Multimethod Analyses of Discretionary Time Use and Health Behaviors Among Urban Low-Income African-American Adolescents: A Pilot Study

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ABSTRACT: ***Objective:*** **The objective of this pilot study was to examine the relations between discretionary time (DT) social context, health behaviors (dietary intake and physical activity), and body mass index (BMI) in a sample of urban low-income African-American early adolescents.** ***Methods:*** **Multiple methods were used, including accelerometers, 24-hour dietary recalls, anthropometric measurements, and Experience Sampling Method (ESM). Participants included 9 boys (mean = 12.9 years) and 16 girls (mean = 12.9 years). Sixteen participants were at a healthy weight (10 girls and 6 boys), and 9 were overweight or obese (5 girls and 3 boys).** ***Results:*** **Eighth graders had higher BMI *z* scores, engaged in less healthful eating during DT, and spent less time in vigorous exercise in DT than sixth graders. Participants spent the majority of DT with siblings, which was associated with increased light physical activity as measured by accelerometers. The ESM data suggested that adolescents engaged in increased physical activity and decreased sedentary activity when with peers but increased sedentary activity when with parents. Increased percentage of DT spent with parents was associated with increased daily fat intake. Data also indicate high consumption of unhealthy foods across all DT social contexts and activities.** ***Conclusions:*** **Peers may provide a protective social context with regard to obesity-related health behaviors. Targeting changes in health behaviors during the middle school years may be an effective means of decreasing obesity risk among urban African-American adolescents. Interventions for urban African-American early adolescents may benefit from facilitating physical activity with peers and targeting change in family health behaviors.**

(*J Dev Behav Pediatr 34:*589–598, 2013) **Index terms:** minority health, health behavior, body mass index, pediatric obesity, physical activity.

Obesity has increased dramatically in youth over the past 20 years, but the prevalence of obesity among African-American youth is increasing even more rapidly.[1] Recent estimates suggest that while approximately 30% of white 12 to 19 year olds are overweight or obese, over 41% of African-American adolescents of the same age are overweight or obese.[1] A number of factors may contribute to this discrepancy. African-American adults are also disproportionately burdened by obesity,[2] and having obese parents is a primary risk factor for child obesity.[3] Another factor is that low-income, ethnic minority youth tend to live in neighborhoods with more fast food restaurants and fewer vendors of healthier food.[4] In addition, when preparing food, African-American parents are more likely to use larger quantities of fats, sugars, and sodium and to fry with oils rather than healthier methods such as broiling or baking.[5,6] African-Americans also tend to report larger ideal body sizes than their counterparts of other ethnicities.[7] However, one relatively overlooked contributing factor to ethnic discrepancies in childhood obesity rates may be differences in how and with whom youth spend their discretionary time (DT).

Discretionary time refers to periods of the day during which youth are not involved in formal schooling, work, or self-maintenance activities (i.e., bathing), and most commonly refers to after-school time, as well as to evenings, weekends, and vacation time including summer.[8] Approximately 40% to 50% of adolescents' waking hours represents DT. High levels of involvement in sedentary DT activities have been linked to increases in obesity.[9] For instance, the odds of being overweight are 50% higher for youth who watch more than 5 hours of television per day compared with youth who watch less than 1 hour daily.[10] Compared with other ethnic groups, African-American youth engage in more sedentary activities, particularly television viewing,[10] and spend very little of their DT in structured activities.[11,12]

Further evidence of the relevance of DT use as a relevant but understudied correlate of obesity among African-American youth is provided by research on body

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mass index (BMI) changes during school versus summer months. School-aged children gain weight faster over the summer, when their amount of DT increases dramatically, compared with the rate at which they gain weight during the rest of the year.[13] This summer weight gain is particularly pronounced for African-American youth[13] and is hypothesized to relate to ethnic differences in the types of activities youth are involved in during their summer DT. However, urban, low-income African-American youth are significantly less likely to be enrolled in such activities[11] and often lack access to affordable and accessible recreation facilities[14] suggesting that DT use may be a relevant but rarely examined correlate of obesity among urban African-American youth.

Social Context of Discretionary Time

In addition to considering how youth spend their DT, research has yet to consider the influence of with whom youth spend their DT as a correlate of obesity among African-American youth. Obesity tends to spread through social ties,[15] but the mechanisms that explain these relations are not well understood. One mechanism may be through social influences on physical activity. A recent meta-analysis has highlighted several processes through which peers and friends may influence youth physical activity, including peer/friend support, peer norms, friendship quality and acceptance, and peer victimization.[16] In the work by Jago et al,[17] youth reported that enjoyment is the primary reason for maintaining activity and that participating in an activity with friends is the most important element influencing enjoyment.

