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A Nutritional Analysis of Food Menus Offered at Local Older Adult Assisted Living Facilities

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Abstract

Nutrition is important in all stages of life, especially in the later years. The purpose of this study was to analyze the food offerings from local assisted living facilities on a nutritional basis. Upon collecting weekly food menus, they were evaluated based on the 2015-2020 Dietary Guidelines for Americans (DGAs) in the domains of food groups, food variety, and excess fats, sugars, and salt. Not a single facility met the DGA requirements completely in food groups or food variety. The food groups facilities were most deficient in were fruits and dairy. Furthermore, each of the menus had items rich in either saturated fat, sodium, or sugar. The greatest source of excess sugars were desserts and sweet sauces. Sources of saturated fats were mostly in the form of beef, pork, and sausage. Rich sources of sodium mostly came from savory sauces, soups, cold cuts, and cured meats. Findings from this research can provide insight into how well older adults are being fed at living facilities of this type.

Keywords

Older adults, assisted living facilities, Dietary Guidelines for Americans 2015-2020, meal plans, malnutrition

Subject Categories

Human and Clinical Nutrition | Other Nutrition

A Nutritional Analysis of Food Menus Offered at Local Older Adult Assisted Living Facilities

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Nutrition is important in all stages of life, especially in the later years. The purpose of this study was to analyze the food offerings from local assisted living facilities on a nutritional basis. Upon collecting weekly food menus, they were evaluated based on the 2015-2020 Dietary Guidelines for Americans (DGAs) in the domains of food groups, food variety, and excess fats, sugars, and salt. Not a single facility met the DGA requirements completely in food groups or food variety. The food groups facilities were most deficient in were fruits and dairy. Furthermore, each of the menus had items rich in either saturated fat, sodium, or sugar. The greatest source of excess sugars were desserts and sweet sauces. Sources of saturated fats were mostly in the form of beef, pork, and sausage. Rich sources of sodium mostly came from savory sauces, soups, cold cuts, and cured meats. Findings from this research can provide insight into how well older adults are being fed at living facilities of this type.

KEYWORDS: *Older adults, assisted living facilities, Dietary Guidelines for Americans 2015-2020, meal plans, malnutrition*

INTRODUCTION

Adequate nutrition is a crucial component of health throughout all the major life stages. One life stage of particular importance is that of older adults, those ages sixty-five and older. This population is of special interest because they face unique challenges and barriers to achieving a healthy and balanced diet that is not seen in younger populations. Beyond having a tendency to consume fewer calories overall, the quality of their diets can also be hindered due to physical factors such as arthritis, xerostomia (dry mouth), dysphagia (difficulty swallowing), cognitive impairments, medication interactions, as well as other disorders such as hypertension and kidney disease (1, 2). These complications can lead to the inability to obtain proper nutrients needed. In fact, malnutrition among the older adult population is one topic that has been a focus of recent research that requires much more attention. Studies conclude that there has been inadequate detection as well as prevention of malnutrition among the older adult population (1). The Academy of Nutrition and Dietetics, formerly The American Dietetic Association, notes how the nutritional risk factors of most concern for older adults include polypharmacy as well as inadequate consumption of the major food groups (2).

It is predicted that the older adult population will outnumber the younger population (those under age 18), an event unprecedented, by 2035 (3). Being a large part of the population, it is essential that older adults are able to achieve adequate nutrition to remain as healthy as possible. The current literature equates proper nutrition to overall health and the prevention of chronic lifestyle diseases such as obesity, hypertension, Type-II diabetes, and cardiovascular disease (4-6). In addition to these diseases, older adults are also more susceptible to a multitude of other ailments such as dementia, Alzheimer's, kidney disease, and gastrointestinal disorders (7,8). A proper diet has the potential to prevent the progression of these disorders (7). While the

notion that a nutrient-dense and balanced diet leads to better health is well known in theory, in practice, there is much more uncertainty as to if older adults are actually being offered nutritionally sound meals. This study sought to answer that question.

Analysis of foods offered to older adults in this study was done in the context of older adult living facilities. Assisted living facilities (ALFs) were selected for this study because these facilities provide three meals per day for the residents, therefore making them ideal for nutritional analysis. Assisted living facilities are facilities where the resident is able to live on his/her own with slight aid. The benefit of living in this type of housing for older adults are amenities such as medical aid on staff, transportation, a community atmosphere and scheduled activities. Nursing homes also provide three meals per day, but require more medical aid

There are approximately 36,000 assisted living facilities within the United States (9), many independently operated. This independence, however, comes with a risk, the main risk being lack of regulation for the food offerings at these facilities to be nutritionally sound (2,10-12). Across states, there is little consensus on the standards that should be implemented for these facilities and it is up to the owners (10,11). This is of concern because the owners might not have proper nutritional knowledge. The only goal that seems to be agreed upon by this type of facility is to provide nutritious meals, which can be defined many ways and might not actually be met. Nutrient analysis and nutrition assessment are “neglected services” in the case of assisted living facilities (10). One study looking at the mealtime experience of assisted living elderly stated that the current studies revealed that most assisted living elderly are not eating well (13). This study also noted the presence of excessive intakes of fats, sugars, and salt (13).

