



RD2B Tower Garden Produce- A qualitative glimpse on the eating habits of older adults as a result of free distribution of produce and herbs

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Abstract

The objective of this program was to increase participant produce intake via the distribution of free foodstuffs and educational materials to a group of older adults at a Middle Tennessee senior center. This was accomplished through utilization of aquaponically grown produce and education materials that were provided weekly to older adults at the center. Following the program, nine subjects and two employees participated in a semi-structured interview. Qualitative findings noted that five participants reported an increase of 1/2 to one additional serving of vegetables per day and all shared that the variety of their vegetables increased. Three themes, Produce Distribution Benefits, Pandemic Flexibility, and Planting for the Future were the result of the qualitative analysis completed following the participant interviews. This pilot exploratory qualitative study provided insight into what produce was used by participants. Tower garden produce was accepted and utilized by the group in the study. As future projects are planned, these results will be useful for guiding distribution and nutrition education.

KEYWORDS: HEALTHY FOOD CHOICES, CONSUMING NUTRIENTS, AQUAPONIC GARDENING

Introduction

According to the 2020 census, 16.8% of United States population is over 65 years of age with the median age of the country as a whole increasing (United States Census Bureau, 2023). This represents a 36% increase since 2009. By 2040, there is expected to be an increase in the 65 and older population to 21.6% or 80.8 million older adults in the U.S. (Administration on Aging [AOA], 2020).

According to Kaur et al., (2019), there has been an increase in the proportion of older adults in virtually all countries of the world. Data from the World Population Prospects states that worldwide, people aged 60 years and above are expected to rise to 56% of the population, from 901 million to 1.4 billion by 2030, and more than double to 2.1 billion by 2050, with all countries seeing an increase in the older adult population. The current global scenario projects that

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people over age 80 are going to increase from 137 million in 2017 to 425 million in 2050, with a potential increase to 909 million by 2100 (Kaur et al., 2019).

Looking at factors that increase longevity and quality of life has always been a goal for populations. Wang et al., (2021) found an inverse association between fruit and vegetable intake and mortality. This research team examined two large cohorts with detailed and repeated dietary measurements. Their findings revealed that the lowest risk of mortality was shown for those consuming five servings daily of fruit and vegetables. The research did show that no further decrease was observed when more fruits and vegetables were eaten daily (Wang et al., 2021). Minich (2019) examined affordability and access of vegetables and fruits. Findings pointed to a relationship between spending and longevity with a decrease in mortality secondary to a decline in food insecurity (Minich, 2019).

Nutrition needs change as aging occurs. Frequently older adults become less active. In addition, metabolism slows and ability to absorb some nutrients becomes less efficient (USDA, 2023). The 2020-2025 Dietary Guidelines for Americans recommend including more vegetables and fruits into one's diet. Current recommendations are to consume 2 cups of fruit and 2-3 cups of vegetables each day (Lee et al., 2022; Duyff, 2017). Many benefits are contributed to a healthy diet. These include a healthy immune function, prevention of obesity and type 2 diabetes, cardiovascular disease, and some cancers. Overall, 12.3% of adults met fruit recommendations, and 10.0% met vegetable recommendations (Lee et al., 2022). It has been postulated, based on the benefits of increased fruit and vegetable intake, that additional policies and programs where citizens live, learn, work, and play may increase produce intake, resulting in improved health and quality of life in aging (Dorner & Friedrich, 2018).

