DEBORAH L. CROOKS
Department of Anthropology
University of Kentucky

Trading Nutrition for Education: Nutritional Status and the Sale of Snack Foods in an Eastern Kentucky School

Overweight and poor nutrition of children in the United States are becoming issues of increasing concern for public health. Dietary patterns of U.S. children indicate they are consuming too few fruits and vegetables and too many foods high in fat and sugar. Contributing to this pattern of food consumption is snacking, which is reported to be on the increase among adults and children alike. One place where snacking is under increased scrutiny, and where it is being increasingly criticized, is in U.S. schools, where snack foods are often sold to supplement inadequate budgets. This article takes a biocultural approach to understanding the nutritional status of elementary school children in a rural community in eastern Kentucky. It pays particular attention to the ways in which the school's nutrition environment shapes overweight and nutritional status for many of the children, focusing on the sale of snack foods and the reasons behind the principal's decision to sell snack foods in the school. [nutritional anthropology, overweight, snack foods, Appalachia]

In the United States, there is increasing public health concern over what is being called an "epidemic of overweight" among children (Strauss and Pollack 2001). Over the last 20 years, children have become fatter and are exhibiting what were formerly thought of as adult diseases associated with overweight (e.g., type 2 diabetes, dislipidemia, and elevated blood pressure) (Deckelbaum and Williams 2001; Dietz and Gortmaker 2001). In addition, evidence continues to mount for an association between childhood and adolescent overweight and adult overweight (Deckelbaum and Williams 2001). Overweight in adults is associated with a variety of chronic diseases, including cardiovascular disease, hypertension, diabetes, and certain cancers (Pi-Sunyer 1993).

Although there is some indication of a genetic component to overweight, as Dietz and Gortmaker (2001) point out, there has not been a major change in the gene pool in the last 20 years, thus the factors influencing the rapid increase in overweight must be environmental. The uneven distribution of overweight across

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the social and geographical landscapes in the United States suggests that the nutrition environment is complex and multifactorial. Based on an analysis of national survey data, Richard Strauss and Harold A. Pollack (2001:2846) report a higher prevalence of overweight among African American and Hispanic children, among boys, and among children living in southern states; and they report an association between income and overweight that varies by ethnicity. With respect to dietary patterns that shape nutritional status, K. D. Reynolds et al. (1999) report ethnic, gender, and regional variation in consumption of fruits and vegetables; Susan J. Crockett and Laura S. Sims (1995) note that economic status, ethnicity, and region are all predictors of nutritional risk among children.

Cara B. Ebbeling et al. (2002) identify a number of interacting environmental influences on diet, activity, and family practices in the United States that promote overweight and poor nutritional status among children and that make long-term improvement in nutritional status difficult to attain. Important among these influences are aggressive marketing of low-quality foods to children, reduced opportunities for physical activity resulting from a cultural "premium on convenience," environmental structures that mitigate against children's play, and long work hours for parents. In addition, they comment that underfunding of schools may lead to reductions in or elimination of physical education classes, the contracting out of food services to companies that often sell low quality fast foods, and/or the placement of vending machines in schools for the sale of soft drinks, and, as others point out (Wechsler et al. 2001), low quality, high calorie snack foods.

Recently, the school nutrition environment has received a great deal of attention, not only from the health community, but from the general population as well, and the sale of soft drinks and other snack foods in schools has come under political fire in many states and individual school districts. Interest in the school nutrition environment has accelerated along with the rise of child overweight, and it is increasingly recognized that schools are important shapers of children's nutritional status in two ways. First, children spend a great deal of time in school, where they may consume up to one-third of their daily food intake (Wechsler et al. 2001; Wildey et al. 2000). Second, schools are a primary source of learning about nutrition and appropriate diet through classroom teaching and they provide a venue for modeling and practicing those lessons during the school day (Dietz and Gortmaker 2001; Wechsler et al. 2001).

This article presents the findings of school-based nutritional anthropological research in a community in eastern Kentucky. Understanding the production of nutritional status in Kentucky is particularly important because Kentuckians exhibit some of the highest rates in the country of mortality from chronic diseases in which diet is implicated (i.e., heart disease, stroke, diabetes, all cancers, lung cancer, and colorectal cancer), and Kentucky is in the mid-range of states for deaths among women due to breast cancer (Centers for Disease Control, September 25, 2002: www.cdc.gov/nccdphp/burdenbook2002). In addition, Kentucky adults have the highest, or among the highest, rates of reported behavioral risk factors for chronic diseases, including overweight, inactivity, and low consumption of fruits and vegetables (Centers for Disease Control, September 25, 2002, www.apps.need.cdc.gov/BurdenBook/DeathCause.asp?state=ky).

