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Dietary Digital Diaries: Documenting Adolescents' Obesogenic Environment

Amanda E. Staiano[1], Christina M. Baker[2], and Sandra L. Calvert[2]

Abstract

Obesogenic environments promote excessive caloric and fat intake. A total of 23 low-income, African American adolescents digitally photographed their lunchtime food environment at a school buffet during summer camp. Depicted food was coded for nutritional content on the platescape (own plate or others' plates) and the tablescape (open buffet). Students digitally depicted high-caloric and high-fat content, particularly students who had higher baseline waist-to-hip ratio. Students who included higher caloric and fat content in their digital diaries gained more weight over the 4-week program than those who did not. Digital photography connects adolescents' perceived food environment with weight gain, revealing the environmental cues that promote excessive caloric and fat intake. Digital photography can also identify adolescents with problematic eating behaviors that increase risk for obesity.

[1]Pennington Biomedical Research Center, Baton Rouge, LA, USA
[2]Children's Digital Media Center, Georgetown University, Washington, DC, USA

Corresponding Author:
Amanda E. Staiano, Pennington Biomedical Research Center, 6400 Perkins Road, Baton Rouge, LA 70808, USA
Email: amandastaiano@gmail.com

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Adolescents are embedded in obesogenic environments that constantly cue excessive eating, contributing to obesity and associated comorbidities at young ages (McGinnis, Gootman, & Kraak, 2006). Average fat and caloric intake of youth far exceeds nutritional recommendations, particularly for low-income and ethnic minority youth (McGinnis et al., 2006). This situation translates to high rates of obesity. In 12- to 19-year-old African American adolescents, 46.3% of females and 33% of males were overweight or obese (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). The microscale built environments that promote overeating may best be seen through the eyes of the adolescent.

This study is the first to use digital photography to examine the impact of adolescents' perceived food environment on weight gain. By providing low-income, African American youth with digital cameras, we captured their experiences at a summer school buffet lunch, examining how physical health affects perceived food availability and caloric and fat intake, which contribute to pediatric obesity.

Food Environments

Microscale contexts—which create one's immediate food environment, including rooms, furniture, objects, and actual foods—can promote caloric and fat overconsumption, which then promotes unhealthy weight gain (Sobal & Wansink, 2007). To better understand how food environment affects eating behavior, salient environmental cues in the food environment can be classified by their spatial characteristics and scope (Sobal & Wansink, 2007). Kitchenscapes, tablescapes, platescapes, and foodscapes are terms developed by Sobal and Wansink (2007) to describe the multilayered food environment that facilitates food intake.

Kitchenscapes, the environment largest in physical size, are the rooms in which eating occurs. Food visibility and access, in combination with the people and activities that populate the room, can provide cues for overeating (Sobal & Wansink, 2007). School cafeterias are a primary kitchenscape for adolescents, with 52% of eating occasions for teens occurring at school (Story, Neumark-Sztainer, & French, 2003).

School cafeterias also promote a social environment of eating with friends, which can increase food consumption by 40% to 70% compared with eating

alone (Shide & Rolls, 1991). Eating duration with friends is longer when compared with eating alone, so there is more opportunity to consume larger amounts of food (de Castro, 1990). Adolescents and college students chiefly eat together in social settings, which distract them from monitoring food consumption (Hetherington, Anderson, Norton, & Newson, 2006). Higher amounts of food consumed in a school cafeteria translate to higher amounts of fat and sugar intake for adolescent males and females (Cusatis & Shannon, 1996).

Within the kitchenscape is the tablescape, which is the furniture that presents the variety, abundance, and accessibility of the food to be consumed. A buffet tablescape, in particular, promotes increased food consumption due to its offerings of plentiful and diverse foods (Stunkard & Mazur, 1978). The effects of buffet tablescapes are notable for college freshmen who experience weight gain during the 1st year of college, which is largely explained by all-you-can-eat buffets in campus dining halls (Levitsky & Youn, 2004). Buffets may also contribute to expanded portion sizes, which have increased substantially in size over the past 3 decades (Young & Nestle, 2002).

