Protocol

# Increasing Fruit and Vegetable Consumption Among Preschool-Age Children and Their Families: Protocol for the Project V.E.G.G.I.E. Pilot/Feasibility Study

Anne-Charles Zimmer[1], MS; Jhada Sims[1], MS; Keith Brazendale[2], PhD; Amy R Mobley[1], RD, PhD; JeeWon Cheong[1†], PhD; Layton Reesor-Oyer[1], PhD

[1]Department of Health Education and Behavior, College of Health and Human Performance, University of Florida, Gainesville, FL, United States
[2]Department of Health Sciences, University of Central Florida, Orlando, FL, United States
[†]deceased

**Corresponding Author:**

Layton Reesor-Oyer, PhD
Department of Health Education and Behavior
College of Health and Human Performance, University of Florida
P.O. Box 118210
Gainesville, FL 32611
United States
Phone: 1 (352) 294-2712
Email: l.reesoroyer@ufl.edu

## Abstract

**Background:** Preschool-age children (2-5 y) living in households experiencing food insecurity are at a higher risk of facing health and behavioral issues, as well as consuming lower-quality diets with fewer fruits and vegetables (FVs). Repeated exposures are necessary for children to accept certain commonly rejected/disliked foods, but parents in households experiencing food insecurity may not purchase foods their child does not readily accept. Project V.E.G.G.I.E. (Vegetable Eating Gets Going by Increasing Exposure) aims to address this issue by providing families with FVs at no cost, alongside education on evidence-based parent-feeding practices tailored to the needs of preschool-aged children.

**Objective:** This study describes the protocol for the Project V.E.G.G.I.E. pilot/feasibility study.

**Methods:** The cluster nonrandomized controlled trial includes 20 dyads: parents and their preschool-age children. Families received 6 boxes of fresh FVs biweekly for 10 weeks, alongside educational materials on parent feeding practices. Parent surveys and daily diaries were completed at 3 time points: baseline, posttest (weeks 10-11), and follow-up (4 wk after intervention). Participants in the intervention group also completed an exit survey to assess the acceptability and utility of the FV boxes across several domains, including quantity, quality, and variety. Standard effect size estimates (Cohen *d*) will be calculated as baseline to posttest and baseline to follow-up analyses. Lastly, both control and intervention participants were invited to complete a qualitative interview to discuss satisfaction with the program.

**Results:** The Project V.E.G.G.I.E. program was funded internally by the Department of Health Education and Behavior at the University of Florida. Recruitment began in February 2025, and data collection took place from March to July 2025. Data cleaning is underway at the time of submission (February 2026); we expect to submit the outcome/feasibility manuscript in fall 2026.

**Conclusions:** The results of the Project V.E.G.G.I.E. study will be used to evaluate the feasibility and acceptability of this pilot intervention. Feedback will inform refinement of the Project V.E.G.G.I.E. intervention and study protocol prior to scaling up to a well-powered cluster randomized controlled trial. Implementing programs like Project V.E.G.G.I.E. that provide families with increased access to FVs at childcare settings may overcome barriers typically associated with FV initiatives. Providing families with both increased access to FVs and education on parent-feeding practices may be more effective at increasing FV consumption among preschoolers than either approach implemented independently.

**International Registered Report Identifier (IRRID):** DERR1-10.2196/93866

***JMIR Res Protoc 2026;15:e93866;*** doi: 10.2196/93866

**Keywords:** food insecurity; fruit and vegetable consumption; parent feeding practices; nonrandomized trial; child eating behaviors

# Introduction

## Background

Food insecurity (FI), the inability to acquire enough food to support a healthy, active lifestyle [1], is a major health concern in the United States [2]. Recent prevalence estimates indicate that 17.9% of households with children experienced FI at some point in 2023 [1]. This is problematic as FI is related to poor mental (depression [3], anxiety [4]) and physical (obesity [5], diabetes [6]) health outcomes among adults. Children living in households experiencing FI are at an increased risk of behavioral, academic, and socioemotional problems [7] as well as poor physical health [8]. Further, individuals experiencing FI report lower diet quality than those classified as food secure. Adults living in households experiencing FI consume fewer fruits and vegetables (FVs) [9] and a higher amount of energy-dense foods with added sugars and high-fat dairy products [10]. Children in these same households have similar dietary patterns, consuming diets high in calories, sugar, and fat [11] and low in FVs [12], compared to their food-secure peers.

Within the context of FI, nutrition security refers to the healthfulness or nutritional adequacy of available foods [13]. FV consumption is one aspect of nutrition security as it is known to be relevant for the prevention of chronic disease [14,15]. Disparities in FV consumption among those experiencing FI exist. Among children aged 1 to 5 years living in households experiencing FI, only 41% ate a daily vegetable and 54% ate a daily fruit compared with those living in food-secure households (53% vegetable; 70% fruit) [16].

An underexplored reason for disparities in FV consumption among this age group is the importance of repeated exposure to novel/disliked foods (such as vegetables). Repeated exposure is consistently identified as necessary for children to accept a variety of foods; children may need up to 15 exposures before they “like” a new food [17]. However, it is common for parents to only provide children with a novel food 3 to 5 times before determining that their child does not like it [18] and no longer offering it. Lack of repeated exposure to novel foods may be especially problematic for households experiencing FI because these families cannot afford to endure costs associated with wasted food [19]. As such, families experiencing FI may rely on highly palatable foods that they know their children will accept, leading to the disparities in FV consumption. The importance of repeated exposure to novel/disliked food is highly relevant for preschool-age (2-5 years old) children because this developmental period often coincides with an increase in food neophobia (fear of new foods) and picky eating. The onset of picky eating typically peaks around 2 years of age and persists until age 4 to 6 years [20,21], thus creating a vulnerable developmental period when parents may decrease offering foods their child is likely to reject [19].

Children are not only influenced by their parents’ feeding practices, but also the environment around them. Many families experiencing FI may send their children to home-based childcare settings as they are normally more affordable and flexible for parents [22]. These home-based childcare providers may be in smaller settings with fewer children, focusing on a family-like environment [22]. In these settings, children also lack exposure to new FVs as the families attending may not be able to afford that food waste in or out of the house.

One strategy to increase FV consumption among families experiencing FI is to provide them with access to FVs at no cost. Such support may enable parents to provide their preschool-age children with the repeated exposures necessary for them to learn to like and eat FVs. However, the efficacy of these initiatives is mixed [23,24]. One highly relevant study which provided discounted FVs detected changes in parents’ but not children’s diets [25], indicating that access alone may not be enough to influence children’s diets.

Many programs to increase FV access involve barriers to participation such as advanced purchasing/ordering and inconvenient pick-up times/locations [25]. We attempt to address this issue by delivering FVs to childcare providers, a convenient location for parents. Families can pick up their FVs when they pick up their child. Much of the literature leveraging childcare settings has focused on center-based care providers and failed to include home-based childcare settings [26]. However, many families with low resources may not work typical hours and use home-based childcare providers due to scheduling flexibility; they are the most common form of nonparental care for young children in the United States [27]. These providers have fewer resources than those in center-based childcare settings [27], making home-based childcare providers an ideal and underutilized location to provide resources to families with preschool-age children at risk of experiencing FI.

