

## Promoting Older Adult Health through a Blackberry Garden and Cooperative Extension Education Program at a Rural Senior Center

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### Abstract

Kentucky's older adult health is poorly ranked as 48<sup>th</sup> in the nation. Despite the well-known health benefits of consuming a diet rich in plant-derived phytonutrients, daily fruit and vegetable consumption by Kentucky older adults is low. To promote consumption of phytonutrient-rich blackberries the BerryCare Cooperative Extension program was launched at a rural Kentucky senior center. The program provided a blackberry garden consisting of forty thornless semi-erect blackberry bushes, six blackberry-themed education lessons and recipe cards. Data collection included interviews with older adults, observation of older adults, plate waste study, anthropometric measurements and a demographic survey. Participants were predominantly prehypertensive non-Hispanic females in the overweight/obese category (n=28). Interviews (n=11) and observation revealed excitement, gratitude, and enjoyment over the blackberries but not for the lessons. The discussions about blackberries did however increase socialization among older adults by fostering conversations across social cliques about gardening and food memories. BerryCare is a low-cost, sustainable, meaningful program that can be replicated in other settings.

**Keywords:** older adults, nutrition education, blackberries, garden, rural.

### Introduction

Out of 50 states in the United States of America (U.S), Kentucky older adults are ranked among the least healthy in the nation with the state being ranked 48<sup>th</sup> in terms of senior health [1]. A diet rich in fruits and vegetables has been shown to reduce oxidation and inflammation, the hallmarks of most chronic diseases and poor health [2]. Fruits and vegetables contain a variety of vitamins, minerals, and plant-based substances known as phytonutrients that can help suppress cell damage commonly produced by oxidation and inflammation [3,4]. Unfortunately, among Kentucky older adults, fruit and vegetable consumption is considerably low with only 8.3% of Kentuckians aged 65 years and older eating at least two fruits and three vegetables per day [1].

Along with poor produce consumption, 5.2 million U.S. older adults were considered food insecure and more than a quarter of seniors had an income below the U.S. federal poverty line, with the prevalence increasing with lower socioeconomic status [5]. Phytonutrient-rich berries, including strawberries, cranberries, blueberries, blackberries, and raspberries can help improve health [6], but they are cost prohibitive as the average older adult in Kentucky may not have the resources to purchase these berries for consumption.

The purpose of this paper was to assess the acceptability of an onsite blackberry garden that was implemented in conjunction with the land grant university's Cooperative Extension education program- *BerryCare*, among older adults attending a senior center in central Kentucky. More specifically, we were seeking to determine if the older adults would eat the blackberries; how the center used the berries; whether the older adults would help care for the blackberry bushes; if any health outcomes changed following the intervention; and if the older adults liked the content of the *BerryCare* education lessons.

### Materials and Methods

Details of the community and organizational relationships that facilitated the implementation of the *BerryCare* program are published elsewhere [7]. In short, the University of Kentucky Superfund Research Center's Community Engagement Core developed the *BerryCare* Cooperative Extension education program in partnership with a senior citizens center in central Kentucky and the university's Cooperative Extension Services. Forty semi-erect, thornless blackberry bushes were planted at the senior center in the spring months of 2017. With long-term sustainability and cultural appropriateness in mind, blackberries were chosen because they grow well throughout Kentucky and when properly cared for, can yield berries for 8 to 15 years [8]. The Kentucky County Family and Consumer Sciences and Horticulture Extension agents were involved in program implementation which included the blackberry garden establishment and the *BerryCare* education series (Table 1).

**Table 1:** *BerryCare* Cooperative Extension Program’s Six Blackberry Lessons and Plate it Up Kentucky Proud Recipes.

<b><i>BerryCare</i>’s Six Blackberry-themed Lessons</b>	<b>Six Plate it Up Kentucky Proud Blackberry Recipes</b>
1. Building a Blackberry Community	Berry and Basil Pizza Crisp with Honey Balsamic
2. Protect Your Body from Pollution with a Healthy Lifestyle	Blackberry and Basil Omelet
3. Protection from Pollution with Phytonutrient Rich Berries	Blackberry and Basil Spritzer
4. When Blackberries and Other Berries are in Season	Blackberry and Cucumber Salad
5. Blackberry Varieties and Plant Establishment	Blackberry Basil Grilled Cheese
6. Blackberry Growth and Maintenance	Blackberry Vinaigrette

