self-proclaimed knowledge. Six confidence-related items asked participants to self-report their ability to identify foods that are good sources of protein, identify recommended portion sizes, and identify ways to get healthy foods. They were also asked to report if they could list ways to increase fluid intake, read food labels, and set healthy eating goals. Each of these items were asked on Likert-type scale ranging from 1 to 4, with higher responses indicating higher self-proclaimed confidence. (See Table 3).

*SUYN: Malnutrition Risk Screening*. Although a variety of nutrition risk screenings exist for older adults,[49,50] this SUYN demonstration used the SCREEN II® because of its applicability to the population and distinct scoring mechanism.[51–53] This instrument is considered a valid malnutrition screening tool for community settings,[49,53] given nutritional assessments administered to older adults can rapidly identify their malnutrition risk.[49] The SCREEN II® consists of 15 multi-part items that assess an older adult's perceptions of weight and appetite, diet composition, and barriers to eating and cooking. Using the predetermined scoring mechanism, scores of 55 and higher indicate no or low nutrition risk, scores of 50 to 54 indicate moderate risk for malnutrition, and scores of 49 and lower indicate high malnutrition risk.[51]

*SO: Baseline Characteristics*. Participants enrolled in SO were asked to report information about themselves prior to attending the brief intervention. Participants self-reported their age, gender, number of self-reported chronic conditions, and whether or not they lived alone. They also reported whether they had fallen in the past three months and their fear of falling. (See Table 6).

*SO: Attendance*. The number of SO workshop sessions was recorded to indicate intervention dose in this fall prevention program. For each workshop, a total of seven sessions are offered. The total number of sessions attended were compared for those only attending SO and those attending SUYN + SO.

*SO: Fall-Related Outcomes*. Per the nature of the seven-week SO workshop, information is traditionally collected from participants at baseline and post-intervention to assess change over time. As reported above, SO participants self-reported whether they had fallen in the past three months and their fear of falling. Additionally, using five Likert-type items (ranging from 1 to 4 with higher scores indicating more confidence), participants reported the degree they could get up from a fall, find ways to reduce falls, protect themselves if they fall, increase strength, and increase steadiness on their feet. Additionally, they reported the degree to which their concerns about falls interfered with their activities over the past month (single item ranging from 1 to 5, with higher scores indicating more concern). (See Table 7).

### *2.4. Statistical Analyses*

All analyses were performed using SPSS version 25 for this pragmatic evaluation. Based on the naturalistic enrollment of participants in these interventions, common data elements were not collected uniformly from all study participants. A series of descriptive and bivariate analyses were executed based on the common data elements between the intervention condition (i.e., SUYN Only vs. SUYN + SO and SO Only vs. SUYN + SO). Descriptive statistics were performed, which were then compared by intervention conditions and nutrition risk scores at baseline. When describing SUYN Only vs. SUYN + SO, categorical variables were compared using chi-square tests and continuous variables were compared using independent sample t-tests and one-way ANOVA. When describing SO Only vs. SUYN + SO, categorical variables were compared using chi-square tests and continuous variables were compared using independent sample t-tests. Paired sample t-tests were used to assess changes in risk and confidence from baseline to post-intervention for SO Only and SUYN + SO intervention conditions. Given the exploratory nature of these analyses, statistical significance was determined as $P < 0.05$. Wilcoxon sign-rank tests were used to identify the proportion of participants who reported improvement for each outcome of interest from baseline to post-intervention. Missing values were excluded case wise, and statistics were reported for non-missing data only.

## 3. Results

### *3.1. Baseline SUYN Characteristics by Malnutrition Risk and Dietary Behavior Factors*

Sixty-two percent of SUYN participants did not subsequently enroll in SO. Of the 38.0% of SUYN participants who also participated in SO, the average time between interventions was 19.48 (±64.36) days [range from 0 days to 393 days]. The average age of SUYN participants was 74.71 (±11.45) years, with 33.7% being age 80 years or older. The majority of participants (63.3%) was female. At baseline, approximately one-in-five (21.1%) SUYN participants reported a fall within the past three months, and 27.2% and 16.5% of participants reported being 'somewhat' and 'a lot' fearful of falling, respectively. Over half of participants (52.2%) reported never/rarely/sometimes eating meals with others daily, while 41.3% self-described their appetite as poor/fair/good and 49.6% sometimes/often skipped meals. Twenty percent of participants reported sometimes/often/almost always having problems getting groceries, and 16.2% reported their groceries didn't last and they didn't have money to purchase more. Approximately 71% of SUYN participants scored at high malnutrition risk on the SCREEN II, followed by 19.6% scoring at moderate risk, and 9.6% scoring at no/low risk.

When comparing SUYN participant characteristics by malnutrition risk score, a significantly larger proportion of SUYN participants who also participated in SO scored at high malnutrition risk on the SCREEN II ($\chi^2$ = 8.73, P = 0.013). A significantly larger proportion of females scored at high malnutrition risk ($\chi^2$ = 10.26, P = 0.006). Larger proportions of those reporting high malnutrition risk also reported eating meals with others less regularly ($\chi^2$ = 23.86, P = 0.001), a poorer appetite ($\chi^2$ = 18.48, P = 0.001), skipping meals more often ($\chi^2$ = 36.40, P < 0.001), and not having money to purchase more groceries when groceries didn't last ($\chi^2$ = 13.50, P = 0.009).