The original aims of the research project were to: (1) document the growth and nutritional status of elementary school children in the community; (2) document

the dietary intake and activity patterns contributing to nutritional status; and (3) gain an understanding of environmental factors that shape dietary intake. Early on in the fieldwork, my ethnographic gaze became focused on the school nutrition environment and the use of snack foods in the school, including the sale of snack foods to children. Although this practice is becoming common in U.S. schools, the reasons behind it are not always clear. In this school, the sale of snack foods is linked to poverty in the community and the constraints it places on educational success. To provide a higher-quality education to help poor children lift themselves out of poverty as adults, the principal supplements the school's budget with revenues from the sale of snack foods, bringing the production of a good education into opposition with the production of good nutritional status for all children in the school.

The Research Approach

In this research, I used a combination of theory and method from cultural and biological anthropology. Research in nutritional anthropology has long been guided by a biocultural approach, one that recognizes that cultural ideologies and social and ecological circumstances come together to shape food-related behaviors and consequent nutritional status (Pelto et al. 2000; Quandt and Ritenbaugh 1986). In an early publication establishing the field of nutritional anthropology, Randy F. Kandel et al. (1980:3–4) pointed out that nutritional anthropology is organized around a combination of four lines of inquiry: dietary survey studies, food habits and foodways, the cognitive aspects (or meaning) of food, and ecological theory. Additional lines of inquiry also come from biological anthropology, because food and foodways interact with human biology and affect anthropometric measures of growth and nutritional status.

Biocultural approaches to understanding health and nutrition are varied (Crooks 1996, 1997; Dressler 1995), but in most cases, biocultural research combines ethnography with quantitative measures of human biological outcome to better determine how human/environment interactions shape health and nutritional status. This necessitates a broadening of perspective on the human environment compared to more traditional, ecological approaches to better account for the influence of social and cultural factors. Thus, to adopt a phrase from R. Levins and R. Lewontin (1985), many biocultural researchers view "human biology as socialized biology," a perspective that guides this research.

The Research Setting: Bridges County, Kentucky, and Bridges Elementary School

This research took place in a community in eastern Kentucky, in the region known as Central Appalachia. The Appalachian Regional Commission designates Bridges County[1] as "severely distressed,"[2] but it was not always so. The area now known as Bridges County had an early history of economic viability resulting from its location along prominent Native American paths connecting major villages in the north and south. European farmers moved into the area in the 1700s, followed by mining concerns and producers of iron and manufactured iron products in the 1800s. By the time of its establishment as a county in the mid-1840s, Bridges had a

vital economy based on resource extraction, milling, forging, and agriculture (Coleman 1978; Collins 1874; Lee 1981; Verhoeff 1911). However, since the 1800s, the economy of Central Appalachia, including Bridges County, has waxed and waned and economic development has always been uneven in the region.

Policies to create business-friendly environments have brought industry to parts of Appalachia, but wages were often low and work conditions hazardous (Fisher 1993; Gaventa et al. 1993b). Economic restructuring in the 1980s continued to create jobs in Appalachia that were low-wage and without benefits (Couto 1994; Fisher 1993; Gaventa et al. 1993a, 1993b), and Bridges County was no exception to this. At the time of the research, the unemployment rate in Bridges County was above the national average at 10 percent compared to 5.8 percent, and for many who were employed, wages were low and/or jobs were seasonal. As a result, the poverty rate in Bridges County at the time of the research exceeded the national rate at 25 percent versus15 percent, with a child poverty rate of 35 percent versus 22.7 percent (Good Samaritan Foundation, Inc. 1997; U.S. Census Bureau 1995).

Bridges County has three elementary schools, and the vast majority of research activities took place in the school that serves the poorest section of the county. Bridges Elementary School is a modern, one-story, brick school building, with grades K–5, serving approximately two hundred and fifty children at the time of the research. The staff and teachers at Bridges Elementary School seem dedicated to providing a high-quality education, seeing education as the key to overcoming poverty. During my time at Bridges, parent volunteers assisted in this endeavor, contributing much to the learning environment. They assisted teachers in the classroom and on field trips; they created art and craft displays for the school corridors; and they helped with various school events and celebrations. Thus, the school was the site of numerous in-class and other activities designed to provide a welcoming environment and the best education possible for Bridges children.

The School Nutrition Environment

Like other schools in the United States (Baxter 1998), food and nutrition are important aspects of the school environment at Bridges Elementary School, and the school administration places great emphasis on the quality of food in the cafeteria. Many teachers and school administrators told me that "good food" is especially important at Bridges because 76 percent of the children qualify for free or reduced-price lunch (i.e., they come from poor households). As a result, the teachers and administrators are concerned that many Bridges children do not have access to high-quality food on a constant basis at home. In addition to the provision of food through school breakfasts and lunch, nutrition and health are also important components of the school's curriculum at Bridges Elementary School. As in most U.S. schools, Bridges children are taught about food, nutrition, appropriate food choices, and the relationship between nutrition and health. Because questions about nutrition and health are included on statewide standardized exams in Kentucky, the results of which can translate to monetary and/or other benefits to educators and schools, lessons on food and nutrition gain additional importance.

