Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
https://foodsystemsjournal.org

Socio-cultural benefits of an urban agriculture initiative designed for vulnerable populations in Tucson, Arizona

Nataliya Apanovich,[a] * Gene Olga King,[b] Ashley Limbaugh,[c]
Garrett Smith,[d] and Sandra Bernal [e]
University of Arizona

Submitted December 27, 2024 / Revised February 25 and March 18, 2025 / Accepted March 24, 2025 / Published online June 19, 2025

Citation: Apanovich, N., King, G. O., Limbaugh, A., Smith, G., & Bernal, S. (2025). Socio-cultural benefits of an urban agriculture initiative designed for vulnerable populations in Tucson, Arizona. *Journal of Agriculture, Food Systems, and Community Development*, *14*(3), 123–140. https://doi.org/10.5304/jafscd.2025.143.022

Abstract

While urban agriculture can address many challenges faced by vulnerable populations, the additive effect of combining two completely different groups in an urban food production setting is murkier. To examine the role of a collaborative urban garden setting in addressing food security and social isolation challenges among university students, refugees, and asylum seekers in Tucson, Arizona, we designed a 10-week-long study centered around communal food production, educational sustainability workshops, and cultural exchange. We relied on the elements of the socio-ecological and nature-based solutions frameworks to emphasize the interconnectedness of human

[a] * *Corresponding author:* Nataliya Apanovich, School of Landscape Architecture and Planning, University of Arizona; 1040 North Olive Road; Tucson, AZ 85719 USA; +1-864-237-3041; apanovichn1@gmail.com; https://orcid.org/0000-0003-4539-5424

[b] Gene Olga King, School of Landscape Architecture and Planning, University of Arizona; 1040 North Olive Road; Tucson, AZ 85719 USA; geneking@arizona.edu

[c] Ashley Limbaugh, School of Landscape Architecture and Planning, University of Arizona; 1040 North Olive Road; Tucson, AZ 85719 USA; alimbaugh@arizona.edu

[d] Garrett Smith, School of Landscape Architecture and Planning, University of Arizona; 1040 North Olive Road; Tucson, AZ 85719 USA; garrettsmith@arizona.edu

[e] Sandra Bernal, School of Landscape Architecture and Planning, University of Arizona; 1040 North Olive Road; Tucson, AZ 85719 USA; sbernal@arizona.edu; https://orcid.org/0000-0002-3235-2014

Funding Disclosure

The funding was provided by the Pat and Peter Herschman University-Community Partnership Research Fund.

Author Note

The first author presented preliminary results from this study at the National Sustainability Society Conference in September 2024.

systems and natural environments. Through pre- and post-study surveys (students) and interviews (refugees) and observations with nine students and refugees, we found that both groups experienced positive impacts on food access and social connections. All of this is reported within the context of developing a sense of agency and belonging.

The results indicate that urban gardening creates pathways to empowerment and equalizes the differences between the groups and the groups and society. We recommend future research explore additional benefits of such collaborations and potential ways of institutionalizing them within communities with significant vulnerable populations.

Keywords
urban agriculture, vulnerable populations, food security, participatory research, social isolation

Introduction

Urban agriculture takes many forms (i.e., traditional farms, community gardens, allotment gardens, rooftop gardens, hydroponics, aquaponics, and indoor vertical farming) and is defined as the cultivation, processing, distribution, and sale of food in urban and suburban areas for commercial, hobby, educational, or nonprofit purposes (Pradhan, 2023; U.S. Department of Agriculture [USDA], n.d.). Over the last three decades, urban agriculture in the U.S. has grown significantly, with an increase of more than 30% (U.S. Senate Committee on Agriculture, Nutrition, & Forestry, 2023). This growth is explained by multiple factors, including expanding awareness of food insecurity (Siegner et al., 2018), sustainability and climate change–related concerns (Skar et al., 2020), desire to make communities more resilient (Gattupalli, 2024), increasing policy support (U.S. Senate Committee on Agriculture, Nutrition, & Forestry, 2023), new health movements (London et al., 2021), and technological advances (Velazquez-Gonzalez et al., 2022).

The benefits associated with urban agriculture include social, economic, and environmental aspects, with social benefits being the most cited in academic literature (Siegner et al., 2018). Environmental benefits come from the reduction of food distribution-related emissions and transformation of vacant urban land to create green space that helps break up the urban heat island effect by capturing carbon, growing native plants, and creating habitats for native animals and pollinators (Clucas et al., 2018). The economic benefits include reducing produce distribution costs and food waste as well as creating jobs (Kafle et al., 2023). The social benefits include community development, reconnection to cultural practices, and increased health, well-being, and food security (Papanek, 2023). A systematic review of over 2000 articles by Cano-Verdugo (2024) found that urban gardening increased physical activity, general health, and healthy eating while decreasing drug use. All of these benefits have been linked to the potential of urban agriculture to develop a sense of belonging and empowerment among its practitioners. For example, when community residents participate in maintaining and building urban farms, neighborhood pride and sense of place strengthens (Firth et al., 2011). Additionally, through social interaction and food, urban agriculture allows marginalized communities, especially non-U.S. citizens, to maintain their cultural heritage, which creates a sense of belonging (Bessho et al., 2020). Overall, urban farming was found to increase social capital through building social networks, providing opportunities for resource sharing and social support, preserving cultural knowledge and practice in diaspora, and reflecting and reinforcing collective efficacy (Shostak & Guscott, 2017).

Most of the literature on social benefits of urban agriculture focuses on marginalized populations such as the elderly, students, people with varied health conditions, and non-citizens (Gregis et al., 2021). Two of these groups, students and non-citizens, face many of the same challenges including social isolation and food insecurity. Studies found that anywhere from 20 to over 60% of all college students experience depression (Gallagher & Taylor, 2014; Ohayon & Roberts, 2014). While some students experience mental health issues before they move to university, others succumb to mental health challenges due to moving away from family and friends. According to some studies, acculturation issues, differences in help-seeking behaviors, worries about families left behind, diffi-

culties managing social situations, lack of support networks, discrimination, post-traumatic stress reactions, and financial struggles are just some of the concerns complicating an already stressful life transition (Ellucian, 2024; Grabmeier, 2015; Riba et al., 2015). Liverpool et al. (2024) identified the following coping strategies used by the students in the U.K.: talking to friends and family, practicing religion or spirituality, engaging in creative or innovative activities like hobbies, using entertainment as a distraction, waiting to see if things improve, and isolating. This is confirmed by Rivera-Morales et al. (2024) who identified social withdrawal as a negative coping strategy with stress and that cooking, seeking family support, and using a wellness center as positive coping strategies among medical school students.

In addition to mental health risk factors, university students also face food insecurity. A seminal study by Bruening et al. (2017) calculated the prevalence of food insecurity affecting nearly one third of students. To cope with food insecurity, college students restrict the quality and quantity of food they consume. Brescia and Cuite (2019) found that food insecure college students stretch their meal plans by taking food out of the cafeteria for later, while some remain in the cafeteria for more than one meal specifically because they cannot afford an additional meal. The study also found that food insecure students attend campus events with food solely because of their inability to afford a meal (Brescia & Cuite, 2019). Olfert et al. (2023) describe food insecurity as one of the biggest threats to students' academic success. Food insecurity also impacts students' health and may even lead to social isolation (McKenzie & Watts, 2020).

