

School Gardens May Combat Childhood Obesity

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Obesity is a contributing factor to a variety of chronic diseases (Wang and Lobstein, 2006). Childhood obesity is particularly troubling because it is much more difficult to sustain weight loss than to maintain a healthy weight. Obese children are much more likely to become obese adults; further, restrictive diets for children could result in a diminished supply of nutrients necessary for healthy growth and development (Daniels, 2009; Han, Lawlor, and Kimm, 2010; Ogden et al., 2007). The National Health and Nutrition Examination Survey (NHANES) has shown that one in six children are obese (Ogden et al., 2012), and the rate is higher among racial minorities and those with fewer economic resources (Ogden et al., 2014).

Eating fruits and vegetables decreases the likelihood of childhood obesity (Bradlee et al., 2010; Roseman, Yeung, and Nickelsen, 2007), but most children do not consume the recommended daily amount of produce (Centers for Disease Control and Prevention, 2013; U.S. Department of Agriculture, 2013; Krebs-Smith et al., 2010). In recent years, considerable emphasis and energy have been invested in hands-on programming—such as cooking, farm-to-school, and gardening—to connect children with healthy foods. The most promising approaches may combine curricular learning with hands-on experiences.

Many of these programs have yielded promising results, such as improved science test scores (Klemmer, Waliczek, and Zajicek, 2005; Rahm, 2002). Evaluations of farm-to-school programs have shown improvements in child and teacher eating behaviors, food service at the school level, farmer involvement, and parent attitudes and/or behaviors toward healthy foods (Joshi, Azuma, and Feenstra, 2008). Children who received garden education combined with nutrition education wished to eat more fruits/vegetables than those who received only the nutrition education, or those in control groups (Parmer et al., 2009). These children also had an increased ability to identify fruits and vegetables and higher confidence in preparation (Somerset and Markwell, 2009). In addition, these types of programs appear to have a greater effect among inner-city students, especially in nutrition and food knowledge (Beckman and Smith, 2008; Somerset and Markwell, 2009). Our study was designed to assess the impact of a school gardening curriculum on children's knowledge of and intent to eat fresh vegetables.

Social Cognitive Theory

Increased knowledge of nutrition and science are positive outcomes, but knowledge has not been strongly correlated with behavior change (Contento, Randall, and Basch, 2002). Social Cognitive Theory (SCT), which considers factors that contribute to healthy behavior adoption (Bandura, 2004), provides a framework for many studies of children and healthy behavior. SCT describes behavior as the result of personal (including knowledge), behavioral, and environmental factors and self-efficacy, or one's belief in the ability to perform a health-related behavior (Bandura, 2004). Self-efficacy affects consumption of healthy foods both directly (Cusatis and Shannon, 1996; Thompson et al., 2007) and indirectly (Anderson, Winnett, and Wojcik, 2007).

One environmental factor is "Social Norms," which describes how a child perceives the behavior of others, including peers, adults, and family members. Changing children's attitudes and beliefs about healthy food—

especially their willingness to try new things and the belief that healthy foods are socially acceptable—is a precursor to making positive changes in their food choice behaviors.

Program Overview

To better understand how school garden programming contributes to children’s knowledge of and intent to consume vegetables, our study followed a cohort of students from just before initial planting of a garden to after the garden was harvested, typically from spring to fall (covering two separate academic years). Participating schools received all the materials necessary for creating a raised-bed garden, as well as curriculum tools to relate the garden to math, science, health, and other concepts. The program also focused on community-wide celebrations and activities.

Twenty-three schools participated in two waves between 2012 and 2014. Each school administered surveys to third- and fourth-grade students for one full “garden year,” before and after participating in the school-based garden program. We also surveyed same-aged students from two control schools to control for normal developmental progress. The surveys did not collect identifying information from students, but a unique code was assigned to each survey to track students’ pre- and post-test data. In addition to the student surveys, eight of the twenty-three schools provided data from adults involved in the program. Only data from students and adults at these schools were used for the socioeconomic status with Program Integration analysis (Figure 1).

Figure 1: Survey Sample Statistics



Knowledge and Intent

Because knowledge is not strongly correlated with behavior, we created a dependent variable that combined knowledge and intent. Before students participated in a school-based gardening program, we estimated the relationship between the SCT factors and knowledge/intent. Student knowledge was measured by students’ answers to a “MyPlate” question: “Shade in the part of the plate that should be covered in fruits and vegetables.” Intent was measured by asking the students about their intent to eat vegetables later that day: “Will you eat vegetables at dinner tonight?” As shown in Table 1, higher Self-Efficacy and Social Norms increased the likelihood of students being “Knowledgeable with Intent” to consume vegetables. In addition, better gardening skills increased the likelihood that students were knowledgeable (MyPlate, Figure 2) and intended to eat vegetables that evening.

