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# Fruit and Vegetable Preferences and Practices may Hinder Participation in Community Supported Agriculture among Low-income Rural Families

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KLH conceptualized the study, led the development of the child interview guide, developed and implemented the coding structure, interpreted data, and drafted and revised most of the text.

JAG collected data, contributed to the development of the coding structure, coded and interpreted data, and revised the manuscript for important intellectual content.

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RAS conceptualized the study and critically revised the manuscript.

All authors approved the submitted manuscript.



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Ethical Standards Disclosure

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Cornell University Institutional Review Board for Human Participants. Written informed consent was obtained from all adult participants; written parent/guardian consent and child assent were obtained for all minor participants.

## Abstract

**Objective:** Describe fruit and vegetable (FV) preferences and other factors that may influence participation in community supported agriculture (CSA)

**Design:** In-depth, semi-structured interviews

**Setting:** Eight rural/micropolitan communities in four U.S. states

**Participants:** 41 caregivers and 20 children (8–12 *y*) from low-income, English-speaking households

**Phenomena of Interest:** Knowledge, attitudes, and behaviors regarding FVs; perceived barriers to CSA participation

**Analysis:** Transcribed verbatim and iteratively coded

**Results:** Caregivers and children believed FVs were important to health, yet FVs were not featured in dinners or snacks and consumption was challenged by limited preferences and neophobia. Few caregivers and children knew about the seasonality of FV. Most caregivers were unfamiliar with CSA and had concerns about CSA cost, accessibility, produce quality, and selection.

**Conclusions and Implications:** These qualitative data support improvements in: 1) CSA distribution practices to offer flexible payment and pick-up options, more fruits, and self-selection of FV; 2) public awareness of produce seasonality and the CSA distribution model as necessary precursors to participation, and lower cost for low-income families who highlighted this barrier; and 3) capacity to prepare FV by enhancing skills and providing time-saving kitchen tools. Approaches to aligning CSA practices with the needs and preferences of low-income families warrant further research.


## INTRODUCTION

Fruit and vegetable (FV) consumption in the U.S. is half the recommended amount,[1,2] and is even lower for individuals with low-income[3–5] or food insecurity,[6] or who live in rural areas.[7,8] These disparities could be attributable, at least in part, to the fact that low-income households are highly responsive to price when choosing food,[9–11] and fresh FVs, in particular, are perceived as expensive.[12,13] In addition, low-income communities have fewer stores that stock fresh FVs,[14,15] less availability of high-quality fresh FVs,[14–17] and higher FV prices.[4,14,16]

Through mechanisms such as community supported agriculture (CSA), local food systems have the potential to improve rural, low-income families' access to affordable, high-quality fresh FVs. CSA connects local farms with customers who pay for a "share" of produce before the growing season begins and receive a weekly supply of FVs from the farm throughout the season.[18–22] Home availability and accessibility of FVs are associated with higher dietary quality[23,24] and may be facilitated through CSA participation. Despite the potential benefits of CSA, low-income households seldom participate in CSA[19,25–27] and only a few small studies report on barriers or facilitators to CSA participation for low-income households,[28–32] three of which include only urban residents.[29,31,32]

This article reports data from in-depth interviews with caregivers and their children from four U.S. states, and explores FV preferences and practices, and other factors that may influence low-income households' participation in CSA. Drawing on constructs from Social Cognitive Theory[33] we consider: personal attributes such as knowledge and attitudes regarding FVs (including preferences), locally-grown produce, and CSA; behaviors such as food preparation and eating; and environmental factors such as household and community facilitators and barriers to healthy eating and, specifically, to CSA participation. Better understanding personal, environmental, and behavioral factors is essential to targeting CSA operations to meet the needs and preferences of low-income households in rural areas, as one approach to addressing the broader issue of insufficient access to, and intake of, FVs by children and adults in low-income households in rural areas.