Only few studies have used the Experience Sampling Method (ESM)[18] to examine social context (i.e., whether youth are with family, peers, or alone) and activity levels but have included primarily white youth. Experience Sampling Method involves participants carrying electronic pagers and providing reports on their behavior when signaled by the pager at random intervals. One ESM study found that adolescents engaged in more intense physical activity when with their peers than their family members, and more intense physical activity when with others than when alone.[19] Another recent ESM study found that children were more likely to engage in physical activity when with friends or family than when alone.[20] This literature suggests that social context plays an important role in adolescents' DT use, particularly their engagement in physical activity, but this link has never been examined among urban, low-income African-American youth.

Social context (i.e., whether youth are with family, peers, or alone) may also influence DT dietary intake, although this has yet to be examined using ESM. Research suggests that the best predictor of whether 10- to 12-year-old youth consume healthy snack foods is whether other youth in their presence also consume healthy snack foods.[21] Similarly, preadolescent girls consume more calories when snacking with an overweight peer than when snacking with a normal weight peer.[22] Peers and friends may be especially influential on youths' eating behaviors during adolescence when social networks become increasingly important sources of motivation for behaviors.[23] Parents and family members also influence nutritional intake through the food they make available and by modeling certain eating habits.[24,25] Given that individuals tend to conform or match how much they eat to the amount of food eaten by others around them,[26] it is crucial to examine the various social contexts in which adolescents eat. Little is known, however, about relations between social context and DT dietary intake, particularly among urban, low-income African-American youth.

This Study

Relying on multiple methods of assessment including ESM approaches, accelerometry, 24-hour dietary recalls, and anthropometric measures, the present interdisciplinary study examines DT use as a potentially significant yet understudied correlate of urban African-American adolescents' obesity and health behaviors. The current investigation focuses on differences during early adolescence because it represents a critical period in the development of obesity,[27] and obesity prevention programs with youth this age have generally lacked success. The current investigation will examine relations between DT health behaviors (e.g., activity level and dietary behavior), DT social context, and BMI among a sample of urban, low-income African-American adolescents. It is hypothesized that adolescents will engage in more activity when with their friends than in other social contexts. It is also hypothesized that adolescents will engage in less healthy eating when with friends and alone. Additionally, it is hypothesized that higher BMI will relate to lower activity levels and less healthful dietary intake during DT.

METHODS

Participants

Participants for this study included 25 African-American adolescents (9 boys and 16 girls) between 12 and 14 years of age (mean = 12.6; SD = 1.0). As shown in Table 1, 14 participants were between the 15th and 85th body mass index (BMI) percentile (10 girls and 4 boys) and 11 youth were at or above the 85th BMI percentile (6 girls and 5 boys). All participants were African-American and were recruited from a public school in an urban neighborhood on the west side of Chicago, IL. The school was 99.1% African-American and 92.7% low-income status as indicated by city and school report. Participants were recruited through school-based announcements made in 2 sixth-grade classrooms and 2 eighth-grade classrooms. Over 87% of adolescents provided assent to participate in the study, and 56% (n = 64) of the assented adolescents returned signed consent forms from their parents authorizing them to participate. Using a stratified random sampling approach, 30 adolescents were selected to participate. Given the low number of males who assented, males were

Table 1. Body Mass Index Descriptives for Sixth- and Eighth-Grade Boys and Girls

	Grade 6 (N = 11)		Grade 8 (N = 14)		Total (N = 25)	
	Mean	SD	Mean	SD	Mean	SD
Age (yr)	11.6	0.8	13.3	0.5	12.6	1.0
Weight (kg)	47.1	7.2	62.0	11.2	55.4	12.1
BMI	19.7	2.5	23.5	3.6	21.8	3.7
BMI z scores	0.37	0.9	1.0	0.6*	0.7	0.8
Mean CDC BMI-for-age percentile (%)	62.4	26.9	81.1	13.7	72.8	22.2
≥85th BMI-for-age percentile (%)	2 (18.2)		7 (50)		9 (36)	

*$p < .05$ between sixth and eighth grade. BMI, body mass index; CDC, Centers for Disease Control and Prevention.

then oversampled to achieve a final sample that was 36%. The Institutional Review Board of the Loyola University of Chicago and Chicago Public Schools approved the study.

