Diet Quality of Clients of a Soup Kitchen

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Abstract This study discerned the impact of a meal donation on the total diet quality of clients of a soup kitchen. A total of 110 adults were selected randomly from a soup kitchen in Central Texas. Participants completed a demographic questionnaire, food frequency questionnaire and a list of meal donations. Diet quality and food servings of the original diet, meal donation and total dietary intake were estimated via both the HEI-2010 and 2015 U.S. Dietary Guidelines. The soup kitchen provided a daily meal, which included fruit, cheese, egg, and bagel, but did not contain any vegetables or meat. Mean diet quality for their original diet was modest (HEI-2010 = 55.25). The extra meal donated by the soup kitchen increased the diet quality of the total diet by 10%, and added fat-soluble vitamins and essential minerals. Health professionals should support these soup kitchens, by volunteering and providing advice to the directors about the importance of offering a variety of healthy foods.

Keywords Clients; Low-income; Meal donations; Nutritional status

1. Introduction

In the United States (U.S.), approximately 47 million individuals are classified as low-income (DeNavas-Walt and Proctor, 2015). Of this population, 7.4% lives below 100% of the poverty rate (<$12,000 per capita), and 0.2% are homeless (Federal Register - the U.S. Department of Health and Human Services, 2018). Consequently, the lack of financial resources may limit the availability and consumption of healthy foods, leading to diminished diet quality (Nackers and Appelhans, 2013).

A number of government food assistance programs have been created to provide food benefits to those in need, including Special Supplemental Nutrition Program for Women, Infants and Children (WIC), Head Start (for low-income children) and Meals on Wheels (for elderly) (U.S. Department of Health and Human Services, 2015). But private non-government programs also have been developed to provide free food, such as community and religious organizations, food pantries and soup kitchens (Office of the Chief Economist USDA, 2014; Campbell et al., 1987). A soup kitchen is a facility that is present in neighborhoods to distribute free meals to those in need. To date, the exact number of soup kitchens in the U.S. is unclear (Office of the Chief Economist USDA, 2014). Yet several nutritional assessment studies have been conducted in soup kitchen populations because of their vital role in supporting the low income.

Smith et al. (2010) examined nutritional status of 254 women who resided in shelters and “food deserts” in Minnesota. The meals contained daily serving of fruits (<2), dairy foods (<2) and meat (<2.5) that were lower than that of the U.S. Dietary Guidelines (P < 0.05) (Smith et al., 2010). In
Nevada, diets of 191 users of emergency programs including food pantries and soup kitchens were evaluated by 24-hour dietary recall (Institute of Medicine (US) Panel on Micronutrients, 2001; Institute of Medicine, 1998; Lenhart and Read, 1989). Mean daily energy intakes of the clients were below Dietary Recommended Intakes (DRI), as they averaged < 1200 kcal. Also levels lower than the DRIs were documented for thiamin (72%), riboflavin (67%), niacin (59%), vitamins A (70%) and C (73%), iron (Fe) (59%), and calcium (Ca) (76%) (Institute of Medicine (US) Panel on Micronutrients, 2001; Institute of Medicine, 1998; Lenhart and Read, 1989). In Canada, Tse and Tarasuk assessed the nutritional content of the meals offered at 18 soup kitchens (Tse and Tarasuk, 2008). These meals provided mean servings of 2.6 of grains, 4.1 of fruits and vegetables, 0.4 of dairy foods, and 1.7 of meat (Tse and Tarasuk, 2008). All of these quantities were less than the recommended Dietary Guidelines for Americans (6, 5, 2 and 2.5 portions, respectively) (U.S. Department of Health and Human Services, 2015). Nonetheless, these donations are believed to improve the diet of the clients of these charitable agencies. Although the previous studies evaluated the nutritional status of the clients or the dietary breakdown of the meals offered, none yet have compared the diets of clients with and without the donated meals. The objective of the present research is to focus on the impact of a meal of soup kitchens on the diet quality of a low-income population before and after the donation (food received). It is hypothesized that the soup kitchen meal will improve the diet quality of the clients.