These studies and findings highlight the importance for nutritional studies in this area. While the current literature voices the concern for the malnutrition of the elderly population and

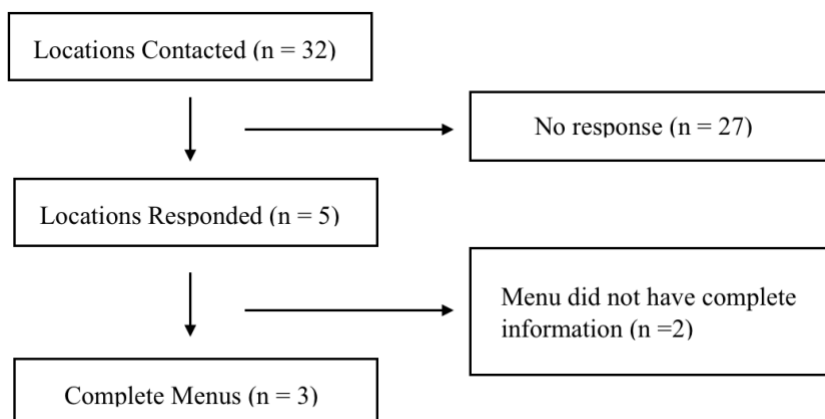
has the impression that assisted living facilities are not offering nutritionally adequate meals, no studies were found that actually analyzed the meal offerings of these facilities on a nutritional basis, which presented an important gap in the literature that needed to be addressed.

METHODS

Recruitment

The aim of this study sought to determine if assisted living facilities were providing residents with nutritionally adequate offerings based on a weekly menu. Assisted living facilities were identified using the website seniorliving.org and were limited to within 50 miles of the University of New Hampshire. A total of 32 locations were contacted first via email and then phone to acquire their menus. 27 locations did not respond to recruitment. Out of the remaining five that did respond with menus, two of the menus did not meet the requirements for nutritional analysis. One of the menus did not include breakfast or dinner while the other menu had breakfast as an à la carte option. The three remaining menus met the inclusion requirements, which contained a week's worth of meals and detailed the three meals each day (Appendix A). A visual of the recruitment process is depicted in Figure 1.

Figure 1: Recruitment Menu Process



Nutritional Analysis

The Dietary Guidelines for Americans:

The Dietary Guidelines for Americans 2015 – 2020 (DGAs) were used to analyze the nutritional adequacy of the meals offered at the various locations. This set of guidelines was chosen because it fits the descriptions of the foods given by the assisted living facilities more adequately than other guidelines like the Dietary Reference Intakes, which required detailed knowledge of the nutrient composition of the food groups (which was unavailable). The *DGAs* focus on the consumption of specific portions of each food group per day: 2 ½ cup/day for vegetables, 2 cup/day for fruits, 6 oz/day for grains, 3 cups/day for dairy and 5 ½ oz/day for protein. The *DGAs* also note the importance of variety for vegetables, grains, and proteins, a majority of which were also analyzed in this study. Finally, the *DGAs* place emphasis on limiting fats, sugars, and salt from the diet, another factor looked upon in this study.

Food Group Analysis:

Each menu was analyzed day-by-day utilizing the following method. Since the portion amounts were not disclosed by the locations, the assumption was made that one standard size of each food type (with the exception of grains) was used as a serving (i.e. if one of the food items was pork tenderloin, the standard serving size of 3 ounces of protein was recorded). The standard serving sizes were determined from Appendices 10-13 of the *DGAs*. Grain standard serving sizes were not determined from the *DGA* appendices because they were extremely limited in item selection and did not represent a realistic serving size. Instead, the common portions were used from the MyPlate Guidelines. This source was better because it not only gave more options of grains and more realistic serving sizes, but also gave the ounce equivalents necessary for *DGA* analysis.

If a given food on a menu was not in the above appendices, the general serving sizes of 3 ounces of protein, $\frac{3}{4}$ cup of fruit, $\frac{1}{2}$ cup vegetable, and 1 $\frac{1}{2}$ ounces of cheese (equivalent to 1 cup of dairy) were used. These general serving sizes were determined from the average *DGA* serving of foods from that group. Meals were analyzed based on their main components, meaning that a chicken with gravy sauce counted as just 3 ounces of protein and the gravy was considered a minimal contribution to the overall results. After each day was analyzed, the amount from each food group was totaled and compared to the *DGAs*. In addition, the percent needs met per week was calculated for each food group by counting the number of days in which the food groups needs were met and then dividing that number by 7 (Appendix B). Overall needs met for all four menus were then calculated to determine the food groups of concern.

The oil category was not analyzed in this study because the oil type and amount could not be determined from the data given by the facilities. The menu from one of the locations provided two food options for lunch and dinner. Both options were analyzed separately and were referred to as different menus (Menu 3 and Menu 4) in the results and analysis.

Food Variety Analysis:

Food variety was analyzed for the protein and vegetable food groups only. Protein from each day was broken down into the following categories: seafood, meats/poultry/eggs, and nuts/seeds/soy. Weekly totals were then calculated and compared to the guidelines. The *DGAs* recommend that individuals consume 8 ounces of seafood per week, 26 ounces of meat/poultry/eggs per week, and 5 ounces of nuts/seeds/soy products per week.