Procedures

Data were collected during two 1-week periods in the fall using the Experience Sampling Method (ESM) procedures established in previous studies.[12,28] A meeting was held with participants at the beginning of the week to hand out preprogrammed watches, notebooks, and accelerometers. Participants were instructed that when watches beeped, they should complete a survey in their notebooks assessing who they were with (social context), what they were doing (activity type), and what they had eaten since the last beep (dietary intake). Watches were set to beep between the hours of 7:30 a.m. and 9:30 p.m. for all 7 days of the week. To obtain a greater density of ESM data during discretionary hours, a stratified sampling design was used for specific periods of the day. On school days, 1 beep was sent at a random time before school (7:30 a.m. until 9:00 a.m.), one during school hours (9:00 a.m. until 2:45 p.m.), and then once every 90 minutes during discretionary after-school hours (2:45 p.m. until 9:30 p.m.). On nonschool days, beeps were scheduled at random times for every 90 minutes, resulting in each participant receiving 55 beeps for the entire week. For the purposes of this study, only data gathered from beeps during discretionary time (DT) (before school, after school, and weekends) were used. Participants were asked to respond to as many beeps as possible. Study personnel met with all participants each school day during the week to verify that the watches and accelerometers were functioning and positioned correctly. Personnel also collected completed ESM booklets and handed out new ESM booklets each weekday. A hotline number for reaching study personnel was printed on the outside cover of the ESM booklets, and participants were instructed to call at any time should they have any questions or should equipment malfunction or get lost. At the end of the data collection week, a final meeting was held with the participants where anthropometric measurements were taken and accelerometers, ESM booklets, and watches were collected.

Using the criteria from previous ESM studies,[12,28,29] adolescents needed to respond to 50% of the signals for their ESM data to be included in analyses. Consistent with previous research, 83% of adolescents in the selected sample of 30 adolescents met this minimum beep criteria, and females (78% of the full sample) were more likely to be included in the final sample of 25 than males (58% of the full sample). Sixth and eighth graders were equally represented in the final sample. Out of a total of 1470 beeps, adolescents responded on average to 77% of beeps. Previous ESM studies demonstrated that missed reports occur for a wide variety of reasons and across activities and have not been shown to bias the results.[30] For this investigation, ESM data were examined at both the signal level (i.e., examining relations among different behaviors at the time of the signal) and person level (i.e., aggregating across all signals for each person and examining relations between percent of beeps spent in certain behaviors and person-level characteristics such as BMI).

Measures

A multimethod assessment strategy including ESM techniques, accelerometry, 24-hour dietary recalls, and anthropometric measures were used to obtain data. For all ESM data, the staff coded responses into mutually exclusive categories (with the exception of the social context data), with a minimum kappa of 0.90 obtained for all coded variables.

Discretionary Time Activity Level

Experience Sampling Method

At each beep, adolescents were asked to report on whether they had engaged in activity since the last beep that made them "sweat or breathe harder than usual." Responses of "yes" were coded as participants having engaged in physical activity. Follow-up questions asked, If yes, what did you do?" and "How many minutes did you do it?" Additionally, participants were asked to rate how intense the activity was on a scale of 1 to 5, with 1 indicating "very light" and 5 indicating "very hard." Participants were also asked to report if they had done any activity "that involved sitting or not moving" since the last signal. A list of sedentary activities that involved sitting or not moving was provided to participants in their booklets.

Responses as "yes" were coded as participants having engaged in sedentary activity. Follow-up questions asked, "If yes, what did you do?" and "How many minutes did you do it?" The ESMs have been shown to be valid and reliable and to accurately capture the experience of preadolescents and young adolescents.[18,30]

Accelerometry

Participants were asked to wear an Actical Activity Monitor (Mini-Mitter/Respironics, Bend, OR) over a 1-week period. The monitor was placed on a belt at the waist, positioned just behind the left hip bone. Accelerometers used in the study are serviced regularly by Mini-Mitter/Respironics, and their batteries are changed every 100 days. Before the start of the study, accelerometers were calibrated. Each participant was asked to wear the monitor at all times, and remove the monitor while bathing, showering, or swimming. We monitored participants for 7 days. Based on preliminary work, this provides a good level of reliability at 0.83% to 0.92%. Data were collected as activity counts/minute as well as kcal and metabolic equivalents (METs). Based on these data, percentage of time spent in sedentary (<1.5 METs), light (1.5–3.9 METs), moderate (4–6.9 METs), and vigorous (>7 METs) activity was calculated. These categories have been used in other recent activity monitoring studies.[31,32] Age-specific count thresholds that correspond to these intensity levels were derived from the MET prediction equation developed by Freedson et al.[33] Although this equation was initially developed with adults, it has subsequently been found to be accurate with children and adolesents.[34] Extensive research has shown that accelerometer-based activity monitors can discriminate the differing intensities of activity[32,35,36] and are both reliable and valid for physical activity monitoring in both adults and children. For this study, accelerometry data were able to be examined for each participant as a whole (24 hours) and within after-school time (3–9 p.m.). The Actical software was used to identify participants with 4 or more days of at least 8 hours of activity levels captured by the accelerometer per day; only these participants were included in analyses.