2. Materials and Methods

2.1. Design

A soup kitchen in Central Texas which served about 1800 individuals each month was the venue for this research. A total of 110 clients (≥ 18 years) of the soup kitchen agreed to participate in this cross-sectional study. Data was collected at the soup kitchen by visiting this facility three times in September 2015. The same meal was offered every day at the soup kitchen. Study participants were interview-administering a demographic questionnaire, food frequency questionnaire (FFQ), and a list to document the meal donation (Klohe-Lehman et al., 2007; George et al., 2004). Instruments were provided in English and Spanish and completed by paper and pencil. The validated FFQ measured the monthly energy and dietary intake of the total diet of clients. A meal donation list documented the frequency of receiving the meals, and their type and amount; these quantities were validated by the researcher who took photographs via a smart phone.

2.2. Study Participants

A total of 110 clients of the soup kitchen who received free meals were enrolled. The number was based on power analysis, in which a one-tailed t-test with a medium effect size of 0.3 requires a sample size of 110 subjects to yield 95% power. The protocol of the study was explained to the participants, and consent was obtained. Study participants were compensated by $10 upon successful completion of the questionnaires. All adult clients aged 18 years and above were included, with the exclusion of children, pregnant and lactating women. This study was approved by the Institutional Review Board at the University of Texas at Austin.

2.3. Tools of Assessment

Demographic questionnaire is a validated 25-item tool that was developed by the author and collected information about: age, sex, ethnicity, weight and height, educational level, marital status, occupation, housing and socioeconomic status of the clients (Klohe-Lehman et al., 2007).

Food frequency questionnaire (FFQ) is a 195-item scale developed and validated by the author in a tri-ethnic low-income population recruited from Central Texas in 2004 (Cronbach’s α = 0.69) (George
et al., 2004). This FFQ measured the frequency and amount of dietary intake over a period of one month; thus, this food intake included the meal consumed at the soup kitchen. Then the total daily intake was calculated by dividing the monthly food intake by 30. The portion size was estimated as small, medium, large or extra-large. A 9-point likert scale of frequency of food consumption ranged between never or <1 per month to 2+ times per day. The researcher and trained nutrition undergraduate students administered the FFQ and used photographs of portion sizes of foods/meals, measuring cups and spoons to assist in estimation of portion size.

The meal donation list (list of foods received) collected descriptive, qualitative and quantitative information about the frequency of receiving the meal, its type (fresh, cooked and/or packaged), amount (quantity or portion size in grams, ounces, liters), and quality (taste and presentation: unsatisfactory, satisfactory, and outstanding). The researcher weighed each food item offered and estimated its price based on grocery market cost. The clients received the same meal during the month of data collection, which was consumed at same facility of the soup kitchen. Each client provided information about the meal eaten on the day of recruitment; thus, one meal was analyzed per client. Content validity of this list was evaluated by comparing the data collected from the participants with the photographs of the free meal that were captured via a smart phone at two sessions. These photographs were taken prior to and after eating the meal, to estimate the plate waste (mean = 12.93 g) and actual amount consumed.

Dietary intake of the total diet (collected via the FFQ, which included the consumed soup kitchen meal), soup kitchen meal (obtained from list of meal donation) and original diet (total diet - the consumed soup kitchen meal) was estimated for all participants via Food Works 8 Professional software (Epi Info., 2015). This software is based on the United States Department of Agriculture (USDA) database (Nutrition.gov - National Agricultural Library USDA, 2014). The nutrient values of foods were compared with the corresponding DRIs for energy, macro- and micro-nutrients (Institute of Medicine (IOM) of the National Academies of Science, 2001; Institute of Medicine (US) Panel on Micronutrients, 2001; Institute of Medicine, 1998). In the case of missing nutrient data for any food during dietary analysis, the nutrient intake was extrapolated from values of closely related foods; this method was used for <1% of food items.