Table 1: The Impact of SCT Factors on Student Knowledge/Intent

	Odds ratio (Likelihood)
Self-Efficacy	6.00*
Gardening Skills	2.74*
Social Norms	2.96*
Preferences	2.23*
Food System Learning	0.41*
Suburban	4.04*
Urban	0.46
County Percent White/Caucasian	0.99*
County Poverty Rate	1.06
County Obesity Rate	1.02
County Fast-food Restaurant Prevalence	3.02

Notes: *Statistically significant at the 10% level or better

Each school was in a different U.S. county, but most county-level environmental variables tested—such as county food environment and poverty rates—did not predict student knowledge/intent. The exception was that enrollment in a suburban school increased the probability of students being knowledgeable with intent.

In Schools that Change the Environment, More Students Intend to Eat Vegetables

Table 2 compares Knowledge, Intent, and Garden Skills among participating students before and after the school-based gardening program compared to a control group. After completing a school-based garden program, three times more students (a statistically significant difference) expressed intent to consume vegetables that evening, while the intent of a control group of same-aged students remained essentially unchanged. MyPlate knowledge and knowledge of gardening were slightly lower, but not statistically significant. Figure 3 shows that gardening knowledge did increase after the program for students of low socioeconomic status. For the purposes of this study, schools with low socioeconomic status were defined as those with 60% or more of students eligible for free or reduced-price lunches.

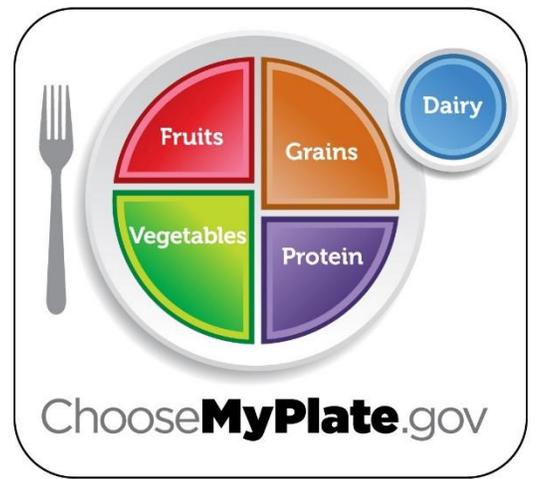
Schools changed their environments through planting, maintaining, and harvesting school gardens. More students at these schools intended to eat vegetables. In a subset of schools (8 of 23), adults at the school who were familiar with the garden program (a combination of teachers, staff, and parent volunteers) shared their involvement and perceptions of the program. Some schools demonstrated to students that adults were committed to these changes to the school environment. Adult modeling of healthy food choices and

engagement, connections from the garden to the classroom, and community involvement in these changes helps students—especially those in low-income communities—change their beliefs and attitudes about healthy food.

Summary

Consistent with other studies, self-efficacy, social norms, and gardening skills helped change student knowledge about and intent to eat vegetables. And, importantly, demonstrated commitment by school personnel can amplify changes in gardening skills, especially in lower income communities. Childhood obesity disproportionately affects those with fewer economic resources. In this study, school gardening programs in inner-city schools increased students' life skills, knowledge of and confidence in their ability to make healthy choices surrounding fresh produce.

Figure 2: USDA MyPlate Graphic



Source: <https://www.choosemyplate.gov/MyPlate>

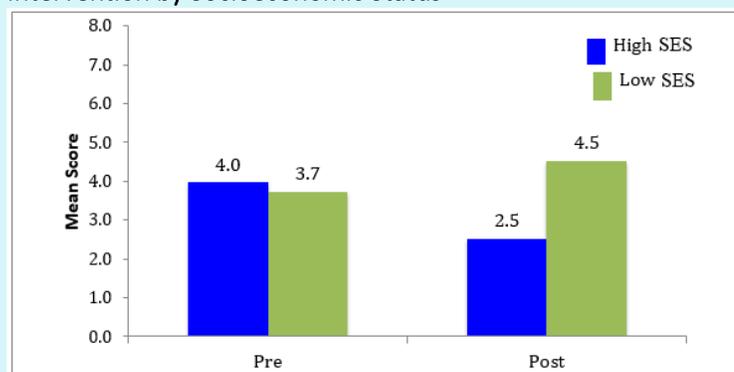
Table 2: Change in Student MyPlate Knowledge and Intent to Eat Vegetables

	Program Group		Control Group	
	Pre-test	Post-test	Pre-test	Post-test
MyPlate Knowledge	41.9	39.7	41.8	36.3
Intent to Eat Vegetables	7.2	24.3***	7.7	9.9
Garden Skills (mean out of 8)	4.4	3.9	3.4	3.7

Notes: ***Statistically significant at the 1% level

Gardens can provide alternative access to fresh produce, especially in urban areas that may lack full-service grocery stores. Locating gardens on school grounds may provide students, teachers, and communities with connections to produce and offer opportunities for learning new skills, developing new preferences, and changing social norms. However, school garden programs appear to provide less effect in communities where gardens and grocery stores are more readily available and households have more resources and choices available to them.

Figure 3: Change in Gardening Knowledge after Garden Intervention by Socioeconomic Status



For More Information

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