Sustainable Lunch Programs: Educational foodservice's sustainability efforts and school nutrition

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A Report

submitted in partial fulfillment of the requirements for the degree

MASTER OF SCIENCE

Department of Food Nutrition Dietetics & Health
College of Health and Human Sciences

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2020

Approved by:

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Abstract

This report examines the relationship between farm-to-school initiatives and environmental sustainability within the dietary and nutritional constructs of the National School Lunch Program (NSLP) and Healthy, Hunger-Free Kids Act (HHFKA). Farm-to-school programs and other hands-on nutritional and agricultural education initiatives can improve compliance with the strict nutrition and dietary guidelines of the NSLP and HHFKA. Innovations in the farm-to-school movement, including sourcing local produce, increasing scratch cooking, using more fresh ingredients, and increasing hands-on nutrition and agricultural education, can increase a school's environmental sustainability. These activities demonstrate the benefits farm-to-school program involvement has on student nutritional intake and dietary habits. Potential environmental benefits of farm-to-school programs include reducing food waste, decreasing long-distance travel, cutting down on packaged and preprocessed foods, and/or creating new green spaces. Chicago Public Schools' current healthy food, farm-to-school, and sustainability initiatives are highlighted in this report. Using the Kansas State University online research database, recent articles studying nutrition education, farm-to-school innovations, school gardens, and cafeteria sustainability were identified. Studies were chosen based on their emphasis on NSLP participation and adherence to current dietary guidelines and standards, including the HHFKA and direct or indirect environmental benefits.

Keywords included: NSLP, farm to school, foodservice sustainability, school lunch, local food, Healthy Hunger Free Kids Act, and National School Lunch Act (NSLA).

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Acknowledgements

Thank you, Dr. Wang, for being my academic advisor and helping me complete this degree. Thank you to Martha Carter for all the support and for reviewing the paper so many times.

Dedication

To my parents and friends who have supported me on this journey.

Chapter 1 - Introduction

The United States Department of Agriculture's (USDA) National School Lunch Program (NSLP) feeds over 30 million American children every year (USDA, 2019b). Recent updates in nutrition standards require less processed, healthier ingredients such as fresh fruits and vegetables (USDA, 2017b). Schools and foodservice professionals are working on new initiatives to help increase student acceptance of these new requirements, reduce food waste, and increase NSLP participation rates (Cohen et al., 2012; Boss, 2017; Gross et al., 2019; Pope et al., 2018).

Although there is no consensus on what the healthiest diet is, many health professionals agree that Americans consume excess amounts of processed foods, sodium, saturated fat, and added sugars (Poti et al., 2015; Khanji et al., 2018). The current Dietary Guidelines for Americans stress the importance of consuming fresh fruits and vegetables as part of a healthy lifestyle (USDA & DHHS, 2015). The Healthy, Hunger-Free Kids Act of 2010 (HHFKA) addressed these concerns by developing stricter nutritional standards but implementation of, and adherence to, the new requirements is challenging (Asada et al., 2017). Farm-to-school, Edible Schoolyards, hands-on classroom-based nutrition and healthy lifestyle learning are a few innovations schools are using to overcome these challenges (Hee-Jung, S., Grutzmacher, S., & Munger, A., 2016; Harper et al., 2017; Knapp et al., 2018). Although data are limited, recent studies assessing the nutritional and dietary impacts of school meals and/or the current farm-to-school movement use increased fruit and vegetable consumption as a proxy for healthier meals and better dietary habits. (Parmer, Salisbury-Glennon, Shannon, & Struempler, 20009; Cohen, et a., 2012; Just, Wansink, & Hanks, 2014; Davis, Spaniol, & Somerset, 2015; Hee-Jung, Grutzmacher, & Munger, 2016; Vernarelli, 2017).

The HHFKA's rigorous guidelines, paired with school participation in culinary and agricultural education, may produce more sustainable food systems and reduce a school's environmental impact through use of fresh and local ingredients (Conner et al., 2011; Jaeschke et al., 2012, Harper et al., 2017; Gilbert, 2018). In 2018, the Society for Nutrition Education and Behavior stated that environmental sustainability "should be inherent in dietary guidance" (SNEB, 2018). School meal programs can learn from sustainability efforts in the broader foodservice industry as part of their effort to improve nutrition and children's health. This report looks at how participation in the NSLP and adherence to the HHFKA can improve students' nutritional intake while creating more environmentally sustainable schools.

Chapter 2 - USDA Nutrition Guidelines

The USDA's nutrition guidelines play an integral role in the National School Lunch Program (NSLP) and other feeding programs like the School Breakfast Program (SBP) and Summer Feeding Program. These guidelines follow the general statement that a healthy lifestyle includes a lot of fresh fruits and vegetables and foods low in added sodium and sugars (USDHHS & USDA, 2015; Khanji et al., 2018).

Individual health and nutrition guidelines vary widely depending on many factors, including one's age, socioeconomic status, country and region of origin, ethnicity, and culture. Recommended dietary guidelines and suggested nutritional intakes have been presented for over a century in the United States. The first set of Recommended Daily Allowances (RDAs) was released in 1941 by the Food and Nutrition Board of the National Academy of Sciences, which recommended intake values for calories and nine essential nutrients (Davis & Saltos, 1999).