Choose MyPlate was developed by the USDA and used to estimate portion size equivalents for each food group based on daily recommended intakes of foods that were derived from the 2015-2020 Dietary Guidelines for Americans (U.S. Department of Health and Human Services, 2015). Food groups utilized included fruits, vegetables, beans, grains (refined and whole), dairy and protein foods (plant proteins, poultry, meat, and seafood), solid fats and added sugars (U.S. Department of Health and Human Services, 2015; Neter et al., 2014). Choose MyPlate was the source used to calculate the number of servings consumed each day for the original and total diets for each client.

The Healthy Eating Index-2010 (HEI-2010) was calculated to measure the quality of the original diet (total diet - meal donation), meal donation, and total dietary intake (obtained from the FFQ) (Guenther et al., 2013). The HEI-2010 describes adherence of food groups consumed with the Dietary Guidelines for Americans, in terms of adequacy and moderation. The scale ranges from 0-100 points, in which higher scores reflect greater compliance with the guidelines. This index consists of 12 items; nine groups measure adequacy (total fruit, whole fruit, total vegetables, greens and beans, whole grains, dairy and total protein foods, seafood and plant proteins, and fatty acids), and the other three evaluate moderation (refined grains, sodium, and empty calories) (Cronbach’s alpha = 0.68) (Guenther et al., 2014).
2.4. Analysis of Statistics

Statistical analyses were conducted using the Graduate Pack SPSS 19.0 for Windows 2010 (Epi Info., 2010). Descriptive statistics were performed and presented as mean ± standard error of the mean (SEM) and frequency distributions. Analysis of variance and paired sample t-tests were used to estimate mean differences for diet quality and food servings when comparing the original diet with the overall diet. Bonferroni post-hoc-test was used to control for covariates. All two-tailed $P < 0.05$ were considered significant.

3. Results

General characteristics of the population sample are presented in Table 1. The soup kitchen clients were adults with an average age of 46 years, and a mean body mass index of 26 kg/m$^2$. Less than half of the participants were overweight or obese (46%). The mean annual income of the clients was $3,878 (Table 1). Only 16% were employed, 66% did not have any income and 93% lived below the poverty level ($11,880 per household) (data not shown). None of the participants reported receiving any housing resources. Moreover, Figure 1 shows that only 9% of the clients received a monthly supplemental social income (SSI), averaging $433.90/month. These SSI benefits were only 6.4% of the mean total annual income, $3,878. None reported having any children or others living in their households; only 23% were married.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean ± SEM</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yrs</td>
<td>45.45 ± 1.14</td>
<td>21 - 78</td>
</tr>
<tr>
<td>Body mass index, kg/m$^2$</td>
<td>25.98 ± 0.55</td>
<td>16.61 - 51.88</td>
</tr>
<tr>
<td>Yearly income, $</td>
<td>3,878 ± 800</td>
<td>0 - 30,000</td>
</tr>
<tr>
<td>Annual Supplemental Security Income per household' $^a$</td>
<td>433.92 ± 181.2</td>
<td>0 - 10,800</td>
</tr>
<tr>
<td>Education, yrs</td>
<td>13.54 ± 0.33</td>
<td>6 - 22</td>
</tr>
<tr>
<td>Household Size</td>
<td>1.00 ± 0.00</td>
<td>1 - 1</td>
</tr>
</tbody>
</table>

$^a$The supplemental security income is provided by the social security administration.

![Figure 1: Clients of soup kitchen receiving Supplemental Security Income (SSI) (n = 110)](image-url)
More than two thirds of the recipients were men (70%); and total participants were Non-Hispanic Whites (51%), Hispanics (15%) and Blacks (28%) (Table 1). In our sample, 95% reported that they were homeless: living in cars, trailers, shelters (53%) or on the streets (43%). Only 50% had finished high school and 45% drank alcohol daily, primarily beer (78%). Moreover, the majority of them were smokers (73%), and physically active (82%), but suffered from a health problem (78%) such as heart disease, type-2 diabetes, arthritis and depression (data not shown).