Within tablescapes are platescapes, which are defined as the containers that hold the food to be eaten. Larger plates promote increased food intake compared with compartmentalized plates that encourage portion control (Sobal & Wansink, 2007). Participants overserve themselves and underestimate total food intake when using an exaggerated environmental cue, such as a large bowl or plate on which food can easily be piled (Wansink & Sobal, 2007). Even when physiological satiety signals are released, consumers typically overconsume calories when using large plates (Kral & Rolls, 2004).

The appearance of the food on the platescape is termed the foodscape, which provides visual indicators that promote eating. Focus group discussions reveal that adolescents' food choices are influenced by appearance, smell, how the food is prepared or served, the temperature of food, and the variety of food (Neumark-Sztainer, Story, Perry, & Casey, 1999). When asked how to encourage adolescents to eat healthier foods, the most frequent response was to make healthy food look more appealing (Neumark-Sztainer et al., 1999).

Adolescent Food Choices and Perceptions of Food Environment

Even when provided with nutritious options, adolescents may continue to choose high-caloric, high-fat foods if they are salient in their environment (Rosenheck, 2008). In particular, overweight and obese youth are more likely to consume high-fat and high-caloric foods (Nicklas, Yang, Baranowski, Zakeri,

& Berenson, 2003), so they may be more drawn toward noticing these foods in their environment.

Low-income youth also tend to live in neighborhoods with a less healthy food environment, characterized by a high concentration of quick serve restaurants that sell low-cost, high-calorie, high-fat foods, and a dearth of supermarkets and healthful foods (McGinnis et al., 2006). Low-income youth often consume a higher percentage of calories from fat compared with higher income youth (Cole & Fox, 2004), revealing the behavioral impact of living in an unhealthy food environment.

Digital Photography as a Measure of Food Environment

Digital photography is emerging as an accurate, reliable measure of food intake in cafeterias, providing an alternative to direct observation or self-report (Williamson et al., 2004). This measure has been validated in school cafeterias for participants as young as elementary school students (Swanson, 2008), but photos have not been linked to weight loss or weight gain. Digital photography may provide a more accurate and cost-effective measure of food intake than traditional tools of self-report and direct observation, which are limited by recall problems, high costs, and time constraints (Swanson, 2008). In addition to using digital photography as a measurement tool, photographs may also reveal how an adolescent perceives the food environment. Allowing adolescents to digitally capture both their own food intake and their perspective of the cafeteria setting provides unique insight into the accessibility and appeal of foods in their environment as well as how their food choices may potentially lead to changes in weight.

Present Study

By providing adolescents with digital cameras to capture their summer school food environment and food intake, we hypothesized the following:

Hypothesis 1: Low-income adolescents will display high-caloric and high-fat foods on their own platescapes, their friends' platescapes, and the tablescapes in their digital diaries, despite having nutritious food available on an affluent college campus.

Hypothesis 2: Low-income adolescents with higher initial waist-to-hip ratio will include more foods that are high in calories and fat on their own platescapes, their friends' platescapes, and the tablescapes in their digital diaries than those with lower waist-to-hip ratios.

Hypothesis 3: Low-income adolescents who depict more fat and caloric content on their own platescapes will increase in weight over the 4-week summer school experience.

Method

Participants

Twenty-three 12- to 17-year-old African American students (17 females) from urban, low-income areas of a metropolitan city were randomly selected from a college-preparatory program on a university campus. The 4-week program recruited students from low-income neighborhoods on a first-come, first-served basis, without any academic, financial, or other criteria. The randomly selected sample participated in a summer digital diary course as an elective to their academic classes. Participants and parents signed assent/consent forms as per the University's Institutional Review Board policy. Participants were awarded a movie gift certificate for participation.