By the 1970s, the United States Department of Health and Human Services (USDHHS) acknowledged that America's obesity rate was on the rise and poor energy balance was becoming a public health concern (USDHHS, 2013). Energy balance is the balance between one's caloric intake and expenditure (USDHHS, 2013). If more calories are consumed from food and beverages than what are burned during physical activity, weight gain occurs. The US Senate Select Committee on Nutrition and Human Needs' 1977 Dietary Goals for Americans consisted of comprehensive nutrient- and food-based goals (U.S. Senate Select Committee on Nutrition and Human Needs, 1977). These goals are presented in Table 1.

Nutrient based	Food based
Increase consumption of complex carbohydrates and “naturally occurring sugars”	Increase consumption of fruits, vegetables, and whole grains
Reduce consumption of refined and processed sugars, total fat, saturated fat, cholesterol, and sodium	Decrease consumption of refined and processed sugars and foods high in such sugars
	Decrease consumption of foods high in total fat and animal fat, and partially replace saturated fats with polyunsaturated fats
	Decrease consumption of eggs, butterfat, and other high-cholesterol foods
	Decrease consumption of salt and foods high in salt
	Choose low-fat and non-fat dairy products instead of high-fat dairy products (except for young children)

Table 1. 1977 Recommended Dietary Goals *(Adapted from “History of Dietary Guidance Development in the United States and the Dietary Guidelines for Americans.”)*

The first edition of *Dietary Guidelines for Americans,* for ages two and over, came out in 1980 as a joint effort between the United States Department of Agriculture and Department of Health and Human Services (DHHS). These Guidelines are revised every five years as mandated in the 1990 National Nutrition Monitoring and Related Research Act (Davis & Saltos, 1999).

The current set of federal dietary guidelines are found in the 2015-2020 *Dietary Guidelines for Americans, Eighth Edition*, which was released in January 2016. In addition to recommended guidelines, this edition includes key recommendations, tips, and "shifts” to help Americans follow a healthy diet. This edition acknowledges the importance of an overall healthy lifestyle and eating patterns on the individual and community/social level (USDHHS & USDA, 2015).

The current *Dietary Guidelines* are:

1) Follow a healthy eating pattern across the lifespan.
2) Focus on variety, nutrient density, and amount.
3) Limit calories from added sugars and saturated fats and reduce sodium intake.
4) Shift to healthier food and beverage choices.
5) Support healthy eating patterns for all.

(USDHHS and USDA, 2015)

Many of the report's Key Recommendations focus on healthy eating patterns. These include eating a variety of fruits and vegetables from all the subgroups, making at least one half of all grains whole grains, choosing fat-free or low-fat dairy options, and consuming a variety of protein foods, which includes meat, seafood, and plant-based sources such as tempeh or tofu (USDHHS & USDA, 2015). Saturated and *trans* fats, added sugars, and sodium are limited in a healthy eating pattern (USDHHS & USDA, 2015).

Chapter 3- Child Nutrition and the National School Lunch Program

Dietary guidelines for children have appeared in America as early as 1916 when nutritionist Caroline Hunt wrote *Food for Young Children* (Hunt, 1916). However, the United States federal government did not pass the first comprehensive legislation addressing child nutrition until the Richard B. Russell National School Lunch Act of 1946 (NSLA). One purpose of the Act was "to safeguard the health and well-being of the Nation's children" by providing nutritious school lunches through the National School Lunch Program (NSLP) (Richard B. Russell National School Lunch Act, 1946). The Act set aside federal funds to be allocated among the States based on the total number of school children and the need for assistance based on per capita income. Key stipulations in this act required participating schools to offer meals at a reduced- or no-cost rate when deemed appropriate, operate on a non-profit basis, utilize USDA food commodities where practical, and serve meals that meet the minimum nutritional requirements (Richard B. Russell National School Lunch Act, 1946). This original set of federal minimal nutrition requirements included whole milk, a protein-rich component, "raw, cooked, or canned" fruits and/or vegetables, "1 portion" of a bread or grain item, and 1-2 tsp of "butter or fortified margarine" (Richard B. Russell National School Lunch Act, 1946).

The Child Nutrition Act of 1966 (CNA) made minor changes to the NSLP in addition to setting nutrition standards for a pilot school breakfast program, which began in 1968. The School Breakfast Program (SBP) became permanent in 1975 via an amendment to the CNA (Hopkins & Gunther, 2015). The CNA gave the USDA oversight of all programs involved with feeding school children, including the NSLP and SBP (Gunderson, 2013). This allowed for the development of uniform standards for nutrition, sanitation, supervision, and other

program components. The CNA also authorized funding to help purchase equipment that allowed schools to "extend the lunch and breakfast services to additional children" (Gunderson, 2013).

In 1994, the USDA established the School Meals Initiative for Healthy Children to improve school meal nutrition based upon updated dietary guidelines (Martin, 1997). The new requirements mandated that school lunch menus provide, over the course of a one-week period, lunches that met one-third of the Recommended Dietary Allowance (RDA), and the SBP meet 25% of the RDA for calories and key nutrients including protein, calcium, iron, Vitamin A, and Vitamin C (Martin, 1997). No school meal could contain more than 30% of calories from fat or 10% of calories from saturated fat. The Initiative also called for a reduction of sodium and cholesterol and an increase in dietary fiber (Martin, 1997).