Food also serves purposes at the school apart from its nutritional aspects. As in most societies, food is an important element of celebrations and other social events in the United States. During the research, children at Bridges Elementary celebrated holidays with classroom parties at which snack foods played a prominent role; cookies and soft drinks were provided at after-school or evening parent–teacher activities at which children were present; and food was central to a number of fund-raising activities, including the annual "Chili Supper" and the sale of candy-grams on Valentine's Day. But the largest income-generating activity involving food at Bridges Elementary School was the sale of snack foods from the "snack room" in the afternoons.

The snack room is located at the end of a corridor in a small room that has been converted to a "store." Shelves in the room are filled with a variety of snacks, mostly candy and chips, but crackers and granola bars are often available. In addition, a soft drink machine is located just outside the snack room door. Most children purchase snacks, but for those without money, teachers provide a snack (usually a small candy), or children share. As a result, most children at Bridges Elementary School have access to afternoon snacks, either directly or indirectly, because of the presence of the snack room.

Methods

The majority of data collection took place during the 1994–95 school year (August–May) and the beginning of the 1995–96 school year (September–October). The University of Kentucky Institutional Review Board and the Bridges Elementary School Family Resource Center (FRC)[3] Advisory Council approved data-collection procedures; the council also approved the dissemination of the results of the research. The research was conducted through the FRC, and data were gathered with the help of the director.

Because research in school settings takes time away from classroom activities, we took care to administer our research protocols with as little disruption to classroom learning activities as possible. To ensure confidentiality, pseudonyms are used for the research site and surrounding towns; children were assigned identification numbers and all children's data are stored according to those numbers; no names are used in the presentation of any data associated with this project; and, finally, identifiers such as job titles are used only where necessary. No one was paid for participating in the research.

A letter sent home via all children in grades 1–5 requested children's participation in the research. Written consent of parents was required, along with verbal assent of the children. From the approximately two hundred and thirty letters sent, we received 102 positive responses. Eleven children moved out of the area during the school year, and another three were eliminated because of unreliable data. A subsample of 54 children, those in grades 3–5, provided the anthropometric and dietary data in this report; children in grades 1–2 were eliminated from this portion of the research because the collection of dietary data from younger children is problematic (see below). I cannot establish if the final sample is representative of all children in grades 3–5 in all aspects; however, the sample is representative in terms of socioeconomic status (78 percent qualified for the federal lunch program versus 76 percent for the entire school).

Teachers and staff provided written consent following a presentation in which I explained the research and provided time for questions and answers. All present were invited to participate and all agreed to do so. In addition, as I participated in the daily activities of the school, I was always careful to state my position as a researcher to parents, volunteers, staff, and children.

Data collected were both quantitative and qualitative. Quantitative data are anthropometric and dietary measures (see Crooks [1999, 2000] for full explanations of data-collection procedures). Children's height was measured without shoes via a portable stadiometer. Weight was measured following removal of shoes and extra clothing (sweaters, coats, etc.) via a digital scale that was calibrated daily. Remaining clothing was noted and approximate weights were later subtracted from the measured weight. Growth and nutritional status were assessed by comparing sample data to the National Center for Health Statistics references for stature and weight (Anthro Software, Centers for Disease Control, Atlanta, Georgia) and the National Health and Nutrition Examination Survey (NHANES) I and II references for body mass index (Frisancho 1990).

Food-consumption data were collected from children in grades 3–5 via four 24-hour dietary recalls, spaced over a year to account for day of the week and seasonal variation. Dietary data-collection techniques are difficult to accomplish with children and can yield inaccurate data (Baranowski et al. 1986; Frank et al. 1977). To increase accuracy, children were verbally "walked" through their day; prompts (analogous to interview probes) assisted them in recalling foods eaten in various daily contexts—at home, school, and elsewhere (Frank 1994). Food models and a large variety of sample plates, cups, etc. assisted in estimating portion sizes. Recalls were not validated by other methods. Food consumption data were entered into a computerized program (Nutritionist V, First DataBank, Inc., San Bruno, California) for analysis, and then all numerical data were entered into SPSS Version 8.0 for Windows (SPSS, Inc., Chicago, Illinois).

Qualitative data were gathered through participant observation in the school and through semistructured and unstructured interviews, as indicated below. Over the course of the research, I spent many days observing and participating in the activities of the FRC, in classrooms I went to, and in schoolwide assemblies and other events at which school children, staff, and parents were present in various combinations and to varying degrees. Some events were school-only events at which children, teachers, and staff, but no parents, were in attendance; others were daytime events at which a few parents (for the most part, those who were volunteers) were present. Still others were evening events, which brought parents and their children into the school for a variety of activities. Other times, I participated in conversations that took place among teachers, staff, parents, and administrators, for example, over lunch, or helping out in the school's kitchen, or when taking the children on field trips.