Dark green vegetables such as kale, mustard greens, and Swiss chard are rich in vitamin K, which has been shown to have a potential protective effect against inflammatory conditions (Harshmen & Shea, 2016). In one study conducted in Australia in 2017, the researchers examined the relationship between cruciferous and allium vegetables, both of which contain organosulfur compounds, and atherosclerotic vascular disease (ASVD) in women seventy years of age or older (Blekkhorst et al., 2017). The fifteen-year study found an inverse relationship between the consumption of these vegetable types and ASVD. In fact, a one-serving increase in cruciferous or allium vegetables per day corresponded to a 20% decline in ASVD-related mortality (Blekkhorst et al., 2017). The psychological benefits of increased vegetable and fruit consumption are lesser-known, but also important. Eating vegetables and fruits has been shown to have a favorable impact on psychological well-being (Mujcic & Oswald, 2016). More than twelve thousand Australian adults were studied over twenty-four months using a validated questionnaire to assess overall life satisfaction (Mujcic & Oswald, 2016). Findings revealed that increasing vegetable and fruit intake (up to eight portions daily) was positively associated with happiness, life satisfaction, and well-being, to the extent that the improvements were equal in measure to the psychological impact of transitioning from unemployment to employment. Similarly, in a large population sample of 60,404 middle- and older-aged adults, food intake and psychological distress were assessed over a three-year period where a lower prevalence of psychological distress was seen in those whose baseline vegetable and fruit intake reached a level of greater than seven servings per day (Nguyen et al., 2017). Matison et al., (2023) found that older adults eating increased servings of fruits and/or vegetables were associated with a significant reduction of cognitive impairment.

During the 2018-2019 academic year, a senior dietetic student group at Middle Tennessee State University worked with the older adults at a Middle Tennessee senior center. The student team performed a BioPhotonic scan to measure carotenoid levels on volunteer participants pre- and post- project intervention. The team then did bi-weekly nutrition education classes, which were well received. The student team highlighted foods and recipes high in carotene, which is

what the BioPhotonic scanner measures. Participants enjoyed the education classes and taste testing of the foods and recipes. Project findings showed that participants did not consume the recommended number of brightly colored vegetables and carotenoid scores fell in the low range prior to the educational series. After the educational classes, participants had improved carotenoid scores and reported using the recipes and purchasing more foods high in carotene. These results led to the idea of the tower garden project and produce distribution with an emphasis on produce and colorful fresh foods.

Methods

As a result of the findings of the BioPhotonic scanning and nutrition education class project, a novel idea of produce distribution surfaced. This exploratory, pilot, qualitative project involved the distribution of tower garden produce grown by a research team. For seven months a research team composed of the project Principal Investigator (P.I.) and senior dietetic students from Middle Tennessee State University grew, harvested, and distributed produce to a group of 20 older adults from one Middle Tennessee senior center location. The older adults were primarily female (18 out of 20) and ranged in age from 70-86.

The produce grown on two tower gardens, which houses 32 pockets where the rock wool was placed and used to grow greens, lettuces, and herbs, were grown and distributed with accompanying nutritional education handouts on usage and storage, and recipes which incorporated the various foodstuffs. These tower gardens were procured through a public service grant at Middle Tennessee State University (MTSU). MTSU offers public service grant opportunities each year. Faculty apply and if awarded, the grant is used to offer community service via various projects. These funds covered the two towers and supplies to grow these foodstuffs.

The COVID-19 pandemic complicated the consent process performed by the P.I. and the students and also the distribution process. During the informed consent process, research staff explained the voluntary nature of participating in the project. With no in-person operations, the senior center personnel opted to have willing participants drive up in their vehicles, roll their window down, and receive produce and nutritional information, such as handouts and recipes, in this manner. The research team was able to talk with participants at a distance, while wearing masks. Those who agreed to participate, completed the consent form, sharing contact information so that information about produce distribution times and location/method of distribution could be shared with them.

Once produce was grown and the team had the collected consents of volunteer participants, distribution began with weekly provisions in the senior center parking lot area. Initial plans had included face-to-face educational classes to complement the produce provided. Due to the continued pandemic, the team, unable to conduct face-to-face classes, provided produce in the previously described drive-through manner until the senior center reopened. At that point, the produce and educational materials were dropped off in the senior center and the older adults picked up the produce at their convenience, allowing for continued social distancing. The senior center did begin offering limited classes with social distancing. During those classes, participants would share details with others attending about the produce distribution project. Three additional participants were added to the project from this word of mouth recruitment. As the senior center returned to its normal operations and more opportunities to socialize were available to the members, participants continued to share information about the project with others, encouraging more members to join the distribution group.

