

Vending Machine
Food Environment Assessment

Literature Review

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The food environment has only recently been studied as an important contributor to the dietary decisions people make every day; decisions which ultimately impact both short- and long-term health outcomes. The built environment, or the surroundings we create for the places we live, work, shop, and so on, impacts the nutrition environment, which includes the external cues that influence one's food choices and consumption (Sallis & Glanz, 2006). Generally, the nutrition environment in the majority of communities in the U.S. focuses on convenience, fast food, and large portion sizes and neglects fresh fruits and vegetables (2006). A nutrition environment conducive to healthy eating, where foods such as low-fat milk, fruits, vegetables, and whole grain bread are readily available at a local grocery or convenience store, is less likely to be found in lower-income communities (Frank et al., 2006; Glanz et al., 2007). Further, when healthy items are available, they are likely to cost more (Glanz et al., 2007). Therefore, one avenue for modifying eating behaviors is to change the nutrition environment in order to create an environment that is more conducive to healthy eating. A number of leading organizations in health and nutrition, including the World Health Organization, the Institute of Medicine, the International Obesity Task Force, and the Centers for Disease Control and Prevention, "have identified environmental and policy interventions as the most promising strategies for creating population-wide improvements in eating, physical activity, and weight status" (Glanz et al., 2005 p.330).

However, before environmental interventions are undertaken, the nutrition environment must first be quantitatively assessed in order to identify the primary areas on which to focus such interventions. One instrument developed to achieve this goal is the Nutrition Environment Measures Study (NEMS), which has been used to assess the nutrition environment of restaurants, grocery stores, and convenience stores (Glanz et al., 2007; Saelens et al., 2007). When assessing the

nutrition environment of restaurants, researchers looked at the following factors: availability of healthy foods, facilitators to healthful eating (i.e., nutrition information on the menu), barriers to healthy eating (i.e., menu discourages special requests), pricing (i.e., healthy entrees less expensive than regular entrees), and signage (i.e., highlighting of healthy options) (Saelens et al., 2007). This application of NEMS to fast-food and sit-down restaurants revealed that 21% of the sit-down restaurants and 36% of the fast-food restaurants assessed had healthy main dishes; however, of all the main dishes assessed in this study, less than 9% were considered healthy, indicating that diners have very limited, if any, healthy main dish choices when eating out (2007).

However, grocery stores, restaurants, and convenience stores are not the only avenues through which we purchase food; vending machines make food and beverages available in a variety of places where these items might not otherwise be purchased. In 2006, the locations of all vending machines in the U.S. could be broken down as follows: manufacturing facilities (33.8%), offices (23.5%), retail sites (10.7%), schools and colleges (9.6%), hospitals and nursing homes (7%), hotels and motels (4.4%), correctional facilities (3.3%), military bases (1.7%), and restaurants, bars, clubs (1.7%), with the remaining 4.4% of the vending machines' locations categorized as 'other'. Sales from all vending machines in 2006 totaled \$22.54 billion (Maras, 2007). Much attention has been given to vending machines in schools in recent years; while schools are home to only a small percentage of all the vending machines in the U.S., their prevalence in schools has certainly increased over the past few decades. Today, soft drink vending machines are available in 98% of U.S. high schools (Hendel-Paterson, French, & Story, 2004), and 'competitive foods,' or those sold outside of the school lunch, either through vending machines, schools stores, canteens, or snack bars, are available in 32.7% of elementary schools, 71.3% of middle schools, and 89.4% of high schools (CDC, 2006).

A large number of schools are providing students with alternatives to traditional school lunches by way of vending machines or à la carte options, and this environmental change is having an impact on students' dietary behaviors. Neumark-Sztainer and others (2005) revealed that the more vending machines found in a school, the higher the number of student snack food purchases. Additionally, research suggests that, in the school setting, vending machine options are displacing students' fruit consumption. Kubik and colleagues (2003) found that, with each snack vending machine available, students' intake of fruit decreased by 11%; à la carte options were negatively associated with students' intake of fruits and fruits and vegetables. Recent surveys of parents of school age children indicate they are concerned about the impact of vending machines in schools on children's health. A survey of parents in Ohio found that 51% preferred their children only have access to vending machines stocked with healthy foods, while 42% preferred that their children have no access to vending machines at all (Murnan et al., 2006). A survey of parents and teachers revealed that the vast majority (90%) of those questioned believed more healthy snack and beverage options should be offered in vending machines and à la carte (Kubik, Lytle, & Story, 2005).