The same analysis process was conducted for vegetables. The *DGA* recommends that individuals consume 1 $\frac{1}{2}$ cup of dark green vegetables per week, 5 $\frac{1}{2}$ cups of red/orange

vegetables per week, 1 ½ cup of legumes per week, 5 cups of starchy vegetables per week, and 4 cups of other vegetables per week. If the food menus did not denote what type of vegetable was served (i.e. vegetable medley), the vegetable was placed in the “other” category. Salads were assumed to be made with lettuce other than iceberg, which would place the vegetable in the “dark green” category. Weekly amounts of vegetable type were calculated and compared to the *DGAs*. Grains were not able to be analyzed because the facilities did not disclose if they were whole grains or not.

Analysis of Excess Fats, Sugars, and Salt:

The menus were also qualitatively analyzed on the basis of foods high in solid fats (mostly saturated fat), added sugars, and sodium. This was done via looking for foods high in these components in the menus and noting the occurrence. Food preparation methods were also considered in this analysis.

RESULTS

Food Groups

The purpose of this study was to assess whether or not local assisted living facilities were providing a nutritionally balanced diet to their residents based on their weekly menu offerings. This was analyzed by comparing the foods provided via the food menus to the *DGA 2015 – 2020* requirements. Individual menu analyses are detailed in Appendix B. Not a single facility in this study met the *DGA* requirements completely for food groups (Figure 2). Menus 1 and 2 were the worst at meeting the vegetable requirement and only met 14.3% of the weekly needs. In contrast, Menu 3 and Menu 4 met 85.7% and 71.4% of the vegetable needs, respectively. All the menus had the same percent needs met for grains (28.6%), with the exception of Menu 3, which met

42.9% of the weekly grain needs. Dairy and fruits were the food groups the most neglected throughout the menus, which all met 0% of the needs. Protein was the most abundant food group served at the assisted living facilities. Menu 1 met 89% of the protein needs while Menu 2 met 57.1% of the needs. Menu 3 and 4 met the protein need 100% for the week. When combining the data from all 4 menus, 89% of the weekly protein needs were met, 46% of the vegetable needs were met, 32% of the grains needs were met, and 0% of the fruit and dairy needs were met (Table 6).

Figure 2: Percent Needs Met per Week Across Menus

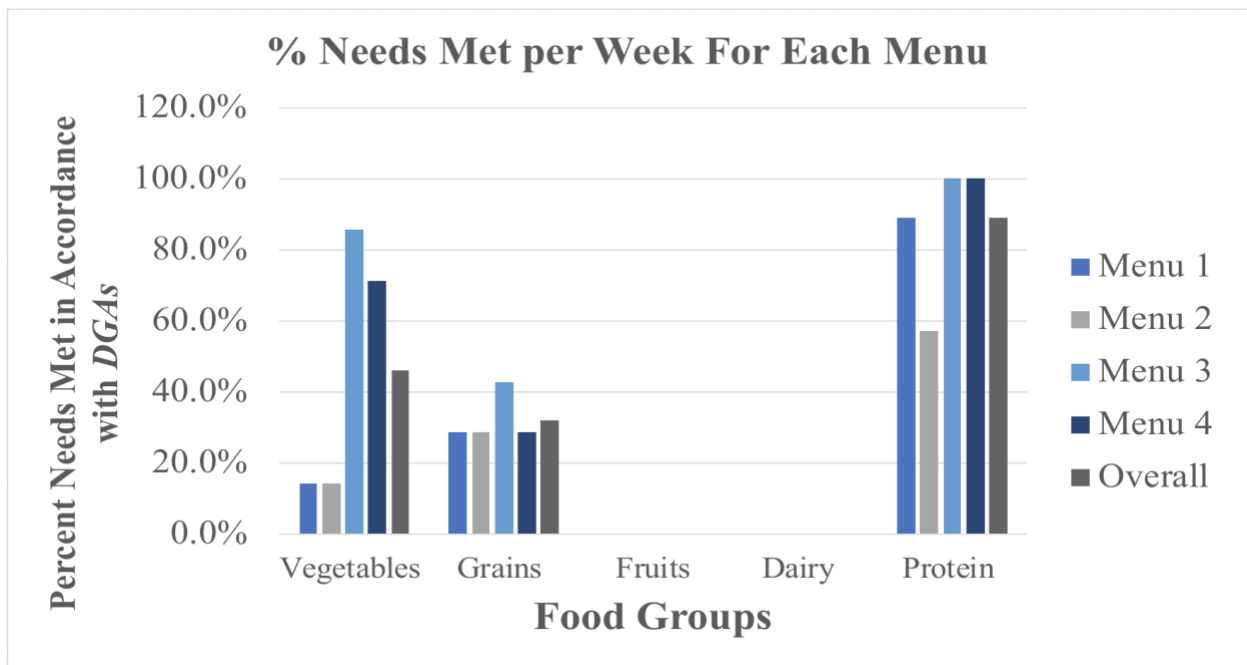


Table 6: Prevalence of Food Groups Across Menus

Overall % Met for Each Food Group	
Protein:	89%
Vegetables:	46%
Grains:	32 %
Fruit/Dairy	0 %

Food Variety

Food variety was analyzed for the vegetable and protein categories (Table 5). Similar to the food groups, many of the food variety groups were not met completely by each menu. The vegetable variety group that was met the best by all the menus was the dark green vegetables, while the least met vegetable variety across all the menus was legumes (0 cups recorded for all the menus). While starchy vegetables seemed to be abundant throughout the food menus, only Menu 1 was able to meet the *DGA* requirements. Menu 3 and Menu 4 were the only menus to meet the requirements for red/orange vegetables. For the protein variety, no location met the *DGA* requirements for nuts/seeds/soy. However, they all met the *DGA* guidelines for meats/poultry/eggs and half the menus (Menu 1 and Menu 3) met the guidelines for seafood.