With a study aim of increasing participant vegetable and herb consumption, this unique means of distribution of greens and herbs facilitated this objective. Following the project distribution,

semi-structured interviews were conducted with participants and senior center staff to assess any changes in intake and satisfaction with the project.

Data Collection

Interview questions were developed by the research team, based on the Principal Investigator's previous experience and knowledge. Ten questions were asked of participants and staff, via a phone interview, following the conclusion of the project. The questions are displayed in Table 1.

Table 1. Researcher questions asked of participants

<ol style="list-style-type: none"> 1. Have you eaten more or fewer vegetables since the tower garden project began? 2. Would you tell me about the number of vegetables you eat? 3. Have you eaten more or fewer fruits since the tower garden project began? Would you tell me more about the number of fruits you eat? 4. Has this program encouraged you to try a greater variety of fruits and vegetables? 5. How has your vegetable and fruit preparation changed since this program began? 6. Would there be other vegetables that you would have liked to receive? If so, what vegetables are you thinking you would have enjoyed? 7. Are there herbs that you especially enjoyed? Others that you would have preferred receiving? 8. Did you try adding the herbs that you received to any of the dishes that you cook? Any other herbs that you now have tried since the project began? 9. What have you learned about the importance of fruits and vegetables in the diet during this program? 10. Do you think programs like this should be implemented in more facilities? If so, what suggestions do you have for future programs?

Information was gathered following the previous formative quantitative study at the same center which showed the need for further intervention focusing on the consumption of vegetables and fruits.

Questions for the semi-structured tower garden survey included how many people the participant cooked for and if the number and variety of vegetables and fruits regularly consumed had changed in any way since the tower garden project began. Questions on the preparation methods of their vegetables and fruits since participation in the project were also included. The research team asked about herbs that were enjoyed or other kinds of produce those participants would have liked to receive. The team asked if the herbs were used in any new methods or recipes. They also asked if the participants learned anything new about the benefits of vegetables and fruits, and if they thought that this type of program should be implemented in the future and in other locations.

To avoid potential bias, two student research assistants utilized a standard script when conducting the interviews following training provided by the Principal Investigator. Following approximately 20 distribution events, the survey was conducted via telephone interviews to consenting participants to comply with COVID-19 restrictions. All responses were recorded for transcription. The research team explained that anonymity and confidentiality would be ensured. These interviews were conducted with the research assistant located in a private study or conference room and recorded by the research team for later transcribing and coding. The institutional review board at Middle Tennessee State University approved the expedited study. Most interviews lasted between 10 and 40 minutes. Data saturation, the point where enough data is collected to draw adequate conclusions, was reached when no new information, or repetitive information, was identified.

Following data collection, debriefing of the project took place. Transcriptions were completed by local dietetic interns and verified by the Principal Investigator to assure validity and accuracy. Qualitative data was then analyzed with themes garnered from the responses.

Data Analysis

The audiotaped interviews were transcribed verbatim by a team of dietetic interns. Following the interns’ transcriptions, the Principal Investigator reviewed all transcriptions to ensure inter-rater reliability, which is a measure of consistency among reviewers or judges often using the same scale. Inter-rater reliability relies on human observers maintaining a great degree of consistency. To better illustrate this concept, consider an Olympic ice-skating judge or a dog judge during their shows. Interviews were then coded using an inductive approach to identify qualitative themes. The Principal Investigator, familiar with the content, read the interview transcripts closely to identify any meaningful patterns that emerged and developed themes. Each transcript was then coded by a second trained research assistant ensuring inter-rater reliability. Research assistants were educated and trained on standard protocol to be used to interpret the transcripts so that consistency was assured in each review and coding. When coding discrepancies occurred, a third trained research assistant weighed in to help provide clarity to the different stated results.

Results

A total of 11 interviews were conducted including nine older participating adults. Additionally, two center employees were willing to provide comments after the project completion. The average age of the interviewed participants was 79 with a range of 70-86. Most of the interviewees cooked for two people. All persons interviewed were female.

During content analysis, themes emerged from the interviews. Saturation was reached after reviewing the transcripts and discovering consistent comments from the interviewees. These themes, shown in Table 2, with supporting quotes, follow.