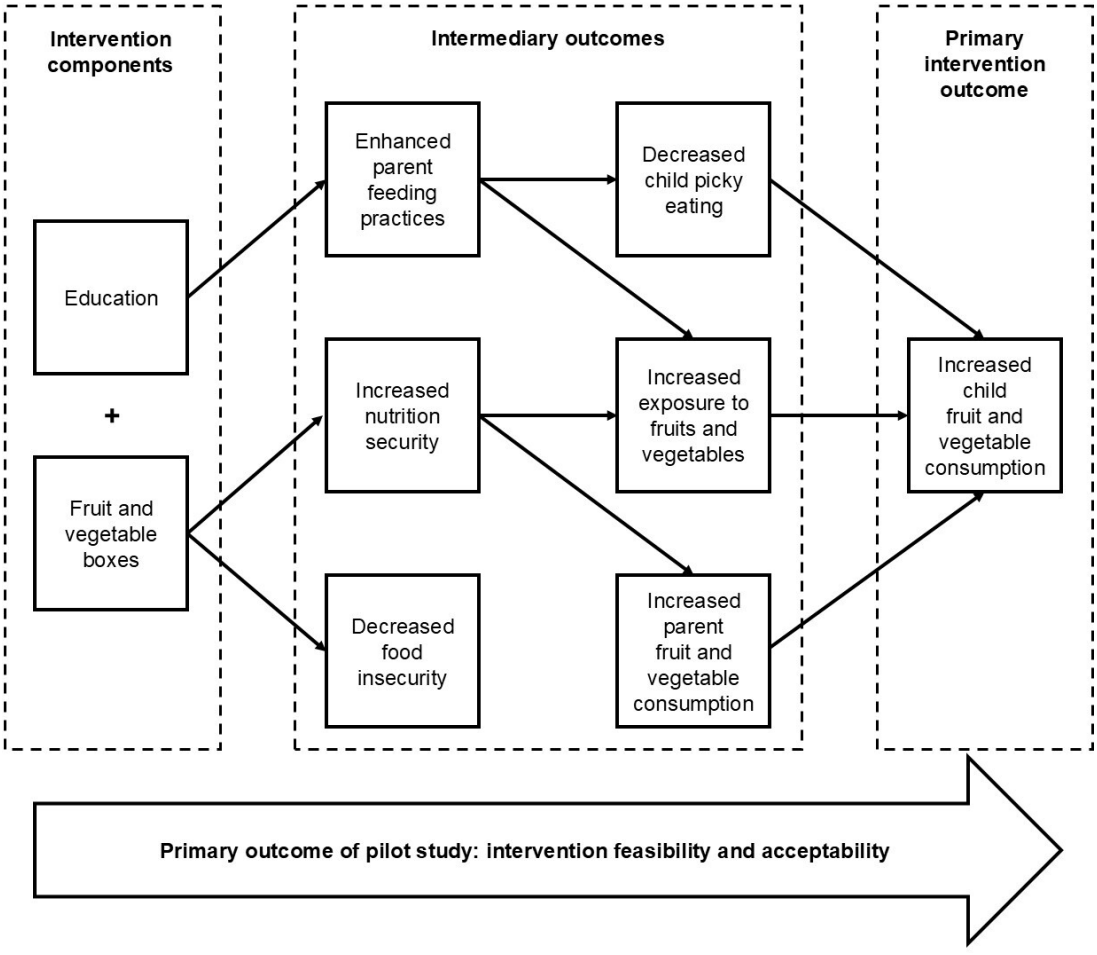
Providing parents with evidence-based strategies to improve their own feeding practices for their child(ren) alongside increased access to FVs may be necessary to impact children’s FV consumption. In line with the Family Systems Theory [28], educating parents on evidence-based parent feeding practices may enable them to endure children’s resistance when offered novel or disliked FVs and ultimately lead to greater child FV consumption. Parents are considered “nutritional gatekeepers” for their children because they have such an important influence on children’s diets. Parents determine not just what children eat, but also when, where, and how much food children eat [29]. Such education may be particularly relevant for families experiencing FI as FI may have detrimental impacts on parent feeding practices. Parents experiencing FI may restrict access to food when resources are scarce and pressure children to eat in the absence of hunger when food is available [30]. These practices disrupt children’s innate ability to self-regulate the amount they eat; they are related to problematic

eating behaviors and obesity [30]. The Satter Division of Responsibility in Feeding is considered the gold standard for evidence-based parent feeding practices. According to this framework, both the parent and child play important roles within a healthy eating environment [31]. Parents are responsible for what food is served as well as the timing and location of meals and snacks; the child is responsible for how much (and whether) they eat from the options provided by the parent [31]. Unfortunately, when a family deviates from these responsibilities (such as the child determining what is served, or the parent determining how much the child must eat), unhealthy child eating behaviors, like picky eating, may occur [31]. In addition to the distinct roles of both parent and child, the Satter Division of Responsibility in Feeding recommends the following strategies to promote a healthy diet for children: repeated exposure to novel/rejected foods, structured meals and snacks with consistent rules/routines, and the importance of parental modeling of desired eating behaviors (eg, FV consumption) [31]. When these strategies are consistently implemented, child food preferences and consumption can be improved. However, families with low resources, such as those experiencing FI, may struggle to implement such education without additional material support. Therefore, to increase FV consumption, it is necessary to provide families with preschool-age children experiencing FI with both education on evidence-based parent feeding practices as well as additional access to FVs.

## Objective

The primary objective of Project V.E.G.G.I.E. (Vegetable Eating Gets Going by Increasing Exposure) is to increase FV consumption among preschool-age children and their families at risk of experiencing FI. To achieve these goals, we propose providing families with increased access to FVs alongside education on evidence-based parent feeding practices (based on the Satter Division of Responsibility in Feeding). The goal of this study is to determine the feasibility and acceptability of the study protocol. Preliminary data will inform the format and contents of future iterations of the Project V.E.G.G.I.E. intervention as well as demonstrate feasibility, acceptability, and a preliminary signal of program efficacy. Figure 1 depicts the Project V.E.G.G.I.E. conceptual model and intervention targets.

**Figure 1.** Conceptual model of Project V.E.G.G.I.E. (Vegetable Eating Gets Going by Increasing Exposure) intervention.



# Methods

## Design Overview

The Project V.E.G.G.I.E. Pilot/Feasibility Study was a cluster nonrandomized controlled trial (non-RCT). We originally planned for it to be a proof-of-concept study where all participants received the intervention. However, due to changes in the federal administration and potential changes in policy due to Department of Government Efficiency cuts [32], a control group was added to account for potential confounding variables (eg, potential cuts to social safety net programs such as the Supplemental Nutrition Assistance Program, the Special Supplemental Nutrition Program for Women, Infants, and Children, and childcare subsidies). Participants in both conditions completed assessments at 3 time points: baseline (prior to the start of the program), posttest (weeks 10-11), and follow-up (4 weeks after the final box delivery). See Table 1 for the assessment schedule.

**Table 1.** Timeline of assessments and intervention activities.

| | Project V.E.G.G.I.E.[a] | Control |
|---|---|---|
| Assessment/activity | Week(s) of | Week(s) of |
| Recruitment | February 17, 2025, to March 3, 2025 | March 3, 2025, to March 10, 2025 |
| Baseline parent survey | February 24, 2025 | March 10, 2025 |
| Baseline daily diaries | February 24, 2025 | March 24, 2025 |
| Intervention (boxes delivered) | March 3, 2025, to May 5, 2025 | N/A[b] |
| Posttest parent survey | May 5, 2025 | May 5, 2025 |
| Posttest daily diaries | May 5, 2025 | May 5, 2025 |
| Exit survey | May 5, 2025 | N/A |
| Exit interviews | May 12, 2025, to June 16, 2025 | July 7, 2025 |
| No contact follow-up period | May 19, 2025, to May 26, 2025 | May 19, 2025, to May 26, 2025 |
| Follow-up parent survey | June 2, 2025 | June 2, 2025 |
| Follow-up daily diaries | June 2, 2025 | June 2, 2025 |

[a]V.E.G.G.I.E.: Vegetable Eating Gets Going by Increasing Exposure.
[b]N/A: not applicable.

## Ethical Considerations

The study protocol was approved by the institutional review board of the University of Florida (study ID: IRB202401344).