Many non-citizens, such as immigrants and refugees, face the same challenges as U.S. university students. For example, statistics on food insecurity among African and Asian refugees living in the U.S. are like those of the college students (Nunnery & Dharod, 2017). Some of the factors that impact food security among refugees are acculturation and social isolation, but root causes of food security within refugee communities are complex (Hadley et al., 2007). These causes can include immigration status, racism and bias, classism, linguistic limitations, lack of childcare and transportation, limited nutritional knowledge, absence of formal training and work histories, and cultural barriers (Bowen et al., 2021). Language proficiency and bureaucratic barriers leave some unable to reapply for Supplemental Nutrition Assistance Program (SNAP) benefits after their initial resettlement term or seek other forms of help. Financial limitations are a major challenge to food security, as many refugees report lengthy job searches resulting in low-paying and/or temporary employment.

Food insecurity coping strategies among U.S. refugees often include relying on social networks (Hadley et al., 2007), participating in food assistance programs (e.g., SNAP and Special Supplemental Nutrition Program for Women, Infants, and Children [WIC]), and adapting cultural food practices to available resources. Many refugees engage in urban agriculture or community gardening to grow culturally significant foods (Alhabas, 2021), which helps address both dietary needs and cultural preferences. Additionally, refugees may use local food pantries or seek support from community organizations tailored to immigrant needs (Ibrahim et al., 2019). These strategies reflect both refugees' immediate needs and long-term adjustment efforts to food insecurity challenges.

Community gardening provides a wide range of benefits to vulnerable populations with social connections, education, and nutrition being the most significant (Tracey et al., 2023). Urban gardens can also bridge cultural differences by bringing people together through their food identities, which is understood as a key way humans define who they are (Hammelman & Hayes-Conroy, 2015). By growing food in traditionally practiced ways, cross-cultural interactions between those in a community garden can help facilitate cultural discussions. Importantly, they act as safe spaces for vulnerable immigrants, refugees, and other groups to integrate socially and become involved in a larger community where their culture is valued (One New Humanity Community Development Corporation, 2022). Community gardening benefits university students through therapeutic healing, increased social interaction, and connection with nature (Apanovich et al., 2023). This, in turn, improves students' academic performance and leads to the development of a meaningful relation-

ship with the community (Apanovich et al., 2023). Additionally, growing one's own food encourages self-reliance, reducing food insecurity. Thus, urban agriculture is a multi-encompassing strategy to address food insecurity and social isolation in vulnerable urban populations.

While there is ample existing research reviewing the effects of urban agriculture on individual vulnerable populations, little literature exists discussing the effects of bringing two different types of vulnerable populations together for collaborative work in a community garden. The benefits of this type of intergenerational and/or intercultural collaboration are worth considering in parallel with the more studied benefits derived from direct engagement in food production activities, as they might bring added value to urban farming.

To fill this gap, our study seeks to understand how bringing two vulnerable populations together (refugees and students) in a community garden setting can create a sense of belonging and empowerment to address psycho-socio-cultural challenges (e.g., social isolation and food insecurity). Specifically, the study has the following objectives: (1) to assess the impacts of a collaborative urban gardening initiative on food security, social isolation, and sense of agency among university students and refugees in Tucson, Arizona; (2) to investigate how intercultural and intergenerational interactions within a community garden foster empowerment, belonging, and resilience in both groups; and (3) to provide practical insights for institutionalizing cross-demographic urban agriculture programs to address socio-ecological challenges in vulnerable communities.

To achieve this, we rely on the elements of socio-ecological and nature-based solutions (NbS) frameworks that emphasize the interconnectedness of human systems and natural environments (Artmann & Sartison, 2018; Colléony & Shwartz, 2019). The socio-ecological framework examines how humans and ecosystems influence each other. By focusing on these interactions within a community garden, the study can explore how students and refugees interact with each other and with the environment, creating opportunities for social cohesion and shared learning. The framework also encourages examining how changes in one system (e.g., people's access to food) can affect the broader socio-ecological system (e.g., community well-being). The NbS framework, meanwhile, advocates for using natural processes, such as community gardening, to address urban challenges (Vujcic et al., 2017). Community gardening acts as a NbS that directly enhances local food production while simultaneously providing mental health benefits and promoting environmental sustainability. When applied to a study involving vulnerable populations, the NbS framework helps frame the community garden not only as a food production space but also as a natural environment that supports well-being and enhances resilience against food insecurity (Barton & Pretty, 2010).

This study is significant because it provides valuable insights on how to create urban spaces that can simultaneously support multiple vulnerable populations while creating a holistic approach to tackling urban socio-ecological challenges. This study contributes to the growing body of literature on urban resilience and sustainability.

Methods

This qualitative study employs a community-based participatory research design, engaging refugees and university students in a series of structured urban gardening and cultural exchange sessions. Data were gathered via semi-structured interviews, pre- and post-intervention surveys, and field observations and subjected to thematic analysis within socio-ecological and nature-based solution frameworks.

The Study Area

The study took place at a community garden space located on the premises of a local nonprofit organization Iskashitaa Refugee Network (Iskashitaa) in Tucson, Arizona. Iskashitaa was founded in 2003 to help U.N.-recognized refugees and asylum seekers (from now on "refugees" only) to integrate into the greater Tucson area through food-based programming. From its inception, Iskashitaa has helped over 60 ethnic groups across Africa, Asia, Eastern Europe, the Middle East, and Latin America. The organization's main activities involve gleaning local food, such as oranges, lemons, pomelos, and grapefruit, from private backyards and

farms for redistribution to the refugees and community partners to share with other vulnerable populations. These activities prevent food waste and address the issue of food insecurity in the community.

Iskashitaa's garden is one of the oldest organic urban gardens in Tucson and is used for education, food production, and social bonding. Specifically, the garden serves as a living laboratory for sustainable desert food production and relies on rainwater harvesting, drip irrigation, Bokashi [Japanese] composting, and mulching. The garden serves as a space for the refugees to grow their traditional foods and share knowledge. Finally, the garden serves as a gateway to other social activities that Iskashitaa offers, such as drum circle, storytelling, and art, aiding refugees with language skills, civic knowledge, and psychological trauma management. This garden was chosen for the study for its pivotal social role in the community and adherence to sustainable gardening practices.

Study Design

This community-based participatory study engaged two vulnerable community groups: university students from the University of Arizona and Iskashitaa-affiliated refugees and asylum seekers. By bringing these groups together in a collaborative urban garden setting, we hoped to address two of the biggest challenges faced by these demographics: food insecurity and social isolation. To achieve this, the participants worked together in the garden for one hour a week for 10 weeks from February to April of 2024. The participants engaged in such gardening activities as weeding, watering, seeding, harvesting, mulching, composting, building and maintaining garden beds, and processing harvested foods. Additionally, the participants were engaged in various workshops to gain knowledge on sustainable food production in a desert climate. For example, the participants partook in rainwater harvesting and Japanese composing workshops. Each working session started with a breakfast that was either prepared by the refugee participants or other refugees from within the community. The participants also engaged in the drum circle, which historically had been used by Iskashitaa to allow refugees practice their culture in a safe place. The purpose of all these activities was to help the participants develop self-empowerment, a stronger sense of agency, and become more familiar with the local community.