**Table 2. Baseline Characteristics for SUYN Participants by Malnutrition Risk Score**

| | TOTAL | SCREEN II NO/LOW | SCREEN II MODERATE | SCREEN II HIGH | $\chi^2$ | P |
|---|---|---|---|---|---|---|
| ***Intervention (n = 429)*** | | | | | 8.73 | 0.013 |
| SUYN Only | 266 (62.0%) | 30 (73.2%) | 61 (72.6%) | 175 (57.6%) | | |
| SUYN + SO | 163 (38.0%) | 11 (26.8%) | 23 (27.4%) | 129 (42.4%) | | |
| ***Age Group (n = 383)*** | | | | | 10.85 | 0.210 |
| 64 Years and Younger | 51 (13.3%) | 2 (6.3%) | 15 (19.5%) | 34 (12.4%) | | |
| 65 - 69 Years | 54 (14.1%) | 2 (6.3%) | 11 (14.3%) | 41 (15.0%) | | |
| 70 - 74 Years | 66 (17.2%) | 10 (31.3%) | 11 (14.3%) | 45 (16.4%) | | |
| 75 - 79 Years | 83 (21.7%) | 7 (21.9%) | 19 (24.7%) | 57 (20.8%) | | |
| 80 Years and Older | 129 (33.7%) | 11 (34.4%) | 21 (27.3%) | 97 (35.4%) | | |
| ***Gender (n = 229)*** | | | | | 10.26 | 0.006 |
| Male | 84 (36.7%) | 10 (55.6%) | 21 (53.8%) | 53 (30.8%) | | |
| Female | 145 (63.3%) | 8 (44.4%) | 18 (46.2%) | 119 (69.2%) | | |
| ***Fallen in Past 3 Months (n = 388)*** | | | | | 5.76 | 0.056 |
| No | 306 (78.9%) | 30 (90.9%) | 65 (84.4%) | 211 (75.9%) | | |
| Yes | 82 (21.1%) | 3 (9.1%) | 12 (15.6%) | 67 (24.1%) | | |
| ***Fear of Falling (n = 429)*** | | | | | 5.41 | 0.492 |
| Not At All | 100 (25.7%) | 13 (37.1%) | 24 (30.0%) | 63 (23.0%) | | |
| A Little | 119 (30.6%) | 11 (31.4%) | 25 (31.3%) | 83 (30.3%) | | |
| Somewhat | 106 (27.2%) | 7 (20.1%) | 19 (23.7%) | 80 (29.2%) | | |
| A Lot | 64 (16.5%) | 4 (11.4%) | 12 (15.0%) | 48 (17.5%) | | |
| ***Weight Changed in Past 30 Days (n =288)*** | | | | | 6.35 | 0.385 |
| Yes, Gained | 49 (17.0%) | 2 (9.1%) | 11 (18.0%) | 36 (17.6%) | | |
| No, Stayed Same | 189 (65.6%) | 19 (86.4%) | 42 (68.9%) | 128 (62.4%) | | |
| Yes, Lost | 43 (14.9%) | 1 (4.5%) | 7 (11.5%) | 35 (17.1%) | | |
| Don't Know | 7 (2.4%) | 0 (0.0%) | 1 (1.6%) | 6 (2.9%) | | |
| ***Eat Meals with Somone Daily (n = 292)*** | | | | | 23.86 | 0.001 |
| Never/Rarely | 53 (18.2%) | 0 (0.0%) | 9 (14.5%) | 44 (21.2%) | | |
| Sometimes | 111 (38.0%) | 6 (27.3%) | 17 (27.4%) | 88 (42.3%) | | |
| Often | 38 (13.0%) | 2 (9.1%) | 9 (14.5%) | 27 (13.0%) | | |
| Almost Always | 90 (30.8%) | 14 (63.6%) | 27 (43.5%) | 49 (23.6%) | | |
| ***Self-Described Appetite (n = 290)*** | | | | | 18.48 | 0.001 |
| Poor | 12 (4.1%) | 0 (0.0%) | 0 (0.0%) | 12 (5.8%) | | |
| Fair/Good | 108 (37.2%) | 3 (13.6%) | 16 (26.7%) | 89 (42.8%) | | |
| Very Good | 170 (58.6%) | 19 (86.4%) | 44 (73.3%) | 107 (51.4%) | | |
| ***Problems Getting Groceries ( n = 285)*** | | | | | 12.59 | 0.050 |
| Never/Rarely | 228 (80.0%) | 21 (95.5%) | 56 (91.8%) | 151 (74.8%) | | |
| Sometimes | 42 (14.7%) | 1 (4.5%) | 4 (6.6%) | 37 (18.3%) | | |
| Often | 8 (2.8%) | 0 (0.0%) | 1 (1.6%) | 7 (3.5%) | | |
| Almost Always | 7 (2.5%) | 0 (0.0%) | 0 (0.0%) | 7 (3.5%) | | |
| ***Groceries Didn't Last, Didn't Have Money for More (n = 277)*** | | | | | 13.50 | 0.009 |
| Never | 232 (83.8%) | 19 (95%) | 59 (96.7%) | 154 (78.6%) | | |
| Sometimes | 33 (11.9%) | 1 (5.0%) | 1 (1.6%) | 31 (15.8%) | | |
| Often | 12 (4.3%) | 0 (0.0%) | 1 (1.6%) | 11 (5.6%) | | |
| ***Skipped Meals (n = 272)*** | | | | | 36.40 | <0.001 |
| Never | 137 (50.4%) | 19 (90.5%) | 44 (72.1%) | 74 (38.9%) | | |
| Sometimes | 111 (40.8%) | 2 (9.5%) | 16 (26.2%) | 93 (48.9%) | | |
| Often | 24 (8.8%) | 0 (0.0%) | 1 (1.6%) | 23 (12.1%) | | |
| ***Know Where to Get Resources, If Not Enough Money for Food (n = 249)*** | | | | | 1.97 | 0.741 |
| Often | 72 (28.9%) | 5 (27.8%) | 14 (25.9%) | 53 (29.9%) | | |
| Sometimes | 48 (19.3%) | 3 (16.7%) | 8 (14.8%) | 37 (20.9%) | | |
| Never | 129 (51.8%) | 10 (55.6%) | 32 (59.3%) | 87 (49.2%) | | |

Generally, SUYN participants self-reported moderate to high knowledge and confidence about nutrition and fall prevention at baseline. Scores for the five knowledge items ranged from 3.33 (±1.14) to 3.94 (±1.11). On average, highest knowledge was reported for "understand the importance of muscle strength to prevent falls," while lowest knowledge was reported for "know how much protein I should consume daily to meet my needs." Scores for the seven confidence items ranged from 3.05 (±0.76) to 3.93 (±1.06). On average, highest confidence was reported for "can identify foods that are good sources of protein," while lowest confidence was reported for "can identify recommended portion sizes for different foods."

When comparing SUYN participant baseline knowledge and confidence by malnutrition risk score, participants with higher nutrition risk scores consistently reported lower knowledge and confidence. On average, participants with higher malnutrition risk reported significantly lower knowledge on four of the five items ($P < 0.05$). Similarly, on average, participants with higher nutrition risk reported significantly lower confidence on five of the seven items ($P < 0.05$). Two of the four non-significantly different items (one for knowledge, one for confidence) surrounded fluid intake (i.e., "know how much fluid I should consume daily to meet my needs," and "can list ways to increase fluid intake").

**Table 3. Knowledge and Confidence for SUYN Participants by Malnutrition Risk Score**

| | TOTAL | | SCREEN II NO/LOW | | SCREEN II MODERATE | | SCREEN II HIGH | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | n | Mean (SD) | n | Mean (SD) | n | Mean (SD) | n | Mean (SD) | f | P |
| Knowledge: Know How Much Protein I Should Consme Daily to Meet Needs | 262 | 3.33 (±1.14) | 20 | 4.15 (±1.04) | 61 | 3.54 (±1.09) | 181 | 3.17 (±1.12) | 8.46 | <0.001 |
| Knowledge: Know How Much Fluid I Should Consume Daily to Meet Needs | 265 | 3.66 (±1.17) | 21 | 4.00 (±1.30) | 61 | 3.87 (±1.15) | 183 | 3.56 (±1.15) | 2.59 | 0.077 |
| Knowledge: Understand Nutrition Risk and Ways to Improve It | 267 | 3.89 (±1.03) | 21 | 4.38 (±0.97) | 58 | 4.14 (±1.08) | 188 | 3.76 (±0.99) | 5.92 | 0.003 |
| Knowledge: Understand the Importance of Nutrition to Prevent Falls | 264 | 3.65 (±1.10) | 21 | 4.38 (±0.97) | 60 | 3.83 (±1.11) | 183 | 3.51 (±1.07) | 7.33 | 0.001 |
| Knowledge: Understand the Importance of Muscle Strength to Prevent Falls | 262 | 3.94 (±1.11) | 20 | 4.40 (±1.00) | 62 | 4.18 (±0.98) | 180 | 3.81 (±1.15) | 4.43 | 0.013 |
| Confidence: Can Identify Foods That Are Good Sources of Protein | 280 | 3.93 (±1.06) | 21 | 4.48 (±0.81) | 62 | 4.05 (±1.29) | 197 | 3.83 (±0.98) | 4.11 | 0.017 |
| Confidence: Can Identify Recommended Portion Sizes for Different Foods | 274 | 3.05 (±0.76) | 20 | 3.25 (±0.97) | 60 | 3.27 (±0.63) | 194 | 2.96 (±0.76) | 4.44 | 0.013 |
| Confidence: Can Identify Ways to Get Healthy Foods | 275 | 3.16 (±0.73) | 20 | 3.30 (±0.92) | 61 | 3.36 (±0.52) | 194 | 3.08 (±0.75) | 4.05 | 0.019 |
| Confidence: Can List Ways to Increase Fluid Intake | 261 | 3.70 (±1.09) | 20 | 3.85 (±1.23) | 61 | 3.97 (±0.95) | 180 | 3.59 (±1.10) | 2.93 | 0.055 |
| Confidence: Can Read Food Labels | 276 | 3.25 (±0.81) | 21 | 3.29 (±1.06) | 61 | 3.39 (±0.80) | 194 | 3.21 (±0.78) | 1.26 | 0.285 |
| Confidence: Can Set a Healty Eating Goal | 268 | 3.12 (±0.70) | 21 | 3.48 (±0.93) | 61 | 3.25 (±0.70) | 186 | 3.03 (±0.65) | 5.39 | 0.005 |

### *3.2. Baseline Malnutrition Risk for SUYN Participants by Study Condition*

Table 4 compares baseline nutritional risk for SUYN participants by whether they only attended SUYN or attended SUYN + SO. On average, SUYN + SO participants were over five years older than SUYN Only participants ($t = -5.39$, $P < 0.001$). Compared to SUYN only participants, a significantly larger proportion of SUYN + SO participants were older (30.1% age 80 years or older vs. 41.9%). A significantly larger proportion of SUYN + SO participants scored at high nutrition risk compared to SUYN Only participants (65.8% vs. 79.1%). A significant difference was also observed for fear of falling between the groups (i.e., a smaller proportion of SUYN + SO participants reported "not at all" and a larger proportion reported "somewhat" compared to SUYN Only participants).