## Participants

### Recruitment of Childcare Providers

Parents and their preschool-age children were recruited from childcare providers (N=5) located in Orange County, Florida, in February/March 2025. The research team partnered with the Early Learning Coalition of Orange County (ELCOC) to identify partner childcare providers. The ELCOC's mission is to provide all children in the Orlando area with fair access to quality learning environments. Childcare providers in the ELCOC network are Supplemental Nutrition Assistance Program eligible and accept childcare vouchers. ELCOC staff invited childcare providers they had successfully collaborated with on previous initiatives (eg, art programs) to participate in Project V.E.G.G.I.E. All contacted childcare providers agreed to participate in the research study (n=5, 100%). Originally, 3 childcare providers (n=2 home-based; n=1 center-based) were contacted to participate in the Project V.E.G.G.I.E. Pilot/Feasibility Study, with all participants receiving the program (proof-of-concept study). An additional 2 home-based childcare providers were later invited to serve as control sites due to concerns that potential changes in federal policy could impact key intervention outcomes (eg, food/nutrition security). Because of this, recruitment of control participants and their baseline assessments occurred a few weeks later. Interested individuals were informed of group allocation during informed consent.

### Recruitment of Participants

Partner childcare providers shared the opportunity to participate in the research study with families enrolled at their site via study flyers (hard copies) featuring a QR code that linked to the informational website, which included informed consent documents and an online screener. Additionally, childcare providers directly shared the link to the study website via their normal communication methods (apps). The recruitment process for the control and intervention participants was identical; both groups were informed of their group allocation (intervention vs control) based on their childcare provider during the online informed consent process. Participants were informed of their eligibility/enrollment status and next steps by the research team (not the childcare providers) via text message.

### Eligibility

Eligibility criteria for primary caregivers included being at least 18 years of age and the primary caregiver (at least 50% custody) of a 2- to 5-year-old child enrolled at a childcare provider participating in the research study. Primary caregivers had to be able and willing to complete surveys in either English or Spanish with smartphone access (to complete study assessments). Exclusion criteria for primary caregivers included not having a child within the target age

range (eg, <2 or >5 years old) and having a child with a medical condition that significantly impacts their diet (parent reported).

## Procedures

### Study Timeline and Data Collection Overview

Parents completed assessments at 3 time points: baseline (prior to the start of the program), posttest (weeks 10-11), and follow-up (4 wk after the end of the program). Parent surveys and daily diaries were distributed via text message with personalized links and completed by parents on their smartphones.

### Intervention

The intervention group received the Project V.E.G.G.I.E. program, which included 6 boxes with 10 to 14 pounds of culturally familiar FVs biweekly delivered to their childcare provider for 10 weeks. Due to the university spring break schedule and corresponding lack of availability of undergraduate research assistants, 2 FV boxes were delivered in 2 consecutive weeks. During this time, parents also received education on evidence-based parent feeding practices.

### FV Boxes

We partnered with Second Harvest Food Bank of Orange County to provide the FV boxes using their existing infrastructure. Undergraduate research assistants collected the FV boxes from Second Harvest and delivered them to the childcare providers. Research assistants remained at the childcare providers to facilitate distribution and collect process evaluation data (eg, number of boxes distributed). To reduce stigmatization, all families enrolled at intervention childcare providers received an FV box during each distribution, regardless of study enrollment or eligibility.

### Educational Materials

#### Parent

Educational materials were provided in both English and Spanish. They focused on evidence-based parent feeding practices and included strategies to increase children's FV consumption tailored to the unique needs of preschool-age children based on the Satter Division of Responsibility in Feeding [31]. Educational materials covered the following topics: normalizing child eating behaviors that are often frustrating for parents (such as inconsistent eating volume, refusing previously liked foods, and preferring snacks over meals), the importance of repeated exposure to FVs and role modeling, not pressuring children to eat certain foods, the distinct roles of parents and children at mealtimes (according to the Satter Division of Responsibility in Feeding), and noneating exposure to foods such as getting their child involved in food preparation. Based on findings from a needs assessment, education was delivered through print materials included with the FV boxes, as well as text messages (infographics) sent to parents' smartphones.

#### Child

As an additional method of exposure [33], children also received print materials with activities and simple information about FVs. Children's materials included topics like how various fruits and vegetables grow (carrots in the ground, apples in trees) and what animals eat vegetables, as well as a checklist to mark what FVs they received in their box that week. Children's materials were not a primary intervention target; they were added to the research study because they were specifically requested by the ELCOC.

### Control/Comparison Group

Participants in the control group completed the same study assessments (eg, parent surveys and daily diaries) as the intervention group. However, they did not receive any intervention materials until after the follow-up assessments were completed. Families in the control group received one FV box and all educational materials delivered at once via hard copies in early July 2025.

## Assessments

### Parent Surveys

The parent survey assessed the following domains: parent and child diet [34], FI [35,36], nutrition security [13,37], parent feeding practices [38], child eating behaviors [39,40], as well as contextual factors that may influence the main outcomes of interest. These included parent mental health [41], parenting stress [42], household disorganization [43,44], parenting skills [45], competence [46], and satisfaction [47]. All survey measures are described in Table 2. On average, participants completed the parent survey in 36.35 (SD 16.74) minutes. This information was extracted from Qualtrics survey metadata, which includes duration in seconds. Parents were texted up to 3 reminders to complete their parent survey at each time point.

**Table 2.** Parent survey measures.

| Domain and measure | Items, n |
|---|---|
| Child and parent diet | |
| National Cancer Institute's Dietary Screener Questionnaire [34] | 54 |
| Food and nutrition security | |
| United States Department of Agriculture Household Food Security Survey Module [35] | 22 |
| Nutrition Security, Healthfulness Choice, Dietary Choice [13] | 26 |
| The Other 3 Pillars: Availability, Utilization, Stability [37] | 16 |

| Domain and measure | Items, n |
|---|---|
| Home Availability of Fruits and Vegetables Scale [48] | 6 |
| Parent feeding practices | |
| Child Feeding Questionnaire [38] | 18 |
| Child eating behaviors | |
| The Children's Eating Behavior Questionnaire [39,40] | 35 |
| Child Food Preference Checklist [48] | 58 |
| Contextual factors | |
| Demographics | 4 |
| Parent Sense of Competency Scale [46] | 17 |
| Parenting and Family Adjustment Scale [45] | 9 |
| Confusion, Hubbub, and Order Scale [43,44] | 15 |
| Center for Epidemiologic Studies Short Depression Scale [41] | 10 |
| The Parental Stress Scale [42] | 17 |
| Kansas Parental Satisfaction Scale [47] | 3 |
| Rules and routines [49,50] | 5 |

## Daily Diaries

At each time point, parents completed electronic daily diaries for a 7-day period to assess relevant day-level behaviors/contextual factors. Using modified/abbreviated versions of the cited scales, parents reported on day-level parent and child diet [48], access to food [51], parent feeding practices [38], and child eating behaviors [39,40]. Daily diary items and survey flow are included in Table 3. Each daily diary took parents an average of 5.33 (SD 2.93) minutes to complete (survey duration included in Qualtrics metadata). Automated text messages were sent at 8 PM with a personalized link specific to that day as a reminder to complete the daily diary. Daily diaries expired after 24 hours so that parents were only able to complete one daily diary per day. Parents who completed at least 5/7 daily diaries were considered compliant with the study protocol. Up to an additional 7 days of daily diaries were sent to participants who requested additional survey opportunities.