Measures

Physical health was measured by same-sex, trained, research assistants in a private space at baseline and at follow-up, which occurred 4 weeks after baseline. Height, waist circumference, and hip circumference were measured with a measurement tape, and weight (clothed, no shoes) was measured on a Tanita body mass scale. Waist-to-hip ratio was calculated by dividing waist circumference by hip circumference, which has been shown to be a valid indicator of health risks due to overweight (Pischon et al., 2008) and a significant predictor for all-cause mortality (Folsom et al., 2000). Body mass index (BMI) percentile was calculated using the age- and sex-specific Centers for Disease Control and Prevention BMI growth reference charts for 2- to 20-year-old youth. For adolescents, healthy weight is considered to be a BMI percentile between 5% and 85%, overweight is a BMI percentile between 85% and 95%, and obese is a percentile exceeding 95% (Kuczmarski et al., 2000). In our sample, 30.43% of participants were overweight or obese (see Table 1).

Procedure

During the first week of the students' 4-week digital diary course, students brainstormed ideas for their diaries and learned how to pitch their ideas to fellow classmates. Students were instructed that their digital diaries would capture

Table 1. Descriptive Statistics for Student Weights, BMI Percentiles, Waist-to-Hip Ratios, and Proportion Overweight and Obese

	Males ($n = 6$)		Females ($n = 17$)		Total ($n = 23$)	
	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2
Weight (kg) (low to high values)	60.15 (35.63-105.48)	60.45 (35.10-106.20)	55.28 (39.32-98.99)	54.20 (40.50-101.00)	55.30 (35.63-105.48)	55.60 (35.10-106.00)
BMI percentile (low to high values)	67.50 (18.00-98.00)	67.50 (18.00-98.00)	65.00 (7.00 to 91.00)	65.00 (7.00 to 91.00)	65.00 (7.00 to 98.00)	65.00 (7.00 to 98.00)
Waist-to-hip ratio (low to high values)	.82 (0.77 to 0.92)	.80 (0.73-0.92)	.80 (0.73 to 0.88)	.78 (0.71-0.88)	.80 (0.73 to 0.92)	.78 (0.71-0.92)
Number overweight (%)	1 (16.67%)	1 (16.67%)	2 (11.76%)	2 (11.76%)	3 (13.04%)	3 (13.04%)
Number obese (%)	1 (16.67%)	1 (16.67%)	3 (17.65%)	3 (17.65%)	4 (17.39%)	4 (17.39%)

Note: BMI = body mass index. Median values reported for weight, BMI percentile, and waist-to-hip ratio. A BMI percentile between 85% and 95% indicates overweight and above 95% indicates obese.

their summer camp experiences, through photographs of their academic and social environments, which would then be shared with fellow students. During the second week of the program, students were taught how to use the digital equipment and were given access to digital cameras to take photos in the campus cafeteria twice during the students' lunch period. Participants were instructed to take photos of their lunchtime environment, which could include both food and friends. Students were also given the opportunity to use the cameras during academic class time, though only photos of food in the cafeteria were coded for the present study.

Before and after taking photos, a professional filmmaker taught students how to assemble digital stories using the iMovie editing software. Students were allowed to include any of the photos they had personally captured during their academic class and lunchtime throughout the study to represent their own summer experiences. During the final 2 weeks of the program, students created and edited their digital diaries and then presented their final digital diaries to the rest of the class.

Students' lunchtime experiences occurred in a university campus cafeteria. All students ate lunch together during a 1-hr period and could choose where to sit within the dining hall. Food was displayed on self-service buffets. Nonpartitioned circular plates were available, and students could return to the buffet as many times as they wished. See Table 2 for the food options available to the participants, which included a full buffet line with meats, fruits, vegetables, grains, desserts, and beverages. Nutritional content was not available to students.

Coding of Food in Digital Diaries

Foods depicted in the digital diaries were coded according to estimated portion sizes that were digitally captured, and caloric and fat amounts were calculated from information provided by the University cafeteria's registered dietitian and the 2008 U.S. Department of Agriculture (USDA) National Nutrient Database for Standard Reference, full version, release 21, for microcomputers. The caloric and fat content of foods digitally captured and included in the digital diaries was calculated for each participant's digital diary and categorized based on whether the food was shown on their platescape (i.e., the student's plate), a friend's platescape, or the tablescape (the buffet). A total sum was also calculated for each participant, which represented total fat and caloric content depicted in the entire digital diary. Platescapes were circular dining plates without partitions, placed on rectangular cafeteria trays that could hold multiple cups, plates, and bowls.