Table 5 compares baseline knowledge and confidence about nutrition and fall prevention for SUYN participants by whether thy only attended SUYN or attended SUYN + SO. No statistically significant differences were observed between study conditions ($P > 0.05$).

### *3.3. Baseline Characteristics for SO Participants by Study Condition*

The average age of SO participants was 76.32 (±9.10) years, with 37.3% being age 80 years or older. On average, SO participants self-reported 1.62 (±1.24) chronic conditions. The majority of SO participants (81.8%) was female and 68.4% lived alone. At baseline, over one-in-four (27.9%) SO participants reported a fall within the past three months, and 36.9% and 16.0% of participants

291 reported being 'somewhat' and 'a lot' fearful of falling, respectively. For SO workshop attendance,
292 on average participants attended 5.20 (1.90) of the seven sessions (considered 'successfully
293 completing' the intervention).

**Table 4. Baseline Characteristics for SUYN Participants by Study Condition**

| | TOTAL | SUYN ONLY | SUYN + SO | t or $\chi^2$ | P |
|---|---|---|---|---|---|
| ***Age Group (n = 428)*** | 74.71 (±11.45) | 72.50 (±12.72) | 77.98 (±8.29) | -5.39 | <0.001 |
| 64 Years and Younger | 58 (13.6%) | 51 (19.9%) | 7 (4.1%) | 24.03 | <0.001 |
| 65 - 69 Years | 60 (14.0%) | 37 (14.5%) | 23 (13.4%) | | |
| 70 - 74 Years | 70 (16.4%) | 39 (15.2%) | 31 (18.0%) | | |
| 75 - 79 Years | 91 (21.3%) | 52 (20.3%) | 39 (22.7%) | | |
| 80 Years and Older | 149 (34.8%) | 77 (30.1%) | 72 (41.9%) | | |
| ***Malnutrition Risk Score (Screen II) (n = 429)*** | 44.11 (±8.40) | 44.65 (±8.55) | 43.21 (±8.10) | 1.75 | 0.081 |
| No/Low | 41 (9.6%) | 30 (11.3%) | 11 (6.7%) | 8.73 | 0.013 |
| Moderate | 84 (19.6%) | 61 (22.9%) | 23 (14.1%) | | |
| High | 304 (70.9%) | 175 (65.8%) | 129 (79.1%) | | |
| ***Fallen in Past 3 Months (n = 431)*** | | | | 1.46 | 0.228 |
| No | 342 (79.4%) | 216 (81.2%) | 126 (76.4%) | | |
| Yes | 89 (20.6%) | 50 (18.8%) | 39 (23.6%) | | |
| ***Fear of Falling (n = 429)*** | | | | 13.65 | 0.003 |
| Not At All | 111 (25.9%) | 81 (30.5%) | 30 (18.4%) | | |
| A Little | 132 (30.8%) | 82 (30.8%) | 50 (30.7%) | | |
| Somewhat | 117 (27.3%) | 58 (21.8%) | 59 (36.2%) | | |
| A Lot | 69 (16.1%) | 45 (16.9%) | 24 (14.7%) | | |
| ***Weight Changed in Past 30 Days (n = 324)*** | | | | 2.42 | 0.490 |
| Yes, Gained | 56 (17.3%) | 35 (19.9%) | 21 (14.2%) | | |
| No, Stayed Same | 211 (65.1%) | 112 (63.6%) | 99 (66.9%) | | |
| Yes, Lost | 49 (15.1%) | 24 (13.6%) | 25 (16.9%) | | |
| Don't Know | 8 (2.5%) | 5 (2.8%) | 3 (2.0%) | | |
| ***Eat Meals with Somone Daily (n = 329)*** | | | | 4.25 | 0.236 |
| Never/Rarely | 55 (16.7%) | 26 (14.4%) | 29 (19.5%) | | |
| Sometimes | 126 (38.3%) | 64 (35.6%) | 62 (41.6%) | | |
| Often | 45 (13.7%) | 27 (15.0%) | 18 (12.1%) | | |
| Almost Always | 103 (31.3%) | 63 (35.0%) | 40 (26.8%) | | |
| ***Self-Described Appetite (n = 327)*** | | | | 3.02 | 0.221 |
| Poor | 13 (4.0%) | 4 (2.3%) | 9 (6.0%) | | |
| Fair/Good | 120 (36.7%) | 67 (37.9%) | 53 (35.3%) | | |
| Very Good | 194 (59.3%) | 106 (59.9%) | 88 (58.7%) | | |
| ***Problems Getting Groceries (n = 321)*** | | | | 0.33 | 0.954 |
| Never/Rarely | 256 (79.8%) | 141 (80.1%) | 115 (79.3%) | | |
| Sometimes | 49 (15.3%) | 26 (14.8%) | 23 (15.9%) | | |
| Often | 8 (2.5%) | 4 (2.3%) | 4 (2.8%) | | |
| Almost Always | 8 (2.5%) | 5 (2.8%) | 3 (2.1%) | | |
| ***Groceries Didn't Last, Didn't Have Money for More (n = 312)*** | | | | 2.09 | 0.351 |
| Never | 260 (83.3%) | 137 (80.6%) | 123 (86.6%) | | |
| Sometimes | 40 (12.8%) | 25 (14.7%) | 15 (10.6%) | | |
| Often | 12 (3.8%) | 8 (4.7%) | 4 (2.8%) | | |
| ***Skipped Meals (n = 305)*** | | | | 3.36 | 0.186 |
| Never | 153 (50.2%) | 92 (54.8%) | 61 (44.5%) | | |
| Sometimes | 128 (42.0%) | 63 (37.5%) | 65 (47.4%) | | |
| Often | 24 (7.9%) | 13 (7.7%) | 11 (8.0%) | | |
| ***Know Where to Get Resources, If Not Enough Money for Food (n = 275)*** | | | | 4.91 | 0.086 |
| Often | 84 (30.5%) | 50 (32.3%) | 34 (28.3%) | | |
| Sometimes | 52 (18.9%) | 35 (22.6%) | 17 (14.2%) | | |
| Never | 139 (50.5%) | 70 (45.2%) | 69 (57.5%) | | |

