

Behavioral Economics Strategies and Vegetable Consumption Among Low-Income  
Children

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Black girls who dare to dream.

## **Abstract**

Children from a low socioeconomic background are at increased risk for becoming obese, which underscores the importance of encouraging healthful behaviors such as vegetable consumption. Several factors influence child vegetable intake, including whether children like vegetables and if vegetables are available for consumption. Researchers have attempted to improve child vegetable intake in the school setting through the use of behavioral economics-informed changes in the cafeteria, where the social and physical environment is manipulated in a way to ‘nudge’ children to make healthier choices. Interventions grounded in behavioral economics have been shown to improve vegetable intake in the school setting but have not been thoroughly explored in the home food environment. The latter is an ideal setting in which to improve vegetable consumption because children consume the majority of their daily calories at home. This dissertation investigated the feasibility and effectiveness of behavioral economics strategies to improve vegetable intake at dinner meals among children aged 9-12 residing in households receiving food assistance. Included in this dissertation were three studies which determined the feasibility of implementing behavioral economics strategies (Phase 1), measured the effectiveness of behavioral economics strategies to increase child vegetable intake (Phase 2), and explored adolescent involvement in home food preparation.

***Exploring the Feasibility of Implementing Behavioral Economics Strategies to Increase Vegetable Intake, Liking, and Variety Among Children Aged 9 to 12 Residing in Food Assistance Households (Phase 1)***

Phase 1 was a formative study that aimed to identify facilitators and barriers caregivers may experience when implementing strategies during dinner preparation and mealtime. One-time, in-home observations of dinner preparation and mealtime were conducted with caregiver/child dyads (n = 20). Survey data to assess vegetable availability, parent and child vegetable liking, and household food security were collected. Facilitators included liking of most vegetables by caregivers and children, and home vegetable availability (most families had 7-21 different types of vegetables available in the home). Barriers included perceived time constraints, lack of appropriate vegetable types or utensils/dishware, and concerns about child involvement in food preparation. Based on Phase 1 data, nine behavioral economics strategies were selected for further evaluation in a randomized controlled trial (Phase 2).

***Testing the Effectiveness of In-Home Behavioral Economics Strategies to Increase Vegetable Intake and Liking Among Children Residing in Households that Receive Food Assistance (Phase 2)***

The objectives for Phase 2 were to 1) to determine the 6 of 9 most effective and feasible behavioral economics strategies, and 2) to evaluate if 9 behavioral economics strategies increase vegetable intake, liking, and availability during a randomized controlled trial. Over the course of six weeks, caregivers in the intervention group (n = 39) incorporated one new strategy/week. Caregivers in the control group (n = 10) were not assigned

strategies. For Objective 1, parent-reported food records (3 days/week) were used to assess child vegetable consumption at dinner meals on the days that strategies were implemented. Caregivers in the intervention group rated the level of difficulty for assigned strategies (1 - not difficult to 10 - very difficult) during weekly phone calls. They also reported facilitators and barriers to implementing the strategies. No differences were observed between intervention and control group for mean child dinner meal vegetable intake for any of the nine strategies. However, pairwise comparisons for the intervention group showed that vegetable intake for the strategy of serving at least two vegetables for the dinner meal was greater than intake for two other strategies: 'Pair vegetables with other foods child likes' and 'Eat dinner together with an adult(s) modeling vegetable consumption'. Caregivers indicated that the strategies were generally not difficult to implement. For Objective 2, three 24-hour dietary recalls were collected at baseline and study conclusion from children to assess changes in overall vegetable intake. Also, at baseline and study conclusion, children and caregivers provided liking scores for 36 different vegetable types on a 10-point labeled hedonic scale (1-Hate it to 10-Like it a lot, or 'Never tried'). For the same 36 different vegetable types, home vegetable availability data were collected at baseline and study conclusion. Change in total daily vegetable intake (baseline to study conclusion) was not different between intervention and control group. No differences were noted in changes (pre-post differences) in caregiver and child mean vegetable liking ratings when mean liking was assessed across all vegetables. There were also no changes in home vegetable availability from baseline to study conclusion between intervention and control group.

### ***Adolescent Involvement in Food Preparation***

In the final study, the objective was to understand how low-income adolescents are involved in home food preparation. At the conclusion of Phase 2, if an adolescent (13-18 years) was present in the home, he or she was invited to participate in a semi-structured interview. Interview questions inquired about how adolescents were involved in food preparation. Interviews (n = 19) were analyzed using grounded theory methodology. Three levels of involvement in food preparation were described. Eight adolescents were highly involved with responsibility for cooking for others in the household. When deciding what to prepare at mealtimes, they considered preferences of others, variety, nutrition, and time. Some adolescents were highly involved in food preparation out of family obligation and cultural expectations. Those highly involved in food preparation indicated that the additional responsibilities produced stress. They also indicated that they were confident in their ability to cook without the assistance of an adult. Adolescents who were moderately involved in food preparation (n = 7) assisted with cooking. They reported that they enjoyed cooking. Four adolescents had low levels of involvement in food preparation and rarely, if ever, helped their caregiver with cooking. They were not expected or encouraged to be involved in food preparation by parents.



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## INTRODUCTION

This dissertation examined whether implementing behavioral economics strategies during dinner meals in the home by caregivers was both feasible and effective for increasing vegetable intake among low-income children between the ages of 9 and 12. Childhood obesity interventions often incorporate dietary behavior change (e.g., vegetable intake) (Kral, Kabay, Roe, & Rolls, 2010; Correia, O'Connell, Irwin, & Henderson, 2014; Leak et al., 2015), acknowledging that diet is an integral part of a healthy lifestyle. The importance of vegetable consumption is underscored in the 2010 Dietary Guidelines for Americans, which recommends that children consume both adequate amounts and a variety of vegetable types (USDA MyPlate, 2011). Despite recommendations, children continue to have insufficient intake of vegetables (USDA ARS, 2014). This is especially concerning for low-income (Kirkpatrick, Dodd, Reedy, & Krebs-Smith, 2012) and food insecure (Fram, Ritchie, Rosen, & Frongillo, 2015) children who may experience barriers to vegetable consumption such as limited vegetable availability. Thus, an intervention was developed and implemented as part of this dissertation research project to improve child vegetable intake among those residing in lower socioeconomic households.

One approach to improve vegetable intake among children used in the school setting is the implementation of strategies grounded in behavioral economics principles (Just & Wansink, 2009) that 'nudge' children into eating more vegetables (Thaler & Sunstein, 2008). For example, the HealthierUS School Challenge: Smarter Lunchrooms



(HUSSC:SL) is an initiative where eligible schools have the opportunity to implement techniques geared towards nudging children to make healthier choices during lunch (USDA Food and Nutrition Service, 2014). Of the 100 techniques (i.e., behavioral economics strategies) listed on the Smarter Lunchroom Self-Assessment Scorecard, 15 are dedicated to encouraging vegetable selection and consumption. One technique is to make sure “available vegetable options have been given creative or descriptive names” (USDA Food and Nutrition Service, 2014). This strategy was shown to be effective at increasing carrot intake among students aged 8 to 11 who were offered “X-ray Vision Carrots” (Wansink, Just, Payne, & Klinger, 2012). The intervention conducted as part of this dissertation was based on the implementation of behavioral economics strategies, as this is a promising approach to behavior change.

In addition to the school setting, researchers are exploring the home food environment as a location to intervene and encourage child vegetable consumption through the use of behavioral economics strategies (Cravener et al., 2015; Leak et al., 2015). For example, in a home-based four-week randomized controlled trial, Cravener and colleagues (2015) tested whether implementing several behavioral economics principles during meal and snack times improved vegetable intake among preschool aged children. The home environment is a promising setting to encourage healthy eating behaviors because children consume 66.1% of their daily kcals in the home setting (Poti & Popkin, 2011). Therefore, the intervention conducted as part of this dissertation implemented behavioral economics strategies in the home, recognizing of the importance of foods consumed at home in meeting dietary recommendations.

It is important to include caregivers in home-based dietary interventions. Caregivers play an essential role in household food availability (Birch & Davison, 2001), deciding what to prepare at mealtimes (Brown & Wenrich, 2012), role modeling (Draxten, M., Fulkerson, Friend, Flattum, & Schow, 2014), and the social environment (e.g., encouragement) (Faught, Vander Ploeg, Chu, Storey, & Veugelers, 2015). Furthermore, it has been shown that caregivers can effectively serve as change agents for the purpose of improving child diet and/or health status (Golan, 2006, Cravener et al., 2015).

However, the feasibility for caregivers to implement behavioral economics strategies in the home, for the purpose of increasing child vegetable intake, remains unclear. Several factors could impact feasibility including, time to plan and actually prepare the meal (Jabs et al., 2007; Mancino & Newman, 2007), child and caregiver vegetable liking, and food preparation knowledge and skills (Fulkerson et al., 2008; Brown & Wenrich, 2012; Berge, Hoppmann, Neumark-Sztainer, 2014). One must also consider that low-income households may encounter additional challenges that higher socioeconomic households may not (e.g., inadequate kitchen equipment needed to prepare vegetables and limited vegetable availability) (Landers & Shults, 2008). A key feature of this dissertation was to assess feasibility of the implementation of behavioral economics strategies by low-income caregivers by examining facilitators and barriers.

Lastly, this dissertation acknowledges that in low-income households, older children/adolescents may take on adult responsibilities (Burton, 2007), such as food preparation. Thus, a final study in this dissertation explored perceived involvement in

home food preparation among low-income adolescents residing in food assistance households (a proxy for income status).

In the following sections relevant literature was reviewed (Chapter 1). Then three chapters (Chapters 2, 3, and 4) report on two studies that address feasibility and effectiveness of behavioral economics strategies. In Chapter 5, a third study explored the role of low-income adolescents in home food preparation.

## **CHAPTER 1: LITERATURE REVIEW**

## 1.1 Childhood Obesity

In the United States, the prevalence of childhood obesity is a major public health concern. Obesity places children at increased risk for developing high blood pressure, elevated blood cholesterol, diabetes and a host of other conditions that continue into adulthood (Serdula et al., 1993; Gurnani, Birken, Hamilton, 2015). Obesity is characterized by an excess accumulation of body fat. Body mass index ( $BMI = \text{weight (kg)}/\text{height (m)}^2$ ) is used to categorize individuals based on weight status. Children with a BMI in the 85<sup>th</sup> to < 95<sup>th</sup> percentile are classified as overweight and those with a BMI  $\geq$  95<sup>th</sup> percentile are classified as obese (Kuczmarski et al., 2000). According to data from the 2011-2012 U.S. National Health and Nutrition Examination Survey (NHANES), 16.9% of children between the ages of 2 and 19 were obese and 17.7% of children aged 6 to 11 were obese (Ogden, Carroll, Kit, & Flegal, 2014). Obesity prevalence was lowest among non-Hispanic Asians (8.6%; 95% CI [5.7-12.7%]), compared to non-Hispanic whites (14.1%;  $p = 0.04$ ), non-Hispanic blacks (20.2%;  $p < 0.001$ ), and Hispanic (22.4%;  $p < 0.001$ ) children between the ages of 2 and 18 (Ogden, Carroll, Kit, & Flegal, 2014). There were no differences in obesity prevalence between girls and boys aged 2 to 19 (Ogden, Carroll, Kit, & Flegal, 2014).

Research suggests that an association exists between household income status and child weight status, as well as between food insecurity and child weight status. In a cross sectional analysis of 2001-2010 NHANES data, Kaur and colleagues (2015) found that children aged 2 to 11 years were more likely to be obese if they were food insecure and if they were low-income (based on poverty-to-income ratio  $\leq$  130) than children who were

food secure and residing in higher income households. Others have shown that children aged 6 to 11 were more likely to be obese if they were food insecure than children aged 6 to 11 who were not food insecure ( $p < 0.001$ ; Kaur, Lamb, & Ogden, 2015). In a cross sectional analysis of the 2003-2004 National Survey of Children's Health data, Lutfiyya et al. (2008) reported that 5 to 18 year old children residing in households  $\leq 150\%$  of the Federal poverty level were more likely to be overweight compared to children residing in households  $> 150\%$  of the Federal poverty level (Odds Ratio 1.54; 95% CI [1.54–1.56]).

## **1.2 Vegetable Intake and Relationship to Overweight/Obesity in Childhood, Food Security and Household Income**

Children in the U.S. are not meeting recommendations for vegetable intake (USDA ARS, 2014). The 2010 Dietary Guidelines for Americans recommend that girls and boys aged 9 to 13 consume 2 to 2.5 cups of vegetables, respectively, on a daily basis, including a variety of vegetables of different colors (e.g., dark green, red and orange), as well as beans and peas, and starchy vegetables (USDA MyPlate, 2011). Cross-sectional data from the Continuing Survey of Food Intakes by Individuals (CSFII) and NHANES showed that despite these recommendations, vegetable intake among children aged 2 to 19 has declined from 1989 to 2010 (Slining et al., 2013). According to a 2011-2012 report of What We Eat in America (USDA ARS, 2014), U.S. children (aged 2 to 19) were not meeting dietary recommendations for vegetable intake (0.93 cups) on a given day, with children between the ages of 6 and 11 consuming less than 1 cup (between 0.84-0.87 cups) of vegetables on a given day. Of the different varieties of vegetables, children in all age groups consumed dark green vegetables in lower amounts than any other

vegetable type (e.g., red and orange, starchy) (Nielson, Rossen, Harris, & Ogden, 2014; USDA ARS, 2014).

The relationship between child vegetable intake and weight status is unclear. Some epidemiologic evidence suggests that an inverse relationship exists between child weight status and vegetable consumption (Matthews, Wien, & Sabaté, 2011; Miller, Moore, & Kral, 2011). In a cross-sectional study conducted with mothers of 5 to 6 year olds, children who were overweight/obese consumed fewer vegetables than normal weight children (Miller, Moore, & Kral, 2011). However, only one of four longitudinal studies among children found an inverse relationship between child vegetable intake and weight status (Ledoux, Hingle, & Baranowski, 2011).

The relationship between child vegetable intake and food security and household income status is also unclear. In an analysis of NHANES 2003-2010, no significant differences in vegetable intake were observed between children (ages of 2 and 18) in three different family income to poverty ratio categories (< 130%, 130% to <349%, and  $\geq$  349%) (Kim et al., 2014). When Kirkpatrick et al. (2012) examined 2001-2004 NHANES data, low-income children ( $\leq$  130% of the poverty threshold) aged 2 to 18 years consumed more vegetables and legumes than children from the highest income group ( $>$  185%) (Kirkpatrick, Dodd, Reedy, & Krebs-Smith, 2012). In another study, among low-income fourth and fifth grade students recruited from San Diego schools, food insecure children had lower vegetable intake compared to children who were food secure (Fram, Ritchie, Rosen, & Frongillo, 2015).

### **1.3 Vegetable Liking and Intake**

One of the many factors that may influence whether children eat vegetables is their liking of vegetables (Gibson, Wardle, & Watts, 1998; Blanchette & Brug, 2005; Anzman-Frasca, Savage, Marini, Fisher, & Birch, 2012; Caton et al., 2013; Fildes, van Jaarsveld, Wardle, & Cooke, 2014). This relationship between vegetable liking and intake was observed in a study conducted by Gibson and colleagues (1998), where 9 to 11 year olds completed 3-day food records and provided liking ratings for 3 vegetables (tomatoes, carrots, and peas) using the following 5 point scale: -2 'hate it' to +2 'love it'. Results indicated that child vegetable liking ratings were positively related to child vegetable intake ( $p < 0.005$ ) (Gibson, Wardle, & Watts, 1998).

Repeated taste exposure is one strategy that has been used to improve liking of novel (Caton, et al., 2013), moderately disliked (Corsini, Slater, Harrison, Cooke, & Cox, 2013), and disliked vegetables (Lakkakula, Geaghan, Zanovec, Pierce, & Tuuri, 2010; Anzman-Frasca, Savage, Marini, Fisher, & Birch, 2012; Noradilah & Zahara, 2012; Fildes, van Jaarsveld, Wardle, & Cooke, 2014; Holley, Haycraft, Farrow, 2015). For example, Caton et al. (2013) examined if vegetable intake among preschoolers would increase after ten taste exposures of pureed artichoke (novel vegetable) offered in the daycare setting. At the conclusion of the study, preschoolers consumed significantly more artichoke than at baseline ( $p < 0.001$ ). In a study conducted by Corsini and colleagues (2013), caregivers prepared  $\frac{1}{2}$  cup of a target vegetable every day for two weeks for their 4 to 6 year old child. To identify the target vegetable, caregivers provided a list of six vegetables that they struggled to get their child to eat. Then the child ranked



the vegetables (1 = most liked and 6 = least liked). The vegetable that was ranked fourth was selected as the target vegetable. Child liking and intake of the target vegetable increased significantly from baseline to post-intervention. Lakkakula and colleagues conducted a study that explored repeated exposure of four vegetables (green bell peppers, carrots, peas, tomatoes) offered to low-income elementary students during lunch in the school cafeteria (Lakkakula, Geaghan, Zanovec, Pierce, & Tuuri, 2010). After the initial tasting of all four vegetables, if a child indicated that they “did not like” at least one of the four vegetables, they were placed in Group 1. Children that either reported “like it” or “like it a lot” for all four vegetables were assigned to Group 2. After tasting all four vegetables once a week for 10 weeks, 4<sup>th</sup> and 5<sup>th</sup> graders in Group 1 significantly improved their liking of carrots, peas, and tomatoes ( $p < 0.05$ ), whereas Group 2 did not experience any increases in mean vegetable liking.

The majority of the repeated exposure studies that have improved liking of novel, moderately disliked, and disliked vegetables have been conducted with young children (ages 2 to 6) (Anzman-Frasca, Savage, Marini, Fisher, & Birch, 2012; Noradilah & Zahara, 2012; Caton, et al., 2013; Corsini, Slater, Harrison, Cooke, & Cox, 2013; Fildes, van Jaarsveld, Wardle, & Cooke, 2014; Holley, Haycraft, Farrow, 2015). Fewer studies have explored if repeated exposure can improve child vegetable liking and vegetable intake among elementary aged children (Lakkakula, Geaghan, Zanovec, Pierce, & Tuuri, 2010; Lakkakula, Geaghan, Wong, Zanovec, Pierce, & Tuuri, 2011).

#### **1.4 Home Food Environment, Family Meals and Relationship to Child Obesity Risk and Vegetable Intake**

Children consume about two-thirds of their daily calories at home (Poti & Popkin, 2011), thus making this an optimal setting to alter child dietary behaviors. One aspect of the home food environment associated with child dietary behaviors is family meals.

A negative relationship may exist between the frequency of family meals and child BMI (Taveras et al., 2005; Fulkerson, Neumark-Sztainer, Hannan, & Story, 2008; Serrano, Torres, Perez, Palacios, 2014). Data from the 2003 National Survey of Children's Health showed that frequency of family meal consumption among non-Hispanic white children between the ages of 6 and 11 was inversely related to being obese (Rollins, Belue, & Francis, 2010). Findings were not statistically significant for children of other race/ethnicity groups. A secondary analysis of data from the Project EAT study found an inverse association between the frequency of family meals and BMI z-scores for adolescent girls and boys (Berge et al., 2014).

More consistent is the research that shows that eating together as a family is related to healthful dietary patterns including vegetable intake. In a study conducted with 2383 children recruited from 52 primary schools in London, children were more likely to meet 5-A-Day government recommendations, based on a single day of food diary questionnaire, if they reported that they always ate with their family at mealtime, in comparison to children who reported that they only sometimes or never ate with their family (Christian, Evans, Hancock, Nykjaer, & Cade, 2013). In another study, a

secondary analysis was conducted based on data collected from the *Home Environment Comparison Study*, a cross sectional study with families from low-income ( $\leq 250\%$  of federal poverty line) households in Chicago (Appelhans, Waring, Schneider, & Pagoto, 2014). The analysis explored the relationship between family meals, home-prepared dinner, and child vegetable intake. Data from 103 households were analyzed, including mostly Black and Hispanic families with a mean child age of 10 years. Excluding salad and fried potatoes, general vegetable consumption was positively associated with frequency of family meals.

## **1.5 Behavioral Economics**

### ***Overview***

Behavioral economics, a concept grounded in principles of psychology and economics (Just & Wansink, 2009), is based on the premise that the social and physical environment can be framed in a way to “nudge” individuals to make choices (Thaler & Sunstein, 2008; Heshmat, 2011). Behavioral economics strategies are presented in a subtle manner where individuals are unaware that they are being employed.

An essential component of behavioral economics is libertarian paternalism, whereby it is acceptable to shape choices but not restrict choices (i.e., individuals should have the option to opt-out) (Thaler & Sunstein, 2008). The requirement that choice not be restricted distinguishes behavioral economics strategies from traditional behavioral strategies. For example, hiding vegetables may increase child vegetable intake (Spill, Birch, Roe, & Rolls, 2011), but this is not a behavioral economics strategy because

children are unaware that vegetables are in the food and thus do not have the option to opt-out from eating them. In a qualitative longitudinal study, low-income parents indicated that hiding vegetables decreases opportunities to develop an appreciation for vegetables, which may impact the development of healthy dietary habits in the long run (Pescud & Pettigrew, 2014). Another example of a strategy that imposes restrictions on choice is banning junk food.

According to Thaler and Sunstein (2008), a choice architect is someone who “has the responsibility for organizing the context in which people make decisions.” The choice architect may vary depending on the setting and the circumstance. For example, if behavioral economics strategies were implemented during school lunch, the choice architects may be a food service director, a teacher, or anyone else who has the authority to make changes. In the home food environment, choice architects could be the primary food preparer or anyone who plays a significant role in the grocery shopping, food preparation, and/or mealtime routines (e.g., serving food, role modeling, etc.).

Altering the size and shape of vegetables (Liem & Zandstra, 2009; Olsen, Ritz, Kramer, & Møller, 2012), as well as giving vegetables attractive names are effective behavioral economics strategies that have increased child vegetable intake in the school setting.

Olsen and colleagues (2012) explored whether shape and/or size impacted child liking of 3 different vegetables (red peppers, cucumbers, and carrots) offered during a school intervention (Olsen et al., 2012). The study was conducted with Danish children between the ages of 9 and 12. Children liked their vegetables cut versus served whole, with slices

and sticks preferred over whole pieces and chunks. Shapes, such as stars, were preferred over slices and sticks. Another study, conducted with 8 to 11 year old children in New York, found that giving vegetables attractive names during school lunch (e.g. “X-ray Vision Carrots”) increased vegetable intake (Wansink, Just, Payne, & Klinger, 2012).

Behavioral economics strategies tested in schools and other settings may be appropriate for increasing child vegetable consumption during home dinner meals. The following sections will explore nine behavioral economics strategies that could be implemented in the home setting to potentially increase child vegetable intake.

***Pair vegetables with other foods the child already likes.***

Choices may be more desirable if presented in conjunction with a cue (i.e., a liked food) (Samson, 2014). Thus pairing vegetables with dips and/or liked foods may be an effective behavioral economics strategy.

Several studies have found that vegetable intake increases when vegetables are paired with dips (Johnston et al., 2011; Savage, Peterson, Marini, Bordi, & Birch, 2013). For example, in a randomized controlled study, once a week for 4 months children (middle school aged) in the control group were served raw vegetables (i.e., carrots, broccoli, and celery), while children in the intervention group were served the same raw vegetables with peanut butter (Johnston et al., 2011). At the conclusion of the study, children in the intervention group who were able to pair peanut butter with vegetables ate significantly more vegetables than children in the control group (Johnston et al., 2011). In another

study conducted with preschoolers, children consumed more celery and yellow squash when offered with a reduced-fat herb dip than when they were offered the vegetables alone without the dip (Savage et al., 2013).

The impact of pairing vegetables with actual food (vs. dips) on vegetable intake remains unclear. One study conducted with preschoolers found that children in the intervention group (i.e., served steamed broccoli on top of cheese pizza) did not consume more vegetables than children in the control group (i.e., served steamed broccoli as a side dish with cheese pizza) (Correia, O'Connell, Irwin, & Henderson, 2014). When pairing vegetables with other liked foods, it may be more effective to have the vegetable mixed in with the food (e.g., green peas mixed in with macaroni and cheese), rather than just placing the vegetable on top of the food. By mixing the vegetable in with the food, it becomes more challenging for the child to pick the vegetable out of the food.

***Make vegetables more easily available and visible than other foods at the dinner meal***

When vegetables are visible and physically convenient, children consume more vegetables. In a study conducted by Musher-Eizenman et al. (2010) children between the ages of 3 and 11 were served carrot sticks for an afternoon snack in the school gymnasium. Children were randomly assigned to sit at one of five tables, which were arranged lengthwise down the room. All children were provided one serving of carrots (i.e., 4 carrot slices). If children wanted more carrots, they got up from their seat and informed the experimenter. They were then able to take another serving of carrots, which was located in a serving bowl placed on the first table. Children were only allowed to

take one serving (i.e., 4 carrot slices) at a time. The study found that after controlling for child's age, the distance from the child's seat to the first table, where the carrots were located, predicted the number of carrots that were consumed.

Privitera and Zuraikat (2014) also conducted a study on how location of foods affects intake. A between-subject study design was used where 56 adults were assigned to one of three treatment groups: Apples Near (130 grams of sliced apples in arms reach and 37 grams of popcorn visibly located 2 m away on a counter top), Popcorn Near (37 grams of popcorn in arms reach and 130 grams of sliced apples visibly located 2 m away on a counter top), Both Near (130 grams of sliced apples in arms reach and 37 grams of popcorn in arms reach). Study participants in the Apples Near and Popcorn Near groups consumed more apples and popcorn, respectively.

### ***Serve vegetables before the rest of the meal***

By serving vegetables before the meal, children have the opportunity to choose and consume vegetables without competition with other foods. An intervention conducted with elementary students (grades K through 5) tested whether serving raw mini carrots, in isolation, prior to the school lunch meal, increased carrot consumption for the total meal (Redden, et al., 2015). On the control day, students could serve themselves pre-portioned amounts of milk, fruit, and carrots from the lunch line. The hot entrée was served by food service employees and included chicken tenders and buttered noodles. Children were also able to go back for second servings of fruits and vegetables. On the intervention day, children were served the same foods as previously mentioned, but they

also were given 2 raw mini carrots prior to entering the school lunch line. The study found that on the intervention day, children consumed more carrots (including carrots served first and carrots from the lunch line) than what was consumed on the control day. The importance of serving vegetables in isolation was also underscored by a study conducted by Harnack et al. (2012). These authors found that when preschoolers at a Head Start Program were served fruits and vegetables prior to lunch, vegetable intake did not improve. The authors suggested that vegetable intake did not improve because the vegetables were served in conjunction with fruit, which is often more preferred and therefore, could displace vegetable consumption.

***Use a dinner plate that shows the amount of vegetables to eat for a meal***

Physical characteristics (e.g., size) of a dinner plate may serve as a visual cue and behavioral economics strategy that influences both food choice and intake. Several studies have shown that there is a positive association between the size of dinnerware, how much food is placed on the dinnerware, and how much of the food is actually consumed (DiSantis et al., 2013; Wansink & van Ittersum, 2013; Libotte, Siegrist, & Bucher, 2014; Wansink, Van Ittersum, & Payne, 2014). For example, one study found that participants who used a larger plate (i.e., 32 cm vs. 27 cm) served themselves more vegetables and consumed more vegetables (Libotte, Siegrist, & Bucher, 2014). McClain and colleagues (2014) also suggested that the width of a dinner plate rim might influence food intake, as wider rims were associated with smaller portions of food placed on the plate. Lastly, dinner plates that are segmented and coupled with a food image can serve as an assortment allocation cue about the type and quantity of food to eat. A study



conducted by Reicks and colleagues (2012) placed photographs of green beans and carrots in separate compartments on cafeteria trays and found that consumption of both vegetables increased significantly for elementary students during lunchtime.

One of the objectives for Healthy People 2010 was to “Increase the proportion of persons aged 2 years and older who consume at least three daily servings of vegetables, with at least one-third being dark green or orange vegetables” (Healthy People 2010, 2000). To support this objective, in 2011 the USDA launched the MyPlate icon, a graphic representation of the appropriate proportions of fruit, vegetables, grains, protein, and dairy recommended at mealtimes (USDA, 2011). When the MyPlate icon is illustrated on an actual plate (i.e., dinnerware), the graphic may have the potential to improve dietary choices by serving as a visual reminder to not only place vegetables on the plate, but also for these vegetables to represent one-quarter of the foods included in the meal.

***Offer the child 2 vegetable options for dinner, one liked and one less liked***

Offering children the choice between a liked and less liked vegetable is an example of the behavioral economics concept known as asymmetric dominance and/or the decoy effect (Samson, 2014). Asymmetric dominance occurs when an individual preference for one option is presented with a less attractive option. It is hypothesized that if children are asked to choose between two vegetable options, one liked and one less liked, children will 1) make a choice and 2) most likely choose the vegetable that they like. Also, if children are involved in selecting the vegetable they may be more likely to consume the vegetable. A study has yet to evaluate if children given the choice between two

vegetables (one liked and one less liked) will increase vegetable intake in comparison to children not given the choice.

***If the caregiver puts vegetables on the child's plate, give more than usual. If children typically serve themselves, put a larger spoon than normally used with the vegetable so they get more than usual***

By making a larger serving spoon the default serving utensil for vegetable dishes, children may serve themselves, or be served, larger portions of vegetables. The food serving size is a visual cue that nudges individuals to consume the amount of food served on their plate, in their bowl, etc. (Wadhera & Capaldi-Phillips, 2014). Mathias et al. (2012) used a 2 X 2 within-subjects study design, where conditions varied by the amount of fruit (75 vs. 150 grams) and vegetables (75 vs. 150 g) served to children between the ages of 4 and 6 during dinner meals. Children who were served 150 grams of vegetables consumed more vegetables than those served 75 grams, regardless if served 75 or 150 grams of fruit (i.e., the portion size of fruit did not influence vegetable intake).

The influence of size of dinnerware on food intake may be mediated by the size of the serving utensil (Wansink, van Ittersum, & Painter, 2006; Fisher, Birch, Zhang, Grusak, & Hughes, 2013). For example, using a 2 X 2 within-subjects study design, Fisher and colleagues (2013) randomly assigned 60 children between the ages of 4 and 6 a serving bowl with varying amounts of macaroni and cheese (275 or 550 grams) and a serving spoon (teaspoon or tablespoon). When children were given the larger serving bowl of macaroni and cheese (i.e., 550 grams) and a tablespoon, they served themselves more and

consumed more than when assigned any of the other conditions. Additional studies are needed to determine if increasing the size of the serving spoon for vegetable dishes will increase vegetable consumption among older children.

### ***Eat dinner together with an adult(s) modeling vegetable consumption***

Caregivers have the opportunity to role model healthy eating, which has been shown to influence child dietary behaviors. Draxten et al. (2014) collected three 24-hour dietary recalls from 8 to 12 year old children. Child/caregiver dyads also completed surveys that assessed perceptions of parental role modeling of fruit and vegetable consumption during dinner meals and snack times. In comparison to children who did not report parental role modeling, children who reported parent role modeling of vegetable intake at snack times and salad intake at dinner, were more likely to meet dietary recommendations for fruit and vegetable intake.

### ***Serve at least two vegetables with dinner meals***

Serving more than one type of food is a visual cue that nudges consumers into eating more (Wadhera & Capaldi-Phillips, 2014). Studies have shown a positive association between the number of foods offered during a meal and how much consumers served themselves and how much they ate (Just, Lund, & Price, 2012; Levitsky, Iyer, & Pacanowski, 2012). The impact of offering more than one vegetable type on the selection and consumption of vegetables has been tested in several studies with children (Kral, Kabay, Roe, & Rolls, 2010; Roe, Meengs, Birch, & Rolls, 2013; Bucher, Siegrist, & van der Horst, 2014). In an experimental study, 7 to 10 year old children were assigned to

serve themselves from one of three fake food buffet lines where the following fake foods were available: 1) pasta, chicken, and carrots, 2) pasta, chicken, and green beans, or 3) pasta, chicken, carrots, and green beans (Bucher, Siegrist, & van der Horst, 2014).

Children who were offered two vegetables (both carrots and green beans) served themselves more vegetables than children who were only offered one vegetable. A study conducted by Roe and colleagues (2013) found that preschoolers offered three types of vegetables (cucumber, sweet pepper, and tomato) during snack consumed more vegetables than preschoolers only offered a single vegetable type.

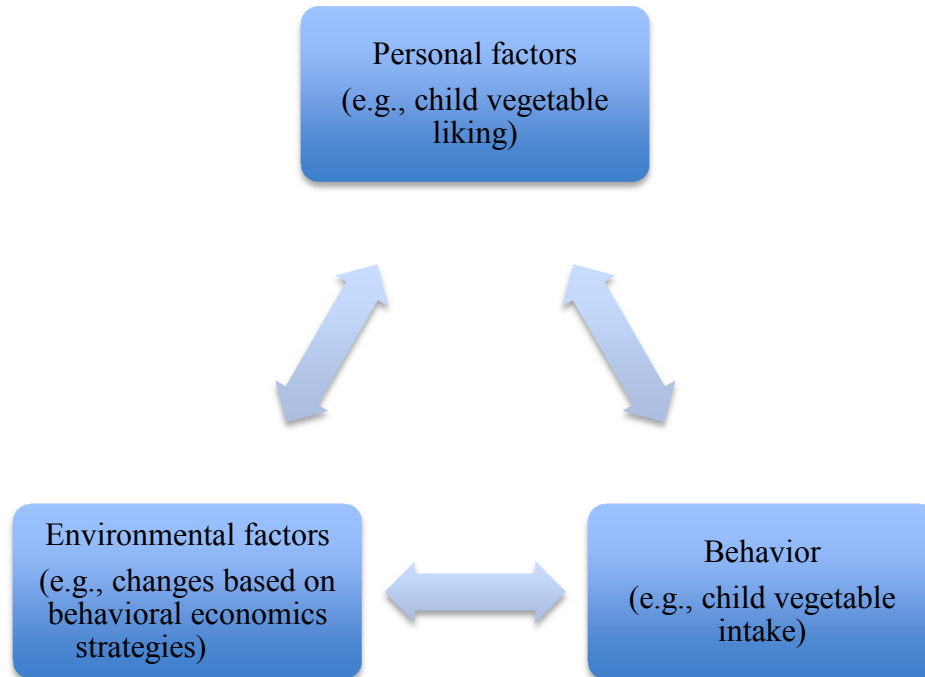
### ***Let the child help prepare vegetable dishes***

Involving children in vegetable preparation may be an effective behavioral economics strategy to increase child vegetable intake by utilizing the “IKEA® Effect” (Norton, Mochon, Ariely, 2011). The “IKEA Effect” is a concept that suggests that when individuals are involved in the labor process, they value their product more highly. In a series of experiments where college students were encouraged to build IKEA boxes, fold origami, and build LEGO® sets, researchers learned that the value students placed on their creation depended on whether or not they successfully completed their creation. Thus children may need to not only be involved in vegetable preparation, but they may need to be involved in the entire process to create the vegetable dish. One intervention study found that 6 to 10 year old children who helped prepare a dinner salad (i.e., select ingredients, wash, and chop vegetables) ate more salad than children who did not help (Van der Horst, Ferrage, & Rytz, 2014).

## **1.6 Social Cognitive Theory**

The Social Cognitive Theory (SCT) proposes a triadic and reciprocal relationship between personal factors (e.g., beliefs and perceptions), environment (e.g. social and physical environment), and behavior (e.g., vegetable intake) (Bandura, 1986; Baranowski T, Perry CL, Parcel GS, 2002). Figure 1.1 is an adaptation of the SCT and illustrates a proposed reciprocal relationship among personal factors (vegetable liking), environmental strategies (behavioral economics strategies), and child behavior (vegetable intake).

The SCT is commonly used to understand child dietary behaviors and inform interventions that aim to modify these dietary behaviors. For example, Pearson and colleagues (2010) used the SCT to inform the design of a study where adolescents (12 to 14 yrs) in the intervention group were mailed two fruit and vegetable newsletters over a month. The newsletters addressed personal factors (e.g., normative beliefs, knowledge, preferences) and healthy eating behaviors (e.g., fruit and vegetable intake). Adolescents in the intervention group did not receive the fruit and vegetable newsletters. At the conclusion of the intervention, adolescents in the intervention group had a higher intake ( $p < 0.05$ ) and preference ( $p < 0.01$ ) for vegetables than adolescents in the control group.



**Figure 1.1. Using the Social Cognitive Theory as a framework to understand relationships between vegetable liking, behavioral economics strategies (i.e., environmental changes), and vegetable intake among low-income 9 to 12 year old children.**

## **1.7 Summary and specific objectives**

Children consume a substantial amount of their daily calories in the home environment, making this a promising setting to improve vegetable consumption, especially among low-income children who are at increased risk for diet-related conditions such as obesity. When designing a home-based nutrition intervention, it is important to acknowledge that personal factors (e.g., vegetable liking) and factors related to the home food environment (e.g., frequency of family meals) influence child vegetable intake.

An alternative to traditional behavioral strategies, such as hiding vegetables in mixed dishes, is the use of behavioral economics strategies. Behavioral economics acknowledges that choices are often irrational and that the choice architecture (i.e., physical and social environment) can be manipulated to nudge individuals to make healthier choices. Behavioral economics strategies, such as making healthier foods more accessible than less healthy foods, nudge children to make healthier choices in the school setting (Privitera and Zuraikat, 2014). In the home setting, a parent is often responsible for preparing meals and thus would be the ideal choice architect to implement the behavioral economics strategies. To our knowledge, a study has yet to explore whether behavioral economics strategies can improve the selection and consumption of vegetables during home-prepared meals among low-income children.

### ***Research objectives and hypotheses***

In two phases, this dissertation used both qualitative and quantitative methodology to explore the feasibility and effectiveness of using behavioral and behavioral economics

strategies to increase dinner vegetable consumption among low-income children ages 9 to 12 residing in the Minneapolis/St. Paul metropolitan area. Additionally, a qualitative study was conducted to understand how adolescent siblings (aged 13 to 18) of the 9 to 12 year old child, were involved in food preparation. The specific objectives and hypotheses (when appropriate) of each study are listed below, along with the chapter numbers indicating where the methodology, results and discussion relating to these objectives are presented.