Clients of the soup kitchen received a modest daily meal, weighing ≈ 400 g per client as seen in Table 2. The monetary value of the free meal was estimated to be slightly over $4. The meal was required to be consumed at the same location. It included a piece of fruit, bakery products, egg, cheese, and coffee. Of these, the bagel provided the highest quantities of energy, carbohydrates and protein; cheddar cheese contained the greatest amount of fat. More than one third of food recipients reported that the meal did not satisfy their hunger; however, most of them considered the meal to be very good (88%) (data not shown).

Table 2: Sample of a meal from a soup kitchen

<table>
<thead>
<tr>
<th>Food</th>
<th>Amount</th>
<th>Energy (Kcal)</th>
<th>Carbohydrate (g)</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple/Orange</td>
<td>1</td>
<td>80</td>
<td>19</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Flour tortilla</td>
<td>1</td>
<td>58</td>
<td>12</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>White/Whole wheat bagel</td>
<td>1</td>
<td>260</td>
<td>52</td>
<td>11</td>
<td>1.5</td>
</tr>
<tr>
<td>Egg (hard-cooked)</td>
<td>1 large</td>
<td>77.5</td>
<td>0.6</td>
<td>6.3</td>
<td>5.3</td>
</tr>
<tr>
<td>Cream cheese</td>
<td>28.3 g</td>
<td>49.6</td>
<td>0.6</td>
<td>0.87</td>
<td>4.9</td>
</tr>
<tr>
<td>Cheddar cheese</td>
<td>28.3 g</td>
<td>111.4</td>
<td>1</td>
<td>7.1</td>
<td>9.1</td>
</tr>
<tr>
<td>Coffee</td>
<td>1 cup</td>
<td>2.4</td>
<td>0</td>
<td>0.3</td>
<td>0</td>
</tr>
<tr>
<td>Total (g)</td>
<td>360</td>
<td>638.9</td>
<td>85.2</td>
<td>27.6</td>
<td>21.8</td>
</tr>
<tr>
<td>Estimated cost ($)</td>
<td>4.3</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Table 3 describes the mean servings of food groups in the original diet, meal donation and total diet, and the HEI-2010 scores of original and total diets of clients of a soup kitchen. Total food consumption (total diet) of participants almost met the 2015 U.S. Dietary Guidelines (U.S. Department of Health and Human Services, 2015) for grains, refined grains, fruits, and protein foods. However, the total diet was lacking in whole grains, vegetables and dairy foods. The soup kitchen meal provided the total diet with more than half of the portions of refined and whole grains, fruits, dairy products and meat (i.e., eggs) and 13% of empty calories [added sugars, saturated fatty acids and alcohol (grams/1000 kcal)] (P <0.05).

Regarding the total diet, participants scored above the cut-off point of the HEI-2010 for total proteins (score = 5), and refined grains (score = 10), and high for empty calories (score = 20) in which higher scores reflect better diet quality. This is believed to be due to low to moderate intakes of protein foods, refined grains and foods that are high in fat and/or sugar. In contrast, the clients had low scores for whole grains, dairy foods, fatty acids and sodium (Na) (score = 10); total and whole fruits, total vegetables, greens and beans, and seafood and plant proteins (score = 5). This poor diet quality of the total diet (with the exception of lack of empty calories) might be due to the inadequate consumption of energy (1919 kcal/day). Total diet quality was modest, with the mean HEI-2010 score of the original diet being 55. This HEI-2010 score improved to 61 with the meal donation. Thus, the meal improved the diet quality of the original diet by ~ 10% (P <0.05) (Table 3).