294

**Table 5. Baseline Knowledge and Confidence for SUYN Participants by Study Condition**

| | TOTAL | | SUYN ONLY | | SUYN + SO | | | |
|---|---|---|---|---|---|---|---|---|
| | n | Mean (SD) | n | Mean (SD) | n | Mean (SD) | t | P |
| Knowledge: Know How Much Protein I Should Consme Daily to Meet Needs | 292 | 3.38 (±1.14) | 156 | 3.31 (±1.12) | 136 | 3.46 (±1.17) | -1.11 | 0.267 |
| Knowledge: Know How Much Fluid I Should Consume Daily to Meet Needs | 295 | 3.68 (±1.17) | 161 | 3.63 (±1.17) | 134 | 3.73 (±1.18) | -0.71 | 0.477 |
| Knowledge: Understand Nutrition Risk and Ways to Improve It | 294 | 3.67 (±1.10) | 160 | 3.69 (±1.08) | 134 | 3.65 (±1.13) | 0.34 | 0.731 |
| Knowledge: Understand the Importance of Nutrition to Prevent Falls | 297 | 3.93 (±1.02) | 163 | 3.88 (±1.03) | 134 | 3.99 (±1.02) | -0.85 | 0.395 |
| Knowledge: Understand the Importance of Muscle Strength to Prevent Falls | 292 | 3.95 (±1.11) | 159 | 4.03 (±1.06) | 133 | 3.85 (±1.18) | 1.34 | 0.180 |
| Confidence: Can Identify Foods That Are Good Sources of Protein | 314 | 3.95 (±1.05) | 174 | 3.94 (±1.04) | 140 | 3.96 (±1.07) | -0.12 | 0.903 |
| Confidence: Can Identify Recommended Portion Sizes for Different Foods | 306 | 3.06 (±0.75) | 164 | 3.00 (±0.76) | 142 | 3.13 (±0.75) | -1.55 | 0.122 |
| Confidence: Can Identify Ways to Get Healthy Foods | 307 | 3.18 (±0.72) | 166 | 3.18 (±0.72) | 141 | 3.17 (±0.72) | 0.13 | 0.899 |
| Confidence: Can List Ways to Increase Fluid Intake | 291 | 3.73 (±1.10) | 158 | 3.75 (±1.10) | 133 | 3.70 (±1.11) | 0.42 | 0.678 |
| Confidence: Can Read Food Labels | 308 | 3.27 (±0.79) | 165 | 3.26 (±0.79) | 143 | 3.27 (±0.79) | -0.14 | 0.893 |
| Confidence: Can Set a Healty Eating Goal | 300 | 3.14 (±0.70) | 163 | 3.18 (±0.67) | 137 | 3.09 (±0.73) | 1.12 | 0.264 |

When comparing SUYN participant characteristics by whether they only attended SO or attended SUYN + SO, those in the SUYN + SO study condition were over two years older than SO Only participants, on average (t = -2.75, P = 0.006). Further, on average, SUYN + SO participants self-reported significantly more chronic conditions (t = -2.18, P < 0.030). On average, SUYN + SO participants attended significantly more SO workshop sessions compared to SO Only participants (t = -2.17, P = 0.031).

**Table 6. Baseline Characteristics and Falls Risk for SO Participants by Condition**

| | TOTAL | SO ONLY | SUYN + SO | t or $\chi^2$ | P |
|---|---|---|---|---|---|
| ***Age Group (n = 703)*** | 76.32 (±9.10) | 75.79 (±9.30) | 77.98 (±8.29) | -2.75 | 0.006 |
| 64 Years and Younger | 60 (8.5%) | 53 (10.0%) | 7 (4.1%) | 7.90 | 0.095 |
| 65 - 69 Years | 92 (13.1%) | 69 (13.0%) | 23 (13.4%) | | |
| 70 - 74 Years | 145 (20.6%) | 114 (21.5%) | 31 (18.0%) | | |
| 75 - 79 Years | 144 (20.5%) | 105 (19.8%) | 39 (22.7%) | | |
| 80 Years and Older | 262 (37.3%) | 190 (35.8%) | 72 (41.9%) | | |
| ***Gender (n = 865)*** | | | | 2.06 | 0.152 |
| Male | 157 (18.2%) | 141 (18.9%) | 16 (13.4%) | | |
| Female | 708 (81.8%) | 605 (81.1%) | 103 (14.5%) | | |
| ***Chronic Conditions (n = 872)*** | 1.62 (±1.24) | 1.58 (±1.22) | 1.85 (±1.34) | -2.18 | 0.030 |
| ***Lives Alone (n = 592)*** | | | | 3.62 | 0.057 |
| No | 187 (31.6%) | 147 (29.9%) | 40 (39.6%) | | |
| Yes | 405 (68.4%) | 344 (70.1%) | 61 (60.4%) | | |
| ***Fallen in Past 3 Months (n = 872)*** | | | | 0.48 | 0.487 |
| No | 629 (72.1%) | 540 (71.7%) | 89 (74.8%) | | |
| Yes | 243 (27.9%) | 213 (28.3%) | 30 (25.2%) | | |
| ***Fear of Falling (n = 869)*** | | | | 2.42 | 0.491 |
| Not At All | 105 (12.1%) | 90 (11.9%) | 15 (13.3%) | | |
| A Little | 304 (35.0%) | 271 (35.8%) | 33 (29.2%) | | |
| Somewhat | 321 (36.9%) | 278 (36.8%) | 43 (38.1%) | | |
| A Lot | 139 (16.0%) | 117 (15.5%) | 22 (19.5%) | | |
| ***Number of SO Workshop Sessions Attended (n = 872)*** | 5.20 (±1.90) | 5.15 (±1.93) | 5.51 (±1.34) | -2.17 | 0.031 |

Table 7 compares baseline fall-related risk and confidence for SO participants by whether thy only attended SO or attended SUYN + SO. No statistically significant differences were observed between study conditions (P > 0.05).

**Table 7. Baseline Fall-Related Risk and Confidence for SO Participants by Condition**

| | TOTAL | | SO ONLY | | SUYN + SO | | | |
|---|---|---|---|---|---|---|---|---|
| | n | Mean (SD) | n | Mean (SD) | n | Mean (SD) | t | P |
| Number of Falls within Past 3 Months | 872 | 0.51 (±1.13) | 753 | 0.53 (±1.17) | 119 | 0.39 (±0.81) | 1.70 | 0.091 |
| Fear of Falling | 869 | 2.57 (±0.90) | 756 | 2.56 (±0.89) | 113 | 2.64 (±0.95) | -0.87 | 0.384 |
| Confidence: Get Up from a Fall | 863 | 2.73 (±0.97) | 746 | 2.73 (±0.98) | 117 | 2.74 (±0.90) | -0.07 | 0.941 |
| Confidence: Find Ways to Reduce Falls | 846 | 2.76 (±0.86) | 730 | 2.76 (±0.87) | 116 | 2.78 (±0.81) | -0.31 | 0.755 |
| Confidence: Protect Myself If I Fall | 843 | 2.30 (±0.93) | 729 | 2.31 (±0.93) | 114 | 2.28 (±0.95) | 0.27 | 0.789 |
| Confidence: Increase Strength | 852 | 2.89 (±0.30) | 737 | 2.90 (±0.90) | 115 | 2.84 (±0.88) | 0.59 | 0.554 |
| Confidence: Increase Steadiness on My Feet | 846 | 2.76 (±0.87) | 729 | 2.77 (±0.90) | 117 | 2.69 (±0.90) | 0.87 | 0.387 |
| Concern about Falls Interfere with Activity Past 30 Days | 799 | 1.86 (±0.95) | 689 | 1.88 (±0.97) | 110 | 1.76 (±0.75) | 1.18 | 0.239 |

Table 8 presents changes in fall-related risk and confidence among SO participants from baseline to 7-week follow-up. When examining all SO participants together, on average, participants reported significantly fewer falls ($t = 6.78$, $P < 0.001$), with 22.8% of participants improving over time. On average, SO participants reported a significant reduction in fear of falling from baseline to follow-up ($t = 2.27$, $P = 0.024$), with 25.6% of participants improving over time. On average, significant improvements on all five fall-related confidence items were reported ($P < 0.001$), with between 40.1% and 47.4% of participants improving over time. On average, SO participants reported significant reductions in activity interference because of fall-related concerns ($t = 2.88$, $P = 0.004$), with 28.9% of participants improving over time.