The Child Nutrition and WIC Reauthorization Act of 2004 made several amendments to the NSLA and CNA. This Act added a nutrition promotion provision to the NSLP and authorized funding for several demonstration projects, including those promoting healthy school nutrition environments (U.S. Senate Committee on Agriculture, Nutrition, and Forestry, 2004). In addition, school districts and agencies participating in federal Child Nutrition Assistance programs such as the NSLP or SBP were now required to create a wellness policy (U.S. Senate Committee on Agriculture, Nutrition, and Forestry, 2004). The Centers for Disease Control and Prevention states the purpose of a school wellness policy is to create "supportive school nutrition and physical activity environments" (CDC, 2018).

As childhood obesity continued to rise, the Healthy, Hunger- Free Kids Act of 2010 (HHFKA) was passed. This law mandated that the NSLP and SBP nutrition guidelines be updated and school wellness policy requirements be enhanced. The final rule, issued in

2012, contained new meal component requirements and nutrient values to be phased in by school year (SY) 2022-2023 which are presented in Table 2 (7 CFR 210, 2012).

In 2017, the USDA loosened some of the 2012 nutrition guidelines, providing "meal pattern flexibilities" for schools (USDA Food and Nutrition Service, 2017a). The original rule required a gradual, three-step reduction in sodium values. The final target was a 25-27% and 53-54% reduction in sodium levels by the 2022-2023 school year, for the SBP and NSLP, respectively, to the amounts shown in Table 2 (7 CFR 210, 2012). After the 2017 amendments, schools only need to reduce sodium levels by 15-17% and 32-33% for the SBP and NSLP, respectively, by SY 2024-2025 (USDA Food and Nutrition Service, 2017a). The final sodium target set by the 2012 rule was eliminated. The 2012 rule stated that flavored milk could only be served if it is fat-free. Schools can now serve low-fat or fat-free flavored milk. Whole grain values were also modified. Originally, all grains needed to be whole grain by SY 2014. This requirement was removed, and only half of the grains must be whole grain (USDA Food and Nutrition Service, 2017a).

Meal pattern	Breakfast meal pattern			Lunch meal pattern		
	Grades K-5	Grades 6-8	Grades 9-12	Grades K-5	Grades 6-8	Grades 9-12
	Amount of food per week (minimum per day)					
Fruits (cups)	5 (1)	5 (1)	5 (1)	2 1/2 (1/2)	2 1/2 (1/2)	5 (1)
Vegetables (cups)	0	0	0	3 3/4 (3/4)	3 3/4 (3/4)	5 (1)
Grains (oz eq)	7-10 (1)	8-10 (1)	9-10 (1)	8-9 (1)	8-10 (1)	10-12 (2)
Meats/Meat Alternates (oz eq)	0	0	0	8-10 (1)	9-10 (1)	10-12 (2)
Fluid milk (cups)	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)
Other Specifications: Daily Amount Based on the Average for a 5-Day Week						
Min-max calories (kcal)	350-500	400-550	450-600	550-650	600-700	750-850
Saturated fat (% of total calories)	< 10	< 10	< 10	< 10	< 10	< 10
Sodium (mg)	≤ 430	≤ 470	≤ 500	≤ 640	≤ 710	≤ 740
Trans fat	Nutrition label or manufacturer specifications must indicate zero grams of *trans* fat per serving.					

Table 2. HHFKA 2012 Nutrition Requirements (7 CFR 210)

Chapter 4 - Healthy School Meals Initiative

Childhood obesity is a growing problem in America. The extent to which the NSLP plays a role in this epidemic has been studied for decades. Hopkins and Gunther (2015) reported that several studies between 1972-2009 found NSLP and/or SBP participants consumed greater amounts of calories, sodium, and fat than what was recommended. Some studies reported that participant BMIs were higher than non-participant BMIs (Hopkins & Gunther, 2015). By updating child nutrition and school meal requirements through the passage of the HHFKA, the federal government acknowledged the role the NSLP has in children's diets

Many schools struggle to create meals that meet the new HHFKA dietary guidelines and appeal to students (Cornish, Askelson, & Golembiewski, 2015). Various initiatives and innovative techniques are being used to tackle this challenge. One example is active student participation in the form of "hands on" learning with nutrition education. This includes gardening activities, agricultural experiences like farm visits, and cooking lessons (Davis, Spaniol, & Somerset, 2015; Song et al., 2015; Asada et al., 2017; Jaeschke, Raeder Schumacher, Cullen, & Wilson, 2012; Farm to School Network, 2017; The Edible Schoolyard Project, 2019). Improved culinary skills and additional training can help foodservice staff perform more scratch cooking and prepare more nutrient-dense meals (Stephens, Shanks, Roth, & Bark, 2016; Cohen et al., 2012). Retrofitting the layout cafeterias can also improve student appeal for the meals and increase the nutritional intake of school meal participants (Boss, 2017).