Despite the research done on vending machines in school settings, few attempts have been made to quantitatively assess the nutritional quality of foods and beverages available in these machines. The Center for Science in the Public Interest (CSPI) used a set of nutrition standards for school foods developed by a panel of experts in order to assess school vending machines in 24 states. This was accomplished by assigning beverages to one of two categories – 'healthier' and 'less healthful' – and by classifying snacks into 'healthier' and those of 'poor nutritional quality'. The beverages classified as 'healthier' included: water, fruit juice with at least 50% real juice, low-fat (1%) or fat-free milk, and diet drinks; the less healthful beverages were soda pop (regular), fruit drinks with less than 50% real juice, whole or 2% milk, sports drinks, iced tea, and lemonade. Healthier snacks included low-fat

chips, pretzels, crackers, Chex Mix, fruits, vegetables, granola bars, cereal bars, nuts, trail mix, low-fat cookies, and other low-fat baked goods; alternatively, regular chips, crackers with cheese, candy, cookies, snack cakes, and pastries were classified as snacks of poor nutritional quality. Applying these guidelines to vending machines in middle schools and high schools revealed that about 75% of the beverages offered were less healthful and about 85% of the snacks stocked in these machines were of poor nutritional quality (CSPI, 2007).

Similarly, a 20-item survey to assess foods and beverages in vending machines in public schools in Delaware demonstrated that those items most commonly sold were of minimal nutritional value (Gemmill & Cotugna, 2005). A study conducted in four metropolitan worksites found that only 15% of foods and 26% of beverages sold in the worksites' vending machines were considered healthy; to be deemed healthy, the food or beverage had to meet all 3 of the following criteria: low calorie (≤ 400 kcals for entrees; ≤ 150 kcals for snacks & sweets; ≤ 50 kcals for cold beverages; ≤ 120 kcals for milk), low sugar ($\leq 35\%$ by weight for entrees, snacks, sweets, and cold beverages; nuts, seeds, mints, and gum sugar-free), and low-fat ($\leq 30\%$ total kcals for entrees, snacks, sweets, and cold beverages) (Shimotsu et al., 2007). Practitioners at Ottawa Public Health developed a schematic for classifying the foods and beverages offered in vending machines according to their nutritional profile; this schematic consists of placing each food or beverage item into one of five product groups (nuts, seeds, legumes; milk-based products; vegetable and fruit products; other beverages; general products). Each product group has its own nutritional standards, which determine the category into which the food or beverage is placed: green (good or excellent nutritional quality), yellow (significant nutritional value), or red (minimal nutritional value) (Messier, Cloutier, & Rowe, 2004). Ottawa Public Health teamed with Ventrex Vending Services to increase the number of healthy items (those categorized as green or yellow) in four secondary schools' vending machines as

part of a pilot program; not only were vending machine profits stable during this intervention, but also, sales of healthier items doubled (2004).

In addition to the poor nutritional profile of foods and beverages purchased from vending machines is the indirect link some researchers have shown between vending machine use and the prevalence of overweight and obesity in children. This is a significant issue because a child who is obese has an increased risk of being diagnosed with metabolic syndrome, insulin resistance, early-onset type 2 diabetes mellitus, polycystic ovarian syndrome, hypertension, hyperlipidemia, and obstructive sleep apnea (Lee, 2007). One study conducted in England examined children's vending machine use and found it to be positively associated with sugar consumption, dental health, and food choice (Maliderou, Reeves, & Noble, 2006). Additionally, vending machine use has been linked to sugar-sweetened beverage consumption (Wiecha et al., 2006), which is associated with weight gain and obesity in children (Malik, Schulze, & Hu, 2006).

Given the poor nutritional quality of foods and beverages offered in vending machines as well as the potential link between vending machine use and overweight and obesity in children, many experts have called for a change in the nutrition environment – including vending machines. At the Action on Obesity Summit, held in Rochester, MN in 2004, one recommendation to slow the growing numbers of children who are overweight or obese was to provide “healthy food options in vending machines and restaurants and increased opportunities for daily physical activity...in schools, worksites, and communities” (Smith et al., 2005 p.527). Similarly, Sothorn (2004) posited that, in order to help children eat healthy foods in appropriate portions, schools should develop vending machines policies and refrain from using ‘junk food’ as positive reinforcement.

A number of recent policy initiatives relating to vending machines have been introduced. In a review of state-level bills and resolutions introduced or adopted between 2003 and 2005, the legislation aimed at limiting obesogenic environments was most commonly focused on school nutrition and vending machines along with physical education/physical activity and the formation of studies, councils and task forces (Boehmer et al., 2007). In 2004, federal legislation mandated that schools draft Wellness Policies and develop nutritional guidelines for competitive foods by the 2006-2007 school year; a recent study found that 95% of school districts surveyed had vending machine policies, but many districts did not have policies for other types of competitive foods, such as those offered à la carte, in student stores, and at fundraising events (Greves & Rivara, 2006). The state of California has gone beyond federal mandates, first banning soda and candy bars from school vending machines, then eliminating vending machines from schools unless the offerings were deemed 'healthy' (Suarez-Balcazar et al., 2007). Chicago Public Schools (CPS) have determined that their vending machines will not dispense foods containing more than 30% fat, candy bars, or soda pop; the beverages sold are limited to water, sports drinks, juice (100% juice for elementary schools and at least 50% juice for high schools), snacks such as pretzels, low-fat foods, and granola bars (2007). CPS students' access to the machines was also limited; in elementary schools, the machines were moved to the teachers' lounge or turned off during the day, while in high schools, the vending machines were allowed anywhere except the lunchroom (2007). Another policy issue impacting vending machine use is the taxation of items sold through the machines; a survey of sales tax policies in all 50 states found that 16 states tax food items sold through vending machines, while 5 states tax all items sold through vending machines (Chriqui et al., 2008).