**Table 8. Changes in Fall-Related Risk and Confidence Over Time for SO Participants by Condition**

**OVERALL SO PARTICIPANTS**

| | | Baseline | 7-Week Follow-Up | | | |
|---|---|---|---|---|---|---|
| | n | Mean (SD) | Mean (SD) | t | P | % Participants Improved |
| Number of Falls | 530 | 0.43 (±0.91) | 0.17 (±0.51) | 6.78 | <0.001 | 22.8% |
| Fear of Falling | 520 | 2.56 (±0.91) | 2.48 (±0.89) | 2.27 | 0.024 | 25.6% |
| Confidence: Get Up from a Fall | 520 | 2.76 (±1.00) | 3.19 (±0.85) | -10.79 | <0.001 | 42.9% |
| Confidence: Find Ways to Reduce Falls | 511 | 2.79 (±0.87) | 3.29 (±0.71) | -12.31 | <0.001 | 47.4% |
| Confidence: Protect Myself If I Fall | 508 | 2.31 (±0.96) | 2.84 (±0.85) | -11.78 | <0.001 | 48.8% |
| Confidence: Increase Strength | 514 | 2.96 (±0.89) | 3.33 (±0.71) | -9.31 | <0.001 | 40.1% |
| Confidence: Increase Steadiness on My Feet | 509 | 2.83 (±0.90) | 3.17 (±0.75) | -8.42 | <0.001 | 41.5% |
| Concern about Falls Interfere with Activity Past 30 Days | 453 | 1.80 (±0.86) | 1.67 (±0.83) | 2.88 | 0.004 | 28.9% |

**SO ONLY**

| | | Baseline | 7-Week Follow-Up | | | |
|---|---|---|---|---|---|---|
| | n | Mean (SD) | Mean (SD) | t | P | % Participants Improved |
| Number of Falls | 446 | 0.45 (±0.93) | 0.17 (±0.51) | 6.49 | <0.001 | 29.1% |
| Fear of Falling | 443 | 2.54 (±0.90) | 2.49 (±0.87) | 1.32 | 0.189 | 25.3% |
| Confidence: Get Up from a Fall | 440 | 2.75 (±1.01) | 3.19 (±0.84) | -9.97 | <0.001 | 41.8% |
| Confidence: Find Ways to Reduce Falls | 429 | 2.78 (±0.88) | 3.28 (±0.71) | -11.49 | <0.001 | 47.1% |
| Confidence: Protect Myself If I Fall | 427 | 2.32 (±0.96) | 2.81 (±0.86) | -10.28 | <0.001 | 47.1% |
| Confidence: Increase Strength | 433 | 2.97 (±0.89) | 3.34 (±0.71) | -8.44 | <0.001 | 39.3% |
| Confidence: Increase Steadiness on My Feet | 427 | 2.85 (±0.89) | 3.17 (±0.76) | -7.35 | <0.001 | 40.3% |
| Concern about Falls Interfere with Activity Past 30 Days | 384 | 1.79 (±0.87) | 1.63 (±0.81) | 3.47 | 0.001 | 30.7% |

**SUYN + SO**

| | | Baseline | 7-Week Follow-Up | | | |
|---|---|---|---|---|---|---|
| | n | Mean (SD) | Mean (SD) | t | P | % Participants Improved |
| Number of Falls | 84 | 0.35 (±0.75) | 0.17 (±0.49) | 2.02 | 0.046 | 21.4% |
| Fear of Falling | 77 | 2.68 (±0.91) | 2.43 (±0.98) | 2.84 | 0.006 | 27.3% |
| Confidence: Get Up from a Fall | 80 | 2.78 (±0.94) | 3.20 (±0.88) | -4.11 | <0.001 | 48.8% |
| Confidence: Find Ways to Reduce Falls | 82 | 2.83 (±0.83) | 3.29 (±0.71) | -4.44 | <0.001 | 48.8% |
| Confidence: Protect Myself If I Fall | 81 | 2.31 (±0.97) | 2.98 (±0.79) | -5.93 | <0.001 | 58.0% |
| Confidence: Increase Strength | 81 | 2.88 (±0.90) | 3.27 (±0.71) | -3.93 | <0.001 | 44.4% |
| Confidence: Increase Steadiness on My Feet | 82 | 2.76 (±0.91) | 3.17 (±0.70) | -4.23 | <0.001 | 47.6% |
| Concern about Falls Interfere with Activity Past 30 Days | 69 | 1.80 (±0.78) | 1.90 (±0.91) | -1.00 | 0.321 | 18.8% |

When examining changes from baseline to 7-week follow-up among SO Only participants, significant improvements were observed for all fall-related risk and confidence measures with exception of fear of falling. When examining changes from baseline to 7-week follow-up among SUYN + SO participants, significant improvements were observed for all fall-related risk and confidence measures with exception of activity interference because of fall-related concerns.

## 4. Discussion

This study described the SUYN brief intervention for identifying malnutrition risk among community-based older adults, with an educational focus on two specific dietary aspects related to malnutrition and falls (e.g., protein and fluid consumption). Then, using data from a naturalistic community-based dissemination effort, data were presented about malnutrition and fall-related risk, which were compared in various ways across intervention conditions. SUYN was offered as a stand-alone intervention as well as Session Zero[41] to SO, an evidence-based fall prevention program, to help orient participants and confirm their commitment to the subsequent intervention.

SUYN's screening component helped detect more than 65% of participants were at risk for malnutrition, higher than anticipated in a community setting. While many attendees were recruited in community-based settings, such as senior activity centers, many were also referred into the program from their physician due to elevated falls risk. This highly salient finding demonstrates that malnutrition may actually have a higher incidence in the community than previously thought, and SUYN reveals the feasibility of a community-based malnutrition awareness program to identify malnutrition risk. At-risk persons were referred to healthcare, food, and other applicable community supports to address their individual risk factors such as food pantries, senior meal programs, evidence-based workshops, dietitians and other applicable clinical professionals, social workers, and/or benefits counselors.

It is likely this malnutrition risk would have remained undetected in the absence of this brief intervention. While clinical settings have incentives, tools, and payment systems to encourage malnutrition screening and intervention,[54] most older adults live in the community rather than healthcare settings. Therefore, an easily implemented, low-cost, community-based intervention that enhances older adults' confidence to improve nutritional health while educating them about nutritional risk and how to proactively prevent malnutrition has potential to limit healthcare expenditures and enhance quality of life as our population ages.

Interestingly, SUYN enhanced the fall prevention programming by retaining participants who had lower knowledge of nutrition and fall prevention, higher malnutrition risk, and greater fear of falling. SUYN screening was an excellent first step to link at-risk older participants to needed resources such as evidence-based programming.[55] While the SUYN brief intervention was designed to address malnutrition and fall-related risk, its content could also apply to other evidence-based programs related to physical activity and chronic disease self-management education (CDSME). Currently, many CDSME programs that emphasize the importance of nutrition neither screen for nor address malnutrition and dehydration.[38]

Seven weeks after enrolling in SO, results suggest that participants in the SUYN + SO condition reported less fear of falling than participants who were in the SO Only condition. This reflects the gain in confidence that understanding the link between nutrition and risk for falls added to reducing fear of falls. In other words, by better understanding how to build and keep strong muscles through

protein and fluid intake, participants were able to make some meaningful changes to their diets and activities, which may have resulted in both lower fear of falling and less falls, with these two concepts being bidirectional.[56]

Conversely, those in SO Only reported a significant reduction in concerns about falls interfering with their activities, whereas no significant reduction was observed for SUYN + SO participants. Considering that SUYN + SO participants were significantly older and had more chronic conditions than SO Only participants, SUYN + SO participants remained at a greater risk for falls.[57–59] This increased risk can help explain how they perceive consequences of fall (e.g., a fall-related injury, limited mobility after a fall) and its interference with their activities.[60]