**Table 3.** Daily diary items and survey flow.

| Variable domain and survey item | Response options and logical flow |
|---|---|
| Child fruit and vegetable consumption | |
| Did you serve your child a fruit or vegetable today? | • Yes<br>◦ Continue with fruit and vegetable consumption questions<br>• No<br>◦ Skip to parent feeding practices questions |
| What fruit or vegetable did you serve your child? | Free response |
| How much _____ did your child eat? | • None<br>• Taste<br>• A little<br>• Some<br>• A lot |
| Did your child like _____? | • Disliked a lot<br>• Disliked a little<br>• Neither disliked nor liked<br>• Liked a little<br>• Liked a lot |
| Did you serve your child another fruit or vegetable today? | • Yes<br>◦ Repeat fruit and vegetable consumption questions<br>• No<br>◦ Skip to parent feeding practices questions<br>Participants were shown this question up to 2 times. |
| Parent feeding practices [38] | |
| Today, I offered my child their favorite foods as a reward for good behavior. | • Disagree<br>• Slightly disagree |

| Variable domain and survey item | Response options and logical flow |
|---|---|
| | • Neither agree nor disagree<br>• Slightly agree<br>• Agree |
| Today, I made sure that my child did not eat too many unhealthy foods. | |
| | • Disagree<br>• Slightly disagree<br>• Neither agree nor disagree<br>• Slightly agree<br>• Agree |
| Today, I tried to get my child to eat when they were hungry. | |
| | • Disagree<br>• Slightly disagree<br>• Neither agree nor disagree<br>• Slightly agree<br>• Agree |
| Food security status [35] | |
| Today, I worried whether our food would run out before we got money to buy more. | • Not true<br>• Somewhat true<br>• True<br>• Don’t know |
| Today, the food we bought just did not last and we did not have money to get more. | • Not true<br>• Somewhat true<br>• True<br>• Don’t know |
| Parent affect | |
| How .... did you feel today? [52]<br>• frustrated/angry<br>• sad/depressed<br>• stressed [53]<br>• happy<br>• calm/relaxed | • Not at all<br>• Slightly<br>• Somewhat<br>• Moderately<br>• Extremely |
| How certain do you feel you can deal with all things that you have to do right now? [54] | • Not at all<br>• Slightly<br>• Somewhat<br>• Moderately<br>• Extremely |
| Sleep quality | |
| How would you rate your sleep quality last night? [55] | • Terrible<br>• Poor<br>• Average<br>• Good<br>• Excellent |
| How would you rate your child’s sleep quality last night? [56] | • Terrible<br>• Poor<br>• Average<br>• Good<br>• Excellent |
| Parent sleep routines [57] | |
| What time did you go to bed last night? | Dropdown with time choices in 30-min increments from 7 PM to 8:30 AM<br>• None of these options are close to my bedtime.<br>◦ Fill in the blank with appropriate time. |

| Variable domain and survey item | Response options and logical flow |
|---|---|
| What time did you wake up this morning? | Dropdown with time choices in 30-minute increments from 5 AM to noon<br>• None of these options are close to my wake time.<br>◦ Fill in the blank with appropriate time. |
| Child sleep routines [57] | |
| What time did your child go to bed last night? | Dropdown with time choices in 30-minute increments from 5 PM to 5:30 AM<br>• None of these options are close to my child's bedtime.<br>◦ Fill in the blank with appropriate time. |
| What time did your child wake up this morning? | Dropdown with time choices in 30-min increments from 5 AM to noon<br>• None of these options are close to my child's wake time.<br>◦ Fill in the blank with appropriate time. |
| Child nap [57] | |
| Did your child take a nap today? | • Yes<br>• No<br>◦ Skip to rules and routines |
| What time did your child fall asleep for their first nap? | Dropdown with time choices in 30-min increments from 9 AM to 5 PM |
| What time did your child wake up from their first nap? | • None of these options are close to when my child fell asleep for their nap.<br>◦ Fill in the blank with appropriate time. |
| Did your child take another nap today? | • Yes<br>• No<br>Participants were shown these questions up to two times. |
| Rules and routines [58] | |
| How much did you stick to your usual routines and rules for your child's .... today?<br>• bedtime<br>• screen time | • Not at all<br>• Slightly<br>• Somewhat<br>• Mostly<br>• Completely |
| Time with child [59] | |
| Since waking up this morning, how many hours have you spent with your child in the same location? | Dropdown with time choices in one-hour increments from less than 1 hour to 10 hours or more. |
| Daycare [58] | |
| How many hours did your child attend preschool/daycare today? | Dropdown with time choices in two-hour increments from not attending childcare today to attending for more than 12 hours. |
| Illness [58] | |
| Were you sick today? | • Yes<br>• No |
| Was your child sick today? | • Yes<br>• No |
| Child food and beverage consumption [60] | |
| Did your child consume ... today?<br>• low-fat or nonfat potato chips, tortilla chips, puffs, or corn chips<br>• regular potato chips, tortilla chips, puffs, or corn chips<br>• other salty snacks such as cheese nibs, Chex Mix, or Ritz Bitz<br>• any candy, including chocolate, Jelly Bellies, gummies, or life savers<br>• any doughnuts, Pop Tarts, or breakfast pastries<br>• any cookies, brownies, pies, or cakes<br>• low-fat or nonfat desserts such as low-fat ice cream or frozen yogurt<br>• any regular ice cream or milkshakes<br>• orange juice, apple juice, or any other 100% juice drink<br>• fruit drinks such as Snapple, Capri-Sun, or Kool-Aid<br>• sports drinks such as Gatorade or Powerade | • Yes<br>• No |

| Variable domain and survey item | Response options and logical flow |
|---|---|
| • flavored waters such as Propel or vitamin-fortified waters<br>• diet soda or pop<br>• regular soda or pop<br>• any energy drinks such as Rockstar, Red Bull, Monster, or Throttle<br>• 1% or skim (nonfat) milk<br>• regular (whole) or 2% (reduced fat) milk<br>• any vegetables, including green salad, peas, green beans, or corn (not including fried potatoes or French fries)<br>• any fruit such as banana, apples, or grapes (do not include juice) | |
| Free response feedback | |
| Is there anything else you would like to tell us about your day? | Free response |

## Exit Survey

The exit survey was embedded in the posttest parent survey for those who received the Project V.E.G.G.I.E. intervention. It was designed to assess acceptability and utility of the FV boxes and educational materials via the following domains: quantity, variety, quality, consumption, waste, familiarity, enjoyment, helpfulness, and program impacts. See Table 4 for exit survey measures and questions.

**Table 4.** Exit survey measures [61].

| Domain | Variable | Response options |
|---|---|---|
| Satisfaction | How satisfied were you with the ...<br>amount of fruits in your boxes?<br>amount of vegetables in your boxes?<br>variety of fruits and vegetables in your boxes?<br>quality of fruits and vegetables in your boxes? | • Very dissatisfied<br>• Dissatisfied<br>• Neither satisfied nor dissatisfied<br>• Satisfied<br>• Very satisfied |
| Consumption | How much of the fruits and vegetables from your boxes were eaten by ...<br>adults in your home?<br>children in your home?<br>people who do not live in your home? | • None<br>• A little<br>• Some<br>• A lot<br>• Most |
| Waste | How much of the fruits and vegetables from your boxes were not eaten by anyone? | • None<br>• A little<br>• Some<br>• A lot<br>• Most |
| Familiarity | How familiar were you with the items in your fruit and veggie boxes? | • Very familiar<br>• Moderately familiar<br>• Somewhat familiar<br>• Slightly familiar<br>• Not at all familiar |
| Enjoyment | How much did your family like the items in your fruit and veggie boxes? | • Strongly like<br>• Like<br>• Neither like nor dislike<br>• Dislike<br>• Strongly dislike |
| Helpful | How helpful were the boxes for feeding your family? | • Very helpful<br>• Moderately helpful<br>• Somewhat helpful<br>• Slightly helpful<br>• Not at all helpful |
| Education utility | How useful was the advice included with your fruit and veggie boxes? | • Very useful<br>• Moderately useful<br>• Somewhat useful<br>• Slightly useful<br>• Not at all useful |

| Domain | Variable | Response options |
|---|---|---|
| Education acceptability | How much did you like the advice included with your fruit and veggie, boxes? | • Strongly like<br>• Like<br>• Neither like nor dislike<br>• Dislike<br>• Strongly dislike |
| Impact on adult consumption | Did the boxes allow you to eat more fruits and vegetables? | • Not at all<br>• A little<br>• Some<br>• More<br>• Many more |
| Impact on child consumption | Did the boxes allow your child to eat more fruits and vegetables? | • Not at all<br>• A little<br>• Some<br>• More<br>• Many more |
| Impact on purchasing | While receiving the boxes, how has your purchasing of fruits and vegetables changed? | • Decreased a lot<br>• Decreased somewhat<br>• Stayed the same<br>• Increased somewhat<br>• Increased a lot |
| Recommendation | Would you recommend this program to others with preschool-age children? | • Definitely not<br>• Probably not<br>• Maybe<br>• Probably yes<br>• Definitely yes |
| Free response feedback | Is there anything else you would like to tell us about the Project V.E.G.G.I.E.[a] program? | Free response |

[a]V.E.G.G.I.E.: Vegetable Eating Gets Going by Increasing Exposure.