I conducted semistructured interviews with the head of Social Services in Bridges County and the administrator and nurse at the County Health Department in which I asked them to talk about the health, nutrition, and education of Bridges County children. These interviews took place in their respective offices. I also participated in unstructured interviews with other community members, including one minister, the president of the local Jay Cees, two staff members of the local Agricultural Extension office, and a representative from the area Girl Scouts. These

discussions took place in various locales. Finally, given that FRCs in Kentucky are charged with assisting families in overcoming barriers to education, I participated in semistructured and unstructured interviews with the director of the FRC, the main FRC staff member, and the school counselor on what they perceived these barriers to be. These conversations took place in the school, sometimes in a private room or office, but at other times in the FRC, the cafeteria, or as we moved through the corridors engaging in the daily activities of the school.

Analysis and Results

Previously Published Results of Anthropometric and Dietary Analyses

Two goals of the greater research project were to (1) assess the growth and nutritional status, and (2) assess the diets of children at Bridges Elementary School. Analyses of the anthropometric and dietary data for the 54 children in grades 3–5 have been reported in detail elsewhere (Crooks 2000). However, because those analyses are highly relevant to this article, I reiterate some of the findings here. Bridges sample children tend to be slightly taller and heavier than the reference group, with higher BMIs (Table 1). BMI percentiles are often used to assess overweight, and although there is some variation in the literature, most researchers now use the 85th percentile to indicate "at risk for overweight," with the 95th percentile to indicate "overweight" (see fuller discussion in Crooks 2000).

Using these categories, 14.8 percent of sample children are at risk for overweight, with an additional 18.5 percent overweight (Table 2). Focusing only on the 95th percentile category, the rate of overweight children at Bridges Elementary School is well above that for the NHANES III nationally representative samples reported in *Morbidity and Mortality Weekly* (MMWR 1997) at 14 percent and in Richard P. Troiano et al. (1995) at 10.9 percent.

Comparing the Bridges data to the NHANES data by gender and ethnicity, far more Bridges boys are overweight at 28 percent compared to 13.2 percent for the NHANES III boys (category "White, non-Hispanic," MMWR 1997) and 10.4 percent (category "Non-Hispanic White," Troiano et al. 1995). The girls' data are closer to those reported by MMWR and Troiano et al. at 10.3 percent for Bridges girls compared to 11.9 percent (MMWR) and 9.8 percent (Troiano et al. 1995). The elevated rate of overweight among Bridges children compared to NHANES

Table 1
Mean height-for-age (HAZ), weight-for-age (WAZ), and body mass index (BMIZ) z-scores for sample children (standard deviations in parentheses).

	Full sample (n = 54)	Boys only (n = 54)	Girls only (n = 54)
HAZ	0.43** (0.95)	0.21 (0.92)	0.62** (0.95)
WAZ	0.70*** (1.30)	0.90** (1.41)	0.53* (1.19)
BMIZ	0.57** (1.31)	0.90** (1.42)	0.29 (1.14)

* Differs significantly from 0 at $p \leq .05$
** Differs significantly from 0 at $p \leq .01$
*** Differs significantly from 0 at $p \leq .001$

Table 2
Distribution of sample children who are at risk for overweight (≥ 85th percentile BMI) and overweight (≥ 95th percentile BMI), NHANES I and II references. [Crooks 2000]

	Full sample (n = 54)		Boys only (n = 25)		Girls only (n = 29)	
	n	*percent*	*n*	*percent*	*n*	*percent*
At risk:	8	14.8	5	20.0	3	10.3
Overweight:	10	18.5	7	28.0	3	10.3

children is consistent with Strauss and Pollack's (2001) report that overweight is increasing faster among boys than girls (actual prevalence rates were not provided), and among children from the south compared to the west (17.1 percent in southern states compared to 10.8 percent in the west, prevalence data for other regions were not included in the report).

The earlier analysis of the 24-hour dietary recalls (Crooks 2000) indicated that Bridges children are not meeting the recommended daily servings from the five food groups according to the food guide pyramid. Table 3 shows low consumption in every food category, with the exception of the milk, yogurt, and cheese group, which shows adequate consumption, and the fats, oils, and sweets group, which shows extremely high consumption. Although there is individual variation among Bridges children, on average, sample children appear to be consuming high-fat and sugary foods at the expense of other, more healthful foods such as fruits and vegetables.