Table 5: Food Variety Analysis Across Menus

Vegetable Variety:	Location 1:	Location 2:	Location 3 (Opt. 1):	Location 3 (Opt. 2):
<i>Dark Green</i>	2/3 c	2 ½ c*	5 ½ c*	6 c*
<i>Red/Orange</i>	2/3 c	2 c	5 ¾ c*	5 ½ c*
<i>Legumes</i>	0 c	0 c	0 c	0 c
<i>Starchy</i>	5 2/3 c*	4 c	4 ¼ c	4 c
<i>Other</i>	3 c	2 ¾ c	3 ½ c	5 ¼ c*
Protein Variety:	Location 1:	Location 2:	Location 3 (Opt. 1):	Location 3 (Opt. 2):
<i>Seafood</i>	9 oz*	6 oz	9 oz*	6 oz
<i>Meats/Poultry/Eggs</i>	51 oz*	40 oz*	60 oz*	63 ½ oz*
<i>Nuts/Seeds/Soy</i>	0 oz	0 oz	0 oz	0 oz

* denotes meeting the *DGAs* Requirements

DISCUSSION

The purpose of this study was to evaluate the food offerings of local assisted living facilities in accordance with the *Dietary Guidelines for Americans 2015 – 2020*. So far, no study found has tried to accomplish this.

The results of this study revealed the nutritional inadequacies of weekly menus provided to older adults at assisted living facilities. Not a single facility in this study met the *DGA* requirements completely for food groups, especially for fruit and dairy where the percent needs met were 0% across all menus. This is a crucial finding because it suggests a trend in assisted living facilities that should be fixed in order for older adults to be properly fed. Even though some of the menus served at least one serving of fruit per day, that was still not enough to meet the requirement of 2 cups per day per the *DGAs*. Similarly, not enough dairy was offered with these meal plans and most of it was in the form of cheese, which goes against the *DGA*'s goal of limiting solid fat intake.

In addition to offering a source of hydration, something that is also an important aspect to older adult nutrition, fruits offer a variety of nutrients that are crucial for proper metabolism and health such as vitamin C, folate, dietary fiber, and potassium. Many nutrients contained in fruit can also act as antioxidants, which reduce the occurrence of free radicals. By lacking in the amount of fruit served at these assisted living facilities, the residents are missing out on all these key nutrients and fiber.

Dairy is another important food group for older adults because of its link to bone health. Dairy is a good source of not only calcium (needed for strong bones), but also vitamin D, needed for calcium absorption. Older adults are more susceptible to diseases of the bones like osteopenia and osteoporosis because bone breakdown outweighs bone formation during this stage of life. As

a result, this physiological process can cause weaker and frailer bones, which is of concern due to an increased risk in breakage upon falling. This concern is what leads for the increased need of calcium and vitamin D among the older adult population and why assisted living facilities should include more dairy products or fortified dairy alternatives into their meal plans.

While vegetables were served more often than fruits and dairy in the menus analyzed in this study, the needs were not completely met across all the meal plans. The closest meal plan met only 85.7% of the weekly needs. Like fruits, vegetables offer a range of nutrients that contribute to the proper functioning of the human body. They also provide a source of fiber, needed for older adults because many experience constipation or diarrhea. Another area of concern this study highlighted in terms of vegetable consumption was the lack of legumes in the meal plans, which was 0 cups across all locations. There is the possibility that some legumes could have been included in some of the composite meals (i.e. chili). However, this amount would be small and not enough to reach the *DGA* guidelines.

Protein was, by far, the food group that was best met by all the locations. This could be because most individuals enjoy eating meat and it is inexpensive compared to fresh fruits and vegetables. Across all life stages, fruits and vegetables tend to be the hardest foods to consume the proper amount, so this is not unique to the older adult population alone (14). The results of this study also point to the need for more seafood to be included in the meal plans of the assisted living facilities. Only two of the four menus achieved the *DGA* requirements for weekly seafood consumption. Seafood is an important part of a balanced diet because it is a good source of protein and also has omega-3 fatty acids, which have been linked to the prevention of chronic diseases.

A surprising finding from this study was the fact that the percentage of grain needs met was lower than that of vegetables. The highest percentage of grain needs met was 42.9% whereas the highest needs met for vegetables was 85.7%. Grains are a staple of many diets. Not only do they provide a good source of calories, but they also provide dietary fiber and nutrients like the B-complex vitamins through enrichment. One area that needs further research that this study was not able to get to was how many whole grains the meal plans provided as opposed to refined grains. Whole grains are better than refined grains because they provide more fiber and also contain more nutrients. The *DGA* guidelines recommend aiming for half of the total grain consumption to be whole grains.