Discretionary Time Dietary Intake

Experience Sampling Method

At each beep, adolescents were asked to indicate what they had eaten or drunk since the last beep. Adolescents' responses were then coded into mutually exclusive categories representing different food groups, including servings of fruits, vegetables, meats, grains, dairy, soft drinks/sugary beverages, fatty snacks (e.g., chips), or sugary snacks (e.g., cookies). Sugary beverages, fatty snacks, and sugary snacks were additionally coded as "unhealthy foods" (i.e., energy dense nutrient poor).

The 24-Hour Dietary Recalls

Dietary patterns were assessed primarily by two 24-hour dietary recalls administered to the adolescent in a face-to-face interview with research staff during ESM data collection weeks. The first recall took place during the initial meeting with research staff at the start of the ESM week (i.e., Wednesday). Adolescents were asked to remember everything he/she ate and drank between the time they awoke the previous morning until the time they got up that current morning. The adolescent was asked to supply estimated portion sizes using food models and to describe cooking methods. Fast food intake, frequency, and type were determined by asking specific questions supplementing the recalls. The second 24-hour dietary recall was administered on day 6 (i.e., Monday) to obtain a recall from a weekend day. Nutrient intake was calculated by multiplying portion sizes, converted to gram weights, by the nutrient content per gram of that food. Information from the 24-hour recalls was analyzed using the University of Minnesota Nutrition Data System (NDS) for Research. This software features a multiple-pass approach that prompts for complete food descriptions and preparation methods and include more than 16,000 foods and values for 117 nutrients and nutrient ratios. Recalls were averaged across the 2 days and analyzed for average daily energy intake, percent of daily calories from protein and fat, and daily servings of fruits, vegetables, and milk. Energy intake was adjusted for body weight by creating residuals in which energy intake was regressed onto participants' weight in kilograms. This was done as an epidemiologic technique to adjust for underreporting.[37] The multiple-pass 24-hour dietary recall has been extensively used with adolescents and has been shown to be both reliable and valid.[38]

Discretionary Time Social Context

Using ESM, adolescents were asked who they were with at the moment of the beep. Their responses were coded into 5 categories (i.e., alone, with parents, siblings, extended family, or peers). Categories were not mutually exclusive.

Body Mass Index

Weight was measured with light clothing and without shoes to the nearest 0.1 kg using a digital scale. Height was measured using a SECA stadiometer with the head held in the Frankfort plane to the nearest 0.1 cm. Equipment were calibrated before the start of the study. Weight and height data were then used to calculate BMI using the following formula BMI = kg/m^2. The BMI-for-age percentile was determined using the Centers for Disease Control and Prevention (CDC) national norms using age to the nearest month and gender-specific median, SD, and power of the Box-Cox transformation. BMI z scores were calculated based on CDC growth charts, and these scores were used in all analyses. BMI z scores have been used in research as a standardized way to assess overweight because there is no ceiling at the upper limit of percentiles where values are collapsed.[39]

Analytic Plan

Data were analyzed using Statistical Package for the Social Sciences (SPSS) (version 19; SPSS, Inc., Chicago, IL) and met assumptions for the use of parametric statistics. Descriptive information about study variables were examined, including differences between after-school and weekend DT and differences between sixth and eighth grade. Chi-square analyses were used to examine the relations between ESM report of health behaviors and whether participants were in a particular social context. Correlational analyses were used to examine the relations between objective measurement of health behaviors (accelerometry, 24-hour recalls), percentage of time spent in each social context, and BMI z scores. Given the small sample and pilot nature of the study, significance levels were not adjusted.

RESULTS

As shown in Table 1, body mass index (BMI) z scores was significantly higher for eighth-grade participants (mean = 1.02) as compared with sixth-grade participants (mean = 0.37), $t(23) = 2.156$, $p = .04$, $d = 0.85$. Participants' BMI z scores did not differ by sex. Using American Academy of Pediatrics standards,[40] 18.2% of sixth-grade adolescents were categorized as overweight or obese (≥85th percentile) as compared with 50% of eighth-grade adolescents. There were no grade differences in the Experience Sampling Method (ESM) report of activity level; however, accelerometers indicated that eighth graders spent significantly less after-school discretionary time (DT) in vigorous activity as compared with sixth graders, $t(23) = 2.461$, $p = .02$, $d = 0.95$. No other physical activity differences were found. Grade differences were also found in ESM reports of dietary intake. During the after-school hours, eighth graders were significantly less likely than sixth graders to have reported consuming fruit, $t(20) = 2.451$, $p = .02$, $d = 1.01$, or vegetables, $t(20) = 2.897$, $p = .01$, $d = 1.21$. On weekends, although eighth graders were significantly more likely than sixth graders to have reported consuming vegetables, $t(14) = -2.378$, $p = .03$, $d = 1.14$, they were also more likely than sixth graders to consume fatty snacks, $t(14) = -2.545$, $p = .02$, $d = 1.26$, and salty snacks, $t(14) = -2.565$, $p = .02$, $d = 1.26$. Dietary intake as assessed through 24-hour recalls did not differ by grade. Sixth graders spent significantly more DT with siblings than eighth graders, $t(17) = 2.150$, $p = .04$, $d = 0.98$. The effect sizes for these grade differences (Cohen's d) are considered large.