As a stand-alone brief intervention, SUYN shows promise to identify otherwise undetected malnutrition risk and complement other community-driven programming efforts. Nationally, senior nutrition programs implemented by the Older Americans Act, are required to provide nutrition education;[61] SUYN could be offered as a single class or its content can be broken down and delivered across several shorter sessions. It can be delivered in groups or in one-on-one settings with more vulnerable populations (e.g., in-home, residential facilities). Evidence-based program leaders, community health workers, healthcare professionals, and volunteers can be trained to deliver SUYN to their older adult clients. While this community-based dissemination demonstration only utilized the in-person SUYN training, the training has since been translated for online delivery to expand the training's access and reach nationwide. Despite the preferred training format, receiving SUYN training can enable those who work with older adults to use the information in versatile ways and contexts within their regular workflow. Such contexts can vary broadly from a group presentation in a faith-based organization to a one-on-one intervention to a homebound older adult (e.g., formally or informally deliver SUYN content by lay health workers such as Meals on Wheels volunteers or community health workers).[62,63]

Despite the benefits seen in this study, some limitations are worth noting. First, this pragmatic trial used a naturalistic dissemination of SUYN and SO in one state. As such, data were not uniformly collected across intervention conditions, which hindered the ability to perform consistent analyses for all participants. Further, there was no randomization into intervention conditions, which may have introduced bias regarding participant preferences for attending workshops and organization ability to offer both interventions. Second, while protein and fluid consumption were the focus of the educational elements of SUYN because of their relationships to falls among older adults, this brief intervention did not address all aspects of malnutrition such as vitamins and minerals needed at varying life stages (e.g., calcium for bone health). Future efforts may consider expanding SUYN to become a multi-session stand-alone workshop that more comprehensively addresses malnutrition among older adults. SUYN was directly assessed with a single evidence-based fall prevention program (i.e., SO) for this study; however, future efforts should link SUYN to a variety of evidence-based programs for falls, disease self-management, physical activity, and other topics. Further, the dissemination of this program was limited to one state because of the in-person delivery infrastructure; therefore, efforts are needed to expand the SUYN training infrastructure and develop complementary delivery modes to directly reach the older adults (e.g., online workshop for older adults). These efforts are forthcoming from the developers of *Stepping Up Your Nutrition*.

## 5. Conclusions

Overall, this study illustrated the advantages of offering SUYN to older adults either on its own as a brief intervention or in conjunction with SO. SUYN can play a crucial role in the health promotion of older adults by screening for malnutrition and referring at-risk individuals directly to resources and related evidence-based programs, for example, to reduce fall risks. While not all SUYN participants attended another evidence-based program, those that did had better workshop attendance, which translates to more intervention dose, and may improve the benefits they receive.

**Author Contributions:** Conceptualization, SL, LAE, JRS; methodology, MLS; formal analysis, MLS; writing—original draft preparation, CDB, MLS; writing—review and editing, MLS, CDB, SL, LAE, JRS; project administration, SL, LAE; funding acquisition, JRS. All authors have read and agreed to the published version of the manuscript.

**Funding:** Funding for this Maryland's Innovations in Nutrition Programs and Services Project was provided by the Administration for Community Living to the Maryland Department of Aging (Grant #90INNU0002). Funding for the initial curriculum development was provided by Abbott Nutrition. Findings from this study do not officially represent those of the funders.

**Acknowledgments:** *Stepping Up Your Nutrition* (SUYN) received the 2017 Innovative Program Award from the International Council on Active Aging (ICAA) and the 2018 Aging Innovations Award from the National Association of Area Agencies on Aging (n4a). More detailed information about SUYN can be found at www.SteppingUpYourNutrition.com. The authors would like to thank the efforts of Karla Beardsley, Pamela Toomey, and Felicia Skinner for their feedback and efforts throughout this project.

**Conflicts of Interest:** The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

## References

1. Kaiser, M. J.; Bauer, J. M.; Rämsch, C.; Uter, W.; Guigoz, Y.; Cederholm, T.; Thomas, D. R.; Anthony, P. S.; Charlton, K. E.; Maggio, M.; Tsai, A. C.; Vellas, B.; Sieber, C. C.; Mini Nutritional Assessment International Group. Frequency of Malnutrition in Older Adults: A Multinational Perspective Using the Mini Nutritional Assessment. J. Am. Geriatr. Soc. 2010, 58 (9), 1734–1738. https://doi.org/10.1111/j.1532-5415.2010.03016.x.
2. Avalere Health LLC; Academy of Nutrition and Dietitics; defeatmalnutrition.today. Dialogue Proceedings: Advancing Patient-Centered Malnutrition Care Transitions; Avalere Health LLC, 2008.
3. Nash, L.; Bergin, N. Nutritional Strategies to Reduce Falls Risk in Older People. *Nurs. Older People* **2018**, *30* (3), 20–24. https://doi.org/10.7748/nop.2018.e1016.
4. Sandoval-Insausti, H.; Pérez-Tasigchana, R. F.; López-García, E.; García-Esquinas, E.; Rodríguez-Artalejo, F.; Guallar-Castillón, P. Macronutrients Intake and Incident Frailty in Older Adults: A Prospective Cohort Study. *J. Gerontol. A. Biol. Sci. Med. Sci.* **2016**, *71* (10), 1329–1334. https://doi.org/10.1093/gerona/glw033.
5. Elia, M. Defining, Recognizing, and Reporting Malnutrition. *Int. J. Low. Extrem. Wounds* **2017**, *16* (4), 230–237. https://doi.org/10.1177/1534734617733902.
6. White, J. V.; Guenter, P.; Jensen, G.; Malone, A.; Schofield, M.; Academy Malnutrition Work Group; A.S.P.E.N. Malnutrition Task Force; A.S.P.E.N. Board of Directors. Consensus Statement: Academy of Nutrition and Dietetics and American Society for Parenteral and Enteral Nutrition: Characteristics Recommended for the Identification and Documentation of Adult Malnutrition (Undernutrition). *JPEN J. Parenter. Enteral Nutr.* **2012**, *36* (3), 275–283. https://doi.org/10.1177/0148607112440285.