Along with the blackberry garden, the agents presented six blackberry-themed lessons [7] at that senior center from February through July 2017 and then repeated lessons 1- 4 in late spring of 2018 (Table 1). Because blackberries take two years to produce fruit, the first harvest occurred mid-June through July 2018 in which the Kentucky County Horticulture agent provided technical maintenance oversight. A *Plate it Up! Kentucky Proud* blackberry recipe card and food sample accompanied each lesson. The *Plate it Up! Kentucky Proud* recipe program features at least one Kentucky specialty crop as an ingredient, which blackberries are considered [9]. The recipe cards were distributed throughout Kentucky through the Family and Consumer Sciences Extension agents and were used in their programs, such as *BerryCare*. The University of Kentucky Office of Research Integrity Institutional Review Board approved all study procedures (#43452).

**Recruitment of Participants**

This longitudinal study design included a voluntary convenience sample of community-dwelling, non-institutionalized older adults aged 60 years or older that attended the county senior center. Participants were recruited through advertisements in the monthly senior center calendar and from the encouragement of the senior center director and manager. Participants were excluded if they were cognitively impaired, as determined by the senior center. Study personnel obtained written informed consent from the interested older adults, yielding 28 participants.

**Data collection**

Multiple methods of data collection were used to provide context for the results of this paper, including interviews with seniors, demographic questionnaires, anthropometrics, observation, and a plate waste study. The University of Kentucky Superfund Research Center’s Community Engagement Core program manager, a registered dietitian, provided direct oversight for all research collection procedures, observed all *BerryCare* lessons in 2017 and 2018, assisted with the plate waste study and all data collection, and conducted other routine visits to the senior center. These observations provide supplemental information concerning how the seniors interacted with each other and responded to research staff and the overall study.

**Interviews with senior center participants**

We conducted face-to-face structured interviews with a total of 11 senior center participants in 2018 including five *BerryCare* participants and six non-participants. Non-participants included three individuals who declined to participate previously and did not listen to the education lessons or complete any pre- or post-lesson questionnaires or anthropometric measurements. Non-*BerryCare* participants still had access to the blackberry bushes and blackberries. Three other non-participants included newcomers, or individuals who were new to the center and were not present at the time of initial recruitment. The interviews lasted anywhere between 7-22 minutes.

The interviews with senior center participants were conducted to inquire about their perceived benefit of attending the senior center, their feelings toward the blackberry bushes and their primary source of blackberries, their use of the senior center blackberry bushes, if they enjoyed the education lessons and recipes, and suggestions for future program improvement. Interviews with newcomers and other non-participants investigated if they had an opportunity to enjoy blackberries from the senior center blackberry bushes and if so, how they prepared the berries for consumption. Questions regarding suggestions for program improvement and interest in future involvement were included during interviews with *BerryCare* participants and newcomers. Interviews with non-participants also asked why the participant did not wish to participate. Researchers did not interview participants in 2017 because the blackberry bushes were not fruitful at the time.

**Questionnaires and anthropometric data collection**

After obtaining consent, participants were asked to fill out paper copies of questionnaires at the beginning and end of each blackberry season (February and August of 2017 and 2018). The questionnaires were reviewed by nutrition and aging experts from the University of Kentucky. Demographics were collected as were self-reported health questions derived from the Behavioral Risk Factor Surveillance System Survey Questionnaire (BRFSS) [10]. Trained undergraduate and graduate students collected anthropometric data from each participant. Height was assessed using a portable scale (Seca 213); weight was measured using a scale (Omron HBF-516B); Waist circumference (three measurements) was obtained, and blood pressure were taken with an automated machine (three measurements).

Physical performance was assessed with the Short Performance Physical Battery test (SPPB) [11]. Poor performance on this test predict future nursing home placement, disability, and mortality [11]. The SPPB assessed mobility of older adults by measuring the categories of balance, strength and gait speed as an older adult performs a standing balance, chair stands, and an eight-foot walk, respectively [11]. Performance within each category is scored on a scale of 0 to 4 [11]. A summary performance score is generated by summing each of the three category scores to give a final score ranging from 0 to 12, in which higher scores indicate higher performance: 0-5: poor function, 6-9: moderate function, and 10-12: good function [11]. Participants were offered a \$10 gift card in exchange for completing questionnaires and anthropometric measurements.