Table 2. Themes that Emerged

Produce Distribution Benefits	Participants and employees expressed satisfaction and enjoyment when receiving said produce. Questions and requests often surfaced during distribution.
Pandemic Flexibility	Delivery and education methods had to be modified during the COVID-19 emergency.
Planting for the Future	Challenges, limitations, and shortcomings were encountered during this project. Participants and employees/staff ideas were collected and documented.

Produce Distribution Benefits

Each week as produce was distributed participants would have questions about how to use the foodstuff. They also asked the research team about recipes to use with the produce or about how to store the produce. Participants shared what they learned about the importance of eating more vegetables and fruits from this unique project.

“Fiber- that is what I learned about vegetables.”

“Next year I may grow some of my own herbs. My niece is a vegetarian and grows her own herbs. I think the program inspired me to do this.”

“This made me aware of a greater variety of greens.”

Pandemic Flexibility

Design and implementation of the project had to be modified due to the COVID-19 pandemic. The drive-through distribution method, the drop off at the office of the Activity Director once the center was reopened, and the inability to present nutrition education sessions were the three major pandemic-related issues or changes. The idea of the lack of nutrition education was the concern that surfaced most frequently in the interviews of the older adult participants. Some of the statements shared by the participants included:

“COVID affected your ability to offer cooking demonstrations.”

“Maybe in the future we could do cooking demonstrations at the center, or something like that. That could really help.”

“I think if you were to give more instructions on how to use them, that would be great.”

Planting for the Future

Student researchers expressed an interest in participating in and learning more about this project. Because this project was in its infancy, there was much more to learn about growing of the produce and the challenges that are encountered when conducting this kind of research project. For example, the students made a master schedule and divided up the tasks to ensure that all the jobs were completed each week. This included checking the water level, checking the pH of the water, harvesting, cleaning and bagging the produce, and delivering the produce. Additionally, the student team created and searched for handouts and recipes to complement the produce that was provided based on questions or requests that surfaced during distribution.

The greatest challenge that the team encountered was aphids, which the team suspected to have come in on the seedlings that were planted in the towers. Many different products were suggested and used by the students to rid the plants of these pests. The P.I. for the project consulted with Agriculture Department personnel seeking their input as well. Due to these concerns the team will work on growing their own plants from seed in the future. The P.I. for the project is experimenting with various seeds to perfect this process and eliminate this challenge in the future growing seasons.

Additionally, one of the questions asked of participants and administrators during the interviews concerned the growing and addition of new items in the future. Suggestions included tomatoes, peppers, peas, and cucumbers. It is not possible to grow root vegetables in the towers, therefore vegetables such as potatoes, onions, or carrots cannot be considered. The P.I. plans to experiment with growing some of these alternative vegetables in anticipation of future projects.

Another change that will be made in the future includes labeling all towers with what is planted in the rock wool and then labeling and separating all produce and herbs that are bagged for distribution. A map of the original tower plants was created at the start of the project but was found to be inaccurate as plants were replaced. Going forward, labels will be placed on the towers themselves and changed simultaneously with any plant changes.

Participants and administrators shared many comments about the project’s future.

“Make no mistake, we appreciated this, and everything was good, a good variety.”

The following quotes were from the employees that participated in the interviews.

“I am so thankful for the relationship we have with Middle Tennessee State University and the wonderful staff and students there! The Tower Garden Project was such a wonderful way for us to work together and benefit our seniors here at the senior center. Our participants were always anticipating “pick up day” and we sometimes had more seniors than produce (pre-COVID, anyway). All of the seniors I spoke with enjoyed trying new greens and herbs and several told me they expanded their diet choices through this program. The student research team involved were always so sweet and polite and a pleasure to work with.”

Another employee stated, “My only suggestions for modification would be labeling the packages so our participants would know what they were eating, and separating the herbs, if possible, as some flavors overpowered others. I heard those requests several times.”