Research indicates U.S. children commonly have low-quality diets, with particularly low consumption of fruits and vegetables and high consumption of sugar

Table 3
Mean daily consumption of food groups servings by Bridges Elementary School children based on an average of four (4) 24-hour diet recalls, compared with recommendations in the Food Guide Pyramid; standard deviations in parentheses. [Crooks 2000]

Food groups in Food Guide Pyramid	Recommended # of servings	Sample mean (sd)	Boys only	Girls only
Bread, cereal, rice, and pasta	6–11	5.49 (1.73)*	6.10 (1.77)**	4.97(1.55)**
Vegetables	3–5	1.80 (0.94)**	1.80 (0.87)**	1.79 (1.01)**
Fruits	2–3	0.93 (0.98)**	0.96 (1.13)**	0.91 (0.85)**
Milk, yogurt, and cheese	2–3	2.57 (1.44)	2.62 (1.20)**	2.53 (1.64)
Meat, poultry,fish, dry beans, eggs, and nuts	2–3	1.80 (0.63)*	1.92 (0.60)	1.69 (0.64)*
Fats, oils, and sweets	sparingly	23.53 (10.55)	24.84 (9.97)	22.41 (11.08)

* Differs significantly from recommendation at $p \leq .05$
** Differs significantly from recommendation at $p \leq .001$

and fat (Brady et al. 2000; Kennedy 1998; Munoz et al. 1997). Using national data from the U.S. Department of Agriculture, Munoz et al. (1997) report consumption of 2.4 servings of vegetables and 1.3 servings of fruit by 6–11-year old boys, compared to 1.80 servings of vegetables and 0.96 servings of fruits for Bridges boys; and they report consumption of 2.4 servings of vegetables and 1.4 servings of fruit for 6–11-year old girls, compared to 1.79 and 0.91 for Bridges girls. Brady et al. (2000) report 2.5 servings of vegetables and 0.90 servings of fruits for 7–14-year-old boys from Birmingham, Alabama, with 2.3 and 0.80 for girls. Both of these studies report high consumption of sugar and fat by sample children; however, the type of analysis used is not comparable with that of this study, therefore, comparisons cannot be made.

Another goal of nutritional analysis is to assess the consumption of certain nutrients compared to the dietary guidelines. Percent of calories from fat, saturated fat, and carbohydrates, and the amount of fiber consumed are important for long-term health (Kimm et al. 1990). The earlier analysis of the dietary recalls indicates that sample children's average consumption of calories from fat (over the four days) is significantly greater than the recommendation (36.3 percent compared to the recommended 30 percent, $p \leq .001$), with consumption of saturated fat also above the recommendation (13.12 percent compared to 10 percent, $p \leq .001$). The percent of calories consumed from carbohydrates is below the recommendation (51.83 percent compared to 55–60 percent, $p \leq .001$), as is the average daily consumption of fiber (12.43 grams, compared to 25 grams, $p \leq .001$; 10–13 g/1,000 kcal, based on a 2000 kcal diet). These figures are similar to other U.S. children reported in Kimm et al. (1990) at 35–36 percent calories from fat, 13 percent from saturated fat, and 49–51 percent from carbohydrates (based on NHANES II–data; fiber was not reported).

The Contribution of Snacks to Diet and Nutritional Status

Although the earlier report revealed few significant associations between overweight and food consumption, perhaps because of small sample size and high variability, as well as the difficulties of ascertaining usual food consumption for individuals, it did find that overweight children consume a greater mean number of daily servings from the fats, oils, and sweets food group (28.29 versus 22.17, $p \leq .10$) compared to nonoverweight children. Snacks are an important source of fat and sugar in the U.S. diet (Jahns et al. 2001; Zizza et al. 2001). Table 4 provides information on consumption of snacks by Bridges children.[4]

Sample children report an average of 1.70 snacks per day, contributing an average of 763.94 calories to the daily diet or 36.71 percent of daily calories. Snacks contribute 27.22 grams of fat to the daily diet, and account for 31.92 percent of daily fat consumption. Boys consume more calories and fat from snacks than do girls, but the differences are not significant. Although more snacking occurs at home than school, children report a daily average of 0.46 school snacks, contributing 134.70 calories to the daily diet. School snacks contribute 4.41 grams of fat to the daily diet, which is 5.56 percent of the total daily fat consumption. Girls consume slightly more school snacks than do boys, as well as more calories and fat from school snacks.

Table 4

Mean daily consumption of snack foods by Bridges sample children based on the average of four 24-hour dietary recalls; standard deviations in parentheses.