Discretionary Time Activity Levels

Experience Sampling Method

As shown in Figure 1, during the after-school hours, participants reported having engaged in physical activity that made them sweat or breathe hard since the last beep 28.9% of the time, whereas they reported having engaged in sedentary activity since the last beep 64.7% of the time. Weekend patterns of physical activity were similar in participants who reported that they had engaged in physical activity that made them sweat or breathe hard since the last beep 32.1% of the time and sedentary activity since the last beep 53.4% of the time. On average, participants reported that physical activity lasted 27.4 minutes after school (SD = 27.4) and 20.1 minutes on weekends (SD = 15.9). Participants rated the intensity of their physical activity on a 1 to 5 scale, with 1 being "very light" and 5 being "very hard" as 2.3 after school and 2.2 on weekends. No difference was found between after-school and weekend ratings of the intensity or minutes spent in physical activity. The BMI z score was not significantly related to ESM activity level data.

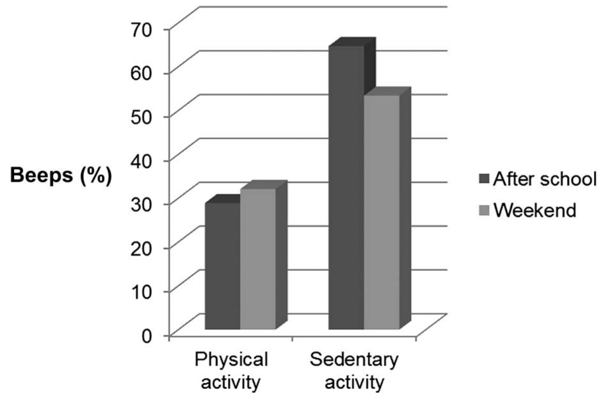

Figure 1. Discretionary time dietary intake as measured through Experience Sampling Method.

Accelerometry

Descriptive analyses indicated that participants spent the majority of their time in sedentary activity (67.6%) followed by light physical activity (21.2%), moderate physical activity (10.9%), and vigorous physical activity (0.3%). After-school patterns of physical activity were similar to overall patterns, with participants spending the majority of after-school DT in sedentary activity (42%), followed by light physical activity (34%), moderate physical activity (23%), and vigorous physical activity (<1%). The BMI z score was significantly negatively associated with percent of after-school DT spent in light physical activity ($r = -.42$, $p = .04$). These findings suggest that participants with higher BMI z scores spent less time in light physical activity during the after-school hours. Percentage of time spent in sedentary and physical activity as measured by accelerometers (after school and in total) were not significantly associated with percentage of DT (after-school or weekend) spent in sedentary and physical activity as captured by ESM.

Discretionary Time Dietary Intake

Experience Sampling Method

In an effort to obtain a general idea of DT dietary intake among urban, low-income African-American adolescents, types of food participants reported consuming were examined across DT beeps. Descriptive analyses (Fig. 2) suggested similar patterns of dietary intake across after school and weekend time. After the majority of beeps (65.9% of after-school beeps and 62% of weekend beeps), respondents reported having eaten unhealthy food (i.e., fatty/sugary snack or sugary beverage). In

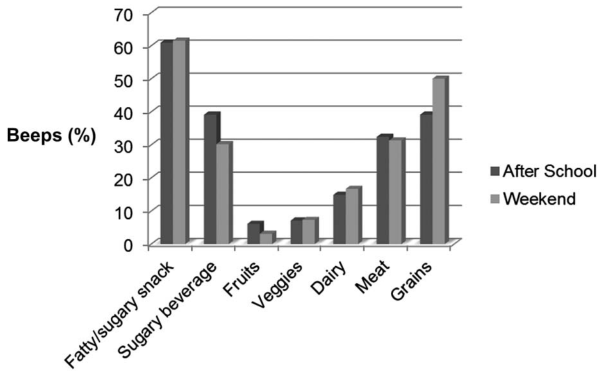

Figure 2. Discretionary time physical and sedentary activity as measured through Experience Sampling Method.

