Teaching Food Security to Low-Income Rural Families in the United States

Taylor Hinton, Kerstin Martin and Eric Pallant

Abstract

In order to achieve the goals of ending poverty and hunger, as stated under the 2030 United Nations Agenda for Sustainable Development, there needs to be a focus on low-income families who are most affected by these issues. Two ways to support low-income families in improving food security include providing access to affordable, fresh foods and education about food systems. Twenty-six percent of residents in Meadville, Pennsylvania live below the poverty line and 50% of students in the school district receive subsidized lunch. In 2014, the Community Wellness Initiative of Allegheny College established an affordable community and school garden in Meadville, Pennsylvania. There are monthly cooking and gardening workshops for community members. The garden-based curriculum is being integrated into middle- and high-school classes to teach students to think critically about the food system while learning basic growing and cooking skills. Students then bring lessons home to their families furthering the education of families in Meadville. This paper will describe how the garden is used to teach families and students of Meadville to grow, prepare, and purchase high-quality food in order to improve food security.

Keywords

Food security · Community gardens · Food education

T. Hinton · K. Martin · E. Pallant (✉)
Department of Environmental Science, Allegheny College, Meadville, PA 16335, USA
e-mail: epallant@allegheny.edu

T. Hinton
e-mail: thinton@allegheny.edu

K. Martin
e-mail: kmartin@allegheny.edu

W. Leal Filho (ed.), *Handbook of Sustainability Science and Research*,
World Sustainability Series, https://doi.org/10.1007/978-3-319-63007-6_10

1 Introduction

When the United Nations established its 2030 Agenda for Sustainable Development its top three goals were targeted at ending poverty, achieving food security, and ensuring health and wellness (Transforming our world 2016a, b; Patel and Agnetta 2016). Underpinning the UN 2030 Agenda for Sustainable Development is the definition of sustainable development as the type of development that meets the needs of the present without compromising the ability of future generations to meet their needs (WCED 1987). Sustainable development is therefore a process that envisions a desirable environment in which living conditions and resource-use continue to meet human needs without undermining the existence of natural biotic systems (Mutangadura 2015; Sterling 2003).

One reason for establishing the 2030 Agenda for Sustainable Development is that much of the current world's population is not living under conditions that are safe and sustainable. According to the UN Food and Agriculture Organization, for example, one in nine people in the world are chronically undernourished and one in eight people in developing countries are hungry (World hunger and poverty facts and statistics 2015). In 2013, the global poverty rate, defined as less than $1.90 per day has fallen to 10.7%, but both hunger and poverty vary widely by country and within countries (The World Bank poverty overview 2016).

The United States is generally perceived as a country where food is abundant and obesity is the major food issue; however, in 2004, approximately 11.9% of Americans did not have sufficient food at least once during the year (Nord et al. 2005). In 2014, the number of Americans that did not have enough food for their families to sustain active, healthy lifestyles climbed to 14%. The number suffering from food insecurity in the severe range as defined by the U.S. Department of Agriculture was 5.6% (Coleman-Jensen et al. 2015).

Food insecurity, the inability to gain access to nutritious, necessary food at all times, has been linked to detrimental health outcomes in growth, chronic health, asthma, cognitive development and behavior among children and depressive symptoms in mothers (Cook and Frank 2008; Heflin et al. 2005; Kirkpatrick et al. 2010). Hunger has pronounced negative psychological impacts on food-insecure children, who manifest symptoms such as mood disorders, mental illnesses, and poor interactions with others. (Slopen et al. 2010). Similarly, adolescents experiencing food insecurity were more likely to experience mood disorders, anxiety, or substance abuse (McLaughlin et al. 2012).

Even in affluent nations like the U.S., families and individuals in lower socioeconomic strata are much more likely to consume foods with lower nutritional value than families with higher incomes (Davey Smith and Brunner 1997; Dubois and Girard 2001; James et al. 1997). Moreover, impoverished populations that are food insecure are more susceptible to the combined impacts of climate change such as those created by heat stress and air pollution (Balbus and Malina 2009).

