Nutritional science originated from the concern for livestock and agricultural productivity, not human health. It was not until the end of the 19th century that European scientists began to apply discoveries about animal feeding to humans. But, the scientific discoveries regarding food and health then and now are subject to preference and politics. Because malnourishment and hunger is often linked to poverty, nutritional science was absorbed into social policy. Towards the end of the 19th century and beginning of the 20th century, also known as the “ Progressive Era,” social reformers and policy makers sought to shape American society. Improving public health was one of the objectives (Levine, 2008).

By the 1920s, nutrition was widely discussed in the United States (Levine, 2008), but it took the onset of World War I for nutrition issues to become apparent to American society as a whole. The severity of malnutrition was unknown until World War I, when one-third of the men called to serve were rejected because they were underweight or suffered from malnutrition (Levine, 2008). Public health physicians, policy makers and home economists reacted to this state of inadequate health by executing meal programs and policy to alleviate the problem. Focusing specifically on childhood nutrition was essential for two reasons. First, children under the age of 18 have more nutritional needs in their early years than in their latter years. A child’s immune system develops and matures with time, and young children are more susceptible to infections compared to older children with developed immune systems (Martorell, Stein and Schroeder, 2001). Second, schools provide a conducive environment to learning and are “one of the primary locations for reaching the nation’s children and youth” (Koplan, Liverman and Kraak, 2005).

Many of the concerns for childhood nutrition helped garner the policy that would provide lunch at schools nationwide. In 1946, the National School Lunch Program (NSLP) was established under the National School Lunch Act to “safeguard the health and well-being of the Nation’s Children and encourage the domestic consumption of nutritious agricultural commodities and other foods” (Ralston et al., 2008). But in reality, the NSLP was in structure more of a subsidy for agriculture than a nutrition program for children (Levine, 2008).

In 1948, the commodity distribution program was also inaugurated. According to Cochrane and Ryan (1981), the purpose of this program was to find constructive uses for surplus agricultural commodities. Soon the USDA donated foods to school lunch programs and charitable institutions. Other food-related programs have been added over time: the Special Milk Program, 1954; the Food Stamp Program, 1961 (Cochrane and Ryan 1981); the School Breakfast Program (SBP); and the Summer Feeding Program, 1969 (Spark 2007). School food programs are “primarily administered by the USDA with some assistance from the Department of Defense” (Spark, 2007). Meals are subsidized by the federal government based on income and economic needs of children and families.

Despite all these efforts to improve the health of the nation’s children, the problems did not subside. Instead, in addition to malnutrition, other health-related issues such as obesity and diabetes became prevalent. Within the past three decades, the obesity rate has more than doubled for preschool children aged two to five years and adolescents aged 12 to 19 years. “Approximately nine million children over six years of age are considered obese” (Koplan, Liverman and Kraak, 2005, 131).

The narrative is similar for children with diabetes. For children born in America in 2000, the risk of being diagnosed with type 2 diabetes is at 30 percent for boys and 40 percent for girls assuming the obesity rate does not increase (Koplan, Liverman and Kraak, 2005). Efforts have been made to address these chronic health problems. Partly created to promote healthy eating among children and partly to provide market outlets for local produce, Farm-To-School (FTS) projects began sprouting throughout the United States.

Previous Studies Related to School Nutrition Programs and Locally Grown Produce

Many researchers have found relationships between participation in school lunch and breakfast programs and school characteristics. For example, Maurer (1984) used national data to estimate the effects various school and
In 1996-1997, FTS was initiated as a pilot project in California (Santa Monica Malibu Unified School District and the Edible Schoolyard, Berkley) and in Florida (New North Florida Marketing Cooperative). In Santa Monica, a farmers’ market salad bar was launched at an elementary school (Vallianatos, Gottlieb and Hasse, 2004). Similar salad bars began appearing in schools throughout the district. In Gadsden County, Florida the New North Florida Cooperative began selling locally grown produce to schools. The awareness of these and other emerging programs began to build momentum.

In 2000, USDA’s Initiative for Future Agricultural Food Systems (IFAFS) supported the establishment of the National FTS Program, which served as a catalyst for program development, research and policy (Kish, 2008). The following year, USDA AMS organized numerous FTS workshops nationwide. In 2003, the “Farm-to-Cafeteria Projects” Act was proposed in a bill submitted to the House and the Senate and failed. The purpose of this act was “to improve access to local foods in schools and institutions receiving funds under this act…” (Library of Congress, 2003). The requirements of the act were well defined: procure local foods from small and medium-sized farms for school meals, support nutrition education activities and develop a sustained commitment to farm-to-cafeteria projects in the community. Despite the Farm-to-Cafeteria Act not passing, there are continued efforts on the state level that have successfully incorporated FTS as law. According to the National Farm to School Network, to date FTS activities exists in 42 states with an estimated 2,051 programs that involves approximately 8,943 schools.

A study by Ham, Hiemstra and Yoon (2002) estimated participation of school lunch programs in Indiana based on total average daily participation rate of all students (Total ADP) and paid average daily participation rate of paid meals (Paid ADP). Total ADP differs from Paid ADP in that Total ADP includes free and reduced-price meals in addition to those paid (Ham, Hiemstra and Yoon). Participation was measured by the number of meals served.

Ham, Hiemstra and Yoon (2002) found the percentage of students eligible for reduced lunch and free lunch were both significant and positive predictors for Total ADP. But for Paid ADP, reduced lunch and free lunch were significant, yet showed positive and negative relationships, respectively. This means as the number of students eligible for free lunch increases, the amount of Paid ADP decreases. Larger schools have higher school lunch participation rates and schools with open campus policies had lower rates (Ham, Hiemstra and Yoon 2002).