**Blackberry plate waste measurement**

In June 2018, we conducted a blackberry plate waste study, utilizing the weighing method. Plain blackberries were served as ~130-150-gram portions (~1 cup serving) in labeled bowls to older adults previously consented, wishing to participate, and in attendance at the senior center on one day. We served blackberries during a “free period” when participants played cards, filled in crossword puzzles, read, or chatted with their social group. We collected the bowls and weighed any remaining berries using a food scale (*Etekcity Kitchen Food Stainless Scale 11lb/5kg*). Participants with poor dentition, diverticulosis, or who did not wish to participate, were not asked to consume the berries.

**Statistical analysis**

The quantitative data derived from the questionnaires, anthropometric measurements, and plate waste measurements were analyzed using SPSS v.24. Descriptive statistics for demographics, physical measurements, and plate waste

measurements included calculation of percentages, means, and standard deviations. The three measurements that were taken for systolic and diastolic blood pressure and waist circumference were averaged together and the average was used in statistical analysis. Paired t-tests were used to compare pre- and post-weights of blackberries served during the plate waste measurement. Differences were considered statistically significant at  $p < 0.05$ .

**Results**

Questionnaires and anthropometric measurements were obtained at baseline from 28 older adults in 2017. Due to an 82% attrition rate, we were not able to compare changes from pre- to post-intervention measurements. Post-measurements were not collected due to lack of interest and refusal (n=18), not being present on the days post-measurements were obtained (n=3), or they no longer attended the center (n=2).

Therefore, the results highlight only the baseline demographic characteristics for all 28 *BerryCare* participants as well as the five participants who also agreed to be interviewed (Table 2). The majority of participants were female and non-Hispanic. Half of the participants self-identified as black and the remaining half as white. The average BMI was  $31.3 \text{ kg/m}^2 \pm 7.3$ , which is considered Class I Obese [12]. Average blood pressure was considered stage 1 hypertensive with systolic at  $131.4 \text{ mmHg} \pm 20.9$ . Average diastolic blood pressure was  $78.9 \text{ mmHg} \pm 11.6$ . Short Performance Physical Battery Test (SPPB) revealed moderate physical function scores for chair ( $2.2 \pm 1.5$ ), speed ( $2.6 \pm 1.3$ ), and balance ( $2.8 \pm 1.6$ ) with a total score of  $7.6 \pm 3.8$ . The SPPB maximum score for chair stand, speed, and balance are all 4 points each summing to a total maximum of 12 points. Additionally, participants had on average 2.6 self-reported diagnosed chronic diseases.

**Table 2:** All participant and *BerryCare* Interviewee Demographic Characteristics.

Characteristics	All (n=28) %*	<i>BerryCare</i> Interviewees (n=5) %
<b>Mean age, years (SD)</b>	72.0 (9.02)	71.6 (5.0)
<b>Gender</b>		
Male	28.6	40
Female	60.7	60
No Answer	10.7	0
<b>Ethnicity</b>		
Not Hispanic or Latino	53.6	40
Hispanic or Latino	0	0
No Answer	46.4	60
<b>Racial Identity</b>		
Black	39.3	40
White	39.3	60

No Answer	21.4	0
<b>Average BMI (kg/m<sup>2</sup>) (SD)</b>	31.3 (7.3)	29.4 (5.1)
<b>Average Waist Circumference (cm) (SD)</b>		
Male	41.7 (6.7)	43.0 (0)
Female	43.6 (4.8)	39.8 (7.7)
<b>Blood Pressure, mean (SD)</b>		
Systolic	131.4 (20.9)	135 (23.9)
Diastolic	78.9 (11.6)	15.7 (16.4)
<b>Physical Function Test</b>		
Average Balance <sup>†</sup> (pts.) (SD)	2.8 (1.6)	3.3 (1.2)
Average Speed <sup>†</sup> (pts.) (SD)	2.6 (1.3)	1.8 (0.5)
Average Chair <sup>†</sup> (pts.) (SD)	2.2 (1.5)	2.0 (1.6)
Average Total Physical Function <sup>§</sup> (pts.) (SD)	7.6 (3.8)	6.8 (3.0)
<b>Health Condition</b>		
Heart Attack	14.3	20
Angina	3.6	20
Congenital Heart Disease (CHD)	10.7	0
Stroke	17.9	40
Diabetes	25.0	80
Asthma	17.9	0
High Blood Pressure	60.7	100
Cancer	7.1	20
Chronic Obstructive Pulmonary Disease (COPD)	14.3	20
Emphysema	10.7	0
Bronchitis	10.7	0
Arthritis	42.9	40
Gout	7.1	20
Fibromyalgia	14.3	0
Kidney Disease	3.6	20
<b>Average Health Conditions per Person</b>	2.6	3.8