To combat the impact that consuming low quality or insufficient food has on the physical and psychological status of families, some studies indicate that involving youth and adolescents in food purchasing and preparation results in improved nutritional quality of the foods they consume (Larson et al. 2006a, b). Children who assist in preparing meals also consume healthier meals and exhibit an increase in positive emotions (van der Horst et al. 2014). School gardens and gardens grown in conjunction with cooking classes can also effectively increase the consumption of fruits and vegetables among low-income youth, increase physical activity, sometimes reduce BMI (and sometimes increase BMI), improve mental health, and reduce consumption of convenience foods (Gatto et al. 2012; Hartmann et al. 2013; Utter et al. 2016a, b; Wells et al. 2014).

For adults, community gardens combat food insecurity and increase consumption of healthful fruits and vegetables, though successful gardens require both directors and grassroots support (Alaimo et al. 2008; Corrigan 2011). Gardens increase physical, social, and emotional well-being for individuals as well as improve social cohesion and support among participants (Armstrong 2000; Comstock et al. 2010; Tieg et al. 2014).

Rural, northwestern Pennsylvania has higher levels of food insecurity and poverty compared to statewide and national averages. According to the U.S. Census Bureau, the percentage of people living in poverty in Meadville, Pennsylvania is roughly double the statewide average: 26.1% in Meadville versus 13.6% for the state of Pennsylvania and 15.6% for the United States (United States Census Bureau 2016). Median household income in Meadville, Pennsylvania over the same time period (2010–2014) was $32,219 while the statewide average was $53,115 (United States Census Bureau 2016). In 2013, one-fourth of the children in Meadville lived below the poverty line as defined by the U.S. government (City-Data.Com).

Poor children in Meadville receive state government-subsidized meals while they are in school. Nearly one-half of children in middle school and high school receive free or reduced-price lunches: 46% in the middle school (grades 7–8), and 44% in the senior high school (grades 9–12) (High Schools.com). Percentages of subsidized lunches in the elementary schools vary by neighborhood, but in some elementary schools a large majority of students receive free lunches (Public School Review 2016).

The Community Wellness Initiative began at Allegheny College in Meadville, Pennsylvania in 2014 to address poverty, food access, and awareness of food production. Gardens were installed near schools and for families in the community. Lesson plans were prepared for school students and guidance in gardening and food preparation was offered to community members. By providing these opportunities —gardens in which families and students can grow food and educational programs on how to best grow and cook produce—the Community Wellness Initiative is supporting low-income families to be more food secure. Families and students participating in these programs gain knowledge to grow their own food so that they have access to healthy, fresh produce. Through cooking workshops and lessons in the classroom, they also learn how to prepare the same fruits or vegetables they are

growing. This empowers families and students to incorporate fresh produce into their daily meals and to be less reliant on heavily processed foods from the grocery store. Therefore, families can better meet their daily needs while utilizing produce that was grown using sustainable practices.

1.1 Community Wellness Initiative Overview

In Meadville, improving fresh food access and education inspired a unique partnership among the community recreation facility, public middle school (ages 11–13), vocational school (ages 15–18), regional hospital, Meadville city government, and Allegheny College beginning in 2014. The support of countless volunteers and businesses has been critical to the success of the multi-project and multi-year Community Wellness Initiative, which is funded by a private foundation based in Pennsylvania.

The work primarily takes place on the property of the Meadville Area Recreation Complex (MARC), which is directly adjacent to the Meadville Area Middle School and the Crawford County Career and Technical Center, a vocational school that teaches occupational and technical training to secondary school students and adults. Both facilities are approximately one mile from downtown Meadville. Projects of the Community Wellness Initiative include: the construction of an interactive "edible trail" that connects the middle school and the recreation facility; the support of a new community kitchen for cooking classes; and the development of the MARC Community Garden, which serves as both a community garden and a school garden by allocating specific areas within the garden to each user group.

The community and school garden have been the primary focus of the initiative. Because both adult community gardeners and students use the garden, the garden serves a range of people and needs. The community section of the MARC Garden involves over 40 residents who maintain and harvest food from both individual garden plots and shared gardens. These garden participants vary in age and income. Within a plastic-covered hoop house, five raised beds (measuring four by 30 ft) serve as the primary garden for the middle school. The majority of the students' academic year (September–May) does not align with the region's short outdoor growing season; therefore, the hoop house extends the growing season through the school year so that students can grow food as part of their classes.