Table 2. Caloric and Fat Content of One Serving of Each Food Option for Participants During School Buffet Lunch

	Total calories	Total fat (g)	Percent calories from fat
Depicted in digital diaries[a]			
French fries[b]	414.43	22.15	48.10
Ice cream[b]	140.00	8.00	51.43
Soda	182.00	0.00	0.00
Pepperoni pizza	553.57	15.38	25.00
Chicken wings[b]	300.00	19.00	57.00
Salad bar	unknown	unknown	unknown
Crispy chicken strips[b]	321.05	19.19	53.80
Grilled cheese and tomato	233.81	6.08	23.40
French toast	155.00	3.00	17.42
Assorted fresh fruits	unknown	unknown	unknown
Deep fried chicken[b]	700.00	48.00	61.71
Chicken pattie sandwich[b]	304.64	12.90	38.11
Garlic breadsticks	196.42	5.21	23.87
Chocolate chip cookies[b]	96.00	4.52	42.38
Captain crunch cereal	110.00	1.50	12.27
Steamed broccoli spears	30.19	0.35	10.44
Not depicted in digital diaries			
Fried red fish	1767.69	6.98	3.55
Vegetable quesadilla[b]	809.99	41.87	46.52
Cheese ravioli in pesto[b]	791.59	37.65	42.81
Hamburger[b]	704.74	42.17	53.85
Patty melt[b]	698.09	42.18	54.38
Meatball sandwich[b]	686.98	30.28	39.67
Beef with broccoli and black bean sauce	629.59	16.22	23.19
Philly cheese steak sandwich	551.01	16.51	26.97
Chicken cacciatore[b]	536.47	33.04	55.43
Fried tofu sweet and sour	467.18	12.25	23.60
Eggplant parmesan[b]	465.61	27.7	53.54
Beef lo mein	464.18	10.92	21.17
Vegetable Indian curry	459.52	8.71	17.06
Sloppy Joe sandwich[b]	413.83	14.22	30.93
Baked macaroni and cheese[b]	407.91	14.48	31.95
Alfredo sauce[b]	380.71	29.26	69.17
Grilled ham and swiss[b]	366.42	17.20	42.25
Black bean burger	346.35	10.71	27.83
Cream of vegetable soup[b]	332.82	18.11	48.97
Cream of chicken soup[b]	328.89	16.59	45.40
Vegetable pizza	323.74	9.09	25.27

(continued)

Table 2. (continued)

	Total calories	Total fat (g)	Percent calories from fat
Cheese pizza	312.99	9.06	26.05
Tater puffs[b]	308.83	14.01	40.83
Cheese and tomato casserole[b]	284.35	14.16	44.82
Hot dog[b]	282.53	16.59	52.85
Three bean chili	262.19	2.84	9.75
Beer-battered fish[b]	245.81	8.93	32.70
Tomato soup[b]	233.75	13.47	51.86
Broccoli cheese soup[b]	231.84	15.3	59.39
Cream of mushroom soup[b]	226.24	11.09	44.12
Vegetable fried rice[b]	189.95	9.18	43.50
Egg noodles	181.44	2.10	10.42
Creamy coleslaw[b]	166.29	15.52	84.00
Manhattan clam chowder	160.02	3.35	18.84
Potatoes O'Brien[b]	158.46	6.41	36.41
Marinated grilled chicken	152.9	4.74	27.90
Baked beans	132.3	2.10	14.29
Jasmine rice	129.64	0.28	1.94
Baked tilapia	120.17	3.66	27.41
Herb-roasted red potatoes	112.73	2.43	19.40
Lentil stuffed peppers[b]	108.7	3.83	31.71
Herb-roasted vegetables[b]	106.68	4.14	34.93
Greek orzo	85.12	2.43	25.69
Sweet 'n sour carrots[b]	84.29	3.37	35.98
Old fashioned chicken with rice soup[b]	84.06	3.12	33.40
Vegetable soup	78.84	0.59	6.74
Peas and carrots[b]	76.24	3.99	47.10
Turkey vegetable chowder	74.10	1.04	12.63
Marinara sauce	68.91	1.55	20.24
Chicken noodle soup	67.06	1.78	23.89
Oriental beef noodle soup	64.32	2.07	28.97
Corn on the cob	61.74	0.49	7.14
Grilled asparagus[b]	41.81	2.49	53.60
Tomato and zucchini sauté[b]	37.40	2.33	56.07
Waffle bar	unknown	unknown	unknown
Deli	unknown	unknown	unknown
Asian stir fry	unknown	unknown	unknown