## METHODS

### Study Design

A mixed methods interview study was conducted with a geographically diverse, cross-sectional sample of caregivers in low-income households and their older children. Qualitative methods were used to elicit themes related to personal attitudes and environmental conditions regarding FVs and CSA, and behaviors related to food preparation and eating. Quantitative methods were used to code preference for particular FVs in order to summarize a large volume of descriptive data about food shopping, preparing meals, and consuming foods into a report of relative preference for particular FVs.

### Participants and Recruitment

Caregivers were recruited from eight rural and micropolitan (population <50,000) communities in four U.S. states: New York (NY), North Carolina (NC), Vermont (VT), and Washington (WA). Flyers and in-person recruitment at public schools, extension offices, health departments, childcare and community centers, and education sessions of the Supplemental Nutrition Assistance Program (SNAP) and the Special Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC) were used to identify potential participants for interviews. Eligibility was determined using a brief paper-based screening tool. Adults were eligible if they were: 1) 18 years of age or older; 2) English-speaking; 3) a primary caregiver of a child between the ages of 2 and 12 years old; and 4) in a household that participated in SNAP, WIC, or Head Start, received free or reduced-price school lunch, or were income-eligible for these programs (≤185% of the federal poverty level). With consent from a parent/guardian, children ages 8 to 12 years old (one per caregiver) were invited to participate in a separate interview. Recruitment was stratified by state and children's ages. A minimum of ten eligible caregivers were recruited in each state, with a minimum of five with a young child (2–7 years) and a minimum of five with an older child (8–12 years) who also was willing to be interviewed. Caregivers (n=41) received $25 and children (n=20) received $5 compensation. This protocol was approved by the Institutional Review Board at Cornell University; all caregivers provided written consent and all children provided oral assent.

## Interviews

Interview guides were developed by a multidisciplinary team with expertise in the fields of nutrition, public health, and economics, and included content informed by current, peer-reviewed evidence and methods (Supplemental Table 1). The caregiver and child interview guides were separate but paralleled one another in content areas such as knowledge, attitudes, and preferences regarding FVs; perceptions of healthy eating; and food preparation and cooking skills. Caregivers were interviewed to learn their knowledge and attitudes regarding CSA and barriers to CSA participation. Caregivers were prompted with picture arrays of 20 vegetables and 12 fruits that were grown locally in all four states,[34–40] and indicated which FVs they would prefer in a CSA share. To obtain information about younger children (who were not interviewed), caregivers were asked to report specifically on the snacking behaviors and FV preferences of their younger children. Caregiver interviews included a brief demographic questionnaire that included sex, age, race, and household composition, and these data were used to describe the sample.

The child interview protocol utilized a number of strategies that have been documented to improve the quality of interviews, including closed-ended questions at the beginning, drawing activities to facilitate question response, props, and hypotheticals or questions that involve imagination[41] (Supplemental Table 2). The child interview started with straightforward questions about where children ate meals on school days.[42] Children were asked to draw a meal, and then a snack, that they usually prepared for themselves on a blank paper plate while the interviewer asked related questions in an original adaptation of the "draw and write" technique.[41,43,44] Children examined the FV picture arrays[45] from which items that are most commonly consumed (e.g. potatoes and tomatoes)[46] were excluded purposively. While viewing the arrays, children were asked for their preferences and to imagine how they might feel[41] trying an unfamiliar or strange-looking item.[47]

Interviews were held in private locations in the caregiver's community (e.g. empty school classroom, library meeting room). Interviewers were researchers or graduate students in the states in which they interviewed, and were centrally trained in recruitment and screening procedures, in-depth interview facilitation, and best practices for engaging children, in order to ensure data consistency across states. Caregiver interviews lasted 35–94 minutes (median=59 minutes) and child interviews 18–58 minutes (median=42 minutes).