We planned to include only 10 refugees and students in the study to be able to create meaningful interaction between the groups. We originally picked 11 students and 11 refugees with the intention that some would not be able to finish the study. As predicted, only nine students and refugees completed the study.

Due to budget considerations and the intentions of the first author to use this study to redesign one of the introductory courses in the Sustainable Built Environments (SBE) program, only students in this program were considered for the study. The criteria for choosing students consisted of a two-step process. First, we identified only those who could get to the garden at the designated time and engage in weekly garden work activities for an hour for 10 weeks. Second, we used that pool of students to identify those who could be or had been experiencing food insecurity and/or social isolation. Thus, to identify the students who met the above criteria, we developed a pre-screening survey and electronically sent it to all 112 students in the SBE program within the School of Landscape Architecture and Planning at the University of Arizona. After reviewing the results, we met with all 22 qualifying participants in person to go over the expectations of the study. This process eliminated some participants, thus reducing the participant pool to 11. After we finalized the student participants, we met with them in person again to review the expectations of the study and to receive written consent. A week before the study started, our Iskashitaa partners organized and delivered Refugee 101 training for the students to better prepare them for collaborative work with refugees. In this training, the students learned about what it means to be a refugee or asylum seeker in the U.S., cultural differences between refugees and the U.S., social challenges that the refugees often face in the U.S., and acceptable forms of attire and communication.

Due to a lack of personal transportation, unfamiliarity with public transportation, and financial challenges that refugees often face, the main crite-

rion behind refugee selection was their ability to get to the garden and participate in the study for all 10 weeks. Once the refugees who satisfied this criterion were identified, our Iskashitaa partners met with them in person to review the expectations of the study and to receive written consent. As a result, a pool of 11 refugees were identified. The chosen refugees represented eight different countries and spoke five languages. The selected refugees represent a much larger refugee community in Tucson. There is no official estimate of how many refugees are in Tucson presently due to their frequent movement in and out of state, but our Iskashitaa partners and local government reports estimate that there are thousands. Our partners also shared that the most important refugee assistance programs usually last only a few months and are simply not enough to ensure that refugees become fully integrated, acquire the necessary language skills for employment, and achieve independent living before the programs end. Many refugees arrive in the U.S. at an older age and with pre-existing conditions, which makes language acquisition and job-finding challenging. Iskashitaa fills this gap by using its networks to connect the refugees to food, housing, and community and by providing opportunities for social interactions and healing through arts and gardening. At the end of the study, all participants were compensated for their time with a $300 stipend. Additionally, because the study took place in the morning, we served breakfast to everyone. Most of the breakfasts came from the refugees themselves (and other refugees in the community) as they were eager to share their culture with the students.

The first author decided to partner with Iskashitaa because of her familiarity with the organization's community work. She had not previously collaborated with Iskashitaa, nor did she have any direct contacts within the organization. Once the relationship was established, she began volunteering with Iskashitaa before, during, and after the study. Two of the co-authors are also instructors in the Sustainable Built Environments program at the University of Arizona; although they have no direct relationship with Iskashitaa, they are deeply rooted in Tucson, Arizona. Finally, the remaining two co-authors, who are students, helped run the study and also volunteered with Iskashitaa throughout the study.

Data Collection and Analysis

Data collection was derived from surveys, interviews, and observations. The students received pre- and post-study online surveys. The pre-study survey consisted of open-ended questions and captured students' real and/or hypothetical coping strategies with food insecurity and social isolation and their engagement with the community. We decided to include hypothetical language due to a small participant pool and the sensitive nature of the issues studied that could make the students feel socially stigmatized. We hoped this language created a mental barrier between the students and the issues that they might have been experiencing and allowed for more authentic responses. We also asked about the perception of the role of culture in food security and social isolation to better understand the role of community and cultural awareness in the students' lives. The pre-study survey also collected information on students' expectations, motivations, and potential challenges in participating. All of this helped us better understand the reasons why the students decided to participate in the study and later compare them with the outcomes.

The post-study survey consisted of open-ended questions and contained questions on food insecurity and social isolation coping strategies, self-reported study outcomes, challenges encountered, and the perception of the role of culture in food security and social isolation. This showed us how students' thinking about and approach to addressing food insecurity and social isolation changed with increased cultural awareness and community engagement. The pre- and post-study surveys were administered online to control bias. All responses were anonymous and analyzed using the thematic approach to identify and interpret recurring patterns. The developed themes were corroborated with observations.

The refugees were interviewed in-person in their native language before and after the study due to literacy challenges. The interpreters came from within the refugee community to ensure trust and familiarity with the participants. The pre-study interview asked questions about refugees' back-

ground and their experiences with engaging with Iskashitaa and the community at large. This allowed us to establish a baseline for their food-related and social challenges. The post-study interview solicited feedback on study outcomes as well as food-related and social challenges. Our focus with the refugees was more on the social component than with food since some of the participants had been working in the garden before the study started. We used the same thematic approach to analyze and code refugee responses. The developed themes were corroborated with observations.

Results

The results section first presents the findings for student participants, detailing changes in survey measures alongside observational data. It then reports the outcomes for refugee participants, summarizing interview responses and corroborating field observations.

Students

Before the garden work, most students reported lacking a satisfactory connection to the community (Table 1). For example, one student reported a connection that "lacks a strong sense of fulfillment." Another student reported experiencing complete disconnection: "I don't really know anyone here, and I don't feel like I am a part of any community." Those who reported being connected characterized the nature of their connection along five themes: community engagement, cultural awareness, social connection, civic participation, and local identity.

The students reported multiple reasons for participating in the study (Table 2), with most students reporting more than one reason. Community engagement, cultural awareness, social connection, financial incentives, learning, and food security were the reported reasons for participating.

Before the work in the garden, the students reported five hypothetical and/or real food insecurity coping strategies: social connections (e.g., family and friends), community engagement, food production, diet change, and government assistance (Table 3). While only three students reported they would try to produce their own food, the rest indicated they would get it from somewhere else. One student indicated the role social media could play in addressing food insecurity: "I would outsource to other places that may have food with my access to social media."