*Phase 1 (Chapter 2)*

Objective: To explore the feasibility, including facilitators and barriers, of implementing 16 behavioral strategies during in-home dinner meals using observational, survey, and interview data.

*Phase 2 (Chapters 3 and 4)*

Objective 1: To determine the 6 of 9 most effective and feasible and feasible behavioral economics strategies. Also, to explore perceived ease of use, as well as barriers and facilitators to implementing the strategies.

Hypothesis: Mean dinner vegetable intake over 1 to 3 days for each strategy will be greater for children exposed to some of the 9 behavioral economics strategies (Intervention group) in comparison to children who are not exposed to the behavioral economics strategies (Control group).

Objective 2: To evaluate if 9 behavioral economics strategies increase vegetable intake, liking, and availability during an 8-week randomized controlled trial.



Hypothesis 1: Children exposed to behavioral economics strategies (Intervention group) will consume more vegetables than children not exposed to the behavioral economics strategies (Control group).

Hypothesis 2: Children exposed to behavioral economics strategies (Intervention group) will have a higher liking of vegetables than children not exposed to the behavioral economics strategies (Control group).

Hypothesis 3: Households where the behavioral economics strategies were implemented (Intervention group) will have more vegetables available than households where the behavioral economics strategies were not implemented (Control group).

*Adolescent Cooking Involvement Study (Chapter 5)*

Objective: To understand how low-income adolescents are involved in home food preparation.

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## **CHAPTER 2: PHASE 1**

Exploring the Feasibility of Implementing Behavioral Economics Strategies to Increase Vegetable Intake, Liking, and Variety Among Children Aged 9 to 12 Residing in Food Assistance Households

## **2.1 Introduction**

According to What We Eat in America NHANES 2011-2012, children (2 to 19 years) are not consuming sufficient amounts of vegetables to meet dietary recommendations (USDA, ARS 2014; USDA, 2010). Child and adolescent vegetable intake has declined in the past 20 years (Slining, et al., 2013). These undesirable vegetable trends raise concerns, especially for low-income children who may be at greater risk for diet-related health conditions such as obesity (Singh, et al., 2010).

One of the most influential determinants of child vegetable consumption is vegetable liking. Many studies have found that repeated exposure increases both vegetable liking and intake among pre-school aged children (Anzman-Frasca, et al. 2012; Fildes, et al., 2014; Holley, et al., 2015), but few have studied this relationship among older children (Lakkakula, et al., 2010; Corsini, et al. 2013; Remington et al., 2012).

Behavioral economics is based on the premise that choices can be framed in a way to “nudge” individuals to make a particular choice, but not to impose objectionable restrictions (Thaler & Sunstein, 2008). Several studies have shown that behavioral economics strategies in the school setting (e.g., making healthy options more accessible than less healthy options) can effectively improve child dietary intake (Hanks et al., 2012; Reicks, Redden, Mann, & Vickers, 2012; Hanks et al., 2013; Wansink et al., 2013; Miller et al., 2015; Price et al., 2015; Redden et al., 2015). The home environment is a promising setting to promote child vegetable consumption because children consume most of their food calories at home (Adair & Popkin, 2005). In the home environment,

there are several ways caregivers play an important role in shaping child dietary patterns, such as deciding what to prepare for meals (Wang, 2013), controlling food availability (Cutler, et al., 2011; Ding et al., 2012; Couch et al., 2014), and modeling healthful eating behaviors (Berge et al., 2014; Draxten et al., 2014). A study has yet to explore the feasibility of implementing behavioral economics strategies in the home setting, especially in low-income households, as a means of increasing child vegetable intake. Research is needed to understand the low-income home food environment choice architecture.

The purpose of this formative study was to assess the feasibility of implementing home-based behavioral strategies to increase dinner vegetable intake among children aged 9 to 12 years who reside in food assistance households. More specifically, the facilitators and barriers that caregivers may experience when implementing strategies during dinner preparation and mealtime were explored. The findings from this study informed the design and implementation of a randomized-controlled study that evaluated the effectiveness of 9 behavioral economics strategies to improve child intake, liking, and variety of vegetables at dinner meals (described in Chapters 3-4).

## **2.2 Methods**

### ***Participants and Recruitment***

The study sample consisted of 20 caregiver-child dyads residing in the Minneapolis/St. Paul metropolitan area. Staff from the University of Minnesota Extension assisted with recruitment efforts by serving as liaisons between the research team and community

partners who worked with the study target population. Recruitment sites included libraries, community centers, school-related events, and health clinics. Caregivers were eligible to participate if they reported having at least one child between the ages of 9 and 12, were the primary food preparer in the home, prepared dinner at least three nights a week, and indicated that someone in the home visited a food shelf in the last three months or participated in at least one of the following programs: Supplemental Nutrition Assistance Program (SNAP), Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and National School Lunch Program (NSLP) at a free or reduced cost. In instances when there was more than one 9 to 12 year old in the home, the caregiver was asked to select one child (i.e., target child) to participate in the study. Caregivers who were not comfortable reading, writing, and speaking English were excluded from the study. Approval was obtained from the University of Minnesota-Twin Cities Institutional Review Board and participants signed informed consent/assent forms. Caregivers were compensated with \$40 for their time.

### ***Study Design***

One time in-home observations of a typical dinner, including preparation and mealtime, were conducted on weeknights (i.e., Monday through Friday) between August and December 2012. Visits were scheduled at various times in the evening when both the caregiver and the target 9 to 12 year old child were home, along with anyone else who was normally present at dinner meals. At least two researchers were present during all in-home visits, which lasted between 1 and 3.5 hours (on average, 1 hour 45 minutes). In-home visits consisted of three components: 1) a checklist form where researchers

recorded observations about the home food environment, dinner preparation, and mealtime, 2) questionnaires about household sociodemographic characteristics and food security, home vegetable availability, as well as caregiver and child vegetable liking, and 3) brief individual interviews with the caregiver and child to better understand typical dinner meal routines and vegetable preferences.

### **Strategy Selection Process**

A literature review was conducted to identify behavioral economics strategies that have improved child dietary behaviors in various settings (e.g., school, home, etc.). After reviewing the literature, a multidisciplinary team selected 20 strategies for further evaluation. These 20 strategies were then sent via email to 48 experts in the field of behavioral economics for review. These experts had 1) authored publications in the area of behavioral economics applied to food choice or factors affecting home vegetable intake among children; 2) made presentations at conferences regarding behavioral economics research and food choice; and/or 3) received funding to apply behavioral economics strategies to child feeding programs. Panelists rated the strategies for feasibility (1 = none, 2 = low, 3 = moderate and 4 = high), potential effectiveness (1 = none, 2 = low, 3 = moderate and 4 = high), and classification as a behavioral economics strategy (1 = no, not at all, 2 = borderline and 3 = yes, definitely). Sixteen strategies were selected, including 14 behavioral economics strategies and two traditional behavioral strategies (i.e., ‘Hide vegetables in other foods’ and ‘Ban junk food at meals’), which were included to compare feasibility (Table 2.1). These strategies were selected based on the expert review panel ratings, as well as feedback provided by the multidisciplinary

team regarding feasibility, potential effectiveness, and whether the strategies were informed by behavioral economics.

**Table 2.1 Behavioral strategies evaluated for feasibility**

Hide vegetables in other foods (like adding pureed squash to spaghetti sauce).
Ban junk food at meals.
Pair vegetables with other foods your child likes (like adding green pepper chunks to spaghetti sauce).
Make vegetable more easily available and visible to your child (like having peeled, chopped, ready to eat vegetables easy to see and find in the fridge).
Let your child prepare vegetable dishes, by providing recipes, ingredients, equipment, and/or time.
Serve vegetables before the rest of the meal.
If your child takes vegetables by herself/himself, increase size of serving spoon. Then your child will take more with each spoonful
If you put vegetables on your child's plate, give her/him bigger servings.
Give your child the usual amount of vegetables, but in a bigger dish than needed. This will make the amount look smaller.
Use a dinner plate or placemat that shows the right amount of vegetables to eat for a meal. An example is a plate with the MyPlate picture. MyPlate is the current USDA guide for portion sizes.
Make sure your child sees other family members eating a lot of vegetables and enjoying them.
Show a positive attitude when serving vegetables to your child.
Use fun names for vegetables when serving them to your child, like calling peas "Power Peas."
Make vegetables look better with garnishes by adding things like parsley or breadcrumbs. You could also use attractive dishes.
Serve vegetables in smaller pieces to make them easy to pick up and eat, like cut up, chopped vegetables.
Plan dinner meals to routinely include a vegetable or salad. An example is to pair a vegetable side dish with one-dish meals such as pizza or macaroni and cheese.

***Procedure***

Caregivers were told that the research team was interested in observing preparation and consumption of a typical family meal in their home. Research team members did not specifically mention vegetables when they introduced the study. When a member of the research team called to confirm the home visit, the caregiver was asked to refrain from preparing any part of the meal until the research team arrived.



Upon arrival, and after consent/assent were obtained (Appendices 7.1 and 7.2), researchers asked the caregiver where to set up the video recorder to capture dinner preparation. When possible, researchers would place the video recorder on a tripod and sit in another room to reduce the risk of influencing what the caregiver prepared and served. At times, several caregivers wanted to talk with a member of the research team during meal preparation. If this occurred, only one researcher remained in the room with the caregiver and was careful not to discuss food and/or any other topic that could introduce bias (e.g., personal dietary habits). The other researcher attempted to be out of sight and would begin completing the Observation Checklist or collecting Field Notes (described in more detail in upcoming sections).

The schedule first allowed the caregiver to prepare the meal and eat with their family, and then complete the surveys/questionnaires and participate in a brief qualitative interview. A researcher administered all surveys/questionnaires, such that questions and answer choices were read aloud for both the caregiver and child. Also, data were collected from the caregiver by one researcher and from the target child by another researcher. Researchers also attempted to collect the data from the caregiver and target child in different areas of the home so they would not influence each other's responses.

The research team was very purposeful about the order in which data were collected, as illustrated in Table 2.2. If free time was available while the meal was being prepared (e.g., the food being prepared needed to bake for 30 minutes), the caregiver was asked to complete the Sociodemographic and Household Characteristics Questionnaire. Also, a

researcher would begin collecting the Home Vegetable Inventory and Observation Checklist data, if they felt they could do so without being obtrusive (e.g., if the caregiver was not in the kitchen). The Vegetable Liking Surveys were not completed until after the meal was consumed to avoid alerting the caregiver that the research team was interested in vegetables, which could have altered what the caregiver would prepare for the dinner meal. The caregiver completed the Household Food Security Questionnaire last due to the sensitive nature of the questions. The study instruments/measures, as well as qualitative data collection measures are described in more detail in the following sections.

**Table 2.2 Order in which data were collected**

<b>Completed by Caregiver</b>	<b>Completed by Target Child</b>	<b>Completed by Researcher</b>
1. Sociodemographic and Household Characteristics Questionnaire	1. Child Vegetable Liking Survey	1. Field Notes
2. Caregiver Vegetable Liking Survey	2. Brief Qualitative Interview	2. Observation Checklist
3. Behavioral Strategy Questionnaire		3. Home Vegetable Inventory
4. Brief Qualitative Interview		
5. Household Food Security Survey		

***Instruments/Measures***

*Sociodemographic and Household Characteristics Questionnaire*

Items on the Household Characteristics Questionnaire were intended to capture data on household sociodemographic characteristics, grocery shopping practices, and caregiver

vegetable consumption patterns (Appendix 7.3). Questions were included to assess caregiver's age, gender, race/ethnicity, highest educational attainment, and employment status. If applicable, information about race/ethnicity and employment status of a spouse/significant other residing in the home was obtained. Information about age, gender, and race/ethnicity of the 9 to 12 year old child was obtained. Household composition data were also collected on the total number of children and adults residing in the home. Caregivers also answered food frequency questions about how often vegetable juices, green salad, potatoes, beans, vegetable soup, and other vegetables were consumed (i.e., less than one week, once a week, 2-3 times a week, 4-6 times a week, once a day, more than 2 times a day) (National Cancer Institute, 2000).

#### *Household Food Security Survey*

An amended version of the 6-item USDA Food Security Survey was used to assess household food security (USDA Economics Research Service, 2012). In the original 6-item USDA Food Security Survey, question AD1 read, "In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?" and question AD1a read, "[IF YES AD1, ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?" For the current study, the response options from AD1a were used for question AD1, and thus participants were only asked 5 questions. For every affirmative response, 1 point was assigned. The following scale was used to determine household food security: 0 to 1 indicated high or marginal food security, 2-3 low food security, and 4-5 very low food security. The 5-

item USDA Food Security Survey used in the current study is provided in Appendix 7.4.

### *Vegetable Liking Survey*

Both the child and caregiver provided liking scores for 16 types of vegetables. For 11 of those vegetables they provided two scores, one score for the vegetable raw and another score for the vegetable cooked (i.e., a total of 27 scores). Caregivers rated liking on a labeled affective magnitude (LAM) scale ranging from “greatest possible dislike” to “greatest possible like”, with “neither liked nor disliked” at the middle of the horizontal scale (Schutz & Cardello, 2001; Appendix 7.5). The scale ranged from 0 cm at one end (greatest possible dislike) to 23 cm at the other end (greatest possible like). Caregivers were able to mark anywhere on the line to indicate vegetable liking. A trained researcher measured the distance from where the caregiver marked the line to the 0 cm mark and this value was recorded. Children used a 10-point hedonic scale to rate vegetable liking (where 1 = “hate it”, 5-6 = “it’s okay”, and 10 = “like it a lot”), which was expressed verbally by the child and written down by the researcher (Appendix 7.6). When a caregiver and/or child indicated that they had never had a vegetable, the researcher checked the “never tried” box.

### *Behavioral Strategy Questionnaire*

Caregivers were asked if they were currently implementing any of the 16 behavioral strategies (Table 2.1), yes or no (Appendix 7.7). If caregivers indicated that they were not currently doing the strategy, they were asked how likely they were to try the strategy

using the following scale: very unlikely (0), somewhat unlikely (1), neither unlikely nor likely (2), somewhat likely (3), or very likely (4).

#### *Home Vegetable Inventory*

A shortened version of a previously validated home food inventory was used to document the presence of 36 vegetables, including four types of legumes (Fulkerson et al., 2008; Appendix 7.8). A member of the research team asked the caregiver where all food was located in the home (e.g., cupboard, refrigerator, freezer). That researcher then checked each of those locations and marked yes (1) or no (0) if the vegetable was present and also noted in what form (s) (e.g., fresh, frozen, and/or canned).

#### *Observation Checklist*

A multidisciplinary research team consisting of professionals in food science, nutrition, health psychology, applied economics, and marketing developed the observation checklist form. Researchers used the observation checklist form to document information about the home food environment that may impact the feasibility of implementing behavioral strategies at dinner meals (Appendix 7.9).

Researchers assessed several aspects of the physical environment, such as vegetable accessibility and available kitchen space for preparation. To determine if caregivers had the necessary kitchen equipment/supplies to implement the behavioral economics strategies, researchers recorded the presence of the following items in the home: knives, strainers, peelers, vegetable brushes, blenders, food processors, cutting boards, steamers,

and any other equipment that could assist with vegetable preparation (e.g., can opener). Other information about the home food physical environment recorded on the observation checklist form included the way the dinner meal was served (e.g., family style, buffet, pre-plated, etc.) and size of serving containers and utensils used for the meal (i.e., small, medium, or large).

Additional questions assessed whether the vegetables were served in a child-friendly form (e.g., cut in small pieces), if the vegetables were paired with other foods the child liked, and if there was positive parental interaction based on consensus between both researchers. Information was collected about the time the menu for the evening was decided upon (the caregiver was asked explicitly), how the vegetables were prepared, and time it took to prepare all of the vegetables.

Relevant social interactions were also assessed, such as child involvement in deciding what was served at the dinner meal and assistance with vegetable preparation. The potential for role modeling vegetable intake was documented by assessing whether the child and caregiver consumed vegetables with their meal and, if so, the fraction consumed (none,  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , all, and seconds). General mealtime observations were also made including who was present for the meal (e.g., how many children and adults), where the meal was consumed (e.g., living room, kitchen table), whether everyone ate together, and if there were any dinnertime distractions (e.g., television, radio, cell phones).

## ***Qualitative Data Collection***

### *Brief qualitative interviews*

Brief individual semi-structured qualitative interviews were conducted with both the caregiver and target child at the end of the home visit. The overall aim of the interviews was to better understand potential barriers and facilitators caregivers may experience when implementing the behavioral economics strategies. More specifically, caregivers were asked about how they decide what to serve for dinner, general dinner meal routines, and grocery shopping habits (Appendix 7.10). Interviews with the caregiver lasted between 5 and 21 minutes (on average, 10 minutes). The target child was asked about vegetable preferences, typical vegetable preparation and serving style in the home, and rules about eating vegetables (Appendix 7.11). Interviews with the children lasted between 5 and 16 minutes (on average, 7 minutes).

### *Field Notes*

Researchers wrote field notes to record relevant observations that may not have been included on the Observation Checklist or captured on the video recording, as well as to document any challenges participants experienced with the data collection tools. Also, notes from conversations were recorded, especially if during those conversations participants revealed information that could impact the feasibility of the behavioral economics strategies.

### *Video Observations*

The data from the video recordings were not used to assess the feasibility of the behavioral economics strategies. The video observations were discussed in more detail in the thesis of Alison Swenson (Swenson, 2015).

### *Pilot Test*

A pilot test of the data collection instruments and procedures was conducted with 5 families who met the study eligibility criteria. Based on the pilot test findings, several changes were made to the data collection instruments and procedures. One concern was that the in-home visits were too long and this might be a burden for some families. In an attempt to decrease participant burden and shorten in-home visits, researchers decided to use the 6-item USDA Food Security Survey moving forward, instead of the 18-item USDA Food Security Survey. During the pilot, the Home Vegetable Inventory included questions about competitive foods (i.e., frozen desserts, microwaveable/quick cook frozen foods, prepared desserts, chips/crackers/other snack foods, beverages, candy) that may displace the presence of vegetables. Researchers decided to only document the presence of vegetables and legumes on the Home Vegetable Inventory to decrease the length of time spent collecting data in the home. Lastly, many of the target children appeared to have a limited attention span during the Child Vegetable Liking Survey, therefore questions about where each vegetable was usually consumed (i.e., home, school, restaurant, friend's house, relative's house, or other) were removed.



Additional changes were also made after the pilot test. For example, because steaming vegetables is a healthy alternative to frying vegetables, vegetable steamers were added to the list of kitchen equipment included on the Observation Checklist. Researchers also believed that it would be better for caregivers to use a labeled affective magnitude (LAM) scale (Schutz & Cardello, 2001) instead of the 10-point hedonic scale used during the pilot study to rate vegetable liking and thus this change was made to the Adult Vegetable Liking Survey. To better determine if caregivers were actually implementing any of the strategies, questions on the Behavioral Strategy Questionnaire were changed to inquire if the caregiver was doing the strategy and if not, would they be willing to implement it, instead of what they thought about the behavioral strategies. Lastly, to encourage more in-depth responses from the participants, questions on the caregiver and child brief qualitative interview guide were rephrased to be more open-ended. Researchers also added more probes.

### ***Data Analyses***

#### *Instruments/Measures*

Descriptive statistics (e.g., mean, ranges, percentages, sum/counts) were calculated to examine the distribution of sociodemographic and household characteristics, household food security, vegetable liking, whether caregivers were currently implementing any of the behavioral strategies, and home vegetable availability. Both quantitative and qualitative data were captured on the Observation Checklist. Descriptive statistics were calculated for some data on the Observation Checklist. Other findings were summarized.

In order for researchers to compare liking ratings between the caregiver and target child, caregiver ratings were converted to a 10-point scale. Children rated vegetable liking on a scale of 1 to 10, so the caregiver rating scale was changed to 1 to 24 cm (originally 0 to 23 cm, but the child rating did not include 0). As reported by Swenson (2015), “these values were converted to the 10-point scale by multiplying by 10/24, then adding 10/24, and rounding any values  $< 1.0$  to 1.0”. For both the Caregiver and Child Vegetable Liking, ratings  $\geq 5$  indicated that the vegetable was liked and  $< 5$  indicated that the vegetable was not liked.

### *Qualitative Analyses*

All interviews were audio recorded and transcribed verbatim. Transcripts were entered into NVivo (version 10, QSR International) to facilitate coding. The research team developed 2 codebooks, one for the child and another for the caregiver to guide analysis, and these codebooks were modified as needed to provide clarification on codes. Two researchers independently coded transcripts. When there were differences in coding, the researchers discussed the differences and came to a consensus to reconcile the difference. After the transcripts were coded, researchers summarized the facilitators and barriers to implementing each of the behavioral economics strategies.

### *Feasibility of Strategies*

A Strategy Analysis Form was developed by the research team to organize the survey, observation, and interview data for the purpose of determining feasibility of each strategy (Appendix 7.12). Two researchers separately assigned a score on a 5-point scale (1 “not

at all” to 5 “very feasible”) upon consideration of the feasibility data collected. Each family received 32 feasibility scores, two scores for each strategy that were later averaged to determine how feasible it was for that family to implement each of the 16 strategies. If the individual scores differed by more than one point, the two researchers met to discuss their rationale behind scoring that strategy for that particular family and came to a consensus. Once the two scores were averaged for each strategy, the total scores for all 20 families were then averaged for each of the 16 strategies to determine how feasible strategies were for the entire study population. A sample page from the Strategy Analysis Form can be found in Appendix 7.12.

## **2.3 Results**

### ***Instruments/Measures***

#### *Sociodemographic and Household Characteristics*

Findings from the Sociodemographic and Household Characteristics Questionnaire are described in Table 2.3. Caregivers were between the ages of 28 and 55 years. The majority of the caregivers were female (n = 19). The self-identified race of the caregivers varied: Black or African American (n = 7), White or Caucasian (n = 5), Alaska Native or American Indian (n = 2), Asian (n = 1), and ‘Other’ (n = 5). Eleven of the caregivers attended some college or technical school. Almost half of the caregivers were employed full-time (n = 9). Nine of the caregivers had a spouse/significant other, the majority of whom were Black or African American (n = 5), non-Hispanic (n = 7).

Slightly more than half of the 9-12 year old target children were female (n = 11). Seven children were Black or African American, two were White or Caucasian, one was Alaska Native or American Indian, one was Asian, one was Native Hawaiian or other Pacific Islander, and eight identified as 'Other'. Among the 20 households, the number of adults in the home ranged from 1 to 6 (average of about 2). The number of children in the home ranged from 1 to 5 (average of about 2).

All caregivers reported eating at least one of the vegetables from one of the six categories vegetable at least 2 to 3 times a week, with three caregivers reporting eating vegetables more than twice daily. Among the six categories of vegetables listed (i.e., vegetable juice, green salad, potatoes, vegetable soup, other vegetables, and legumes), the most frequently consumed vegetables were from the 'other vegetables' category, which included string beans, peas, corn, broccoli, and any other kind of vegetable not included in the remaining categories. Also, the majority of caregivers reported eating some type of potato more than 2 to 3 times per week. Vegetable juices were consumed least often, with the majority of caregivers reporting that they drink these juices less than once a week.

**Table 2.3 Sociodemographic and household characteristics**

<b>Individual Characteristics</b>	<b>Caregiver n = 20</b>	<b>Spouse/Significant Other n = 9</b>	<b>Target Child n = 20</b>
Age, y (mean [range])	37.9 (28-55)		10.45 (9-12)
Female, n (%)	19 (95)		11 (55)
Race (n [% of sample]) <sup>1</sup>			
Black or African American	7 (35)	5 (62.5)	7 (35)
White or Caucasian	5 (25)	2 (25)	2 (10)
Alaska Native or American Indian	2 (8)	0 (0)	1 (5)
Asian	1 (5)	1 (12.5)	1 (5)
Native Hawaiian or other Pacific Islander	0 (0)	0 (0)	1 (5)
Other <sup>2</sup>	5 (25)	0 (0)	8 (40)
Hispanic or Latino n (%) <sup>3</sup>	1 (5)	1 (5)	3 (15)
Education n (%)			
Have not completed high school	2 (10)		
Received high school diploma or GED	4 (20)		
Some college or technical school	11 (55)		
4-year college	3 (15)		
Employment Status n (%)			
Homemaker	2 (10)	2 (22)	
Not employed	4 (20)	2 (22)	
Employed part time	4 (20)	2 (22)	
Employed full time	9 (45)	3 (33)	
Retired	1 (5)	0 (0)	
<b>Household Characteristics</b>			
Total number of adults (mean [range])	1.7 (1-6)		
Total number of children (mean [range])	2.35 (1-5)		

<sup>1</sup>. One caregiver did not provide race of spouse/significant other.

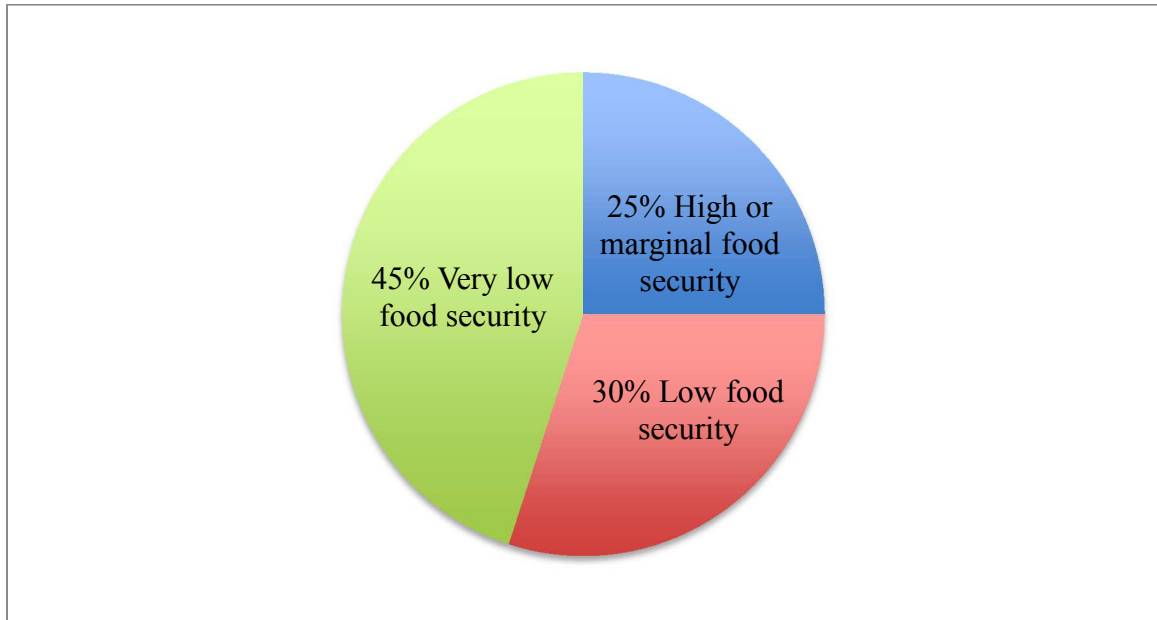
<sup>2</sup>. 'Other' category also included when more than one race was selected.

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<sup>3</sup>. Two caregivers did not provide ethnicity data.

### *Household Food Security*

Nine of the caregivers were characterized as having very low food security, six low food security, and five high or marginal food security (Figure 2.1).



**Figure 2.1 Distribution of household food security status among the study population based on the following scale: 0-1 high or marginal food security, 2-3 low food security, and 4-5 very low food security.**

### *Vegetable Liking*

The 20 caregivers had tried all of the vegetable types and forms (raw and cooked), with the exception of raw green beans (n = 18), raw green peas (n = 19), and raw spinach (n = 19).

The majority of caregivers liked (i.e., provided a rating of  $\geq 5$  on a scale of 1 to 10) all of the vegetables listed on the Vegetable Liking Survey, with few caregivers rating any vegetable less than 5 (regardless if it was cooked or raw) (Figure 2.2). Cooked broccoli, corn, and lettuce were the most liked vegetables, whereas raw Brussels sprouts, raw cabbage, and black beans were least liked. In general, caregivers rated liking of cooked vegetables higher than raw vegetables.



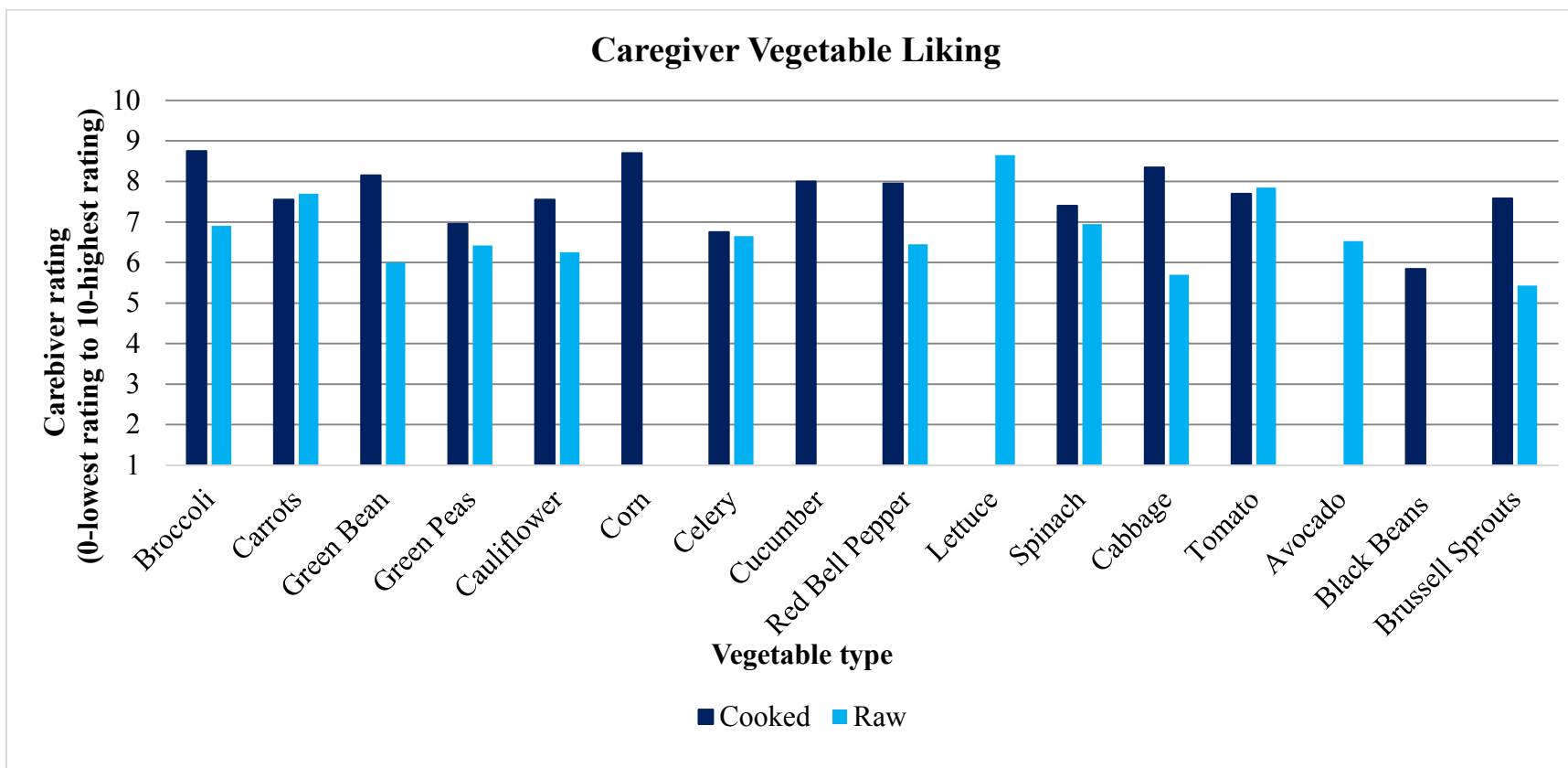
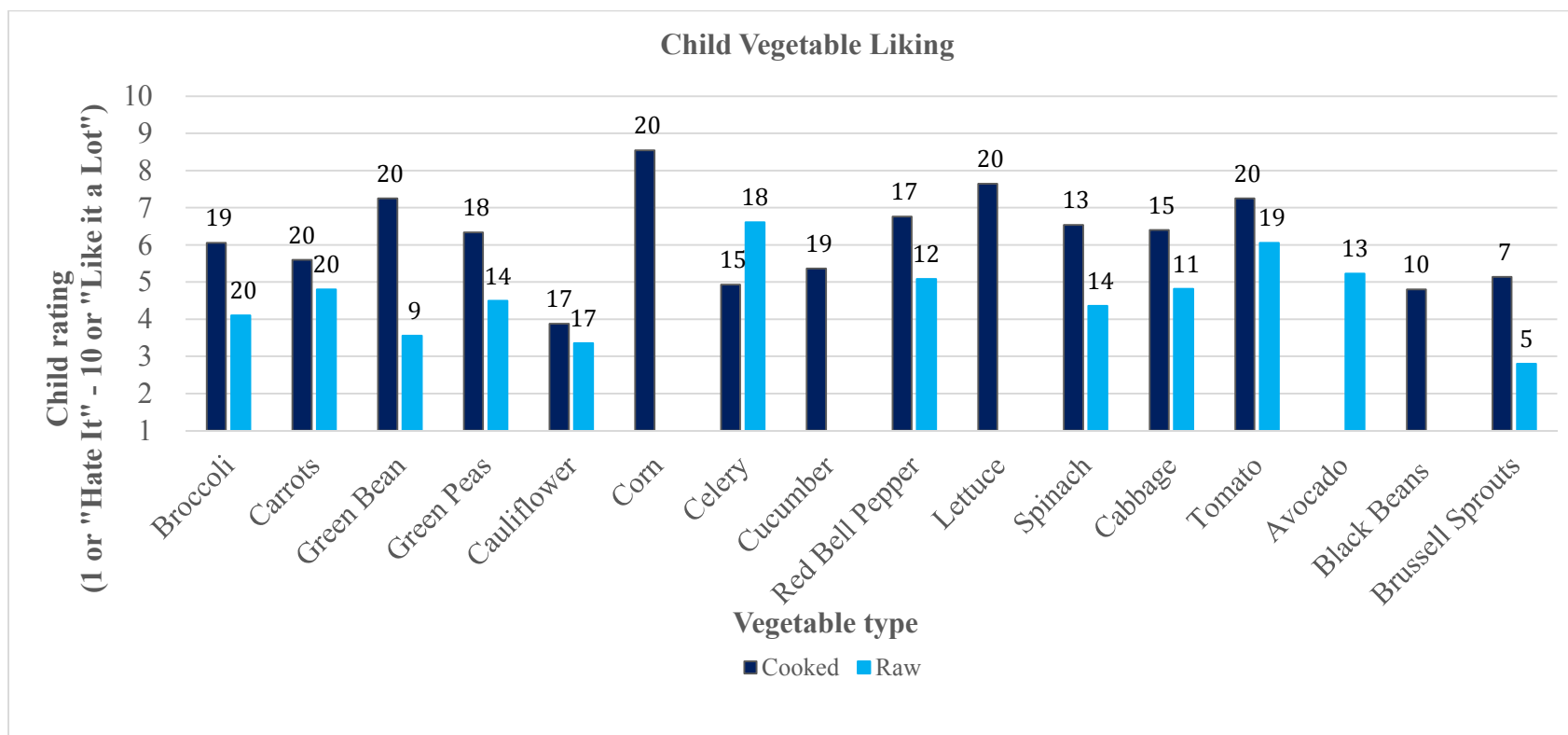


Figure 2.2 Caregiver vegetable liking ratings based on the transformed rating scale where 0 and 10 corresponded with the lowest and highest rating of vegetables respectively, and a value of 5 represented neither like nor dislike.

All 20 children had tried the following vegetables: cooked broccoli, cooked and raw carrots, cooked green beans, cooked corn, raw lettuce, and cooked tomatoes (Figure 2.3). Few children had tried raw green beans (n = 9), cooked Brussels sprouts (n = 7), and raw Brussels sprouts (n = 5).

Of the 27 vegetable types/forms (i.e., cooked vs. raw), children on average liked 16 vegetables and disliked 11 vegetables (Figure 2.3). Corn and lettuce had the highest liking scores. The least liked vegetables were raw Brussels sprouts and raw cauliflower. Few children had tried raw Brussels sprouts (n = 5) and those who did tended to indicate a low rating for them (mean rating 2.8). Ratings for cooked vegetables ranged from about 4 to 8.6, whereas ratings for raw vegetables ranged from about 2.8 to 7.7. Generally, children provided higher likings scores for cooked versus raw vegetables.



**Figure 2.3 Mean target child vegetable liking ratings where 1 = “hate it”, 5-6 = “it’s okay”, and 10 = “like it a lot.” The number at the top of each bar in the graph represents the number of children who had tried each of the vegetable types.**

### *Behavioral Strategy Questionnaires*

The majority of caregivers indicated that they were currently implementing most of the strategies (Table 2.4). The largest number (n = 18) of caregivers reported doing the strategy ‘Give your child the usual amount of vegetables, but in a bigger dish than needed. This will make the amount look smaller’ strategy. Few caregivers reported implementing the ‘MyPlate’ and ‘Serve vegetables before the rest of the meal’ strategies (n = 3). In general, caregivers who were not currently implementing a strategy reported they were “somewhat likely” to try the strategy.