## Analysis

Interviews were transcribed verbatim and imported into NVivo version 11 (QSR International). Transcripts were structurally coded for knowledge, skills, and behaviors, and all text was descriptively coded to reflect participants' attitudes and perceptions as they emerged throughout the interview. An original framework for coding was developed by the first two authors. Five caregiver and five child interviews were independently coded by at least two of the first three authors. Differences in data interpretation were discussed and resolved by all three researchers via consensus. The framework and codes were updated to reflect the new decisions, a consensus codebook was created, and these ten interviews were fully coded using the consensus codebook. The remaining 51 interviews were double-coded by two trained student researchers, with supervision provided by the third author. Inter-rater

reliability was high, with observed agreement >99% and prevalence- and bias-adjusted kappa >0.90. Although children and their caregivers lived in the same households, adult and child samples were analyzed independently. Emergent themes were subsequently identified. Findings were qualified based on the number of interviews that included information to support the theme:[48] "all" designates >90% (37+ caregivers or 18+ children); "most" indicates the majority (21–36 caregivers or 11–17 children); "many" is equivalent to one-third to one-half (14–20 caregivers or 7–10 children); "some" indicates one-quarter to one-third (10–13 caregivers or 5–6 children); and "few" indicates less than one-quarter (5–9 caregivers or 3–4 children) of respondents.

Preference for specific FVs was quantitatively summarized by coding 'preference' as any mention of preferring, purchasing, or preparing that item. FV preferences were tallied for caregivers, for young children (from caregiver report of their preferences), and for older children (from self-report). Percentages for each type of FV preferred, and the median number of preferred FVs were reported. Preferred FVs were compared to agricultural calendars to ascertain which of the items were grown in the participant's state of residence, and these locally grown FVs were tallied.

## RESULTS

The sample included 41 low-income caregivers (21 with a young child, 16 with an older child, and 4 with a child in both age groups) and 20 of their older children. The majority of interviewed caregivers were women (90%), white (51%) or black/African American (27%), and had three or fewer children in their households (83%). The age of caregivers ranged from 23–64 years (mean 36.4 ± 9.4); all were parents except one guardian grandparent.

### Knowledge and Attitudes Regarding FVs

Most children and many of their caregivers knew that half of their dinner plate should be full of FVs: "My rule of thumb is half of my plate is fruit and vegetables and then the other half is … usually meat and then that part is … where I would put starch." (36-year-old woman from VT). Most caregivers described FVs as "important." A few caregivers mentioned that vegetables were important because they contained "nutrients," "vitamins," "minerals," or "fiber." Most caregivers and children simply stated that FVs were important because "they're good for you." Others mentioned the role of vegetable consumption in the control of chronic disease: "[*I*] need to get more vegetables in the house. My mom was a diabetic and 500+ pounds, so I'm trying to teach [*the children*] the whole spectrum of the food chart." (41-year-old woman from WA). Likewise, most children described that their caregivers tell them to eat FVs because they are "good" or "healthy."

Overall, caregivers and children preferred 64 different FVs, suggesting a wide range of preferences across families and individuals. FVs were considered to be grown locally only if they appeared on agricultural calendars in the interviewee's home state: 44 of the preferred FVs were grown locally in all the states in which they were preferred. Caregivers preferred a median of 11 FVs: most caregivers preferred green beans, tomatoes, broccoli, carrots, corn, and onions, and many preferred lettuce, peppers, potatoes, and peas (Table 1). Older children preferred a median of eight FVs: most preferred carrots and broccoli and many preferred

tomatoes. Many caregivers reported that their younger children preferred broccoli, carrots, and corn. A few caregivers and no older children reported preference for sweet potatoes, turnips, beets, kohlrabi, or fennel.

Most caregivers and children preferred apples and grapes, with watermelon preferred by most interviewed children (Table 2). Oranges and bananas, which are never seasonally available in any of the states, were preferred by most caregivers and children. The preferred FVs were often described as fresh, whole produce items, but caregivers also described apple, grape, and tomato juices; apple and tomato sauces; dried onions; instant potatoes; canned and frozen vegetables; and dried and frozen fruits.

Many caregivers described in detail how trying to get their family to eat healthfully was difficult because their children were "picky" eaters, were unwilling to try new foods (particularly vegetables), or both.