After the work in the garden, the students reported three main food insecurity coping strategies: community engagement, personal food production, and individual behavior change (Table 3). Some students reported that they would rely on multiple coping strategies: "I would have a few resources available such as my local community bank, the ladies at the garden who hand out food, and I could also grow some of my own food." Interestingly, after the work in the garden, none of the students reported social connections (e.g., friends and family) as a coping strategy. This reflects a shift in the students' perceptions of the role of the community in addressing food insecurity: "If I were to experience issues accessing food now, I would look at community resources to find

Table 1. Student Participants' Perceived Connection to the Community Before the Work in the Garden, with Representative Quotes

	Connection				
Themes	**Community Engagement**	**Cultural Awareness**	**Social Connection**	**Civic Participation**	**Local Identity**
Quote	"I am involved in a lot of community service and volunteer work around Tucson."	"I shop regularly at cultural food markets."	"I feel I know people from all around."	"I don't participate in public forums on the state of the city or give my input on certain decisions."	"I am a university student in my local community."
Explanation	Commitment to local initiatives	Appreciation for diversity	Interconnectedness	Disengagement in civic decision-making	Role of education in shaping community identity

options." Additionally, some students changed their coping strategy from relying on the community for donations to relying on the community to volunteer in exchange for receiving produce: "I would continue pursuing community resources for food. Perhaps expanding my horizons on places that need volunteering." Some students exhibited a realization of the richness of community resources available to address food insecurity: "Before the study, I was not very familiar with the amount of similar community organizations and nonprofits in Tucson that dealt with this issue." Some students expressed enough confidence in the gardening skills that they acquired during the study to start their own food production: "I would leverage the skills I've acquired to grow my own plants." Overall, this seems to point to the sense of agency that the students gained over their lives: "By taking control of my food production, I can ensure greater resilience and self-sufficiency." This claim is further supported by some students changing their own behavior to address food insecurity: "I think I would be far more mindful about my food waste and ... consider ... composting food waste."

Before the work in the garden, the students reported two main coping strategies for social isolation: social connections and community engagement. In terms of social networks, the students reported relying on family and friends: "I would reach out to old friends and get in touch with family," "I would hang out with family and friends." In terms of community engagement, the students said they would "look for events where people with common interests gather" and "I would ... get involved with a popular community activity if I was in the position to afford it." One reported experiencing social isolation and not doing anything about it: "I tend to isolate myself even more by staying in and watching TV." Another student acknowledged having this issue and addressing it by participating in this study: "signing up for this is one thing I am doing about that [social isolation]."

After the work in the garden, the students reported they would rely on community resources and newly formed networks to address social isolation. Some reported they "would find a community group that suited my interests" while others

Table 2. Reasons for Student Participation in the Study, with Representative Quotes

	Participation					
Themes	**Community Engagement**	**Cultural Awareness**	**Social Connection**	**Financial Incentives**	**Learning**	**Food Security**
Quote 1	"I am hoping to be social and experience community while also providing for the community."	"To learn about the refugee experience."	"networking opportunities."	"The financial incentive sounded appealing."	"aiming to enhance my practical skills for future internships and jobs."	"to bring home fresh crops."
Explanation	Commitment to local initiatives	Appreciation for diversity	Building professional relationships	Motivations for involvement	Role of education in community engagement	Participation in a local food system
Quote 2	"to interact with more of the community."	"Help refugees and obtain a better cultural perspective from worldwide situations."	"A stronger connection with those in my career field."	"The [US]$300 at the end will be nice because I need money."	"to gain more practical experience at community gardens."	
Explanation	Desire for social connection	Broader cultural understanding	Enhancing professional network	Practical considerations for participation	Hands-on learning in local settings	

Table 3. Pre-and Post-Garden Work Hypothetical and/or Real Food Insecurity Coping Strategies as Reported by the Student Participants, with Representative Quotes

	Food Insecurity Coping Strategies									
Themes	**Social Connections**		**Community Engagement**		**Food Production**		**Diet/Behavior Change**		**Government Assistance**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Quote 1	"I don't have a car, but I have my friends that help me get groceries."	—	"I would reach out and find areas that give out donations."	"I would look to see if there is one or multiple community gardens I can volunteer at where I can get some food to eat."	"I would cultivate vegetables, fruits, and roots."	"I would leverage the skills I've acquired to grow my own plants."	"I would switch to cheaper and unhealthier food options."	"I would be far more mindful about my food waste… and would consider composting food waste."	"I have utilized EBT food assistance as a student with a limited budget."	—
Explanation	Reliance on personal connections	—	Exploring community resources	Relying on multiple resources	Self-reliance through personal food production	Self-reliance through personal food production	Compromising food quality and health to save money	Changing habits around food to prevent and manage waste	Reliance on the government for food access	—
Quote 2	"carpool with neighbors"	—	"I would go to a food bank."	"I would utilize resources like a community garden."	"I would likely begin to garden."	—	"I used to dumpster dive regularly."	—	—	—
Explanation	Reliance on those physically around	—	Reliance on a specific community resource	Volunteering to gain access to food	—	—	Adopting diet to what is wasted	—	—	—

"would look for community volunteer opportunities, especially garden or plant related." This seems to indicate that community gardens are perceived not only as a method to address food insecurity but also social isolation. Others reported "a greater social network after completing the study" and that they "would hang out with the new friends ... made during the study."

The students reported two main benefits from their participation in the study: social connection and new knowledge and skills (Table 4). The social connections were based on the development of new relationships and cultural and language exchange. For example, one student reported "we've been able to break down barriers and form meaningful connections, despite our differences in language or upbringing." The new knowledge and skills came from learning gardening and environmental stewardship. Some reported learning about the refugee experience: "I became more aware of the reality of being a refugee." Despite the efforts to create smooth communication among the participants, some students reported that "it was difficult to communicate with the refugees when we needed to complete a task in the garden. For instance, if we needed to cut some leaves off of a plant but not all of it, the refugees wouldn't understand us when we would say, 'I think that's enough.'"

Refugees

The refugee participants came from eight different countries spanning across South America, Eastern Europe, Africa, and South Asia. Most of the participants reported coming from agricultural backgrounds where they directly contributed to the production of some or all of their food. The time the refugee participants spent in the U.S. ranged from six months to 19 years.

The refugee participants reported joining Iskashitaa for multiple reasons: to give back to the community ("we volunteered in Poland for the Red Cross and because we are grateful people, we try to give the same in return"), to develop a deeper connection to the community ("I joined for the community"), to get connected to additional refugee-related assistance ("Iskashitaa directed us to other organizations that provided some benefits to us"), to stay connected to the land ("I missed so much of my own life in the fields, planting and being around plants"), and to learn more about other cultures ("Even though I am African, I want to know the American culture").

Most reported not having adequate access to

Table 4. Student Participants' Perceived Study Outcomes, with Representative Quotes

	Perceived outcomes			
	Social Connections	**Community Engagement**	**Cultural Awareness**	**Learning**
Quote 1	"I was able to interact with my partner and help her with some more English..."	"I got to enjoy a sense of community each week..."	"I also learned a little bit about some different cultures."	"This experience introduced me to various gardening basics and techniques, specifically Bokashi composting."
Explanation	Supporting language development and communication	Experiencing belonging	Expanding cultural understanding	Engaging in sustainable practices
Quote 2	"I made new friends."	"I was able to enjoy time with everyone in the community while helping out in the garden that is able to feed this beautiful community."	"I learned about the refugee experience and how this transition can be challenging."	"I also learned skills in gardening and sustainable landscape keeping."
Explanation	Building social connections	Experiencing community building and social solidarity	Understanding diverse life experiences	Skills development and social learning

the staple foods, such as sweet potatoes, yams, cassava leaf, plantains, and pigeon peas, that they used to eat in their home countries. While the garden didn't grow these foods during the study, after the study, some reported the acquisition of new knowledge about how to produce food in a desert: "In a desert, to learn about how to grow food is very interesting." Others reported learning about the foods that grow well in a desert: "I learned many plants I didn't know before." Some learned about the health value of eating fresh produce: "Many diseases come from foods that are not healthy. Eating vegetables and fruit help us to stay in good health."