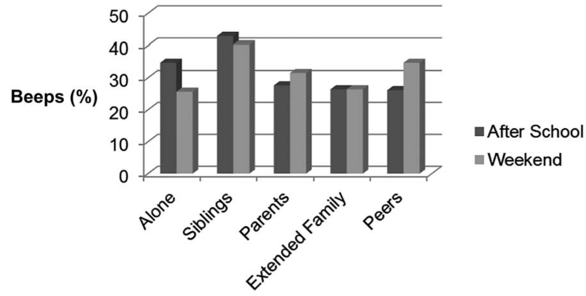

Figure 3. Discretionary time social context as measured through Experience Sampling Method.

contrast, only a small percentage of beeps did participants report having eaten fruit (5.2% of after-school beeps, 4.0% of weekend beeps) or vegetables (6.8% of after-school beeps, 6.9% of weekend beeps). Dietary intake did not differ significantly between after-school and weekend DT, and no relations were found between ESM dietary intake and BMI z scores.

The 24-Hour Recalls

Descriptive analyses indicated that on average, participants received approximately 19% of their total daily calories from unhealthy snacks (e.g., candy, chips) and 15% from soft drinks. Twenty-two percent of total daily calories were consumed after school (before dinner). In addition, participants' total daily energy in kilojoules was composed of 13% protein and 32% fat on average. Participants consumed an average of 1.4 servings of fruits and vegetables and less than 1 serving of milk per day. The relation between dietary intake as measured by 24-hour recalls and dietary intake as reported by ESM was examined with correlational analyses. Average daily protein as measured through 24-hour recalls was significantly positively associated with percentage of DT beeps after which participants reported eating a sugary snack ($r = .57$, $p = .02$) or more generally, unhealthy foods ($r = .52$, $p = .02$). Average total energy intake as measured through 24-hours recalls was significantly negatively associated with percentage of DT beeps after which participants reported eating a salty snack ($r = -.73$, $p < .01$). Dietary intake was not related to BMI z scores. The effect sizes for these correlational analyses (Pearson's r) are considered large.

Discretionary Time Social Context

As shown in Figure 3, the majority of adolescents' after-school DT was spent with siblings (42.9%), followed by time spent alone (34.7%), with parents (28.6%), with peers (26.1%), and extended family (22.6%). On weekends, adolescents also spent the majority of their DT with siblings (40.3%). In contrast, however, on weekends, adolescents spent more time with peers (34.7%) than with parents (31.5%), extended family (26.4%), or alone (25.6%). The BMI z scores was not significantly associated with percentage of DT spent in different social contexts (i.e., alone, with parents, siblings, extended family, or peers).

Relations Between Discretionary Time Social Context and Activity Levels

Experience Sampling Method

Chi-square analyses indicated that whether participants reported that they had engaged in physical activity since the last beep depended on social context. During the after-school hours, participants were more likely to have engaged in physical activity since the last beep, χ^2 (1) = 27.492, $p < .001$, Cramer's $V = 0.25$, and less likely to have engaged in sedentary activity since the last beep, χ^2 (1) = 6.095, $p = .01$, Cramer's $V = 0.12$, if they had been with peers. In addition, participants were more likely to have engaged in sedentary activity since the last beep if they were with parents, χ^2 (1) = 18.021, $p < .001$, Cramer's $V = 0.20$. The effect sizes for these findings (Cramer's V) were considered small.

Weekend patterns of physical and sedentary activity were similar. On weekends, participants were more likely to have engaged in physical activity since the last beep, χ^2 (1) = 8.862, $p = .003$, Cramer's $V = 0.24$, and less likely to have engaged in sedentary activity, χ^2 (1) = 4.545, $p = .03$, Cramer's $V = 0.17$, if they had been with peers. In addition, on weekends, participants were more likely to have engaged in physical activity since the last beep if they had been with extended family, χ^2 (1) = 8.524, $p < .01$, Cramer's $V = 0.23$. In contrast, participants were more likely to have engaged in sedentary activity if they had been with their parents, χ^2 (1) = 6.661, $p = .01$, Cramer's $V = 0.21$. The effect sizes for these findings (Cramer's V) are considered small.

Accelerometers

Correlational analyses revealed that participants who reported a greater percentage of DT spent with siblings were significantly more likely to engage in light physical activity as measured by accelerometers ($r = .50$, $p = .03$). This effect size (Pearson's r) is considered large. Percentage of DT spent in other social contexts was not significantly related to levels of physical activity as measured by accelerometers.