> They're not willin' to try. I be like 'Try all the peas, just try a little. Come on, just taste it.' Yeah, I'm good with finding recipes and stuff. It's just that they don't be wanting to taste it. If they know what it's got in it, be like 'nuh uh' … I can't let my daughter know I put onions in [*recipe*]. I have to chop stuff up real fine so they can't see it. Going off of that, I've actually served 'em some mushrooms and I had the hardest time 'cause I had to cut it up so fine.
>
> (40-year-old woman from WA)

When presented with photos of FVs, most children reported reluctance to try the items that were unfamiliar to them, particularly due to their appearance or texture, or because they were afraid that they would not like them. Most children, however, mentioned that they either had already tried an unfamiliar fruit or vegetable or that they are willing to try one. The children described trying new foods at school, being encouraged by friends or family members to try something new, or that the appearance of a new item was appealing or similar to a food that they had already tried and enjoyed. "I think the first time I tried … yeah, the first time I tried sweet potatoes was with my dad, and I wanted to try some too, and he gave me a piece. And, when I like, I had actually, I licked it before I bit it … At first I thought it tasted weird, and then I took a couple of bites out of it and I was like 'This is actually pretty good!'" (Child from WA)

## Food Preparation and Eating Behaviors

All caregivers had basic food preparation skills and were able to fry, sauté, or roast meats, "That's a quick meal … with the chicken breast sometimes … I'll cook it in the skillet, most of the time I'll bake it. It's a lot easier, the same process, I'll clean it and season it, and then I'll put it in the oven, take it out, and I'll cut it up for them." (31-year-old female from NY); all caregivers could boil, sauté, or steam vegetables, "I get the [*vegetables*], steamed ones that you can microwave in the bag." (25-year-old female from NC).

However, few caregivers described more advanced food preparation skills such as using a crockpot, adapting a recipe, "improvising," or "inventing" a dish. "'Cause, I have a crockpot. So, you know, just throw it in. So, usually … that's the pot roast and carrots, potatoes, and green peppers, onions. I like a lot of vegetables, it's really good." (Unknown-age female

from WA). Most of the older children described making simple dishes such as eggs, oatmeal, noodles, or quesadillas, or heating frozen food items, and some helped to peel or "cut up" fruits or vegetables, or make a salad. Only a few caregivers discouraged their children from food preparation, but most had rules requiring supervision or forbidding the use of sharp knives. A few parents volunteered that a teenager in their household prepared entire meals for the family including complex dishes such as 'a roast' or 'homemade red beans and rice.'

Typical dinners did not emphasize FV, and were described with meat as "usually the main part" with common side dishes of rice, potatoes, or pasta. While some meals included side dishes of vegetables such as salad or broccoli, starchy vegetables such as corn or peas were common. One participant described a typical meal as, "We have … I don't know what you want to call it … a meat, two vegetables, and probably like a starch. So, it's like chicken, rice, peas, and, I don't know, cornbread, something like that." (35-year-old man from NY). Although this participant described two vegetables as part of his 'typical' dinner, the meal he described included one starchy vegetable (peas) and two other starches (rice and cornbread).

Some caregivers described an entrée of spaghetti or noodles, with or without other components, as a typical "easy" or "weeknight" dinner. "The 'easy nights' would be somethin' like spaghetti or somethin' like that with garlic bread or somethin' … [*with*] usually a, like a salad or somethin' on the side … one of those bags with the mixed stuff with the carrots and … that stuff, and then I'll add cucumber or somethin' to it, usually a dressing." (33-year-old woman from NY)

Snacking among young children typically involved dry items such as cereals and crackers, dairy items such as yogurt or cheese, peanut butter, or "bars." Some caregivers reported fruits such as apples or grapes as snacks, and almost none described their children snacking on vegetables. Older children themselves reported snacking on foods similar to those reported for younger children, and a few described snacking on more complex items such as fruit smoothies.