Most reported developing new friendships as a result of their connection to Iskashitaa but when asked about the connections outside of their refugee community, several refugees indicated no connections. For example, one refugee reported that she and her husband "don't get out hardly." The pre-study responses indicate that most social connections come from within the refugee community, while the post-study responses show more diversified social networks (Table 5).

Overall, the refugees characterized the study's perceived benefits along the following themes: social connection, cultural awareness, learning, overcoming barriers, and environmental stewardship (Table 6). In terms of social connections, the refugees reported bonding as a result of developing relationships, exchanging knowledge, working collectively, and exchanging cultures. Some reported how important it was to work in a multigenerational setting: "The difference in age with the students was educational for us," "I think that overall combining different generations was a good strategy." Another participant reported they would recommend this experience to other refugees "so [that] people can join others, talk and share information and get more friends."

In terms of new knowledge and skills, the refugees reported learning about food production, improving their English language skills, and learning about plant knowledge. One refugee shared about how learning about water use in a desert was very educational for him. Another said that now "... [I] know how to grow fruits and vegetables and protect my health." One refugee indicated that she learned environmental stewardship from watching the students care for the garden. Finally, the refugees reported overcoming barriers such as social anxiety. Observations show increased social interactions especially among those refugees who had no or very minimal English language skills.

Discussion

This participatory study examined the benefits of an urban garden project by combining two vulnera-

Table 5. Pre- and Post-Garden Work Refugees' Self-Reported Social Connections

	Social Connections			
	Refugee-Related Networks		Non-Refugee Networks	
	Pre	Post	Pre	Post
Quote 1	"I have two friends from Burundi. Also, I am friends with volunteers [from Iskashitaa]."	"I tell others about the Iskashitaa garden and some of them are joining the group."	—	"I make a lot of friends, now I have student friends."
Explanation	Relationship with community organizations that assist refugees	Relationship based on sharing about community resources	—	New intergenerational relationships
Quote 2	"I connect with people who know who you are and where you come from."	"Some of the people I met from this organization have become like friends and we have chat about jobs and life."	—	"I share some of the fruits that I got here with my neighbors, so they are willing to come here and join. I am really happy."
Explanation	Relationships based on shared background/experiences	Relationships that evolved over time	—	Relationship based on sharing resources

ble groups in a collaborative setting based on garden work, educational workshops, and opportunities for cultural exchange. The participants reported positive impacts on food access and social connections as well as the acquisition of new knowledge. Overall, both groups experienced a closer connection to the community and an increased sense of agency over their lives.

One of the most notable changes occurred in students' food insecurity coping strategies. While the pre-study answers demonstrate a strong dependence on others (e.g., friends, family, and government) for food access, the post-study responses indicate a shift toward self-reliance. For example, most of the students reported turning to the community not for food donations, as they reported in the pre-study responses, but to volunteer in hopes of gaining access to fresh produce. In fact, after the study, more students reported wanting to grow their own food. One student even indicated making a personal behavior change such as limiting his food waste generation, contrasting the potentially harmful diet change strategies (eating cheaper fast food and dumpster food) that were reported before the study. This indicates that the students acquired a sense of agency over their lives and are willing to actively engage in addressing their own challenges rather than relying on others for help. This is reflected in the fact that after the study, none of the students indicated personal networks as a possible food insecurity coping strategy. Similar results were reported by Dunlap et al. (2019), who found that community garden involvement was a means to foster self-reliance and address food insecurity, and Reese (2018), who found that community gardens foster a sense of agency that helps marginalized groups navigate spatial inequalities. Additionally, Gripper (2023) found that participation in urban agriculture was a demonstration of agency and power. Thus, improved food access was achieved as a result of direct food production (e.g., garden yields) and harvesting, skill-building and knowledge transfer (skills for independent food production), and strengthened community networks (networks enabling resource-sharing).

Table 6. Refugees' Perceived Study Outcomes, with Representative Quotes

	Social Connection	Cultural Awareness	Learning	Overcoming Barriers	Environmental Stewardship
Quote 1	"I discovered I have a good touch and relationship with the students."	"It gave me an opportunity to get to know the students, to ask them questions about where they are from, what they are studying, to learn about their culture."	"I also improved my English."	"My first experience was to be comfortable, not to be afraid anymore and to talk and work with the students."	"working with the students allowed me to know that young people love the environment. I started to teach my children to like and protect the environment, and one of them came sometimes to join us in the garden."
Explanation	Building social rapport and interpersonal skills	Practicing cultural exchange and interpersonal communication	Enhancing communication skills	Building confidence in community interactions	Intergenerational connection through shared values
Quote 2	"I had one partner … and I learned a lot about what he did and he learned a lot about me."	"We were curious to learn about the students."	"I learned many plants I didn't know before."		
Explanation	Practicing interpersonal understanding	Engaging with diverse backgrounds	Gaining practical knowledge		

The results also indicate a more meaningful connection to the community, which shifted from being extractive to collaborative. By relying on the community to volunteer rather than for donations, the students demonstrate a change in understanding of the community's utility. Now they perceive the community as a place to collaborate with, learn from, and contribute to. Indeed, Hoh et al. (2021) found that those who participate in urban agriculture perceive the social value of community gardens higher than those who do not. Additionally, Lampert et al. (2021) found that community gardening activities are positively associated with life satisfaction and happiness, reshaping gardeners' worldviews and outlooks. In this study, participants' enhanced well-being emerged through three pathways: (1) social bonds formed via intercultural friendships and communal activities ("I made new friends"), aligning with Storm et al. (2023) on gardens as therapeutic spaces; (2) skill mastery (e.g., composting, desert gardening) fostering pride and self-efficacy, echoing Ryan & Deci's (2000) self-determination theory; and (3) nature engagement, described as calming ("Working with plants calmed my mind"), mirroring Ward et al.'s (2022) findings. These mechanisms explain students' post-study shift toward valuing community interdependence, as Lampert et al. (2021) theorized, highlighting how gardens transform perceptions of social and ecological belonging.

Most of the students reported increased social connections as one of the study's benefits. For students, the transition to community-based strategies (e.g., volunteering for food access) reflects the development of bridging social capital (Alaimo et al., 2010), which fosters connections across diverse groups and enhances access to shared resources. This is especially evident in the change in students' social isolation coping strategies. Before the study, the students reported turning to personal networks and community for social support. However, after the study, the students reported that they would turn to the friends made during the study and the community. This indicates that new relationships were formed and that they might be more beneficial to students' mental well-being than the old relationships, which is most likely explained by the fact that it is much easier to turn to someone for help when you already interact with them regularly. Because many students attend college not in their home states, thus leaving close personal networks behind, turning to them for meaningful help might be unrealistic in moments of crisis. Current literature points to the value of social capital in addressing this issue. For example, Firth et al. (2011) found that community gardening leads to bridging and linking of social capital. Storm et al. (2023) reports that gardening creates a community, enhances social capital, well-being, and a sense of belonging. 'Yotti' Kingsley and Townsend (2006) found that urban agriculture, in addition to social cohesion (sharing of values) and social connections (development of social bonds), also provides social bonding (having people to turn to in times of crisis). Sharif and Ujang (2021) recommend community gardens as a safe open space in cities to encourage more people-people-places interaction to address such social well-being problems as individualism and social isolation. Bowe et al. (2020) found that volunteering builds a sense of belonging to their community and that this belonging is closely connected with personal well-being. Indeed, Gray and Stevenson (2020) found that sharing an identity with other volunteers promotes feelings of belonging, which in turn impacts the participants' well-being. All of this points to the psychosocial benefits of urban agriculture.