Relations Between Discretionary Time Social Context and Dietary Intake

Experience Sampling Method

The intersection between dietary intake and social context was examined using χ^2 analyses. When with parents, participants were more likely to report consuming meat, χ^2 (1) = 7.584, p = .008, Cramer's V = 0.12, and less likely to report consuming fatty snacks, χ^2 (1) = 4.310, p = .039, Cramer's V = 0.09. When with siblings, participants were also more likely to consume meat, χ^2 (1) = 4.682, p = .030, Cramer's V = 0.10, and grains, χ^2 (1) = 5.036, p = .025, Cramer's V = 0.10. When with peers, participants were less likely to consume meat, χ^2 (1) = 6.440, p = .013, Cramer's V = 0.11. The effect sizes for these findings (Cramer's V) are considered small. No other relations between DT social context and ESM measure of dietary intake were found.

The 24-Hour Recalls

Correlational analyses were used to examine the relation between dietary intake and percentage of DT spent in different social contexts. Increased percentage of DT spent with parents was significantly associated with increased daily fat intake (r = .566, p = .01) and increased percentage of daily energy intake from fat (r = .53, p = .02). The effect sizes for these correlational analyses (Pearson's r) are considered large.

DISCUSSION

This pilot study used multiple methods, most notably Experience Sampling Method (ESM), to examine relations between discretionary time (DT) health behaviors (e.g., activity level and dietary intake), DT social context, and body mass index (BMI) among a sample of urban, low-income African-American adolescents. Several interesting findings emerged from this work, in particular, links between DT social context and health behaviors. The ESM data indicated that across both after-school and weekend DT, adolescents engaged in more physical activity and less sedentary activity while they were with peers. In contrast, adolescents were more likely to have engaged in sedentary activity after school and on weekends if they were with their parents. These results are consistent with the findings of Salvy et al,[21] who demonstrated that children reported more intense physical activity when in the company of peers or close friends. Our preliminary findings highlight peers as a potential protective social context for adolescents with regard to physical activity. Facilitating increased DT spent in activities with peers, as opposed to alone or with parents, may be an effective avenue toward increasing physical activity and decreasing risk for obesity among adolescents.

In addition to physical activity, DT social context was also linked with dietary intake. In particular, adolescents were more likely to report eating meat when with parents, and 24-hour recall data indicated that adolescents who spent more time with parents consumed more fat. These findings are consistent with research indicating the influential role of parents on child nutritional intake.[24,25] Greater intake of meat and fat in relation to time spent with parents may reflect family meals or food provided by parents, as opposed to snack foods youth may be able to more easily access or purchase on their own. The associations found between time spent with parents, dietary intake, and physical activity suggest the possible benefit of interventions that involve parents of adolescents, in an effort to facilitate improved adolescent health behaviors through improved family health behaviors. Approaches that use the parents may be particularly beneficial for urban African-American youth given that previous research has found urban African-American youth to spend significantly more time with their family than suburban white youth.[29] Indeed, while white young adolescents experience a marked decline in the amount of DT they spend with family,[41] urban, African-American young adolescents may not experience this decline.[27] Thus, the greater proportion of time urban African-American youth spend with family could be considered a developmental asset on which health interventions could capitalize.

Patterns of activity during DT among urban African-American youth were another noteworthy finding. In another ESM study,[29] researchers compared time use among urban African-American and suburban white adolescents. Results suggest that urban youth spent two thirds less time in structured activities as compared with their suburban counterparts. On average, urban African-American youth spent less than 1% of their time each day involved in structured DT activities. Urban African-American youth also spent more time engaged in sedentary activities relative to suburban white youth. These ethnic discrepancies in DT use may result from community-level barriers faced by urban African-American youth. Low-income urban communities often lack resources to provide structured after-school programming.[42] Furthermore, even if programming does exist, safety concerns may prevent adolescents in neighborhoods with substantial crime and violence from accessing facilities.[14] Findings from this study suggest that adolescents were spending the majority of their DT engaged in sedentary activities. When asked through the ESM if they engaged in physical activity that made them sweat or breathe hard (i.e., moderate to vigorous physical activity), adolescents reported that approximately one third of their DT was spent in this way. Accelerometers suggested that these rates were closer to 24%. As for sedentary behavior, adolescents indicated by means of ESM that they engaged in sedentary activity approximately 65% of the time during after-school DT. These rates were actually lower for accelerometers (42%) during DT after school.

Another interesting finding was age-related differences in BMI z scores and health behaviors. Adolescents enrolled from the eighth grade had significantly higher BMI z scores, with 50% of these adolescents at or above the 85th percentile. In contrast, less than 20% of the sixth-grade adolescents were at or above the 85th percentile. Eighth graders also engaged in less healthful behavior. Most notably, data from accelerometers indicated that eighth graders spent significantly less of their after-school DT in vigorous activity as compared with sixth graders. The ESM dietary intake data suggests that eighth graders reported more intake of unhealthy snack foods and vegetables on the weekends but less intake of fruits and vegetables during their weekday DT. These preliminary findings suggest that early adolescence may represent a particularly critical period in the development of obesity among urban African-American youth. Youth obesity interventions that are tailored to specifically address changes in health behaviors during the middle school years may be more successful at reducing obesity risk among urban African-American youth.