**Table 2.4 Number of caregivers currently doing the behavioral strategies, and of those who are not doing the strategies, the mean rating of likelihood to trying the strategy.**

<b>Behavioral Strategy</b>	<b>No. of Caregivers Doing Strategy (%)</b>	<b>Mean Rating of Likelihood of Trying Strategy <sup>a</sup></b>
Give your child the usual amount of vegetables, but in a bigger dish than needed. This will make the amount look smaller.	18 (90)	3.6
Plan dinner meals to routinely include a vegetable or salad.	17 (85)	3.6
If your child takes vegetables by herself/himself, increase size of serving spoon. Then your child will take more with each spoonful.	17 (85)	3.2
Pair vegetables with other foods your child likes	17 (85)	2.0
Ban junk food at meals.	16 (80)	2.8
Have a positive attitude when serving vegetables.	14 (70)	3.3
Let your child prepare vegetable dishes, by providing recipes, ingredients, equipment, and/or time.	14 (70)	2.7
Use fun names for vegetables when serving them to your child.	14 (70)	2.6
Make sure your child sees other family members eating a lot of vegetables and enjoying them.	12 (60)	3.7
Serve vegetables in smaller pieces to make them easy to pick up and eat, like cut up, chopped vegetables.	12 (60)	3.6
Hide vegetables in other foods.	10 (50)	3.5
If you put vegetables on your child's plate, give her/him bigger servings.	8 (40)	3.2
Make vegetables more easily available and visible to your child	6 (30)	3.5
Make vegetables look better with garnishes by adding things like parsley or breadcrumbs. You could also use attractive dishes.	6 (30)	3.2
Serve vegetables before the rest of the meal.	3 (15)	3.6
Use a dinner plate or placemat that shows the right amount of vegetables to eat for a meal. An example is a plate with the MyPlate picture.	3 (15)	3.4

<sup>a</sup>. Ratings 0 = very unlikely, 1 = somewhat unlikely, 2 = neither unlikely nor likely, 3 = somewhat likely, 4 = very likely.

### *Home Food Inventory*

Almost all of the homes had potatoes (n = 18), tomatoes (n = 18), corn (n = 17), onions (n = 17), and green beans (n = 16) (Figure 2.4). None of the 20 households had Bok Choy, edamame, jicama, plantains, or squash. On average a household had 7 types of vegetables available in canned form (range: 2 to 17), 5.5 types of vegetables available in fresh form (range: 1 to 12), and 2 types of vegetables available in frozen form (range: 0 to 7). Families had, on average, 13 types of vegetables available in the home (range: 7 to 21).

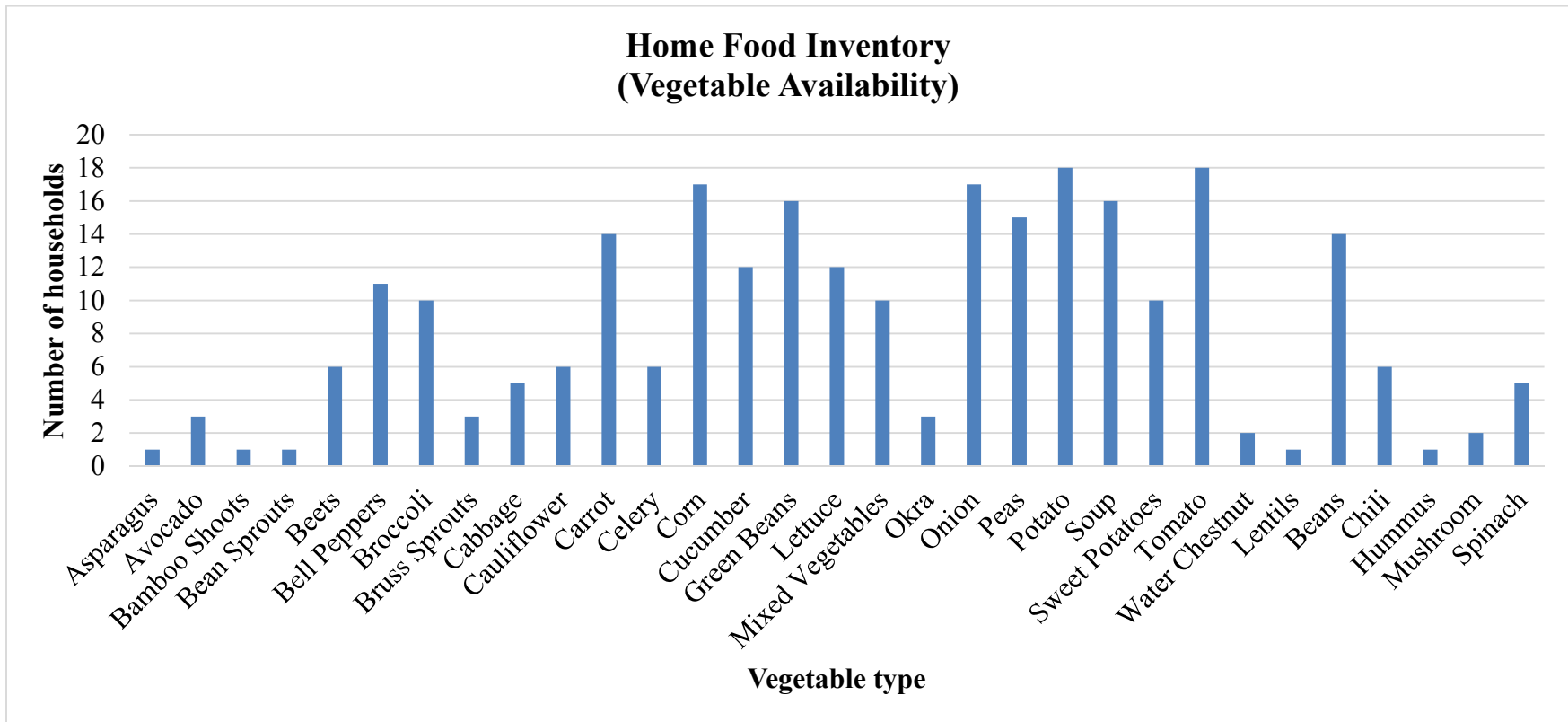


Figure 2.4 Number of households where a vegetable type was present.

### *Observation Checklist*

On average, households had at least 4 pieces of kitchen equipment (range: 1 to 7) (Table 2.5). All 20 households had at least one knife, though one family only had a butter knife. Other less common kitchen equipment found in several homes were a whisk, mandoline slicer, potato ricer. Several homes had can openers and microwave ovens. Observations by researchers indicated that some households had a kitchen flow that could easily accommodate vegetable preparation, whereas others were narrow and had little counter space. Based on their observations, researchers suggested that most kitchens had adequate space for the food preparer, but if the child were to assist with the dinner/vegetable preparation this space would be cramped.

**Table 2.5 Kitchen equipment availability**

<b>Equipment</b>	<b>Availability, n (%)</b>
Knives	20 (100)
Peeler	14 (70)
Strainer	17 (85)
Vegetable Brush	6 (30)
Blender	14 (70)
Food Processor	1 (5)
Cutting Board	16 (80)
Steamer	15 (75)
Other	12 (60)

Advance menu planning varied greatly, with the most frequently reported response being 3-5 days in advance. Most caregivers reported that children did not have a say in what was prepared for dinner. Vegetable preparation time varied; with some caregivers spending minimal time preparing vegetables (e.g., opening a can of mushroom soup and



heating in a microwave) and others spending more than an hour on vegetable preparation (e.g., one caregiver stewed tomatoes for 2 hours). Half of the children assisted with vegetable preparation. Most of the vegetables were prepared in a child-friendly manner (e.g., vegetables chopped), paired with other foods the child likes, and several dishes were served in ways where the child could not avoid the vegetable (e.g., onions in a sauce). The types of foods prepared during the in-home visits are reported in Table 2.6. One caregiver did not serve vegetables with the meal. Most caregivers did not serve any food before dinner. Of the caregivers who served food before the dinner, only 2 served vegetables before dinner, which included raw red peppers, carrots, and celery.

**Table 2.6 Dinner meal description**

<b>Main Dinner Entrée</b>	<b>Vegetables Prepared</b>
Tacos with ground beef	Lettuce, tomato
Chicken tinga	Tomato, onion, chipotle pepper
Breakfast burrito	None
Chicken pita	Lettuce, onion
Hamburger	French fries, pickles
Spaghetti	Tomato sauce
Taco with ground beef	Lettuce
Pork loin	Mashed potatoes
Rice a roni with ground beef	Cream of mushroom soup
Hamburger	French fries, corn
Fried cat fish	Mashed potatoes, cauliflower
Chicken enchilada	Peas, carrots, onions
Chicken casserole	Green beans
Ethiopian beef stew	Onions, tomatoes, cabbage
Hamburger	French fries, carrots, broccoli
Taco with ground beef	Refried beans, lettuce
Taco with ground beef	Corn
Pho	Onion, cabbage
Fish sticks	Carrots, tater tots
Fry bread	Refried beans, green beans, corn

The serving containers and utensils used with the vegetables varied greatly depending on the dish prepared. The majority of the meals were pre-plated for the child, with 5 meals served buffet style and 1 meal served family style.

The majority of the caregivers (n = 15) ate vegetables at the dinner meal. Four caregivers did not eat dinner at all during the in-home visit (i.e., the child ate alone or with someone other than the caregiver). All of the children ate vegetables at the dinner meal, with the exception of two children. One child chose not to put lettuce on a taco and another child was not offered any vegetables with the dinner meal. Fifteen households experienced some form of distraction during the mealtime, including 6 families that had the television on while eating dinner. Other distractions observed were people going in and out of the house during mealtime and telephones ringing.

### ***Summary of Brief Qualitative Interviews***

Findings from the caregiver interviews suggest that time and availability greatly influenced what was prepared for mealtimes. Many caregivers specifically mentioned that they attempted to prepare healthy meals, which included vegetables, but sometimes this was challenging because healthier foods were viewed as more expensive. When caregivers were asked how they decided what to prepare for the observed dinner meal, responses varied. Some caregivers reported that they allowed others in the home (including children) to make a request about what was served, whereas other caregivers decided on their own because they were too busy to consider the preferences of others and needed to make dinner quickly. Some caregivers allowed their child(ren) to help

with meal preparation and gave examples of how they implemented other strategies listed in Table 2.1. Most common were discussions about how caregivers hid vegetables and paired vegetables with condiments. Several caregivers mentioned that they role-modeled healthy eating for their children. When discussing grocery-shopping practices, caregivers made decisions based on what was affordable and attempted to purchase healthy foods (e.g., fruits and vegetables) when they were affordable.

The child interviews indicated that all children liked at least some vegetables, whereas responses were mixed regarding the preference for raw versus cooked vegetables. Taste, smell, and appearance were cited as reasons why children did not like some vegetables. Most children were open to trying new vegetables, but some considered the smell and appearance of that vegetable before trying it. Sometimes children preferred to eat vegetables by themselves and other times they liked to pair vegetables with condiments (e.g., carrots with ranch dressing). The way that vegetables were served varied. Sometimes children served themselves and other times their caregiver would prepare their plate. Most children said that their caregivers did not have rules about eating vegetables specifically, with the exception of not wasting food, which was a rule about eating in general.

### ***Feasibility of Strategy Findings***

Based on the findings from the Strategy Analysis Form (Table 2.7), mean feasibility scores ranged from 1.8 to 4.6. The strategy with the highest mean feasibility rating score (4.6) was 'Pair vegetables with other foods your child likes'. The strategy with the lowest

mean feasibility rating score (1.8) was ‘Use fun names for vegetables when serving them to your child’.

Strategies were generally provided a high feasibility score if the caregivers were observed implementing the strategy during the in-home dinner observation. For example, ‘Ban junk food at meals’ was rated the second highest strategy because during the in-home observations, few caregivers offered junk foods during the dinner meal. Also, ‘Plan dinner meals to routinely include a vegetable or salad’ was considered feasible because all households served at least one vegetable during the dinner meal observations, with the exception of one household.

**Table 2.7 Strategy feasibility scores and comments**

<b>Behavioral Strategy</b>	<b>Mean Feasibility Rating (1 “not at all” to 5 “very feasible”)</b>	<b>Comments</b>
Pair vegetables with other foods your child likes.	4.6	Sometimes this strategy was interpreted as pair with condiments, such as carrots with ranch dressing, instead of pair with other foods. There were preconceived ideas of what foods went well together, for example, steak and potatoes. According to the caregiver and child interviews, many families were already implementing this strategy. Caregivers reported knowing their child’s food preferences and made efforts to purchase vegetables that their child liked.
Ban junk food at meals.	4.1	During the dinner observations, most families did not offer or prepare junk food.
Plan dinner meals to routinely include a vegetable or salad.	3.9	Most caregivers reported that they were already doing this strategy and only one family did not serve vegetables during the observation period. All households had at least one vegetable available in the home. It was observed that some caregivers only prepared one canned vegetable for dinner, even though they had additional cans of other vegetables in the cupboard.
Let your child prepare vegetable dishes, by providing recipes, ingredients, equipment, and/or time.	3.8	In half of the households (n = 10), the 9-12 year old assisted with vegetable preparation. Girls were more likely to assist than boys, some of whom explicitly said they had no interest in cooking. Some caregivers were fearful that children could hurt themselves while managing sharp kitchen utensils and/or get burnt by the oven/stovetop. Another concern was that it would take longer to prepare dinner if the child was involved in food preparation. Also, concerns about how to find a task for multiple children were expressed. Limited space was also a barrier in several homes that had small/narrow kitchens without adequate counter space.
Make sure your child sees	3.8	All of the caregivers who prepared a vegetable with the dinner meal ate at least

other family members eating a lot of vegetables and enjoying them.		some of the vegetables, with the exception of two households where the caregiver did not eat at all during the in-home visit. One home had only one dining room chair so the mother ate in the living room. Most caregivers reported liking at least some vegetables. Most of the caregivers ate dinner with the child.
Have a positive attitude when serving vegetables.	3.8	The subjective appraisal by researchers indicated that most dinner meals were pleasant based on the caregiver's attitude. Also, when caregivers completed the Behavioral Strategy Questionnaire, they questioned the term 'positive attitude'. Only a few caregivers fussed at the child during the dinner meal.
Make vegetables more easily available and visible to your child.	3.8	Several households had chopped vegetables ready to eat in the refrigerator. For one family, the children took the vegetable tray out on their own and ate vegetables while the mother prepared dinner. Most caregivers perceived this strategy to only work with fresh vegetables, which was a barrier because most households did not have many fresh vegetables.
Serve vegetables in smaller pieces to make them easy to pick up and eat, like cut up, chopped vegetables.	3.6	Many vegetables served during the dinner meal were canned and thus inherently in small pieces. Many participants interpreted this strategy to mean cut fresh vegetables into smaller pieces, which was a barrier since only a few of the homes served fresh vegetables with the dinner meal. Participants were concerned that it would take a lot of time to cut up vegetables in smaller pieces. Additionally, they felt that it was not necessary to cut up vegetables in smaller pieces in order for their children to eat vegetables. Some caregivers reported that this strategy would work better for younger children.
If you put vegetables on your child's plate, give her/him bigger servings.	3.3	Participants indicated that they were likely to try this strategy per the Strategy Questionnaire, but concerns about food waste were reported during the adult interviews, which might limit their ability to use this strategy. Some caregivers commented that money was tight and they had to make food stretch. In a few instances, the child did not finish the vegetables that were served, so bigger servings could go to waste.
Serve vegetables before the	3.1	Most caregivers interpreted this strategy as serve raw vegetables as a snack

rest of the meal.		before dinner and/or serve a salad first with the meal. Both interpretations required raw vegetables, which was a barrier for most families who did not have many raw vegetables in their home. Children did appear to be hungry before dinner, which was a facilitator for this strategy. Several children ate raw vegetables while dinner was being prepared, but a few children snacked on other foods such as yogurt, a banana, or a cookie. Thinking about ways to implement this strategy with canned and/or frozen vegetables was challenging for families. Another barrier to this strategy was the perceived amount of time it takes to prepare a canned and/or frozen vegetable before the dinner meal. Most caregivers preferred to cook the entire meal at one time.
Make vegetables look better with garnishes by adding things like parsley or breadcrumbs. You could also use attractive dishes.	2.9	Most participants indicated that they were already doing this strategy, though researchers did not observe this during the in-home visits, with the exception of 1 family who used cilantro and two families who used green onion and limes to garnish foods. Perceived lack of time was also a concern as many caregivers indicated that they prepare quick and easy meals for dinner and adding a garnish would take more time.
If your child takes vegetables by herself/himself, increase size of serving spoon.	2.7	Most families indicated that they were already implementing this strategy and if they were not, they reported that they were likely to try it. Some households did not have a variety of spoon sizes.
Give your child the usual amount of vegetables, but in a bigger dish than needed.	2.4	Many families ate dinner on a paper plate. There was a lack of different sized dishware.
Use a dinner plate or placemat that shows the right amount of vegetables to eat for a meal. An example is a plate with the MyPlate picture.	2.4	One family had a MyPlate and/or something that provided a visual image of appropriate vegetable portion sizes. Half of the caregivers said that they were doing this strategy and the other half reported that they were likely to try MyPlate.

Hide vegetables in other foods.	2.2	If the child helped with vegetable preparation, the caregiver was not able to hide the vegetable. In the interviews with the caregivers, they gave examples of how they had implemented this strategy, mostly hiding onions in hamburgers and putting cut up vegetables into casseroles.
Use fun names for vegetables when serving them to your child.	1.8	One mother gave a fun name to a vegetable, calling broccoli “trees,” but none of the other caregivers implemented this strategy during the visit.



## 2.4 Discussion

In general, availability of kitchen equipment, vegetable availability, and vegetable liking were facilitators for all strategies. Because vegetable preparation was necessary for the implementation of most strategies, one of the most essential kitchen supplies was a knife to prepare or chop vegetables. All households had at least one knife, however the Observation Checklist did not capture whether the knife present in the home was sharp enough to actually chop vegetables (i.e., researchers could have checked the yes box for the presence of a knife even if it were a butter knife). The Observation Checklist also did not account for the presence of a can opener in the home, though many researchers documented whether or not the home had one in the 'Other' kitchen supplies category. Considering that the majority of vegetables available in the home were canned, documenting whether households had a working can opener is important. Regarding vegetable availability, households had a minimum of 7 types of vegetables on hand (on average 13 vegetable types), although researchers did not collect data on actual amounts (e.g., number of cans of each vegetable). Also, all of the caregivers, with the exception of one, served a vegetable with the dinner meal, thus providing an opportunity for researchers to observe how vegetables were prepared and served in the home setting. Both caregivers and children liked at least some vegetables, with a higher liking for cooked vegetables than raw vegetables (based on liking scores).

Barriers to implementing the strategies included perceived time constraints, lack of appropriate vegetable types or utensils/dishware, and concerns about child involvement

in food preparation. During the brief qualitative interviews, caregivers talked about time being a major factor when deciding what to prepare for dinner. Several of the strategies were perceived as taking more time such as using garnishes to make foods more attractive or cutting up vegetables into small pieces. According to Alison Swenson (2015), caregivers spent, on average, 8 minutes to prepare vegetables. Caregivers reported that they believed the ‘Serve vegetables before the rest of the meal’, ‘Serve vegetables in smaller pieces to make them easy to pick up and eat, like cut up, chopped vegetables’, and ‘Make vegetables more easily available and visible to your child’ strategies required raw/fresh vegetables. Households had anywhere between 1 to 12 different types of raw/fresh vegetables, therefore, it is possible that some caregivers did not believe they had an adequate amount or variety of raw/fresh vegetables available in the home. Households did not have serving spoons and dishes of various sizes, which was a barrier for ‘Give your child the usual amount of vegetables, but in a bigger dish than needed. This will make the amount look smaller’ and ‘If your child takes vegetables by herself/himself, increase size of serving spoon. Then your child will take more with each spoonful’ strategies. Barriers for the ‘Let your child prepare vegetable dishes, by providing recipes, ingredients, equipment, and/or time.’ strategy were concerns about children being harmed, additional dinner preparation time, finding tasks for multiple children, and limited kitchen space.

The strengths of this study included collection of multiple forms of data, which were collected in the home. The ethnographic/observational nature of the current study

allowed researchers to better understand facilitators and barriers to improving dietary quality for this population group. Another strength was use of previously validated surveys such as the Home Food Inventory (Fulkerson, et al., 2008) and the USDA Food Security Survey (USDA Economics Research Service, 2012).

One limitation of the study was that in-home visits were conducted only at one time point. It would have been advantageous to conduct in-home observations on more than one night in order to draw conclusions about typical dinner preparation and mealtime routines. Also, vegetable availability was only collected at one time point and may have been influenced by when the family last went grocery shopping and/or received food assistance. Due to the lack of information on the quantity of vegetables available in the home, it is unclear if families had adequate amounts of vegetables to implement the strategies.

## **2.5 Selection of Strategies for Phase 2**

Researchers decided which of the 16 strategies to include in Phase 2 based on a variety of issues that could impact the ability of these strategies to become habits for the caregiver and thus have long-term impacts on child vegetable intake and liking. Seven of the 16 strategies were not selected for further evaluation in Phase 2 for several reasons. The ‘Plan dinner meals to routinely include a vegetable or salad’ strategy was excluded because all 16 strategies required caregivers to serve a vegetable. Also, researchers were concerned that ‘Use fun names for vegetables when serving them to your child’ was not

age appropriate for 9 to 12 year olds and thus was excluded. The following strategies were perceived by caregivers to require additional time and thus were excluded from Phase 2: ‘Serve vegetables in smaller pieces to make them easy to pick up and eat, like cut up, chopped vegetables’ and ‘Make vegetables look better with garnishes by adding things like parsley or breadcrumbs. The ‘Use attractive dishes’ strategy was excluded because households did not have colorful dishware and/or dishware that would be considered attractive by a child. The ‘Have a positive attitude when serving vegetables’ strategy was not included in Phase 2 because when caregivers were completing the Behavioral Strategy Form, there appeared to be confusion about what it meant to have a positive attitude. Researchers were also concerned that it may be challenging for caregivers to always have a positive attitude if they were dealing with food insecurity and other sensitive issues. Lastly, researchers were interested in evaluating behavioral economics strategies. As such, ‘Hide vegetables in other foods’ and ‘Ban junk food at meals’ were not included in Phase 2. These strategies take away the child’s ability to choose, a requirement for a strategy to be classified as a behavioral economics strategy (Thaler & Sunstein, 2008).

Several strategies were revised based on the facilitators and barriers discussed in the current study. For example, ‘If you put vegetables on your child’s plate, give her/him bigger servings’ and ‘If your child takes vegetables by herself/himself, increase size of serving spoon. Then your child will take more with each spoonful’ were merged and redefined so a larger spoon will be used to serve vegetables regardless if the caregiver

serves the child or if the child serves themselves. Researchers felt it was important for caregivers to have this choice about how to use the larger spoon because it was evident in some households that caregivers and children had preferences about who served the vegetable.

After the Phase 1 research was completed, researchers identified an additional strategy to include in Phase 2. This strategy was based on the idea that contrasting a liked vegetable option against the competition of a less liked option could result in greater consumption. The strategy was ‘Offer the child 2 vegetable options for dinner, one liked and one less liked. Then let the child choose what is served.’

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### CHAPTER 3: PHASE 2 METHODOLOGY

\*Prior to data analyses, Phase 2 methodology was published by the *Journal of Nutrition Education and Behavior* in an article entitled, “Testing the effectiveness of in-home behavioral economics strategies to increase vegetable intake, liking and variety among children residing in households that receive food assistance.” Authors included: Tashara M Leak, MS, RD; Alison Swenson, MS; Zata Vickers, PhD; Traci Mann, PhD; Elton Mykerezzi, PhD; Joseph P. Redden, PhD; Aaron Rendahl, PhD; Marla Reicks, PhD, RD. The current chapter is a revised version of the published article and more accurately reflects data collection and analyses completed for Phase 2.

### **3.1 Overview of Phase 2 Methodology (Chapter 3)**

**Objective:** To test the effectiveness of behavioral economics strategies for increasing vegetable intake, variety, and liking among children residing in homes receiving food assistance.

**Design:** A randomized controlled trial with data collected at baseline, once weekly for 6 weeks, and at study conclusion.

**Setting:** Family homes.

**Participants:** Families with a child (9-12 years) will be recruited through community organizations and randomly assigned to an intervention (n = 36) or control (n = 10) group.

**Intervention:** The intervention group will incorporate a new behavioral economics strategy during home dinner meal occasions each week for 6 weeks. Strategies are simple and low-cost.

**Main Outcome Measure(s):** The primary dependent variable will be child dinner meal vegetable consumption based on weekly reports by caregivers. Fixed independent variables will include the strategy and week of strategy implementation. Secondary dependent variables will include vegetable liking and variety of vegetables consumed based on data collected at baseline and study conclusion.

**Analysis:** Mean vegetable intake for each strategy across families will be compared using a mixed model analysis of variance with a random effect for child. Additionally, overall mean changes in vegetable consumption, variety, and liking will be compared between intervention and control groups.

### **3.2 Introduction**

Childhood obesity remains a significant public health concern in the United States, especially among populations with low socioeconomic status.<sup>1,2</sup> While the direct relationship between vegetable intake and weight status among children remains unclear, replacing high energy-dense foods with vegetables has the potential to lower dietary energy intake, thereby reducing risk of obesity.<sup>3</sup> According to National Health and Nutrition Examination Survey (NHANES) data (2007-2008), approximately 95% of children between the ages of 9 and 13 years do not meet the dietary recommendation for total daily vegetable intake.<sup>4</sup> To address this concern, the National School Lunch Program (NSLP) provides nutritious meals, including vegetable choices, to low-income children at a free or reduced cost.<sup>5</sup> Although programs such as the NSLP address the issue of availability in schools, additional efforts are necessary to encourage vegetable selection and consumption among children at home.

The relatively new field of behavioral economics is proposed as a means to improve dietary behavior based on the effectiveness of small, environmental changes known as nudges to alter choice behavior.<sup>6</sup> Nudges are made by someone with control over the choice environment, but not in a way that imposes objectionable restrictions. They “guide” the consumer into making particular choices (e.g., healthier foods), often without the consumer noticing. Nudges work best when they address behaviors based on quick, automatic decisions that may represent a departure from a strictly rational model of beliefs, preferences, and decision-making. Behavioral economics strategies have strong

appeal because they are potentially easy to implement, inexpensive, and influence desired choices. Nudges have been successfully applied to change food choice and intake among children in school cafeterias, but less often have these strategies been explored in the home setting.<sup>7</sup> Children consume about two-thirds of their daily calories from foods prepared in the home;<sup>8</sup> therefore, using behavioral economics strategies at home has the potential to affect overall vegetable intake.

The purpose of the current study is to test the effectiveness of 9 behavioral economics strategies or nudges (Table 3.1) for improving vegetable intake, liking, and variety of vegetables consumed by children (9-12 years) during dinner. Researchers will use the socio-ecological model as a framework for addressing eating behavior based on how individual, social, physical, and macro-level environments influence food choices.<sup>20</sup>

Caregivers will implement the behavioral strategies or nudges to improve the food choice set for children by manipulating the home physical and/or social environment (Table 3.1).

The goal of the study is to select 6 of these 9 strategies for incorporation into future Cooking Matters for Families courses conducted in the Minneapolis/St. Paul area.

Cooking Matters for Families is a program implemented in many states in the U.S. where parents and children learn to prepare food together.<sup>21</sup>

There are two primary objectives for this study:

Objective 1: To determine the 6 of 9 most effective and feasible and feasible behavioral economics strategies. Also, to explore perceived ease of use, as well as barriers and facilitators to implementing the strategies.

Hypothesis: Mean dinner vegetable intake over 1 to 3 days for each strategy will be greater for children exposed to some of the 9 behavioral economics strategies (Intervention group) in comparison to children who are not exposed to the behavioral economics strategies (Control group).

Objective 2: To evaluate if 9 behavioral economics strategies increase vegetable intake, liking, and availability during an 8-week randomized controlled trial.

Hypothesis 1: Children exposed to behavioral economics strategies (Intervention group) will consume more vegetables than children not exposed to the behavioral economics strategies (Control group).

Hypothesis 2: Children exposed to behavioral economics strategies (Intervention group) will have a higher liking of vegetables than children not exposed to the behavioral economics strategies (Control group).

Hypothesis 3: Households where the behavioral economics strategies were implemented (Intervention group) will have more vegetables available than households where the behavioral economics strategies were not implemented (Control group).

### **3.3 Methods**

#### ***Participants***

Researchers will recruit caregivers of at least 1 child (9-12 years) and the 9-12 year-old child through local agencies and organizations, such as community centers, churches, and afterschool/summer programs. In addition to having a child between the ages of 9 and 12, inclusion criteria include 1) being the caregiver primarily responsible for food preparation for the child; 2) preparing dinner at home at least 3 times weekly; and 3) reporting use of food assistance (e.g., participating in the Supplemental Nutrition Assistance Program). Caregivers who report not feeling comfortable speaking, reading, and writing in English will be excluded. Families from diverse backgrounds will be included to reflect the race/ethnicity distribution of those participating in the Minnesota Cooking Matters for Families program.

#### ***Sample size calculations***

Calculations will assume a standard deviation of 0.25 cups, based on findings of Wengreen et al. (2013),<sup>39</sup> who reported mean intake of 0.22 to 0.40 cups and standard deviations of 0.19 to 0.30 cups. To detect strategies that would increase the response by 0.225 cups (0.9 standard deviations) from the control with 80% power, 33 intervention families and 15 control families are needed, using a level of significance of 0.05. Additionally, for the aim of simply detecting the 6 best strategies, if 3 strategies increase the response by 0.25 cups (1 standard deviation), 3 increase the response by 0.15 cups (0.6 standard deviations), and 3 have no effect, there will be 80% power to correctly

identify the 6 with positive effect. The minimal detectable difference for the 3 paired t-tests between baseline and study conclusion is .275 cups (1.1 standard deviations), using a Bonferroni-corrected significance value. To account for a possible 25% drop out rate, the goal is to enroll 44 families in the intervention group and 20 in the control group. All computations will be performed in R<sup>40</sup>, and simulations will be used for the mixed model computations.

#### *Compensation and research ethics*

To enhance study retention, caregivers will receive a total of \$100 (\$25 at baseline, \$25 at mid-study, and \$50 at the final in-home visit) and children will receive a total of \$20 (\$10 at baseline and \$10 at the final in-home visit). Researchers will also distribute newsletters to caregivers and small gifts (e.g., water bottles) to children to enhance retention. The University of Minnesota Institutional Review Board approved the study.

#### *Selection of Behavioral Economics Strategies*

The 9 behavioral economics strategies that will be tested in this study (Table 3.1) were identified through a literature review/expert panel review process followed by in-home observation sessions. A multidisciplinary team with expertise in nutrition, food science, health psychology, marketing, and economics conducted a literature search to identify previously tested behavioral economics strategies that aimed to improve dietary behaviors. Based on the reviewed literature and consensus discussions among the team, a survey was constructed listing 20 commonly reported strategies each with rating scales



for feasibility in the home and potential impact on vegetable consumption and liking. The survey was sent via email to 48 experts who had 1) authored publications in the area of behavioral economics applied to food choice or factors affecting home vegetable intake among children; 2) made presentations at conferences regarding behavioral economics research and food choice; and/or 3) received funding to apply behavioral economics strategies to child feeding programs. Responses from 24 experts were used to reduce the list of 20 strategies to 16 considered to be feasible and potentially effective.

Observation sessions with 20 families receiving food assistance were conducted during dinner meal preparation and consumption to identify barriers and facilitators to implementation of the 16 strategies in home settings. Observation sessions were conducted to assess availability of cooking utensils/tools, vegetable availability, cooking skills, typical menus, and potential family responses. Based on these observations, 9 behavioral economics strategies were selected for further evaluation in the current study.

**Table 3.1 Behavioral economics strategies tested for effectiveness**

Strategy/Example	Rationale
Pair vegetables with other foods the child already likes. For example, add beans (less liked) to tacos (liked).	Associative conditioning (flavor-flavor learning) has promoted vegetable intake among middle-school children. <sup>9</sup>
Make vegetables more easily available and visible than other foods at the dinner meal. For example, place the vegetable serving dish on the dinner table and keep other foods in another room and/or out of sight.	Increasing the prominence and convenience of certain foods while decreasing the accessibility and convenience of other foods has resulted in changes in intake of each food. <sup>10</sup>
Serve vegetables before the rest of the meal. For example, serve vegetables while dinner is being prepared.	Removing competition with other foods or decreasing non-fruit or vegetable options improved fruit intake among preschool children. <sup>11</sup>
Use a dinner plate that shows the amount of vegetables to eat for a meal. Use paper plates provided for all family members for 3 meals with sections printed according to MyPlate. <sup>12</sup> [Caregivers will be provided enough 9” disposable MyPlates for everyone in the household to use on the 3 dinner meals when this strategy is implemented.]	Use of assortment allocation cues (pictures in school lunch tray compartments) has improved selection and consumption of vegetables among school-aged children. <sup>13</sup>
Offer the child 2 vegetable options for dinner, one liked and one less liked. Then let the child choose what is served.	Contrasting a liked option against the competition of a less liked option (asymmetric dominance) has resulted in changes in consumer decision making. <sup>14</sup>
If the caregiver puts vegetables on the child’s plate, give more than usual. If children typically serve themselves, put a larger spoon than normally used with the vegetable so they get more than usual. [Caregivers will be provided a serving spoon that holds approximately ½ cup vegetables.]	Using a larger serving spoon makes the default option a larger serving and has increased ice cream intake among nutrition experts. <sup>15</sup>
Eat dinner together with an adult(s) modeling vegetable consumption.	Decision-making may be influenced by parental social (descriptive) norms representing a departure from the assumption of rationality. Associations have been established between parental normative influence and vegetable intake of children. <sup>16</sup>
Serve at least two vegetables with dinner meals. Include 2 different vegetables as side	Increasing variety of vegetables offered has increased selection and consumption

dishes OR 1 side dish of vegetables plus another food item with vegetables.

among children.<sup>17,18</sup>

Let the child help prepare vegetable dishes. For example, ask the child to get vegetables out and wash them.

Individuals have liked and preferred products they made themselves over those made by others. The mere act of preparing a certain food enhanced liking and consumption among adults.<sup>19</sup>

### ***Study Design and Intervention***

A randomized, controlled trial will be conducted over 6 weeks with intervention families implementing 1 new strategy each week during at least 3 dinner meals. Caregivers will be randomly assigned 6 of the 9 strategies to implement over the 6-week intervention period. To assess effectiveness of the individual strategies, weekly phone calls will be made by a research team member to 1) estimate the frequency that the assigned strategy was used; 2) document the manner in which the strategy was implemented during each attempt to determine if the caregiver implemented the strategy as defined by researchers; 3) identify barriers and facilitators to use; 4) collect information about the type and amount of vegetables the child consumed at the dinner meal on the assigned days using a Dinner Vegetable Record Form completed by the caregiver; and 5) provide detailed instructions for implementing the next week's strategy. Instructions will include specific information about how caregivers should implement the strategy in the home with their child, including a discussion of overcoming barriers to using the strategy. The fourth weekly contact will be conducted in person instead of by phone to enhance retention.

On the nights when the behavioral economics strategy is implemented, the caregiver will record child vegetable intake on a Dinner Vegetable Record Form (Appendix 7.13). At the end of each week, during an audio-recorded telephone call, a researcher will review the data from the Dinner Vegetable Record Form and ask the following questions: “How difficult was it to implement the strategy on a scale from 1 to 10 (1 being not difficult and 10 being very difficult)?,” “What were some things that helped you implement the strategy?,” “What were some things that kept you from implementing the strategy?” The researcher will record the caregiver’s responses on the Weekly Strategy Record Script Follow-Up Call Form (Appendix 7.14). At the end of the call, the researcher will assign the caregiver another behavioral economics strategy and refer them to the Strategy Guide (Appendix 7.15), which provides several examples of how the caregiver can implement the strategy. To gauge whether or not the caregiver understands the strategy, the researcher will ask the caregiver to explain the strategy in his or her own words and to brainstorm ways in which he or she may implement the strategy in the upcoming week. Before ending the call, the researcher will ask the caregiver if he or she has any questions about the strategy and/or can foresee any challenges with implementing the strategy in the upcoming week.

Caregivers in the control group will not be assigned strategies and will be asked to prepare dinner as they normally would. They will complete the same Dinner Vegetable Record Form to report child dinner meal vegetable intake on 3 days each week for a total

of 6 weeks. At the end of each week, during an audio-recorded telephone call, a researcher will review the data from the Dinner Vegetable Record Form.

Data will be collected in three blocks (i.e., block 1, 2, or 3). The blocks represent a time frame when the families will be part of the study. The proposed 44 families in the intervention group and 20 families in the control group will be assigned to 1 of the 3 blocks. Families assigned to block 1 will start the study in September and finish by November. Families in block 2 will begin in January and finish by March. The final set of families will start in March and finish by May. Researchers will attempt to assign equal number of families in each block (~21 to 22 families in each block).