In addition to building the community garden for the purpose of growing food, an accompanying food education program has been developed for both adults and students who use the garden. Evening workshops on gardening and cooking are provided for adult community gardeners, while students learn similar topics during their core classes of the school day and through a summer program. With 26.1% of Meadville residents living at or below the poverty level, the educational component of the garden is important: workshops and classes provide skills that participants can use during their time in the garden and in their homes to grow and prepare fresh food.

Allegheny College supports the garden with grant administration, staff, and college student involvement. Two employees direct the garden's activities: the garden manager coordinates the garden spaces and community participants, while the program coordinator directs the educational programming. Allegheny College students have also been involved at all stages of planning and implementing the programs. An internship program gives Allegheny students the opportunity to develop and implement garden-based curriculum for the Community Wellness Initiative. Other students work as gardeners building and maintaining the garden. Several courses in the majors of Community and Justice Studies, Global Health Studies, Environmental Science, and Political Science have worked on designing aspects of the garden and assessing food accessibility in Meadville. Allegheny students increase the capacity of the Community Wellness Initiative, while themselves learning how to improve food security in low-income areas through food access and education programs.

1.2 Methodology

The purpose of this work is to evaluate whether food insecurity can be alleviated through community-based projects such as a community and school garden with accompanying educational programming. The Community Wellness Initiative has implemented such a model that combines food education with food access. The effectiveness that the Community Wellness Initiative has had on making progress toward the goals of the 2030 Agenda for Sustainable Development was analyzed through informal conversations, surveys, and personal observations. This data about participants' knowledge, experiences, and outcomes was collected by the garden staff. The full results of this program are discussed in this paper for both adult participants and student participants, focusing on how this program addresses food education and food access for each participant group.

2 Increasing Food Security for Community Residents

2.1 Education for Community Members

Throughout the growing season, the Community Wellness Initiative provides adult participants with educational opportunities to learn how to successfully grow produce and how to prepare fresh foods in ways that they will enjoy eating. Food security is increased when participants can grow produce affordably and use that produce to meet their dietary needs.

Before the growing season officially starts in mid-May, the garden manager meets with gardeners to provide information about how the garden works and resources on how to grow crops, and to answer questions. Resource and discussion topics include acquiring seeds and seedlings, determining when various crops should be planted during the season, and planning for multiple crops through the season. Other resources include information on pest management and water conservation. Information is provided early in the year to prepare gardeners for the season and to encourage them to grow spring crops, increasing the volume of produce they can bring home; similarly, gardeners are reminded to plant fall crops to extend the end of the season. Pre-season meetings also encourage participants to develop social connections and feel comfortable in the garden. By fostering these connections and building a sense of community early on, some gardeners are more likely to spend time at the garden and utilize their plot to its fullest growing potential, increasing the likelihood that they will grow and consume more fresh food.

During the growing season both formal and informal garden sessions are scheduled. Formal opportunities include one cooking workshop and one gardening workshop each month. Sometimes more experienced participants of the garden lead these sessions, while other times presenters are recruited from the community. Workshop topics have included: organic gardening basics, which is especially important for first-time gardeners to gain an understanding of how to grow vegetables without adding synthetic products; pest management, which helps gardeners to prevent and manage pests that may impact their yield; making compost with food scraps and other plant materials to create nutrient-rich soil for future crops; how to rotate crops to ensure vegetables will have adequate nutrients to grow; and seed saving, enabling gardeners to grow food the next season without paying for seeds or seedlings. Cooking workshops have covered topics such as utilizing early-spring produce and cooking recipes that are quick, simple, and mostly plant-based. These regular workshops are intended to build gardeners' knowledge and interest so that they can grow significant yields of high quality vegetables to supplement their diets.

