

Impact of a Community Gardening Project on Vegetable Intake, Food Security and Family Relationships: A Community-based Participatory Research Study

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Published online: 23 December 2011
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Abstract This community-based participatory research project used popular education techniques to support and educate Hispanic farmworker families in planting and maintaining organic gardens. Measures included a pre- post gardening survey, key informant interviews and observations made at community-based gardening meetings to assess food security, safety and family relationships. Thirty-eight families enrolled in the study during the pre-garden time period, and four more families enrolled in the study during the post-garden period, for a total of 42 families enrolled in the 2009 gardening season. Of the families enrolled during the pre-gardening time period there were 163 household members. The mean age of the interviewee was 44.0, ranging from 21 to 78 years of age. The median number of occupants in a household was 4.0 (range: 2–8), Frequency of adult vegetable intake of “Several time a day” increased from 18.2 to 84.8%, ($P < 0.001$) and frequency of children’s vegetable intake of “Several time a

day” increased from 24.0 to 64.0%, ($P = 0.003$). Before the gardening season, the sum of the frequencies of “Sometimes” and “Frequently” worrying in the past month that food would run out before money was available to buy more was 31.2% and the sum of these frequencies dropped to 3.1% during the post garden period, ($P = 0.006$). The frequency of skipping meals due to lack of money was not statistically significantly different before and after the gardening season for either adults or children. Analysis of text responses and key informant interviews revealed that physical and mental health benefits were reported as well as economic and family health benefits from the gardening study, primarily because the families often worked in their gardens together. A community gardening program can reduce food insecurity, improve dietary intake and strengthen family relationships.

Keywords Community gardening · Vegetable intake · Health promotion · Community-based participatory research

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Introduction

More than 10% of US households experience food insecurity in any given year [1]. The risk of food insecurity is higher among Hispanics, with 20.1% experiencing some type of food insecurity annually [1]. Studies have shown there is an even greater rate among Hispanic migrant seasonal farm workers with rates of food insecurity ranging from 47.1 to 63.8% [2, 3]. Many studies have focused on rates of and health outcomes associated with food insecurity among Hispanic migrant seasonal farmworkers [4]. Most studies of community gardens have been conducted in urban settings [5, 6], and few studies done to-date have examined how a community gardening program affects food security in rural populations.

The benefits of community-based gardening projects likely extend beyond food security, as gardens provide fresh vegetables, and the process of gardening involves physical exercise. Family and social relationships can also be strengthened through community gardening, since community members provide advice and support to help overcome challenges and all receive the benefits the gardening project offers. Immigration issues can lead to the loss of these essential social networks [7], and may leave migrant families feeling isolated [8]. This is especially true for Hispanic cultures where, traditionally, a strong sense of family and community known as “familismo” has shaped their perception of their world [8]. Hispanic families also carry the tradition of a family garden with them from Mexico [9]. Approaches to studying family gardening are complicated. This is due in part to the distance from the academic centers and communities can be significant. It is also due to prior suboptimal experiences that community members have encountered with university-based investigators which have resulted in mistrust [10, 11].

Fortunately, community-based participatory research (CBPR) approaches offer important alternatives when collaborating on research with underserved/vulnerable populations, such as Hispanic migrant seasonal farmworkers, for several reasons. First, the CBPR approach allows for the time necessary to develop a successful relationship between academic partners and community members that is essential when a lack of trust initially exists. This approach is unlike traditional research study approaches [12]. Secondly, CBPR methods can alleviate perceptions of potential racial discrimination especially regarding immigration status, which can be a barrier to successful collaboration [13]. Thirdly, CBPR approaches combine the expertise offered in study design and evaluation from academic partners with important insights provided by community members, creating unique synergies that when successful, can result in important research collaborations [12]. Finally, community members have special knowledge about the individuals that live in their communities that is vital to choosing methodologies that will foster trust. For example, using CBPR may benefit recruitment into studies [13].

We used a community-based participatory research approach to study the impact of a community gardening program on vegetable intake, food security and family relationships of migrant seasonal farmworker families in a rural Oregon community.