Gleason (1995) examined participation rates in the National School Lunch Program (NSLP) and the School Breakfast Program (SBP). Three main questions were addressed: Who is participating in the NLSP and SBP? What policy changes at the school, district or federal levels could directly influence the number or type of participants? Would policy changes designed to improve nutritional quality of school meals adversely affect program participation as a whole? The author found that free and reduced meal certification status of students is strongly related to NSLP participation. “More than three-fourths of certified students eat a school lunch on a given day, compared with fewer than half who pay the full price” (Gleason, 1995).

The final study included in this literature review is by Grainger, Senauer and Runge (2005). These authors measured student receptiveness to health innovations in a high school cafeteria in Minneapolis. When à la carte and full meals were analyzed together, students were clearly making healthier food choices, which were described as meals with less trans fats, low in sugar and high in fiber.
FTS in Oklahoma

FTS in Oklahoma began in a way similar to the programs in California and Florida. In 2002, the Oklahoma Food Policy Council sent a survey to schools, colleges, prisons and resorts. These entities were asked questions about their practices and preferences on locally grown foods. The results of the survey showed large school (school districts with more than 1,500 students) systems were least likely to make local purchases (83%), whereas medium (300 to 1,500 students) and small (less than 300 students) school districts were slightly more likely to do so, with 72% and 74%, respectively. “If price and quality were competitive and local sources were available, 68% of the institutions would like to purchase locally produced foods” (McDermott, 2003).

FTS was initialized due to the positive feedback from the survey as a pilot program in 2004-2005 with assistance from the Oklahoma Food Policy Council. This pilot program consisted of distributing seedless watermelons grown near Hinton, Oklahoma, to 144 schools in six districts. In 2006, the State Legislature passed the “Oklahoma Farm-to-School Program Act” (Oklahoma State Courts Network, 2006). The purpose of the act is to provide schools with minimally processed farm commodities grown in Oklahoma. The act also encourages activities that integrate nutrition and agriculture in school curriculum and activities. To date, there are a total of 60 Oklahoma school districts and four universities participating in a FTS program.

Determining Local Food Costs

Due to small school cafeteria budgets, it is difficult for food service personnel to provide meals that meet standard nutritional requirements. School feeding programs have been under continuing pressure in recent years to keep prices consistent while food and labor costs are escalating (Daft et al 1998). For these reasons, analyzing the cost associated with purchasing local foods is necessary.

Studies have been conducted on the cost of the National School Lunch Program (NSLP) and the School Breakfast Program (SBP) (Daft et al, 1998; Bartlett, Glantz and Logan, 2008). According to Daft et al. (1998), large school districts tend to pay lower per unit prices for their food. It was undetermined as to whether this was due to economies of size or accessibility to more vendors allowing for more market competition.

According to the School Lunch and Breakfast Cost Study-II conducted by Bartlett, Glantz and Logan during the 2005-06 school year, the mean reported cost of producing a lunch was $2.36 when the unit of analysis is a school food authority. For a breakfast, this value was $1.92. The authors also reported that food costs, accounted for about 46% of reported costs while labor accounted for less than 45% (Bartlett, Glantz and Logan, 2008).

Through regression analysis, Wagner, Sanauer and Runge (2007) found nutritious meals do not cost more to produce; however, capital equipment costs were not included. This implies, in the short-run, capital investments are necessary to change to more nutritious meals, but the long-run costs of producing these meals are not higher. Mascarenhas and Gottlieb (2000) found shortly after a Farmers’ Market Salad bar was implemented at an elementary school in California, more than three times the number of children selected the salad bar option than in the previous year when the produce used was purchased through a produce broker. In addition, the cost of the Farmers’ Market Salad Bar meal was approximately $0.77 with the price of a hot meal at $0.88 (Mascarenhas and Gottlieb, 2000). The cost of meals from the salad bar with non-local produce was not reported; therefore, determining the difference in cost between local and non-local produce is not possible.

Another study conducted in California by Brillinger, Ohmart and Feenstra (2003) included a break-even analysis on a Farmers Market Salad Bar. It was reported, in two consecutive years, the project yielded profits; however, this included financial assistance from grants.

Transportation Costs for Food

Transportation costs can be absorbed in food costs and should be considered when determining a food distribution system. When determining which distribution system is least costly to schools, four different distribution options are commonly considered:

Option 1: Farm → School
Option 2: Farm → Distributor → Schools
Option 3: Farm → Distributor (via backhauling) → Schools
Option 4: Farm → Packing shed (near the supplying farms) → Distributor → Schools

The third option of distribution allows backhauling as a distribution alternative. Determining truck rates and alternative means of reducing transportation costs should be taken into consideration when determining distribution alternatives. A study conducted by Kilmer and Stegelin (1982) determined the amount of money saved when reducing empty backhauls of trucks when transporting Florida fresh fruits and vegetables. The authors found producers of fresh fruits and vegetables would benefit from reducing empty backhauls and the potential savings per truck would be $364.90. Barnes and Langworthy (2003) described a methodology and spreadsheet for calculating the variable cost of operating cars and trucks. The authors provided a table of the fuel efficiency for various trucks and their associated maintenance and repair costs.
The fourth option of distribution considers an added packing and handling facility utilized in addition to the distributor. Determining the associated cost and feasibility of building and operating a packing plant is needed. There are some studies that look at the feasibility of building a packing plant for different types of produce (Peacock et al., 1995; Hattar et al., 1994; Pichop, 2005). However, the appropriateness of a packing shed or packing plant depends heavily on the volume of local production, the packing capabilities of nearby wholesale warehouses and the form in which the produce is desired by buyers.

**References**