The findings of this study are very much aligned with the results from the What We Eat in America NHANES study which looked at the average intake of each food group for each sex as well as age bracket. Individuals aged 51 – 71+ only met the DGAs requirements for the grain and protein group (14). All other groups were not met. Similarly, the individuals' intake for food varieties were lacking in all the categories with the exception for other vegetables. This study is important because it shows that older adults are not consuming a well-balanced diet per the *DGA* requirements. Though this study only looked at foods offered, NHANES data could be reflective of this lack of adequate foods offered at assisted living facilities and shows the overall need for older adults to work towards a more nutritious diet.

Another aspect of the *DGAs* that was examined for this study was the prevalence of excess salt, added sugars, and fat. The *DGAs* promote consuming fewer foods with these components in order to have a healthier diet. While specific amounts could not be determined because serving sizes were not disclosed, the presence of foods high in these components was examined instead.

Menu 1 did not have that many foods that contained added sugars. This was mostly because they did not provide desserts for their residents (or at least did not disclose this on the menu). However, some sources for added sugars in this menu came from the maple syrup used for the pancakes, French toast, and waffles. Furthermore, two of the lunch options contained marinades and sauces that were sweet: Hawaiian sauce for a pork shoulder and a cranberry raisin sauce. These sauces most likely included some added sugar. Overall though, this menu seemed to be within the *DGA* guidelines for added sugars. Fat-wise, this menu did contain some fattier cuts of meat including corn beef and pork, which are naturally higher in saturated fat than chicken and seafood. However, there was a fairly even distribution of the fattier cuts, chicken, and seafood throughout this menu. Breakfast dishes included sausage and bacon, which have more saturated fat, but these were only served twice. Most of the cuts of meat were either grilled, roasted, or baked, which are preparation methods that are healthier than frying or braising (only two occurrences in this menu). Sources of excess sodium could be found in this menu as well. The sausage, bacon, and turkey cold cuts for sandwiches often contain more sodium because they are processed. They only showed up three times throughout this menu. Two other sources of salt in this menu were the gravy on the pork tenderloin as well as the corn chowder.

Menu 2 was very similar to Menu 1 in the analysis of excess salt, sugar, and fat. One major difference, however, was the fact that Menu 2 also provided desserts, a major source of added sugar, fat, and salt, twice a day. The *DGA* recommends fewer than 10% of total calories be from added sugar (about 200 calories in the average 2,000 calorie diet). When looking at the sugar content of these deserts, the standard serving sizes ranged from 50 – 100 calories of sugar. However, desserts higher in sugar were usually paired with those containing less sugar, so it appears that the menu was within the *DGA* guidelines. Other added sugar sources for this menu,

like Menu 1, were contained in sauces and marinades. Waffles and French toast appeared twice on this menu and it was assumed that maple syrup accompanied them. Strawberry crepes were also present on the menu, which could be associated with a sweet syrup of some sort. Two other sources of added sugars include glazed carrots and cranberry sauce (offered twice). Like Menu 1, there were some meat choices that were higher in fat including the beef in beef stew and meatball subs. However, these were not served every day and there are also healthier options other days such as chicken, tuna salad, and baked haddock. Most of the meat options were either baked or roasted and few items were fried on the menu (French fries were the only fried item mentioned). Major sources of sodium in this menu comes from the sausage and bacon served during breakfast as well as the soups served (three total). Cold cuts were also present on this menu, but for only a few days.

Menus 3 and 4 came from the same location but contained different options. Therefore, they were very similar in this analysis. Both contained dessert twice a day. However, they also offered a sugar-free desert option, something Menu 2 did not provide. Thursday and Friday, however, a pastry was offered during breakfast in addition to the other desserts. This made it so these days would most likely reach the maximum added sugar level per the *DGAs*. Menu 3 also contained some sauces that were sweet (maple glaze and raisin sauce), while Menu 4 contained sauces that were more likely to have added sodium and fat (gravy and alfredo sauce). Menu 4 also offered more fried options than any other menu. Four out of the seven dinner options contained a fried food element either potato chips, waffle fries, or onion rings. Menu 3's only fried option was catfish. While there was an even distribution of meat options in Menus 3 and 4, there was concern because bacon, sausage, or corn beef hash, items rich in fat and sodium, were served at every breakfast meal.

Overall, each of the menus had items that were rich in either saturated fat, sodium, or sugar. The greatest source of excess sugars in these menus were desserts and sweet sauces for meat dishes. Sources of saturated fats from these menus were mostly in the form of beef and sausage. Not many items overall were fried, which helps reduce fat consumption. Rich sources of sodium present in the menus mostly came from savory sauces, soups, cold cuts, and cured meats (bacon and sausage).