Methods

The Community/Academic Partnership

Nuestra Comunidad Sana uses the Community Health Worker model to offer culturally relevant health promotion

services to the Columbia River Gorge Latino community. It is one of several programs overseen by The Next Door Inc, a community-based organization. The community served by this program is diverse and historically rooted in agriculture, particularly apple, pear and cherry orchards, where the Latino population is a significant contributor to maintaining and harvesting these orchards. This community is 96% white with 27.2% of Hispanic ethnicity, and 18.1% are uninsured [14].

Oregon Health & Science University (OHSU) is Oregon’s only research university and houses the *Oregon Clinical and Translational Research Institute (OCTRI)*, funded in 2006 by the National Institutes’ of Health National Center for Research Resources to create an academic home for clinical/translational investigation. One of the Institute’s key programs is Community Research and Engagement, which seeks to work collaboratively with community organizations and researchers to study how best to improve the health of the public. OCTRI provided assistance to both the community and academic partners to attain this research funding.

Funding attained for this project supported local families who want to grow a home garden by providing resources, materials, volunteer support, and a social network that included meetings, an end of growing season fiesta and ongoing contact with Promotores. Families enrolled in the project share and learn about nutrition and new opportunities for physical exercise, which results in community building. The specific objectives of the *Harvest Fiesta* Project included: (1) to pilot a peer network supporting the establishment of home gardens (growing healthful produce) among Hispanic families; (2) to analyze the vegetable intake among participants before and after their garden is implemented; and (3) to build community self-sufficiency through neighborhood and household gardening, in ways that honor and utilize traditional skills and Hispanic culture.

Implementation

The study had funding to sustain 40 farm families, which were enrolled on a first come first served basis. Community meetings were held nearly every month starting in March of each growing season to provide project materials, such as seeds, and to share about gardening, such as how to choose plants, compost, organic approaches for pest control, preparing the land, maintaining the garden and harvesting the vegetables. Popular education techniques [15] were used for these sessions. Attendance at these sessions was high during the first year of the two-year project with between 87 and 131 family members attending (~75% of all participants). The education sessions were also designed to address the concerns of farmworkers, who are exposed

to pesticides while working in the fields but are not using pesticides in their own gardens because of health concerns. A final community meeting (*Harvest Fiesta*) was held in October, where families prepared dishes with food grown in their gardens and the group celebrated what it had learned and grown.

The community group organized all study meetings and interactions with participating families. The OHSU group developed educational materials about the harms of pesticides and how best to avoid them while still controlling insects. The community group translated and adapted those materials for appropriate grade level, plain language and health literacy. Both the OHSU and community groups conducted the key informant interviews, four of which were conducted in the fall of 2009 and six of which were done in the fall of 2010 using two open-ended questions (#1 What has the gardening project meant for you and your family? and #2 How has the education program on pesticides, insects and ground cover been helpful to the program?). The OHSU team also developed databases for entry of study data and conducted data analyses, while the community group worked on translating text responses from Spanish into English and entering data into the databases designed for this purpose.

Study Instruments, Data Collection, Data Analysis

Pre- and post gardening questionnaires were developed and pilot tested with the project's health promoters. Questions focused on obtaining demographic and family size information as well as frequency of eating vegetables, and food security. Additional open-ended questions were included on the survey to identify areas where the community-gardening project has had an impact on the families that the structured survey questions may have missed. The project's health promoters administered the questionnaire verbally to one family member (typically male or female head of household) who was identified by the study health promoters as best representing the family's experiences. The surveys were administered in either face-to-face sessions in participants' homes or over the telephone.

Community meetings done at the end of the growing season assessed the effects these gardens had on the families involved, resulting in participants' recommendations for the future. Key informant interviews were conducted with participating families at the end of the gardening season to further evaluate the project. The community group staff interpreted for OHSU partners during each interview. Field notes were recorded manually at these interviews and analyzed for emerging themes. OHSU Institutional Review Board reviewed all study activities (IRB #5421) and the study received an exemption, as all study activities were anonymous.

Analyses of pre-post gardening questionnaires involved the use of descriptive statistics and Wilcoxon Signed-Ranks Test. Two or more independent coders reviewed the text responses from pre-post gardening questionnaires and used classical content analysis [16] and constant comparative techniques to identify, define and characterize emerging themes. Occurrences of frequent themes were counted, and exemplars were selected that best reflected the themes. Field notes from the 10 key informant interviews were also reviewed and coded similarly.