#### *Baseline and Final Outcome Measures*

Two research team members will meet with each family (both intervention and control groups) in their home at baseline, at the 4<sup>th</sup> week, and at the conclusion of the study. At the baseline home visit, after informed consent/assent is obtained, a research team member will measure the child's height and weight according to standard procedures.<sup>22,23</sup> The caregiver and child will then be separated while completing several questionnaires. The only questionnaires/forms from Phase 2 that are provided in the Appendices are those that were not included in Chapter 2, Phase 1. Thus, many of the questionnaires/forms from Phase 1, which were used in Phase 2, can be found in the Phase 1 Appendices. The caregiver will complete demographic (Appendix 7.16), vegetable liking and variety (Appendix 7.17),<sup>24, 25</sup> and household food insecurity

questionnaires.<sup>26</sup> After caregivers complete their questionnaires, a research team member will provide instructions to caregivers about how to record child dinner meal vegetable intake using a Dinner Vegetable Record Form (for 3 dinner meals during the week) (Appendix 7.13). At this time, the caregiver will practice completing the Dinner Vegetable Record Form by indicating the type and amount of vegetables the child ate the night before. Caregivers will be encouraged to use the visual aids provided, such as the Nutrition Data System for Research (NDSR) food amount booklet and the Center for Disease Control and Prevention (CDC) “What Counts as a Cup” guide, to improve the accuracy of amounts reported.<sup>27,28</sup>

The child will complete vegetable liking (Appendix 7.18)<sup>24</sup> and physical activity questionnaires<sup>29</sup> (Appendix 7.19) with a research team member. To assess dietary intake, that same team member will also conduct a 24-hour dietary recall with the child following an amended version of the NHANES Dietary Interviewers Procedures Manual.<sup>30</sup> Caregivers will assist their 9-12 year child with the 24-hour dietary recall, especially for eating occasions in which the caregiver was present. Two additional 24-hour recalls will be completed with the child by phone within the next 10 days, similar to NHANES procedures.<sup>30</sup> Recalls will be collected on nonconsecutive days and will also be used to evaluate child vegetable variety.<sup>31</sup> Recall data will be entered into the NDSR software (University of Minnesota Nutrition Coordinating Center, Minneapolis, MN), and dietary output data will be analyzed. According to the NDSR Manual, “Vegetable servings are defined per the *2000 Dietary Guidelines for Americans* as 1 cup of raw leafy

vegetables or, ½ cup of other cooked or raw vegetables” (University of Minnesota Nutrition Coordinating Center, Minneapolis, MN). To increase the accuracy of the recalls, food models in addition to the NDSR food amount booklet will be used at the first recall collected during the in-home visit. The children will also participate in measurement exercises where they practice measuring liquids in glasses that they frequently use. The research team member will take notes of these measurements in case the child references these glasses during the telephone recalls. Lastly, a research team member will conduct a home vegetable inventory (Appendix 7.20) and complete an observation checklist (Appendix 7.21) regarding cooking supplies/equipment and take notes about the layout of the kitchen/dining area.<sup>32-34</sup>

At the final home visit, the same procedures and instruments will be used for data collection, except that demographic, food security, child height/weight, and the child physical activity data are only collected at baseline. Also, at the final in-home visit, caregivers will complete an exit questionnaire (Appendix 7.22) to assess reactions to their experience and whether household composition changes during the study. Data collection description and schedules are described in Table 3.2.

**Table 3.2 Description of in-home data collection surveys, questionnaires, and procedures**

Data Collection Tool	Schedule	Description	Analysis
<i>Completed with the caregiver</i>			
Demographic questionnaire (Appendix 7.16)	Baseline in-home visit	Age, gender, race/ethnicity, household composition, education, employment, and participation in food assistance programs.	Means and standard deviation (or frequencies) as appropriate.
Exit questionnaire (Appendix 7.22)	Final in-home visit	Intervention families' perceptions about the effectiveness of the behavioral economics strategies and control families' perceptions about whether participating in the study impacted child vegetable intake.	Means and standard deviation (or frequencies) as appropriate.
Vegetable liking/variety questionnaire (Appendix 7.17)	Baseline and Final in-home visit	Adapted from an existing validated questionnaire, <sup>25</sup> including 36 vegetable items. Caregivers will indicate if they consumed the vegetable in the past 30 days (yes/no) to assess variety. Liking of each vegetable will be assessed using a 10-point hedonic labeled scale.	Mean variety scores will be determined as the sum of the 36 vegetable items where 1 point is assigned for each yes response. Liking of each vegetable will be rated on a 10-point labeled hedonic scale from Hate it (1) to Like it a lot (10) or 'Never tried'. <sup>35</sup>
Household food security	Baseline	Household food security status will be assessed using an amended version of the 6-item USDA Food Security Survey, where questions AD1 and AD1a are combined. <sup>26</sup>	Participants who respond with 0 to 1 affirmative responses will be classified as food secure, 2 to 4 affirmative responses low food security, and 5 to 6 affirmative responses very low food security.



<i>Completed with the child</i>			
Height and weight of child	Baseline	Trained researchers will collect data according to standard procedures. Height will be measured twice barefoot using a stadiometer (Seca 202, Hanover, MD) to the nearest 0.1 cm. Weight will be measured twice barefoot and in light clothing on a digital scale to the nearest 0.1 kg (Tanita BWB-800P, Arlington Heights, IL).	Mean height and weight will be calculated from the 2 measurements. BMI z-score and BMI percentile for sex and age will be calculated using CDC growth curves. <sup>36</sup>
Physical activity (Appendix 7.19)	Baseline	Youth Risk Behavior Surveillance System questions with well-established reliability. <sup>29</sup>	Will assess whether children meet physical activity recommendations (i.e., > 60 minutes of moderate or vigorous intensity aerobic activity). <sup>37</sup>
24-Hour Dietary Recalls and variety evaluation	Baseline and Final in-home visit	Three non-consecutive 24-hour dietary recalls (the first recall conducted in person followed by 2 via telephone). Changes in dietary intake: vegetable servings, energy, energy density (kcal/g), and foods/nutrients expected to vary with vegetable intake. Vegetable variety for the child will be measured with 3 days 24-hour dietary recalls.	Intake will be analyzed using NDSR software and averaged across the 3 days of intake data. The number of NDSR vegetable groups consumed over 3 days of dietary recall will be used to assess variety of vegetables consumed. <sup>31</sup>
<i>Completed by researchers</i>			
Home vegetable inventory (Appendix 7.20)	Baseline and Final in-home visit	A validated home food inventory form was adapted and will be used to record the availability of vegetables in the home. <sup>33</sup> Revisions were made to estimate amount (ounces) of vegetables present.	A count of different types of vegetables will be made based on all forms of the same vegetable (fresh, canned or frozen). One point will be assigned for each vegetable regardless of its form. Mean vegetable counts will be calculated.

Observation checklist (Appendix 7.21)	Baseline and Final in-home visit	An observation checklist was developed and includes information on cooking supplies present in the home as well as a description of the home dining environment (e.g., presence of dining room table).	A count of specific equipment for use in vegetable preparation will be made based on its presence in the home (e.g., knives, strainers, peelers). <sup>38</sup>
<i>Completed by caregiver after baseline visit</i>			
Dinner Vegetable Record Form (Appendix 7.13)	Weekly phone calls	This form includes information on the days/dates the intervention was implemented in the home and lists the names and the amounts of vegetables eaten by the child at the dinner meal on that day.	The names of specific vegetables eaten and the quantity eaten (cups)
Weekly strategy record script-follow-up call (Appendix 7.14)	Weekly phone calls	A questionnaire script for interviewing the caregiver regarding the experience of implementing the strategy.	Open-ended questions addressing the manner in which the strategy was implemented, facilitators and barriers.
Vegetable liking questionnaire (Appendix 7.18)	Baseline and Final in-home visit	The same questionnaire that adults complete will be used, except that children will not be asked about vegetables consumed in the last 30 days as a measure of variety.	Liking of each vegetable will be rated on a 10-point labeled hedonic scale from Hate it (1) to Like it a lot (10) or 'Never tried'. <sup>35</sup>

### *Pilot testing*

Data collection protocols were developed to maintain consistent data collection procedures throughout the study for all families. Study personnel experienced in community research methods trained other research team members to improve skills through repeated demonstration/modeling/critiquing and in-home practice sessions. The protocols were first pretested with 6 families using 6 strategies to refine data collection procedures and instructions for study participants. After the pretest, the research team conducted a pilot test with 16 families (11 in the intervention group and 5 in the control group) for the entire length of the study (implementation of 6 strategies per family). At the conclusion of the pilot test, 3 of the 9 strategies were revised to improve consistency as implementation of these 3 strategies widely varied across families. The instructions for most of the strategies were also clarified and simplified. To improve the accuracy of food/vegetable amounts reported, additional resources (e.g., a pre-measured serving spoon) were provided to families, and the Dinner Vegetable Record Form was simplified.

### *Data Analysis*

To determine if there are differences in sociodemographic characteristics between the intervention and control group at baseline, t-tests and chi-square tests will be conducted for continuous and categorical variables, respectively.

*Data Analyses for Objective 1. Determining the Most Effective Behavioral Economics Strategies*

To determine if each of the 9 behavioral economics strategies increased child dinner vegetable intake when compared to the control group, mean dinner vegetable intake will be analyzed from the Dinner Vegetable Record Forms completed by the caregiver. Mean dinner vegetable intake will be calculated over the 3 days each strategy is implemented in its assigned week. For the control group, mean dinner vegetable intake will be calculated over 3 days/week selected by the caregiver. Least square means for dinner vegetable intake per each of the 9 strategies and 95% confidence intervals will be reported.

Vegetable intakes for the strategies will then be compared using a mixed model analysis of variance (ANOVA) with a random effect for child. Fixed independent variables will include strategies, the week of strategy implementation, and the block when the strategy will be implemented. The week\*block interaction will also be included in the model.

The first fixed independent variable will be the strategies, which will consist of 10 levels (i.e., the 9 behavioral economics strategies and the 1 control group). The second fixed independent variable will be the week the strategy is implemented (i.e., weeks 1 to 6), which will be treated as a continuous variable. The last fixed independent variable will be the block when strategies will be implemented, which will be treated as a categorical variable.

Dunnett's post hoc test will be applied to the mixed model ANOVA to identify if any of the behavioral economics strategies improved mean vegetable intake compared to the control group. In addition to the mixed model ANOVA, multiple pairwise comparisons of the behavioral economics strategies will be evaluated using Tukey Honestly Significant Difference (HSD) test. Statistical significance will be set at  $p\text{-value} < 0.05$ .

Several covariates will be tested to control for possible differences observed between each strategy. Variables used as covariates will include caregiver's age, race/ethnicity, caregiver education and employment status, number of individuals residing in the household, household food security, household vegetable availability, caregiver vegetable intake, child BMI, and vegetable liking for both children and caregivers. Due to the relatively small sample size and large number of covariates (i.e., too many degrees of freedom), each covariate will be tested separately in the mixed model ANOVA.

Covariates will be tested separately to avoid overfitting in the model where random error and noise is interpreted as a true effect.

After the weekly telephone call to review the Dinner Vegetable Record Form, a second researcher will listen to the audio recording and add missing details to the Weekly Strategy Record Script Follow-Up Call Form. The difficulty rating scores will be averaged for each strategy, and caregivers' perceived facilitators and barriers when implementing the strategies will be summarized. Considerations for determining which 6 strategies will be implemented in the next phase of the project will include the mean

increase in vegetable intake for each strategy in the intervention compared to the control group (according to dinner vegetable record data), ratings of ease of use, and considerations of perceived facilitators and barriers.

*Data Analyses for Objective 2. Vegetable Intake, Liking, Availability-Comparison of Baseline and Study Conclusion Outcome Measurements*

To determine if children in the intervention group experienced a greater increase in vegetable intake from baseline to study conclusion than children in the control group, differences in the daily mean amount of vegetables (servings), energy, and nutrients consumed will be tested for significance using Wilcoxon signed-rank test (based on 3 days of 24-hour dietary recalls collected at baseline and study conclusion). Also, 95% confidence intervals for mean total vegetable intake will be calculated. Findings will be reported for average daily intake and average dinner intake.

To determine if children in the intervention group experience a greater increase in the number of vegetables tried, number of vegetables liked, and vegetable liking across all vegetables from baseline to study conclusion than children in the control group, t-tests will be conducted. Also, to determine if children in the intervention group experience an increase in vegetable liking for each of the 36 different vegetable types from baseline to study conclusion, t-tests will be conducted. Vegetable liking will be based on a 10-point labeled hedonic scale from 'Hate it' (1) to 'Like it a lot' (10). A score of  $\geq 5$  will be considered a liked vegetable. If a child indicates that they 'Never tried' a vegetable, they

will not provide a liking rating. Researchers will inquire about 36 different vegetable types.

To determine if households in the intervention group experience a greater increase in the number of vegetables available in the home from baseline to study conclusion than households in the control group, t-tests will be conducted. The total number of households with fresh, frozen, and canned types of each of the vegetable types will also be reported. Pearson's correlation coefficients will be computed to determine if there is a relationship between baseline child vegetable liking (rating score of  $\geq 5$ ), caregiver vegetable liking (rating score of  $\geq 5$ ), and home vegetable availability separately for each of 36 different vegetable types. A p-value  $< 0.05$  will be used as the criterion for statistical significance.

### **3.4 Discussion**

A major strength of the study includes the efforts to recruit and retain participants for the entire length of the randomized controlled trial. A high dropout rate (~25%) is expected given that this audience tends to be extremely mobile (i.e., change housing often) and telephone numbers change frequently. To address this issue, the research team will oversample to account for dropouts, compensate caregivers and children for their time, and conduct sessions at times convenient for the family. The research team will also collect information for an alternate contact person in case they lose contact with the participant. Reasons for dropouts will be recorded and addressed as much as possible to

enhance retention. The contacts at baseline, the fourth week, and at study conclusion will be conducted in the participants' homes to allow researchers to build rapport with the family and enhance retention. Also, a monthly newsletter will be mailed to each family's home to enhance retention.

Another strength is that the research team will inquire about facilitators and barriers caregivers experience, as well as how they actually implement each behavioral economics strategy during dinner meals. This information will be considered when selecting the subset of 6 behavioral economics strategies for the next phase of the project and will help the research team determine how to revise the instructions provided to caregivers for implementing the strategies.

Strengths and limitations exist with respect to conducting 24-hour dietary recalls with children and using the Dinner Vegetable Record Forms provided by caregivers as a proxy for child dinner vegetable intake. Although dietary recalls are criticized because they rely on memory, especially among children, they are less burdensome and an appropriate option when researchers are interested primarily in mean intake of vegetables.<sup>41</sup>

Collection of this information over 3 days (1 day in person) using the NDSR multi-pass approach with visual portion-size estimation aids will minimize misreporting error. Also, the use of the food models, NDSR food amount booklets, and measurement exercises completed during the first recall at the in-home visit should improve the accuracy for the child 24-hour dietary recalls. Similarly, the practice Dinner Vegetable Record Form



completed with the caregiver at the first in-home visit will also help minimize reporting errors.

Limitations for this study will include the use of a non-representative convenience sample, with caregivers residing in the Twin Cities or surrounding areas having a similar sociodemographic background. Furthermore, prior to participating in the study, caregivers must report preparing dinner meals in the home at least 3 times weekly. Thus, findings cannot be generalized to a broader group of caregivers and children. Caregivers may provide socially desirable responses, as those interested in nutrition may be more likely to volunteer and have higher compliance rates throughout the study. Lastly, this study will not address the outcome of weight change, only the potential proximal outcome of dinner meal vegetable intake.

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## **CHAPTER 4: PHASE 2 FINDINGS**

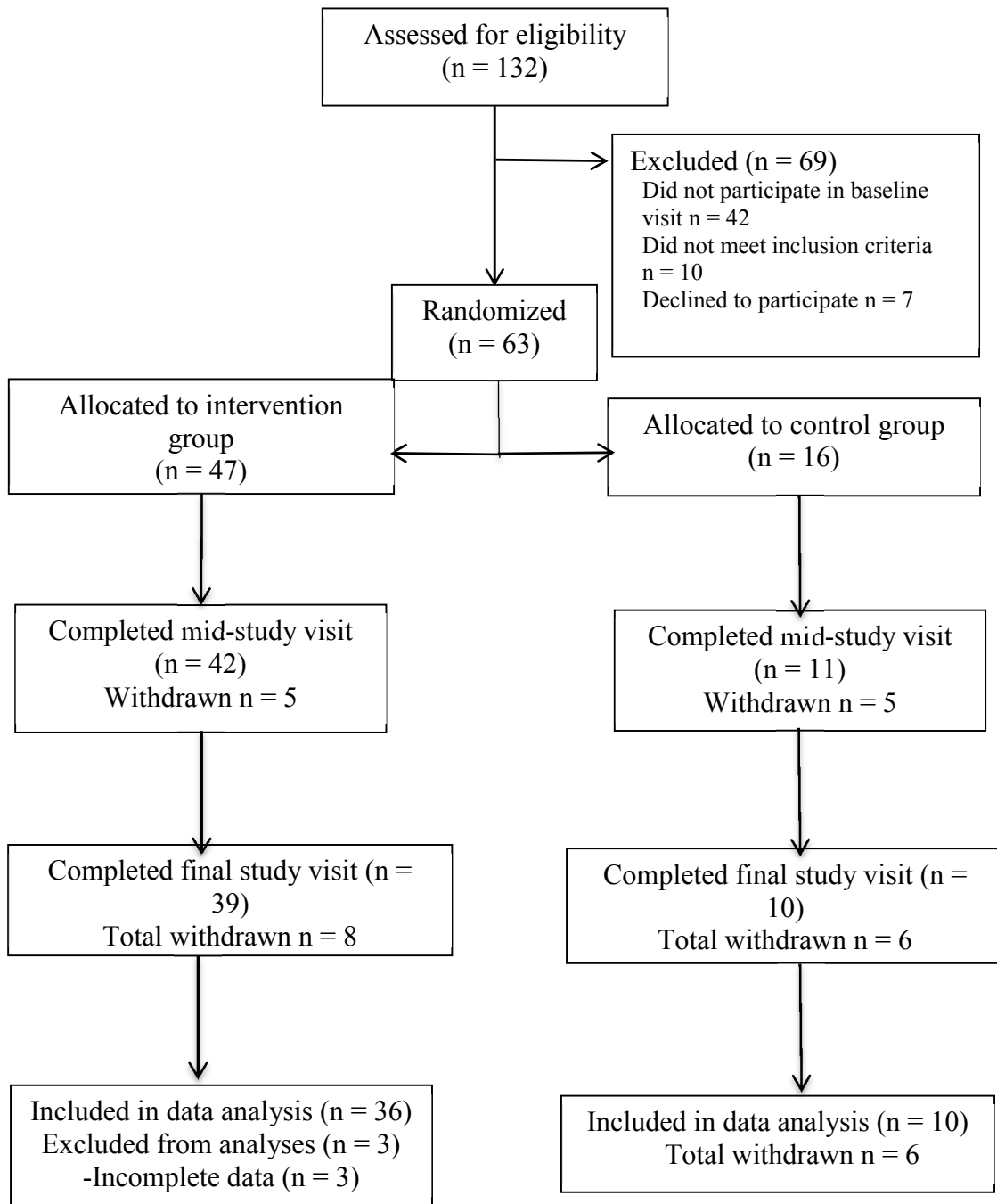
### Testing the Effectiveness of In-Home Behavioral Economics Strategies to Increase Vegetable Intake and Liking Among Children Residing in Households that Receive Food Assistance

\* The introduction and methods for Phase 2 were described in Chapter 3, while Phase 2 results are provided and discussed in the current Chapter 4.



#### **4.1 Results**

A total of 63 child-caregiver dyads were assigned to either the intervention (n = 47) or control (n = 16) group. By the conclusion of the study, 14 child-caregiver dyads had withdrawn from the study (intervention: n = 8, control: n = 6). Thus, data were collected at baseline and study conclusion in-home visits from 39 child-caregiver dyads in the intervention group and 10 child-caregiver dyads in the control group. Participant flow through the study is presented in Figure 4.1.



**Figure 4.1 Participant flow through a study to determine if behavioral economics strategies implemented at dinner meals increased child vegetable consumption.**

At baseline, no significant differences in sociodemographic characteristics were observed between the intervention and control group (all p values > 0.13; Table 4.1). The mean age of children in both groups was 10. Gender was relatively evenly distributed for those in the intervention group, but in the control group there were eight girls and two boys. Most of the children (n = 24) in the intervention group were normal weight (BMI 5<sup>th</sup> percentile to < 85<sup>th</sup> percentile), whereas six were overweight (BMI 85<sup>th</sup> to < 95<sup>th</sup>), seven were obese (BMI ≥ 95<sup>th</sup> percentile), and one was underweight (BMI < 5<sup>th</sup> percentile). In the control group, there was a relatively even number of normal, overweight, and obese children. None of the children in the control group were underweight. The majority of the children in both the intervention and control group were either non-Hispanic Black/African American or non-Hispanic White/Caucasian. Several children in the intervention group (n = 7) classified themselves as mixed race.

Mean age of caregivers in the intervention and control groups was 37 and 38 years, respectively. All of the caregivers in both the intervention and control group were female, with the exception of one father in the intervention group. Race/ethnicity of caregivers was similar to that of the child, though fewer caregivers identified themselves as mixed race in comparison to children who identified themselves as mixed race. The majority of caregivers in both the intervention and control group attended at least some college or technical school. Employment status among the caregivers in the intervention group was relatively evenly distributed among homemaker, part-time employment, or full-time employment. Half of the caregivers in the control group were homemakers.

Half of the caregivers in the control group were employed full-time. Caregivers in the intervention and control group reported consuming vegetables on average about one time per day. They reported consuming on average 1 cup of vegetables on the days they consumed vegetables.

The largest percentage of households experienced low food security (37% in the intervention group and 50% in the control group), followed by high or marginal food security, then very low food security. Lastly, most households had more than one adult and more than one child residing in the home.

**Table 4.1 Participant sociodemographic characteristics at baseline.**

	<b>Intervention (n = 39)</b>	<b>Control (n = 10)</b>
<b>Target Child Characteristics</b>		
Age, mean (SD) <sup>a</sup>	10.4 (1.0)	10.4 (1.3)
Male, n (%) <sup>b</sup>	20 (51.3)	2 (20)
Race, n (%) <sup>b</sup>		
Black or African American	18 (47.4)	3 (30)
White or Caucasian	9 (23.7)	4 (40)
Alaska Native or American Indian	2 (5.3)	0 (0)
Mixed Race	7 (18.4)	2 (20)
Other	2 (5.3)	1 (10)
Hispanic or Latino, n (%) <sup>b</sup>	3 (7.9)	0 (0)
BMI Status, n (%) <sup>b</sup>		
Underweight	1 (2.6)	0 (0)
Normal weight	24 (63.2)	3 (30)
Overweight	6 (15.8)	4 (40)
Obese	7 (18.4)	3 (30)
<b>Primary Food Preparer Characteristics</b>		
Age, mean (SD) <sup>ac</sup>	37.1 (7.1)	38.1 (5.6)
Male, n (%) <sup>bc</sup>	1 (2.6)	0 (0)
Race, n (%) <sup>bc</sup>		
Black or African American	18 (47.4)	2 (20)
White or Caucasian	14 (36.8)	7 (70)
Alaska Native or American Indian	2 (5.3)	0
Mixed Race	2 (5.3)	0
Other	2 (5.3)	1 (10)

<b>Primary Food Preparer Characteristics</b>	<b>Intervention (n = 39)</b>	<b>Control (n = 10)</b>
Hispanic or Latino, n (%) <sup>bc</sup>	3 (7.9)	0
Education, n (%) <sup>bc</sup>		
Have not completed high school	3 (7.9)	1 (10)
Received high school diploma or GED	5 (13.2)	0
Some college or technical school	24 (63.2)	7 (70)
4-year college, university degree or advanced degree	6 (15.8)	2 (20)
Employment Status, n (%) <sup>bc</sup>		
Homemaker	16 (42.1)	5 (50)
Employed part time	11 (28.9)	0
Employed full time	11 (28.9)	5 (50)
During the past 7 days how many times did you eat vegetables other than white potatoes?, mean times per day (SD) <sup>ac</sup>	1.0 (0.78)	0.9 (0.64)
On the days you eat vegetables, on average how much do you eat?, mean cups/day (SD) <sup>ac</sup>	1.0 (0.86)	1.0 (1.2)
<b>Household Characteristics</b>		
Food Security, n (%) <sup>bc</sup>		
High or marginal	13 (34.2)	4 (40)
Low food security	14 (36.8)	5 (50)
Very low food security	11 (28.9)	1 (10)
Number of Adults in the Home, mean (SD) <sup>a</sup>	1.6 (0.9)	1.8 (.63)
Number of Children in the Home, mean (SD) <sup>a</sup>		
<9 years	1.2 (.54)	1.4 (.52)
9 to 12 years	1.1 (1.0)	0.9 (.88)
13-18	0.5 (.64)	0.5 (.85)

<sup>a</sup>. T-test used to compare responses between intervention and control groups

<sup>b</sup>. X2 test used to compare proportions between intervention and control groups

<sup>c</sup>. Missing data for one caregiver in the intervention group

***Objective 1. Determination of the Most Effective Behavioral Economics Strategies***

Mean dinner vegetable intake for children in the control group was 0.82 cups (95% CI [0.54, 1.09]) and ranged from 0.77 to 1.21 cups/dinner meal for those in the intervention group (Table 4.2). Mean dinner vegetable intake among children exposed to any of the behavioral economics strategies was not significantly different from children in the control group according to Dunnett's test (Table 4.2).

Children consumed more vegetables with the 'Serve at least two vegetables with dinner meals' strategy than with the 'Pair vegetables with other foods child likes' strategy (0.43 more cups;  $p = 0.01$ ). Also, children consumed more vegetables with the 'Serve at least two vegetables with dinner meals' strategy than with the 'Eat dinner together with an adult(s) modeling vegetable consumption' strategy (0.39 more cups;  $p = 0.04$ ).

**Table 4.2 Behavioral economics strategies impact on child mean dinner vegetable intake.**

<b>Behavioral Economics Strategies</b>	<b>No. of Households Where the Strategy Was Implemented<sup>a</sup></b>	<b>Dinner Vegetable Intake, LS mean (SE) (cups)<sup>b</sup></b>	<b>Dinner Vegetable Intake, 95% CI (cups)</b>	<b>Differences between Intervention and Control (cups)<sup>c,d</sup></b>	<b>Differences between Intervention and Control, 95% CI (cups)</b>	<b>P value<sup>e,f</sup></b>
Serve at least two vegetables with dinner meals.	27	1.2 (0.11)	1.00-1.42	0.4	-0.05-0.83	0.11
Serve vegetables before the rest of the meal.	21	1.09 (0.12)	0.85-1.32	0.27	-0.19-0.73	0.43
Let child help prepare vegetable dishes.	23	0.99 (0.11)	0.77-1.22	0.17	-0.28-0.63	0.8
Offer child two vegetable options for dinner, one liked and one disliked, let child choose what is served.	21	0.97 (0.12)	0.74-1.19	0.15	-0.31-0.60	0.9
Use a dinner plate that shows the right amount of vegetables to eat for a meal.	25	0.96 (0.11)	0.74-1.17	0.14	-0.31-0.59	0.92
If caregiver puts vegetables on child's plate, give child more than usual.	27	0.95 (0.11)	0.74-1.16	0.13	-0.31-0.58	0.93
Make vegetables more easily available and visible than other foods at the dinner meal.	23	0.88 (0.12)	0.64-1.12	0.06	-0.41-0.52	1
Eat dinner together with an adult(s) modeling vegetable consumption.	25	0.81 (0.11) <sup>g</sup>	0.60-1.03	-0.01	-0.45-0.44	1



Pair vegetables with other foods child likes.	25	0.77 (0.11) <sup>g</sup>	0.55-0.99	-0.05	-0.49-0.40	1
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<sup>a</sup> Within a week, a caregiver may have provided Vegetable Dinner Food Record data from 1 to 3 dinners.

<sup>b</sup> Least square means (standard error of the mean), according to the ANOVA model.

<sup>c</sup> Differences = Intervention – Control

<sup>d</sup> Mean vegetable intake for control group was 0.82 cups.

<sup>e</sup> Dunnett's test,  $p < 0.05$  was considered statistically significant.

<sup>f</sup> Adjusted p values  $> 1$  were truncated to one.

<sup>g</sup> Consumed significantly fewer vegetables than 'Serve at least two vegetables with dinner meals', according to Tukey pairwise comparisons (p values for these differences are not provided in Table 4.2, see text).

### *Caregiver Perception of Behavioral Economics Strategies*

On average, caregivers rated the difficulty of implementing the strategies as 2.6 (scale of 1 - not difficult to 10 - very difficult), with mean scores for individual strategies ranging from 2.1 to 2.9 (Table 4.3).

Several strategies shared common facilitators as reported by caregivers (Table 4.3). One common facilitator was having implemented the behavioral economics strategies prior to the study. Another frequently reported facilitator was the Strategy Guide provided by the research team because the guide provided several examples for ways caregivers could implement the strategy.

There were several common barriers to implementing the strategies. A commonly reported barrier was that some strategies were out of the norm and felt unnatural for caregivers. For example, this was an issue for the 'Make vegetables more easily available and visible than other foods at the dinner meal' strategy because caregivers said it was strange to have foods located in different places during the dinner meal and because children made negative comments about the food being separated. Caregivers who implemented the 'Serve at least two vegetables with dinner meals' and 'If caregiver puts vegetables on child's plate, give child more than usual' strategies, were concerned that implementation of the strategy would result in wasting food.

Having enough time to implement the strategies was reported as both a facilitator and barrier, depending on the strategy. Some caregivers reported that ‘Serve vegetables before the rest of the meal’ gave them more time to prepare the meal, but a barrier to this strategy was that it required children to be home prior to dinner. This was an issue when children had after school activities and/or did not get home until the actual dinner meal was served. Caregivers reported that other strategies added an extra step to their normal dinner routine and increased time spent on the dinner meal. For example, caregivers reported that ‘Let child help prepare vegetable dishes’ increased the food preparation time because they had to take the time to instruct the child. This was especially a barrier considering that caregivers reported that dinners needed to be prepared relatively quickly due to hectic work/school schedules.

Caregivers reported that they had enough vegetables in the home to implement most strategies, but there were several strategies where caregivers reported that not having enough vegetables and/or not having a variety of vegetable types was a barrier. Not having enough vegetables was a commonly reported barrier for the ‘Serve at least two vegetables with dinner meals’ and ‘If caregiver puts vegetables on child’s plate, give child more than usual’ strategies. Also, caregivers who implemented ‘Offer child two vegetable options for dinner, one liked and one disliked, let child choose what is served’ reported that it was helpful when they had vegetables available in the home that the child liked and disliked. Not having raw vegetables in the home was a commonly reported as a barrier to ‘Serve vegetables before the rest of the meal’. Caregivers reported that they

often did not have raw vegetables available in the home and were unsure about the feasibility of using canned vegetables to implement the strategy.

Lastly, vegetable liking was a facilitator and vegetable disliking was a barrier, depending on the strategy. Many caregivers reported that it was helpful that they could choose vegetables they knew their child liked to implement the strategies. One common barrier for the 'Eat dinner together with an adult(s) modeling vegetable consumption' strategy was that some caregivers reported that they did not like vegetables in general and/or it was challenging to find a vegetable to prepare that both they and the child liked.

**Table 4.3 Caregiver rating of difficulty, and perceived facilitators and barriers to implementing behavioral economics strategies.**

<b>Behavioral Economics Strategy</b>	<b>Rating of Difficulty, Mean<sup>a</sup> (SD)</b>	<b>Facilitators<sup>b</sup></b>	<b>Barriers<sup>b</sup></b>
Serve at least two vegetables with dinner meals.	2.9 (2.3)	<ul style="list-style-type: none"> <li>• Implemented strategy in the past</li> <li>• Target child liked vegetables</li> <li>• Vegetable availability</li> <li>• Planning ahead</li> <li>• Having help in the kitchen</li> </ul>	<ul style="list-style-type: none"> <li>• Concerned about food waste</li> <li>• Misinterpretation of the strategy</li> <li>• Not enough vegetables available in the home</li> <li>• Money to buy more vegetables</li> <li>• Extra time required</li> <li>• Planning ahead</li> <li>• Children noticed and complained</li> <li>• Trying to form a new habit</li> <li>• Multiple preferences in the home</li> <li>• Finding 2 vegetables that go with the meal.</li> </ul>
Use a dinner plate that shows the right amount of vegetables to eat for a meal.	2.8 (2.5)	<ul style="list-style-type: none"> <li>• Implemented strategy in the past</li> <li>• Images on the MyPlate facilitated conversation about food groups</li> <li>• Some children reported that they liked the plate</li> <li>• Guided portions allotted</li> </ul>	<ul style="list-style-type: none"> <li>• Difficult with certain foods (e.g., soup, combination foods)</li> <li>• Not sure how to explain MyPlate</li> <li>• Plate was too small</li> <li>• Not having all the food groups to put on the plate</li> <li>• Everyone not accepting the plate (i.e., age appropriate)</li> <li>• Time and forgetting to use the plate</li> <li>• Plate was not sectioned and children complained about food touching</li> </ul>
If caregiver puts	2.7 (2.2)	<ul style="list-style-type: none"> <li>• Served children liked vegetables</li> </ul>	<ul style="list-style-type: none"> <li>• Concerned about food waste</li> </ul>

vegetables on child's plate, give child more than usual.		<ul style="list-style-type: none"> <li>• Large spoon researchers provided helped caregivers know that they were serving more than usual</li> <li>• Child liked vegetables</li> <li>• Easy strategy to implement</li> <li>• Having enough vegetables available</li> </ul>	<ul style="list-style-type: none"> <li>• Not enough vegetables available in the home</li> <li>• Children noticed and complained</li> <li>• Forgot to use the large spoon provided (i.e., not the norm)</li> <li>• Vegetables that do not fit in a spoon (e.g., lettuce, mixed dish)</li> <li>• Using the large spoon was an extra step</li> <li>• Large spoon was too big (i.e., too many vegetables)</li> <li>• Shape of the large spoon was awkward</li> </ul>
Pair vegetables with other foods child likes.	2.7 (2.5)	<ul style="list-style-type: none"> <li>• Implemented strategy in the past</li> <li>• Examples in the Strategy Guide</li> <li>• Not a lot of preparation time needed</li> <li>• Required less time than other strategies</li> <li>• Choosing vegetables child liked</li> </ul>	<ul style="list-style-type: none"> <li>• Instructions unclear, some interpreted as hide vegetables</li> <li>• Not enough vegetables available in the home</li> <li>• Extra time required</li> <li>• Planning ahead</li> <li>• Multiple preferences in the home</li> <li>• Trying to figure out what to pair</li> </ul>
Offer child two vegetable options for dinner, one liked and one disliked, let child choose what is served.	2.7 (2.4)	<ul style="list-style-type: none"> <li>• Have given children choices in the past</li> <li>• Had vegetables child liked and disliked available in the home</li> <li>• Easy strategy to implement</li> </ul>	<ul style="list-style-type: none"> <li>• Extra time required</li> <li>• Not enough vegetables available in the home</li> <li>• Children did not want to pick</li> <li>• Normally children do not have choices (i.e., going against the norm)</li> </ul>
Serve vegetables before the rest of the meal.	2.6 (2.4)	<ul style="list-style-type: none"> <li>• Implemented strategy in the past</li> <li>• Examples in the Strategy Guide</li> <li>• Allowed for more time to cook dinner</li> <li>• Child was normally in the kitchen anyways while the parent is cooking</li> </ul>	<ul style="list-style-type: none"> <li>• Extra time required</li> <li>• Not having a variety of fresh vegetables (using canned vegetables was against the norm)</li> <li>• Planning ahead</li> <li>• Children not home before dinner</li> <li>• Disliked separating vegetables (i.e., going against</li> </ul>

		<ul style="list-style-type: none"> <li>• Having vegetables available</li> </ul>	the norm)
Let child help prepare vegetable dishes.	2.4 (2.0)	<ul style="list-style-type: none"> <li>• Implemented strategy in the past</li> <li>• Examples provided in the Strategy Guide</li> <li>• Caregiver and child enjoyed cooking together</li> <li>• Caregiver appreciated the help</li> <li>• Having vegetables that were easy for child to prepare</li> </ul>	<ul style="list-style-type: none"> <li>• Extra time required</li> <li>• Child not interested in helping</li> <li>• Child not home to help prepare the meal</li> <li>• Child's safety (e.g., using the knife, stove)</li> <li>• Chaos when multiple children want to help</li> <li>• Inadequate kitchen supplies (e.g., vegetable peeler)</li> <li>• Not knowing how to involve child</li> <li>• Caregiver too busy for help</li> <li>• Caregiver unsure of their own cooking skills</li> </ul>
Make vegetables more easily available and visible than other foods at the dinner meal.	2.4 (2.1)	<ul style="list-style-type: none"> <li>• Easy to implement</li> <li>• Having vegetables available</li> <li>• Using vegetables the target child likes</li> </ul>	<ul style="list-style-type: none"> <li>• Not enough serving dishes</li> <li>• Disliked separating the food (i.e., going against the norm)</li> </ul>
Eat dinner together with an adult(s) modeling vegetable consumption.	2.1 (2.2)	<ul style="list-style-type: none"> <li>• Implemented strategy in the past</li> <li>• Examples provided in the Strategy Guide</li> <li>• Caregiver enjoyed eating with family</li> <li>• Caregiver wanted to encourage child vegetable consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Caregiver did not like vegetables</li> <li>• Not enough vegetables available</li> <li>• Caregiver does not always eat with family because of busy schedules</li> <li>• Finding vegetables that the caregiver and target child liked</li> <li>• Kitchen table too small to seat everyone</li> </ul>

<sup>a</sup>. Rating of difficulty was based on a scale of 1 - not difficult to 10 - very difficult.

<sup>b</sup>. When multiple caregivers reported the same facilitator and/or barrier, it was only listed once in Table 4.3.

***Objective 2. Vegetable Intake, Liking, and Availability-Comparison of Baseline and Study Conclusion Outcome Measurements***

*Mean Daily Dietary Intake*

Child 24-hour dietary recall data collected at baseline and study conclusion visits showed no difference when comparing change (pre-post differences) in daily mean total vegetable intake between the intervention and control group (Table 4.4). At baseline, children in the intervention group had a mean total daily vegetable intake of 2 servings (Table 4.4), 95% CI [1.55-2.49]. Children in the control group had a mean total daily vegetable intake of 1.83 servings (Table 4.4), 95% CI [1.28-2.38]. By the study conclusion visit, children in the intervention group reported that they had a daily mean total vegetable intake of 2.5 servings, 95% CI [1.89-3.07], and the control group had a daily mean total vegetable intake of 1.6 servings, 95% CI [0.91-2.33].

No significant differences between the intervention and control group were observed when comparing change (pre-post differences) in daily mean intake of dark green vegetables, deep yellow vegetables, tomatoes, white potatoes, fried potatoes, other starchy vegetables, legumes, other vegetables, and vegetable based savory snacks (Table 4.4).

The vegetable subgroup with one of the lowest intakes was dark green vegetables. At baseline, mean daily dark green vegetable intake was 0.13 and 0.04 servings, respectively for children in the intervention and control groups. By the conclusion of the study, mean



daily dark green vegetable intake for children in the intervention group was 0.22 servings and 0.17 servings for children in the control group.