There are a multitude of reasons for which the weekly menu offerings at these assisted living facilities were not as nutritionally adequate as they should be. As noted in the introduction, there are no uniform regulations or guidelines (such as the *DGAs*) for assisted living facilities to follow for their meal plans. There is a general requirement that three meals be served and that they be nutritious, but that could be interpreted in many different ways. As a result of this lack of regulation, the institutions are left to decide on their own what is “nutritionally adequate.” Achieving an adequately nutritious diet for many individuals is extremely difficult, let alone for one individual. With older adults, there also comes in the complication of specialized diets needed if the residents have disorders such as hypertension, diabetes, or kidney disease. This lack of nutritionally adequate diets could be due to lack of nutritional education since the owners of these institutions are left to make the decisions on their own. When looking at the different institutions websites, however, some did mention that they had Registered Dietitians (RDs) on the premises, which would help counterbalance the lack of education. While some places may have RDs, some locations do not. For example, one of the institutions that was eliminated from this study reported not having an RD to help them make the food choices. Upon looking at their menu, it also included many desserts and very little fruit.

Another factor that could be preventing these assisted living facilities from providing nutritious meal plans could be economics and the nature of the assisted living facility itself. There are many other factors that are involved in running an assisted living facility including having enough rooms, the aesthetics, the amenities, the activities, and the health care on staff. By having to consider all these factors, it could very well be that the focus on the food program is not as much a concern as long as the individuals are being fed and are content. Since the assisted living facility is a business, it makes sense that they cater more towards what individuals want so that they will be able to get residents to commit. Otherwise, they would go out of business. It could very well be that there is an underlying battle between wanting to be nutritious, but also wanting to maximize the retention rate and influx of new residents.

A solution to these problems that could increase the nutritional quality of the meal plans could be to either have a RD on the premise or to hire an RD to work with the institution to make nutritional meal plans. Also, a separate meal plan could be constructed that is purposely crafted to meet the *DGA* standards. Similar to Location 3 having options for the meals (Menu 3 and Menu 4), this strategy could be implemented to have a nutrition-focused meal plan. One study concluded that older adults have the desire to eat better, just do not have access to the resources to do so (15). This suggests that older adults would be favorable towards a meal plan that was explained to them to be nutritious. Furthermore, an educational program for the residents themselves could be another strategy to implement so they realize the importance of getting proper nutrition at their age and steps they can take to consume a more balanced diet.

Upon looking at the entirety of the results, it can be concluded that many of the meal plans for older adults from assisted living facilities are lacking in some of the most important

food groups and steps should be made to focus more in this area so the residents can maximize their nutritional health.

LIMITATIONS

One of the limitations of this study was the sample size, which only featured three assisted living facilities. This was due to not many locations responding to the initial request for the food menus. Three of the locations declined all together while many others did not respond at all. The method used to communicate with these locations was by email, which could have easily been ignored or placed in a spam folder by accident. An alternative method of communication could be implemented such as an online platform where institutions can anonymously upload their food menus. Future researches should aim to gather as many food menus as possible to increase the sample size and to gain a more significant understanding of the nutritional offerings at assisted living facilities.

Another limitation, perhaps the largest limitation by far, was the fact that the actual serving sizes were not disclosed from the locations and, as a result, had to be assumed based on a set of standards for the purposes of this study. This brings in a significant amount of potential error since the serving sizes could be more than what was assumed. Furthermore, the ingredients of the mixed meals were also assumed based on what is generally in them. For example, it was assumed that lasagna contained pasta, some vegetables (in the sauce), and cheese. Finally, external food sources were not taken into account for this study. It is quite possible that the residents also have access to snacks in between meals or food offerings during community events. Drinks were also not disclosed by all the assisted living facilities, and therefore were not analyzed. Beverages are also important to consider because some drinks such as a glass of orange juice or milk can count for one whole serving of fruit or dairy, respectively. In order to

prevent assumption of the food portion sizes and offerings in future research, the researcher should work intimately with the head of food preparation or the chef providing these meals to know exactly how much food is going on the plates. The researcher could also take the meals and measure out the exact amount. External food sources should also be considered in analysis for future research in this area. Though tedious, these methods would result in significantly more accurate data for analysis.

In addition to not knowing the exact serving sizes, only menus from the winter season were analyzed and as well as only one week's worth of menu items. It could very well be that the foods offered during a different rotation or season contain foods more nutritious and more aligned with the *DGA* guidelines. Future researchers should assess multiple weeks for each institution as well as during each season to get a more complete profile of the food offerings.

One limitation that could not be improved was the fact that the different institutions disclosed different details about their meal plans and had different ways of keeping track of the food. This made analysis more difficult to standardize. Furthermore, analysis of whole grains vs refined grains and oil amount for the food groups could not be analyzed due to lack of detailed information from the location. Future researchers should try and determine how much of the grains served were whole grains. Oil amount will be a much harder task.

While many limitations were present in this study, they can be improved by doing a variety of things such as including more locations, knowing exactly how much of each food is offered, and analyzing menus for multiple weeks throughout the year. Though much more labor-intensive, time-consuming, and tedious, future researchers making these changes would achieve results that are much more comprehensive and conclusive than those that this study has achieved.

This preliminary study highlighted the need for further research into the nutritional quality of the menu offerings in assisted living facilities, especially in the domains of fruit and dairy offerings. Nutrition is a crucial part of health and wellbeing and should not be neglected, especially in the later years of life. Future research in this field should look to replicate this study with the suggestions mentioned above to really determine the nutritional adequacy of assisted living meal plans.