Informal educational opportunities are equally important in building gardeners' knowledge, interest, and skills in gardening and cooking. During weekly "shared work" sessions, gardeners work together to maintain shared spaces of the garden: staff plan the crops for these garden beds and assign gardeners with tasks to plant and maintain them. Gardeners have said they benefit from helping to care for these shared spaces because they actively participate in unfamiliar growing methods or in growing different crops than they themselves would have chosen. Gardeners also use the shared work time to inspect others individual plots and exchange information about particular vegetable varieties and growing techniques they are using. Additionally, monthly potluck dinners held at the garden provide opportunities for participants to share favorite recipes and to sample new ones. The communal nature of the garden provides informal support for gardeners to learn from each other.

The weekly sessions that have been described are scheduled each month as follows:

	Monday	Thursday
Week 1	5:00–7:00 pm: Shared work (working together on shared spaces and projects)	9:00–11:00 am: Shared work
Week 2	5:00–6:00 pm: Shared work 6:00–7:00 pm: Garden workshop	9:00–11:00 am: Shared work
Week 3	5:00–6:00 pm: Shared work 6:00–7:00 pm: Potluck dinner	9:00–11:00 am: Shared work
Week 4	5:00–6:00 pm: Shared work 6:00–7:00 pm: Cooking workshop	9:00–11:00 am: Shared work

These formal and informal learning opportunities support gardeners throughout the season. Workshops and shared work times encourage gardeners to utilize their plot throughout the season, even if it is not always successful. Many participants are first time gardeners who benefit from a supportive learning environment; this learning support makes them more likely to have a successful garden and more likely to have food to take home. Food security is increased when the gardeners know how to affordably and successfully grow food that they can also confidently prepare to eat.

2.2 Access for Community Members

The MARC garden provides physical resources to a variety of residents who may not otherwise grow food: some residents lack space or adequate sunlight for vegetable gardens at home, some are not permitted to garden outside rental units, and others may be more successful growing food as part of a community rather than alone. Each gardener is allotted a wooden raised bed measuring four by eight feet. These beds are rented on a sliding scale basis, which accepts monetary payment, volunteer hours, or a combination of both. Thus, income is not a barrier to accessing the community garden. Gardeners choose the types of vegetables they would like to grow in their own plot and they harvest that food for themselves. Food security is increased when gardeners are familiar with produce they bring home, have recipes with which to cook the produce, and enjoy preparing and eating those recipes.

In addition to harvesting food from their own plots, gardeners have access to produce from the "shared spaces" in the garden. Staff encourage gardeners to harvest mature crops through weekly emails, a list written on a whiteboard at the garden, and color-coded flags in the garden beds that signal when crops are ready to harvest. Produce that gardeners can take home from shared spaces has included onions, garlic, carrots, peas, tomatoes, kale, lettuce, zucchini, beets, strawberries, swiss chard, and herbs. Access to produce from the shared space is especially important for gardeners who may not get a high yield of produce from their own

plot. Some gardeners are first-time growers who may not have high yields, and even experienced gardeners may have crops in their individual plots fail due to pest damage, weather, or inconsistent maintenance due to gardeners' time restraints. Shared spaces in the garden ensure that gardeners are able to take home produce no matter their own personal success and therefore this space provides a second layer of food security.

The MARC Garden serves as a community garden for Meadville area residents to grow their own food, increasing the volume of fresh produce available for consumption and thereby increasing food security. Individual plots provide autonomy in choosing produce, while shared spaces provide a guaranteed harvest and increased variety. The twofold approach of individual plots and shared spaces ensures that participants have access to affordable and fresh foods throughout the growing season. In this way, the community garden increases food security for adult participants and their families.

3 Increasing Food Security for Students Through Food Access and Education

3.1 Academic Year (August–June)

The MARC Garden additionally provides school students with a space to learn about gardening and cooking that also increases their access to fresh produce. During the school year, students learn about food and agriculture in their existing classes at the public middle school. Students consume garden produce in these classes and during their lunch periods through Community Wellness Initiative programs.

To reach a wide audience of school students, the wellness program coordinator works with middle school teachers to develop curricula and to ensure that lessons meet state learning requirements. Each seventh-grade student (ages 11–12) participates in multiple food and garden-based lessons within two of their core subjects, including science, family consumer science (formerly home economics), and geography. Content is not added to lessons, but instead modified to focus on sustainable agriculture and foods that promote a healthy lifestyle.