## Household and Community Environment

All caregivers reported well-equipped kitchens with a stove and refrigerator, pots and pans, knives, a spatula and cooking spoons, storage containers, measuring cups and spoons, a colander, mixing bowl, and microwave. Most owned a cutting board, crockpot, and vegetable peeler. Some owned a food processor and a few had a salad spinner. A few would have liked more kitchen tools, "I would like [*a salad spinner*]. Things to prepare vegetables and other meals easily for me are always welcomed in my kitchen." (34-year-old woman from WA).

Outside the household environment, the most commonly mentioned supports for healthy eating were WIC and SNAP benefits, such as this participant who stated "we were lucky to have some food stamps, which we put toward the produce." (31-year-old woman from VT). Others mentioned the availability of healthy foods from, "a close grocery store with fresh produce" (43-year-old woman from NC) or from local farms. One caregiver noted, "There's trucks on the side of the road to get corn from when it's that season, and it's nice. It makes it more accessible. The farmers' market, the stuff is a lot cheaper, and they're all real friendly,

great people that really wanna help people out." (28-year-old woman from VT). When probed about the "use of coupons or discounts to purchase FVs," a few caregivers mentioned incentive programs for use of WIC or SNAP benefits at farmers' markets.

### Knowledge and Attitudes Regarding Seasonal Produce and CSA

Caregivers and children had little knowledge of the seasonality of produce grown in their communities. When asked which FVs were being harvested at the time of the interview (late fall and winter), many caregivers and children said "I don't know." Some correctly named one item available from local farms, such as apples, greens, winter squash, or pumpkins. A few caregivers mentioned items that were never locally available from farms: "Like oranges or something? Or … I have no idea. I was just trying to think of, when I walk into [*discount retailer*], what I saw." (34 -year-old woman from WA).

Most caregivers were unfamiliar with CSA, which was described to them as:

> A partnership between a local farm and customer in which the customer pays the farm a set price for a 'share' of the farm's harvest. Some farms deliver a box of produce to a pick-up site at a set day and time each week, and other farms ask customers to pick-up their share of the produce at the farm. Each produce share contains a variety of the farm's seasonal fruits and vegetables, but the customer often does not choose which items they receive.

After learning about CSA, many caregivers described nearby farms and farmland as valuable to their community, and remarked that purchasing local FVs might benefit the farms, their community, the local economy, and the quality of their own diets. This woman emphasized the economic benefits to the community, "I think if people bought from farmers instead of stores, it would help everybody out. You could get more, and then the farmers, you help support them." (25-year-old woman from NC); whereas another woman emphasized the relational benefits to her community, "Well it's from the farm so, you know, you get to learn where it's coming from. You get to know, you know, how it's grown. You build a … you're building a relationship with your farmer, and you're just helping your community … Yeah, there's lots of positive … I love the idea of it actually!" (34-year-old woman from WA).

When asked which FVs they would like to receive in a CSA share (Tables 1 and 2, column 3), selections paralleled the preferred items described above. However, many caregivers also expressed interest in fruits they had not previously mentioned preferring, such as watermelon, peaches, blueberries, melon, plums, and raspberries.

Many caregivers developed an interest in CSA during the interview, but most were uncertain. Cost, accessibility, produce quality, and control over selection were concerns about CSA mentioned by most caregivers (Table 3). Many caregivers wanted low cost and payment options, and a few specifically mentioned that the upfront payment was a barrier to CSA participation.

> If I could pay my portion of it with my food stamps, would be ideal … If you're not able to use the EBT [*Electronic Benefit Transfer*] to pay for it, and let's say I've committed to this, and then I don't have the cash to pay for this week … I might be

> stressed to commit to something that I have to pay every week, if I don't know that I can pay it every week.
>
> (40-year-old woman from WA)

Most caregivers wanted the CSA pick-up to be at both a convenient location and time, "I mean, it just depends on the days that we would have to pick it up. Like if it was the same day that we go grocery shopping, that'd be fine 'cause we're driving anyways. But if it's something that's kind of inconvenient …" (23-year-old woman from VT). Many caregivers mentioned that delivery would be the best option for them,