The refugees also benefited from increased social interactions. The fact that the refugee participants reported joining Iskashitaa to forge greater connections to the community and to receive additional refugee-related assistance indicates that there are strong unmet social needs among the refugees. While both groups reported experiencing increased social interactions from developing relationships and learning each other's cultures and languages, the refugees also emphasized the importance of knowledge exchange and collective work. The emphasis on knowledge exchange is especially interesting: refugees highlighted the value of intergenerational interactions, with some acknowledging that being around a younger generation motivated them to learn more about the American culture and people. One even stated that observing a

younger generation care about the garden motivated her to be a greater environmental steward, extending this motivation to her children by bringing them to the garden. This points to the role of intercultural and intergenerational public spaces in fostering personal and climate resilience (Datta et al., 2022). Indeed, Beckie and Bogdan (2010) suggest that involvement in urban agriculture can contribute to the integration of senior immigrants into society, while also contributing to the evolution of local food systems and more inclusive communities. This is exemplified by one of the refugees who shared that she wanted to open her own restaurant after she learned how much the students enjoyed the ethnic breakfast that she had prepared that morning. Other research found similar results among refugees, suggesting a link between community gardening and connection to the past and self-reliance (Datta, 2019). Indeed, toward the end of the study, a refugee who rarely spoke with anyone showed pictures of the crops that he grew in his home country, expressing his desire to grow them now in the garden. This demonstrates that the refugees gained confidence in their unique lived experiences and felt welcomed to share these experiences with others outside of the refugee community. They now perceived these experiences not as a liability but something valuable. This is supported by the fact that after the work in the garden, most refugees reported having a social connection outside of the refugee community.

Both groups reported increased food production knowledge as one of the study's benefits. While the students' knowledge was based on the processes that facilitate food production (e.g., composting and rainwater harvesting), the refugees' knowledge was based on both the processes that facilitate food production and the learning and identification of new foods. Because the refugees came from the countries not familiar with the U.S. culture, food systems, and climate, they had to learn not only what foods are generally available in the U.S. but also how to grow them in extreme heat and water scarce conditions. Additionally, for the refugees, it was important to understand the nutritional value of the food that they grew, indicating that they perceive food not just as a source of energy but also as a source of healing. This is supported by one of the refugees who stated that she would use the nutritional knowledge that she acquired from this experience to keep herself and her family healthy. This shows that different groups derive different benefits from the same land-based engagement and points to the importance of tailored garden programming that reflects participants' unique challenges and needs but also the ecological context.

The garden initiative yielded distinct yet complementary outcomes for each group. For students, participation fostered social connections through cross-cultural collaboration, practical skills in sustainable food production, and exposure to diverse worldviews that broadened their understanding of community resilience. For refugees, the garden provided a platform to reclaim cultural continuity by adapting agricultural traditions to their new environment, while simultaneously cultivating a sense of identity and agency in a society often indifferent to their histories. This duality—students gaining tools for future civic engagement and refugees rebuilding place-based belonging—illustrates how urban agriculture can serve as both a social equalizer and a bridge between displacement and empowerment.

While our study found that collaborative gardening improved food access and social connections, other research suggests urban agriculture alone rarely addresses systemic food insecurity without institutional support (Siegner et al., 2018). The partnership with Iskashitaa—a refugee-led organization providing land, training, and gleaning networks—may explain the stronger outcomes observed here compared to gardens lacking such infrastructure.

The authors would like to acknowledge several study limitations. First, the small participant pool might have impacted the range of perspectives and outcomes. A larger population size would have allowed for a more inclusive understanding of the challenges faced by the two groups and the impacts of the study. Second, while 10 weeks was enough to generate noticeable change in the participants, a longer timeline would have allowed for a more nuanced exploration of the benefits and challenges of this project. Third, while we were guided by the socio-cultural and geographic realities of southern

Arizona to design and execute this study, other locations must rely on their unique contexts to design similar studies.

Conclusions

This study set out to explore whether collaborative urban gardening could simultaneously alleviate food insecurity and social isolation among two vulnerable populations—university students and refugees. By uniting these groups in a participatory garden initiative, we discovered that such spaces do far more than grow food: they empower individuals through skill-building and agency, dissolve social barriers via intercultural exchange and mutual learning, and redefine belonging through shared stewardship of nature. These outcomes highlight urban agriculture's dual role as both a socio-ecological intervention and a catalyst for community resilience. To harness this potential, cities must reimagine green spaces as platforms for cross-demographic collaboration, ensuring marginalized voices shape urban futures.

Acknowledgments

We acknowledge the financial help received from the Pat and Peter Hirschman University-Community Partnership Research Fund to conduct this research. We also thank all the students and refugees who participated in the study. Finally, we would like to acknowledge the help that Iskashitaa Refugee Network provided to conduct this project. Without their help, this project would not have been possible.

References

Alaimo, K., Reischl, T. M., & Allen, J. O. (2010). Community gardening, neighborhood meetings, and social capital. *Journal of Community Psychology*, *38*(4), 497–514. https://doi.org/10.1002/jcop.20378

Alhabas, M., Frongillo, E., Blake, C., Fram, M., & Sahyoun, N. (2021). Understanding food insecurity resilience of refugee families in the United States [Conference abstract]. *Current Developments in Nutrition*, *5*(Suppl. 2), 96. https://doi.org/10.1093/cdn/nzab035_004

Apanovich, N., Okyere, S. A., Mensah, S. L., & Frimpong, L. K. (2023). Education for sustainable development: Societal benefits of a community garden project in Tucson, Arizona. *Societal Impacts*, *1*(1–2), Article 100011. https://doi.org/10.1016/j.socimp.2023.100011

Artmann, M., & Sartison, K. (2018). The role of urban agriculture as a nature-based solution: A review for developing a systemic assessment framework. *Sustainability*, *10*(6), Article 1937. https://doi.org/10.3390/su10061937

Barton, J., & Pretty, J. (2010). What is the best dose of nature and green exercise for improving mental health? *Environmental Science & Technology*, *44*(10), 4000–4005. https://doi.org/10.1021/es903183r

Beckie, M., & Bogdan, E. (2010). Planting roots: Urban agriculture for senior immigrants. *Journal of Agriculture, Food Systems, and Community Development*, *1*(2), 77–89. https://doi.org/10.5304/jafscd.2010.012.004