The change in pre-post daily mean energy intake between the intervention and control group was not significant, nor were there any significant differences in changes in pre-post daily mean intake of any macronutrients or micronutrients listed in Table 4.4.

**Table 4.4 Mean daily vegetable group, energy, and nutrient intakes based on 24-hour dietary recalls.**

<b>Dietary component<sup>a</sup></b>	<b>Intervention baseline (n = 39) mean (SD)</b>	<b>Intervention study conclusion (n = 36) mean (SD)</b>	<b>Pre-post change intervention mean (SD)</b>	<b>Control baseline (n = 10) mean (SD)</b>	<b>Control study conclusion (n = 10) mean (SD)</b>	<b>Pre-post change control mean (SD)</b>	<b>P value (difference in pre-post change between group)<sup>b</sup></b>
Vegetable Total (servings)	2.0 (1.5)	2.5 (1.8)	0.5 (1.7)	1.83 (0.8)	1.6 (1.0)	-0.23 (0.8)	0.21
Dark Green Vegetables (servings)	0.13 (0.29)	0.22 (0.68)	0.09 (0.60)	0.04 (0.09)	0.17 (0.33)	0.13 (0.25)	0.26
Deep Yellow Vegetables (servings)	0.12 (0.22)	0.14 (0.22)	0.02 (0.34)	0.10 (0.14)	0.08 (0.13)	-0.02 (0.10)	0.09
Tomato (servings)	0.36 (0.38)	0.45 (0.52)	0.09 (0.52)	0.32 (0.27)	0.24 (0.33)	-0.08 (0.44)	0.40
White Potatoes (servings)	0.18 (0.38)	0.32 (0.67)	0.14 (0.70)	0.37 (0.55)	0.11 (0.26)	-0.26 (0.57)	0.06
Fried Potatoes (servings)	0.21 (0.30)	0.37 (0.66)	0.15 (0.62)	0.19 (0.23)	0.14 (0.35)	-0.05 (-0.46)	0.17
Other Starchy Vegetables (servings)	0.10 (0.18)	0.28 (0.41)	0.16 (0.43)	0.02 (0.03)	0.15 (0.24)	0.13 (0.24)	0.86
Legumes (servings)	0.25 (0.58)	0.13 (0.50)	-0.12 (0.34)	0.09 (0.15)	0.19 (0.44)	0.10 (0.51)	0.89
Other Vegetables (servings)	0.53 (0.50)	0.46 (0.45)	-0.07 (0.60)	0.64 (0.43)	0.43 (0.43)	-0.21 (0.45)	0.71
Vegetable Based Savory Snack (servings)	0.15 (0.34)	0.09 (0.22)	-0.06 (0.31)	0.06 (0.20)	0.11 (0.31)	0.05 (0.40)	0.82
<b>Energy (kcal)</b>							
Energy (kcal)	1769 (462)	1891 (693)	129 (707)	1726 (401)	1661 (481)	-65 (381)	0.47
<b>Total Fat (g)</b>							
Total Fat (g)	69 (22)	75 (36)	7 (37)	62 (18)	62 (22)	0 (25)	0.80
<b>Total Carbohydrate (g)</b>							
Total Carbohydrate (g)	225 (65)	241 (80)	14 (91)	230 (56)	216 (68)	-14 (46)	0.25
<b>Total Protein (g)</b>							
Total Protein (g)	67 (21)	70 (27)	4 (24)	66 (14)	65 (21)	-1 (20)	0.78

<b>Dietary component<sup>a</sup></b>	<b>Intervention baseline (n = 39) mean (SD)</b>	<b>Intervention study conclusion (n = 36) mean (SD)</b>	<b>Pre-post change intervention mean (SD)</b>	<b>Control baseline (n = 10) mean (SD)</b>	<b>Control study conclusion (n = 10) mean (SD)</b>	<b>Pre-post change control mean (SD)</b>	<b>P value (difference in pre-post change between group)<sup>b</sup></b>
Total Dietary Fiber (g)	13.3 (6.2)	15.0 (7.3)	1.6 (6.8)	12.2 (4.2)	13.1 (5.3)	0.9 (5.0)	1
Iron (mg)	13.4 (4.2)	13.7 (5.4)	0.4 (5.7)	13.2 (4.5)	13.5 (5.6)	0.3(4.4)	1
Vitamin D (mcg)	6.5 (3.8)	5.8 (3.3)	-0.28 (2.9)	7.0 (4.0)	4.7 (3.3)	-2.3 (3.8)	0.19
Calcium (mg)	951 (406)	1004 (473)	59 (453)	1061 (345)	894 (332)	-168 (301)	0.13
Sodium (mg)	2999 (815)	3373 (1475)	401 (1521)	2925 (677)	2933 (725)	7.8 (968)	0.55
Potassium (mg)	1937 (727)	2175 (838)	247 (843)	1899 (424)	1767 (620)	-131 (463)	0.24

<sup>a</sup>. 1 serving = 1 cup of raw leafy vegetables or ½ cup of other cooked or raw vegetables.

<sup>b</sup>. Difference in pre-post change between intervention and control group, Wilcoxon signed rank test, p < 0.05 was considered statistically significant.

### *Mean Dinner Dietary Intake*

There were no significant differences when comparing change (pre-post differences) in dinner mean total vegetable intake between the intervention and control group (Table 4.5). At baseline, children in the intervention group had a mean dinner total vegetable intake of 1.09 servings (Table 4.5), 95% CI [0.81-1.36]. Children in the control group had a mean dinner total vegetable intake of 0.84 servings (Table 4.5), 95% CI [0.33-1.33]. By the study conclusion visit, children in the intervention group had a mean dinner total vegetable intake of 1.2 servings, 95% CI [0.79-1.67]. Children in the control group had a mean dinner total vegetable intake of 0.83 servings, 95% CI [0.21-1.45].

No significant differences between the intervention and control group were observed when comparing change (pre-post differences) in dinner mean intake of dark green vegetables, deep yellow vegetables, tomatoes, white potatoes, fried potatoes, other starchy vegetables, legumes, other vegetables, and vegetable based savory snacks.

The vegetable subgroup with one of the lowest intakes during dinner meals was deep yellow vegetables. According to the mean dinner vegetable group intakes, deep yellow vegetables were consumed in small amounts (i.e., about 0.06 servings for the intervention group and less than 0.01 servings for the control group). At baseline, mean dinner deep yellow vegetable intake for children in the intervention group was 0.05 servings and 0.01 servings for the control group. By the conclusion of the study, mean dinner deep yellow vegetable intake for children in the intervention group was 0.06 servings and 0.01

servings for the control group. Change (pre-post differences) in mean deep yellow vegetable intake when comparing intervention to the control group was not significantly different (Table 4.5).

Change in pre-post mean dinner energy intake when comparing intervention to control group was not significant, nor were there significant differences in changes in pre-post dinner intake for any macronutrients or micronutrients listed in Table 4.5.

**Table 4.5 Mean dinner vegetable, energy, and nutrient intakes based on 24-hour recalls.**

<b>Dietary component<sup>a</sup></b>	<b>Intervention baseline (n = 39) mean (SD)</b>	<b>Intervention study conclusion (n = 36) mean (SD)</b>	<b>Pre-post change intervention mean (SD)</b>	<b>Control baseline (n = 10) mean (SD)</b>	<b>Control study conclusion (n = 10) mean (SD)</b>	<b>Pre-post change control mean (SD)</b>	<b>P value (differences in pre-post change between group)<sup>b</sup></b>
Vegetable Total (servings)	1.09 (0.85)	1.2 (1.3)	0.11 (1.24)	0.84 (0.69)	0.83 (0.87)	-0.003 (0.81)	1
Dark Green Vegetables (servings)	0.12 (0.26)	0.13 (0.38)	-0.01 (0.39)	0.04 (0.12)	0.11 (0.33)	0.12 (0.35)	0.32
Deep Yellow Vegetables (servings)	0.05 (0.14)	0.06 (0.14)	0.03 (0.16)	0.01 (0.03)	0.01 (0.03)	0.01 (0.01)	1
Tomato (servings)	0.22 (0.26)	0.26 (0.49)	0.02 (0.53)	0.14 (0.21)	0.18 (0.30)	0.06 (0.46)	0.66
White Potatoes (servings)	0.16 (0.34)	0.27 (0.69)	0.11 (0.66)	0.19 (0.41)	0.00	-0.22 (0.43)	0.12
Fried Potatoes (servings)	0.08 (0.22)	0.08 (0.27)	0.03 (0.32)	0.16 (0.33)	0.10 (0.22)	-0.06 (0.46)	0.76
Other Starchy Vegetables (servings)	0.07 (0.17)	0.18 (0.31)	0.12 (0.35)	0.00	0.17 (0.50)	0.19 (0.53)	0.81
Legumes (servings)	0.13 (0.38)	0.07 (0.26)	-0.08 (0.33)	0.10 (0.22)	0.21 (0.47)	0.20 (0.51)	0.56
Other Vegetables (servings)	0.30 (0.30)	0.32 (0.52)	0.004 (0.50)	0.29 (0.34)	0.14 (0.21)	-0.15 (0.29)	0.32
Vegetable Based Savory Snack (servings)	0.01 (0.05)	0.01 (0.08)	0.01 (0.10)	0.00	0.00	0.00	1
<b>Energy (kcal)</b>	<b>675 (253)</b>	<b>688 (341)</b>	<b>17 (397)</b>	<b>594 (175)</b>	<b>515 (155)</b>	<b>-99 (266)</b>	<b>0.34</b>
<b>Total Fat (g)</b>	<b>29 (14)</b>	<b>30 (21)</b>	<b>1.3 (23.3)</b>	<b>23.5 (9.2)</b>	<b>19 (12)</b>	<b>-6.6 (17.8)</b>	<b>0.47</b>

<b>Dietary component<sup>a</sup></b>	<b>Intervention baseline (n = 39) mean (SD)</b>	<b>Intervention study conclusion (n = 36) mean (SD)</b>	<b>Pre-post change intervention mean (SD)</b>	<b>Control baseline (n = 10) mean (SD)</b>	<b>Control study conclusion (n = 10) mean (SD)</b>	<b>Pre-post change control mean (SD)</b>	<b>P value (differences in pre-post change between group)<sup>b</sup></b>
Total Carbohydrate (g)	71 (33)	74 (32)	2.0 (45)	66 (22)	63 (16)	-1.4 (25.8)	0.65
Total Protein (g)	32 (12)	32 (18)	-0.36 (18.04)	29 (12)	25 (13)	-7.1 (17.5)	0.4
Total Dietary Fiber (g)	5.0 (3.2)	5.2 (3.5)	-0.05 (3.67)	4.0 (1.5)	4.8 (3.0)	1.4 (3.1)	0.26
Iron (mg)	4.6 (1.7)	4.5 (2.2)	-0.11 (2.57)	4.5 (2.5)	5.0 (2.5)	0.61 (1.89)	0.45
Vitamin D (mcg)	1.9 (2.0)	1.5 (1.8)	-0.40 (2.28)	1.6 (1.9)	1.5 (1.6)	-0.17 (1.07)	0.91
Calcium (mg)	313 (202)	315 (299)	-7.8 (308.8)	335 (192)	234 (127)	-99 (174)	0.34
Sodium (mg)	1293 (511)	1604 (892)	330 (1034)	1159 (583)	1147 (372)	30 (882)	0.52
Potassium (mg)	772 (375)	832 (495)	52 (508)	673 (229)	665 (259)	32 (312)	0.73

<sup>a</sup>. 1 serving = 1 cup of raw leafy vegetables or ½ cup of other cooked or raw vegetables.

<sup>b</sup>. Difference in pre-post change between intervention and control group, Wilcoxon sign rank test,  $p < 0.05$  was considered statistically significant.

### *Vegetable Liking*

On average, caregivers in both the intervention and control group had tried approximately 30 different types of vegetables at baseline (out of a total of 36 vegetable types), with no change in the number of vegetables tried by the study conclusion. There was no change (pre-post differences) in the mean number of vegetables tried from baseline to study conclusion when comparing caregivers in the intervention group compared to the control group ( $p = 0.56$ ). On average at baseline, children in the intervention group had tried approximately 24 vegetable types (23.7) and children in the control group had tried on average 22 vegetable types (21.8). On average at study conclusion, children in the intervention group had tried 24 vegetable types and children in the control group had tried on average approximately 22 vegetable types (22.2). There was no change (pre-post differences) in the mean number of vegetables tried from baseline to study conclusion when comparing children in the intervention group compared to the control group ( $p = 1$ ).

At baseline, caregivers in the intervention group liked (rating  $\geq 5$  on a 10-point labeled hedonic scale from 'Hate it' (1) to 'Like it a lot' (10)) approximately 24 types of vegetables (23.7) and caregivers in the control group liked approximately 23 different types of vegetables (23.1). On average at study conclusion, caregivers in the intervention group liked 24 (23.9) vegetable types and caregivers in the control group liked on average approximately 23 vegetable types (22.7). There was no change in the mean number of vegetables liked from baseline to study conclusion for caregivers in the intervention group compared to the control group ( $p = 0.61$ ). On average, at baseline



children in the intervention group liked approximately 17.3 vegetable types (Figure 4.2) and children in the control group liked approximately 16.2 vegetable types (Figure 4.3). At the conclusion of the study, children in the intervention group liked a mean of 17.8 types of vegetables and children in the control group liked a mean of 15.9 types of vegetables. There was no change (pre-post differences) in the mean number of vegetables liked from baseline to study conclusion for children in the intervention group compared to the control group ( $p = 0.41$ ).

On average at baseline, caregivers in the intervention group provided a mean vegetable liking of 7.0, and caregivers in the control group provided a mean vegetable liking of 6.9 (on a 10-point labeled hedonic scale from 'Hate it' (1) to 'Like it a lot' (10)) across all vegetables (Table 4.6). On average at study conclusion, caregivers in the intervention group provided a mean vegetable liking of 7.1. Caregivers in the control group provided a mean vegetable liking of 6.5 across all vegetables. When comparing the intervention and control group, the change in mean vegetable liking (pre-post differences) across all vegetables showed that there were no differences for caregivers ( $p = 0.2$ ). On average at baseline, children in the intervention group provided a mean vegetable liking of 6.7 and children in the control group provided a mean vegetable liking of 6.8 across all vegetables. On average at study conclusion, children in the intervention and control group provided a mean vegetable liking of 6.8. When comparing the intervention and control group, the change in mean vegetable liking (pre-post differences) showed that there were no differences for children ( $p = 1$ ).

Children in the intervention group provided the highest individual vegetable liking ratings for potatoes, corn, and carrots (Figure 4.2) and children in the control group provided the highest individual vegetable liking ratings for corn, potatoes, and beans/legumes other than black beans (Figure 4.2). Children in the intervention group provided the lowest individual vegetable liking ratings for beets, water chestnuts, and Brussels sprouts (Figure 4.2) and children in the control group provided the lowest individual vegetable liking ratings for edamame, eggplant, and beets (Figure 4.3). Children in the intervention group reported an increase in individual vegetable liking from baseline to study conclusion for jicama ( $p = 0.035$ ) and soup ( $p = 0.03$ ), based on t-tests.

**Table 4.6 Mean vegetable liking across all vegetables for caregivers and children in the intervention and control group at baseline and study conclusion.**

	<b>Intervention baseline (n = 39) mean (SD)</b>	<b>Intervention study conclusion (caregiver n = 36) child n = 35) mean (SD)</b>	<b>Pre-post change intervention mean (SD)</b>	<b>Control baseline (n=10) mean (SD)</b>	<b>Control study conclusion (n = 10) mean (SD)</b>	<b>Pre-post change control mean (SD)</b>	<b>P value (differences in pre-post change between group)<sup>a</sup></b>
<b>Caregiver</b>	7.0 (1.1)	7.1 (1.4)	0.11 (1.0)	6.9 (1.1)	6.5 (0.9)	-0.4 (1.0)	0.2
<b>Child</b>	6.7 (1.1)	6.8 (1.4)	0.07 (1.4)	6.8 (1.5)	6.8 (1.8)	0.06 (1.2)	1

<sup>a</sup> Pre-post change between intervention and control group, t test,  $p < 0.05$  was considered statistically significant.

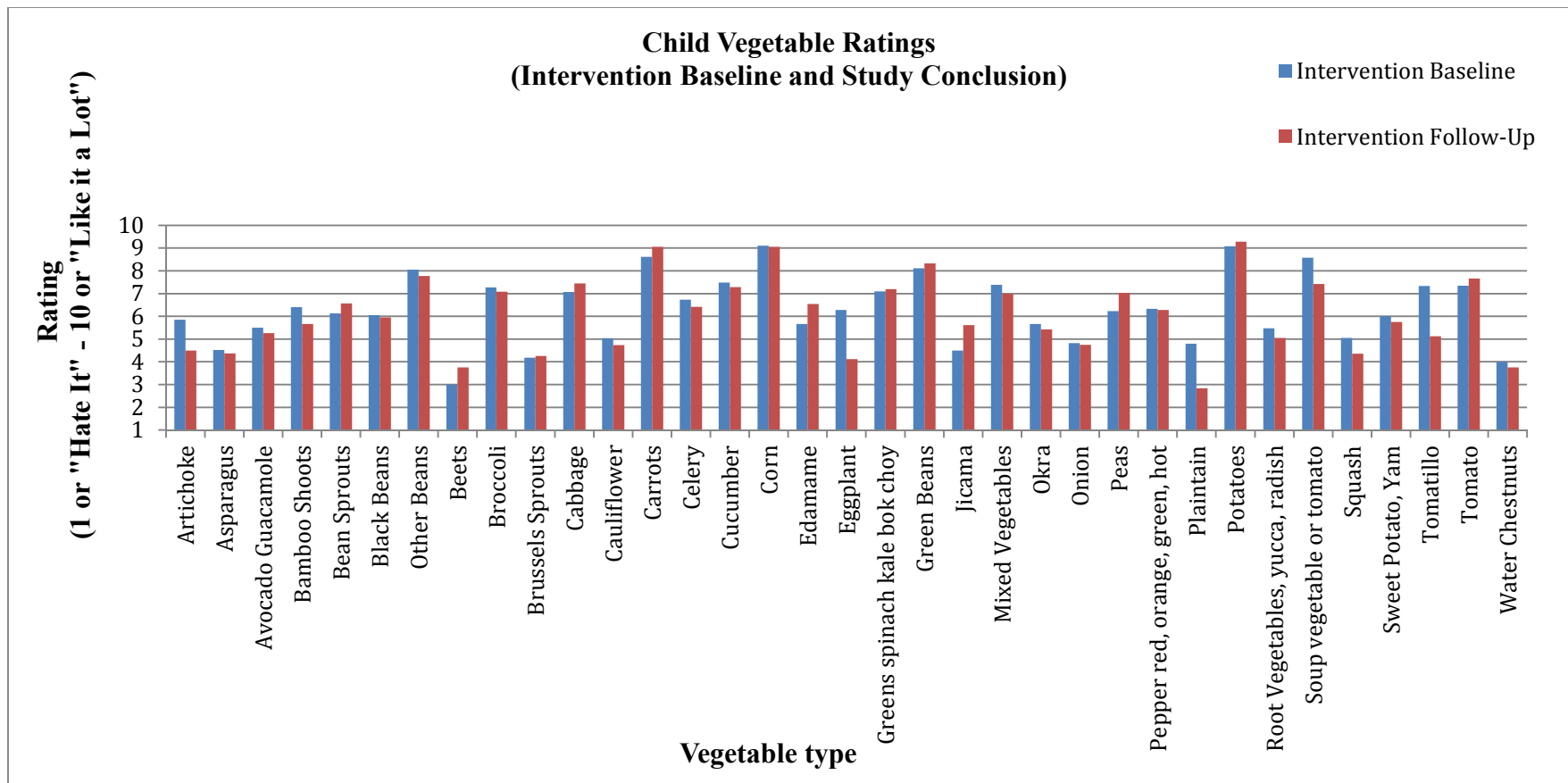


Figure 4.2 Intervention group child ratings for each of the 36 vegetables they had tried at baseline and study conclusion.

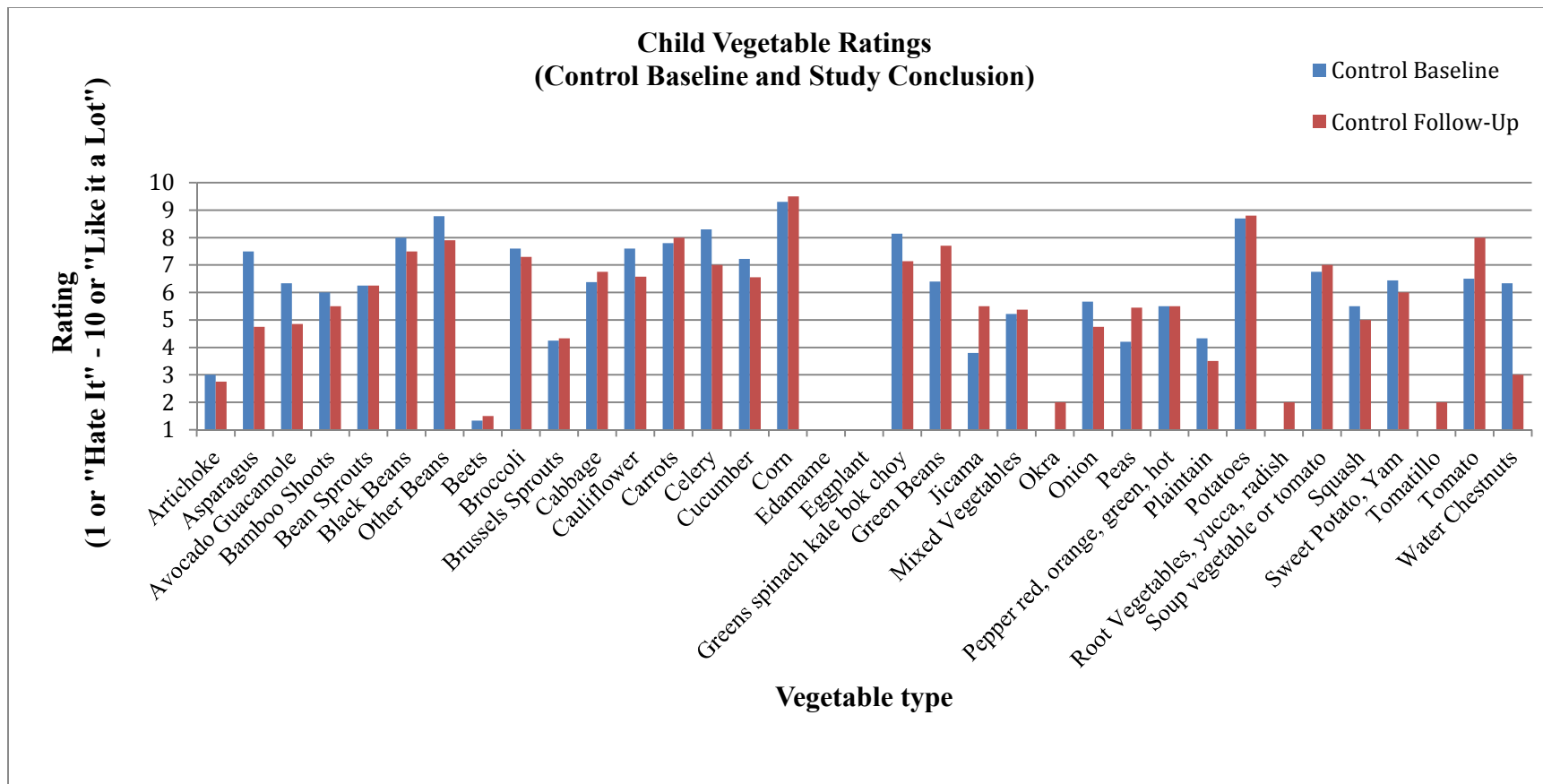


Figure 4.3 Control group child ratings for each of the 36 vegetables they had tried at baseline and study conclusion.

### *Home Vegetable Availability*

At baseline, families in the intervention group had on average 10 different types of vegetables present in the home. Families in the control group had on average 11 different types of vegetables at baseline. At the conclusion of the study, families in both the intervention and control group had on average 11 different types of vegetables. The change in the number of vegetable types available in the home from baseline to conclusion of the study between intervention compared to control group was not statistically significant ( $p = 0.42$ ). Households in both the intervention and control group had more canned vegetables than fresh or frozen vegetables (Table 4.7).

**Table 4.7 Number of households where fresh, canned, and frozen vegetables were present at the baseline and study conclusion visit.**

Vegetable Type	Baseline						Study Conclusion					
	Intervention (n = 39)			Control (n = 10)			Intervention (n = 35) <sup>a</sup>			Control (n = 10)		
	Fresh	Canned	Frozen	Fresh	Canned	Frozen	Fresh	Canned	Frozen	Fresh	Canned	Frozen
Artichoke		4			1			7			1	
Asparagus		1					5	1	1			
Avocado/guacamole	6						5	1		2		
Bamboo shoots		1						6				
Bean sprouts		1										
Beans <sup>b</sup>	27	23		8	5		11	25		3	7	
Beets		5			2			4			1	
Broccoli	6		10			4	5		9	1		4
Brussels sprouts	1		1		2		1		2			1
Cabbage <sup>c</sup>	3	3					4	2	1		2	
Cauliflower	1		1			1	2		2			1
Carrots	15	8		2	4	2	16	6	1	8	4	
Celery	10			2			7			2	1	
Corn (hominy)	5	28	11	1	8	4	3	29	15		9	4
Cucumbers <sup>d</sup>		14		1	4	2	7	13		1	4	
Edamame			1						1			
Eggplant												
Greens <sup>e</sup>	5	9	2	4	2	1	1	8	2	2	3	
Green beans <sup>f</sup>	2	22	7		5	3	3	20	8		5	2
Jicama												
Lettuce <sup>g</sup>	14			6			19			6		
Mixed vegetables		7	11		3	4	2	8	12		2	4

Vegetable Type	Baseline						Study Conclusion					
	Intervention (n = 39)			Control (n = 10)			Intervention (n = 35) <sup>a</sup>			Control (n = 10)		
	Fresh	Canned	Frozen	Fresh	Canned	Frozen	Fresh	Canned	Frozen	Fresh	Canned	Frozen
Okra								1	1			
Onions <sup>h</sup>	20		4	5		1	18		3	5		
Peas <sup>i</sup>		11	9		4	1	3	11	8	1	2	2
Peppers <sup>j</sup>	11	9	3	3	1		9	8	3	4	4	
Plantains												
Potatoes <sup>k</sup>	19	5	9	2	2	3	21	6	10	6		3
Root vegetables <sup>l</sup>			3									
Soup <sup>m</sup>		15			4			15			5	1
Squash <sup>n</sup>		4		1	1		2	4	1	1	1	
Sweet Potatoes/Yams	3	8	1		4		2	3			3	1
Tomatillos							1	3				
Tomatoes <sup>o</sup>	14	32		2	10		10	31	2	1	9	
Water chestnuts		6						5				
<b>Sum:</b>	162	216	73	37	64	26	157	217	82	43	63	23

<sup>a</sup> Missing a home food inventory for 1 household at follow-up, so reporting on n = 35 families instead of n = 36

<sup>b</sup> Included black, pinto, kidney, navy, white, refried, baked, lima, soy, black-eyed, garbanzo/chickpea, hummus, lentils, split peas

<sup>c</sup> Included sauerkraut, coleslaw

<sup>d</sup> Included pickles

<sup>e</sup> Included spinach, collard, mustard, turnip, kale, bok choy

<sup>f</sup> Included snap, string, wax beans

<sup>g</sup> Included romaine, endive, iceberg

<sup>h</sup> Included white, red, green, leek

<sup>i</sup> Included green, snap peas, snow peas

<sup>j</sup> Included red, green, hot



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<sup>k</sup> Included white and russet, fries, box mixes, hashbrowns, potato salad

<sup>l</sup> Included yucca/cassava, yautia, taro, rutabaga, parsnip, turnip, radish (excluded white potatoes)

<sup>m</sup> Included vegetable, tomato

<sup>n</sup> Included butternut, acorn, pumpkin, zucchini

<sup>o</sup> Included tomato sauce, canned tomatoes, salsa, spaghetti sauce, pizza sauce, tomato juice, in mixed dishes

*Comparing Baseline Caregiver and Child Vegetable Liking and Home Vegetable Availability*

The percentage of caregivers who liked various vegetables ranged from 8% (edamame) to 98% (other beans, tomatoes, potatoes) at baseline (Table 4.8). The percentage of children who liked various vegetables ranged from 4% (okra) to 98% (potatoes) at baseline (Table 4.8). At baseline, black beans, other beans (i.e., beans other than black beans), and tomatoes were present in 90% of the homes. No household had edamame, jicama, okra, plantains, or tomatillo at baseline. Pearson correlation analysis showed a strong positive relationship between baseline caregiver vegetable liking and home vegetable availability ( $r = 0.74$ ), and also baseline child vegetable liking and home availability ( $r = 0.77$ ). Thus, vegetables were more likely to be available in the home if the caregiver (Figure 4.4) and child (Figure 4.5) liked the vegetable.

**Table 4.8 Number of caregivers and children in both the intervention and control group that liked a vegetable (rating of  $\geq 5$ ) and the number of homes where the vegetable was present at baseline (n = 49).**

<b>Vegetable</b>	<b>Number of caregivers that liked the vegetable (%)</b>	<b>Number of children that the liked vegetable n (%)</b>	<b>Number of homes where the vegetable was present n (%)</b>
Black Beans	34 (69)	18 (36)	44 (90)
Other Beans	48 (98)	41 (84)	44 (90)
Tomato	48 (98)	37 (76)	44 (90)
Corn	45 (92)	47 (96)	41 (84)
Green Beans	46 (94)	42 (86)	35 (71)
Potatoes	48 (98)	48 (98)	35 (71)
Onion	43 (88)	22 (45)	28 (57)
Carrots	47 (96)	45 (92)	24 (49)
Peas	34 (69)	32 (65)	24 (49)
Peppers	47 (96)	30 (61)	24 (49)
Mixed Vegetables	33 (67)	36 (74)	23 (47)
Lettuce	49 (100)	44 (90)	21 (43)
Greens	44 (90)	33 (67)	20 (41)
Soup	38 (78)	40 (82)	19 (39)
Broccoli	42 (86)	41 (84)	18 (37)
Cucumber	45 (92)	35 (71)	18 (37)
Sweet Potatoes	40 (82)	30 (61)	16 (33)
Celery	41 (84)	37 (76)	12 (25)
Cabbage	43 (88)	30 (61)	8 (16)
Beets	11 (22)	3 (6)	7 (14)
Avocado	34 (69)	18 (37)	6 (12)
Squash	31 (63)	15 (31)	6 (12)
Water Chestnuts	14 (29)	5 (10)	6 (12)
Artichoke	22 (45)	5 (10)	5 (10)
Cauliflower	34 (69)	17 (35)	3 (6)
Brussels Sprouts	19 (39)	9 (18)	2 (4)
Root Vegetables	21 (43)	12 (25)	2 (4)
Asparagus	32 (65)	13 (27)	1 (2)
Bean Sprouts	31 (63)	13 (27)	1 (2)
Bamboo Shoots	16 (33)	6 (12)	1 (2)
Edamame	4 (8)	7 (14)	1 (2)
Eggplant	12 (25)	4 (8)	0

<b>Vegetable</b>	<b>Number of caregivers that liked the vegetable (%)</b>	<b>Number of children that the liked vegetable n (%)</b>	<b>Number of homes where the vegetable was present n (%)</b>
Jicama	7 (14)	9 (18)	0
Okra	20 (41)	2 (4)	0
Plantain	16 (33)	4 (8)	0
Tomatillo	18 (37)	7 (14)	0

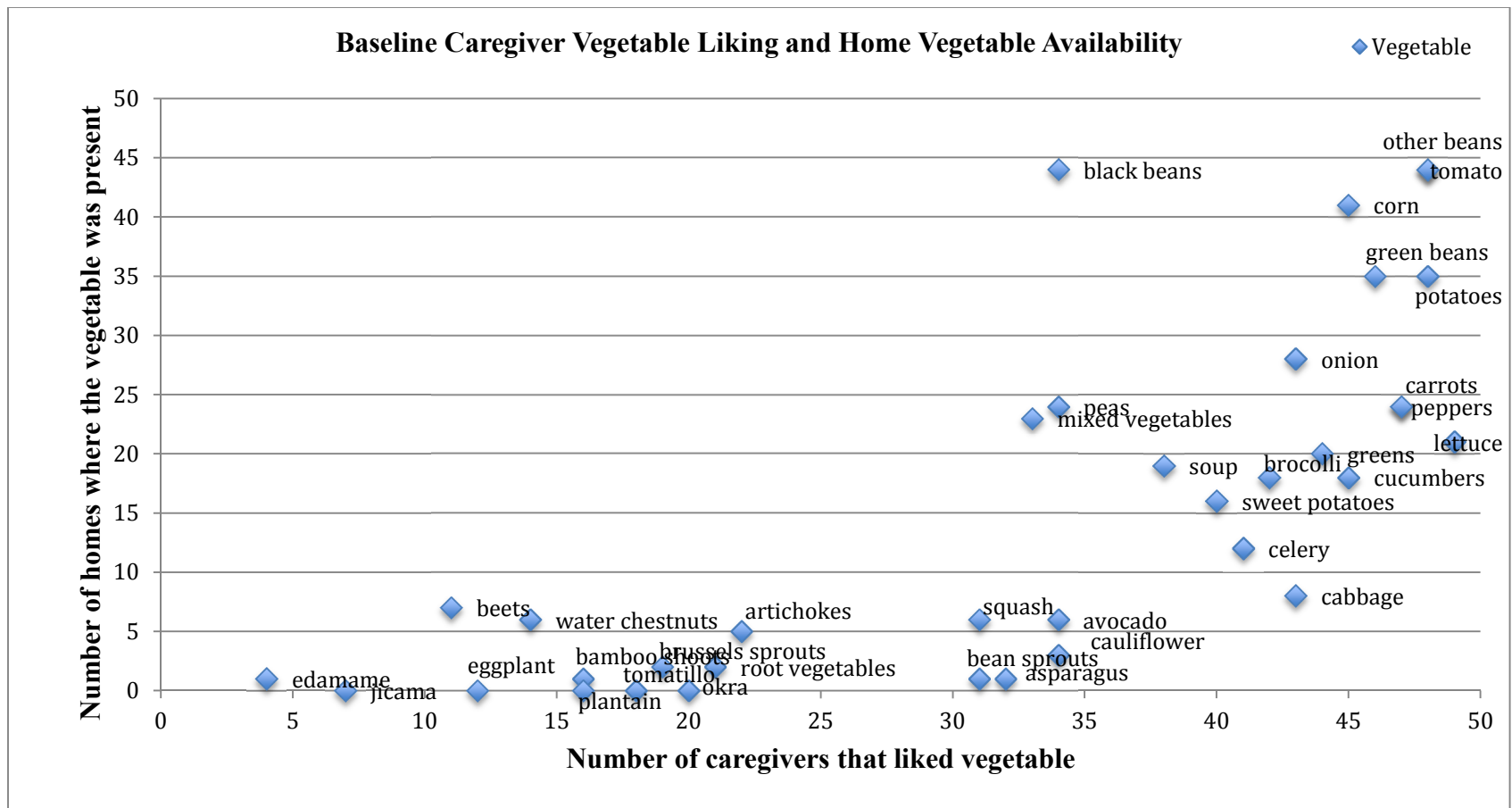


Figure 4.4 A comparison of baseline number of caregivers in both the intervention and control group that liked a vegetable and the number of households where that vegetable was available.

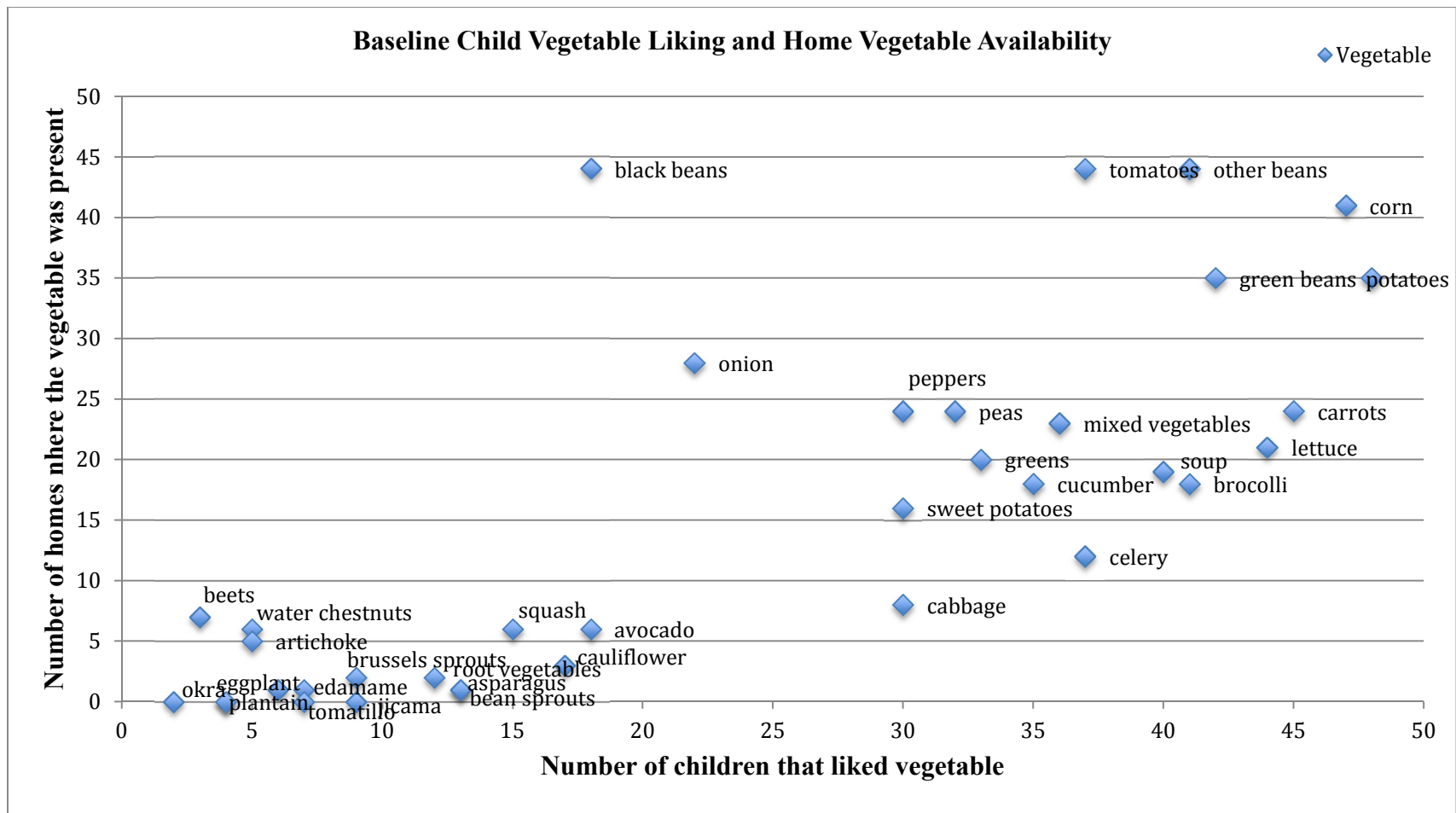


Figure 4.5 A comparison of baseline number of children in the intervention and control group that liked a vegetable and the number of households where that vegetable was available.