## Exit Interviews

Both intervention and control participants were invited via text message to complete exit interviews about their experience with the study. Exit interviews were conducted in the participant's preferred language (either English or Spanish) over the phone using a semistructured interview guide. Interviews took approximately 30 minutes, and questions assessed participants' satisfaction with the Project V.E.G.G.I.E. program, including the ease of picking up the FV boxes at the childcare centers, the topics covered in the educational materials, as well as the quality and quantity of produce in the boxes. Participants in the control group were asked questions about their satisfaction with the study protocol and their one box of FVs. The semistructured interview guides for both groups are included as Multimedia Appendices 1 and 2. All exit interviews were recorded and transcribed using Otter.ai, an online transcription software. Transcriptions were imported into NVivo (version 15.3; Lumivero) software for data analysis, conducted by trained research assistants using an immersion crystallization approach (inductive) and constant comparison methodology.

## Compensation

Parents received up to US $175 in Amazon e-gift card codes via text message. Gift card codes were distributed after completion of each assessment. Table 5 presents participant compensation by assessment and time point.

**Table 5.** Participant compensation by assessment and time point[a].

| Time point and assessment | Compensation |
|---|---|
| Baseline | |
| Parent survey | US $25 |
| Daily diaries | US $25 |
| Posttest | |
| Parent survey | US $25 |
| Daily diaries | US $25 |
| Exit interviews: intervention group | US $25 |
| Follow-up | |

| Time point and assessment | Compensation |
|---|---|
| Parent survey | US $25 |
| Daily diaries | US $25 |
| Exit interviews: control group | US $25 |

[a]Participants received US $25 for completing each assessment at each time point for a total of US $175 in Amazon e-gift card codes.

## Statistical Analysis

### Feasibility

Descriptive statistics of the feasibility outcomes will be presented as: recruitment (number of families who complete the screener), enrollment rate (proportion of families enrolled relative to the number of eligible families), retention rate (proportion of families who remain in the study across time points relative to the total number of participants), and adherence to the study protocol/missing data (proportion of parent surveys and daily diaries completed at each time point). We will evaluate intervention fidelity as delivery of FV boxes and educational materials. Delivery of FV boxes and printed educational materials will be directly assessed by onsite undergraduate research assistants. Educational materials sent via text message will be documented by a trained graduate research assistant. Participant barriers and facilitators to receiving the intervention (FV boxes; education) will be included in the exit interviews. In line with previous pilot/feasibility studies among similar populations (families with low resources), the protocol and intervention will be deemed feasible if enrollment, retention, and protocol compliance rates of at least 70% are achieved [58,61-64].

### Acceptability

The proportion of participants who indicate they are satisfied with each facet of the program will be reported; the program will be considered acceptable to families if at least 70% of participants indicate they are satisfied/very satisfied across measures.

### Progression Criteria

Progression to larger-scale trials will be determined jointly with community partners based on feasibility and acceptability metrics. It is expected that the intervention will be refined and the protocol modified prior to future iterations of the Project V.E.G.G.I.E. study in order to enhance recruitment, retention, acceptability, and intervention fidelity.

### Efficacy

To assess an initial signal of program efficacy, we will assess whether those who received the intervention changed differently than those in the control group over time (time-by-treatment interaction). We will conduct a series of mixed-effects models, accounting for the nesting of repeated measures within participants with one analysis per outcome of interest: diet, FI, nutrition security, parent feeding practices, and child eating behaviors. Full information maximum likelihood estimation will be used to account for missing data and allow all available data to be included in the models. Standard effect size estimates (Cohen *d*) will be calculated as baseline to posttest and baseline to follow-up. Results will be interpreted with caution due to small sample size and limited statistical power. Due to the small number of childcare providers (n=5), analyses will not account for nesting of participants within sites. Demographic characteristics will be presented separately for those in the treatment and control conditions, and differences will be evaluated (independent samples *t* tests). We will consider and discuss detected differences between groups and their potential impacts on study outcomes. Analyses will be conducted in Stata 18.0 statistical software (StataCorp LLC).

## Sample Size

This pilot/feasibility study consisted of a sample size of 20 participants recruited from 5 childcare providers. This sample size is sufficient to provide an initial signal of the feasibility and acceptability of the Project V.E.G.G.I.E. intervention [65]. A well-powered RCT is needed to evaluate study outcomes; as such, a power analysis was not necessary for this pilot/feasibility nonrandomized trial.

# Results

The Project V.E.G.G.I.E. Pilot/Feasibility Study was internally funded by the Department of Health Education and Behavior in the College of Health and Human Performance at the University of Florida. Recruitment of participants (n=20) began in February and ended in March 2025. The study protocol and data collection took place from March to July 2025. Data cleaning and analyses are underway (January 2026), and the outcome paper for this pilot/feasibility study is expected to be submitted for publication in fall 2026.

# Discussion

## Overview

Ultimately, Project V.E.G.G.I.E. aims to increase FV consumption among preschool-age children and their families at risk of experiencing FI through enhanced nutrition security (increased FV access) and education tailored to the needs of parents of preschoolers. The underlying premise of Project V.E.G.G.I.E. is that children from families at risk of experiencing FI lack the necessary exposure to FVs, an unexplored factor contributing to inadequate FV consumption. Our study protocol overcomes the weaknesses of previous interventions using increased FV access. Programs that provide individuals with reduced- or no-cost FVs often involve many challenges, such as advanced purchasing/ordering and inconvenient pick-up times/locations. We aim to

create a more convenient program by delivering FVs to childcare providers, an ideal time and location for parents of preschool-age children, thus increasing program uptake and use. In addition to increased access, we provided parents with educational materials focused on evidence-based parent feeding practices aimed at increasing child FV consumption. By targeting both FV access and parent feeding practices, we hypothesize that Project V.E.G.G.I.E. will result in improved program acceptability, treatment fidelity, and ultimately a more efficacious approach to increasing FV consumption among preschool-age children at risk of experiencing FI.

## Strengths and Limitations

A key strength of this research study is the capable and experienced community partners who assisted with participant recruitment and intervention implementation: ELCOC and Second Harvest Food Bank of Central Florida. By leveraging the existing ELCOC network of childcare providers serving families with low resources, we were able to connect with 5 childcare providers eager to be involved with the pilot/feasibility study, as demonstrated by our 100% recruitment rate. Their large network (632 childcare centers and 31,761 children) [66] will enable us to recruit additional sites/participants for future iterations of the Project V.E.G.G.I.E. intervention.

The Second Harvest Food Bank of Central Florida is a private, nonprofit organization that has served the community for over 40 years. They collect, store, and distribute food to more than 750 feeding partners in seven Central Florida counties. In 2024, they distributed enough food for 82 million meals to partner programs [67]. Their "Bring Hope Home" initiative delivers boxes of food (including fresh FVs) to the homes of senior citizens and individuals with disabilities [68,69]. As such, Second Harvest was able to leverage this existing infrastructure to build the FV boxes for Project V.E.G.G.I.E. They have the resources and expertise to support Project V.E.G.G.I.E. as we scale up to a well-powered cluster RCT and provide support to additional families throughout central Florida.

This study is not without limitations. As a pilot/feasibility study, we are not adequately powered to evaluate intervention impacts or account for clustering within childcare providers. As such, between-group differences may be due to differences at the site level that cannot be disentangled from the intervention effects, limiting our ability to determine causation. A well-powered cluster RCT is necessary to evaluate the efficacy of the Project V.E.G.G.I.E. intervention. Because the intervention is implemented at childcare providers, it is necessary for all participants enrolled at a given site to receive the same treatment. This study design reduces the risk of contamination and is essential for our community partners. It would be unethical to supply food to only some families while withholding it from others who witness its distribution.