4.1 - Agricultural Education

Hands-on agricultural education exposes students to fresh, unprocessed, food, and has flourished over the past few decades (National Farm to School Network, 2017; The Edible Schoolyard Project, 2019). The Edible Schoolyard Network and the National Farm to School

Network are two prominent nonprofits that help schools connect learning potential with hands-on gardening skills. A 2009 study including qualitative and quantitative data found nutrition education supplemented with gardening activities increased knowledge, preference, and consumption of fruits and vegetables of second-grade students (Parmer, Salisbury-Glennon, Shannon, & Struempler, 2009). A recent review article identified 10 studies that found hands-on gardening and agricultural education effective in improving dietary behaviors, such as fruit and vegetable consumption, nutrient intake, and/or vegetable intake variety, of school children (Davis, Spaniol, & Somerset, 2015). Bontrager Yoder et al., (2014) found farm-to-school programs increased fruit and vegetable intake among students with low baseline intake, thus increasing the nutrient intake of those students.

A 2016 article chronicled a group of Massachusetts students' journey from learning and working on a community farm, seeing the produce in the cafeteria, to watching students eat the fresh produce, and seeing change on the administration and policy levels (Harper et al., 2017). Buffalo Public Schools' farm-to-school program contains the "Harvest of the Month" where a local, seasonal fruit or vegetable is highlighted by the school. This item is served in cafeteria meals, featured on flyers and posted on the BPS website. Recipes, nutrition information, and growing information provide great learning opportunities for students, parents, staff, and community members (Gilbert, 2018). Educational initiatives that allowed students to share their food system knowledge were successful in improving adolescent diet quality by increasing fruit and vegetable selection and consumption in two Colorado middle schools (Prescott et al., 2019).

4.2 - Taste Testing and Staff Training

Farm-to-school programs can help reduce the use of canned, over-cooked, and highly processed fruits and vegetables found in many schools by encouraging larger fruit and vegetable portions, serving more whole grains, and using less salt (Colasanti et al., 2009; Gilbert 2018); however, these measures do little good if the students won't eat it. Providing samples and taste-testing events for students and staff, including student input and feedback during menu development, and bringing in professional chefs to help train staff are ways schools can increase student and staff acceptance of the updated nutrition requirements (Gilbert, 2018; Davis, Spaniol, & Somerset, 2014; Cohen et al., 2012; Just, Wansik, & Hanks, 2015; Asada, Ziemann, Zatz, & Chriqui, 2017).

In 2010 the Obama administration launched the Chefs Move to Schools program, which paired chefs with school foodservice workers and nutrition staff who wanted to provide nutritious meals that appealed to students while adhering to the strict HHFKA guidelines (Just, Wansink, & Hanks, 2015). One study found NSLP participation rates and vegetable consumption increased with chef-created meals in several New York high schools (Just, Wansink, & Hanks, 2015). The Chef Initiative was a pilot program in several Boston middle schools that taught cafeteria staff how to use fresh produce and scratch cooking to provide "healthier, more palatable" school meals (Cohen et al., 2012). The author found the chef-based training was a key component of this project, which resulted in increased vegetable consumption in the treatment schools. Similarly, the Montana Cook Fresh Workshop provided hands-on training for school nutrition program staff so they could increase scratch cooking and utilize more whole, raw, and/or fresh ingredients in their schools (Stephens, Shanks, Roth, & Barks, 2016). A 2014 study examined the cost and nutritional values of meals with varying amounts of

scratch preparation involved (Woodward-Lopez, et al., 2014). The researchers found scratch cooking could produce meals with lower *trans*, saturated, and total fat values, though not consistently. The researchers also found a wider variety (i.e., Asian, Mexican, Italian) of meals were offered at schools that participated in scratch cooking (Woodward-Lopez et al., 2014). During a recent multi-state qualitative study involving high school students, increasing the amount of scratch cooking was one of the recommendations from this critical stakeholder group (Asada et al., 2017).

Taste testing and sampling items allow students to give direct feedback and potentially influence the cafeteria menu. During a pilot study on the effectiveness of the Chefs Move to Schools program, the participating chef provided afterschool taste-testing events to observe student acceptance of, and receive feedback on, the new menu items (Just, Wansink, & Somerset, 2014). "Taste Test Thursdays" is an intervention Buffalo Public Schools implemented to introduce new, healthier meals to students (Gilbert, 2018). Pope et al. (2018) found more students selected vegetable-focused entrees when samples were provided the day before the meal was offered. In addition, programs like Food Bank for New York City's CookShop NYC provides classroom cooking lessons that allow students to create and taste the meals while maximizing the impact farm-to-school has on the children (Food Bank for New York City, 2019).

4.3 - Cafeteria Environment Initiatives

Dining room and kitchen layout affect almost every aspect of a meal. Cafeteria renovations can improve the school foodservice staff's ability to create healthy, palatable meals that students want to eat. The USDA provides grants for NSLP- participating schools wanting to purchase equipment that helps "realize meaningful impacts on nutrition or quality of meals"

and/or enables “changes that provide more convenience and appeal” (USDA Food and Nutrition Service, 2019a). Schools are able to remodel their kitchens to facilitate more scratch cooking, easier processing, and improved storage of fresh ingredients. For example, after a recent renovation, staff at an Iowa high school found that positioning the salad bar so that it is one of the first things the high schoolers see as they enter the cafeteria increased healthier selections (Boss, 2017).