Discussion

In this exploratory pilot study, older adult participants and employees shared their experiences of receiving tower garden produce along with accompanying education material and recipes. Each participant stated that they enjoyed the produce and used many of the items on a weekly basis. There were limitations and challenges that were mentioned by the older adults enrolled in the project. These included the lack of nutrition education sessions, including cooking demonstrations. The idea of being able to observe and taste demonstrated foods was a future request of the participating group. The participants offered ideas for project improvement, some of which will be self-correcting as the COVID-19 restrictions are discontinued. Participants shared an overwhelming interest in participating in cooking demonstrations and nutrition education sessions. The research team had originally planned to offer classes where recipes that included the produce grown and provided would have been demonstrated. Inclusion of the dietetic interns to assist with transcription not only allowed them to practice applied research skills, but also introduced an increased awareness of the interests of older adults and possibly project ideas for future implementation.

There have been a variety of studies investigating the effects of nutritional educational interventions on healthy eating among older adults (Gallois et al., 2012; Kimura et al., 2013; Lammes et al., 2012). Interventions consisted of nutrition education and coaching or counseling with the focus on the benefits of consuming healthy diets. Kimura et al., (2013) and Yates et al., (2012) reported significant differences in their experimental studies between the intervention and control groups. They saw differences in the frequency and intake of fruits and vegetables. Salehi et al., (2011) also delivered nutrition education sessions to increase fruits and vegetables in older adults. Their interventions showed higher intakes of fruits and vegetables with a higher perceived benefit of these foodstuffs. Yates et al., (2012) and Salehi et al., (2011) examined self-efficacy, potential benefits, and barriers of fruit and vegetable intake. These researchers suggest that hands-on cooking classes and activities may help improve perceptions of vegetables and fruits.

A survey conducted by Francis et al., (2020), reported results that were useful for our tower garden distribution program. NEWS, a monthly 2-page newsletter, contained content on the foods provided in the monthly commodity food pick up such as their nutrition, usage, and storage information. Food safety, and budget-friendly tips and easy, low-cost healthy recipes were also included. These NEWS newsletters were distributed to commodity food participants at their monthly food pick-up. Over 3,500 NEWS participants completed a program survey following monthly pick-ups. Of those completing the survey approximately 50% attended at least one recipe tasting. Over eighty percent reported that the food assistance information and/or budget-friendly shopping tips were useful. Additionally, 89.4% enjoyed the monthly recipe samples with 60.8% reporting making at least one of the NEWS recipes at home.

Gardening programs may be effective at improving both mental and physical health benefits. Fruits and vegetables grown by older adults can have a positive effect on one's diet as well as increase food security (Thompson, 2018).

The tower garden project used qualitative methods to explore attitudes, perceptions, and usage of provided tower garden produce for older adults attending senior center activities and functions. Participant perceptions about the vegetables and herbs could provide valuable insights that will be useful in developing future educational programs tailored to the community. One topic of discussion throughout the interviews was information about accessibility and affordability of vegetables and fruits. Interviewees also discussed their knowledge of the benefits of consumption of vegetables and herbs in various dishes and the effect these foodstuffs could have on their health. Research points to the primary grocery shopper's self-efficacy and knowledge as having an impact on buying behaviors for both healthful and less nutritious food items.

This study provides insights into perceptions of grown vegetables and herbs and general nutrition perceptions among the older adult participants from the senior center. With an aim to improve consumption and variety of produce such as the greens and herbs in older adults, the research team's mission was successful. Future research should apply qualitative methods exploring the issue of vegetables and healthy food consumption among older adults and those within senior living communities. Research should also strive to assess applicability to vegetable consumption among adults utilizing quantitative assessment to generalize the findings and future qualitative studies to inform the development of educational programs

Two upcoming projects are planned as a result of the tower garden project. One project will mimic the senior center project with a new target audience. A dietetic student research team, under the direction of the P.I., will grow, harvest, and distribute produce for a church congregation as target audience and subject pool. Nutrition education sessions will accompany the produce distribution. Produce will be divided by type into individual labeled bags, incorporating the suggestions given by the interviewees in the tower garden project.

The second project created, as a result of a request, will be conducted at a women's treatment center. An alumna of the dietetic program has agreed to donate a tower garden for use at the treatment center. The center residents will grow produce and herbs under the guidance of the P.I. and nutrition students. Additionally, the student research team will deliver nutrition education to these participants. This mixed methods study will include a focus group to explore the idea of improvement in produce intake when participants are involved in growing their own plants.