TAKE AWAY POINTS

- This study sought to analyze whether or not older adults in assisted living facilities were being offered nutritionally adequate weekly food menus in accordance with the *DGAs*.
- Results of this study revealed that older adults were not meeting the requirements for the *DGAs* in either food groups or food variety.
- Food groups of concern included fruits and dairy while protein needs were met the best.
- The assisted living facilities did not provide enough legumes as well as nuts/seeds/soy.
- Sources of excess sugars, fats, and salts were present mostly in the form of desserts, sweet sauces, fattier cuts of meat (beef, pork, and sausage), soups, cold cuts, and cured meats.
- Limitations of this study include a small sample size, the assumption of the serving sizes for foods, and analysis of menus only during the winter rotation.
- This study highlighted the need for further research into the nutritional adequacy of assisted living facility food offerings as well as the regulation of the meals plans in these institutions.

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APPENDIX A

Menu 1:

Meal:	Mon:	Tues:	Wed:	Thurs:	Fri:	Sat:	Sun:
Breakfast:	- Ham, cheddar, chive scramble - Pan fries - Orange slices	- Blueberry buttermilk pancakes	- Fried eggs - Canadian bacon - Corn bread muffin	- Cinnamon raisin French toast - yogurt with granola	- Scrambled eggs - Sausage - Home fries - Chef's choice fruit	- Belgian waffles with strawberry sauce - Ham	- Sausage and cheddar omelet - Hash browns
Lunch:	- Hawaiian braised pork shoulder	- Corn beef and cabbage - Carrots, turnip, and potatoes	- Mediterranean tortellini with roasted chicken	- Baked ham with cranberry raisin sauce	- Sole Florentine - Roasted carrots - Rice pilaf	- Pork Tenderloin with gravy - Cheesy hash browns - Vegetable medley	- Grilled chicken with fresh strawberries, basil, and balsamic
Dinner:	- Fish and chips - Cole slaw	- Shrimp quesadilla	- Ham salad sandwich on rye - Green bean salad	- Caesar salad with grilled chicken - Vegetables - Bread	- Grilled cheese with bacon and tomato - Corn chowder	- Open faced turkey sandwich with gravy - cranberry sauce	- Broccoli and cheddar quiche - Fruit salad

Menu 2:

Meal:	Mon:	Tues:	Wed:	Thurs:	Fri:	Sat:	Sun:
Breakfast:	- Belgian waffles - Fresh fruit	- Strawberry crepes - Sausage	- Fried eggs - Home fries - Toast	- Broccoli and cheese omelet - Fresh fruit	- French toast - Sliced banana	- Eggs to order - Muffin of the day	- Scrambled eggs - Bacon - Toast
Lunch:	- Italian roasted pork - Fresh bread - Peppers and onions - Pie	- BBQ Chicken - Scalloped potatoes - Sautéed kale - Jenny's dessert	- Spaghetti and meatballs - Garlic stick - Garden salad - Brownie	- Beef stew - Biscuit - Blueberry cobbler	- Baked haddock - Roasted red potatoes - Glazed carrots - Rice pudding	- Chicken pot pie - Cranberry sauce - Chef's choice	- Stuffed peppers - Rice - Mixed veggies - Dinner roll - Boston cream pie
Dinner:	- ½ Rubeen sandwich - French fries - Coleslaw - Ice cream	- Tuna salad sandwich - Pasta salad - Peaches	- Broccoli cheddar soup - Biscuit - Bread Pudding	- Open face turkey sandwich - Cranberry sauce - Jell-O surprise	- Minestrone soup - ½ Sandwich - Chocolate cake	- Homemade pizza - Side salad - Pears	- Meatball subs - Spinach - Fruit cocktail

Menu 3:

Meal:	Mon:	Tues:	Wed:	Thurs:	Fri:	Sat:	Sun:
Breakfast:	- Scrambled eggs - Bacon	- Cheese omelet - Sausage - Home fries	- Pancakes - Bacon	- Scrambled Eggs - Bacon - Cinnamon donuts	- Waffles - Sausage	- Scrambled eggs with cheese - Corned beef hash	- French toast - Sausage - Danish
Lunch: <i>Note: all meals also included garden salad, fresh fruit, carrots, and a roll</i>	- Maple glazed salmon - Sweet potato - Dessert - Sugar-free dessert	- Pork tenderloin - Mashed potato - Broccoli - Dessert - Sugar-free dessert	- Chicken cacciatore - Linguine - Veggies - Dessert - Sugar-free dessert	- Pot roast with gravy - Baked potatoes - Spinach - Dessert - Sugar-free dessert	- Crab cakes - Couscous - Squash - Dessert - Sugar-free dessert	- Chicken stuffed with cranberries and apples - Wild rice - Carrots - Dessert - Sugar-free dessert	- Honey baked ham w/ raisin sauce - Potatoes au gratin - Beets - Dessert - Sugar-free dessert
Dinner:	- Chef's quiche - Asparagus - Dessert - Sugar-free dessert	- Manicotti with marinara - Chef's choice vegetables - Dessert - Sugar-free dessert	- Meat chili - Cornbread - Roasted butternut squash - Dessert - Sugar-free dessert	- Cheese ravioli w/ Pomodoro sauce - Bread - Green beans - Dessert - Sugar-free dessert	- Fried Cajun catfish - Onion rings - Coleslaw - Dessert - Sugar-free dessert	- Spaghetti and Italian sausage - Garlic bread - Side Caesar salad - Dessert - Sugar-free dessert	- Meatball sub - Potato salad - Peas and carrots - Dessert - Sugar-free dessert