\*At baseline there was a total of 28 adults that were consented to participate in the intervention and had baseline anthropometrics measured and questionnaire data collected. A total of 11 older adults were interviewed, but only 5 were consented participants in which we were able to collect their anthropometric measurements. The other 6 interviewees were considered non-participants because they either chose not to participate in the *BerryCare* program (3 older adults) or they joined the senior center at a later time and missed the opportunity to have baseline measurements collected (3 older adults).



In terms of *BerryCare* interviewees, the majority were female with an average BMI of  $29.4 \text{ kg/m}^2 \pm 5.1$ , which is considered to be in the overweight range and average blood pressure of  $135 \text{ mmHg} \pm 23.9 / 75.7 \text{ mmHg} \pm 16.4$ , indicating that on average interviewees had high blood pressure or hypertension. Interviewees were shown to have an average of 3.8 self-reported diagnosed chronic conditions. Their overall physical function score of  $6.8 \pm 3.0$  was considered moderate. Sixty percent of the interviewees self-identified as white, 40% as black.

### ***Blackberry harvesting, use, and plate waste***

Approximately 13 pounds of blackberries were harvested by the partnering local detention center, between June through mid-July of 2018. The older adults did not participate in the care, maintenance or harvesting of blackberries. The senior center, which relies heavily on older adult volunteers, utilized the berries in a combination of low labor activities, such as serving the berries plain to seniors during snack time or simply sending pints of blackberries home with them. When possible, the senior center included blackberries in the Meals on Wheels food packages that were provided to home-bound seniors.

To assess the acceptability of the blackberries, we conducted a single time plate waste measurement. Results demonstrated that the older adults consumed 98% of the 150 g blackberry portions (~1c serving) ( $p < 0.001$ ,  $n = 10$ ). The few pieces left behind were browned or otherwise considered inedible. Furthermore, participants expressed excitement and gratitude when presented with their carefully measured portions. Many participants asked for a second helping or if they could take some home to enjoy later and share with family or neighbors.

### ***Participant reception of BerryCare program education lessons***

The enthusiasm to consume berries, however, was not reflected in the *BerryCare* education lessons (Table 1). Due to a lack of interest in learning about caring for, and/or maintaining the blackberry bushes, we repeated only the first four lessons in 2018. We asked in interviews about the education and lessons provided throughout the program and participants either were unable to recall the education they received or reported that they only liked the lessons when snacks or beverages were provided.

In addition to receiving a nutritionally rich snack, *BerryCare* also provided an opportunity for seniors to engage with each other in a way that center staff had not previously observed. The director of activities at the center noted that the older adults had their own cliques as evidenced by their sitting in the same place with the same people each day. But, when the seniors were asked to share memories about blackberries and gardening, they all had something to say – even seniors known to be shy or quiet. The opportunity for structured reminiscence broke down social barriers as seniors recalled picking berries with their parents, making blackberry jam with their grandparents, or running to wild patches of berries with their friends. A few told stories of returning to half-forgotten patches with their grandchildren, repeating the history they so fondly had lived and creating new memories for future generations. Everyone seemed to have a story about blackberries and this nostalgia promoted socialization between established cliques.

In this way, *BerryCare* fit seamlessly into the aspirations many seniors held for attending the center. In interviews, all participants stated that their primary reason for attending the center was the connections they were able to make with other older adults. One participant made this point exceptionally clear: “I have met a lot of new people that I probably never knew if I hadn't been coming down here.” Another responded, “I come for one reason only, because I enjoy being around the people.”