Our sample (n=5 childcare providers; n=20 parent/child dyads) recruited from Orange County, Florida, is not generalizable to the entire population of US families at risk of experiencing FI. However, there are a number of reasons why Central Florida is an ideal location to conduct this work. Orange County, Florida, is racially/ethnically diverse, with approximately 37% of the population categorized as Non-Hispanic White, 19% Non-Hispanic Black, and 33% Hispanic [70]. In 2023, 23% of residents were foreign born [70], and 13% of residents and 15% of residents with children were classified as below the Federal Poverty Line, slightly higher than the national average [70]. Further, although the Orlando area is classified as urban/suburban, the county also includes "Rural Residential Enclaves," single-family neighborhoods with low residential densities similar to rural settings. Thus, this location will enable future Project V.E.G.G.I.E. studies to assess intervention efficacy and unique barriers/facilitators across varying levels of urbanicity/rurality.

As previously mentioned, the control group was not initially included in the study. It was added later due to potential changes in federal policy that could impact the target population. Because of this late addition, recruitment and baseline dates differed for the intervention and control, resulting in potential site-selection bias and temporal confounding.

Due to limited funding, this pilot/feasibility study relies on self/parent-report to evaluate all outcomes of interest, including diet, food and nutrition security, parent feeding practices, and child eating behaviors. Although there is error inherent in self/parent-reported measures, we attempt to improve data quality by collecting day-level data (improved recall) and using validated measures. In the future, we hope to address these weaknesses by conducting a well-powered cluster RCT that includes an objective measure of FV consumption (eg, VeggieMeter) [71-73].

## Conclusions

This study will provide insight into the feasibility and acceptability of the intervention and study protocol. Feedback from participants will enable us to refine the Project V.E.G.G.I.E. intervention prior to scaling up to a well-powered cluster RCT. Ultimately, policy and research implications of this work include facilitating programs that provide families with preschool-age children with increased access to FVs, as well as education around evidence-based parent feeding practices. Integrating such programs into childcare settings may overcome barriers typically associated with initiatives to increase FV access.

### Acknowledgments

The authors would like to thank the families who participated, as well as our partners at the Early Learning Coalition of Orange County, Second Harvest Food Bank, and the childcare providers who made this program possible. We would like to honor our dear colleague, Dr. JeeWon Cheong who passed away prior to the publication of this article. We are grateful for her

mentorship, expertise, and substantial contributions to this work. She is greatly missed. The authors attest that they did not use generative AI technology in the generation of text, figures, or other informational content of this manuscript.

## Funding

This research was supported by the principal investigator's startup package provided by the Department of Health Education and Behavior in the College of Health and Human Performance at the University of Florida. The principal investigator is supported by the National Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health under Award Number L40DK137281. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

## Conflict of interest.

None declared.

## Multimedia Appendix 1

Exit interview guide for intervention participants.
[DOCX File (Microsoft Word File), 62 KB-Multimedia Appendix 1]

## Multimedia Appendix 2

Exit interview guide for control participants.
[DOCX File (Microsoft Word File), 66 KB-Multimedia Appendix 2]

## References

1. Rabbitt MP, Hales LJ, Reed-Hones M. Food security in the US - key statistics & graphics. Economic Research Service (ERS), US Department of Agriculture (USDA). 2026. URL: https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/key-statistics-graphics [Accessed 2026-09-10]
2. Notice of special interest (NOSI): stimulating research to understand and address hunger, food and nutrition insecurity. US Department of Health and Human Services (HHS), National Institutes of Health (NIH). 2022. URL: https://grants.nih.gov/grants/guide/notice-files/NOT-OD-22-135.html [Accessed 2026-09-10]
3. Reesor-Oyer L, Cepni AB, Lee CY, Zhao X, Hernandez DC. Disentangling food insecurity and maternal depression: which comes first? Public Health Nutr. Nov 2021;24(16):5506-5513. [doi: 10.1017/S1368980021000434] [Medline: 33517950]
4. Whitaker RC, Phillips SM, Orzol SM. Food insecurity and the risks of depression and anxiety in mothers and behavior problems in their preschool-aged children. Pediatrics. Sep 2006;118(3):e859-68. [doi: 10.1542/peds.2006-0239] [Medline: 16950971]
5. Martin KS, Ferris AM. Food insecurity and gender are risk factors for obesity. J Nutr Educ Behav. 2007;39(1):31-36. [doi: 10.1016/j.jneb.2006.08.021] [Medline: 17276325]
6. Seligman HK, Bindman AB, Vittinghoff E, Kanaya AM, Kushel MB. Food insecurity is associated with diabetes mellitus: results from the National Health Examination and Nutrition Examination Survey (NHANES) 1999-2002. J Gen Intern Med. Jul 2007;22(7):1018-1023. [doi: 10.1007/s11606-007-0192-6] [Medline: 17436030]
7. Perez-Escamilla R, Pinheiro de Toledo Vianna R. Food insecurity and the behavioral and intellectual development of children: a review of the evidence. J Appl Res Child Inform Policy Child Risk. 2012;3(1):9. [doi: 10.58464/2155-5834.1071]
8. Thomas MMC, Miller DP, Morrissey TW. Food insecurity and child health. Pediatrics. Oct 2019;144(4):e20190397. [doi: 10.1542/peds.2019-0397] [Medline: 31501236]
9. Ranjit N, Macias S, Hoelscher D. Factors related to poor diet quality in food insecure populations. Transl Behav Med. Dec 31, 2020;10(6):1297-1305. [doi: 10.1093/tbm/ibaa028] [Medline: 33421089]
10. Leung CW, Epel ES, Ritchie LD, Crawford PB, Laraia BA. Food insecurity is inversely associated with diet quality of lower-income adults. J Acad Nutr Diet. Dec 2014;114(12):1943-1953.e2. [doi: 10.1016/j.jand.2014.06.353] [Medline: 25091796]
11. Fram MS, Ritchie LD, Rosen N, Frongillo EA. Child experience of food insecurity is associated with child diet and physical activity. J Nutr. Mar 2015;145(3):499-504. [doi: 10.3945/jn.114.194365] [Medline: 25733465]
12. Canter KS, Roberts MC, Davis AM. The role of health behaviors and food insecurity in predicting fruit and vegetable intake in low-income children. Children's Health Care. Apr 3, 2017;46(2):131-150. [doi: 10.1080/02739615.2015.1124772]
13. Calloway EE, Carpenter LR, Gargano T, Sharp JL, Yaroch AL. Development of new measures to assess household nutrition security, and choice in dietary characteristics. Appetite. Dec 1, 2022;179:106288. [doi: 10.1016/j.appet.2022.106288] [Medline: 36049571]