Results

Thirty-eight families enrolled in the study in the spring and completed the pre-gardening survey. Four more families enrolled in the summer but did not complete the pre-gardening survey, for a total of 42 families enrolled in the 2009 gardening season (Table 1), though two families dropped out prior to completion of the post-questionnaire. Of the families enrolled during the pre-gardening time period there were 163 household members. The mean age of the interviewee was 44.0, ranging from 21 to 78 years of age. Participants had lived in the US an average of 20 years, ranging from 4 to 44 years. The median number of occupants in a household was 4.0 (range: 2–8), and the average number of children, among homes with children under 18, was 2.3 (range: 1–4). Eighty-one and a half percent of homes with children under 18 were two parent homes. The percent of the homes with only adults, (i.e. 18 years or older), was 33.3%. Over a third of the families (39.5%) live in communities that are less than two miles from The Next Door Inc, and about three quarters of the families (76.3%) live in communities that are less than six miles away. The furthest community is 18 miles away from The Next Door Inc. The mean garden space size reported was 132 ft² (range: 20–900), which is roughly a 11ft by 12ft space.

Participants were asked questions about their family's vegetable intake, worry about food running out, and skipping meals before and after the gardening season (Table 2). Frequency of adult vegetable intake of "Several times a day" increased from 18.2 to 84.8%, ($P < 0.001$) and frequency of children's vegetable intake of "Several times a day" increased from 24.0 to 64.0%, ($P = 0.003$). Before the gardening season, the sum of the frequencies of "Sometimes" and "Frequently" worrying in the past month that food would run out before money was available to buy more was 31.2% and the sum of these frequencies dropped to 3.1% during the post garden period, ($P = 0.006$). The frequency of skipping meals due to lack of money was not statistically significantly different before and after the gardening season for either adults or children.

Table 1 Demographic characteristics of participants/gardens

Characteristics	Responses
Interviewee characteristics	
Mean age of interviewee ^a (n = 36) (range)	44.0 (21–78)
Mean number of years living in US (range)	20 (4–44)
Family, household & resident characteristics	
Total number of families representing 163 individuals	38
Household characteristics	
Median number (range)	4.0 (2–8)
Average # children among homes with children (<18 years old) (n = 24**)	2.3 (1–4)
% of single parent homes with children under age 18 (n = 27)	18.5
% of two parent homes with children under age 18 (n = 27)	81.5
% of households with adults only (≥18 years old) (includes single person homes)	33.3
Distance residence is from community organization (n = 8 communities)	
Community A (same location as community organization)—0 miles, %	21.1%
Community B—1.8 miles	18.4%
Community C—3.8 miles	2.6%
Community D—5.8 miles	34.2%
Community E—11.0 miles	2.6%
Community F—13.6 miles	10.5%
Community G—16.6 miles	2.6%
Community H—18.0 miles	7.9%
Garden characteristic	
Mean garden space (ft ²) (n = 24) (range)	132 (20–900)

* n = 38 unless otherwise noted

** Some families with children had missing ages (n = 3), and were not included. Also, some families did not have children (n = 5), and some families had older children (>18 years old—n = 6)

^a Interviewee is designated family member

During the post gardening season participants were asked questions regarding use of fertilizers, compost, organic approaches for pest control, and cover crops (Table 3). A small percentage of the participants, 12.8%, used fertilizer in their garden, whereas 84.6% used compost. Additionally, 97.4% reported planning to use compost in the coming years. Only 5.1% reported using pesticides or herbicides in their garden. One hundred percent of participants reported planning to use a cover crop in the garden over the winter and 100% planned to plant another garden next year.

When asked if the garden helped the health of the family, 94.9% of participants reported that it did. A high percentage of participants (92.3%) also encouraged other families to start a garden too. Over two-thirds of the participants (69.2%) reported that children under the age of 18 helped in the garden. This may have been their children, relatives or neighbors. All respondents reported receiving the support that they needed to prepare, plan, tend, and harvest the garden, though there were requests for support in the future. Specifically, many families requested support with getting seeds (n = 24), composting (n = 23), pest control (n = 19), and advice on garden care (e.g. mulching and watering) (n = 14). Almost all the families (92.1%) planned to attend the *Harvest Fiesta* Celebration, though of the families that responded to the question about attendance only 33.3% reported attending.