For example, in seventh-grade science class, students learn about plant cell structures by looking at kale cells under a microscope. In the same lesson, they prepare a kale salad to eat. This lesson not only teaches students how to use a microscope (a concept from their seventh-grade science curriculum), but students are also introduced to kale and learn how to prepare it. The majority of students have never eaten kale, yet nearly all of them try and enjoy the kale salad prepared in class. By introducing students to vegetables at school, students are more likely to request those vegetables at home. Kale is a nutritious food that is both affordable and easy to grow in northwestern Pennsylvania, making it more accessible to families in Meadville.

Beyond just learning about food, students consume produce from the garden during most of the food and agriculture-based lessons. The program coordinator works with middle school teachers to plant the school section of the garden. Once vegetables are ready for harvest, teachers utilize the garden produce in their classes. Lessons sometimes focus on the garden produce specifically (such as a class about herbs and spices from the garden), while other lessons are supplemented by the garden produce (such as a lesson on using good bacteria in fermentation that ends with making pickles from cucumbers from the garden).

In addition to the science, family consumer science, and geography classes that use the garden, two special needs classes (for students with autism and learning disabilities) also cook and garden regularly. Special needs classes are specifically intended to teach students everyday skills. Practicing growing and preparing food is particularly important in reducing food insecurity for this potentially vulnerable population.

Prior to the involvement of the Community Wellness Initiative, middle school students only learned about food preparation, budgeting, and nutrition in the family consumer science class. Through the Wellness Initiative, teachers of other subjects are now incorporating food-based lessons in their curricula. Students are therefore learning about how to grow and prepare food through multiple subjects and perspectives. By integrating this learning into the classroom, students are better able to prepare food for themselves or their families, increasing their food security at home.

The Community Wellness Initiative also promotes food and agriculture-based education in the school cafeteria. A 2014 survey of seventh-grade students at the Meadville middle school found that they had a weak understanding of seasonality and what can be grown in northwestern Pennsylvania. Starting in 2015, a "Harvest of the Month" program was implemented to encourage students to recognize which foods are available locally at different times of the year. This type of program has been offered at schools throughout the United States, but had not been offered in Meadville before. Once per month during lunch hours in the middle school cafeteria, students are encouraged to sample a dish prepared with in-season fruits or vegetables. For example, the Harvest of the Month in March 2016 was lettuce, prepared with a homemade honey-mustard dressing. Of students who tried the salad, more students recorded that they liked it than did not. Samples are prepared by students during morning classes, easily integrating with existing learning outcomes of the family consumer science class. Because they are actively involved in the food preparation, students are eager to try the dishes and encourage their friends to do so as well. The produce used in the taste test is either sourced from the MARC Garden or local farmers, supporting the local food economy and utilizing fresh food from the garden.

In addition to the educational benefits of the Harvest of the Month described above, students are provided with a small quantity of fresh produce during the taste tests. The school is now considering adding a salad bar to their lunch menu because the Harvest of the Month salad was well received, which would increase the availability of fresh produce to students. If other local foods are added to the school

cafeteria in the future, students may be more likely to recognize and choose those dishes and request them at home.

The Community Wellness Initiative reaches every seventh-grade student at the Meadville Area Middle School, which includes many students from low-income, food-insecure households. The opportunities offered by the Community Wellness initiative to participate in cooking, gardening, and other forms of learning about food and agriculture increase students' capacity to improve their own food security, both as youth and later on as adults.

3.2 Summer (June–July)

When school is not in session in June and July, the school section of the garden continues to provide youth with learning opportunities and access to fresh produce. The Community Wellness Initiative, in partnership with a local non-profit focused on youth development, offers a free summer program at the garden. Lunch and transportation are provided to all participants, ensuring accessibility to the low-income population living in and around the Meadville area. The program targets students entering eighth, ninth, and tenth grade (ages 13–15) and has three main goals: (1) to learn the basics of growing and cooking food; (2) to understand how the food system operates, both locally and globally; and (3) to learn how youth can have a voice in local organizational and governmental decisions about food. Students are recruited locally using social media and in-person interactions.