## **4.2 Discussion**

### ***Determination of the Most Effective Behavioral Economics Strategies***

Children consumed significantly more vegetables when the ‘Serve at least two vegetables with dinner meals’ strategy was implemented than when the ‘Pair vegetables with other foods child likes’ strategy was implemented. Previous research has shown that serving more than one vegetable significantly increased both the selection (Bucher, Siegrist, & van der Horst, 2014) and consumption of vegetables (Roe, Meengs, Birch, & Rolls, 2013). Also, consistent with the findings from the current study, Correia and colleagues (2014) reported that pairing broccoli with pizza (i.e., a liked food) was not an effective means of increasing child vegetable intake. Children may have consumed more vegetables when the ‘Serve at least two vegetables with dinner meals’ strategy was implemented because they were served a larger quantity of vegetables than when the ‘Pair vegetables with other foods child likes’ strategy was implemented. A positive association has been observed between the amount of vegetables served and the amount consumed (Rolls, Roe, Meengs, 2010; Mathias et al., 2012). The vegetables served when the ‘Pair vegetables with other foods the child likes’ strategy was implemented may have been served in addition to the liked food. They may also have been served in a small quantity. Caregivers implementing the ‘Serve at least two vegetables with dinner meals’ strategy were asked to serve at least one of the two vegetables as a side dish.

Children exposed to the ‘Serve at least two vegetables with dinner meals’ strategy also consumed significantly more vegetables than when exposed to the ‘Eat dinner together

with an adult(s) modeling vegetable consumption’ strategy. The ‘Eat dinner together with an adult(s) modeling vegetable consumption’ strategy may have been less effective if there were influential people at the dinner meal who were not role modeling vegetable consumption. For instance, research suggests that siblings can influence dietary habits of other children in the home (Salvy, Vartanian, Coelho, Jarrin, & Pliner, 2008; Hingle et al. 2012). In one study, parents of 3 to 5 year olds reported that one way to encourage child vegetable consumption was to have older siblings role model healthy eating (Hingle et al. 2012). Thus, it is possible that siblings could choose not to role model healthy eating, which would serve as a barrier to the implementation of the ‘Eat dinner together with an adult(s) modeling vegetable consumption’ strategy.

***Explanations for why the behavioral economics strategies did not significantly impact child mean vegetable intake***

The ability to detect differences in child vegetable intake between the intervention and control groups when different behavioral economics strategies were implemented may depend on how caregivers implemented the strategies. The Strategy Guide instructions allowed for caregivers to implement the strategies in various ways (Appendix 7.15). This variability makes it challenging to determine the effectiveness of the strategy. For example, as part of the ‘Serve More’ strategy, researchers did not specify whether or not children should serve themselves or be served by their caregivers. Research suggests that children consume more when they serve themselves in comparison to when food is served by others (Savage, Haisfield, Fisher, Marini, & Birch, 2012). Thus, the amount of



vegetables consumed by the child during the ‘Serve More’ strategy may have varied depending on who served the vegetables. Also, caregivers were instructed to use a larger serving spoon for vegetables as part of the ‘Serve More’ strategy. They were given a serving spoon that held approximately  $\frac{1}{2}$  cup of vegetables that they could use if they chose. If caregivers had been given a larger spoon (e.g., a serving spoon that held 1 cup), the strategy may have been more effective in increasing child vegetable intake. Wansink and colleagues (2006) found that when two serving spoons only differed in size by 50%, no difference was observed in ice cream intake. These authors suggested that there should be at least a 100% difference between treatments (e.g., spoon size) in order to observe an effect. Thus, there may not have been a 100% difference in the size of the serving spoon that families used for the ‘Serve More’ strategy in the intervention group and the size of the serving spoon that families in the control group used. Another example is the ‘Make vegetables more easily available and visible than other foods at the dinner meal’ strategy, which allowed caregivers to decide where vegetables were placed. When vegetables were placed at the dinner table, children may have consumed varying amounts of vegetables depending on the proximity of the vegetable serving dish. Wansink and colleagues (2006) found that adults consumed more candy when the candy dish was located on their desk versus when the candy was 2 meters away from their desk. Thus, vegetables may have been consumed in larger quantities if caregivers placed the vegetable serving dish within arm’s reach.

Some of the strategies are common behaviors and thus caregivers in the control group may have been implementing the strategies as part of their usual routine. According to Phase 1 findings from the Behavioral Strategy Questionnaire (Chapter 2), many of the caregivers were already implementing several of the strategies. In previous studies, mothers of young children indicated that they implemented similar strategies at home to improve vegetable intake among children (Quan, Salomon, Nitzke, Reicks, 2000; Evans et al., 2011; Hingle et al., 2012). In a study conducted by Williams and colleagues (2011), children between the ages of 7 and 12 reported that one way their caregivers encouraged healthy dietary behaviors was by making healthy food available in the home environment. This is very similar to the ‘Make vegetables more easily available and visible than other foods at the dinner meal’ strategy tested in the current study.

Another explanation for why the behavioral economics strategies were not effective is that the strategies may have been contrary to mealtime cultural norms and traditions, thus creating a barrier to strategy implementation. One way in which mealtimes are culturally structured is by how food is displayed and served (Ochs & Shoshet, 2006). Several caregivers who implemented the ‘Make vegetables more easily available and visible than other foods at the dinner meal’ strategy reported that others in the home made negative comments about the vegetables being located apart from the rest of the meal. Also, several caregivers believed that serving raw/fresh vegetables was the only way to implement the ‘Serve vegetables first’ strategy. The Strategy Guide provided examples for how caregivers could use canned vegetables for the ‘Serve vegetables first’ strategy,

but caregivers reported that this was ‘odd’ and others people in the family questioned why cooked vegetables were being served prior to the meal. As reported by Ryden and Snyder (2011), caregivers find it challenging to make mealtime changes if their family is not accepting and/or supportive of the changes (Ryden & Snyder, 2011).

Lastly, wide confidence intervals (e.g., 95% CI [0.64-1.12 cups]) may explain why the differences in intake of vegetables at the dinner meal were not significantly different between intervention and control group for any of the nine behavioral economics strategies. This is especially important for two strategies where the differences in intake were 0.4 and 0.27 cups more in the intervention compared to the control group. One explanation for the wide confidence intervals is that the variability in mean child dinner vegetable intake was large. This variability may be due to limitations associated with caregivers serving as proxies for child dinner vegetable intake. For example, despite efforts to train caregivers on how to document child dinner vegetable intake, measurement error is a possibility. Variability may also be due to reporting bias, where caregivers over reported vegetable intake. Lastly, some of the variability may be due to using the Dinner Vegetable Record Form (Appendix 7.13), which was not validated. Another explanation for the wide confidence intervals is the small sample size. The sample size calculation (Chapter 3) called for 15 children in the control group, yet there were only 10.

***Explanations for why changes in vegetable intake, liking, and availability were not observed from baseline to study conclusion***

*Vegetable intake*

When comparing the change (i.e., baseline to study conclusion) in mean child total vegetable intake between the intervention and control group, wide confidence intervals may explain why there were no significant differences (e.g., 95% CI [0.91-2.33servings]). Large variability in mean child total vegetable intake may be due to issues associated with children recalling what they had eaten the previous day. In general, one of the challenges with dietary recalls is that they rely on memory. Studies have shown that children > 8 years are often able to recall what they ate, but struggle with reporting accurate portion sizes (Lytle, Murray, Perry, & Eldridge, 1993). Furthermore, it is possible that it was more difficult for younger children (e.g., 9 year olds) to accurately recall what they ate and how much than older children in the study. This could result in outliers that contribute to greater variability in intake. The sample size for the control group was small (n = 10), also contributing to the wide confidence intervals for the difference in intake between the intervention and control groups. Comparison of vegetable intake across groups of children is typically done with larger sample sizes because of the variability in intake (> 10 children) (Diep, Chen, Davies, Baranowski, & Baranowski, 2014).

### *Vegetable liking*

In the current study, caregivers were allowed to choose which vegetables they served at the dinner meal, and thus no specific vegetable(s) was targeted for strategy implementation. If specific vegetables had been targeted, exposure to the vegetable may have increased, which could have affected liking. Research studies that have improved vegetable liking have targeted specific vegetables (Lakkakula, Geaghan, Zanovec, Pierce, & Tuuri, 2010; Lakkakula, Geaghan, Wong, Zanovec, Pierce, & Tuuri, 2011; Noradilah & Zahara, 2012; Caton et al., 2013). For example, fourth and fifth grade students attending a low-income elementary school were asked to taste four vegetables (green bell peppers, carrots, peas, tomatoes) once a week for 10 weeks and rate their liking of each vegetable (1 = I don't like this, 2 = I like this, 3 = I like this a lot, 4 = I don't know what this is) (Lakkakula et al., 2010). Students who disliked at least one of the vegetables at baseline reported an increase in liking for carrots, peas, and tomatoes by the 10<sup>th</sup> exposure.

Qualitative findings from Phase 2 also suggest that caregivers used vegetables that their child already liked to implement the behavioral economics strategies. The studies that have been most successful at improving child vegetable liking have done so with novel vegetables (Caton et al., 2013) and vegetables that are less liked (Anzman-Frasca, Savage, Marini, Fisher, Birch, 2012; Corsini, Slater, Harrison, Cooke, & Cox, 2013; Holley, Haycraft, Farrow, 2015). In the current study, changes in vegetable liking may not have been observed from baseline to study conclusion because children were served

vegetables they already generally liked. Thus, repeated exposure may only be effective at increasing child vegetable liking when specific vegetables are targeted (Caton et al., 2013) and those vegetables are not previously liked (Anzman-Frasca, Savage, Marini, Fisher, Birch, 2012; Corsini, Slater, Harrison, Cooke, & Cox, 2013; Holley, Haycraft, Farrow, 2015). This would explain why children in the intervention group did not experience a greater increase in vegetable liking than children in the control group.

### *Vegetable availability*

In the current study, home vegetable availability was highly correlated with both child and caregiver vegetable liking. According to a review conducted by Jago et al. (2007), availability may be the mediating variable between liking and consumption patterns among children. For example in one study, Cullen and colleagues (2003) found a positive relationship between fourth through sixth graders' preference and intake of fruit, fruit juice, and vegetables that was mediated by the availability of those items. This is similar to findings from the current study that suggests that child and caregiver vegetable liking, and home vegetable availability are highly correlated.

Comparing the results of the current study regarding the number of vegetable types available in the home with other studies is challenging because of differences in methodology and populations studied (Nackers & Appelhans, 2013; (Fulkerson et al., 2010). For instance, Nackers and Appelhans (2013) measured the presence of 20 different vegetable types and found that households had on average 10.8 different types

of vegetables. The current study inquired about 36 different vegetable types. The participants in the Nackers and Appelhans (2013) study may have had additional vegetable types available in the home that were not included in the assessment. Also, in a home-based randomized controlled trial, Fulkerson et al. (2010) found that at baseline, households in the control group had on average 23.7 different fruit and vegetable types and the intervention group had on average 21.7. The proportion of vegetables is unknown because researchers did not report on fruits and vegetables separately. Neither study (Nackers & Appelhans, 2013; Fulkerson et al., 2010) was conducted with a low-income population. Therefore, because household vegetable availability may vary by socioeconomic status, the results may not be applicable to those of the current study.

### ***Strengths & Limitation***

Strengths and limitations of the Phase 2 study were described in detail in Chapter 3 prior to the completion of data collection and analysis. The Strategy Guide was commonly cited as a facilitator for implementing the strategies. Caregivers commented on how the examples provided in the Strategy Guide were helpful and made it easier to implement the strategies. This appeared to be especially true for the ‘Let child help prepare vegetable dishes’, because many caregivers expressed feeling nervous about having their child in the kitchen. Many were also unsure about which tasks were age appropriate. Thus, without the suggestions provided in the Strategy Guide, caregivers may have struggled to identify ways to implement the strategy. While the Strategy Guide provided

caregivers flexibility in strategy implementation, this likely resulted in non-standardized implementation, which needs to be considered when interpreting findings from this study.

### ***Conclusion***

The ‘Serve at least two vegetables with dinner meals’ strategy produced a significantly larger increase on mean child dinner vegetable intake than the ‘Pair vegetables with other foods child likes’ and ‘Eat dinner together with an adult(s) modeling vegetable consumption’ strategies. When compared to the control group, none of the individual 9 behavioral economics strategies increased mean child dinner vegetable intake.

Children in the intervention group, in comparison to the control group, did not experience a greater increase in vegetable intake or liking from baseline to study conclusion. Also, households in the intervention group, in comparison to the control group, did not experience an increase in vegetable availability from baseline to study conclusion. Household vegetable availability was highly correlated with child and caregiver vegetable liking at baseline.



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## **CHAPTER 5: ADOLESCENT INVOLVEMENT IN FOOD PREPARATION**

## 5.1 Introduction

A growing body of literature suggests that the frequency in which children and adolescents are involved in food preparation is positively associated with improved dietary behaviors (Larson, Story, Eisenberg, & Neumark-Sztainer, 2006; Woodruff & Kirby, 2013; Chu, Storey, & Veugelers, 2014; de Jong, Visscher, HiraSing, Seidell, & Renders, 2014; Leech, et al., 2014). For example, in a cross-sectional analysis of data collected from the Project EAT adolescent cohort (11 to 18 years), Larson and colleagues (2006) found that frequency of helping with dinner preparation was positively associated with fruit and vegetable intake among girls and fruit consumption among boys. Another study found that children (4 to 13 years) residing in low socioeconomic status households were less likely to consume vegetables daily (i.e. 7 days/week) if they assisted with food preparation less than 5 days a week, in comparison to 5 to 7 days/week (de Jong, Visscher, HiraSing, Seidell, & Renders, 2015).

Several studies have also explored whether helping with specific tasks during food preparation is associated with healthful dietary behaviors (Woodruff & Kirby, 2013; van der Horst, et al. 2014). An intervention study conducted with parent-child dyads found that 6 to 10 year old children who helped select ingredients, wash, and chop vegetables for a salad, ate more salad than children who were not involved in meal preparation (van der Horst, et al. 2014).

In addition to improving dietary behaviors (e.g., consuming vegetables), there are other ways in which assisting with food preparation is beneficial for children. Several studies have shown that children view cooking with family members as enjoyable (Telzer & Fuligni, 2009; Lukas & Cunningham-Soba, 2011; Van der Horst, et al., 2014). Telzer and Fuligni (2009) found that middle adolescents (14 and 15 year olds) who perceived themselves as fulfilling a household role (including cooking) reported increased feelings of happiness and decreased feelings of stress. Involvement in home food preparation may also improve child and adolescent cooking self-efficacy (Woodruff & Kirby, 2013).

When children and adolescents have adult roles and responsibilities, the phenomenon is often referred to as child adultification. Burton (2007) describes this phenomenon as the “contextual, social, and developmental processes in which youth are prematurely, and often inappropriately, exposed to adult knowledge and assume extensive adult roles and responsibilities within their family networks”. One form of adultification is parentification, which occurs when certain children behave more as a parental figure to siblings and often become caretakers (Jurkovic, 2014). Low-income children are at risk for taking on adultified roles and responsibilities, including cooking, because of family need (e.g., parents away at work for long periods of time) and as such, may be involved in food preparation to a greater extent than merely providing assistance (Burton, 2007). Certain children in lower socioeconomic homes are more likely to experience adultification because of their gender, birth order (i.e., oldest child), and/or cultural beliefs (Burton, 2007). While adultified children often demonstrate self-confidence and

responsible behaviors, they may also experience stress and a decline in school performance (Burton, 2007).

Considering the potential positive and negative consequences of adultification from the perspective of responsibility for food preparation, a deeper understanding of adolescent involvement in household food preparation is necessary. The current study aimed to better understand how low-income adolescents residing in food assistance households (a proxy for income status) perceived their involvement in household food preparation.

## **5.2 Materials and Methods**

### ***Study Design and Participants***

Semi-structured interviews were conducted with 19 adolescents, a purposive sample drawn from a randomized-controlled study that explored the use of behavioral economics strategies in the home environment to improve dinner vegetable consumption (Leak et al., 2015, Chapter 3). In the randomized-controlled study, caregivers were eligible to participate if they were the primary food preparer, had at least one child between the ages of 9 and 12, prepared dinner at least three times weekly, received food assistance (e.g., Supplemental Nutrition Assistance Program), and resided in the Twin Cities metropolitan area. If caregivers also reported having an adolescent between the ages of 13 and 18, the adolescent was invited to participate in a semi-structured interview at the conclusion of the randomized-controlled study. The University of Minnesota Institutional Review Board approved this study. Informed consent/assent was collected at the beginning of the

randomized-controlled trial. Adolescents were compensated with \$40 for their participation.

Sixty-three families participated in the original study with 24 of these families having an adolescent in the household. Five of the 24 families dropped out of the study and thus 19 adolescents were invited and participated in the interview. Caregivers provided demographic information at the beginning of the randomized controlled trial.

Adolescents were on average 14 years old, mostly female (n = 12), and racially diverse (42% African American, 32% White, 26% Other). Caregivers were on average 44 years old, mostly female (n = 18), and also racially diverse (47% African American, 42% White, 11% Other). Caregiver employment status varied (26% full time, 26% part time, 47% not employed or homemakers). Households consisted of 2 adults (ranging from 1 to 4), 3 children  $\leq$  18 years old (ranging from 2 to 6). The sample had a relatively equal distribution of food security status (37% high food security, 37% low food security, 26% very low food security).

### ***Interview Guide and Protocol***

The role of low-income adolescents in food preparation is a topic supported by limited research, therefore a semi-structured (vs. structured) interview guide with broad open-ended questions was appropriate (Turner, 2010). A funneling approach was used to organize the interview guide (Table 5.1) such that questions were broad initially and then became increasingly more specific. The interview guide was pilot tested to determine if



the research questions needed refinement for clarity. Four pilot interviews were conducted with adolescents from the randomized-controlled trial. Upon reviewing the data from the pilot study, researchers decided to include additional probes in the interview guide in order to obtain more in-depth responses from the participants. The four pilot interviews were included in the final analysis since major changes were not made to the interview guide.

All interviews took place in the participants' home at the conclusion of the randomized-controlled study and were conducted by the lead author (TML), a researcher with experience collecting interview data and working with ethnically diverse, socioeconomically disadvantaged populations. Interviews were audio recorded and lasted on average 30 minutes. Field notes were recorded to capture relevant non-verbal communication.

**Table 5.1 Interview guide used to explore perceived role in home food preparation among low-income adolescents**

<b>Main Question</b>	<b>Probe (s)</b>
Tell me about your family.	What is it like living in your house? What do you like about living in this family? What do you dislike about living in this family? What would you change if you could?
What is it like being the oldest child in your family OR What is it like being an older brother/sister?	What do you like about being an older brother/sister? What do you dislike about being an older brother/sister?
What do your parents expect of you?	Specific responsibilities. How you feel about these responsibilities/expectations?
Describe a typical dinner meal. What do you all normally eat for dinner?	Location and composition (who regularly participates in a family dinner meal)
Who primarily prepares dinner? What is it like when they make dinner?	How do they decide what to prepare? What are you doing while they are preparing dinner? What is everyone else doing while they are making dinner?
Who is the other person who prepares dinner most often? What's it like when they makes dinner?	How do they decide what to prepare? What are you doing while they are preparing dinner? What is everyone else doing while they are making dinner?
Tell me about a time that you prepared dinner or helped prepare dinner?	How did you decide what to prepare (e.g., home food availability, family preferences, adolescent's preferences, cookbook/recipes)? Did anyone help you? If so, who? What are you comfortable with making? What cooking skills do you have (i.e., chopping, etc.)? What are you uncomfortable with making? What cooking skills do you wish you had? Potential limitations such as time, space, food, kitchen equipment
Once dinner is prepared, how is the meal served (i.e. family style, buffet, pre-plated)? How are vegetables served?	Where do you typically eat (e.g., living room, kitchen table)? <i>If family style or buffet:</i> How do you decide what to put on your plate? <i>If pre-plated:</i> Who prepares your plate? How do they decide what to put on your plate and how much? What would you prefer in terms of how the meal is served?

What is it like eating dinner with your family?	Who is usually present during dinner? Describe the overall environment: relaxed versus rushed; stressed; conversational Other than eating, what else is going on during a typical dinner? What are you normally doing during the meal? What about everyone else? Is the television on? Radio? What about texting, phone calls during meals?
Tell me about any rules your parents have about eating.	Food behaviors: manners, help with preparation and/or cleanup

### ***Data Analysis***

Audio recordings were transcribed verbatim and transcripts were coded using an iterative process informed by grounded theory and the constant comparative method (Glaser & Strauss, 1967; Denzin & Lincoln, 2005). Open coding techniques were applied by two of the authors (TML and TAA), who independently coded the first four interviews, line-by-line, to identify potential themes that emerged from the interviews. The researchers then met to assess the level of coding concordance. Coding discrepancies were discussed until a consensus was reached. The two researchers then proceeded to apply open coding to the remaining 15 transcripts using the previously described process. Throughout this process, the two researchers constantly explored similarities and differences between codes until major themes were identified. To increase the credibility of the findings, data from the demographic form, field notes, and transcripts were triangulated as a means of corroborating the findings (Denzin & Lincoln 2005).

### **5.3 Results**

Emerging from the data were three levels of involvement in food preparation (i.e., high, moderate, low) and perceived roles in both food preparation and the food decision-making process at mealtime within the household. Eight adolescents (6 girls, 2 boys) described cooking as one of their main responsibilities. Several of these stated that they were the primary or secondary food preparer for the household, cooking mostly without the assistance of an adult. Seven adolescents (6 girls, 1 boy) were moderately involved in food preparation. The extent of their involvement was mostly to “help with the food sometimes.” Four adolescent boys described having little to no involvement in cooking. Two of the boys said that they have never helped, one boy said that he “helped [his] dad make breakfast like once”, and another said, “I haven’t prepared dinner since we [moved from] Missouri.”

#### ***High Level of Involvement***

Adolescents characterized as having a high level of involvement provided several reasons to explain the extent of their responsibility for food preparation. Many believed that they had more cooking responsibilities than their sibling(s) because they were the oldest and “had to grow up extra fast.” One Hmong adolescent girl cited cultural expectations as the reason for cooking responsibilities. She stated, “in [her] culture it’s like the girl who has to cook and clean, watch kids and do everything you know and the men are the ones that don’t have as much responsibilities. And the girls are supposed to be like good wives.” Other adolescents provided more practical explanations about why they were expected to

cook for others in the home. For example, many of the caregivers had busy work schedules and as such, adolescents became responsible for cooking for siblings. As explained by one adolescent girl, “when my mom’s not around, I kinda keep everybody in order, like I cook food too.” Another practical explanation for cooking responsibilities was provided by an adolescent boy who cooked for his dual-parent household. He stated that, “since my mom got her job at the cafeteria she hasn’t been cooking as much...because she has to cook for like hundreds of kids at the school.”

Some adolescents described the time period when they began taking on more cooking responsibilities and how long they had served in this capacity. For example, one adolescent girl with four younger siblings recalled that she started cooking at the age of 7. She went on to state, “I wasn’t really experienced and these responsibilities kinda just popped out of nowhere. I was like whoa I don’t think I remember signing up for this.” Another adolescent girl with 2 younger brothers suggested that after her parents separated several years ago and her mother moved out of the home, she acquired additional household responsibilities, including cooking. Also, an adolescent who reported a high level of involvement in food preparation for his 2 parents and 2 younger siblings stated, “my [older] sister moved out to go to college which was probably like 2 years ago [2012] and I started having to do more stuff and take responsibility, like more chores.”

Adolescents who had a high level of involvement in food preparation were also highly involved in deciding what to prepare for dinner meals. They described several factors that

they took into consideration when deciding what to prepare. Adolescents would cook “what [caregiver] says [they] should have for dinner”, sometimes they would ask “what everybody else wants”, and other times they cooked “whatever [they] want that day.” They talked about how difficult it was to find something to cook that everyone would eat because everyone “wants different things.” It was especially challenging when trying to please a picky eater. One female adolescent in a dual-parent household explained, “my dad is kinda like a picky eater so if it doesn’t look good then he’s going to be like ‘ew that’s weird’.” Adolescents were also interested in learning how to make “different things” and increasing the variety of meals served. One female participant described that she’s “trying to work on what foods are good to eat with each other.” Many adolescents “only [knew] a few recipes” and when they wanted to cook new foods they would look up recipes “online” or use “the recipe on the box.” There were even instances when adolescents experimented with their own recipe. One adolescent stated that her siblings “love [her] meat loaf. They are addicted to it.” The main reason adolescents did not experiment more often was that they “really [didn’t] wanna like waste the food.” Adolescents also considered the type of foods available in the home, their familiarity with a dish and/or ingredients, and nutrition, such as having vegetables for the dinner meal. Regarding health and nutrition, one female adolescent in a single parent household with 4 younger siblings stated, “I usually do baked chicken because I think it’s actually like a healthy alternative to fried chicken seeing as it might contain less grease and oil.”

The types of foods that highly involved adolescents prepared varied greatly, as did the skill required to prepare those foods. Some of the foods that adolescents prepared were “quick and easy”, such as “hot dogs”, “Ramen noodles”, “chicken nuggets like the frozen ones”, “quesadillas”, and “peanut butter and jelly sandwiches”. Other times, the foods were more elaborate such as “chicken stir fry”, “Salisbury steak with potatoes”, “chicken alfredo”, “Brussels sprout chips”, and “cornbread.” Adolescents prepared foods on the stovetop, oven, and in the microwave. They often described using a knife to help prepare meals. For example, one adolescent who described julienning potatoes to make French fries explained, “I actually cut the potatoes up in a different manner and I showed my mom how it looked and how to do it. Now she wanna do it because we just usually do round potatoes.”

There were also conversations indicating that having extensive food preparation responsibilities had negative and positive consequences. Some adolescents talked about how cooking for others “can be stressful.” Adolescents who were highly involved in cooking talked about the challenge of having to multi-task responsibilities. A frustrated adolescent girl said, “Dad you should have been in here to help...[because] like if somebody’s watching [infant sister], then I can cook really quick and I can get to my homework.” Several other adolescents also mentioned that excessive responsibilities, such as cooking, “get in the way of homework.” Positive experiences with cooking were often related to the social interactions that take place during meal preparation. And while not directly related to food preparation, one adolescent who enjoyed role modeling

healthy eating for her younger siblings said, “my little sister wasn’t really a fan of vegetables, but as soon as I started eating more vegetables, she actually started eating more vegetables as well.”

### ***Moderate Level of Involvement***

Adolescents who were moderately involved in food preparation often said that there was an adult in the home who did most of the cooking. Some also provided information that indicated the reason why that particular adult was responsible for the cooking. For example, one adolescent said that living with her aunt, the primary food preparer, was different than living with her mother because “there’s no violence, no drinking, no abuse in the house.” She went on to say that, “I get more food here than I used to get.” For her, cooking was something fun she did with her aunt, rather than a chore. In several households another sibling was responsible for cooking. For instance, an adolescent boy with two parents who “worked pretty late” explained that his sister does most of the cooking and explained that, “she really likes cooking. I’m a horrible cook.” He went on to say that his younger sister will cook for him and their younger brother, and their “mom would leave a note and ingredients out and then [sister] would cook that.” Several of these adolescents suggested that their caregiver often times preferred to cook meals alone. As one adolescent explained, “she gets like aggravated when we’re all in the kitchen together, it’s really cramped.” There were circumstances where the adolescents would prepare foods for themselves, but they “don’t make it for everybody.” For



example, adolescents would “make [their] our own sandwich”, “make hamburger helper”, and other foods you just “throw in the oven and its done.”

Adolescents who were moderately involved in food preparation described collaborating with the primary food preparer to decide what was served at mealtime. Adolescents responded that “basically all of us” decide what is served for dinner. As one adolescent stated, “well sometimes she [mother] tells us or sometimes she will ask us what we want to eat.”

There were several ways in which adolescents assisted with food preparation. One adolescent girl responded, “whenever she [mom] needs something cut, I’ll cut it. Or like if she makes noodles, I’ll do the noodles or like stir the noodles... I season stuff.”

Another adolescent girl said that her mother might say something like “you do the chicken and I’ll do the mashed potatoes.” An adolescent boy responded, “a time that I helped my mom cook dinner would be fish fry. What I did was I actually got the recipe and my mom helped me get the ingredients and she helped me get it all started and then I just took over.” Others said that they would “cut [vegetables] up and then put them in the pan”, “cut up the cabbage or onions and peppers”, and “give [aunt] supplies...peel the onion.” Most of the cooking skills described included using a knife to chop foods and using a whisk, fork, and/or blender for mixing. Many adolescents were not comfortable using the stovetop and oven because as one adolescent stated, “I’m scared I might burn myself.”

Adolescents who were moderately involved in food preparation tended to enjoy cooking, as one adolescent girl explained, “I like to help her cook. It’s fun.” Adolescents enjoyed the social interactions that took place while helping with food preparation. One adolescent girl said, “we interact pretty good. We talk about our day and talk about how school was.” Furthermore, adolescents who were moderately involved in food preparation did not describe negative feelings about cooking. A couple of adolescents even expressed interest in wanting to be more involved at mealtime, but they suggested that their caregiver (s) was hesitant. For example, one adolescent girl said, “[mom] don’t want me to touch [stove]...[but] I am older and I can show [mom] responsibility.”

### ***Low Level of Involvement***

Four adolescents described a low level of involvement based on not participating in food preparation and being removed from the decision-making process. Two of these adolescents suggested that because of sensitive issues taking place in the home, their caregivers did not expect them to take on extensive responsibilities, which included cooking. One adolescent said, “I’m not really the person to take responsibility for things...I know my [parents] won’t let me sit with the kids, I’d beat them senseless by the end of the night.”

The four adolescent boys who had little involvement in food preparation were also removed from the mealtime decision-making process. When asked how the primary food

preparer decides what to serve for dinner, many of these adolescents responded, “I don’t know” or they stated that the primary food preparer “just cooks dinner and we eat it.” The two adolescents in this group who had assisted with meal preparation depended on their parents to give instructions, as one adolescent said, “my dad just tells me.” The other adolescent said, “basically, my mom gives me a set of instructions unless I know what it is and have made it enough times where I can make it by myself. I usually just follow the description as best as I can and hope it ends well and doesn’t all end up burned.”

Adolescents with little to no involvement in meal preparation described having minimal cooking skills. One simply stated that he “never learned how to cook.” Most of these adolescents said they felt comfortable with “like stuff that’s easy like that I can throw in the microwave”, but even using the microwave was a challenge for one adolescent who “burned ramen noodles in a microwave.” None of the adolescents talked about actual skills (e.g., cutting, etc.), with the exception of one who said that his mother “showed [him] how to cut [chicken] the correct way.”

The adolescents with little involvement in food preparation did not report that their caregiver (s) expected or encouraged them to participate in cooking. These adolescents did not express an interest in wanting to be more involved in the mealtime decision-making process and often described being satisfied with what their caregiver selected.

## **5.4 Discussion**

The results of this qualitative study showed that the level of involvement in home food preparation and responsibility for specific tasks by adolescents residing in low-income households varied greatly. Previous research has relied on child, adolescent and parent survey data regarding frequency of food involvement and tasks performed (Chu et al., 2013; de Jong, Visscher, HiraSing, Seidell, & Renders, 2015; Leech, et al., 2014). The limited response options associated with survey data make it challenging to assess the various levels of involvement and tasks completed by children and adolescents. The surveys used in these studies estimated the frequency of food preparation (Chu et al. 2013), the frequency of cooking or grocery shopping with a caregiver (de Jong et al. 2015), and frequency of predefined tasks (e.g., making breakfast) (Leech et al. 2014). In contrast, the current study used qualitative methods to better understand the various levels of involvement and specific tasks completed. Studies relying on survey methods also indicated that the level of involvement and tasks varied (Chu et al., 2013; de Jong et al., 2015; Leech et al., 2014), but the rationale for these variations and implications, positive or negative, were not assessed.

Cooking was a primary responsibility for adolescents who were highly involved in food preparation. Many adolescents felt that they had no choice as to whether they prepared dinner, and some even explained that others in the home (e.g., siblings and adults) verbally reprimanded them if dinner was not prepared in a timely manner. As other studies have reported (Burton, 2007), some of the adolescents who were highly involved

in food preparation perceived their birth order, gender, and/or cultural expectations, as justification for this level of involvement. Consistent with the literature on child adultification consequences (Burton, 2007), the majority of adolescents who were highly involved in food preparation acknowledged that cooking for others was gratifying at times, but cooking was also associated with stress and interfered with schoolwork.

A particularly noteworthy finding was that adolescents who were highly involved in food preparation were also extensively involved in the food decision-making process. These adolescents described challenges such as catering to multiple food preferences and having minimal food preparation knowledge and skills, which are barriers that caregivers in other studies have described when deciding what to prepare for meals (Fulkerson, Story, Neumark-Sztainer, & Rydell, 2008; Brown & Wenrich, 2012; Berge, Hoppmann, Hanson, & Neumark-Sztainer, 2013). Also, similar to what caregivers have reported in other studies (Berge et al., 2013), adolescents were interested in preparing healthy meals and considered nutrition when deciding what to prepare.

### ***Limitations***

There are several limitations that must be acknowledged. The small sample size and geographically similar population make it challenging to generalize the findings to a broader audience. As such, the study should be replicated with a larger sample size, which includes equal representation of girls and boys, and a more racially/ethnically diverse population.

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## **CHAPTER 6: COMPLETE LIST OF REFERENCES FOR DISSERTATION**



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## **CHAPTER 7: APPENDICES**



## 7.1 Phase 1 Consent Form

### CONSENT FORM Dinner Meals Study

You and your child are invited to be in a research study of ways that parents make dinner meals for children. You and your child were selected as possible participants because your child is 9-12 years-old and you are the main person responsible for preparing dinner meals for this child. We ask that you read this form and ask any questions you may have before agreeing to be in this study and before allowing your child to be in this study.

This study is being conducted by: Marla Reicks, Zata Vickers, Food Science and Nutrition, Traci Mann, Psychology, Elton Mykerezi, Applied Economics and Joseph Redden, Carlson School of Management; University of Minnesota; Teri Burgess-Champoux and Dennis Degeneffe, Consultants; Alison Swenson, Rachel Iannazzo and Tashara Leak, Nutrition students and Alicia Perales-Esparza, Community Nutrition Educator, University of Minnesota Extension Service.

#### **Background Information**

The purpose of this study is to learn more about how parents/caregivers and children prepare foods at home for dinner.

#### **Procedures:**

If you agree to be in this study, we would ask you to participate in one observation/interview session in your home as you prepare and eat your dinner meal with your 9-12 year-old child. We will ask questions about food selection, preparation, and consumption after your dinner meal. We will ask you to fill out questionnaires about the foods you have at home and about yourself, vegetable preferences, likelihood of using strategies to help children change food intake, and food security. The session is expected to take 2-3 hours depending on the length of time it takes for you to prepare and eat dinner.

We ask that you allow your child to answer interview questions about foods he or she likes after your meal.

We will video record you and your family as you prepare and eat your dinner meal. We will audio record your responses and your child's responses to interview questions after dinner. We will take several pictures of your kitchen, dining area, dinner plates, and places where you store food. We will take notes about the food you have at home. All video and audio recordings and notes will be kept private and will only be accessible to the researchers. The photos will be used for educational purposes only.

#### **Risks and Benefits of being in the Study**

The study has the following risk: Researchers will visit your home and observe a family meal which will be an invasion of your privacy. There are no benefits to participation.

#### **Compensation:**

You will receive payment of \$40 cash after the dinner meal observation in your home.

**Confidentiality:**

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records. Video and audio recordings will only be accessible to study investigators and will be destroyed after being transcribed or viewed. By law, the privilege of confidentiality does not extend to all data collected. The following information is not limited by confidentiality and may be released as governed by law: 1) information about a child being maltreated or neglected, 2) information about an individual’s plan to seriously harm him/herself, 3) information about an individual’s plan to seriously harm another person. If members of the research staff have or are given such information, they may be required to report it to the authorities. The obligation to report includes alleged or probable abuse as well as known abuse.

**Voluntary Nature of the Study:**

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota or the University of Minnesota Extension nutrition education programs. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

**Contacts and Questions:**

The researchers conducting this study are Marla Reicks, Zata Vickers, Traci Mann, Elton Mykerezi, Joseph Redden, Teri Burgess-Champoux, Dennis Degeneffe, Alison Swenson, Rachel Iannazzo, Tashara Leak, and Alicia Perales-Esparza. You may ask any questions you have now. If you have questions later, you are encouraged to contact Alison Swenson or Alicia Perales-Esparza at the University of Minnesota, Alison – 612-454-9055 or [witm0005@umn.edu](mailto:witm0005@umn.edu) or Alicia – 763-767-2884 or [612-819-8687](tel:612-819-8687) or [pera0009@umn.edu](mailto:pera0009@umn.edu).