[a]Foods are ordered from most to least depicted on adolescents' platescapes when presented in the digital diaries and by total calories for foods that were not depicted in digital diaries.
[b]Indicates foods that exceed the recommendation of <30% calories from fat. Caloric and fat values are based on 1 serving size.

Table 3. Means of Caloric and Fat Content Depicted on Male (n = 6) and Female (n = 17) Own Platescapes, Friends' Platescapes, and Tablescapes

	Platescape			Friends' platescape			Tablescape			Total		
	Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
Caloric content	1312.62 (993.56)	838.29 (792.36)	962.03 (852.24)	90.00 (146.29)	786.24 (873.80)	604.61 (811.09)	130.23 (170.42)	567.32 (881.15)	453.30 (780.89)	1532.85 (850.17)	2191.85 (1707.27)	2019.93 (1540.02)
Fat content (g)	75.92 (64.23)	35.64 (36.81)	46.15 (47.44)	4.08 (6.48)	33.40 (39.00)	25.75 (35.91)	7.78 (11.66)	24.77 (49.97)	20.34 (36.19)	87.79 (57.22)	93.80 (77.56)	92.23 (71.60)

Note: Standard deviation indicated in parentheses. For each "All" column, the summary score is weighted by sex.

All repeat photos were only coded for the first occurring photo because these photos did not introduce new material to the digital diary. Twenty-five percent of the sample was coded by a second independent observer for inter-observer reliability. Interrater reliability, measured as Cohen's kappa, exceeded $\kappa = .70$ for food depicted on platescape, friends' platescapes, and tablescape. Following the completion of coding, data were compiled and analyzed using the statistical program SPSS.

Results

We hypothesized that the foods depicted in students' digital diaries would include high-caloric and high-fat content. Table 3 depicts the caloric and fat content for foods appearing on the adolescent's platescape, on their friends' platescapes, on the tablescape, and the combined total score. As predicted, the foods depicted in students' digital diaries for the combined score of platescapes and tablescapes were very high for total caloric content (M = 2019.93, SD = 1540.02) and for total grams of fat (M = 92.23, SD = 71.60). In order of most to least often depicted, the following foods were most commonly displayed on students' own plates: French fries, ice cream, soda, pepperoni pizza, and chicken wings. Students almost always had at least two servings of each food on their own plates. Typical platescapes are depicted in Figures 1 and 2.

Overall, the foods displayed on the tablescape were on average high in caloric and fat content. As depicted in Table 2, 50% of the food categories (7 of 14) captured in the digital diaries exceeded the USDA threshold of 30% calories from fat for school lunch foods. Of all of the food options available to students, 52.17% (36 of 69 food options) exceeded the 30% calories from fat criteria. Five food categories that were available to students were excluded from analysis because nutritional information was unavailable, as indicated in Table 2. A tablescape is depicted in Figure 3.

Figure 1. Photo of the student's own platescape depicting crispy chicken strips, French toast, and French fries

Figure 2. Photo of another student's platescape depicting ice cream in a waffle cone

Figure 3. Photo of tablescape depicting French fries

To examine the relationship between baseline physical health and nutritional content depicted in the digital diaries, linear regression analysis was conducted with the baseline health measure of waist-to-hip ratio as the independent variable and nutritional content of foods as the dependent variable. Waist-to-hip ratio significantly predicted fat content on adolescents' platescapes, $F(1, 21) = 4.602$, $p = .044$, $R^2 = .180$. The positive relationship indicated that those with higher waist-to-hip ratios at baseline depicted higher amounts of fat content on their own plate.