7. McLean, R. R.; Mangano, K. M.; Hannan, M. T.; Kiel, D. P.; Sahni, S. Dietary Protein Intake Is Protective Against Loss of Grip Strength Among Older Adults in the Framingham Offspring Cohort. *J. Gerontol. A. Biol. Sci. Med. Sci.* **2016**, *71* (3), 356–361. https://doi.org/10.1093/gerona/glv184.
8. Bauer, J.; Biolo, G.; Cederholm, T.; Cesari, M.; Cruz-Jentoft, A. J.; Morley, J. E.; Phillips, S.; Sieber, C.; Stehle, P.; Teta, D.; Visvanathan, R.; Volpi, E.; Boirie, Y. Evidence-Based Recommendations for Optimal Dietary Protein Intake in Older People: A Position Paper From the PROT-AGE Study Group. *J. Am. Med. Dir. Assoc.* **2013**, *14* (8), 542–559. https://doi.org/10.1016/j.jamda.2013.05.021.
9. Starr, K. N. P.; McDonald, S. R.; Bales, C. W. Nutritional Vulnerability in Older Adults: A Continuum of Concerns. *Curr. Nutr. Rep.* **2015**, *4* (2), 176–184. https://doi.org/10.1007/s13668-015-0118-6.
10. Moreland, J. D.; Richardson, J. A.; Goldsmith, C. H.; Clase, C. M. Muscle Weakness and Falls in Older Adults: A Systematic Review and Meta-Analysis: MUSCLE WEAKNESS AND FALLS IN OLDER ADULTS. *J. Am. Geriatr. Soc.* **2004**, *52* (7), 1121–1129. https://doi.org/10.1111/j.1532-5415.2004.52310.x.
11. Tucker, K. Nutrition Concerns for Aging Populations. In *Providing Healthy and Safe Foods As We Age: Workshop Summary.*; National Academies Press: Washington, DC, 2010.
12. El-Sharkawy, A. M.; Watson, P.; Neal, K. R.; Ljungqvist, O.; Maughan, R. J.; Sahota, O.; Lobo, D. N. Hydration and Outcome in Older Patients Admitted to Hospital (The HOOP Prospective Cohort Study). *Age Ageing* **2015**, *44* (6), 943–947. https://doi.org/10.1093/ageing/afv119.
13. Fraser, A. M. Malnutrition in Older Adults in the United States. In *Handbook of Famine, Starvation, and Nutrient Deprivation*; Preedy, V., Patel, V. B., Eds.; Springer International Publishing: Cham, 2018; pp 1–20. https://doi.org/10.1007/978-3-319-40007-5_87-1.
14. Evans, C. Malnutrition in the Elderly: A Multifactorial Failure to Thrive. *Perm. J.* **2005**, *9* (3). https://doi.org/10.7812/TPP/05-056.
15. Leslie, W.; Hankey, C. Aging, Nutritional Status and Health. *Healthcare* **2015**, *3* (3), 648–658. https://doi.org/10.3390/healthcare3030648.
16. National Institute on Aging. Prevent Falls and Fractures https://www.nia.nih.gov/health/prevent-falls-and-fractures (accessed Feb 24, 2020).
17. Bergen, G. Falls and Fall Injuries among Adults Aged 65 Years—United States, 2014. *MMWR* **2016**, 993–998.
18. Houston, D. K.; Nicklas, B. J.; Ding, J.; Harris, T. B.; Tylavsky, F. A.; Newman, A. B.; Lee, J. S.; Sahyoun, N. R.; Visser, M.; Kritchevsky, S. B.; Health ABC Study. Dietary Protein Intake Is Associated with Lean Mass Change in Older, Community-Dwelling Adults: The Health, Aging, and Body Composition (Health ABC) Study. *Am. J. Clin. Nutr.* **2008**, *87* (1), 150–155. https://doi.org/10.1093/ajcn/87.1.150.
19. Deer, R. R.; Volpi, E. Protein Intake and Muscle Function in Older Adults: *Curr. Opin. Clin. Nutr. Metab. Care* **2015**, *18* (3), 248–253. https://doi.org/10.1097/MCO.0000000000000162.
20. Mayo Clinic. Dizziness https://www.mayoclinic.org/diseases-conditions/dizziness/symptoms-causes/syc-20371787.
21. Soriano, T. Falls in the Community-Dwelling Older Adult: A Review for Primary-Care Providers. *Clin. Interv. Aging* **2008**, *Volume 2*, 545–553. https://doi.org/10.2147/CIA.S1080.

22. Mangels, A. R. CE: Malnutrition in Older Adults. *AJN Am. J. Nurs.* **2018**, *118* (3), 34–41. https://doi.org/10.1097/01.NAJ.0000530915.26091.be.

23. Hooper, L.; Bunn, D.; Jimoh, F. O.; Fairweather-Tait, S. J. Water-Loss Dehydration and Aging. *Mech. Ageing Dev.* **2014**, *136–137*, 50–58. https://doi.org/10.1016/j.mad.2013.11.009.

24. Foldvari, M.; Clark, M.; Laviolette, L. C.; Bernstein, M. A.; Kaliton, D.; Castaneda, C.; Pu, C. T.; Hausdorff, J. M.; Fielding, R. A.; Singh, M. A. F. Association of Muscle Power With Functional Status in Community-Dwelling Elderly Women. *J. Gerontol. A. Biol. Sci. Med. Sci.* **2000**, *55* (4), M192–M199. https://doi.org/10.1093/gerona/55.4.M192.

25. Mayo Clinic. Senior health: How to prevent and detect malnutrition https://www.mayoclinic.org/healthy-lifestyle/caregivers/in-depth/senior-health/art-20044699 (accessed Feb 26, 2020).

26. Quandt, S. A.; Chen, H.; Bell, R. A.; Savoca, M. R.; Anderson, A. M.; Leng, X.; Kohrman, T.; Gilbert, G. H.; Arcury, T. A. Food Avoidance and Food Modification Practices of Older Rural Adults: Association With Oral Health Status and Implications for Service Provision. *The Gerontologist* **2010**, *50* (1), 100–111. https://doi.org/10.1093/geront/gnp096.

27. Pilgrim, A. L.; Robinson, S. M.; Sayer, A. A.; Roberts, H. C. An Overview of Appetite Decline in Older People. *Nurs. Older People* **2015**, *27* (5), 29–35. https://doi.org/10.7748/nop.27.5.29.e697.

28. Kenney, W. L.; Chiu, P. Influence of Age on Thirst and Fluid Intake: *Med. Sci. Sports Exerc.* **2001**, *33* (9), 1524–1532. https://doi.org/10.1097/00005768-200109000-00016.

29. Boyce, J. M. Effects of Ageing on Smell and Taste. *Postgrad. Med. J.* **2006**, *82* (966), 239–241. https://doi.org/10.1136/pgmj.2005.039453.

30. Malafarina, V.; Uriz-Otano, F.; Gil-Guerrero, L.; Iniesta, R. The Anorexia of Ageing: Physiopathology, Prevalence, Associated Comorbidity and Mortality. A Systematic Review. *Maturitas* **2013**, *74* (4), 293–302. https://doi.org/10.1016/j.maturitas.2013.01.016.

31. Easterling, C. S.; Robbins, E. Dementia and Dysphagia. *Geriatr. Nur. (Lond.)* **2008**, *29* (4), 275–285. https://doi.org/10.1016/j.gerinurse.2007.10.015.

32. Shaw, L.; Cook, G. Hydration Practices for High-Quality Dementia Care. *Nurs. Resid. Care* **2017**, *19* (11), 620–624. https://doi.org/10.12968/nrec.2017.19.11.620.

33. Aselage, M. B. Measuring Mealtime Difficulties: Eating, Feeding and Meal Behaviours in Older Adults with Dementia. *J. Clin. Nurs.* **2010**, *19* (5–6), 621–631. https://doi.org/10.1111/j.1365-2702.2009.03129.x.

34. Huang, D. L.; Rosenberg, D. E.; Simonovich, S. D.; Belza, B. Food Access Patterns and Barriers among Midlife and Older Adults with Mobility Disabilities. *J. Aging Res.* **2012**, *2012*, 1–8. https://doi.org/10.1155/2012/231489.

35. Shim, J. E.; Hwang, J.-Y.; Kim, K. Objective and Perceived Food Environment and Household Economic Resources Related to Food Insecurity in Older Adults Living Alone in Rural Areas. *BMC Geriatr.* **2019**, *19* (1), 234. https://doi.org/10.1186/s12877-019-1231-y.

36. Conklin, A. I.; Maguire, E. R.; Monsivais, P. Economic Determinants of Diet in Older Adults: Systematic Review. *J. Epidemiol. Community Health* **2013**, *67* (9), 721–727. https://doi.org/10.1136/jech-2013-202513.

37. National Council on Aging. Title IIID Highest Tier EBPs February2020 https://d2mkcg26uvg1cz.cloudfront.net/wp-content/uploads/Title-IIID-Highest-Tier-EBPs-February2020.pdf (accessed Mar 12, 2020).

38. National Council on Aging. Evidence-Based Falls Prevention Programs https://www.ncoa.org/healthy-aging/falls-prevention/falls-prevention-programs-for-older-adults-2/ (accessed Feb 24, 2020).

39. Young, K.; Bunn, F.; Trivedi, D.; Dickinson, A. Nutritional Education for Community Dwelling Older People: A Systematic Review of Randomised Controlled Trials. *Int. J. Nurs. Stud.* **2011**, *48* (6), 751–780. https://doi.org/10.1016/j.ijnurstu.2011.03.007.