The open-ended questions, “How do you think having a garden will help your family?” and “Do you think the garden helped the health of your family? If yes, how?”, were asked in the pre and post gardening surveys, respectively. Thirty-six participants responded to the pre-gardening open-ended question, with two other participants leaving the question blank. On the post gardening survey, 38 participants answered the open-ended question, with two other participants leaving the open-ended question blank, and two other participants had dropped out of the study. The responses to these two open ended questions generated several emergent themes (Table 4). Comments about physical health benefits and economic benefits were the most frequently mentioned concepts in the pre-gardening open-ended question. Comments about mental health and well-being, and family health were mentioned much less often. In the post gardening open-ended question, physical health benefits was still the most frequently mentioned concept, however, comments about economic benefits were mentioned much less often.

One participant responded to the pre gardening open-ended question by expressing a desire to learn how to cultivate more vegetables, falling under the concept of “learning” (data not shown). Additionally, when participants were asked why or why not the gardening meetings were helpful, almost half (10/21) of participants mentioned the benefits of learning from others through sharing knowledge and experiences.

Table 2 Comparisons of food intake and food security before and after gardening project

Food intake/security variables	Pre-garden	Post garden ^a	<i>P</i> value
Frequency that adults in household eat vegetables (n = 33)			<0.001
Several times a day, %	18.2	84.8	
Once a day, %	45.5	12.1	
A few times a week, %	33.3	3.0	
Almost never, %	3.0	0	
Frequency that children <18 years old in household eat vegetables (n = 25)			0.003
Several times a day, %	24.0	64.0	
Once a day, %	44.0	32.0	
A few times a week, %	32.0	4.0	
Almost never	0	0	
Frequency in past month that family worried food would run out before money was available to Buy more (n = 32)			0.006
Never, %	68.8	96.9	
Sometimes (a few times a year), %	15.6	3.1	
Frequently (at least once a month), %	15.6	0	
All the time	0	0	
Frequency in past month that adults skipped meals due to lack of money to buy food (n = 33)			0.32
Never, %	93.9	97.0	
Sometimes (a few times a year), %	3.0	3.0	
Frequently (at least once a month), %	3.0	0	
All the time	0	0	
Frequency in past month that children <18 Years old skipped meals due to lack of money to buy food (n = 27)			0.32
Never, %	100	96.3	
Sometimes (a few times a year), %	0	3.7	
Frequently (at least once a month)	0	0	
All the time	0	0	

^a Wording in the post gardening questionnaire referred to community gardening—e.g., during the summer when your gardening was producing did you skip meals because you ran out of money?

Table 5 provides summary results from the 10 post-gardening key informant interviews. Two core questions were asked and from these six themes emerged. The primary area of importance relevant to what the gardening program has meant for these underserved families is food security and safety. A secondary theme is carrying on the traditions from their home country. The second core question was relevant to the sharing and learning educational program delivered about pesticides and other aspects of organic gardening. Both anticipated and unexpected learning occurred related to both the gardening program

Table 3 Post-gardening report of activities, benefits and needed support associated with the project

Perceived activities and benefits	Responses
Activities	
Used store bought fertilizers in your garden (n = 39), %	12.8
Used compost in your garden (n = 39), %	84.6
Plan to use compost in garden in coming years (n = 39), %	97.4
Used pesticides or herbicides in garden (n = 39), %	5.1
Plan to use a cover crop in the garden over the winter (n = 37), %	100
Plan to plant another garden next year (n = 38), %	100
Benefits	
Perceived the garden helped the health of the family (n = 39), %	94.9
Families where children under age 18 helped in the garden (n = 39) ^a , %	69.2
Encouraged other families to start a garden (n = 39), %	92.3
Planned to attend the <i>Harvest Fiesta</i> Celebration of the Project (n = 38), %	92.1
Were able to attend the <i>Harvest Fiesta</i> Celebration (n = 30), %	33.3
Received the support needed to prepare, plan, tend, and harvest garden (n = 35), %	100
Support requests for future	
Getting seeds	n
Composting	24
Pest control	23
Advice on garden care (e.g., mulching, watering)	19
Advice on what to plant and when to plant it	14
Preparing the land	8
Tools to work in the garden	5
Canning or freezing vegetables	2
Other	2
	8

^a Among all families (not just those with children under age 18)

and building trust with investigators from the academic partnership.