Finally, the P.I. for the project is experimenting with growing other produce and herbs. Finding other produce that grows well will allow for a greater variety of produce and nutrients in future endeavors, with the goal of increasing vegetable and fruit consumption among this target population.

Strengths and Limitations

Strengths of this project included a design and method of providing fresh tower grown produce and herbs at no charge to older adults. The idea that the produce was provided with no cost is a strength for those on a limited income.

The research team had a good response with eager interest on the date of consent. Participants who had not been out of their quarantined locales prior to the start of the project seemed interested in the project and its mission, along with the possible benefit of getting out of their home and seeing other people in a safe environment. Participants would ask for recipes and

information about how to identify the herbs, for example, pointing to interest in using the produce and herbs that the project supplied.

Another strength of the project was that the drive-through distribution allowed participants an opportunity to talk safely with the student research team and the senior center staff through their car window and at a distance. The research team wore masks and were very respectful and responsible regarding participants' safety and health. It is possible that feelings of isolation and social support were improved by this project during the pandemic as many people, including older adults, were said to have suffered from isolation and a lack of social interactions.

Although this project had numerous strengths, the most discussed and notable limitation was the inability to conduct the education in person due to the COVID-19 pandemic. Having to conduct the project and research remotely impacted the ability to offer cooking demonstrations and provide the social support that could have been beneficial for increased intake. One common theme found during the interview sessions was the desire to learn more about the use of the herbs including identifying, drying, and storing them, along with recipes for herb and produce use. Interactions between the student research team and the older adults could have demonstrated to the older adults the ease of accomplishing these tasks. Additionally, group education can frequently encourage peers in attendance to expand variety and/or include foods that they might not have tried in the past.

A second limitation of the project design, that was also impacted by the COVID -19 pandemic, was that the produce was distributed in two bags per participant, one greens, and one herbs. The produce and herbs were in two separate bags, but all the herbs, for example, were combined. This method was decided on to distribute the produce safely while limiting the amount of waste produced, but it did not allow participants a choice of which herbs or produce varieties they received. Due to the pandemic, we were unable to distribute the produce in a different manner such as separate bowls where participants could have used tongs and taken what and how much of each variety or product that they desired. Once produce and the herbs that were available each week were cleaned, they were put in sealed bags for distribution. The research team did not label what was in the bags other than to mark them as "greens" and "herbs", thus making it challenging for the participants to know what some items were. The specific herbs and greens varied from week to week, so it makes sense that a way to label and separate the produce and herbs was one suggestion that almost all participants had in common and shared in their project interview. This may be an indication that the participants were using the produce and herbs but also that they may have had improved utilization with more descriptive labeling.

The format of delivery changed during the project. At the start of the project, the produce was delivered through vehicle windows in a drive-through fashion. Once the center reopened, the produce was taken to the Activity Director's office and set out for pick up, eliminating the interaction between the senior subjects and the research team. The number of participants picking up inside the center declined. The reason for the decline is unknown, although it could have been the factor of safety with some participants not feeling ready to venture out inside a building in public yet. Also, as the center reopened, classes and other activities began to be offered in a safe socially distanced manner. The decline could have been due to less participants coming to the center as they were not enrolled or participating in structured classes, but rather were accustomed to coming to the center to socialize and talk to other members rather than attend classes.

Conclusions


The number of adults aging in the United States and worldwide is rising, and maintaining health is imperative for them to enjoy continued quality of life, independence, and potentially to avoid costly medical care. The need for increased vegetable and fruit consumption amongst the older adult population is necessary to increase immunity and protect against diseases. Vegetables and fruits contribute many vitamins, minerals, and phytochemicals that are not only important for maintaining daily nourishment, but also may help decrease mortality rates among older adults. Tower garden produce and herb provisions are an idea that seemed to have a positive effect on those receiving the items. Inclusion of nutrition education in the future should strengthen the impact of these types of interventions.

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Biographies

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