The meal provided 616 kcal which consisted of 51% of carbohydrates, followed by fat (33.9%) and protein (17%). Moreover, carbohydrates, fat, protein and dietary fiber of the meal provided 25%, 32%, 44% and 41% of their DRIs, respectively (Institute of Medicine (IOM) of the National Academies of Science, 2001). The contribution of carbohydrates, protein, fat and dietary fiber from the additional
meal to the total diet was 38% for carbohydrates, 44% for protein, 45% for fat and 64% for dietary fiber (P <0.05) (data not shown).

**Table 3:** Mean servings of food groups in original diet, meal donation and total diet, and Healthy Eating Index-2010 (HEI-2010) scores of diets of clients of a soup kitchen (n = 110) *4

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Original diet</th>
<th>Meal donation</th>
<th>Total diet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Serving/d</td>
<td>HEI-score</td>
<td>Serving/d</td>
</tr>
<tr>
<td>Adequacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total fruits a</td>
<td>0.78 ± 0.17</td>
<td>2.44 ± 0.05</td>
<td>1.66 ± 0.02</td>
</tr>
<tr>
<td>Whole</td>
<td>0.52 ± 0.13</td>
<td>3.25 ± 0.13</td>
<td>1.11 ± 0.01</td>
</tr>
<tr>
<td>Total vegetables a</td>
<td>1.83 ± 0.15</td>
<td>3.32 ± 0.14</td>
<td>0.00 ± 0.00</td>
</tr>
<tr>
<td>Greens and beans a</td>
<td>0.59 ± 0.07</td>
<td>4.54 ± 0.11</td>
<td>0.00 ± 0.00</td>
</tr>
<tr>
<td>Whole grains</td>
<td>0.07 ± 0.02</td>
<td>0.23 ± 0.09</td>
<td>0.50 ± 0.00</td>
</tr>
<tr>
<td>Dairy a</td>
<td>0.73 ± 0.08</td>
<td>0.36 ± 0.19</td>
<td>0.48 ± 0.02</td>
</tr>
<tr>
<td>Total protein foods</td>
<td>5.57 ± 0.31</td>
<td>5.57 ± 0.14</td>
<td>1.09 ± 0.03</td>
</tr>
<tr>
<td>Sea food and plant Proteins</td>
<td>0.79 ± 0.05</td>
<td>2.47 ± 0.17</td>
<td>0.00 ± 0.00</td>
</tr>
<tr>
<td>Fatty acids (g) b</td>
<td>_</td>
<td>1.03 ± 0.16</td>
<td>_</td>
</tr>
</tbody>
</table>

**Moderation**

<table>
<thead>
<tr>
<th></th>
<th>Original diet</th>
<th>Meal donation</th>
<th>Total diet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Serving/d</td>
<td>HEI-score</td>
<td>Serving/d</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refined grains</td>
<td>2.71 ± 0.26</td>
<td>7.53 ± 0.29</td>
<td>2.79 ± 0.02</td>
</tr>
<tr>
<td>Sodium</td>
<td>_</td>
<td>5.69 ± 0.29</td>
<td>_</td>
</tr>
<tr>
<td>Empty calories (g) c</td>
<td>3.19 ± 0.21</td>
<td>18.82 ± 0.46</td>
<td>13.43 ± 0.10</td>
</tr>
<tr>
<td>Total</td>
<td>55.25 ± 0.69</td>
<td>_</td>
<td>60.58 ± 0.68</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total grains</td>
<td>2.79 ± 0.27</td>
<td>3.29 ± 0.02</td>
<td>6.08 ± 0.29</td>
</tr>
<tr>
<td>Meat</td>
<td>2.17 ± 0.14</td>
<td>_</td>
<td>3.26 ± 0.17</td>
</tr>
<tr>
<td>Poultry</td>
<td>1.78 ± 0.13</td>
<td>_</td>
<td>1.78 ± 0.13</td>
</tr>
<tr>
<td>Sea Food</td>
<td>0.43 ± 0.05</td>
<td>_</td>
<td>0.43 ± 0.05</td>
</tr>
<tr>
<td>Discretionary foods</td>
<td>1.89 ± 0.10</td>
<td>_</td>
<td>1.89 ± 0.10</td>
</tr>
<tr>
<td>Fat in foods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>7.87 ± 0.43</td>
<td>_</td>
<td>7.87 ± 0.43</td>
</tr>
<tr>
<td>Low</td>
<td>0.20 ± 0.04</td>
<td>_</td>
<td>0.20 ± 0.04</td>
</tr>
</tbody>
</table>

Maximum HEI component-score for: total and whole fruits, total vegetables, greens and beans, total protein foods, seafood and plant proteins is 5; whole and refined grains, dairy and sodium is 10; and empty calories is 20.