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact the Research Subjects’ Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

*You will be given a copy of this information to keep for your records.*

**Statement of Consent:**

I have read the above information. I have asked questions and have received answers. I consent to participate in the study. I consent to have my child to participate in this study.

Signature of participant: \_\_\_\_\_ Date \_\_\_\_\_

Signature of Investigator: \_\_\_\_\_ Date: \_\_\_\_\_

## 7.2 Phase 1 Assent Form

### *Assent Form for Children* **Dinner Meals Study**

We are asking if you are willing to have us watch while you and your parent or other caregiver make and eat dinner one night, because we are trying to learn more about the foods kids your age like. Because you are between the ages of 9 and 12, we are asking if you want to be in a study. We hope that watching how families make and eat dinner will help us learn how to help families eat better in the future.

If you agree to be in this study, we will ask you to let us come to your home one night during the week. We will ask if we can watch and video record while you and your parent or other caregiver make and eat dinner. We will ask you some questions about the foods you eat and like and record your voice while you answer.

*And, if you change your mind during the study, you can always let us know and we will stop our session where we watch you and your parent make and eat dinner. Being in this study is totally up to you, and no one will be mad at you if you don't want to do it.*

You can ask any questions that you have about this study.

Signing here means that you have read this paper or had it read to you and that you are willing to be in this study. If you don't want to be in this study, don't sign. Remember, being in this study is up to you, and no one will be mad at you if you don't sign this or even if you change your mind later.

Signature of participant \_\_\_\_\_

Signature of person explaining study \_\_\_\_\_ Date \_\_\_\_\_

## 7.3 Phase 1 Sociodemographic and Household Characteristics Questionnaire

### About You and Your Family

Questions 1-7 are about YOUR CHILD. If you have more than one child between the ages of 9-12, choose one child and answer these questions about that child.

Fill in the appropriate circle.

1. **How old is your 9-12 year old child?**  
 9 years  10 years  11 years  12 years
2. **Is this child a boy or girl?**  Boy  Girl
3. **Please fill in only one circle about the ethnicity of your 9-12 year old child.**  
 **Hispanic or Latino.** A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race.  
 **Not Hispanic or Latino**
4. **How would you best describe this 9-12 year old child with respect to race? You may fill in more than one circle.**  
 **Black or African American.** A person having origins in any of the Black racial groups of Africa.  
 **White.** A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.  
 **Alaska native or American Indian.** A person having origins in any of the original peoples of North, Central and South America, and who maintains tribal affiliation or community attachment.  
 **Asian.** A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand and Vietnam  
 **Native Hawaiian or other Pacific Islander.** A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.  
 **Other.** A group not mentioned above. Please describe \_\_\_\_\_
5. **What is your relationship to this child? (Fill in only one circle)**  
 Parent (includes step parent/foster)  
 Grandparent  
 Aunt or uncle  
 Sibling  
 Other, please specify \_\_\_\_\_
6. **On average, how many days of the week does this child live in your home? (Fill in only one circle)**  
 1-3 days  
 4 or more days
7. **How many children living in your home are:**  
**Under the age of 9? \_\_\_\_\_**  
**Between 9-12? \_\_\_\_\_**  
**Between 13-18? \_\_\_\_\_**

**Questions 8-9 are about YOUR SPOUSE/SIGNIFICANT OTHER**

**8. Please fill in only one circle about the ethnicity of your spouse/significant other.**

**I don't have a spouse/significant other.**

**Hispanic or Latino.** A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race.

**Not Hispanic or Latino**

**9. How would you best describe your spouse/significant other with respect to race? You may fill in more than one circle.**

**I don't have a spouse/significant other.**

**Black or African American.** A person having origins in any of the Black racial groups of Africa.

**White.** A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

**Alaska native or American Indian.** A person having origins in any of the original peoples of North, Central and South America, and who maintains tribal affiliation or community attachment.

**Asian.** A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand and Vietnam

**Native Hawaiian or other Pacific Islander.** A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

**Other.** A group not mentioned above. Please describe \_\_\_\_\_

**Questions 10-27 are about YOU.**

**10. Please fill in only one circle about your ethnicity.**

**Hispanic or Latino.** A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race.

**Not Hispanic or Latino**

**11. How would you best describe yourself with respect to race? You may fill in more than one circle.**

**Black or African American.** A person having origins in any of the Black racial groups of Africa.

**White.** A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

**Alaska native or American Indian.** A person having origins in any of the original peoples of North, Central and South America, and who maintains tribal affiliation or community attachment.

**Asian.** A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand and Vietnam

**Native Hawaiian or other Pacific Islander.** A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

**Other.** A group not mentioned above. Please describe \_\_\_\_\_

12. How old are you? \_\_\_\_\_ years
13. Are you a man or a woman?
- Man
  - Woman
14. How many adults over the age of 18, counting yourself, live in your home?
- 1
  - 2
  - 3 or more
15. What is your highest level of formal education?
- Have not completed high school
  - Received high school diploma or GED
  - Some college or technical school
  - 4-year college, university degree or advanced degree
16. Which of the following best describes your employment status? (Mark all that apply)
- Homemaker/househusband
  - Not employed
  - Employed part-time
  - Employed full-time
  - Retired
17. Which of the following best describes the employment status of your spouse/significant other? (Mark all that apply)
- Homemaker/househusband
  - Not employed
  - Employed part-time
  - Employed full-time
  - Retired
18. Are you a student (either full or part time)?
- Yes
  - No
19. Are you or your family members participating in the following programs? (Mark all that apply)
- WIC
  - SNAP (Supplemental Nutrition Assistance Program) or formerly called Food stamps
  - Free/reduced priced school lunch
  - Food shelves, meals, or other food distribution programs
  - None
20. What language do you speak at home?
- Only English
  - Mostly English
  - English and another language about the same
  - Mostly another language
  - Only another language

- 21. How long have you lived in the U.S.?**
- 1-5 years
  - 6-10 years
  - More than 10 years
- 22. Where do you usually shop for groceries? Mark all that apply.**
- Supermarkets (like Cub, Rainbow, Lunds, Byerly's, Trader Joe's)
  - Supercenters (like Target or Wal\*Mart)
  - Club Stores (like Sam's Club or Costco)
  - Discount grocery (like Mike's Discount Foods, So Low Grocery)
  - Convenience/corner store (like Super America or Holiday)
  - Dollar Stores (like Family Dollar or Dollar General)
  - Specialty/Ethnic Food Stores (like Mercado Central, Patel Groceries)
  - Drug Stores (like Walgreen's or CVS)
  - Farmer's market
  - Natural/Organic/Health Stores (like Whole Foods)
  - Bakery (stand alone - not inside a supermarket)
  - Butcher/meat market
  - Home Delivered Internet Grocery
  - Other \_\_\_\_\_ please write where you shop (if other)
- 23. During the past month, how often did you use a food shelf to provide foods for you and your family?**
- None
  - 1-2 times
  - 3-4 times
  - 5 or more times
- 24. During the past month, when did you receive SNAP benefits?**  
Write in the date: \_\_\_\_\_  
or  
 I did not receive SNAP benefits
- 25. During the past week, how much of the vegetables in your home were thrown away because they spoiled before you and your family could eat them?**
- None
  - Some
  - Half
  - Most
  - All
- 26. When did you make your last major grocery shopping trip?**
- 0 to 7 days ago
  - 1 to 2 weeks ago
  - 3 to 4 weeks ago
  - More than a month ago

**27. Where did you shop when you made your last major grocery shopping trip?**

Write in the location: \_\_\_\_\_

**28. Think about your eating habits over the past year or so. About how often do you eat each of the following foods? Remember breakfast, lunch, dinner, snacks and eating out. Check one box for each food.**

	Less than 1/WEEK	Once a WEEK	2-3 times a WEEK	4-6 times a WEEK	Once a DAY	2+ a DAY
Vegetable juice, like tomato juice, V-8, carrot	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Green salad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Potatoes, any kind, including baked, mashed or French fried	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vegetable soup, or stew with vegetables	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Any other vegetables, including string beans, peas, corn, broccoli or any other kind	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beans such as baked beans, pinto, kidney, or lentils (not green beans)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**29. How did you learn about this study?**

\_\_\_\_\_

Thank you for your participation!



## 7.4 Phase 1 US Household Food Security Survey Module: Amended Five-Item Short Form

### U.S. Household Food Security Survey Module: Amended Six-Item Short Form<sup>1</sup>

These next questions are about the food eaten in your household in the last 12 months, since November of last year and whether you were able to afford the food you need.

HH3. Please indicate below whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months—that is, since last November.

The first statement is, “The food that we bought just didn’t last, and we didn’t have money to get more.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

HH4. “We couldn’t afford to eat balanced meals.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

AD1. In the last 12 months, since last November, did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn’t enough money for food?

- Yes, almost every month
- Yes, some months but not every month
- Yes, only 1 or 2 months
- No
- Don’t know

AD2. In the last 12 months, did you ever eat less than you felt you should because there wasn’t enough money for food?

- Yes
- No
- Don’t know

AD3. In the last 12 months, were you every hungry but didn’t eat because there wasn’t enough money for food?

- Yes
- No
- Don’t know

---

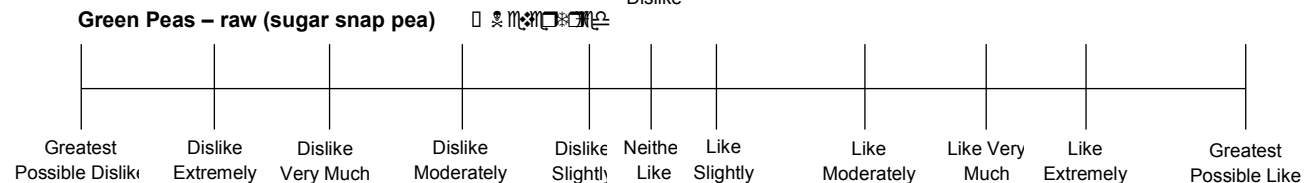
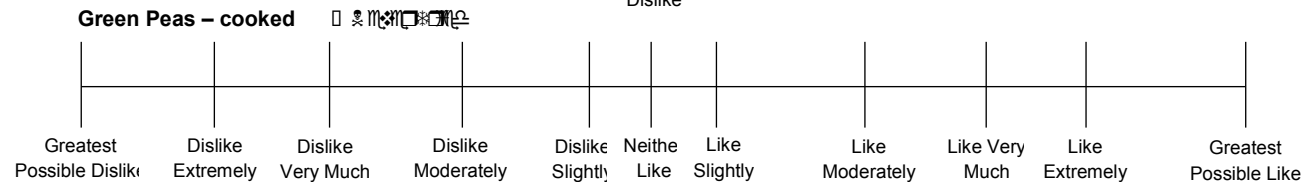
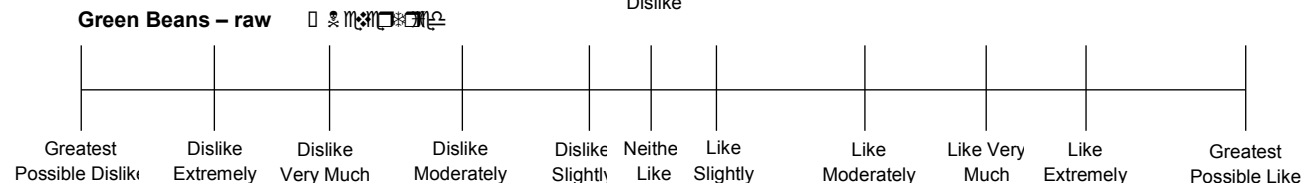
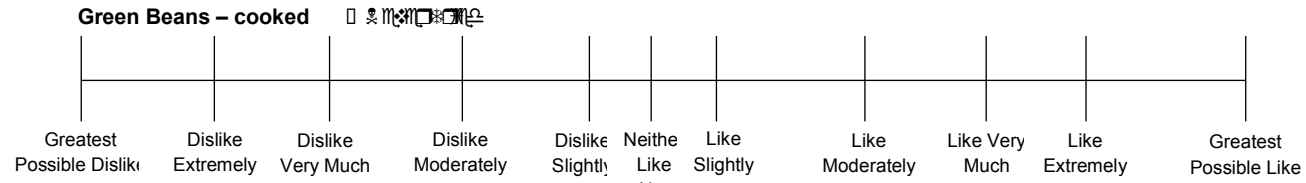
<sup>1</sup> Score of 0 to 1 indicated high or marginal food security, 2-3 low food security, and 4-5 very low food security.

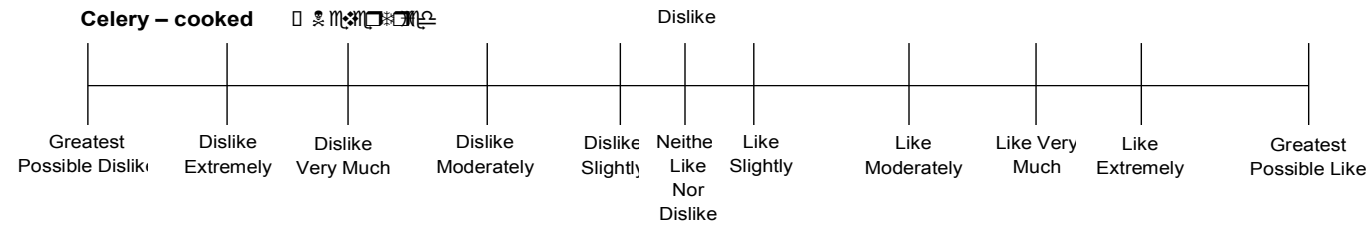
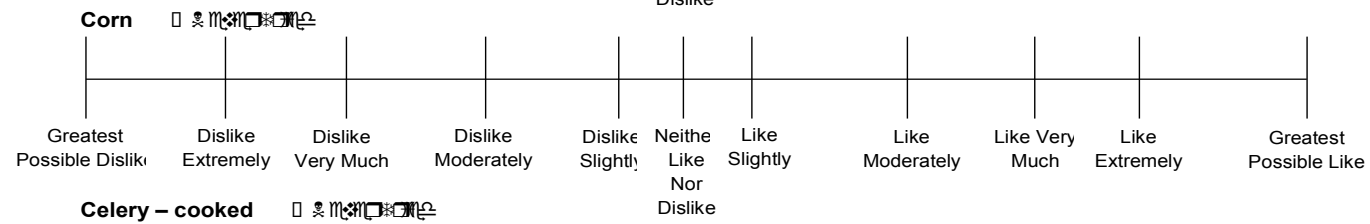
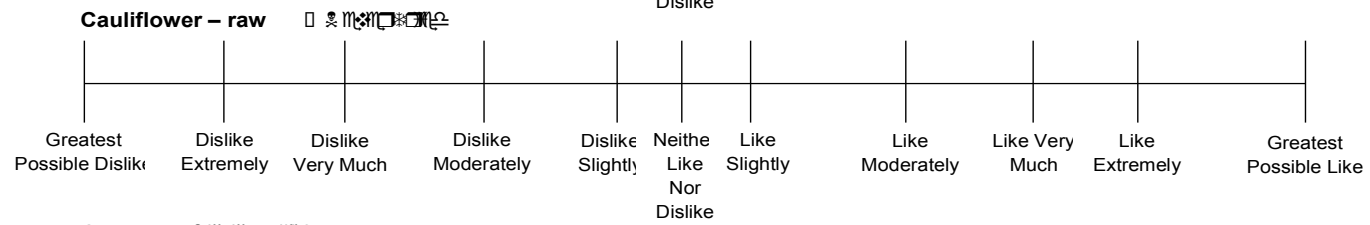
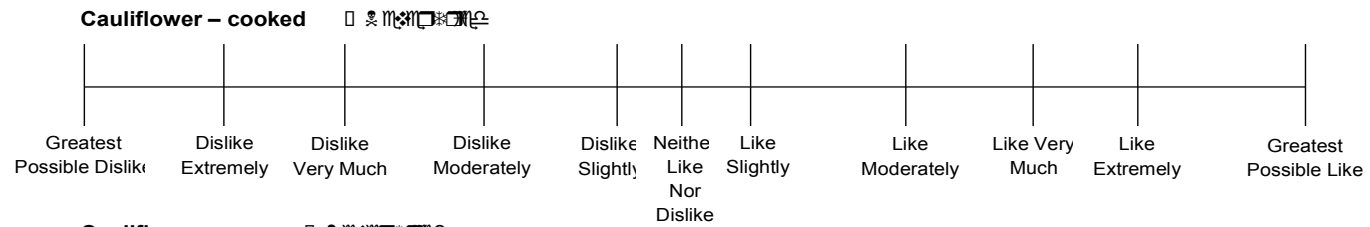
## 7.5 Phase 1 Adult Liking

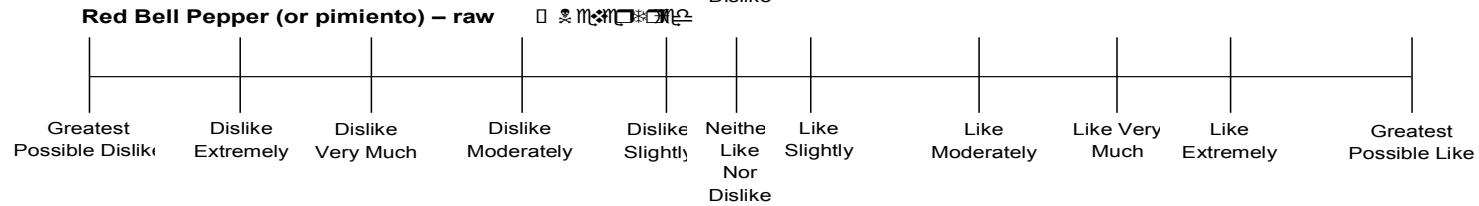
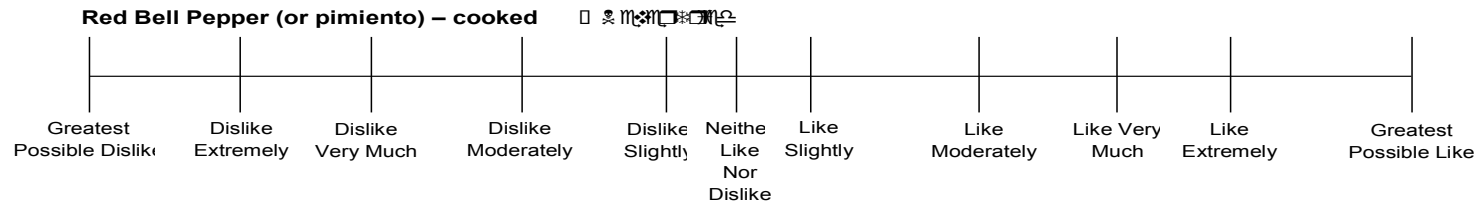
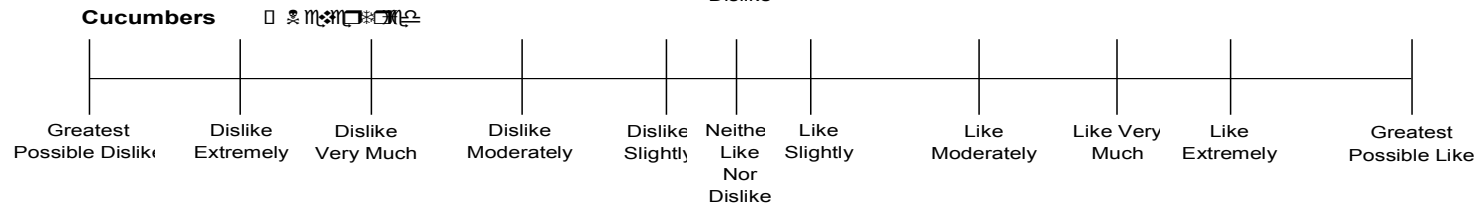
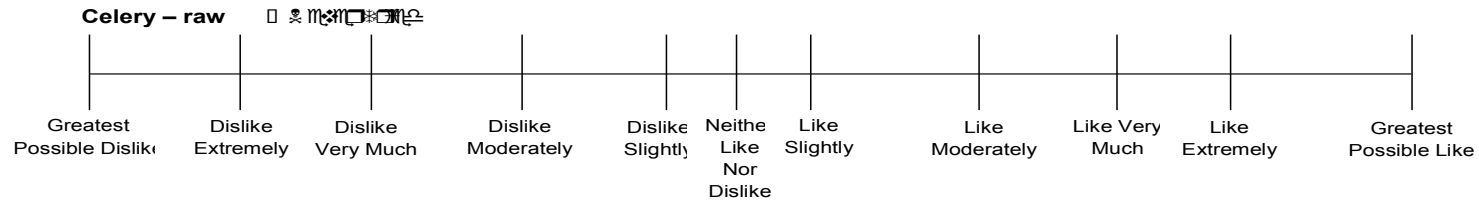
### Vegetable Liking

Please use the following scales to tell us how much you like certain vegetables. Place a mark anywhere on the line to show how much you like or dislike that vegetable, from “Greatest possible dislike for any food” to “Greatest possible like for any food.” You can also mark that you have never tried the vegetable.

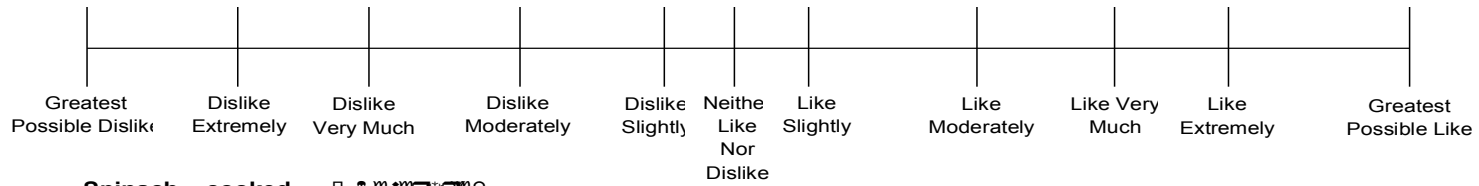
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Greatest Possible Dislike	Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like Nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely	Greatest Possible Like	
<b>Broccoli – raw</b> □ <input type="checkbox"/> Never Tried											
Greatest Possible Dislike	Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like Nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely	Greatest Possible Like	
<b>Carrots – cooked</b> □ <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>											
Greatest Possible Dislike	Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like Nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely	Greatest Possible Like	
<b>Carrots – raw</b> □ <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>											
Greatest Possible Dislike	Dislike Extremely	Dislike Very Much	Dislike Moderately	Dislike Slightly	Neither Like Nor Dislike	Like Slightly	Like Moderately	Like Very Much	Like Extremely	Greatest Possible Like	



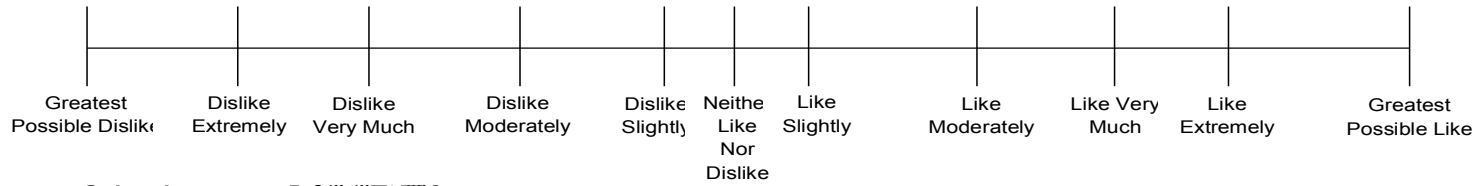




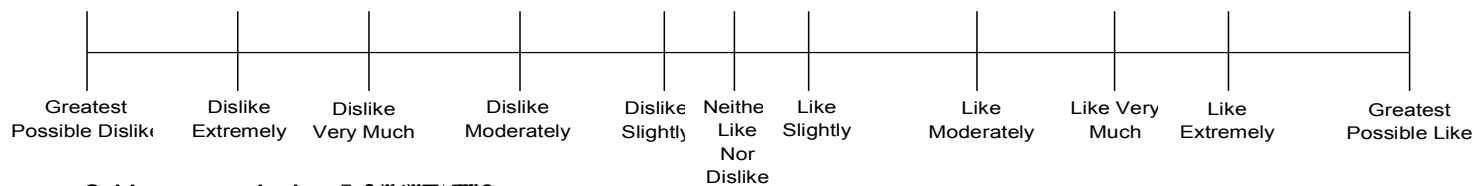
**Lettuce** □ ☹️ 🤢 🤨 🤗 😊



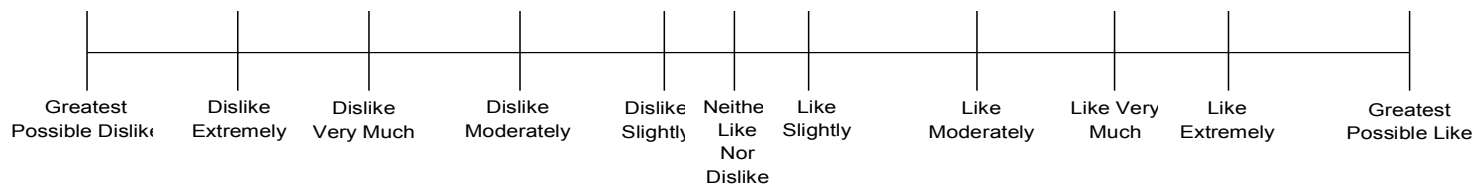
**Spinach – cooked** □ ☹️ 🤢 🤨 🤗 😊



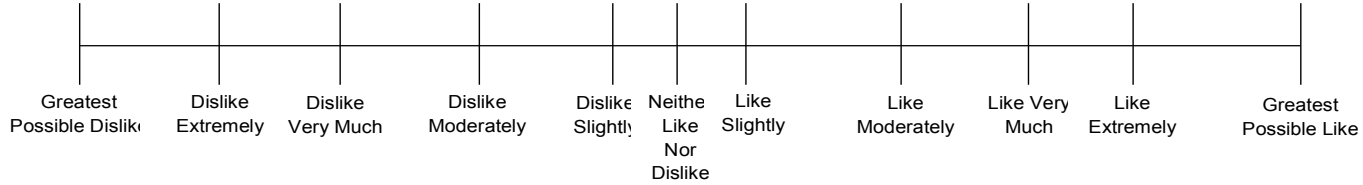
**Spinach – raw** □ ☹️ 🤢 🤨 🤗 😊



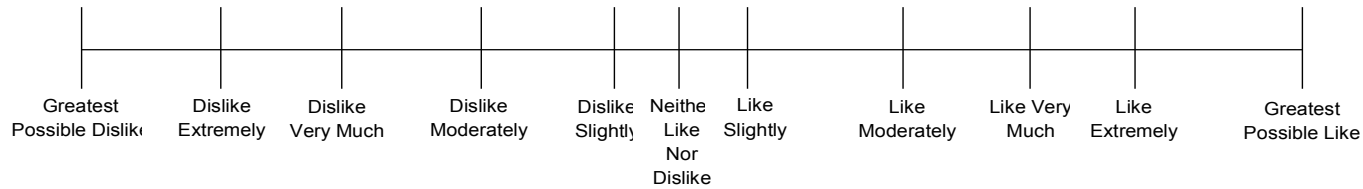
**Cabbage – cooked** □ ☹️ 🤢 🤨 🤗 😊



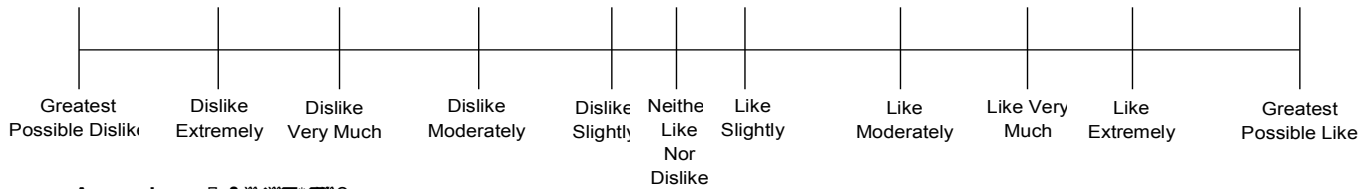
**Cabbage – raw** □ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻



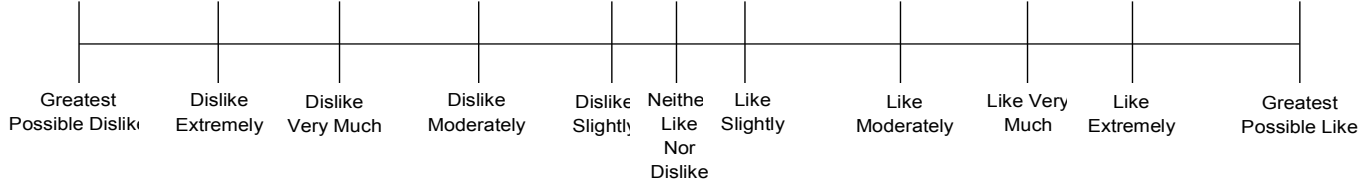
**Tomatoes – cooked** □ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻

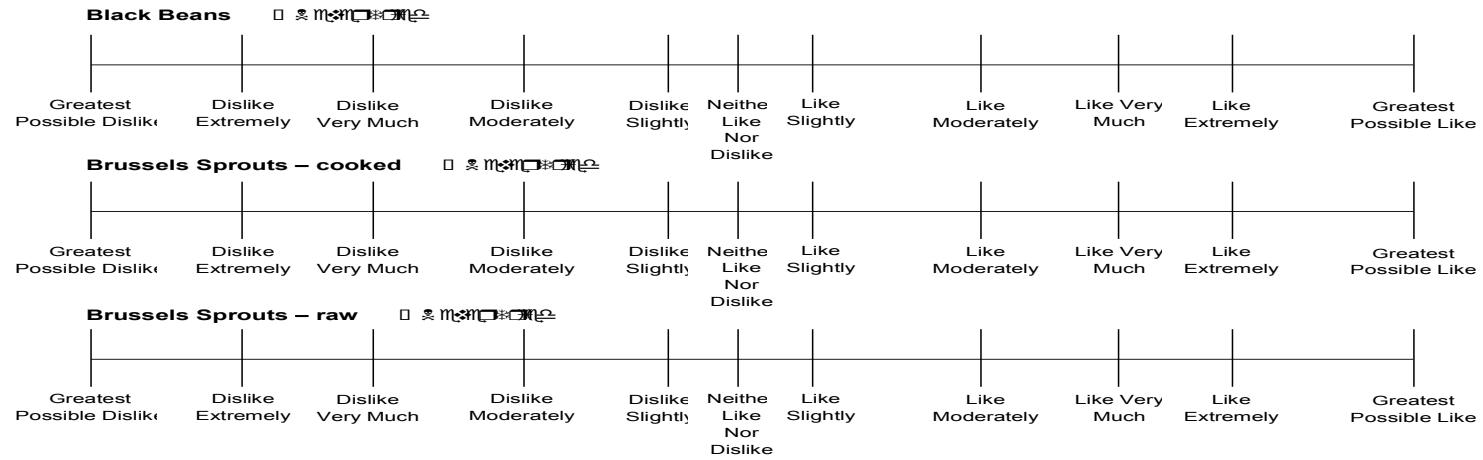


**Tomatoes – raw** □ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻



**Avocado** □ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻







## 7.6 Phase 1 Child Liking

### Child Liking

I'm going to ask you some questions about vegetables that you may or may not have eaten and about meal times with your family and/or friends. Try to answer in the best way you can.

I'm going to ask you to rate how much you like certain vegetables on a scale of 1 to 10 where 1 means you Hate it and 10 means you Like it a lot.

For example, what is a food you really don't like, and where would you rate it on the scale?

How about a food you really love? Where would you rate that on the scale?

So that is the same way you should rate how much you like the vegetables I'm going to ask you about. If you've never had the vegetable before then just tell me that.

---

#### Broccoli - cooked

Never had it	1	2	3	4	5	6	7	8	9	10	
	Hate it				It's okay						Like it a lot

#### Broccoli – raw

Never had it	1	2	3	4	5	6	7	8	9	10	
	Hate it				It's okay						Like it a lot

---

#### Carrots - cooked

Never had it	1	2	3	4	5	6	7	8	9	10	
	Hate it				It's okay						Like it a lot

#### Carrots - raw

Never had it	1	2	3	4	5	6	7	8	9	10	
	Hate it				It's okay						Like it a lot

---

#### Green beans - cooked

Never had it	1	2	3	4	5	6	7	8	9	10	
	Hate it				It's okay						Like it a lot

**Green beans - raw**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Green peas - cooked**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Green peas – raw (sugar snap peas)**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Cauliflower - cooked**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Cauliflower - raw**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Corn - cooked**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Celery- cooked**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay				Like it a lot	

**Celery - raw**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay				Like it a lot	

---

**Cucumbers - raw**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay				Like it a lot	

---

**Red bell pepper (or pimiento) - cooked**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay				Like it a lot	

**Red bell pepper (or pimiento) - raw**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay				Like it a lot	

---

**Lettuce - raw**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay				Like it a lot	

---

**Spinach - cooked**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay				Like it a lot	

**Spinach - raw**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Cabbage - cooked**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Cabbage - raw**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Tomatoes - cooked**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Tomatoes - raw**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Avocado - raw**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Black beans - cooked**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

---

**Brussels sprouts - cooked**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

**Brussels sprouts - raw**

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay					Like it a lot

## 7.7 Phase 1 Behavioral Strategy Questionnaire

### Vegetable Strategy Questionnaire

**Directions:** Please answer the following questions about strategies you can use to get your 9 to 12 year-old child to eat vegetables. If you have more than one child 9 to 12 years, choose one child and answer these questions about that child. Mark or circle one response to each question.

**Hide** vegetables in other foods (like adding pureed squash to spaghetti sauce).

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

Pair vegetables with other **foods your child likes** (like adding green pepper chunks to spaghetti sauce).

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

Make vegetable more easily **available and visible** to your child (like having peeled, chopped, ready to eat vegetables easy to see and find in the fridge).

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

**Ban junk food** at meals.

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

Let your **child prepare** vegetable dishes, by providing recipes, ingredients, equipment, and/or time.

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

Serve vegetables **before** the rest of the meal.

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

If your child takes vegetables by herself/himself, **increase size of serving spoon**. Then your child will take more with each spoonful

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

If you put vegetables on your child's plate, give her/him **bigger servings**.

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

Give your child the usual amount of vegetables, but in a bigger dish than needed. This will make the amount **look smaller**.

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

Use a *dinner plate* or *placemat* that shows the right amount of vegetables to eat for a meal. An example is a plate with the MyPlate picture. MyPlate is the current USDA guide for portion sizes.



Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

Make sure your child *sees other family members* eating a lot of vegetables and enjoying them.

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

*Show a positive attitude* when serving vegetables to your child.

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

Use *fun names* for vegetables when serving them to your child, like calling peas “Power Peas.”

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

*Make vegetables look better* with garnishes by adding things like parsley or bread crumbs. You could also use attractive dishes.

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

Serve vegetables in *smaller pieces* to make them *easy to pick up and eat*, like cut up, chopped vegetables.

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

Plan dinner meals to *routinely* include a vegetable or salad. An example is to pair a vegetable side dish with one-dish meals such as pizza or macaroni and cheese.

Are you doing this now?  Yes  No  
 If no, how likely are you to try this? Very unlikely    Somewhat unlikely    Neither unlikely nor likely    Somewhat likely    Very likely

## 7.8 Phase 1 Home Food Inventory

### Home Food Inventory

#### 1. Vegetables

Yes	No		<u>Fresh</u>	<u>Can/Jar</u>	<u>Frozen</u>
			<b>(mark all that apply)</b>		
1	0	a. Asparagus	1	1	1
1	0	b. Avocado	1	1	1
1	0	c. Bamboo shoots	1	1	1
1	0	d. Bean sprouts	1	1	1
1	0	e. Beets	1	1	1
1	0	f. Bell peppers (e.g. pimiento, green, red)	1	1	1
1	0	g. Bok choy	1	1	1
1	0	h. Broccoli	1	1	1
1	0	i. Brussels sprouts	1	1	1
1	0	j. Cabbage (e.g. includes sauerkraut, coleslaw)	1	1	1
1	0	k. Cauliflower	1	1	1
1	0	l. Carrots	1	1	1
1	0	m. Celery	1	1	1
1	0	n. Corn (e.g. includes hominy)	1	1	1
1	0	o. Cucumbers	1	1	1
1	0	p. Edamame	1	1	1
1	0	q. Green beans	1	1	1
1	0	r. Jicama	1	1	1
1	0	s. Lettuce (e.g. romaine, endive, iceberg)	1	1	1
1	0	t. Mushrooms	1	1	1
1	0	u. Okra	1	1	1
1	0	v. Onions	1	1	1
1	0	w. Peas (e.g. green, snap peas, snow peas)	1	1	1
1	0	x. Plantains	1	1	1
1	0	y. Potatoes (e.g. fresh, frozen, box mixes, salad)	1	1	1
1	0	z. Spinach/other greens (e.g. collard, mustard, turnip, kale)	1	1	1
1	0	aa. Soup (e.g. vegetable, tomato)	1	1	1
1	0	bb. Squash (example: butternut, zucchini)	1	1	1
			<u>Fresh</u>	<u>Can/Jar</u>	<u>Frozen</u>
1	0	cc. Sweet Potatoes/Yams	1	1	1
1	0	dd. Tomatoes (e.g. includes in mixed dishes and prepared main dishes, pasta sauce, salsa)	1	1	1
1	0	ee. Mixed vegetables	1	1	1
1	0	ff. Water chestnuts	1	1	1



2. Other Legumes

Yes	No	
1	0	a. Lentils
1	0	b. Beans (example: black beans, pinto beans, kidney beans, refried beans, baked beans, lima beans)
1	0	c. Chili (e.g. vegetarian or meat-based with beans)
1	0	d. Hummus

**Note: Take pictures of stored food, plated food, serving bowls being used and stored, containers/Tupperware, dishes being used and stored (plates and platters), cutlery (large spoons, spatulas, knives, graters, peelers, etc.), and condiments.**

## 7.9 Phase 1 Observation Checklist Form

### Observation Checklist

**Instructions:** As the researcher completes the checklist items, questions involving a child should be completed with the 9-12 year-old child in the home in mind. Add notes to further explain responses.