Research performed during SY 2011-2012 found vegetable consumption rates were higher at schools with 30 minute seating lunch periods versus 20 to 25 minute periods (Cohen et al., 2015). Gross et al. (2019) found the physical cafeteria environment affected fruit, vegetable, and/or whole grain consumption in New York City elementary students. This cross-sectional observational study recorded the noise levels, lunch time length, and extent of cafeteria crowding at 10 schools, then compared the fruit, vegetable, and whole grain consumption rates between the schools. Quieter cafeterias, longer lunch periods, and/or less crowding were correlated with higher consumption rates of these food items, leading to increased nutrient intake of these students (Gross et al., 2019).

Chapter 5 - Foodservice Sustainability

The United States Department of Agriculture Economic Research Service (USDA ERS) defines foodservice establishments as "facilities that serve meals and snacks for immediate consumption on site" (USDA ERS, 2019). This includes restaurants, hotels, and resorts as well as institutional settings such as schools, universities, hospitals, prisons, and military bases.

The foodservice sector is now poised to be a leader in environmental sustainability. Since 2014, Americans spend more on food away from home than on food eaten at home (Elitzak and Okrent, 2018). Several sustainable initiatives and best operating procedures (BOPs) exist in the foodservice industry. These include energy efficient equipment, water saving innovations, eco-friendly and "smart" packaging, reducing food waste, and increasing recycling and composting. Increasing efforts are also being made to use more local and organic ingredients (National Restaurant Association Sustainability Report, 2018). Today, online stores and websites expand the options for, and potentially help with the costs of, more sustainable, environmentally friendly equipment and products. The Green Restaurant Association has an online "Certified Green Products Guide" searchable database, while online retail stores such as Letsgogreen.biz, WebstaurantStore, and Go-Green Packaging carry a variety of products.

Since 1990, the Chicago-based nonprofit Green Restaurant Association (GRA) has provided resources and a third-party certification program to help restaurants and foodservice establishments achieve their sustainability goals. The GRA has created several definitions to help standardize foodservice sustainability. According to the GRA, local food is "transported 100 miles or less from farm / orchard to your plate, using the most direct transportation route" while regional food is "transported 300 miles or less from farm / orchard to your plate, using the

most direct transportation route;" humanely raised and handled ingredients must be "Certified Humane, Animal Welfare Approved, American Grass-fed, American Humane Certified, Global Animal Partnership 4, 5 and 5+;" while sustainable seafood must be "favorably listed by Monterey Bay Aquarium, ASC, OceanWise, or MSC Certified" (Green Restaurant Association, 2015). Green Restaurant Association restaurant listings exist for Chicago, Boston, San Diego, Los Angeles, New York City, Washington, DC, and Asheville, NC but are found in smaller markets as well including Athens, OH, Lexington, KY, many National Park locations, and college or university dining facilities (GRA, 2019).

Chapter 6 - Sustainability in The School Cafeteria

School cafeterias are an ideal location to practice and teach environmental sustainability due to the vast number of people served, the quantity of food prepared by the workers, and the amount of resources used at these operations. However, the practical capabilities of the school and region must be taken into consideration before implementing school foodservice sustainability. While some schools may have space to grow their own food, others may rely on local food hubs and/or foodservice distributors to provide local products. At large school districts and in urban areas, economies of scale and a large market force may increase availability and affordability of environmentally sustainable products, ingredients, and practices (Conner et al., 2011). Increasing numbers of municipalities, states, and school districts have commercial composting programs (Litterless, 2019). The environmental benefits of cafeteria sustainability include reduced packaging, fewer transportation costs and distances, and less food waste in the refuse stream. Below are several successful methods to improve cafeteria sustainability.

6.1- Supporting Local Agriculture

The farm-to-school movement is an increasingly common approach in schools to involve the students with the growth, procurement, and nutrition of the food they eat. A recent multinational study found farm-to-school programs can improve sustainability in the entire community, reduce food waste and food miles (transportation), increase food security, increase economic support for local farmers, promote healthier food consumption in low-income areas, and lead to increased agricultural knowledge (Oostindjer et al., 2017). The USDA's 2015 Farm to School Census found over 42,000 schools across the country participated in farm-to-school

activities leading to an investment of $789 million in local economies (USDA FNS, 2016). The 2019 Farm to School Census is currently underway to update this information.

Central to this movement is that schools buy food from local and regional farmers or producers, then serve these products to the students. A farm-to-school program "connects schools, farms, and community partners...through agriculture, health, and nutrition education; and [strengthens] our economy" (Gilbert, Schindel, & Robert, 2018). This movement is in urban and rural, public or private, schools across the country, with growing support from local, state, and federal agencies. The Child Nutrition and WIC Reauthorization Act authorized funding and competitive grants to expand access to and procurement of local foods (U.S. Senate Committee on Agriculture, Nutrition, and Forestry, 2004). As part of the HHFKA, the USDA Farm to School program was established and competitive grant funding made available to eligible organizations and schools for farm-to-school efforts (Lyson, 2016). A 2017 study found it was significantly more likely that school garden produce was used in school nutrition service programs where state-level laws supporting school gardens existed (Turner et al., 2017). These findings recognize the potential school gardens have in increasing student fruit and vegetable consumption (Turner et al., 2017). The National Farm to School Network (NFSN) is a leading nonprofit organization advancing farm-to-table goals. The NFSN acts as "an information, advocacy and networking hub" for schools and communities working on initiatives such as increasing local food sourcing, school gardens, food and agricultural education, childhood nutrition, and supporting local economies (NFSN, 2017).