*Total diet is calculated from the food frequency questionnaire. Original diet is estimated by subtracting the total diet from the meal donation.

†Cup.

‡Fatty acids = (Poly-unsaturated fatty acids + Mono-unsaturated fatty acids)/Saturated fatty acids

§Empty calories = [added sugars (grams) + saturated fatty acids (grams) + alcohol (grams)] per 1000 kcal

¶Range of total HEI-2010 score is 0 - 100; a higher score reflects greater diet quality.

‖Burnt; chicken nuggets; full fat mayonnaise.

*Different superscripts indicate significant differences for servings between overall and total diets at P ≤ 0.05.

 †Different superscripts indicate significant differences for HEI-scores between overall and total diets at P ≤ 0.05.

‡The meat group of the meal is the cooked egg.

Figure 2 shows the percentage of contribution of micronutrients of the meal to the total diet and DRI of soup kitchen clients. The soup kitchen meal increased the total dietary intake by more than 40% for vitamins A and D, and riboflavin, as well as trace minerals, copper (Cu), phosphorus (P) and magnesium (Mg). The vitamin C contribution from the meal was the lowest of all nutrients added, only 14.4%. 

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Compared with the DRIs, the meal provided < 30% of the reference intakes of the vitamins, with the exception of riboflavin (Institute of Medicine (US) Panel on Micronutrients, 2001; Institute of Medicine, 1998).

Minerals that were not provided at this 30% level were calcium (Ca), Mg, potassium (K), zinc (Zn), manganese (Mn) and selenium (Se) intakes (Institute of Medicine (US) Panel on Micronutrients, 2001). The only nutrients of the meal that contributed > 50% to the respective DRIs were P and Cu (Institute of Medicine (US) Panel on Micronutrients, 2001; Institute of Medicine (IOM) of the National Academies of Science, 2001) (Figure 2).

4. Discussion

This study observed that clients of the soup kitchen were almost all homeless and quite poverty-stricken. Only 9% of the sample reported receiving a social supplemental income. Most of the participants did not receive a SSI presumably because of age (<65 years), residence in shelters, and/or not having a taxable income due to lack of employment. It should be noted that the majority of clients reported lack of knowledge about the presence of public food assistance programs such as the Supplemental Nutrition Assistance Program (SNAP). Others indicated encountering challenges such as being convicted of a crime, and/or not being a citizen (the eligibility criteria to enroll in government assistance programs) (Food and Nutrition Services, 2016).

The meal offered by the soup kitchen was not, nor did it include, soup. Rather the meal provided a variety of other food groups, with exception of a lack of vegetables. Nonetheless, the meal enhanced the total nutrient intake of their original diet and was considered to be very good. Similar findings have been reported by others, in which the free meal consisted of bakery products, fresh fruits, eggs,
cheese, coffee and/or tea (Lyles et al., 2013; Keller-Olaman et al., 2005). Two studies also reported inclusion of vegetables in the soup kitchen meal (Tse and Tarasuk, 2008; Sisson and Lown, 2011). Moreover, clients of food emergency programs including shelters, food pantries and soup kitchens stated food preferences were not considered (Campbell et al., 2011). Clients reported desiring more fruits, vegetables, and diabetic and cultural foods (Azurdia et al., 2011; Verpy et al., 2003). Nonetheless, the various types of foods offered at soup kitchens modestly improved the diet quality of its clients (P <0.05).