Total snacks:	**Sample mean**	**Boys only**	**Girls only**
Snacks consumed:	1.70 (0.47)	1.68 (0.49)	1.72 (0.46)
Calories from snacks:	763.94 (342.60)	797.35 (289.19)	735.14 (385.53)
Percent of total calories from snacks:	36.71 (13.60)	37.51 (13.97)	36.02 (13.48)
Fat (g) from snacks:	27.22 (17.47)	27.68 (13.22)	26.83 (20.67)
Percent of total fat from snacks	31.92 (18.46)	33.52 (17.05)	30.54 (19.79)
School snacks:	**Sample mean**	**Boys only**	Girls only
Snacks consumed:	0.46 (0.19)	0.41 (0.19)*	0.50 (0.18)*
Calories from snacks:	134.70 (89.15)	113.68 (91.0)	152.83 (84.9)
Percent of total calories from snacks:	6.79 (4.44)	5.27 (3.88)**	8.10 (4.54)**
Fat (g) from snacks:	4.41 (4.58)	3.16 (3.20)**	5.48 (5.32)**
Percent of total fat from snacks	5.56 (5.59)	4.05 (4.20)*	6.86 (6.33)*

*Indicates significant difference between boys and girls at $p \leq .10$
**Indicates significant difference between boys and girls at $p \leq .05$
***Indicates significant difference between boys and girls at $p \leq .01$

The distinction between total snacks consumed in a day and snacks consumed at school is important. School is a primary source of information about good nutrition, thus offering snack foods in school provides a contradictory message, one that can affect snack consumption outside of school and has the potential to undermine both short- and long-term nutrition goals (Cline and White 2000; Wechsler et al. 2001). In addition, at Bridges, sample boys "at risk" for overweight report a higher average daily consumption of school snacks compared to other boys, 0.48 versus 0.35 snacks (Table 5), with higher consumption of calories (146.33 versus 83.54 kcal) and carbohydrates (27.00 versus 14.31 g.) from school snacks. These relationships do not hold for girls, perhaps because of the small number of girls who are overweight, making statistical comparison of nonoverweight to overweight girls difficult.

These results indicate that school snacks are an important source of calories for sample children, and, among boys, they contribute to the risk for overweight. In addition, the large number of servings from the fats, oils, and sweets food group, and the low number of servings from the fruits and vegetable food groups, suggests that snacks are substituting for more healthful foods in the daily diet, possibly leading to underconsumption of many nutrients associated with good nutrition and health. Given the recognized association between diet and chronic disease, and the high levels of adult chronic disease in Kentucky, it makes sense to ask why snack foods are being sold at Bridges Elementary School.

Table 5

Mean snack consumption (average of four 24-hour recalls) by overweight status (NOW = not overweight, BMI < 85th percentile NHANES references, OW = overweight, BMI ≥ 85th percentile) among sample boys and girls, evaluated via student T-tests (standard deviations in parentheses).

	Boys		*Girls*	
	NOW	OW	NOW	OW
Total snacks	1.67(0.46)	1.69(0.53)	1.175(0.48)	1.63(0.41)
School snacks	0.35(0.19)*	0.48(0.17)	0.51(0.18)	0.46(0.19)
Snack calories (kcal)	850.15(297.59)	740.17(281.06)	756.83(351.94)	652.00(526.23)
School snack calories (kcal)	83.54(66.61)*	146.33(104.83)	146.61(81.54)	176.67(101.37)
Snack carbs (g)	130.46(41.64)	120.92(48.10)	114.35(49.45)	102.50(40.00)
School snack carbs (g)	14.31(11.51)**	27.00(18.96)	25.43(13.21)	26.33(15.62)
Snack fat (g)	31.08(13.92)	24.00(11.90)	27.78(16.24)	23.17(34.83)
School snack fat (g)	2.62(2.66)	3.75(3.72)	4.91(3.91)	7.67(9.18)

*Indicates significant difference between NOW and OW at $p \leq .10$

**Indicates significant difference between NOW and OW at $p \leq .05$

The Sale of Snacks at School

The sale of snack foods in U.S. schools is becoming increasingly common (Wechsler 2001), but the practice is controversial. At Bridges Elementary School, teachers and parents express a variety of concerns over the sale of snack foods to children. One afternoon, when her students left the classroom to purchase their snacks, a teacher criticized the principal for selling snack foods because she felt that the excess sugar provided by these foods contributed to the unruliness of children.[5] At a Parent–Teacher Forum, a parent expressed a similar concern, "What about more nutritious snacks? This stuff hypes them up for the ride home." Another parent was concerned that snacks were not available to all children because of the cost. She stated, "About the snack issue—these are not free, therefore, they're not for all." The principal responded that most children have money for snacks, noting that when they do not, teachers provide snacks. As she continued to be questioned, the principal registered the parents' concern, and although she agreed that the nutritional quality of snacks was important for children, for her, the more important issue was the quantity of funds generated from snack food sales. As she explained:

> These things [snack foods] pay the telephone bill. Also supplies for the office and teacher's equipment, like slide projectors. Also, trips for kids who can't afford them. Parents don't understand all the expenses at the school—snacks bring in $7,000–$8,000 per year. Teachers only have to ask for something and they get it.