Additionally, the blackberry bushes and nearby community garden (planted and maintained by the partnering local detention center, independent of this project) provided fresh produce, and to many seniors, this concretely symbolized the support of the broader community. When specifically asked what they thought of the gardens, one senior responded “[it shows] that they think about us” while another shared “I think what you all do, coming out here and doing that, it's great to have out here.” Another simply stated, “I think that it's beautiful.” While a few participants specifically mentioned the products from the gardens (for example: “I like [the garden]. They gave me some of the watermelon last year”), seniors expressed more gratitude for the labor and resources that went into growing fresh produce right at the senior center.

During interviews, many participants discussed the challenges of affording fresh fruits and vegetables, noting a challenge that many food insecure individuals experience. “On a fixed income,” one participant shared, “or you get a check every month after you've worked all your life – you can't go to the grocery and buy apples and oranges.”

A few participants discussed previously mentioned strategies for navigating food insecurity challenges, such as clipping coupons and noting sale items of desired foods. A limited food budget led participants to straddling the line of looking for and desiring affordable fresh produce while in practice, purchasing frozen or canned items due to lower relative cost and convenience. When reflecting on recent years, most participants reported rarely consuming blackberries prior to participation in the *BerryCare* program, with a few consuming blackberries every couple of months or just a couple times a year. As one participant stated, “I don't get many chances to eat blackberries.... They cost way too much for that little bitty thing they gonna give you.” All participants reported that the primary place they obtained blackberries was from the senior center.

We interviewed non-*BerryCare* participants to better understand why some seniors did not wish to participate in this project. This information was important in helping the research team make adjustments to improve the project for implementation at other future sites. Non-participants however, struggled to verbalize the reason behind their decision to not participate. One participant mentioned that they didn't participate because they did not like the blackberry recipes that were sampled during the lessons. All non-participant interviewees expressed interest in participating in the *BerryCare* program in the future and encouraged the team to “keep doing what you're doing.”

## Discussion

Results of this study found that an onsite blackberry garden at a senior citizens center aligned very well with accomplishing two pillars of the Older Americans Act nutrition program, to improve nutrition and socialization among older adults [13]. Blackberries were a well-liked fruit choice among the seniors that promoted increased fruit consumption, as well as generating an unintended, positive, and important consequence of expanding socialization opportunities among older adults. The education lessons, while not providing the depth of engagement or education primarily anticipated, did provide a positive rupture to the day-to-day routines of older adults as they were allowed to reminisce and share their experiences with one another. The lack of engagement by the older adults in caring for the blackberry bushes did further solidify an existing community partnership between the senior center and the detention center. However, their lack of engagement with data collection did prevent the research team from collecting and reporting post-intervention measurements to assess change in health outcomes. The plate waste study and observations at the senior center however, demonstrated that participants consumed and enjoyed the blackberries.

The *BerryCare* program provided more than nutritive benefits. Participants received emotional benefits as social boundaries broke down through the sharing of memories and experiences. This was a key theme to emerge from this study, which articulate with previous research findings that demonstrate how participants value local, quality fruits and vegetables for the emotional and psychological meaning beyond nutritional or medicinal features [14]; as well as how memories imprint foods with special meaning [15]; and the ways in which food can intervene in social relationships in positive (or negative) ways [16]. The social setting of the senior center, in combination with the specific blackberry education lessons, provided the framework for structured reminiscing that broke down social boundaries and opened conversational doors. Similar results have been observed nationally and internationally in the sharing and consumption of beverages [17], meals [18], and culturally significant foods [19,20]. The *BerryCare* program allowed participants to share their own degree of expertise, however basic, elementary, or personal. This demonstrates that even though participants did not latch onto the lesson topic of how good nutrition may help protect against environmental pollution, they did get excited about the blackberries themselves because of personal experiences. The older adults ate the blackberries at the senior center and wanted to take berries home to consume, which was a very important outcome to our research team considering that fruit consumption is low among Kentucky older adults [1].