School gardens and edible schoolyards, in which students are directly involved in the production and preparing of the ingredients, are common in farm-to-school programs (Harper, 2017; Knapp et al., 2018; The Edible Schoolyard Project, 2019). The organic and/or sustainably

grown produce from these programs is immediately available with few environmental consequences due to lengthy transportation and storage times or excess packaging (Harper et al., 2017). School gardens can increase the number of urban green spaces and other positive effects like increasing pollinator habitat and reducing stormwater runoff (The Edible Schoolyard Project, 2019; Healthy Schools Campaign & Openlands, 2016a).

6.2- Purchasing Power and Procurement

Large districts and urban schools can use their size to become more sustainable. They have a great deal of purchasing power. When customers require mass quantities of specific items, or have large accounts, they can potentially affect what their distributor/purveyor carries and/or the price of the item, thus altering the market (Gilbert, 2018; Center for Good Food Purchasing, 2019). A market mechanism used by some large districts is called Value Chains (VCs). VCs with mid-scale farmers "creat[e] strategic partnerships that contribute to the welfare of all participants," while securing the quantity and quality of a food item(s) the school needs (Conner et al., 2011).

One initiative enabling large school districts to use their purchasing power to promote sustainability is the Good Food Purchasing Program. This program was created by the Center for Good Food Purchasing as "a coordinated local-national initiative that harnesses the power of procurement to create a transparent and equitable food system, which prioritizes the health and well-being of people, animals, and the environment" (Center for Good Food Purchasing, 2019), The program's five core values are local economies, environmental sustainability, animal welfare, nutrition, and valued workforce (Center for Good Food Purchasing, 2019).

Another program focusing on healthy, sustainable, and regional procurement is the W.K. Kellogg School Food FOCUS collaborative. This collaborative helps over 30 large school

districts overcome the challenges of securing local or regional food that is healthier (i.e., minimally processed) and with a smaller environmental impact (W.K. Kellogg Foundation, 2019).

6.3- Reducing Food Waste

Food waste is a major social and environmental issue in America. A recent review indicated that as much as 30% of the food served as part of the NSLP is wasted (Shanks et al., 2017). A three-year cohort study that studied consumption rates before and after the HHFKA 2012 nutrition guidelines found food waste decreased by the third year (Schwartz et al., 2015).

Education and repeated exposure to new foods are potential ways to combat food waste in cafeterias. Field trips, gardening classes, taste-tests, and cooking classes are just a few educational tools with the potential to reduce food waste, often through increased fruit and vegetable consumption rates (National Farm to School Network, 2017; Harper et al., 2017). For example, a recent study at several Florida schools showed that after farm-to-school programs started, fruit and vegetable consumption increased, thus decreasing plate waste (Kropp et al., 2018). Student led initiatives and input in school lunch meals can also have positive impacts on plate waste (Asada et al., 2017; Prescott et al., 2019).

The federal government also acknowledges the challenges of food waste. Forcing students to take something, like the mandatory vegetable in the HHFKA, may increase their resistance to eating it, thus increasing waste (Asada, Ziemann, Zatz, & Chriqui, 2017). The USDA established the Offer Versus Serve program, which is now mandatory in high schools and optional for grades K-8. This program allows schools to provide several options to the students, allowing the students to choose their preferred components of a reimbursable meal (USDA, 2015). Prior to the implementation of this program, Schwartz et al. (2015) found an increase in the number of fruits offered increased selection by 9.3% in their 3-year cohort study. A study of

over 800 elementary students at schools participating in the Offer Versus Serve program, found when rewards were given to students who ate their fruits and vegetables, a decrease in food waste was sustained post-intervention (Thapa & Lyford, 2019). Asada et al. (2017) found in addition to the Offer Versus Serve program, student input on meal development may improve palatability and consumption of school meals, thus reducing the amount of food waste.

Chapter 7-Success Story: Chicago Public Schools

Chicago is the third largest city in America and Chicago Public Schools (CPS) serves millions of meals every year. There are over 470 schools, several dozen of which are charter schools (Chicago Public Schools, 2019). Chicago Public Schools partners with their foodservice provider Aramark to provide healthy, nutritious, and sustainable food options to the thousands of students they serve every year. CPS maintains several webpages to educate the public on their health and wellness, Farm to School, school gardens, and culinary education initiatives.

7.1 - Nutrition and Wellness Policies

Chicago Public Schools has successfully implemented several policies and procedures in its effort to encourage healthier students and communities. LearnWELL is "an initiative to improve the well-being of every CPS student by helping schools align with the updated Local School Wellness Policy" (CPS, 2012b). Nutrition education is incorporated into the schools' core curriculum and CPS acknowledges that dining facilities and school gardens play an important role in teaching about healthy eating (CPS, 2012b). The *LearnWELL Toolkit* is a resource to help students, staff, and community members understand and follow Chicago Public School's *Local School Wellness Policy* (CPS, 2012b). The *Toolkit* summarizes CPS's Healthy Snack and Beverage policy while offering suggestions and snack ideas to the reader.