Although the meal of the soup kitchen was not substantial in size, it added more than half of the portions of refined and whole grains, fruits, dairy foods and meat (i.e. egg) to the total diet of the participants. The total food intake of the soup kitchen clients met the 2015 U.S. Dietary Guidelines for grains, refined grains, fruits and protein foods; however, the total diet was still lacking in whole grains, vegetables and dairy foods (U.S. Department of Health and Human Services, 2015). The low levels of these foods in their original diet could be due to the high prices of vegetables and dairy food. Low-income populations may lack the financial resources to purchase these types of foods, as previously reported by Morrissey et al. (Morrissey et al., 2014).

In Minnesota, Smith et al. (2010) observed that 254 homeless women consumed quantities that were less than the recommended for grains (5.4 vs. 6 servings), fruits (0.7 vs. 2 servings), vegetables (2.1 vs. 2.5 servings), milk (1.2 vs. 2 servings) and meat (2 vs. 2.5 servings), respectively. All of these portions are less than the quantities found in our sample, with the exception of vegetables and dairy foods. Similarly, Martins et al. indicated that 197 homeless using shelters in Rhode Island did not meet the dietary guidelines for fruits, dairy and meat/beans (≤ 2.2 servings/day); these values are less than the amounts consumed by our sample (Martins et al., 2015).

The overall diet quality of our participants was modest (mean HEI-2010 = 61), despite the consumption of the donated meal. The moderate score was due primarily to low amounts of whole grains, vegetables, seafood and plant proteins, as well as elevated intakes of fatty acids, empty calories and Na (U.S. Department of Health and Human Services, 2015).

Nguyen et al. (2015) recently explored diet quality in a population of 8,333 low-income men and women (mean age 45.5 years) that included SNAP recipients (27.3%). The diet quality of their diets was even lower than that found in the present study (HEI 2010 score = 45.4 vs. 55, respectively) (Nguyen et al., 2015). Yet other studies conducted in the low-income in Texas by the author and in Canada reported findings that are similar to our outcomes (Shah et al., 2010; Huet et al., 2012). For instance, Shah et al. (2010) found that diet quality was modest (mean HEI-2005 = 51.4) in 125, multi-ethnic, low-income post-partum women receiving WIC and SNAP benefits (Shah, 2010). Huet et al. (2012) also observed that diet quality of 1901 low-income Inuit families was similar (HEI 2010 = 54) to that of our sample (x HEI-2010 = 55). Thus, the nutritional quality of diets of the individuals who receive food donations was modest.

The meal donation of the soup kitchen added to the total diet more than 50% of the DRIs of P and Cu, yet <30% of vitamins C and B₁₂, folate and Mn (Institute of Medicine (US) Panel on Micronutrients, 2001; Institute of Medicine, 1998). In 2013, Lyles et al. (2013) examined 22 meals of soup kitchens in San Francisco. Quantities of dietary fiber, Ca, K and vitamins A and E were lower than the DRIs by 77% - 93% (Institute of Medicine (US) Panel on Micronutrients, 2001; Institute of Medicine, 1998; Lyles, 2013). These levels are similar to our results, except that our meal provided larger amounts of dietary fiber (7.1 vs. 13.3 g, respectively), presumably due to the incorporation of a whole-wheat bagel and large piece of fruit.

A nutritional analysis of three soup kitchens in Michigan (Sisson and Lown, 2011) also determined that the offered meal provided lower amounts than the recommended intakes of energy,
carbohydrates, protein, fat, vitamins A and C, B-vitamins, Mg, iron (Fe), P, Zn, Ca, and Na (Institute of Medicine (US) Panel on Micronutrients, 2001; Institute of Medicine, 1998; Institute of Medicine (IOM) of the National Academies of Science, 2001; Sisson and Lown, 2011). But a single meal would not be expected to provide all the nutrients needed for one day.