Three-week sessions are offered twice per summer during which youth meet on Tuesdays, Wednesdays, and Thursdays from 9:00 am to 1:00 pm. Students begin each day with an hour of garden work, then transition to a class period where they learn about the food system. Students then make their lunch together using food they harvested from the garden. After lunch, there is either a team building activity or a community-centered activity where youth discuss where they live and what change they want to see in their community.

The students in the summer program experience a more focused study of food, nutrition, and agriculture than during the school year due to the additional time available. They are in the garden every day of the program learning how to grow, maintain, and harvest vegetables. This allows them to see the entire growing process, from seed to harvest. Students prepare and eat lunch each day of the program, giving them new recipes as well as access to fresh foods. Students also have the opportunity to take home additional vegetables from the garden that they learned to prepare earlier that day. This availability of produce combined with learning opportunities for cooking makes them more likely to prepare the foods at home. For example, in 2016, one student especially liked a kale salad prepared during lunch. She was then able to harvest kale every day to bring home to her family along with the knowledge of how to prepare the salad. Other studies have found that involving youth in food preparation improves the nutritional quality of the foods they consume (Larson et al. 2006a, b). Similarly to the adult community gardeners,

food security for youth improves when they gain the knowledge, skills, and interest in growing and eating affordable, fresh produce.

4 Other Wellness Benefits of the Garden

In addition to the opportunities for food education and access that the garden provides to both adults and students, there are also social and emotional benefits for those involved in the garden. There is frequent multi-generational interaction in the garden: school students between ages 12 and 18, college students, and the wide range of community members (ages range from infants to those in their mid-80s) all have the opportunity to meet and interact. Many gardeners have developed new connections because of their involvement at the garden. Gardeners frequently comment that they feel more relaxed after they have spent time in the garden, that they feel safe there, and that they take pride in the food they grow.

5 Next Steps

5.1 For Community Gardeners

Based on the success of the garden's initial two seasons, the Community Wellness Initiative plans to expand the gardens' capacity to include more residents in garden education and access to fresh produce. In addition to increasing garden membership through the rentable garden plots, an alternative option to participate as a "friend of the garden" will be offered. This second option will offer participants less commitment than what is required to maintain a plot for an entire season, but will provide structure for volunteers who choose to attend workshops and shared work sessions. In addition to receiving weekly updates about upcoming workshops and events, these volunteers will receive a share of produce from the garden to take home. By offering another way to be involved, more residents will benefit from educational components of the garden and have the opportunity to bring home and prepare fresh produce, improving food security.

5.2 For Students

The Community Wellness Initiative plans to incorporate the garden into other aspects of the school community so that more students learn how to grow food and have access to fresh foods. The garden is currently used in science, family consumer science, geography, and special education classes; moving forward, lessons will be developed for other subject areas. Incorporating the garden into many different subject areas will provide students with a broader knowledge of food and

agriculture. It will also increase students' exposure to new fruits and vegetables, thereby increasing the chances they are introduced to foods and recipes they like and want to make at home with their families.

Additionally, produce from the garden and local farms will continue to be served in the school cafeteria so that students have access to fresh, local foods during their lunch. The Harvest of the Month program demonstrated that students were enthusiastic about eating salad; the programs coordinator will work with stakeholders at the school to develop and implement a plan for a salad bar in the cafeteria. The produce for this salad bar will be sourced locally when possible so that students make connections between what they are learning in the classroom and what they eat in the cafeteria.

5.3 For the Community Wellness Initiative

One of the limitations of this study is that assessment is based mostly on staff observations, informal conversations, and surveys from the first year (2015) of programs. These methods may not fully capture the impact of the garden on those involved. In 2016, structured interviews of community gardeners and surveys of students who participated in garden-based programs are being conducted to collect further data.

6 Conclusion

The Community Wellness Initiative is enhancing food security in Meadville for both low-income adults and school students by providing better access to and education about growing and preparing fresh foods. The result of this program is that a growing number of residents in a low-income community are consuming fresh, local food with little to no added financial cost. They are also gaining skills around food preparation that they can continue to use throughout their lives.