Discussion

This study is important because it succeeded in enrolling and following 38 underserved families who actively participated in an organic community gardening project over

Table 4 Emergent themes from responses to pre-survey and post-survey questions: pre: how do you think having a garden will help your family? post: do you think the garden helped the health of your family? If yes, how?

Emergent theme	Definition	Pre: # of mentions	Sample quotes ^a	Post: # of mentions	Sample quotes ^a
Physical health benefits	Statements reflecting improvements to overall physical health including mention of nutritional benefits gained from eating fresh, chemical free vegetables, and mention of physical activity or exercise	24	“We will eat fresh vegetables, be healthier, the vegetables wont have chemicals and we will save a lot of money.”; “To do exercise, share with the family, learn how to cultivate more vegetables.”	29	“Eating fresh, natural, and healthy”; “We did more exercise and we ate healthier.”; “we exercised more, we ate healthier, it was a way to pass time and keep busy.”
Economic benefits	Statements mentioning how the availability of fresh vegetables has helped them to save money and/or time. Also comments regarding food security addressing the ability to keep fresh vegetables year round	21	“Save money. Prevent buying expensive vegetables”; “It will help save money. I wont have to go to the store.”	11	“When we had vegetables we would just go and cut them out side and eat them.”; “We saved money we ate good and I also could save some vegetables for the winter. I freezed some and also dried some.”
Mental health& well-being	Statements mentioning a feeling of calm or relief from the assurance that the vegetables are chemical free, and any comments regarding gardening efforts as a pass time bringing relaxation, enjoyment, or stress reduction	8	“To eat healthy. To entertain self, could be like therapy but also an obligation.”; “To relax, save money, fresh vegetables.”; “To save money, destress myself, pass time”	11	“I feel calmer knowing I am eating more naturally and the veggies don’t have chemicals.”
Family health	Statements involving how gardening efforts contribute to a sense of togetherness felt within the family, allude to family traditions, or mention of the garden as a place to spend quality family time building relationships	3	“So we can eat more vegetables and my son get involved.”; “The family will cultivate their own vegetables and the children will eat more vegetables because they cultivated them.”	5	“The kids enjoy watching the plants grow they try to help them grow bye trying to water them.”; “Yes it helped us a lot. We saved money and we also are showing our kids the love of the land who feeds us.”

Total number of participants providing responses for the Pre-survey and Post-survey questions vary independently (data do not represent responses from the same individual). Although some overlap occurs in respondents to pre- and post-test questions, this occurrence is infrequent

^a The number of mentions per emergent theme is not mutually exclusive; statements made by participants may be applicable to multiple themes

two growing seasons. Our findings indicate that the community gardening project held many health benefits, including a nearly four-fold increase in vegetable intake among adults and a three-fold increase among children. In addition, many families expressed satisfaction with knowing the vegetables they grew in their gardens were pesticide free, the process of having a garden carried on traditions they learned from family in Mexico and the economic benefits of not having to spend money on food. The median annual income for a family of four in the community studied was \$9,000, far below the 2011 US poverty level for a family of four, which is \$22,350 [17].

Though we expected vegetable intake to increase as a result of the gardening project, we were surprised to learn the importance of the project on family relationships. Several individuals reported that the gardening efforts contributed to a sense of togetherness within the family or as a place to spend quality family time building relationships. Over 69%

of children worked in the garden along with their parents. Clearly family traditions are strong among this population, even though many participants had lived in the US for a decade or more. We were similarly surprised to learn about the mental health benefits of the gardening project. Families enrolled in this study were agricultural workers who were either working in fields or packing houses for long hours, but found the community gardening activities were a good way to pass time, and bring relaxation, enjoyment, or reduce stress.

We found that in our sample of families, food security was a concern for about 31% of respondents to the survey before the gardening project, which dropped to 3% after the gardening project. However, very few adults or children reported having to skip meals either before or after the gardening project. Family pride is very important to these families and being able to provide for one’s family is a highly held value among this population. So these

Table 5 Thematic summary from post gardening key informant interviews—2009/2010 *Harvest Fiesta*