To examine the relationship between weight change during the 4-week program and depiction of caloric and fat content on participants' platescape, separate linear regressions were conducted with caloric or fat content on the platescape as the independent variable and with weight change as the dependent variable. Weight gain was significantly predicted by both caloric content on one's platescape, $F(1, 19) = 7.333$, $p = .014$, $R^2 = .278$, and by fat content on one's platescape, $F(1, 19) = 10.642$, $p = .004$, $R^2 = .359$. Of the 23 participants, 14 gained weight (3 males, 11 females), with an average weight gain of 1.02 kg. Six participants lost weight (2 males, 4 females), with an average weight loss of 1.28 kg.

Discussion

This study examined the use of digital diaries as a method to capture student eating patterns and weight gain. Given the high obesity rates and poor nutrition typical of urban, low-income African American adolescents (Mullen & Shield, 2004), we hypothesized that students would include high-caloric and high-fat content from the cafeteria in their digital diaries, despite the availability of low-caloric, low-fat, nutritious food. As expected, digital diaries contained foods with high-caloric and high-fat content. More specifically, foods with a total caloric average of 2,020 calories and a total fat average of 92 g were digitally captured. Students' platescapes during lunch time consisted of food with an average of 962 calories and 46 g of fat. This caloric amount is 25.75% higher than the average caloric intake by middle and high school students at lunchtime in a school cafeteria (Newman, Guthrie, Mancino, Ralston, & Musiker, 2009). The higher than average depiction by study participants may be because adolescents were exposed to an open buffet line in which they selected their own portions and could return for additional portions.

Average caloric depiction for lunchtime was also very high when compared with daily caloric recommendations. The USDA recommends a daily intake of 2,000 calories for a moderately active 14- to 18-year-old female and 2,400 to 2,800 calories for a moderately active male within this age range (USDHHS & USDA, 2011). The average calories depicted on the girls' own platescapes in their digital diaries was 42% of total recommended daily caloric intake for females and 47% to 55% of the recommended daily caloric intake for males in the boys' digital diaries. This finding is of particular concern considering that the depiction was only of one meal, excluding breakfast, dinner, and snacks. Moreover, the average fat content depicted on student's own platescapes exceeded recommendations. Based on a 2,000 calorie diet, it is recommended that a 14- to 18-year-old adolescent consumes 25-35% calories from fat (USDHHS & USDA, 2011), yet the average amount of fat depicted on our girls' lunch plates was 46-64% of the recommended fat intake (based on a 2,000 average calorie daily consumption model) and a whopping 70-114% of recommended fat intake (based on a 2,400-2,800 average calorie daily consumption model) on boys' lunch plates.

Although nutritious foods were available to the students, many of the food options at the cafeteria were high in caloric and fat content. National School Lunch Program guidelines developed by the USDA do not allow foods to exceed 30% total calories from fat (Newman et al., 2009), yet more than 50%

of the food options available to participants in the cafeteria exceeded this criteria. This finding echoes national trends in which 88% of middle and high schools serve foods that exceed the 30% maximal fat from calories recommended by the USDA guideline (Newman et al., 2009). Interest in these unhealthy foods was captured in the adolescents' digital diaries, in which 3 of the 5 most frequently depicted foods exceeded the maximal calories from fat recommendation. The depiction of ice cream and French fries, two high-caloric and high-fat content foods, is particularly problematic considering these foods are available in 73% and 71% of middle- and high school cafeterias, respectively (Newman et al., 2009). As students chose to include photos of high-caloric, high-fat foods in their digital diaries out of all the photos they had captured during the course of the study, it is apparent that students found these foods most appealing in comparison with more nutritious foods.