40. Cate, D.; Ettema, R. G. A.; Huisman-de Waal, G.; Bell, J. J.; Verbrugge, R.; Schoonhoven, L.; Schuurmans, M. J.; On behalf of the Basic Care Revisited Group (BCR); Zwakhalen, S.; Vermeulen, H.; Man-van Ginkel, J.; Heinen, M.; Metzelthin, S.; Verstraten, C.; Belle, E.; Noort, H.; Berg, G.; Manen, A. Interventions to Prevent and Treat Malnutrition in Older Adults to Be Carried out by Nurses: A Systematic Review. *J. Clin. Nurs.* **2020**, jocn.15153. https://doi.org/10.1111/jocn.15153.

41. Jiang, L.; Smith, M. L.; Chen, S.; Ahn, S.; Kulinski, K. P.; Lorig, K.; Ory, M. G. The Role of Session Zero in Successful Completion of Chronic Disease Self-Management Program Workshops. *Front. Public Health* **2015**, *2*. https://doi.org/10.3389/fpubh.2014.00205.

42. Stevens, J. A.; Burns, E. *A CDC Compendium of Effective Fall Interventions: What Works for Community-Dwelling Older Adults*; Centers for Disease Control and Prevention: Atlanta, GA, 2015.

43. Ory, M. G.; Smith, M. L.; Jiang, L.; Lee, R.; Chen, S.; Wilson, A. D.; Stevens, J. A.; Parker, E. M. Fall Prevention in Community Settings: Results from Implementing Stepping On in Three States. *Front. Public Health* **2015**, *2*. https://doi.org/10.3389/fpubh.2014.00232.

44. Clemson, L.; Cumming, R. G.; Kendig, H.; Swann, M.; Heard, R.; Taylor, K. The Effectiveness of a Community-Based Program for Reducing the Incidence of Falls in the Elderly: A Randomized Trial. *J. Am. Geriatr. Soc.* **2004**, *52* (9), 1487–1494. https://doi.org/10.1111/j.1532-5415.2004.52411.x.

45. Wisconsin Institute for Healthy Aging. Stepping On An Implementation Guide: How to prepare for, implement, and evaluate Stepping On in community settings https://wihealthyaging.org/_data/files/SO_materials/Stepping-On-Manual_10-17-2013.pdf (accessed Feb 26, 2020).

46. Mahoney, J. E. "Stepping On": Stepping Over the Chasm from Research to Practice. *Front. Public Health* **2015**, *2*. https://doi.org/10.3389/fpubh.2014.00148.

47. Smith, M.; Towne, S.; Herrera-Venson, A.; Cameron, K.; Horel, S.; Ory, M.; Gilchrist, C.; Schneider, E.; DiCocco, C.; Skowronski, S. Delivery of Fall Prevention Interventions for At-Risk Older Adults in Rural Areas: Findings from a National Dissemination. *Int. J. Environ. Res. Public. Health* **2018**, *15* (12), 2798. https://doi.org/10.3390/ijerph15122798.

48. Smith, M.; Towne, S.; Herrera-Venson, A.; Cameron, K.; Kulinski, K.; Lorig, K.; Horel, S.; Ory, M. Dissemination of Chronic Disease Self-Management Education (CDSME) Programs in the United States: Intervention Delivery by Rurality. *Int. J. Environ. Res. Public. Health* **2017**, *14* (6), 638. https://doi.org/10.3390/ijerph14060638.

49. Phillips, M. B.; Foley, A. L.; Barnard, R.; Isenring, E. A.; Miller, M. D. Nutritional Screening in Community-Dwelling Older Adults: A Systematic Literature Review. *Asia Pac. J. Clin. Nutr.* **2010**, *19* (3), 440–449.

50. Skipper, A.; Ferguson, M.; Thompson, K.; Castellanos, V. H.; Porcari, J. Nutrition Screening Tools: An Analysis of the Evidence. *J. Parenter. Enter. Nutr.* **2012**, *36* (3), 292–298. https://doi.org/10.1177/0148607111414023.

51. Keller, H. H.; Goy, R.; Kane, S.-L. Validity and Reliability of SCREEN II (Seniors in the Community: Risk Evaluation for Eating and Nutrition, Version II). *Eur. J. Clin. Nutr.* **2005**, *59* (10), 1149–1157. https://doi.org/10.1038/sj.ejcn.1602225.

52. Reimer, H. D.; Keller, H. H.; Maitland, S. B.; Jackson, J. Nutrition Screening Index for Older Adults (SCREEN II©) Demonstrates Sex and Age Invariance. *J. Nutr. Elder.* **2010**, *29* (2), 192–210. https://doi.org/10.1080/01639361003772426.

53. Dwyer, J. T.; Gahche, J. J.; Weiler, M.; Arensberg, M. B. Screening Community-Living Older Adults for Protein Energy Malnutrition and Frailty: Update and Next Steps. *J. Community Health* **2019**. https://doi.org/10.1007/s10900-019-00739-1.

54. Academy of Nutrition and Dietetics; Avalere Health LLC. Malnutrition Quality Improvement Initiative http://malnutritionquality.org/ (accessed Mar 8, 2020).

55. Volkert, D. Malnutrition in Older Adults - Urgent Need for Action: A Plea for Improving the Nutritional Situation of Older Adults. *Gerontology* **2013**, *59* (4), 328–333. https://doi.org/10.1159/000346142.

56. Friedman, S. M.; Munoz, B.; West, S. K.; Rubin, G. S.; Fried, L. P. Falls and Fear of Falling: Which Comes First? A Longitudinal Prediction Model Suggests Strategies for Primary and Secondary Prevention. *J. Am. Geriatr. Soc.* **2002**, *50* (8), 1329–1335. https://doi.org/10.1046/j.1532-5415.2002.50352.x.

57. Grundstrom, A. C.; Guse, C. E.; Layde, P. M. Risk Factors for Falls and Fall-Related Injuries in Adults 85 Years of Age and Older. *Arch. Gerontol. Geriatr.* **2012**, *54* (3), 421–428. https://doi.org/10.1016/j.archger.2011.06.008.

58. Gale, C. R.; Cooper, C.; Aihie Sayer, A. Prevalence and Risk Factors for Falls in Older Men and Women: The English Longitudinal Study of Ageing. *Age Ageing* **2016**, *45* (6), 789–794. https://doi.org/10.1093/ageing/afw129.

59. Paliwal, Y.; Slattum, P. W.; Ratliff, S. M. Chronic Health Conditions as a Risk Factor for Falls among the Community-Dwelling US Older Adults: A Zero-Inflated Regression Modeling Approach. *BioMed Res. Int.* **2017**, *2017*, 1–9. https://doi.org/10.1155/2017/5146378.

60. Bergeron, C. D.; Friedman, D. B.; Messias, D. K. H.; Spencer, S. M.; Miller, S. C. Older Women's Responses and Decisions after a Fall: The Work of Getting "Back to Normal." *Health Care Women Int.* **2016**, *37* (12), 1342–1356. https://doi.org/10.1080/07399332.2016.1173039.

61. Kowlessar, N.; Robinson, K.; Schur, C. *Older Americans Benefit from Older Americans Act Nutrition Programs*; Research Brief No 8; Administration on Aging, Administration for Community Living, 2015.

62. Houston, D. K.; Tooze, J. A.; Demons, J. L.; Davis, B. L.; Shertzer-Skinner, R.; Kearsley, L. B.; Kritchevsky, S. B.; Williamson, J. D. Delivery of a Vitamin D Intervention in Homebound Older Adults Using a Meals-on-Wheels Program: A Pilot Study. *J. Am. Geriatr. Soc.* **2015**, *63* (9), 1861–1867. https://doi.org/10.1111/jgs.13610.

599 63. Lancaster, K. J.; Carter-Edwards, L.; Grilo, S.; Shen, C.; Schoenthaler, A. M. Obesity Interventions in African
600 American Faith-Based Organizations: A Systematic Review: Faith-Based Obesity Programmes in Blacks.
601 *Obes. Rev.* **2014**, *15*, 159–176. https://doi.org/10.1111/obr.12207.



602