1. Observation of Food Preparation Area Physical Layout	Yes	No	Don't Know
Is appropriate kitchen equipment present to prepare vegetables? (Record by observation, and ask if not seen)			
Knives			
Peelers			
Strainers			
Brushes			
Blenders			
Food Processors			
Cutting Boards			
Steamers			
Other:			
Notes: (Whether equipment enables child to help)			
Are the vegetables <u>and</u> related ingredients to be used for the meal easily accessible? Notes: (Decisions or changes in plans related to what is readily available in home)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the kitchen flow (proximity of sink, counter space, appliances) conducive to vegetable preparation? Notes: (How is the kitchen flow conducive or how not conducive?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assess the adequacy of the space for food preparation for the preparer, and the preparer and child. <b>For the Preparer - Circle: Cramped...Adequate...More than adequate</b> <b>For the Preparer <u>and</u> child - Circle: Cramped...Adequate...More than adequate</b>			
Assess the level of sanitation for food preparation - is it adequate for the participation of the child? Notes: (dish towels, cloths, soap use, cleanliness of surfaces, cleaning behaviors, handling of meats)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Meal Planning & Food Selection	Yes	No	DK
( <i>Observe, but if necessary ask respondent</i> ) When was the menu for this occasion decided upon? <b>Circle: At the time of meal... Within an hour prior... Within 4 hours prior... The day of the meal... The day before... 3-5 days before... A week before... More than a week before.</b>			
( <i>Observe, but if necessary ask respondent</i> ) What specific dishes were planned for this occasion? <b>Circle: The main dish(es)... Side dish(es)... Salad(s)... Dessert(s)... Other dishes</b>			
Did the child have any influence in deciding what vegetables will be served today? Notes: (How, and assess extent child influence and/or involvement)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Meal Preparation	Yes	No	DK
Describe vegetable preparation for this meal - If more than one, note preparation method for each: cleaned, chopped, sliced, boiled, fried, sautéed, baked, other (specify)  _____  _____  How much time did it take to prepare all of the vegetables to be served? _____ minutes			
Is the child helping with vegetable preparation during meal preparation? Notes: <i>(Assess feasibility of child involvement, note tasks child is doing – cleaning, chopping, etc.)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the vegetables prepared so they are more kid friendly? Notes: <i>(E.g. cut into small, convenient finger foods as appropriate?)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are vegetables being mixed with other foods the child likes? Notes: <i>(overt/covert incorporation)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the vegetables served with positive parental interaction: Notes: <i>(e.g. with a smile, etc.)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Serving the Meal	Yes	No	DK
Were any foods served ahead of the meal to the child? Notes: <i>(Explain the order of foods served)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are vegetables being served in ways that children can't avoid them (hidden in sauces, part of well-liked dishes – e.g., on pizza)? Notes: <i>(If so, how?)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Describe the vegetables serving container(s) <b>Circle and Note size (S, M, L) and "fullness" (1/4, 1/2, 3/4, or full) :</b> <b>Plate/platter,</b> Size _____, Fullness _____ <b>Bowl,</b> Size _____, Fullness _____ <b>Pan/skillet,</b> Size _____, Fullness _____ <b>Other,</b> Type _____, Size _____, Fullness _____  Describe serving utensils type and size: <b>Circle and Note: Spoon(s),</b> Size _____... <b>Fork(s),</b> Size _____ <b>Other,</b> Type _____, Size _____  Notes: <i>(portion size manipulation, labeling dinnerware, take pictures of dinner plates when full before consumption with ruler in background to estimate plate size)</i>			
How is the meal served? <b>Circle: Family Style....Buffet Style....Pre-Plated.....Other _____</b> Notes: <i>(portion size manipulation, norms, accessibility)</i>			

Are foods served to children by a parent? Notes: (portion size manipulation, norms, accessibility)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>5. Eating the Meal</b>	Yes	No	DK
Did the adult eat the vegetables? <i>Describe type, amount):</i> Type _____ Amount Circle: None...1/4...1/2...3/4...All...Seconds Type _____ Amount Circle: None...1/4...1/2...3/4...All...Seconds Type _____ Amount Circle: None...1/4...1/2...3/4...All...Seconds Type _____ Amount Circle: None...1/4...1/2...3/4...All...Seconds Notes: (Other observations with respect to amount eaten)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Did the child eat the vegetables? <i>Describe type, quantity):</i> Type _____ Amount Circle: None...1/4...1/2...3/4...All...Seconds Type _____ Amount Circle: None...1/4...1/2...3/4...All...Seconds Type _____ Amount Circle: None...1/4...1/2...3/4...All...Seconds Type _____ Amount Circle: None...1/4...1/2...3/4...All...Seconds Notes: (Other observations with respect to amount eaten)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Did family members (parents and siblings, etc) role model eating and enjoying vegetables? Notes: (How, instituting norms)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Was vegetable consumption by the child expected? Notes: (Describe how this was assessed - instituting norms)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other things that are observed that may affect vegetables being served or consumed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**General Meal Observations**

***What Foods Were Served (List, and circle that contained vegetables)***

Appetizer(s) \_\_\_\_\_  
 Salad(s) \_\_\_\_\_  
 Main Dish(es) \_\_\_\_\_  
 Side Dishes \_\_\_\_\_  
 Dessert \_\_\_\_\_

***Who Was Present?***

Adults \_\_\_\_\_  
 Children \_\_\_\_\_

***Where Meal Was Served and Consumed?***

**Circle:** Kitchen...Dining room...Family room...Living room...Deck/Patio...Bedroom...

**Other Location** \_\_\_\_\_

**Table...Counter...Tray(s)...Other** \_\_\_\_\_

*Did they all eat together?*

\_\_\_\_\_

*When Meal Was Served?*

Day of Week \_\_\_\_\_

Time of Day \_\_\_\_\_

**How Long Did the Meal Take to Eat?** \_\_\_\_\_

*Situational Factors/Distractions:*

TV on in eating area Yes No \_\_\_\_\_

TV on in other room in home Yes No \_\_\_\_\_

Radio/Music playing Yes No \_\_\_\_\_

Members coming and going Yes No \_\_\_\_\_

Members rushed, need to eat/finish quickly Yes No \_\_\_\_\_

Telephone/texting interruption(s) Yes No \_\_\_\_\_

Other (*Specify*) \_\_\_\_\_

*Other information of interest concerning the meal:*

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## 7.10 Phase 1 Adult Interview Guide

### Adult Interview Questions

*Inform the participant that the following questions should be answered with their 9-12 year-old child in mind.*

#### Typical Dinner Meals

1. Tell me about how you decided what to prepare for dinner tonight? Talk me through the process.
  
2. How did you decide whether or not you would include vegetables? This includes vegetables that may have been an ingredient in your meal such as tomato sauce or potato salad.  
  
PROBE (If Some): Why did you decide to serve vegetables? How did you decide to serve these vegetables specifically?  
  
PROBE (If None): Tell me more about why you did not serve vegetables tonight? What would have encouraged you to include vegetables?
  - a. What if you had more time – would anything change?
  - b. What if you had more money – would anything change?
  
3. (Optional Questions) If vegetables were served:
  - a. What did you think about the vegetables served during tonight's meal?
  - b. What did your child think about the vegetables served during tonight's meal?
  
3. How would you compare the meal you had tonight to the dinner meals you would typically prepare on a weekday? Describe a typical dinner in your home.  
  
PROBE: How was this meal like and/or different from what you would normally prepare for dinner (where you eat, who you eat with, what you're eating, time you have to eat)?

### **Vegetable Preferences**

4. Which vegetables do you like/dislike? Why?
  
5. Which vegetables do your child like/dislike? Why?
  
6. In general, how do you decide which vegetables to serve during dinner meals (eg. time constraints, money constraints, taste, pleasure, hunger, other people's influence, brand preference, deal, coupons, ads, health-related)  
  
PROBE: What role does everyone play in the decision? Talk me through this process.
  
7. What happens when you serve a vegetable that you do not like? How do you decide whether or not you would eat it?  
  
PROBE: Give an example of a time when you prepared a vegetable you did not like for dinner and whether or not you ate the vegetable? How did you make this decision?
  
8. What happens if you serve a vegetable that your child does not like? How does your child decide whether or not they will eat them?  
  
PROBE: Give an example of a time when you prepared a vegetable that your child did not like for dinner and whether or not they ate the vegetable? How did they make this decision?
  
9. Tell me about any challenges you have faced when trying to encourage your child to eat vegetables?
  - a. If none, then, what do you recommend to other parents if their children do not like vegetables?

10. What are some things you have done or could do to encourage your child to eat vegetables at the dinner meal?

PROBE: Which have been or could be most effective?

11. What role does your child play in preparing dinner?

PROBE: Does your child help you make dinner?

a. If yes, can you give some examples of what they do?

b. If no, do you think they would like to? And what might he/she be interested in doing?

### **Food Shopping**

12. Who typically does the grocery shopping in the household? Anyone else go with \_\_\_\_\_?

PROBE: What about the child?

a. How does your child influence the types of vegetables that are purchased for the home?

b. Do you think having your child choose which vegetables they want at the store will encourage them to eat more vegetables? Tell me more about this.

13. When shopping for vegetables, how do you decide what to buy (eg. Coupons, prices, quality, taste)?



## 7.11 Phase 1 Child Interview Guide

### Child Interview Questions

1. (Assuming the Child Liked A Vegetable) Tell me what you like about eating \_\_\_\_\_ (select 1-2 vegetables from above)?  
PROBE: What is it about \_\_\_\_\_ that you like?
2. In general, how do you like your vegetables prepared?  
PROBE: What is it that makes you like your vegetables prepared this way?
3. (Assuming the Child Disliked a Vegetable) Tell me what you dislike about eating \_\_\_\_\_ (select 1-2 vegetables from above)?  
PROBE: What is it about \_\_\_\_\_ that you dislike?
4. Tell me about a time you ate a vegetable that you did not like, but ate it anyways.  
PROBE: Why did you eat it?
5. Tell me about a vegetable that you did not like when you first tried it, but then tried it later and you liked it?  
PROBE: What do you think changed your mind about eating the vegetable?
6. With this in mind, thinking about some of the vegetables you listed that you do not like, what would make you like those vegetables more?  
PROBE: For example, you listed that you do not like \_\_\_\_\_, what would make you like eating that vegetable more.
7. What do you think about trying new vegetables?  
PROBE: If offered a new vegetable, how do you decide whether or not to try it?
8. Tell me what it's like when you eat vegetables at home with your family?  
PROBE: How are vegetables served (eg. Self served, etc.)  
PROBE: Do you ever add anything to the vegetables served (eg. Sauces, dips, etc.)

9. What role do you play in what vegetables are served during meal times?

10. Tell me about any rules your parents have about eating vegetables?

Anything else I should know about what you think about vegetables?



## 7.13 Phase 2 Dinner Vegetable Record Form

### Daily Food Record

- Directions:** (1) Record only on days your child eats dinner at home.  
(2) Complete this Record immediately after your child goes to bed.

**Child name:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Day of the week (Circle):**

Monday    Tuesday    Wednesday    Thursday    Friday    Saturday    Sunday

**Did your child eat a vegetable at home on the day you circled above?**

Yes                  No

**List each vegetable your child ate and how much your child ate.**

\_\_\_\_\_ (meal)

(Χιρρ/ε Ονε)  χυπ ...χυπ | χυπ 1 χυπ 1 | χυπς 2 χυπς 2 | χυπς 3 χυπς

\_\_\_\_\_ (meal)

(Χιρρ/ε Ονε)  χυπ ...χυπ | χυπ 1 χυπ 1 | χυπς 2 χυπς 2 | χυπς 3 χυπς

\_\_\_\_\_ (meal)

(Circle Ονε)  χυπ ...χυπ | χυπ 1 χυπ 1 | χυπς 2 χυπς 2 | χυπς 3 χυπς

\_\_\_\_\_ (meal)

(Χιρρ/ε Ονε)  χυπ ...χυπ | χυπ 1 χυπ 1 | χυπς 2 χυπς 2 | χυπς 3 χυπς

\_\_\_\_\_ (meal)

(Χιρρ/ε Ονε)  χυπ ...χυπ | χυπ 1 χυπ 1 | χυπς 2 χυπς 2 | χυπς 3 cups

**Please do not show or discuss this record with your child.**

## 7.14 Phase 2 Weekly Record Follow Up

### Weekly Strategy Record Script-Follow-up Call

Participant ID: \_\_\_\_\_ Week \_\_\_\_\_ (# 1-6)

Date and Day of phone call: \_\_\_\_\_

Strategy introduced the previous week: \_\_\_\_\_

Date and Day strategy was assigned: \_\_\_\_\_

#### Introduction

I would like to check in with you about the strategy we asked you to use last week.

**1. Since, \_\_\_\_\_ (day or date), can you tell me how many days you tried this idea?**

1: (day and date), (yes, no, maybe)

2:

3:

**2. How difficult was it to do this on a scale from 1 to 10 (1 being not difficult, 10 being very difficult)? Why did you rate it a \_\_\_\_\_?**

**3. Can you briefly tell me how you did this? I would love to hear some examples of how you \_\_\_\_\_ (insert strategy).**

**4. (facilitators): What were some things that helped you \_\_\_\_\_ (strategy)?**

Preparation (Choose 1)

SEE PROBES FOR STRATEGY

**5. (barriers): What were some things that kept you from \_\_\_\_\_ (strategy)?**

Cost (Choose 1)

a. What was the most challenging thing about trying the strategy this week?

- If money was a barrier ask, “if I gave you an unlimited credit card and you could buy whatever food you wanted at the grocery store, do you think you would do the strategy regularly.”
- If time was a barrier asks, “what if you had more time and were not as rushed, could you see yourself doing this strategy regularly.” Why or why not?

SEE PROBES FOR STRATEGY

**6. How would you compare dinner tonight regarding your use of this strategy, to what you would normally do for dinner?**

**7. What made this strategy easier than the others?**

**8. What made this strategy harder than others?**

**9. Could you see yourself continuing to use this strategy after the study? Why or Why not?**

If not, what could be done to encourage you and/or help you be able to do this strategy on a regular basis?

**10. When did you fill out the green record sheets last week?**

Probe: Did you do it at the end of the week or the day you completed the strategy (intervention)/prepared dinner (control)?

**11. Tell me about any other strategies you used this week.**

NOTES

CLOSING

Thank you for talking with me today. You have been very helpful. I need to schedule another call/home visit with you for one week from now. (Schedule next call/visit.)

## 7.15 Phase 2 Strategy Guide

**Strategy: Prepare a vegetable that is new to your child.**

**During our visit, we asked your child what vegetables he or she has never eaten. We left some vegetables that will be new to your child.**

- \* **There are recipes in this envelope to give you and your child ideas for what to do with the vegetables.**
- \* **You can also serve the vegetables anyway you think your child will like them.**
- \* **Feel free to use any vegetable your child has not tried.**

**Please try this idea at least 3 days this week. You can give your child the same new vegetable all 3 days, or try a new vegetable each day.**



**Give it a try at least 3 times this week.**

**Strategy: Your child helps prepare vegetables.**

**Look at the ideas below to get started!**

**Ask your child to:**

- \* **Get vegetables out and wash them**
- \* **Add spices and/or seasonings to vegetables**
  - \* **Make a salad**
- \* **Read a recipe aloud on how to prepare the vegetable**
  - \* **Cut vegetables with your help if necessary**
  - \* **Peel vegetables with a safe vegetable peeler**
    - \* **Add vegetable toppings to pizza**
    - \* **Make fresh salsa**
  - \* **Use a can opener to open vegetables**
    - \* **Stir vegetables on the stove top**
- \* **Put vegetables in microwaveable bowl and use the microwave to warm them**



**Give it a try at least 3 times this week.**





**Strategy: Serve at least two vegetables with a meal.**

**This can include 2 different vegetables as side dishes OR 1 side dish of vegetables plus another food item with vegetables.**

- \* **Macaroni and cheese mixed with peas and collard greens on the side**
- \* **Hamburgers with a side of baby carrots and side of cucumber slices**
- \* **Spaghetti with tomato sauce with a side of green beans**
- \* **Corn on the cob and cooked zucchini served with hot dogs**
- \* **Tacos topped with lettuce and tomato plus a mixed vegetable salad on the side**



**The possibilities are endless!  
Think about vegetables that  
your child likes.**



**Give it a try at least 3 times this week.**

**Strategy: You set an example by eating vegetables with your child at dinner.**

**Have your child see you eat vegetables with dinner.**

**Look at the ideas below to get started!**

- \* **Eat dinner with your child while having a meal that includes vegetables.**
- \* **Share a snack of raw carrots with your child right before dinner is ready.**
- \* **Eat vegetables at dinner that you both like.**



**Give it a try at least 3 times this week.**

**Strategy: Pair a vegetable with the foods you know your child already likes.**

**Look at the ideas below to get started!**

- \* Add chopped fresh veggies such as peppers to pizza
- \* Add diced peppers, onions, spinach, carrots, squash, tomatoes, zucchini to spaghetti sauce
- \* Add beans, peppers, avocado, lettuce, tomatoes to tacos
- \* Add lettuce, tomatoes, onion, avocado to hamburgers or sandwiches
- \* Add peas, corn, carrots, celery, green beans, mixed vegetables to casseroles/hot dishes/soups
  - \* Add canned squash or sweet potato to mashed potatoes
- \* Add peas, green beans, broccoli, cauliflower to macaroni and cheese
  - \* Add mixed vegetables, peas, beans, salsa to rice



**Give it a try at least 3 times this week.**

**Strategy: Make vegetables more easily available and visible than other foods at the dinner meal.**

**Look at the ideas below to get started!**

- \* **After plates are fixed, have the vegetables on the table during dinner, but keep other foods in another room and/or out of sight.**
- \* **If you eat somewhere other than at a table, for example, if you eat in the living room, have the vegetables on a coffee table or TV tray and keep other food in the kitchen.**



**Give it a try at least 3 times this week.**

**Strategy: Use a bigger spoon to serve a larger amount of vegetables with the dinner.**

**Look at the ideas below to get started!**

- **If you normally serve your children, use the larger spoon we left you to serve the vegetables so they will get more than they normally would.**
- **If your children normally serve themselves, put the larger spoon with the vegetable so they get more than they normally would.**



**Give it a try at least 3 times this week.**

**Strategy: Serve vegetables before eating dinner.**

**Look at the ideas below to get started!**

- \* **Serve vegetables while dinner is being prepared.**
- \* **Serve vegetables 5-10 minutes before dinner is ready.**
- \* **Serve a salad before the rest of the meal.**



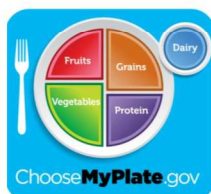
**Give it a try at least 3 times this week.**

**Strategy: Use a plate that shows the right amount of vegetables to eat for a meal.**

Use the plates in this folder that show how much of the plate should be covered by vegetables.

**Look at the ideas below to get started!**

- \* Put cooked or raw carrots on the vegetable part of the plate.
- \* Put spaghetti sauce in the vegetable part and pasta in the grain part of the plate.
- \* If you serve a mixed dish like lasagna, talk about the amount of vegetables that you think would be on the vegetable part.
- \* Serve tacos with the tortilla as the grain, beans as the protein, and lettuce and tomato as the vegetable and have your child put it together.
- \* Serve hamburgers with the bun as the grain, the patty as the meat, and lettuce, tomato, cucumber or avocado as the vegetable and have your child put it together.



**Feel free to let  
vegetables fall into fruit  
space.**



**Give it a try at least 3 times this week.**

**Strategy: Offer your child two vegetable options for meals– one liked and one less liked.**

Let your child decide what vegetable they want from the two choices.

**Look at the ideas below to get started!**

- Put two cans of vegetables on the counter-one your child likes and one your child doesn't like and have him or her pick what vegetable will be eaten with the meal.
- Show your child two bags of frozen vegetables, one liked and one disliked, and have him or her choose the one that will be served.
- \* Have one liked vegetable and one vegetable that is not liked as much in the refrigerator and tell your child to get the one that they will eat with the meal.



**You do not need to prepare the disliked vegetable.**



**Give it a try at least 3 times this week.**



## 7.16 Phase 2 Demographic Questionnaire

### Demographic Form

1. **How old are you? \_\_\_\_\_ years**
2. **Are you a man or a woman?**
  - Man
  - Woman
3. **What is your ethnicity? (Check one only)**
  - Hispanic or Latino
  - Not Hispanic or Latino
4. **What is your race? (Check all that apply)**
  - Black or African American
  - White
  - Alaska native or American Indian
  - Asian
  - Native Hawaiian or other Pacific Islander
  - Other \_\_\_\_\_
5. **What language do you speak at home? (Check one only)**
  - Only English
  - Mostly English
  - English and another language about the same
  - Mostly another language
  - Only another language
  - Other \_\_\_\_\_
6. **How long have you lived in the U.S.? (Check one only)**
  - 1-5 years
  - 6-10 years
  - More than 10 years
7. **What is your highest level of formal education? (Check one only)**
  - Have not completed high school
  - Received high school diploma or GED
  - Some college or technical school
  - 4-year college, university degree or advanced degree
8. **Which of the following best describes your employment status? (Check all that apply)**
  - Homemaker
  - Not employed
  - Employed part-time
  - Employed full-time
  - Retired

9. How many adults over the age of 18, counting yourself, live in your home? (Check one only)

- 1
- 2
- 3 or more

10. How many children living in your home are:

- Under the age of 9? \_\_\_\_\_
- Between 9-12? \_\_\_\_\_
- Between 13-18? \_\_\_\_\_

Answer the following questions based on your 9 to 12 year old child participating in this study.

11. How old is your 9-12 year old child?

- 9 years
- 10 years
- 11 years
- 12 years

12. Is this child a boy or girl?  Boy  Girl

13. What is the ethnicity of your 9-12 year old child? (Check one only)

- Hispanic or Latino
- Not Hispanic or Latino

14. What is the race of your 9-12 year old child? (Check all that apply)

- Black or African American
- White
- Alaska native or American Indian
- Asian
- Native Hawaiian or other Pacific Islander
- Other \_\_\_\_\_

IF APPLICABLE, answer the following questions about your 13 to 18 year old adolescent child.

15. How old is your 13-18 year old adolescent?

- 13 years
- 14 years
- 15 years
- 16 years
- 17 years
- 18 years

16. Is this adolescent a boy or girl?  Boy  Girl

17. What is the race of your 13-18 year old adolescent? (Check all that apply)

- Black or African American
- White
- Alaska native or American Indian
- Asian
- Native Hawaiian or other Pacific Islander
- Other \_\_\_\_\_

18. On average, how many days of the week does your 13-18 year old live in your home? (Check one only)

- 1-3 days
- 4 or more days

**Answer the following questions about grocery shopping.**

**19. When did you make your last major grocery shopping trip? (Check one only)**

- 0 to 7 days ago
- 1 to 2 weeks ago
- 3 to 4 weeks ago
- More than a month ago

**20. Are you or your family members participating in the following programs? (Check all that apply)**

- WIC
- SNAP (Supplemental Nutrition Assistance Program) or formerly called Food stamps
- Free/reduced priced school lunch
- Food shelves, meals, or other food distribution programs
- None

**21. During the past month, when did you receive SNAP benefits?**

Write in the date: \_\_\_\_\_ or  I did not receive SNAP benefits

**22. During the past 7 days how many times did you eat vegetables other than white potatoes? (Check one only.)**

- I did not eat vegetables other than white potatoes during the past 7 days
- 1 to 3 times during the past 7 days
- 4 to 6 times during the past 7 days
- 1 time per day
- 2 times per day
- 3 times per day

**23. On the days you eat vegetables, on average how much do you eat? (Check one only)**

- 0
- ¼ cup
- ½ cup
- 1 cup
- 1½ cups
- 2 cups
- 2½ cups
- 3 cups

**24. How did you learn about this study?**

\_\_\_\_\_

Thank you for your  
participation!

## 7.17 Phase 2 Caregiver Vegetable Liking/Variety Questionnaire

### Caregiver Vegetable Liking/Variety Questionnaire

**Directions:** We are going to ask how much you like a variety of vegetables and how often you eat them.

1. You will see this box next to each vegetable to mark if you have eaten the vegetable in the past month:

<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't Know
------------------------------	-----------------------------	-------------------------------------

Please remember to include vegetables in casseroles, soups, and other mixed dishes.

2. Then we will ask you to rate how much you like the vegetable on a scale of 1 to 10. Circle a number where 1 means you Hate it and 10 means you Like it a lot. Circle **Never had it** if you have never eaten the vegetable.

<b>Never had it</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
	<b>Hate it</b>				<b>It's okay</b>			<b>Like it a lot</b>		

---

<b>Artichoke</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't Know
------------------	------------------------------	-----------------------------	-------------------------------------

<b>Never had it</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
	<b>Hate it</b>				<b>It's okay</b>			<b>Like it a lot</b>		

---

<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't Know
------------------------------	-----------------------------	-------------------------------------

**Asparagus**

<b>Never had it</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
	<b>Hate it</b>				<b>It's okay</b>			<b>Like it a lot</b>		

---

**The same format is used for the following vegetables:**

Bean sprouts, beans- black beans, beans- other (bean dishes, kidney, lentil, hummus), beets, broccoli, Brussels sprouts, cabbage, cauliflower, carrots, celery, corn, cucumber, edamame, eggplant, greens (spinach, collard, bok choy, kale), green beans, jicama, lettuce, mixed vegetables, onion, peas, pepper (red, orange, green, hot), plantain, potato, root vegetables (yucca, radish, rutabaga, parsnip, turnip, taro), soup (vegetable or tomato), squash, sweet potato/yam, tomatillo, tomato, water chestnuts

!

## 7.18 Phase 2 Child Vegetable Liking Questionnaire

### Child Vegetable Liking

I'm going to ask you to rate how much you like certain vegetables on a scale of 1 to 10 where 1 means you Hate it and 10 means you Like it a lot.

For example, what is a food you really don't like, and where would you rate it on the scale?

How about a food you really love? Where would you rate that on the scale?

So that is the same way you should rate how much you like the vegetables I'm going to ask you about. If you've never had the vegetable before then just tell me that.

---

#### Artichoke

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay				Like it a lot	

---

#### Asparagus

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay				Like it a lot	

---

#### Avocado/guacamole

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay				Like it a lot	

---

#### Bamboo shoots

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay				Like it a lot	

---

#### Bean sprouts

Never had it	1	2	3	4	5	6	7	8	9	10
	Hate it				It's okay				Like it a lot	

**The same format is used for the following vegetables:**

Bean sprouts, beans- black beans, beans- other (bean dishes, kidney, lentil, hummus), beets, broccoli, Brussels sprouts, cabbage, cauliflower, carrots, celery, corn, cucumber, edamame, eggplant, greens (spinach, collard, bok choy, kale), green beans, jicama, lettuce, mixed vegetables, onion, peas, pepper (red, orange, green, hot), plantain, potato, root vegetables (yucca, radish, rutabaga, parsnip, turnip, taro), soup (vegetable or tomato), squash, sweet potato/yam, tomatillo, tomato, water chestnuts

!

## 7.19 Phase 2 Child Physical Activity Form

### PHYSICAL ACTIVITY FORM The Eating at Home FOR Kids (or FORK) Study

**This survey is about health behavior. It has been developed so you can tell us what you do that may affect your health. The information you give will be used to improve health education for young people like yourself. Please read each question below and circle your answer.**

1. During the past 7 days, on how many days were you physically active for a total of **at least 60 minutes per day**? (Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time.)
  - A. 0 days
  - B. 1 day
  - C. 2 days
  - D. 3 days
  - E. 4 days
  - F. 5 days
  - G. 6 days
  - H. 7 days
2. On how many of the past 7 days did you do exercises to **strengthen or tone your muscles**, such as push-ups, sit-ups, or weight lifting?
  - A. 0 days
  - B. 1 day
  - C. 2 days
  - D. 3 days
  - E. 4 days
  - F. 5 days
  - G. 6 days
  - H. 7 days
3. On an average school day, how many hours do you watch TV?
  - A. I do not watch TV on an average school day
  - B. Less than 1 hour per day
  - C. 1 hour per day
  - D. 2 hours per day
  - E. 3 hours per day
  - F. 4 hours per day
  - G. 5 or more hours per day



4. On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work? (Count time spent on things such as Xbox, PlayStation, an iPod, an iPad or other tablet, a smartphone, YouTube, Facebook or other social networking tools, and the Internet.)
- A. I do not play video or computer games or use a computer for something that is not school work
  - B. Less than 1 hour per day
  - C. 1 hour per day
  - D. 2 hours per day
  - E. 3 hours per day
  - F. 4 hours per day
  - G. 5 or more hours per day
5. In an average week when you are in school, on how many days do you go to physical education (PE) classes?
- A. 0 days
  - B. 1 day
  - C. 2 days
  - D. 3 days
  - E. 4 days
  - F. 5 days
6. During the past 12 months, on how many sports teams did you play? (Count any teams run by your school or community groups.)
- A. 0 teams
  - B. 1 team
  - C. 2 teams
  - D. 3 or more teams

## 7.20 Phase 2 Home Vegetable Inventory

### Home Food Inventory

**Directions:** Look through refrigerator, freezer, cupboards, and pantries. When a vegetable is present, write the number of units on the first line and describe the units on the second line (i.e. Artichoke: 2 Heads, Beans: 6 15 oz. cans). Be sure to ask if there is food somewhere else in the home besides the kitchen.

	<b>Fresh (#, unit: such as small, medium, large or estimate how much in cups)</b>	<b>Can/Jar (#, unit)</b>	<b>Frozen (#, unit)</b>
a. Artichoke			
b. Asparagus			
c. Avocado/guacamole			
d. Bamboo shoots			
e. Bean sprouts			
f. Beans (black, pinto, kidney, navy, white, refried, baked, lima, soy, black-eyed, garbanzo/chickpea, hummus, lentils, split peas)			
g. Beets			
h. Broccoli			
i. Brussels sprouts			
j. Cabbage (sauerkraut, coleslaw)			
k. Cauliflower			
l. Carrots			
m. Celery			
n. Corn (hominy)			
o. Cucumbers (pickles)			

	<b>Fresh (#, unit: such as small, medium, large or estimate how much in cups)</b>	<b>Can/Jar (#, unit)</b>	<b>Frozen (#, unit)</b>
p. Edamame			
q. Eggplant			
r. Greens (spinach, collard, mustard, turnip, kale, bok choy)			
s. Green beans (snap, string, wax)			
t. Jicama			
u. Lettuce ( romaine, endive, iceberg)			
v. Mixed vegetables			
w. Okra			
x. Onions (white, red, green, leek)			
y. Peas (green, snap peas, snow peas)			
z. Peppers (red, green, hot)			
aa. Plantains			
bb. Potatoes - white/russet (fries, box mixes, hash browns, potato salad)			
cc. Root vegetables – other than potatoes (yucca/cassava, yautia, taro, rutabaga, parsnip, turnip, radish)			
dd. Soup (vegetable, tomato)			
ee. Squash (butternut, acorn, pumpkin, zucchini)			
ff. Sweet potatoes/yams			
gg. Tomatillos			

	<b>Fresh (#, unit: such as small, medium, large or estimate how much in cups)</b>	<b>Can/Jar (#, unit)</b>	<b>Frozen (#, unit)</b>
hh. Tomatoes (tomato sauce, canned tomatoes, salsa, spaghetti sauce, pizza sauce, tomato juice, in mixed dishes)			
ii. Water chestnuts			
Other			
Other			
Other			

## 7.21 Phase 2 Observation Checklist

### Observation Checklist

**Instructions:** As the researcher completes the checklist items, keep the 9-12 year-old child in the home in mind. Add notes to further explain responses.

Observation of Food Preparation Area Physical Layout	Yes	No	Don't Know
Is appropriate kitchen equipment present to prepare vegetables? (Record by observation, and ask if not seen)			
Knives (butcher/chef's knife for cutting vegetables)			
Peelers			
Strainers			
Measuring Cups			
Measuring Spoons			
Brushes			
Blenders			
Food Processors			
Cutting Boards			
Steamers			
Can Opener			
Cookie Sheet			
Serving Spoons (indicate sizes)			
Other:			
Is the kitchen flow (proximity of sink, counter space, appliances) conducive to vegetable preparation? Notes: (How is the kitchen flow conducive or how not conducive?)  Assess the adequacy of the space for food preparation for the preparer, and the preparer and child.  <b>For the Preparer - Circle:                      Cramped...Adequate...More than adequate</b>  <b>For the Preparer and child - Circle:   Cramped...Adequate...More than adequate</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assess the level of sanitation for food preparation - is it adequate for participation of the child? Notes: (dish towels, cloths, soap use, cleanliness of surfaces, cleaning behaviors, handling of meats)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other things that are observed that may affect vegetables being served or consumed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presence of a table where the family can eat together?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location of the table?			

## 7.22 Phase 2 Exit Questionnaire

### Exit Questionnaire

#### Household Characteristics

1. How many adults over the age of 18, counting yourself, live in your home?  
 1  
 2  
 3 or more
2. How many children living in your home are?  
Under the age of 9? \_\_\_\_  
Between 9-12? \_\_\_\_  
Between 13-18? \_\_\_\_
3. Which of the following best describes your employment status? (Check all that apply)  
 Homemaker  
 Not employed  
 Employed part-time  
 Employed full-time  
 Retired
4. Are you or your family members participating in the following programs? (Check all that apply)  
 WIC  
 SNAP (Supplemental Nutrition Assistance Program) or formerly called Food stamps  
 Summer food program  
 Free/reduced priced school lunch  
 Food shelves, meals, or other food distribution programs  
 None
5. During the past month, when did you receive SNAP benefits?  
Date: \_\_\_\_\_ or  I did not receive SNAP benefits
6. Which of the following has your child attended since our first in home visit? We are only interested in programs attended while in the study.  
 Summer school  
 Summer overnight camp  
 Summer day camp  
 After school program  
 Traditional School  
 Year Around School  
 Home School

!

### Adult Intake

7. During the past 7 days how many times did **you** eat vegetables other than white potatoes? (**Check one only.**)
- I did not eat vegetables other than white potatoes during the past 7 days
  - 1 to 3 times during the past 7 days
  - 4 to 6 times during the past 7 days
  - 1 time per day
  - 2 times per day
  - 3 times per day
8. On the days you eat vegetables, on average how much do you eat? (**Check one only**)
- 1/8 cup
  - 1/4 cup
  - 1/2 cup
  - 1 cup
  - 1 1/2 cups
  - 2 cups
  - 2 1/2 cups
  - 3 cups

### Intervention Families

9. Did your child notice that you were doing any of the strategies?
- Yes
  - No
  - I don't know
10. Compared to before the study, which of the strategies helped your **9-12 year old** to eat more vegetables? (Check all that apply)
- Prepare a vegetable that is new to your child.
  - Your child helps prepare vegetables.
  - Serve at least two vegetables with a meal.
  - You set an example by eating vegetables with your child.
  - Pair a vegetable with the foods you know your child already likes.
  - Make vegetables more easily available and visible than other foods.
  - When you put vegetables on your child's plate, give more than usual.
  - Serve vegetables before the rest of the meal.
  - Use a plate that shows the right amount of vegetables to eat for a meal.
  - Offer your child two vegetable options for meals– one liked and one less liked.
11. Of all of the strategies you were assigned, which one do you think worked the best to help your 9-12 year old eat more vegetables?
- \_\_\_\_\_
12. If applicable, compared to before the study, which of the strategies helped your **13-18 year old** to eat more vegetables? (Check all that apply)

!

- ✍ Prepare a vegetable that is new to your child.
- ✍ Your child helps prepare vegetables.
- ✍ Serve at least two vegetables with a meal.
- ✍ You set an example by eating vegetables with your child.
- ✍ Pair a vegetable with the foods you know your child already likes.
- ✍ Make vegetables more easily available and visible than other foods.
- ✍ When you put vegetables on your child's plate, give more than usual.
- ✍ Serve vegetables before the rest of the meal.
- ✍ Use a plate that shows the right amount of vegetables to eat for a meal.
- ✍ Offer your child two vegetable options for meals– one liked and one less liked.

13. Of all of the strategies you were assigned, which one do you think worked the best to help your 13-18 year old to eat more vegetables?

\_\_\_\_\_

14. After being in the FORK Study, which of the following strategies will you keep doing?

- a. Prepare a vegetable that is new to your child.
  - ✍ Yes
  - ✍ No
  - ✍ NA
- b. Your child helps prepare vegetables.
  - ✍ Yes
  - ✍ No
  - ✍ NA
- c. Serve at least two vegetables with a meal.
  - ✍ Yes
  - ✍ No
  - ✍ NA
- d. You set an example by eating vegetables with your child.
  - ✍ Yes
  - ✍ No
  - ✍ NA
- e. Pair a vegetable with the foods you know your child already likes.
  - ✍ Yes
  - ✍ No
  - ✍ NA
- f. Make vegetables more easily available and visible than other foods.
  - ✍ Yes
  - ✍ No
  - ✍ NA

!



- g. When you put vegetables on your child's plate, give more than usual.  
 Yes  
 No  
 NA
- h. Serve vegetables before the rest of the meal.  
 Yes  
 No  
 NA
- i. Use a plate that shows the right amount of vegetables to eat for a meal.  
 Yes  
 No  
 NA
- j. Offer your child two vegetable options for meals– one liked and one less liked.  
 Yes  
 No  
 NA
15. Of all of the strategies you were assigned, which one would you be most likely to do weekly?  
\_\_\_\_\_

**Control Families**

16. While in the study, were the foods you prepared in the home typical (i.e. The type of meals you prepared)?  
 Yes  
 No
17. Did participating in the study (the surveys, weekly phone calls, or keeping track of what your child ate), impact what type of foods your child ate?  
 Yes  
 No
18. Do you think your child ate more vegetables while in the study?  
 Yes  
 No

!