Although previous literature shows that low-income, urban African American adolescents often do not have access to nutritional foods, this study illustrates that students choose to eat the poor nutritional foods the most, even when healthier options were present. As the participants were from low-income homes, it is possible that they did not have access to an abundance or diversity of foods at school or at home (see the Federal Research and Action Center, 2006; Prevention Institute, 2002). Therefore, students may have compensated by eating several portions of foods in the school cafeteria during the summer program. Nonetheless, healthy options were also available at the cafeteria, including an array of fruits and vegetables.

As expected, participants who depicted higher caloric and fat content on their platescape gained more weight during the 4-week summer school program. Participants who had a higher baseline waist-to-hip ratio also depicted more fat content on their platescape than those with a lower waist-to-hip ratio. High waist circumference and high waist-to-hip ratio predict cardiovascular risk factors, including high triglyceride levels, high insulin levels, and the metabolic syndrome (Janssen et al., 2005). An effective weight loss strategy is to restrict caloric and fat intake (Spear et al., 2007), a strategy that was not being implemented at this particular cafeteria kitchenscape.

Interestingly, males depicted less fat and caloric content for their friends' plates and tablescapes than females did. Sex differences in adolescents' concern for others' food choices and their food environment warrants future research.

This study was limited to capturing only adolescents' lunchtime environment, without accounting for breakfast, dinner, or snacks consumed outside of the school lunch. Even so, selections for just one meal of the day nearly met recommended amounts for an entire day's worth of caloric and fat intake. Although the digital diaries only documented the food that participants put on

their plates and not what was actually consumed, those who photographed more fat and calories on their own plates were also more likely to gain weight during the summer program. Therefore, examining adolescents' platescapes revealed a relationship between food environment and health outcomes.

Students chose what to photograph and include in their digital diaries. Because of this procedure, only platescapes and tablescapes were documented, without providing evidence of other environmental factors that affected adolescent food choice, such as peers, food placement, and the cafeteria layout. Examining these additional important environmental factors is an area for future research.

The kitchenscape in our study was also unlike a typical high school cafeteria in which portions are not self-served and returns to the buffet may be restricted. A full lunch hour is also atypical of students' lunchtime experiences during high school. Using food photography to capture more typical lunchtime experiences would provide additional examination of adolescent food environments. Nevertheless, we did capture what these students may soon be experiencing in their food environments if they enter college, and they enrolled in a program designed to prepare them for college so that outcome seems likely. Future studies could also investigate whether adolescent food patterns change as a result of digitally photographing their food choices, particularly if combined with a nutrition course about caloric intake and fat concentrations of various foods.

In conclusion, digital diaries provided a snapshot of low-income adolescents' high-caloric, high-fat food environment during a summer school program in which lunch was served. School meal policies should consider the obesogenic environments promoted during school lunchtime, including the tablescape of all-you-can-eat buffets, the platescape of nonpartitioned plates and large trays that encourage multiple portions, and the foodscape of appealing unhealthy foods that tempt students to overconsume caloric and fat content. Our use of digital photography is a unique method to capture how adolescents' perceptions of their food environment affect weight gain. Photographs reveal the environmental cues that promote excessive eating, which once identified can be altered to shape adolescents' food choices. Digital photography may be, then, an important method to identify adolescents who are consuming high amounts of caloric and fat content and are thus at higher risk of developing obesity and its problematic comorbidities.

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Bios

Amanda E. Staiano, PhD, is now a postdoctoral research fellow in the Division of Population Science at Pennington Biomedical Research Center. She received her doctoral degree in psychology and a master of public policy from Georgetown University. At the Children's Digital Media Center, she examined the impact of digital media on children's physical, cognitive, and socioemotional health.

Christina M. Baker, MA, received her master's degree in psychology from the Catholic University of America and was a researcher at the Children's Digital Media Center. She holds a bachelor's degree in film and media arts from American University and has a background in film and television production, with a particular interest in children's programming.

Sandra L. Calvert, PhD, is a professor of psychology at Georgetown University and director of the Children's Digital Media Center. Her research, which spans the fields of psychology, communications, health, and education, seeks to improve the well-being of children by bridging the gap between knowledge generation and knowledge application.