Bessho, A., Terada, T., & Yokohari, M. (2020). Immigrants' "role shift" for sustainable urban communities: A case study of Toronto's multiethnic community farm. *Sustainability*, *12*(19), Article 8283. https://doi.org/10.3390/su12198283

Bowe, M., Gray, D., Stevenson, C., McNamara, N., Wakefield, J. R., Kellezi, B., Wilson, I., Cleveland, M., Mair, E., Halder, M., & Costa, S. (2020). A social cure in the community: A mixed-method exploration of the role of social identity in the experiences and well-being of community volunteers. *European Journal of Social Psychology*, *50*(7), 1523–1539. https://doi.org/10.1002/ejsp.2706

Bowen, S., Elliott, S., & Hardison-Moody, A. (2021). The structural roots of food insecurity: How racism is a fundamental cause of food insecurity. *Sociology Compass*, *15*(7), Article e12846. https://doi.org/10.1111/soc4.12846

Brescia, S. A., & Cuite, C. L. (2019). Understanding coping mechanisms: An investigation into the strategies students use to avoid, manage, or alleviate food insecurity. *Journal of College and Character*, *20*(4), 310–326. https://doi.org/10.1080/2194587X.2019.1669463

Bruening, M., Argo, K., Payne-Sturges, D., & Laska, M. N. (2017). The struggle is real: A systematic review of food insecurity on postsecondary education campuses. *Journal of the Academy of Nutrition and Dietetics*, *117*(11), 1767–1791. https://doi.org/10.1016/j.jand.2017.05.022

Cano-Verdugo, G., Flores-García, B. D., Núñez-Rocha, G. M., Ávila-Ortíz, M. N., & Nakagoshi-Cepeda, M. A. A. (2024). Impact of urban farming on health: A systematic review. *Journal of Public Health*, *46*(3), e500–e509. https://doi.org/10.1093/pubmed/fdae056

Clucas, B., Parker, I. D., & Feldpausch-Parker, A. M. (2018). A systematic review of the relationship between urban agriculture and biodiversity. *Urban Ecosystems*, *21*(4), 635–643. https://doi.org/10.1007/s11252-018-0748-8

Colléony, A., & Shwartz, A. (2019). Beyond assuming co-benefits in nature-based solutions: A human-centered approach to optimize social and ecological outcomes for advancing sustainable urban planning. *Sustainability*, *11*(18), Article 4924. https://doi.org/10.3390/su11184924

Datta, R. (2019). Sustainability: Through cross-cultural community garden activities. *Local Environment*, *24*(8), 762–776. https://doi.org/10.1080/13549839.2019.1641073

Datta, R., Kayira, J., & Datta, P. (2022). Land-based environmental education as a climate change resilience: A learning experience from a cross-cultural community garden. In E. M. Walsh (Ed.), *Justice and equity in climate change education* (pp. 214–233). Routledge. https://doi.org/10.4324/9780429326011-11

Dunlap, R., Harmon, J., & Camp, B. H. (2020). Cultivating self-reliance: Participation in urban agriculture as civil leisure. *Annals of Leisure Research*, *23*(4), 530–543. https://doi.org/10.1080/11745398.2019.1613668

Ellucian. (2024). *Student voice: Understanding the impact of financial challenges on today's students*. https://lp.ellucian.com/whitepaper-student-voice-report.html

Firth, C., Maye, D., & Pearson, D. (2011). Developing "community" in community gardens. *Local Environment, 16*(6), 555–568. https://doi.org/10.1080/13549839.2011.586025

Gallagher, R. P., & Taylor, R. (2015). National survey of college counseling centers 2014. https://d-scholarship.pitt.edu/28178/

Gattupalli, A. (2024, January 16). Urban agriculture in the United States: Revitalizing neighborhoods. *ArchDaily*. https://www.archdaily.com/1012190/urban-agriculture-in-the-united-states-revitalizing-neighborhoods

Grabmeier, J. (2015, June 30). *70 percent of college students stressed about finances* [Press release]. The Ohio State University. https://news.osu.edu/70-percent-of-college-students-stressed-about-finances/

Gray, D., & Stevenson, C. (2020). How can 'we' help? Exploring the role of shared social identity in the experiences and benefits of volunteering. *Journal of Community & Applied Social Psychology*, *30*(4), 341–353. https://doi.org/10.1002/casp.2448

Gregis, A., Ghisalberti, C., Sciascia, S., Sottile, F., & Peano, C. (2021). Community garden initiatives addressing health and well-being outcomes: A systematic review of infodemiology aspects, outcomes, and target populations. *International Journal of Environmental Research and Public Health*, *18*(4), Article 1943. https://doi.org/10.3390/ijerph18041943

Gripper, A. B. (2023). Practices of care and relationship-building: A qualitative analysis of urban agriculture's impacts on Black people's agency and wellbeing in Philadelphia. *International Journal of Environmental Research and Public Health*, *20*(6), Article 4831. https://doi.org/10.3390/ijerph20064831

Hadley, C., Zodhiates, A., & Sellen, D. W. (2007). Acculturation, economics and food insecurity among refugees resettled in the USA: A case study of West African refugees. *Public Health Nutrition*, *10*(4), 405–412. https://doi.org/10.1017/S1368980007222943

Hammelman, C., & Hayes-Conroy, A. (2015). Understanding cultural acceptability for urban food policy. *Journal of Planning Literature*, *30*(1), 37–48. https://doi.org/10.1177/0885412214555433

Hoh, Y. K., Chae, J., & Lee, H. (2022). An analysis of differences in perceived social value of community gardens as urban green spaces between participating and non-participating residents. *Journal of People, Plants, and Environment*, *25*(1), 77–92. https://doi.org/10.11628/ksppe.2022.25.1.77

Ibrahim, N., Honein-AbouHaidar, G., & Jomaa, L. (2019). Perceived impact of community kitchens on the food security of Syrian refugees and kitchen workers in Lebanon: Qualitative evidence in a displacement context. *PloS ONE*, *14*(1), Article e0210814. https://doi.org/10.1371/journal.pone.0210814

Kafle, A., Hopeward, J., & Myers, B. (2023). Modelling the benefits and impacts of urban agriculture: Employment, economy of scale and carbon dioxide emissions. *Horticulture*, *9*(1), Article 67. https://doi.org/10.3390/horticulturae9010067

Kingsley, J. "Y.," & Townsend, M. (2006). "Dig in" to social capital: Community gardens as mechanisms for growing urban social connectedness. *Urban Policy and Research*, *24*(4), 525–537. https://doi.org/10.1080/08111140601035200

Lampert, T., Costa, J., Santos, O., Sousa, J., Ribeiro, T., & Freire, E. (2021). Evidence on the contribution of community gardens to promote physical and mental health and well-being of non-institutionalized individuals: A systematic review. *PLoS One*, *16*(8), Article e0255621. https://doi.org/10.1371/journal.pone.0255621

Liverpool, S., Moinuddin, M., Bracegirdle, K., Eddison, J., Joseph, S., Aithal, S., Allen, E., Carmichael-Murphy, P., Marsden, J., McKenzie, H., Murphy, C., Owen, M., Patel, T., Raji, N. A., Roocroft, L, Fletcher, K., & Karkou, V. (2024). Mental health coping strategies and support needs among marginalised further and higher education students in the UK: A cross-sectional study. *PLOS Mental Health*, 1(1), Article e0000046. https://doi.org/10.1371/journal.pmen.0000046