The CWI model of community and school gardens, which emphasize access and education, can easily be scaled to fit a variety of other communities, although paid staff is important to the success of the program. Even small areas of land can be used to support this kind of garden, so space should not be a constraint. By bringing together multiple segments of the population (schools and various community members), more people benefit from the garden and become invested in the programs so that they can be sustained over the long term. In addition, school gardens and accompanying education programs are a resource that a growing number of schools are utilizing. These schools may benefit from adopting the Community Wellness Initiative's model in which community gardeners are also a part of the school garden. Conversely, community gardens might consider the benefits of integrating local schools into their structure, especially for maintenance and usage during the fall and spring.

The program demonstrates one method of alleviating food insecurity. By providing food and gardening education and access to low-income families, it may be possible to address poverty and hunger, as set in the goals of the 2030 United Nations Agenda for Sustainable Development.

References

Alaimo, K., Packnett, E., Miles, R. A., & Kruger, D. J. (2008). Fruit and vegetable intake among urban community gardeners. *Journal of Nutrition Education and Behavior, 40*(2), 94–101.

Armstrong, D. (2000). A survey of community gardens in upstate New York: Implications for health promotion and community development. *Health and Place, 6*(4), 319–327.

Balbus, J. M., & Malina, C. (2009). Identifying vulnerable subpopulations for climate change health effects in the United States. *Journal of Occupational and Environmental Medicine/American College of Occupational and Environmental Medicine, 51*(1), 33–37.

City-Data.com. (2016). http://www.city-data.com/poverty/poverty-Meadville-Pennsylvania.html. Accessed August 2016.

Coleman-Jensen, A., Rabbitt, M., Gregory, C., & Singh, A. (2015). *Household food security in the United States in 2014*. Economic research report no. (ERR-194) 43 p, September 2015. http://www.ers.usda.gov/publications/err-economic-research-report/err194.aspx.

Comstock, N., Miriam Dickinson, L., Marshall, J. A., Soobader, M., Turbin, M. S., Buchenau, M., et al. (2010). Neighborhood attachment and its correlates: Exploring neighborhood conditions, collective efficacy, and gardening. *Journal of Environmental Psychology, 30*(4), 435–442.

Cook, J. T., & Frank, D. A. (2008). Food security, poverty, and human development in the United States. *Annals of the New York Academy of Sciences, 1136,* 193–209.

Corrigan, M. P. (2011). Growing what you eat: Developing community gardens in Baltimore, Maryland. *Applied Geography, 31*(4), 1232–1241.

Davey Smith, G., & Brunner, E. (1997). Socio-economic differentials in health: the role of nutrition. *Proceedings of the Nutrition Society, 56,* 75–90.

Dubois, L., & Girard, M. (2001). Social position and nutrition: A gradient relationship in Canada and the USA. *European Journal of Clinical Nutrition, 55,* 366–373.

Gatto, N. M., Ventura, E. E., Gyllenhammer, L. E., & Davis, J. N. (2012). LA Sprouts: A garden-based nutrition intervention pilot program influences motivation and preferences for fruits and vegetables in Latino youth. *Journal of the Academy of Nutrition and Dietetics, 112* (6), 913–920.

Hartmann, C., Dohle, S., & Siegrist, M. (2013). Importance of cooking skills for balanced food choices. *Appetite, 65,* 125–131.

Heflin, C. M., Seifert, K., & Williams, D. R. (2005). Food insufficiency and women's mental health: Findings from a 3-year panel of welfare recipients. *Social Science and Medicine, 61*(9), 1971–1982.

High Schools.com. (2016). http://high-schools.com/directory/pa/counties/crawford-county/42039/. Accessed August 2016.

James, W. P. T., Nelson, M., Ralph, A., & Leather, S. (1997). The contribution of nutrition to inequalities in health. *British Medical Journal, 314,* 1545–1549.

Kirkpatrick, S. I., McIntyre, L., & Potestio, M. L. (2010). Child hunger and long-term adverse consequences for health. *Archives of Pediatrics and Adolescent Medicine, 164*(8), 754–762.

Larson, N. I., Perry, C. L., Story, M., & Neumark-Sztainer, D. (2006a). Food preparation by young adults is associated with better diet quality. *Journal of the American Dietetic Association, 106* (12), 2001–2007.