Differences observed in dietary intake and physical activity when comparing sixth and eighth graders in this study may reflect developmental differences in independence. Throughout middle school years, youth gain more choice over what food they consume[43] and how they spend their DT.[44] Our preliminary findings suggest that interventions targeting increases in risk for obesity during middle school years may benefit from using strategies that focus on self-choice. For example, interventions could include components addressing the benefits and excitement of increased choice in diet and time use, as well as the typical pitfalls many adolescents experience along with this new responsibility (i.e., poor dietary habits, lack of exercise). Additionally, given the increased time spent socializing and the increased influence of peers on decision making, interventions that incorporate the importance of peer culture may be effective among early adolescents. For example, interventions that foster the idea of physical activity as a social activity friends do together, or that challenge friend groups to make healthy changes in eating together, may be valuable.

Overall, across both sixth and eighth graders, both ESM and 24-hour recalls suggested that urban African-American adolescents are eating very few fruits and vegetables and consuming snack foods both overall and during the DT at an alarmingly high rate. These findings echo those previous studies indicating that youth snacking, particularly on salty snacks and candy, has increased dramatically over the last several decades.[45,46] Recent estimates suggest that over 27% of adolescents' daily calories now come from energy-dense, nutrient-poor snacks (e.g., chips).[45] These results add to the literature suggesting that reducing adolescents' consumption of unhealthy snacks may be an increasingly important step in combating adolescent obesity. Although the BMI z score was not significantly related to dietary intake, this may have been due to small sample size. Previous studies have also failed to find relations between BMI z score and caloric intake in ethnic minority youth at risk for obesity.[47]

Although there were differences in health behaviors based on the method of assessment, the use of multiple measures allowed for methodological triangulation that should lead to a better understanding of the factors that predict adolescents' obesity and health behaviors. Across both self-report (ESM) and more objective assessment methods (accelerometers, 24-hour dietary recalls), youth were found to spend most of their DT in sedentary activities and to consume energy-dense nutrient-poor food. This consistency suggests the validity of our findings. To our knowledge, this is the first study to use ESM, accelerometers, and 24-hour dietary intake interviews in an urban minority population. The use of time sampling method such as ESM allows for assessment of health behaviors as they occur. In this regard, ESM data are more immediate, less inferential, and less vulnerable to the biases known to be associated with self-reports and others.[48] We assert that the fine-grained analysis that can be provided with ESM sheds new insight onto the role of daily life experiences that may contribute to obesity among a high-risk group. Insights that can are critical for developing preventions and interventions that address the growing obesity epidemic in urban African-American youth.

This study is not without limitations. Similar to previous studies using ESM with youth,[19] our study included a small number of participants, and thus results should be interpreted with caution. The robustness of several of the findings despite the small sample size is particularly noteworthy. The lack of statistical power was most problematic with the person-level data, which may explain why there were no significant findings related to BMI z scores. Additionally, the greater proportion of girls in our sample may have influenced the pattern of results. Adolescent girls engage in less physical activity than boys,[10,49] and they experience greater declines in physical activity during early adolescence as compared with boys.[50] Thus, the greater proportion of girls in our study may have contributed to the high levels of sedentary activity and the differences in physical activity that was found between sixth and eighth graders.

Another important consideration is that this study only included African-American adolescents, and all were from the same predominantly low-income school in an urban neighborhood. Relations found between DT social context, health behaviors, and BMI may not generalize to youth of other ethnic groups, higher socioeconomic status, or suburban and rural environments. For example, among more affluent youth or youth of other cultural backgrounds, spending time with parents may be associated with different patterns of health behaviors than those found in this study. Future research should examine how DT social context relates to DT health behaviors and BMI among a larger sample of adolescents, among adolescents of higher socioeconomic status, and among other ethnic groups at high risk for obesity (e.g., Latino youth). Additionally, given the potential impact on our results of the large number of females in our sample, future research with larger samples should consider gender differences in relations between DT social context, DT health behaviors, and BMI.

This pilot study contributes to the literature by using multiple methods, including ESM, to consider in 1 study how several aspects of DT (social context, activity level, and dietary intake) may relate to each other among an urban, ethnic minority population at high risk for obesity. Taken together, the results of this study preliminarily suggest that obesity interventions should focus not only on younger adolescents but also carefully consider how and with whom adolescents are spending their DT.

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