Study question	Themes	Exemplars
1. What has the gardening program meant for you and your family?	Food security (for family and neighbors)	“Garden for me is very important because for a while you have everything you need. Every family should have one to learn how to produce for themselves. It is also important as a family tradition because we share the food with neighbors, daughters, sons-in-law....”
<i>Probe:</i> how long have you been in the program?	Food safety (no chemicals)	“I do need to buy things at the store and we do use our own garden harvest for winter vegetables—we do this because the food is so expensive in the winter. We buy some vegetables in the summer because it is cheaper and the food is fresh and we save our garden’s food for winter.” “We enjoy vegetables with no chemicals in them” “The most important things are that there are no chemicals in the vegetables”
	Carrying on traditions of 1st family in Mexico both for raising culturally important foods (e.g. salsa) and for working in the soil	“My wife is one of 12 siblings and gardening is a family tradition. This came from living in Mexico, which was the only food they had.” “Working the soil is important—my husband loves the earth and cultivating the earth is so important. I love to learn and it is important for the children to see planting and helping with it. I worked with my father in the garden in Mexico” “We have so much pride about the vegetables. We love to work with the earth—it is a family tradition”
2. How has the education program on pesticides, insects and ground cover been helpful to the program?	Unexpected learning	“It has been important to know about bad dirt and not to bring dirt from the pesticide garden. We are now bringing it from the cow pasture. “We now use natural fertilizer that my husband makes—we have been composting.”
	Anticipated learning	“We also want to learn more about composting to make the soil better. We have so much hope for our children, but fears too (about documentation).” “The educational materials that were really helpful because of the fear of pesticides—we have had to deal with slugs and snails though we have been about to keep these away by giving them beer—they eat the beer and die.”
<i>Probe:</i> what was it like having researchers from Portland be a part of the program?	Building trust & interdependence	“Having you visit us it good—communication is better this way because you can see how we live and we can hear your voice.” “Having people from Portland coming makes us feel valued and we want them to know how much work the gardening is—it is good that they (people from Portland) care about us and want to learn from us—we can support each other.”

responses may have been affected by social or cultural bias, which indicated an underestimation of the degree of concerns these families have about food security and whether meals are actually skipped. Our findings differ from those of Kirkpatrick et al. [5], which found when surveying 484 urban low-income families that over two-

thirds were food insecure and 25% were severely food insecure in the past year. In addition, even though community gardening was an option to address food insecurity, very few families in this study used this option. The majority used children’s food programs or food banks. It may be that the relationship the community partner

developed with the underserved farm workers helped to foster participation in the program.

We found that both the community partner and the enrolled families valued the relationship with investigators at OHSU. The community partner was happy to get assistance with survey design and data analysis. The community partner credits the success of this partnership to the community partner's built trust from the community and the investigators' respect and sensitivity to working with the community partner and community members. As a partnership, we also learned that CBPR can be effective and a positive experience when both the community and research partners treat each other with mutual respect, acknowledge the strengths each brings to the table, collaborate on equal playing field and with community members in an ethical way.

Investigators were attentive to interacting appropriately and respectfully with community members. They followed the guidance of the community partner to do so. Community members who attended the group meetings reported that having people come from OHSU made them feel they were important and listened to. Though we succeeded in enrolling nearly 40 families, attendance at the community meetings was lower than expected. This study was conducted shortly after a high level of documentation was required to obtain a drivers license in Oregon and more immigrants were being detained, then deported. This limited the number of people willing to drive to a central location for these meetings due to immigration concerns. When attendance was low, the health promoters delivered the educational messages to families at their homes.

The strengths of our study include that we were able to enroll and track 38 families' participation in a community organic gardening study, were able to orally administer pre- and post test surveys to a majority of these families to determine the impact of the gardening project on vegetable intake, food security and family relationships. The weaknesses include that the study design was observational and pre-post rather than a randomized design, which would have provided more rigorous evaluation. It was not possible to include a randomized design in this study because the relationship between the community and academic partners was not yet well established and these families were very underserved; thus, we felt it unethical to assign families to receive gardening supplies and assistance versus not, when they are struggling economically.

The community partner is committed to help families build skills for loving relationships and healthy lifestyles. The academic partner is committed to conducting research that will improve the health of US populations, especially those in underserved settings. By coming together, these partners can achieve both goals. We are currently planning the next project and are hopeful that the partnership can

both continue and grow. In conclusion, we learned in this study that a community gardening program can reduce food insecurity, improve vegetable intake and strengthen family relationships.

Acknowledgments This study was funded by the National Institute of Child Health and Human Development (R03-HD059488).

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