Another means of providing healthy food in Chicago schools is through the USDA's Fresh Fruit and Vegetable Program (FFVP). This program is designed to increase fresh fruit and vegetable exposure and consumption in elementary schools (USDA Food and Nutrition Service, 2017b). Although Ohri-Vachaspati, Turner, & Chaloupka, (2012) observed that schools participating in the FFVP were more likely to have fresh fruits and vegetables available during

lunch, Masis et al. (2017) noted more research is needed to determine FFVP's impact on preference for, and subsequent consumption of, fruits and vegetables.

7.2 - School Gardens

A recent survey of 382 Illinois school administrators found schools in Cook County, which includes Chicago, had a significantly higher likelihood of having a garden versus schools outside the county (Loftus et al., 2017). The survey revealed that 71% of respondents who did not have edible school gardens believed these gardens would encourage students to "accept more fruits and vegetables in their current diets" (Loftus et al., 2017). The same survey found two-thirds of respondents indicated that edible school gardens assisted in nutrition education and had a positive influence on fruit and vegetable consumption among students (Loftus et al., 2017). Several of the administrators surveyed were with Chicago Public Schools (Loftus et al., 2017). This survey supports the findings of Jacsehke, Raeder Schumacher, Cullen, & Wilson (2012) that there is a general belief among school personnel that school gardens can have nutritional and health benefits students.

There are over 400 school gardens in Chicago and CPS's *GrowWELL Toolkit* helps these gardens reach their full potential, including using the produce in the cafeteria (CPS Nutrition Services, 2018). The *GrowWELL Toolkit* explains the food and garden safety program *Eat What You Grow*, which enables school foodservice staff to serve produce from these gardens in school meals (CPS, 2012a). The *Eat What You Grow* program can increase student access to fresh fruits and vegetables, thus potentially increasing the consumption rates of these nutrient-dense foods. The *GrowWELL Toolkit* provides resources "to support the maintenance and academic integration" of gardens, both at school and in the community, and is free to the public, making it

a model for districts and schools throughout the country (CPS Nutrition Services, 2018; CPS, 2012a).

Some school gardens were made possible through *Space to Grow*. *Space to Grow* is a unique collaboration between Chicago Public Schools, the Chicago Department of Water Management, and the Metropolitan Water Reclamation District of Greater Chicago to bring green spaces back to schools (Healthy Schools Campaign & Openlands, 2016a). These spaces enable children to play outside, learn about nature, plant a garden, and improve the environment. Known environmental benefits of this program include:

1) Reducing neighborhood flooding by absorbing large amounts of rainwater
2) Keeping the city's water resources clean by preventing combined sewer overflow
3) Reducing heat island effects and building resilience to climate change by replacing asphalt with green space

(Healthy Schools Campaign & Openlands, 2016b)

CPS's Garden Harvest-Culinary events help "students form a deeper understanding and better appreciation of food" by allowing them to grow and prepare it and encouraging the students to eat healthier (CPS, n.d.). Two or more schools collaborate, plan for, and create a meal using the schools' garden produce. Garden teams and culinary arts teams from the different schools perform demonstrations throughout the event to enhance the learning experience.

7.3- Farm to School Program

School gardens are only one part of the greater farm-to-school movement. Chicago Public Schools' Farm to School program "integrates local food in the dining center, growing food in the school garden and nutrition education in the classroom" (CPS Nutrition Services, 2018). Hundreds of farmers and producers have visited classrooms monthly to "discuss local foods served in the dining center, school garden activities [and] food system education" (CPS

Nutrition Services, 2018). Farmers and producers meet and talk with the classes while the students taste their local products.

Chicago Public Schools and Aramark have utilized countless farmers and producers from the Chicagoland and Midwest regions. Over $20M has been spent on locally sourced food resulting in hundreds of millions of local meals being served since 2013 (Aramark and CPS, 2019). Local ingredients are highlighted on a "100% Locally Grown" menu. The September 2019 menu included green beans, chicken, carrots, potatoes, corn, zucchini, and yellow squash (Aramark and CPS, 2019).

7.4- Sustainable Dining Services

Food scraps, leftovers, and plate waste are major components of school trash, and food waste is addressed in CPS' Environmental Stewardship Plan. The FoodShare program donates CPS's surplus food to area food pantries to reduce food waste and some schools have started composting initiatives (CPS Nutrition Services, 2019). CPS partnered with a local nonprofit, Environmental Impact Initiative, to create a "Go-Green Guide" to lead schools through the process of starting a composting program (EII, 2016).

In 2017, as part of the revised *Local School Wellness Policy*, the Chicago Board of Education voted to adopt the Good Food Purchasing Policy for school food procurement and require local food items to be served at least once a week (Chicago Board of Education, 2017). The revised wellness policy also stated that items grown in school gardens could be consumed only if the guidelines, policies, and procedures outlined in the *Eat What You Grow* manual were followed (Chicago Board of Education, 2017).

Chapter 8 – Challenges

Stakeholder support is vital for the success and longevity of healthy meals initiatives and farm-to-school programs. Stakeholders include students, parents, teachers, school administrators, foodservice staff, local farmers and producers, and community members (Cornish, Askelson, & Golembiewski, 2015; Asada, Ziemann, Zatz, & Chriqui, 2017; Harper et al, 2017). Schools that want to provide more nutritious meals while supporting farm-to-school and sustainable foodservice initiatives must overcome a number of challenges. These challenges include the acceptance of healthy meals and the support of, and participation in, farm-to-school programs and other food-related educational activities (Jaeschke, Raeder Schumacher, Cullen, & Wilson, 2012; Cornish, Askelson, & Golembiewski, 2016).