London, J. K., Cutts, B. B., Schwarz, K., Schmidt, L., & Cadenasso, M. L. (2021). Unearthing the entangled roots of urban agriculture. *Agriculture and Human Values*, *38*, 205–220. https://doi.org/10.1007/s10460-020-10158-x

McKenzie, J. S., & Watts, D. C. (2020). Re-thinking the relationship between food insecurity, health and social isolation. *Proceedings of the Nutrition Society*, 79(OCE3), Article E740. https://doi.org/10.1017/S0029665120007260

Nunnery, D. L., & Dharod, J. M. (2017). Potential determinants of food security among refugees in the U.S.: An examination of pre- and post-resettlement factors. *Food Security*, *9*, 163–179. https://doi.org/10.1007/s12571-016-0637-z

Ohayon, M. M., & Roberts, L. W. (2014). Links between occupational activities and depressive mood in young adult populations. *Journal of Psychiatric Research*, *49*, 10–17. https://doi.org/10.1016/j.jpsychires.2013.10.002

Olfert, M. D., Hagedorn-Hatfield, R. L., Houghtaling, B., Esquivel, M. K., Hood, L. B., MacNell, L., Soldavini, J., Berner, M., Savoie Roskos, M., Hingle, M. D., Mann, G. R., Walty, J. F., Knol, L. L., Walsh, J., Kern-Lyones, V., Paul, C., Pearson, K, Goetz, J. R., Spence, M., ... Coleman, P. (2023). Struggling with the basics: Food and housing insecurity among college students across twenty-two colleges and universities. *Journal of American College Health*, *71*(8), 2518–2529. https://doi.org/10.1080/07448481.2021.1978456

One New Humanity Community Development Corporation. (2022, June 7). *The benefits of community gardens* [Blog post]. https://www.onenewhumanitycdc.org/blog/the-benefits-of-community-gardens

Papanek, A., Campbell, C. G., & Wooten, H. (2023). Social and community benefits and limitations of urban agriculture: FCS3378 FY1517, 1 2023. *Environmental Data & Information Science*, *2023*(1). https://doi.org/10.32473/edis-fy1517-2023

Pradhan, P., Callaghan, M., Hu, Y., Dahal, K., Hunecke, C., Reusswig, F., Lotze-Campen, H., & Kropp, J. P. (2023). A systematic review highlights that there are multiple benefits of urban agriculture besides food. *Global Food Security*, *38*, Article 100700. https://doi.org/10.1016/j.gfs.2023.100700

Reese, A. M. (2018). "We will not perish; we're going to keep flourishing": Race, food access, and geographies of self-reliance. *Antipode*, *50*(2), 407–424. https://doi.org/10.1111/anti.12359

Riba, M., Kirsch, D., Martel, A., & Goldsmith, M. (2015). Preparing and training the college mental health workforce. *Academic Psychiatry*, *39*, 498–502. https://doi.org/10.1007/s40596-015-0406-x

Rivera-Morales, N., Fernández-Lockwood, C. B., Ramos-Monserrate, G. M., Ramírez-Rivera, E., Raimundí-Santos, N., Méndez, M., Rodríguez-Anziani, I., & Martínez-González, K. G. (2024). Medical students' coping strategies and burnout syndrome in preclinical and clinical years. *Academia Mental Health and Well-Being*, *1*(2). https://doi.org/10.20935/MHealthWellB7291

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Sharif, S. M., & Ujang, N. (2021, April). Community gardening and the capacity to enrich social bonding in urban neighborhoods. In *IOP Conference Series: Earth and Environmental Science*, *737*, Article 012061. https://doi.org/10.1088/1755-1315/737/1/012061

Shostak, S., & Guscott, N. (2017). "Grounded in the neighborhood, grounded in community": Social capital and health in community gardens. In S. Shostak (Ed.), *Food systems and health* (pp. 199–222). Emerald Publishing. https://doi.org/10.1108/S1057-629020170000018009

Siegner, A., Sowerwine, J., & Acey, C. (2018). Does urban agriculture improve food security? Examining the nexus of food access and distribution of urban produced foods in the United States: A systematic review. *Sustainability*, *10*(9), Article 2988. https://doi.org/10.3390/su10092988

Skar, S. L. G., Pineda-Martos, R., Timpe, A., Pölling, B., Bohn, K., Külvik, M., Delgado, C., Pedras, C. M. G., Paço, T. A., Ćujić, M., Tzortzakis, N., Chrysargyris, A., Peticila, A., Alencikiene, G., Monsees, H., & Junge, R. (2020). Urban agriculture as a keystone contribution towards securing sustainable and healthy development for cities in the future. *Blue-Green Systems, 2*(1), 1–27. https://doi.org/10.2166/bgs.2019.931

Storm, H., Nielsen, N. O., Andersen, J., Præstegaard, J., Kjærsgaard, H., Petersen, B., Sønderskov, A. J., Rafn, J., & Lindahl, M. (2023). Community garden developed by refugees from Syria—A sanctuary and a space for learning and empowerment. *Wellbeing, Space and Society*, *5*, Article 100162. https://doi.org/10.1016/j.wss.2023.100162

Tracey, D., Gray, T., Manohar, N., Kingsley, J., Bailey, A., & Pettitt, P. (2023). Identifying key benefits and characteristics of community gardening for vulnerable populations: A systematic review. *Health & Social Care in the Community*, *2023*, Article 5570089. https://doi.org/10.1155/2023/5570089

U.S. Department of Agriculture [USDA], National Agricultural Library. (n.d.). *Urban agriculture.* https://www.nal.usda.gov/farms-and-agricultural-production-systems/urban-agriculture

U.S. Senate Committee on Agriculture, Nutrition, & Forestry. (2023, November 1). *Stabenow restores funding for urban agriculture in Senate-passed bill* [Press release]. https://www.agriculture.senate.gov/newsroom/dem/press/release/stabenow-restores-funding-for-urban-agriculture-in-senate-passed-bill

Velazquez-Gonzalez, R. S., Garcia-Garcia, A. L., Ventura-Zapata, E., Barceinas-Sanchez, J. D. O., & Sosa-Savedra, J. C. (2022). A review on hydroponics and the technologies associated for medium- and small-scale operations. *Agriculture*, *12*(5), Article 646. https://doi.org/10.3390/agriculture12050646

Vujcic, M., Tomicevic-Dubljevic, J., Grbic, M., Lecic-Tosevski, D., Vukovic, O., & Toskovic, O. (2017). Nature based solution for improving mental health and well-being in urban areas. *Environmental Research*, *158*, 385–392. https://doi.org/10.1016/j.envres.2017.06.030

Ward, K. S., Truong, S., & Gray, T. (2022). Connecting to nature through community engaged scholarship: Community gardens as sites for collaborative relationships, psychological, and physiological wellbeing. *Frontiers in Psychiatry*, *13*, Article 883817. https://doi.org/10.3389/fpsyt.2022.883817