In support of the principal's position, a parent stated, "It's worth selling snacks—it gives money for the paper [the construction paper used in the many wall displays created by parent volunteers], and other things." The principal added, "and props for plays, too; and for the school calendars we send home." But the

discussion ended with a comment on the nutritional quality of the snacks. Although the commenting parent agreed that the funds generated by the sale of snack foods were important, she added, "Still. I would prefer nutritious snacks—juice boxes, fruit, and milk from the cafeteria." In a separate conversation with the principal, I asked about the sale of snack foods versus some other kind of food or commodity. She responded that she had tried other things, but candy, chips, and pop were the best income generators.[6]

The principal and the teachers at Bridges Elementary School seemed very aware of the relationship between food, nutrition, and health—nutrition is taught in the classrooms; school administrators and teachers talk about it over lunch and in the school's kitchen while preparing food for special events. Teachers and school administrators are parents, too, and they often discuss how to get children to eat better and how one finds the time to cook good meals. Physical education programs focus on fitness and wellness; the physical education teacher often creates individual programs for children who need to lose weight and/or exercise more. It is clear from these and other examples that the educators at Bridges Elementary School consider good nutrition and nutritional status to be important elements of the school environment.

But even more important, and the primary objective at Bridges, is the provision of a quality education for *all* children. As the director of the FRC told me, this requires additional funding for programs to fill in the "gaps between what is provided in the community and parental, teacher and kid needs." In her opinion, as well as that of the principal and many teachers, these gaps result from a low funding base due to high poverty in the community and the increased educational needs of those Bridges children who grow up in poverty. Comparing the situation of Bridges Elementary School to two other schools in the same county, one teacher told me,

> All schools are not treated equally, because there is difference in the local contribution of money to the schools. Bridges, for instance, has lots of poverty—little money for the school. Rockridge probably has more [money], and Hill Valley certainly does. Therefore, Bridges is particularly strapped for cash for programs.[7]

At Bridges Elementary School, the programs funded through the sale of snacks are perceived to be fundamental to the education of Bridges children, especially those who come from poor families. When speaking of the importance of field trips, one school administrator told me,

> They don't get out to see things outside of Bridges County walls. The low income kids are everywhere . . . lots have never been past Hill Valley—to plays, museums, shopping malls. There is a different culture from here to Hill Valley. . . . Hill Valley is more included with common things—Cub Scouts, Girl Scouts, library, and courthouse. . . . How can we relate to something in a book if we haven't seen it?

This inability to relate to "common" things for many Bridges children is perceived as a barrier to school success by this administrator, who believes it contributes to the high drop-out rate in Bridges County, continuing the "cycle of poverty" for some families. Therefore, programs that can help break the cycle are considered of primary importance at the school, and funds for those programs must be found, despite the costs.

Conclusion: Trading Nutrition for Education

Rebecca A. Huss-Ashmore and R. Brooke Thomas (1997) argue that gaining an understanding of how humans perceive their environments is important in biocultural research because perceptions structure responses that may have biological impact. At Bridges Elementary School, the realities of historically constituted poverty shape the school leaders' perceptions of the environment in which many children grow and develop, and it structures their responses to the challenge of providing a good education where needs may be greater and resources fewer than in more affluent communities. One response is to sell snack foods to fund activities and programs to enrich the life experiences of poorer children, enabling them to compete on a par with richer children once they move on to middle school.

But the sale of snack foods is not without biological cost for children across the socioeconomic range at Bridges. On the whole, Bridges children exhibit higher rates of overweight than the general population, with boys at particular risk; and Bridges children consume low-quality diets, irrespective of gender. At Bridges, overweight boys consume more snack foods than nonoverweight boys, increasing their risk for elevated blood pressure, dyslipidemia, insulin resistance, and type II diabetes (Deckelbaum and Williams 2001; Dietz and Gortmaker 2001). And although the same relationship does not hold for girls, snacks are probably displacing higher-quality foods in the diets of both genders, increasing nutritional risk from micro-nutrient deficiencies, many of which are implicated in cardiovascular disease, osteopenia, and bone fractures, and colon, breast, and other cancers (Fletcher and Fairfield 2002; Key et al. 2002). Finally, although children consume more snacks at home than school, school is, nevertheless, a powerful influence on children's behavior in all life settings (Dietz and Gortmaker 2001). Because nutritional conditions and food-related behaviors track from childhood to adulthood (Devine et al. 1998; Dietz 1998), establishing healthy food behaviors early on may lead to reductions in the excessive rates of chronic disease seen among Bridges County adults.