Moreover, sharing their past experiences led to the unexpected and unique way in which the senior center built its blackberry community (lesson 1) which contributed to programmatic success. The older adults formed a community through sharing their lived experiences about blackberries with those within and outside of their usual social circles. The comradery likely contributed to their willingness to try the non-traditional healthy blackberry recipe samples that included an omelet, pizza, and a

grilled cheese sandwich. Previous research demonstrates how community food events play a large role in what foods are considered acceptable [21] and the critical relationship between sociality and adequate food intake among older adults [22]. Importantly, not only is it necessary to consider the broad, structural processes that take place to satiate hunger, it is also critical to consider the unmeasurable and ambiguous nature of eating and its stimulation of other bodily senses [23]. Recognizing and responding to the psychological and emotional aspects of food consumption may help support the intake of a variety of healthy foods. In short, when attempting to promote the consumption of healthy foods, it is important to observe for positive and negative psychological and emotional responses to certain foods as an individual's response will impact their receptiveness and cooperation with a nutrition education program [24].

Despite program successes, there were several challenges with offering the *BerryCare* program. Limitations included no participation of the older adults in the maintenance or harvesting of the blackberries; dismal participation in the education lessons offered with the *BerryCare* program; and refusal by most participants to provide follow-up measurements. This lack of interest in engaging with the blackberry bushes – despite enjoying the fruits of someone else's labor – is likely due to the low physical function and relatively high burden of health conditions present among participants (Table 2). The older adults that regularly attended the senior center self-reported having 2.6 chronic health conditions, had varying levels of agility, cognition, and health literacy. While they did not (or could not) walk across the parking lot and up a small, grassy hill to the blackberry bushes, or show much interest in the lessons, they received, consumed, and enjoyed regular doses of phytonutrient-rich blackberries over the course of the season. Furthermore, seniors expressed gratitude for the labor and resources that went into growing fresh produce on site at the senior center, which demonstrate the “social and affective experiences of eating” [18], as they moved beyond a narrow focus on individualized needs and desires for fresh produce.

Regarding the lessons, the underlying goal of the *BerryCare* program was to teach participants about the health benefits of phytonutrient-rich plant-based foods, with a particular focus on berries. A lesson specifically focused on how berries may help negate the negative effects of environmental pollutants to potentially protect against cancer and other chronic diseases [2,25] was novel to *BerryCare* program participants, but it was not interesting enough for them to recall during interviews. The information presented in each lesson was intended to interest the audience enough in the blackberries to consume them, but it seemed to be their past experiences with blackberries that prompted them to consume the berries rather than information presented during the lessons.

The high attrition rate prevented *BerryCare* researchers from assessing changes in anthropometric measurements. We were not able to recruit any of the study drop-outs for an interview to help understand why they did not participate in post-intervention measurements, but many participants had voiced that they come

to the center to be around people and to receive a free, hot meal. Therefore, it was not surprising that the majority of this particular older adult population did not express a great deal of motivation to be involved in a research project.

### Conclusion

In conclusion, the *BerryCare* program performed at a much deeper level or function by providing a different and unexpected food experience that positively disrupted the day-to-day routine of the older adults. Similar to the foods provided in the congregate meals, blackberries are nutrient-rich, but in this situation, they also generated an emotional and social richness experienced by the older adults that fed their individual bodies while nourishing new relationships as they shared stories and memories stemmed from the blackberries. The *BerryCare* program provides an example of a low-cost, meaningful program that provides free and sustainable phytonutrient-rich produce to older adults while facilitating a bidirectional exchange of knowledge among participants.

The results of the current study suggest that to move people towards the desired outcome of consuming healthy foods, existing nutrition and food assistance programs and other nutrition programs may better serve their clients by responding to lived experiences and building opportunities to share them into lesson outlines and outreach events. Giving clients the time to have a guided discussion about their memories and experiences may increase the likelihood of those unfamiliar with the foods to try them, for others to continue eating the foods, or for some to return to eating a particular food. No one comes to nutrition education a blank slate [26-29]. Rather than a confrontational or “banking” method of nutrition education, different types of experts can work together to explore the multiple meanings and benefits of various foods [30].

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### Conflict of interest

The authors have no conflict of interests to report.

### Role played by each co-author declaration

A.K. developed the presented idea; carried out the experiment; wrote the manuscript with support from K.O., T.S., and D.B. The intervention was designed by D.B. with assistance from T.S. and A.K. and K.O. All authors discussed the results, provided critical feedback and contributed to the final manuscript.

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