These policy changes have not gone unnoticed by vending machine companies, many of whom are stocking their machines with healthier items. Vending companies like Sodexo, Aramark, and

Compass Group, The Americas Division not only offer healthier items but also use signage, such as check marks or heart symbols, to highlight these options (Baar, 2008). Launched in April 2006, YoNaturals, Inc. stocks their vending machines with healthy snacks, such as fresh fruit and yogurt, hot organic meals, protein shakes, and health bars (Healthy, 2007). This company uses machines that allow each tier of the vending machine to be set to a different temperature, which enables the same machine to hold yogurt and fresh fruit as well as cookies and nutrition bars (2007). In addition to using machines with different temperature zones, vending machine company Westomatic promotes healthy eating through a color-coded graphic representing the components of a healthy diet, which is found on their EatSmart vending machines (Healthy, 2008). The National Automatic Merchandising Association (NAMA) recently made their Fit Picks program, which provides nutrition information and educational tools, available to all vending machine operators (NAMA, 2008). When ordering a Fit Picks packet, the vending machine operator chooses a nutrition standard – either the Fit Pick Standard or the Alliance for a Healthier Generation Standard – and can alert consumers to items that meet this nutritional standard with “stickers that can be placed in front of qualifying products, thin clings that explain the nutrition standard, coin slot stickers and round stickers to help educate consumers, and a list of products that meet the specified nutrition standard.” (2008). The Fit Picks Standard includes any item that has less than 35% fat, less than 10% saturated fat, and less than 35% total weight in sugar, excluding nuts and seeds; the Alliance for a Healthier Generation Standards incorporates the same 35-10-35 guidelines but also places limits on calories, trans fat, and sodium (2008).

Despite the progress some companies are making in increasing the availability of healthier food choices, many others remain unwilling to change their ways. Interviews with professionals in the food industry reveal disbelief that healthier choices are truly what consumers want as well as

reticence to offer such items until they have evidence of an increased demand for healthier options (Glanz et al., 2007). In addition, those in the food industry see a number of barriers to offering healthier foods including “the short shelf life of produce, increased preparation time, low sales, and high labor costs” (2007 p. 383). Some vending machine companies even reported decreased revenue from those machines where healthier items replaced less healthy fare, with estimates revealing that healthier items bring in only about half the money as compared to more traditional vending machine offerings (Baar, 2008). As a general rule, vending machine companies are advising operators to fill only about 20-30% of each vending machine’s slots with healthier choices in order to maintain profits (2008).

Even with some vending machine companies stocking 20-30% of their machines with healthier options, consumers still must identify and choose the healthier option from among the unhealthier alternatives in order to benefit from these changes. A number of recent interventions have attempted to increase the number of people making healthy food choices by focusing on promotion, pricing, and information. Fiske and Cullen (2004) used labels or a combination of labels and signs to promote three low-fat items stocked in 10 different worksites’ vending machines; while the increase in the number of low-fat items sold in these vending machines was not statistically significant, it is important to note that sales from these vending machines were not impacted by the introduction of the healthier items. Researchers have also combined price reductions with promotional signage to enhance sales of healthier items and found that “reducing relative prices on low-fat snacks was effective in promoting lower-fat snack purchases from vending machines in both adult and adolescent populations” (French et al., 2001 p. 112).

In addition to pricing and promotion, another way to influence consumers' food choices is by providing information. For example, fast-food restaurant customers in New York City who had access to calorie information at the point-of-purchase were more likely to order the lower calorie food options (Bassett et al., 2008). Another study found that when vending machines were stocked with items that were considered nutrient dense, sales declined; however, when the nutrition information was posted, sales went back up (Hoerr & Loudon, 1993). Researchers have tried a number of ways to encourage consumers to make healthy food choices, such as increasing the availability of these items, offering coupons, reducing prices, and many others; however, information at the point-of-purchase has proved to be one of the more successful tactics (Glanz & Hoelscher, 2004).

Despite vending machines' contribution to the food environment, particularly in places such as workplaces and schools, researchers have yet to develop an instrument that can quantitatively assess the nutritional profile of the food and beverages sold in vending machines. This is essential information, given the evidence that one's food environment does impact dietary behaviors. Further, in order to determine whether or not a food or beverage is 'healthy,' we must find an acceptable way to quantify that term. Finally, much of the research on vending machines and their effect on nutrition environments has been done in schools, largely as a result of the recent legislation regarding vending machines in school settings. While this is certainly an important area for research, similar research must be done in workplace settings to determine if the findings from schools are transferable to a workplace. The development and testing of a valid and reliable instrument for assessing the nutritional quality of foods and beverages offered in vending machines is the next step to a better understanding of how these machines impact people's food choices.

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