> Especially if it were delivered! I think for a lot of families that would take away huge barriers … 'cause I'm in such a time crunch and I even have a car, and I know lots of people that don't have any way to get around. So, it wouldn't matter how cheap things were, they couldn't, they probably wouldn't be able to, get out there and get [*the CSA share*].
>
> (30-year-old woman from WA)

Most caregivers mentioned that the CSA FVs might be "fresher," "better quality than what we find at the grocery store," and that "it's not been in a truck for over a week." Many caregivers described choice in the FVs that they received as being important: "Selection. Choice. Because I think you said in the beginning that some of the items might not be available that we choose. So, I wanted to know what would happen with that. Would they just, you know, give us something that they wanted us to have, or …?" (62-year-old woman from NY)

## DISCUSSION

In these samples of low-income caregivers and children from rural and micropolitan communities, FV consumption appeared insufficient; dinners did not emphasize FVs and snacking rarely included FVs. These behaviors are consistent with low FV consumption among Americans generally,[1,2] and particularly among households with low-income,[3–5] food insecurity,[6] or rural residence.[7,8]

When considering personal influences, factors that support FV consumption appeared to be overshadowed by attitudes that hindered FV consumption. The belief that FVs are important and knowledge that FVs should be plentiful at dinner were widespread within samples of caregivers and children. However, attitudes such as "picky" eating and neophobia also were common among children and caregivers, who described how these attitudes hindered healthy eating and particularly FV consumption. This is consistent with prior research suggesting that, when selecting FVs, familiarity is important to adults[49,50] and children.[5,51] However, neophobia was conditional, as most interviewed children could recall trying an unfamiliar FV, because it was "appealing" in looks or smell, was similar to something they had already tried and liked, or due to encouragement from family or friends.

Regarding environmental factors related to FV consumption, caregivers reported that WIC and SNAP benefits supported the affordability of FVs, and proximity to stores or farms with quality FVs strengthened accessibility of FVs. In the household environment, caregivers had

the basic skills and kitchen tools to prepare meals for their families, however, the typical meals they described emphasize meat and starches. When vegetables were served, they were likely to be frozen peas or corn or a packaged salad bag. Few caregivers in this sample had advanced skills like improvisation and food preservation, which might be advantageous in the preparation of fresh, whole seasonal FVs, nor did they have tools such as a food processor or salad spinner which might save time in their preparation.

Among these caregivers from low-income households, personal factors seemed very important to considering CSA participation. Foremost, caregivers and children knew little about the seasonality of FV availability in their area. Prior research reports varied levels of general knowledge about locally seasonal produce (high among high school and college students[52,53] and low among urban consumers[54]) with both groups unable to specify the timeframe within which specific produce items were locally harvested and available for purchase. To our knowledge, no study has previously examined familiarity with locally seasonal FVs among low-income adults and children in rural and micropolitan communities. Furthermore, few of these caregivers were aware of CSA, consistent with a low level of awareness recently reported for a low-income urban sample.[32] An emergent theme regarding CSA was having a choice or control over the FVs included in the share, to avoid unwanted or unfamiliar items. This theme echoed the general neophobia discussed above, and is consistent with prior research documenting a general desire to "stick to what I like"[50] when shopping for FVs, and more specific concern about unfamiliar FVs in CSA.[29,30,32]

FV preferences among interviewed caregivers and children did not harmonize with fluctuations in FV availability across the growing seasons, nor with the wide range of FV varieties typically grown for CSA shares.[55] Caregivers and children were particularly enthusiastic about vegetables harvested during summer, and were less interested in spring items such as greens and radishes and root vegetables like beets or turnips which are abundant in the fall. These less popular FVs are commonly grown in local food systems and included in CSA shares,[34] which highlights a discrepancy between the FV preferences in these low-income households and CSA contents. Furthermore, many caregivers wanted multiple fruits in their CSA share, which corroborates prior research that suggests low-income consumers have more positive attitudes toward fruit than vegetables,[50] and desire more fruit in a CSA.[28] CSA shares sometimes include fruit, but typically emphasize vegetables.[55]