14. Boeing H, Bechthold A, Bub A, et al. Critical review: vegetables and fruit in the prevention of chronic diseases. Eur J Nutr. Sep 2012;51(6):637-663. [doi: 10.1007/s00394-012-0380-y] [Medline: 22684631]
15. Wang X, Ouyang Y, Liu J, et al. Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies. BMJ. Jul 29, 2014;349:g4490. [doi: 10.1136/bmj.g4490] [Medline: 25073782]
16. Hamner HC, Dooyema CA, Blanck HM, et al. Fruit, vegetable, and sugar-sweetened beverage intake among young children, by state—United States, 2021. MMWR Morb Mortal Wkly Rep. Feb 17, 2023;72(7):165-170. [doi: 10.15585/mmwr.mm7207a1] [Medline: 36795611]
17. Sullivan SA, Birch LL. Pass the sugar, pass the salt: experience dictates preference. Dev Psychol. 1990;26(4):546-551. [doi: 10.1037/0012-1649.26.4.546]
18. Carruth BR, Ziegler PJ, Gordon A, Barr SI. Prevalence of picky eaters among infants and toddlers and their caregivers' decisions about offering a new food. J Am Diet Assoc. Jan 2004;104(1 Suppl 1):s57-64. [doi: 10.1016/j.jada.2003.10.024] [Medline: 14702019]
19. Daniel C. Economic constraints on taste formation and the true cost of healthy eating. Soc Sci Med. Jan 2016;148:34-41. [doi: 10.1016/j.socscimed.2015.11.025] [Medline: 26650928]
20. Addessi E, Galloway AT, Visalberghi E, Birch LL. Specific social influences on the acceptance of novel foods in 2-5-year-old children. Appetite. Dec 2005;45(3):264-271. [doi: 10.1016/j.appet.2005.07.007] [Medline: 16239048]
21. Cashdan E. A sensitive period for learning about food. Hum Nat. Sep 1994;5(3):279-291. [doi: 10.1007/BF02692155] [Medline: 24214627]
22. Family child care homes. ChildCare.gov. URL: https://www.childcare.gov/consumer-education/what-are-my-child-care-options/family-child-care-homes [Accessed 2026-08-26]
23. Hodder RK, O'Brien KM, Wyse RJ, et al. Interventions for increasing fruit and vegetable consumption in children aged five years and under. Cochrane Database Syst Rev. Sep 23, 2024;9(9):CD008552. [doi: 10.1002/14651858.CD008552.pub8] [Medline: 39312396]
24. De Bock F, Breitenstein L, Fischer JE. Positive impact of a pre-school-based nutritional intervention on children's fruit and vegetable intake: results of a cluster-randomized trial. Public Health Nutr. Mar 2012;15(3):466-475. [doi: 10.1017/S136898001100200X] [Medline: 21859516]
25. Seguin-Fowler RA, Hanson KL, Jilcott Pitts SB, et al. Community supported agriculture plus nutrition education improves skills, self-efficacy, and eating behaviors among low-income caregivers but not their children: a randomized controlled trial. Int J Behav Nutr Phys Act. Aug 31, 2021;18(1):112. [doi: 10.1186/s12966-021-01168-x] [Medline: 34461931]
26. Yoong SL, Lum M, Jones J, et al. A systematic review of interventions to improve the dietary intake, physical activity and weight status of children attending family day care services. Public Health Nutr. Aug 2020;23(12):2211-2220. [doi: 10.1017/S1368980019005275] [Medline: 32383429]
27. Home-based child care supply and quality. Administration for Children and Families (ACF). URL: https://www.acf.hhs.gov/opre/project/home-based-child-care-supply-and-quality-2019-2024 [Accessed 2026-09-10]
28. Bowen M. Family Therapy in Clinical Practice. Jason Aronson Inc.; 1993. ISBN: 978-1568210117
29. Larson N, Story M. A review of environmental influences on food choices. Ann Behav Med. Dec 2009;38(suppl_1):S56-73. [doi: 10.1007/s12160-009-9120-9] [Medline: 19802648]
30. Arlinghaus KR, Laska MN. Parent feeding practices in the context of food insecurity. Int J Environ Res Public Health. Jan 6, 2021;18(2):366. [doi: 10.3390/ijerph18020366] [Medline: 33418887]
31. Satter E. Eating competence: definition and evidence for the Satter Eating Competence model. J Nutr Educ Behav. 2007;39(5 Suppl):S142-53. [doi: 10.1016/j.jneb.2007.01.006] [Medline: 17826695]
32. H.r.1 - an act to provide for reconciliation pursuant to title II of h. con. res. 14. Congress.gov. 2025. URL: https://www.congress.gov/bill/119th-congress/house-bill/1/text/rh [Accessed 2026-10-16]
33. Owen LH, Kennedy OB, Hill C, Houston-Price C. Peas, please! Food familiarization through picture books helps parents introduce vegetables into preschoolers' diets. Appetite. Sep 1, 2018;128:32-43. [doi: 10.1016/j.appet.2018.05.140] [Medline: 29807124]
34. Thompson FE, Midthune D, Kahle L, Dodd KW. Development and evaluation of the National Cancer Institute's Dietary Screener Questionnaire scoring algorithms. J Nutr. Jun 2017;147(6):1226-1233. [doi: 10.3945/jn.116.246058] [Medline: 28490673]
35. U.S. household food security survey module: three-stage design, with screeners. Economic Research Service, U.S. Department of Agriculture (USDA); 2012. URL: https://www.ers.usda.gov/media/6422/us-household-food-security-survey-module.pdf [Accessed 2026-09-10]

36. Calloway EE, Carpenter LR, Gargano T, Sharp JL, Yaroch AL. New measures to assess the "Other" three pillars of food security-availability, utilization, and stability. Int J Behav Nutr Phys Act. Apr 26, 2023;20(1):51. [doi: 10.1186/s12966-023-01451-z] [Medline: 37101157]
37. "Other" 3 pillars: availability, utilization and stability pillars of food security + measures. Center for Nutrition & Health Impact. 2025. URL: https://www.centerfornutrition.org/pillars [Accessed 2026-09-10]
38. Birch LL, Fisher JO, Grimm-Thomas K, Markey CN, Sawyer R, Johnson SL. Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. Appetite. Jun 2001;36(3):201-210. [doi: 10.1006/appe.2001.0398] [Medline: 11358344]
39. Sleddens EF, Kremers SP, Thijs C. The children's eating behaviour questionnaire: factorial validity and association with body mass index in Dutch children aged 6-7. Int J Behav Nutr Phys Act. Oct 20, 2008;5(1):49. [doi: 10.1186/1479-5868-5-49] [Medline: 18937832]
40. Wardle J, Guthrie CA, Sanderson S, Rapoport L. Development of the children's eating behaviour questionnaire. J Child Psychol Psychiatry. Oct 2001;42(7):963-970. [doi: 10.1111/1469-7610.00792] [Medline: 11693591]
41. Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). Am J Prev Med. 1994;10(2):77-84. [doi: 10.1016/S0749-3797(18)30622-6] [Medline: 8037935]
42. Berry JO, Jones WH. The parental stress scale: initial psychometric evidence. J Soc Pers Relat. Aug 1995;12(3):463-472. [doi: 10.1177/0265407595123009]
43. Matheny AP, Wachs TD, Ludwig JL, Phillips KJ. Bringing order out of chaos: psychometric characteristics of the confusion, hubbub, and order scale. J Appl Dev Psychol. Jul 1995;16(3):429-444. [doi: 10.1016/0193-3973(95)90028-4]
44. Emond JA, Tantum LK, Gilbert-Diamond D, Kim SJ, Lansigan RK, Neelon SB. Household chaos and screen media use among preschool-aged children: a cross-sectional study. BMC Public Health. Oct 29, 2018;18(1):1210. [doi: 10.1186/s12889-018-6113-2] [Medline: 30373557]
45. Sanders MR, Morawska A, Haslam DM, Filus A, Fletcher R. Parenting and Family Adjustment Scales (PAFAS): validation of a brief parent-report measure for use in assessment of parenting skills and family relationships. Child Psychiatry Hum Dev. Jun 2014;45(3):255-272. [doi: 10.1007/s10578-013-0397-3] [Medline: 23955254]
46. Ohan JL, Leung DW, Johnston C. The Parenting Sense of Competence scale: evidence of a stable factor structure and validity. Can J Behav Sci. 2000;32(4):251-261. [doi: 10.1037/h0087122]
47. James DE, Schumm WR, Kennedy CE, Grigsby CC, Shectman KL, Nichols CW. Characteristics of the Kansas Parental Satisfaction Scale among two samples of married parents. Psychol Rep. Aug 1985;57(1):163-169. [doi: 10.2466/pr0.1985.57.1.163]
48. Harris HA, Staton S, Morawska A, Gallegos D, Oakes C, Thorpe K. A comparison of maternal feeding responses to child fussy eating in low-income food secure and food insecure households. Appetite. Jun 1, 2019;137:259-266. [doi: 10.1016/j.appet.2019.03.005] [Medline: 30858067]
49. Buxton OM, Chang AM, Spilsbury JC, Bos T, Emsellem H, Knutson KL. Sleep in the modern family: protective family routines for child and adolescent sleep. Sleep Health. May 1, 2015;1(1):15-27. [doi: 10.1016/j.sleh.2014.12.002] [Medline: 26779564]
50. Stahlmann K, Hebestreit A, DeHenauw S, et al. A cross-sectional study of obesogenic behaviours and family rules according to family structure in European children. Int J Behav Nutr Phys Act. Mar 5, 2020;17(1):32. [doi: 10.1186/s12966-020-00939-2] [Medline: 32138743]
51. Bickel G, Nord M, Price C, Hamilton W, Cook J. Guide to measuring household food security. U.S. Department of Agriculture, Food and Nutrition Service; 2000. URL: https://nhis.ipums.org/nhis/resources/FSGuide.pdf [Accessed 2026-09-10]
52. Mason TB, O'Connor SG, Schembre SM, Huh J, Chu D, Dunton GF. Momentary affect, stress coping, and food intake in mother-child dyads. Health Psychol. Mar 2019;38(3):238-247. [doi: 10.1037/hea0000714] [Medline: 30762403]
53. Berge JM, Tate A, Trofholz A, et al. Momentary parental stress and food-related parenting practices. Pediatrics. Dec 2017;140(6):e20172295. [doi: 10.1542/peds.2017-2295] [Medline: 29167378]
54. O'Connor SG, Habre R, Bastain TM, et al. Within-subject effects of environmental and social stressors on pre- and post-partum obesity-related biobehavioral responses in low-income Hispanic women: protocol of an intensive longitudinal study. BMC Public Health. Feb 28, 2019;19(1):253. [doi: 10.1186/s12889-019-6583-x] [Medline: 30819155]
55. Snyder E, Cai B, DeMuro C, Morrison MF, Ball W. A new single-item sleep quality scale: results of psychometric evaluation in patients with chronic primary insomnia and depression. J Clin Sleep Med. Nov 15, 2018;14(11):1849-1857. [doi: 10.5664/jcsm.7478] [Medline: 30373688]
56. Leppert KA, Bufferd SJ, Olino TM, Dougherty LR. A daily diary analysis of preschool depressive behaviors: prospective associations and moderators across 14 days. J Abnorm Child Psychol. Sep 2019;47(9):1547-1558. [doi: 10.1007/s10802-019-00535-4] [Medline: 30911869]