Larson, N. I., Story, M., Eisenberg, M. E., & Neumark-Sztainer, D. (2006b). Food preparation and purchasing roles among adolescents: associations with sociodemographic characteristics and diet quality. *Journal of the American Dietetic Association, 106*(2), 211–218.

McLaughlin, K., Greif Green, J., Alegría, M., Costello, E. J., Gruber, M. J., Sampson, N. A., et al. (2012). Food insecurity and mental disorders in a national sample of U.S. adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry, 51*(12), 1293–1303.

Mutangadura, B. G. (2015). Sustainable development in Southern Africa: Progress in addressing the challenges. *Journal of Sustainable Development in Africa, 1,* 56–69.

Nord, M., Andrews, M., & Carlson, S. (2005 October). Household Food Security in the United States, 2004. *United States Department of Agriculture-Economic Research Service*. USDA-ERS Economic Research Report No. 11. Available at SSRN: http://ssrn.com/abstract=878333 or http://dx.doi.org/10.2139/ssrn.878333.

Patel, D. R., & Agnetta, A. (2016). Food insecurity and nutrition. *Journal of Alternative Medicine Research, 8*(1), 17–22.

Public School Review. (2016). *Second district elementary school*. http://www.publicschoolreview.com/second-district-elementary-school-profile. Accessed August 2016.

Slopen, N., Fitzmaurice, G., Williams, D. R., & Gilman, S. E. (2010). Poverty, food insecurity, and the behavior for childhood internalizing and externalizing disorders. *Journal of the American Academy of Child and Adolescent Psychiatry, 49*(5), 444–452.

Sterling, S. (2003). *Whole systems thinking as a basis for paradigm change in education: explorations in the context of sustainability*. Ph.D. Thesis, Bath: University of Bath.

The World Bank Poverty Overview. (2016). http://www.worldbank.org/en/topic/poverty/overview. Accessed October 2016.

Tieg, E., Amulya, A., Bardwell, J., Buchenau, M., Marshall, J. A., & Litt, J. S. (2014). Collective efficacy in Denver, Colorado: Strengthening neighborhoods and health through community gardens. *Health and Place, 15*(4), 1115–1122.

Transforming Our World: The 2030 Agenda for Sustainable Development. (2016). https://sustainabledevelopment.un.org/post2015/transformingourworld. Accessed October 2016.

United States Census Bureau. (2016). *Poverty status in the past 12 months: 2010–2014*. American Community Survey 5-Year estimates. http://www.census.gov/quickfacts/table/IPE120214/4248360,42. Accessed August 2016.

Utter, J., Denny, S., & Dyson, B. (2016a). School gardens and adolescent nutrition and BMI: Results from a national, multilevel study. *Preventive Medicine, 83,* 1–4.

Utter, J., Denny, S., Lucassen, M., & Dyson, B. (2016b). Adolescent cooking abilities and behaviors: Associations with nutrition and emotional well-being. *Journal of Nutrition Education and Behavior, 48*(1), 35–41.

Van der Horst, K., Ferrage, A., & Rytz, A. (2014). Involving children in meal preparation. Effects on food intake. *Appetite, 79,* 18–24.

Wells, N., Myers, B. M., & Henderson, C. R. (2014). School gardens and physical activity: A randomized controlled trial of low-income elementary schools. *Preventive Medicine, 69* (Supplement), S27–S33.

World Commission on Environment and Development. (1987). *From one earth to one world: An overview*. Oxford: Oxford University Press.

World Hunger and Poverty Facts and Statistics. (2015). http://www.worldhunger.org/2015-world-hunger-and-poverty-facts-and-statistics/. Accessed October 2016.

Author Biographies

Taylor Hinton is the Wellness Programs Coordinator for the Community Wellness Initiative. Hinton develops and delivers food and agriculture-based curriculum at the Meadville Area Middle School.

Kerstin Martin is the Director of the Community Wellness Initiative and Garden Manager for Allegheny College's Carr Hall Garden.

Eric Pallant is Professor of Environmental Science at Allegheny College. Pallant's research incorporates international sustainable development in small communities including college campuses.