Interviewed caregivers also described environmental factors that may hinder their participation in CSA. In particular, cost and the logistics of acquiring the weekly CSA share were concerns, which mirrors the more general themes of affordability and accessibility of FV being facilitators to healthy eating. Two prior studies of low-income families enrolled in CSA also report these concerns.[29,30]

## Limitations

The stratified convenience sample of rural and micropolitan residents may limit the external validity of these findings, as it is not possible to test the representativeness of this sample. However, validity was strengthened by wide geographic diversity and the inclusion of the perspectives of both caregivers and children. Many of the reported findings (e.g. lack of

emphasis on FV consumption, neophobia) mirror prior research on low-income households that used a variety of designs and samples,[50,56,57] suggesting that this sample may be typical in these regards and that their attitudes toward CSA deserve note in that context.

Internal validity of knowledge and attitudes regarding FVs, and eating more generally, may have been limited by social desirability bias given that education and public health messaging around healthy eating are pervasive.[58,59] Interview participants were always asked questions about "typical eating" before any discussion of healthy eating in an effort to minimize this bias. Furthermore, qualitative interview techniques included multiple and flexible probes that allowed interviewers to collect extensive details. Given that almost no caregivers described high levels of vegetable consumption, this potential bias appears to have been minimized.

## IMPLICATIONS FOR RESEARCH AND PRACTICE

The themes that emerged from these interviews were further examined through the lens of the Integrated Model of the Food and Nutrition System,[60] and suggest strategies to improve the distribution of FVs through CSA, facilitate the acquisition of CSA shares by low-income households, and enhance the capacity of low-income families to prepare the whole, fresh FVs provided through CSA. Further, opportunities for future research to test the ideas garnered from these data are outlined.

### Improve CSA Distribution Practices to Increase Accessibility

Cost, pick-up convenience, and FV selection were barriers to CSA participation noted in these interviews, all of which could be addressed by changes in CSA distribution practices. Affordability could be enhanced by offering payment plans that do not require a large upfront payment, and by accepting weekly or bi-weekly payment plans that are compatible with SNAP redemption regulations.[61] Accessibility might be improved if farms strategically offer pick-up locations that minimize transportation time for low-income households (e.g. neighborhood churches, subsidized housing complexes). Many farms already offer multiple share sizes so that families can select the size that meets their needs and budget, and a few farms allow participants to control the selection of FVs through a market-style display of harvested items,[62] both of which may address the desire for control in FV selection. Future research should examine the relative effectiveness of each of these changes to CSA distribution practices in regard to participation by low-income households. Themes from these interviews also suggest that farms might attract low-income consumers with CSA share contents that better align with their preference for familiar vegetables and more fruit. Future research could explore how best to align the choices of farms and consumers, and study the impact of this alignment on FV consumption and farm-related outcomes.

### Facilitate the Acquisition of CSA Shares by Low-income Households

Few of these caregivers knew about CSA, which suggests that informing the public about CSA and how it provides consistent access to FVs may be a necessary first step toward increasing participation. Nutrition professionals could play an important role in educating the general public, and particularly low-income households, about CSA. In addition, low

cost was important to these low-income families, and could be supported by cost-offsets or other strategies to subsidize CSA shares. Research is needed to explore strategies for lowering CSA cost, and may yield important insights for adapting the CSA model to better serve low-income households.

### Enhance Capacity to Prepare FV among Low-income Caregivers and Children

Caregivers in this study seldom owned tools like a food processor or salad spinner that save time in the preparation of fresh, whole FVs, nor did they possess advanced food preparation skills. Skills such as the adaptation of recipes to substitute seasonally-variable produce and improvisation of dishes might support CSA participation by these caregivers. Further, since caregivers often described serving frozen or pre-packaged produce to their families, they may need some support in preparing FVs that are unfamiliar or imperfect. Finally, caregivers may benefit from learning food preservation skills, such as freezing, so that their preferred summer FVs can last longer. Future research is needed to test the effectiveness of such supports for the preparation and consumption of fresh, whole, seasonal produce like that provided through CSA.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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**Table 1.**