57. Burkart S, Beets MW, Pfledderer CD, et al. Are parent-reported sleep logs essential? A comparison of three approaches to guide open source accelerometry-based nocturnal sleep processing in children. J Sleep Res. Aug 2024;33(4):e14112. [doi: 10.1111/jsr.14112] [Medline: 38009378]
58. Reesor-Oyer L, Parker H, Burkart S, et al. Measuring microtemporal processes underlying preschoolers' screen use and behavioral health: protocol for the tots and tech study. JMIR Res Protoc. Sep 28, 2022;11(9):e36240. [doi: 10.2196/36240] [Medline: 36169993]
59. Li JJ, Lansford JE. A smartphone-based ecological momentary assessment of parental behavioral consistency: associations with parental stress and child ADHD symptoms. Dev Psychol. Jun 2018;54(6):1086-1098. [doi: 10.1037/dev0000516] [Medline: 29608072]
60. Neuhouser ML, Lilley S, Lund A, Johnson DB. Development and validation of a beverage and snack questionnaire for use in evaluation of school nutrition policies. J Am Diet Assoc. Sep 2009;109(9):1587-1592. [doi: 10.1016/j.jada.2009.06.365] [Medline: 19699839]
61. Adams EL, Savidge M, Reesor-Oyer L, et al. The Veggie Vouchers intervention to promote SNAP fruit and vegetable incentive program use for families with food insecurity: a single arm feasibility study. Pilot Feasibility Stud. Dec 2, 2025;11(1):157. [doi: 10.1186/s40814-025-01732-3] [Medline: 41331706]
62. Parker H, Burkart S, Reesor-Oyer L, et al. Feasibility of measuring screen time, activity, and context among families with preschoolers: intensive longitudinal pilot study. JMIR Form Res. Sep 29, 2022;6(9):e40572. [doi: 10.2196/40572] [Medline: 36173677]
63. Cepni AB, Taylor A, Crumbley C, et al. Feasibility and efficacy of the "FUNPALs playgroup" intervention to improve toddler dietary and activity behaviors: a pilot randomized controlled trial. Int J Environ Res Public Health. Jul 23, 2021;18(15):7828. [doi: 10.3390/ijerph18157828] [Medline: 34360118]
64. Ortiz C, Del Vecchio T. Cultural diversity: do we need a new wake-up call for parent training? Behav Ther. Sep 2013;44(3):443-458. [doi: 10.1016/j.beth.2013.03.009] [Medline: 23768671]
65. Totton N, Lin J, Julious S, Chowdhury M, Brand A. A review of sample sizes for UK pilot and feasibility studies on the ISRCTN registry from 2013 to 2020. Pilot Feasibility Stud. Nov 21, 2023;9(1):188. [doi: 10.1186/s40814-023-01416-w] [Medline: 37990337]
66. 2022-2023 community report. Early Learning Coalition of Orange County; 2023. URL: https://elcoforangecounty.org/community-report/_2022-2023-community-report-pdf/ [Accessed 2026-09-10]
67. Your 2024 impact. Second Harvest Food Bank of Central Florida. 2025. URL: https://feedhopenow.org/stories/your-2024-impact [Accessed 2026-09-10]
68. Spence E. Serving our veterans. Second Harvest Food Bank of Central Florida. 2026. URL: https://feedhopenow.org/stories/serving-our-veterans [Accessed 2026-09-10]
69. Food distribution. Second Harvest Food Bank of Central Florida. 2026. URL: https://feedhopenow.org/our-work/feeding-neighbors/food-distribution [Accessed 2026-09-10]
70. Orange county, FL. Data USA. 2023. URL: https://datausa.io/profile/geo/orange-county-fl#demographics [Accessed 2026-09-10]
71. Jones AM, Keihner A, Mills M, et al. Measuring skin carotenoids using reflection spectroscopy in a low-income school setting. Nutrients. Oct 26, 2021;13(11):3796. [doi: 10.3390/nu13113796] [Medline: 34836051]
72. Ermakov IV, Whigham LD, Redelfs AH, et al. Skin carotenoids as biomarker for vegetable and fruit intake: validation of the reflection-spectroscopy based "Veggie Meter". The FASEB J. Apr 2016;30(S1):409. [doi: 10.1096/fasebj.30.1_supplement.409.3]
73. May K, Jilcott Pitts S, Stage VC, et al. Use of the Veggie Meter® as a tool to objectively approximate fruit and vegetable intake among youth for evaluation of preschool and school-based interventions. J Hum Nutr Diet. Dec 2020;33(6):869-875. [doi: 10.1111/jhn.12755] [Medline: 32281191]


## Abbreviations

**ELCOC:** Early Learning Coalition of Orange County
**FI:** food insecurity
**FV:** fruit and vegetable
**RCT:** randomized controlled trial
**V.E.G.G.I.E.:** Vegetable Eating Gets Going by Increasing Exposure

*Edited by Javad Sarvestan; peer-reviewed by Randa Salah Gomaa Mahmoud; submitted 20.Feb.2026; final revised version received 26.Aug.2026; accepted 27.Aug.2026; published 13.Nov.2026*

*Please cite as:*
*Zimmer AC, Sims J, Brazendale K, Mobley AR, Cheong J, Reesor-Oyer L*
*Increasing Fruit and Vegetable Consumption Among Preschool-Age Children and Their Families: Protocol for the Project V.E.G.G.I.E. Pilot/Feasibility Study*
*JMIR Res Protoc 2026;15:e93866*
*URL: https://www.researchprotocols.org/2026/1/e93866*
*doi: 10.2196/93866*

© Anne-Charles Zimmer, Jhada Sims, Keith Brazendale, Amy R Mobley, JeeWon Cheong, Layton Reesor-Oyer. Originally published in JMIR Research Protocols (https://www.researchprotocols.org), 13.Nov.2026. This is an open-access article distributed under the terms of the Creative Commons Attribution License (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work, first published in JMIR Research Protocols, is properly cited. The complete bibliographic information, a link to the original publication on https://www.researchprotocols.org, as well as this copyright and license information must be included.