Menu 4:

Meal:	Mon:	Tues:	Wed:	Thurs:	Fri:	Sat:	Sun:
Breakfast:	- Scrambled eggs - Bacon	- Cheese omelet - Sausage - Home fries	- Pancakes - Bacon	- Scrambled Eggs - Bacon - Cinnamon donuts	- Waffles - Sausage	- Scrambled eggs with cheese - Corned beef hash	- French toast - Sausage - Danish
Lunch: <i>Note: all meals also included garden salad, fresh fruit, carrots, and a roll</i>	- Turkey tips with gravy - Sweet potato - Turnips - Dessert - Sugar-free dessert	- Shepherd's pie - Broccoli - Dessert - Sugar-free dessert	- Shrimp Alfredo - Linguine - Vegetable medley - Dessert - Sugar-free dessert	- Sesame pork - Baked potatoes - Spinach - Dessert - Sugar-free dessert	- Chicken with cornbread crust - Couscous - Squash - Dessert - Sugar-free dessert	- Meat lasagna - Carrots - Dessert - Sugar-free dessert	- Stuffed sole - Potatoes au gratin - Roasted beets - Dessert - Sugar-free dessert
Dinner:	- Grilled ham and cheese - Chips and pickle - Asparagus - Dessert - Sugar-free dessert	- Grilled Rubeen and swiss on rye - Chips and pickle - Veggies - Dessert - Sugar-free dessert	- Monte Cristo - Roasted butternut squash - Dessert - Sugar-free dessert	- Turkey burger - Waffle fries - Green beans - Dessert - Sugar-free dessert	- Roast beef and cheddar - Onion rings - Cole Slaw - Dessert - Sugar-free dessert	- Chicken pot pie - Garlic bread - Side Caesar salad - Dessert - Sugar-free dessert	- Caesar salad with grilled chicken - Garlic bread - Dessert - Sugar-free dessert

APPENDIX B

Table 1: Menu 1 Food Group Analysis

Servings:	Mon:	Tues:	Wed:	Thurs:	Fri:	Sat:	Sun:	% met per week
Vegetables:	2 ½ c*	1 c	½ c	1 c	2 c	1 ½ c	1 c	14.3%
Grains:	0 oz	7 oz*	6 oz*	4 oz	4 oz	4 oz	0 oz	28.6%
Fruits:	¾ c	0 c	0 c	0 c	¾ c	0 c	¾ c	0%
Dairy:	1 c	1 c	0 c	2 c	2 c	0 c	2 c	0%
Protein:	9 oz*	6 oz*	12 oz*	6 oz*	9 oz*	9 oz*	9 oz*	89%

* denotes meeting the *DGAs* Requirements

Table 2: Menu 2 Food Group Analysis

Servings:	Mon:	Tues:	Wed:	Thurs:	Fri:	Sat:	Sun:	% met per week
Vegetables:	2 ½ c*	2 c	1 ½ c	2 c	½ c	2 c	¾ c	14.3%
Grains:	6 oz*	5 oz	4 oz	7 oz*	3 oz	4 oz	5 oz	28.6%
Fruits:	¾ c	¾ c	1 ½ c	0 c	1 ¼ c	¾ c	1 ¼ c	0%
Dairy:	1 c	0 c	0 c	1 c	1 c	0 c	1 c	0%
Protein:	9 oz*	4 ½ oz	9 oz*	6 oz*	9 oz*	4 ½ oz	4 oz	57.1%

* denotes meeting the *DGAs* Requirements

Table 3: Menu 3 Food Group Analysis

Servings:	Mon:	Tues:	Wed:	Thurs:	Fri:	Sat:	Sun:	% met per week
Vegetables:	4 c*	3 c*	4 c*	2 ½ c*	3 c*	2 ½ c*	1 ½ c	85.7%
Grains:	5 oz	1 oz	3 oz	8 oz*	4 oz	6 oz*	6 oz*	42.9%
Fruits:	¾ c	¾ c	¾ c	¾ c	¾ c	¾ c	¾ c	0%
Dairy:	1 c	1 c	2 c	0 c	1 c	0 c	1 c	0%
Protein:	9 oz*	12 oz*	9 c*	9 oz*	9 oz*	9 oz*	12 oz*	100%

* denotes meeting the *DGAs* Requirements

Table 4: Menu 4 Food Group Analysis

Servings:	Mon:	Tues:	Wed:	Thurs:	Fri:	Sat:	Sun:	% met per week
Vegetables:	3 c*	3 c*	4 c*	2 c*	4c*	3 c*	1 ¾ c	71.4%
Grains:	5 oz	3 oz	3 oz	8 oz*	3 oz	6 oz*	5 oz	28.6%
Fruits:	¾ c	¾ c	¾ c	¾ c	¾ c	¾ c	¾ c	0%
Dairy:	0 c	1 c	2 c	2 c	0 c	1 c	1 c	0%
Protein:	9 oz*	10 ½ oz*	10 oz*	9 oz*	12 oz*	9 oz*	10 oz*	100%

* denotes meeting the *DGAs* Requirements