Vegetables Preferred by Caregivers (n=41) and Children (n=20) from Low-income Households in Four US States

| Prompted Vegetables | Interviews with Caregivers | | | Preferences of older children,[c] % |
|---|---|---|---|---|
| | Caregiver preferences,[a] % | Preferences of young children,[b] % | Desired in CSA share, % | |
| Green beans | 75 | 25 | 61 | 20 |
| Tomatoes | 60 | 10 | 51 | 35 |
| Broccoli | 55 | 35 | 78 | 70 |
| Carrots | 50 | 45 | 61 | 75 |
| Lettuce | 48 | 10 | 39 | 20 |
| Peppers | 45 | 10 | 58 | 30 |
| Potatoes | 43 | 5 | 51 | 15 |
| Peas | 38 | 10 | 32 | 30 |
| Cucumbers | 30 | 15 | 73 | 20 |
| Squash | 25 | 5 | 22 | 0 |
| Cabbage | 20 | 0 | 43 | 5 |
| Cauliflower | 18 | 10 | 34 | 5 |
| Greens (kale, chard) | 15 | 0 | 26 | 10 |
| Sweet Potatoes | 10 | 0 | 46 | 0 |
| Radishes | 5 | 0 | 12 | 5 |
| Turnips | 5 | 0 | 2 | 0 |
| Beets | 3 | 5 | 7 | 0 |
| Kohlrabi | 3 | 0 | 2 | 0 |
| Fennel | 0 | 0 | 2 | 0 |
| **Emergent Vegetables**[d] | | | | |
| Corn | 63 | 45 | --- | 30 |
| Onions | 53 | 5 | --- | 5 |
| Spinach | 25 | 0 | --- | 5 |
| Garlic | 18 | 0 | --- | 0 |
| Mushrooms | 15 | 5 | --- | 0 |
| Asparagus | 10 | 5 | --- | 0 |
| Avocado | 10 | 0 | --- | 0 |
| Celery | 8 | 5 | --- | 15 |

CSA, community supported agriculture.

[a](n=40), one caregiver only reported preferences for children.

[b]Reported by the caregiver. Children age 2–7 years old.

[c]Self-reported by child. Children age 8–12 years old.

[d]Produce items were considered emergent if they were mentioned by ≥10% of caregivers or children.

**Table 2.**

Fruits Preferred by Caregivers (n=41) and Children (n=20) from Low-income Households in Four US States

| Prompted Fruits | Interviews with Caregivers | | | Preferences of older children,[c] % |
|---|---|---|---|---|
| | Caregiver preferences,[a] % | Preferences of young children,[b] % | Desired in CSA share, % | |
| Apples | 85 | 90 | 80 | 85 |
| Grapes | 68 | 80 | 71 | 50 |
| Strawberries | 40 | 20 | 71 | 45 |
| Pears | 23 | 15 | 46 | 15 |
| Watermelon | 15 | 5 | 56 | 67 |
| Peaches | 13 | 25 | 59 | 20 |
| Blueberries | 5 | 5 | 39 | 10 |
| Melon | 3 | 5 | 41 | 5 |
| Plums | 3 | 5 | 37 | 0 |
| Blackberries | 3 | 0 | 24 | 0 |
| Raspberries | 0 | 0 | 32 | 10 |
| Nectarines | 0 | 0 | 29 | 0 |
| **Emergent Fruits**[d] | | | | |
| Oranges | 78 | 50 | --- | 45 |
| Bananas | 68 | 60 | --- | 55 |
| Pineapple | 18 | 10 | --- | 10 |
| Cranberries | 15 | 0 | --- | 0 |
| Kiwi | 15 | 10 | --- | 10 |
| Mango | 8 | 15 | --- | 5 |

CSA, community supported agriculture.

[a](n=40), one parent only reported preferences for children.

[b]Reported by the caregiver. Children age 2–7 years old.

[c]Self-reported by child. Children age 8–12 year old.

[d]Produce items were considered emergent if they were mentioned by ≥10% of caregivers or children