8.1- Healthy Meal Acceptance

Several studies have reported limited or slow acceptance of the new nutrition standards and HHFKA requirements by students and staff (Jaeschke, Raeder Schumacher, Cullen, & Wilson, 2012; Schwartz et al., 2015, Mansfield & Savaiano, 2016; Asada, Ziemann, Zatz, & Chriqui, 2017; Gilbert, 2018). Some studies found plate waste increased during an initial adjustment period (Asada, Ziemann, Zatz, & Chriqui, 2017; Schwartz et al., 2015; Mansfield & Savaiano, 2016). Interviews conducted shortly after the implementation of the 2012 guidelines found rural school foodservice directors found the policy as a "threat and burden" and taxing on their small staff (Cornish, Askelson, & Golembiewski, 2016).

A recent study of focus groups with high school students found the quality of the food and palatability of the meal affected their decision to choose the school lunch (Asada et al., 2017). A review of Buffalo Public Schools' Good Food Purchasing program reported BPS factored in appearance of food when choosing contracts due to the finding that students avoid

eating food they "find to look unappetizing" (Gilbert, 2018). The importance of taste and looks in regard to consumption is not new. In 1936, Scottish scientist H.C. Moir noticed the impact of the senses on food acceptance (Moir, 1936). Moir found visual appearance of a food affected a person's willingness to eat it, supporting the common cliché that "customers eat with their eyes."

8.2- Farm-to-School and Hands-On Learning Initiatives

As promising as they are, there are many challenges involved with farm-to-school programs and food-related learning initiatives. Community, regulatory, teacher, administration, and student support and participation are obstacles faced early on (Jaeschke, Raeder Schumacher, Cullen, & Wilson, 2012; Lyson, 2016; Loftus, 2017). Funding for purchases, labor, and/or training are also concerns for many schools (Jaeschke, Raeder Schumacher, Cullen, & Wilson, 2012). A recent survey of school administrators in Illinois found recruitment of and commitment from volunteers to help maintain the gardens were barriers to starting school gardens (Loftus et al., 2017). This study also found perceived barriers to edible school garden development included potential allergies, pesticide use, pests, vandalism, and volunteer background checks (Loftus et al., 2017). Although not always the case, local and/or sustainably produced food may be more expensive or have limited availability, making utilization of these items challenging (Gilbert, 2018).

Research in Wisconsin found fruit and vegetable liking scores decreased the first year farm-to-school programs were implemented (Bontrager Yoder et. al., 2014). Harper et al. (2017) noted the farm-to-school supply chain for a Massachusetts school system failed due to lack of commitment from the foodservice provider. The school system created a "School Food Taskforce" with the new foodservice provider to ensure food related concerns were addressed (Harper et al., 2017). A University of Iowa professor conducted an ethnographic examination of

the social barriers of farm-to-school programs and found school foodservice staff had very different approaches to food production and handling, compared to the local farmers (Janssen, 2014). For example, one farmer hand-picked lettuce without gloves because "the handling of the produce was a benefit to her customers," while the food service director appreciated the mechanization of harvesting where produce was handled less and, "presumably, cleaner" (Janssen, 2014). Adherence to food safety plans, regulatory guidelines, and local health codes must also be addressed before the local produce can be purchased by the schools, demonstrating how social differences can negatively affect farm-to-school efforts (Janssen, 2014).

Chapter 9 – Conclusion

Providing children with education, good health, and proper nutrition are core goals of the country's schools. The National School Lunch Act and Healthy Hunger Free Kids Act demonstrate the federal government's commitment to these goals, while the National School Lunch Program provides millions of children access to nutritious, well-balanced meals. There is some evidence that efforts to improve the nutritional quality of school lunches have been successful, yet quantitative research is still minimal (Mansfield & Savaiano, 2016). The 2009–2012 National Health and Nutrition Examination Survey, a large, cross-sectional survey conducted by the National Center for Health Statistics, found students (n=2190) who participated in school lunch programs often consumed more nutritious meals (Vernarelli & O'Brien, 2017).

One limitation of this report is the limited number of large-scale studies on the effectiveness of the HHFKA and farm-to-school programs to improve student nutritional intake and/or dietary habits. Many of the studies reviewed for this report cannot be generalized for the entire nation due to their limited size and non-randomized design. This does not mean these findings are insignificant, just that further research is warranted.

Schools can inject environmental sustainability into the framework of the National School Lunch Program through updated school nutrition and wellness policies, innovations in school foodservice programs, and support for local food systems. The hands-on food education common in many farm-to-school programs, combined with nutrition education and dietary guidance, allows food-related concepts to "com[e] together and mak[e] sense" to the children (Asada, Ziemann, Zatz, & Chriqui, 2017). Along with efforts to make school meals more nutritious, and students healthier, some schools have also reduced their environmental impact. This is in part through reducing food waste, cutting down on packaged and highly processed

foods, and/or creating new green spaces. With continued support from the federal government, state and local agencies, and countless public and private organizations, farm-to-school activities can become more prevalent in America's schools, potentially leading to a healthier student body and natural environment.

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