Because of the "epidemic of overweight" among U.S. children and the seeming intractability of adult chronic illnesses related to overweight and poor nutritional status, the nutrition environment in which children live and grow is coming under increased scrutiny. In the past, undernutrition was the nutritional problem of concern for U.S. children, and the National School Lunch Act was created in 1946 to help protect children against undernutrition. However, because of the rising prevalence of overweight, the act was amended in 1994, requiring school meals to adhere to the Dietary Guidelines for Americans (DGA), to reduce the fat, sodium, and sugar content, and meet the RDAs for a variety of nutrients (Wechsler et al. 2001).

Many (not all) schools have accomplished this change, but school meals are only one aspect of the school nutrition environment that contributes to children's nutritional status. Recently, the American Dietetic Association took the position that "school and community have a shared responsibility to provide all students with access to high-quality foods and nutrition services as an integral part of the total education program" (reported in Cline and White 2000). This level of "nutrition integrity" in the schools necessitates that *all* foods be consistent with the DGAs,

not just school meals, and that schools provide positive nutrition experiences as a part of everyday school experiences (Cline and White 2000).

But all over the country, school districts and school administrators are making the decision to sell foods in their schools that are of limited nutritional value and that compete with higher-quality foods (Wechsler et al. 2001). Although there is ample documentation of the sale of snack foods in U.S. schools, there is near silence in the literature as to why. Agnes Molnar (2000:403) points out that snack food sales are the "inevitable response to decades of inadequate funding for schools," but like others (Miller 1994; Wildey et al. 2000), she suggests the funds generated are usually applied to "noneducation" or "extra-curricular" activities, such as music, art, and sports. The case of Bridges Elementary School indicates that these revenues may be put to more fundamental uses, especially in schools situated in high-poverty areas. A recent report of Kentucky's Coalition on Type 2 Diabetes and Overweight in Children (now the Lt. Governor's Task Force on Childhood Nutrition and Fitness) (Tietyen n.d.; Tietyen et al. 2002) shows that vending machines in Kentucky's schools generate an average of $6,016 per school surveyed, and school stores generate $7,788. Revenues are used for sports equipment, music programs, guest speakers, field trips, and student awards and incentives, but also for books, instructional materials, computers, paper supplies, and even the school lunch or cafeteria fund.

Therefore, if we consider the school nutrition environment as one element of a greater environment, we can begin to understand the decision by some administrators to sell snack foods. As Rebecca A. Huss-Ashmore and R. Brooke Thomas (1997) point out, environmental negotiations to produce well-being often involve competing goals and motivations that are not biological, but that may have biological costs. Like all schools, Bridges Elementary is charged with providing the best possible education for children so they can grow up to be productive members of the community. But the funds with which to carry out this charge are inadequate. To augment those funds, the principal sells a commodity that generates high revenue (i.e., snack foods), because the cost of a less-than-adequate education appears greater than the cost of poor nutritional status. In other words, the decision to sell snack foods is a decision about education, not biology; and in Kentucky, "Education Pays";[8]—it is seen as the key to overcoming poverty for poor families and communities in the commonwealth. In this context, trading nutrition for education can make sense; at least, it may appear to be the better of a bad choice.

NOTES

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1. Bridges County is a pseudonym; I take the name from my grandfather who was also from the Appalachian Mountains.

2. "Distressed" is an official designation of the Appalachian Regional Commission. It is based on three criteria: poverty, market income, and unemployment.

3. According to the director of the Family Resource Center at Bridges, FRCs are funded by the Commonwealth of Kentucky to act as liaison between community services and poorer families. The intent is to help children overcome barriers to school success.

4. Although snacks and snacking are variably defined in the literature, I define snacks here as between-meal eating events, irrespective of foods consumed; however, most foods were those typically identified as snack foods—cookies, candy, pop, chips, etc. One reviewer raised a concern that by utilizing "snacking" in this way, I was presuming that three meals a day was the best nutrition strategy for children, for example, as opposed to "grazing." That is not my intent. For the most part, these children are following the breakfast/lunch/supper meal pattern that is fairly common in the United States, in addition to which they are consuming what would commonly be termed "snack-foods." Whether or not this is a pattern of grazing versus meals-plus-snacks would make an interesting discussion, but it is outside the scope of the article and requires additional research to sort out.

5. The notion that sugar contributes to hyperactivity in children is a common misconception.

6. Snacks (i.e., chips, candy, and soda pop) are desired commodities on the part of children and their parents. This may be due, in part, to the intensive advertising campaigns that directly target children. At the time of the research, the snack food market in the United States was worth $15 billion dollars per year; the children's food market was worth $9 billion, and marketers were targeting beverages and candy as two growth areas within that market (Littman 1998).

7. Hill Valley and Rockridge are pseudonyms for other towns and their elementary schools in Bridges County.

8. "Education Pays" is a promotional campaign in Kentucky aimed at decreasing dropout rates and encouraging continuing education. This slogan can be seen on billboards and in other public relations venues throughout the commonwealth.

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