In North Carolina, Eppich and Fernandez (2004) documented that the meal served by a church supplemented the clients with about 1,149 - 1,244 kcal, 139 - 157 g carbohydrate, 36 - 54 g protein, 41 - 50 g fat, 98 - 142 µg folate, 46 - 54 mg, vitamin C, 569 - 1,244 µg vitamin A, 1 µg vitamin D, 300 - 411 mg Ca, 7 - 8 mg Fe, 2, and 2,113 - 3,939 mg Na. Nonetheless, these quantities were less than the reference intakes, except for Fe and vitamin A (Institute of Medicine (US) Panel on Micronutrients, 2001; Institute of Medicine, 1998; Institute of Medicine (IOM) of the National Academies of Science, 2001; Sisson and Lown, 2011). In comparison to our results, quantities of energy (1,149 - 1,244 kcal/day; 999 kcal/day), macro- and micronutrients of the meals reported by Sisson et al. (2011) and Eppich and Fernandez (2004) were greater than what we found (616 kcal/day). Therefore, it is believed that clients of soup kitchens need to receive meals of better diet quality, such as the inclusion of vegetables and meat/poultry in the donation.

In a study conducted in Manhattan of 69 men and women who attended the Flint Hills Breadbasket, total food intake was less than our findings and of the recommendations for dietary fiber (16 g) and folate (239 µg); but not for vitamin D (3.5 µg), Ca (831 mg) and Mg (285 mg) (Institute of Medicine (US) Panel on Micronutrients, 2001; Institute of Medicine, 1998; Bell et al., 1998). Similarly, Tse and Tarasuk (2008) observed that the offered meal provided 1,136 kcal, 48 g protein, 10 g dietary fiber, 411 µg vitamin A, 99 mg vitamin C, 266 µg folate, 1 mg thiamin, 1 mg riboflavin, 22 mg niacin, 1 mg vitamin B₆, 3 µg vitamin B₁₂, 158 mg, 8 mg Fe, 667 mg P, 7 mg Zn and 360 mg Ca. Compared with our meal, the nutrients in the meals observed by Tse and Tarasuk (2008) contained larger quantities of all nutrients except of fiber, which was greater in our research (10 vs. 13 g, respectively).

The variations in results could be due to the diverse characteristics of the participants and meals, as well as methods of diet assessment. For example, most studies used 24-hour dietary recalls to estimate dietary intake, in contrast to our use of a FFQ that incorporated foods consumed over a month.

Limitations of this research may include: limited resources and participation of soup kitchens that did not allow for a larger sample size, measurement error from the instrument (FFQ), under- or over-estimation of the amount of the meal that the client received, recall bias, and the use of self-reported weights and heights (Kirkpatrick et al., 2012; Subar, 2004). However, the utilization of a validated FFQ, visual aids to estimate and report the portion size consumed, and a smart phone to document the quantity of the offered and consumed meal, were strengths of this research.

5. Conclusion

According to our knowledge, this is the first study that measured diet quality of clients of a soup kitchen by the HEI. Although the meal itself was modest in size, the diet quality of the total diet was increased by 10% with the addition of a soup kitchen meal. Total daily dietary consumption of the participants met the recommendations for most food groups, with the exception of whole grains, vegetables and dairy foods. The addition of a citrus fruit and green leafy vegetables would greatly increase the intake of nutrients lacking (such as Mn, folate and vitamin C). Yet, it is recognized that the addition of these types of food may be the constrained by limited budgets and storage facilities. Health professionals should be cognizant of these soup kitchens for their impact on improving nutritional status of the low-income and homeless in their communities. It would be helpful to provide advice to the directors of soup kitchens about the importance of offering a variety of healthy foods.
Conflict of Interest

The authors report no conflict of interest.

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Author Agreement

The lead author affirms that this manuscript is an honest, accurate, and transparent account of the study being reported. The reporting of this work is compliant with The Code of Ethics of the World Medical Association (Declaration of Helsinki). The lead author affirms that no important aspects of the study have been omitted and that any discrepancies from the study as planned have been explained.

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