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# Adolescent Girls' Most Common Source of Junk Food Away from Home: Someone Else's House

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## Abstract

Contextual factors associated with adolescent girls' dietary behaviors could inform future interventions to improve diet. High school girls completed a 7-day diary, recording all trips made. In places other than home or school they recorded the food eaten. Girls made an average of 11.4 trips per week other than home or school. Snacks high in solid oils, fats and added sugars (SOFAS) were frequently consumed. Girls reported eating an average of 3.5 servings per week of snacks high in SOFAS at someone else's house compared to 3.0 servings per week at retail food outlets. Findings demonstrate that low nutrient foods are ubiquitous and efforts should be made to reduce their availability in multiple settings.

### Keywords

Adolescent girls; travel diary; SOFAS; obesity; snacks



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## Introduction

Developing solutions to address overweight and obesity, now affecting 1 in 3 youth, requires insight into the circumstances surrounding calorie consumption and physical activity. (IOM 2005); (Flegal, Carroll et al. 2010) The rate of increase in overweight and obesity has been substantially higher for youth than adults (Ogden, Yanovski et al. 2007), so understanding contextual factors related to the eating and physical activity patterns of young people is particularly important.

Snacking, defined as eating between meals, has been considered one of the important sources of excess calorie intake and has been increasing over the past two decades. On average, youth snack between meals nearly three times per day and adults more than twice daily; these snacks account for 27% and 24% of total calories, respectively (Piernas and Popkin 2009; Piernas and Popkin 2010) Indeed, the composition of the modern diet has been considered as containing too many calories from solid oils, fats, and added sugars (SOFAS), and these now comprise 40% of the energy consumed by youth (Reedy and Krebs-Smith 2010). The overconsumption of SOFAS has been associated with negative consequences including diabetes and insulin resistance (Ludwig 2003; Schulze, Manson et al. 2004; Dhingra, Sullivan et al. 2007; Curhan and Forman 2010). Increases in snacking have not been accompanied by increases in physical activity that would offset the higher level of calorie consumption (Kimm, Glynn et al. 2000).

In addition to increased snacking, the frequency of eating away from home has increased dramatically. From 1962 to 2002, spending on food away from home rose from 27 percent to 46 percent of all food dollars (Jahns, Siega-Riz et al. 2001; Variyam 2005). Away from home foods are likely to explain much of the increase in daily eating occasions. Eating occasions have increased in part because food provision and consumption are also signs of hospitality and generosity, backdrops for socializing, and for the past several decades, global businesses with high profit margins (Whitford and Burke 2011). A substantial increase in the availability of convenience foods has paralleled the modern obesity epidemic. Prepared, ready-to-eat foods are ubiquitous: available in home, school, and work and other away from home settings (Steidtmann 2005). Identifying where different types of foods are obtained, and in which context, may provide important insights.

As youth mature and gain independence by getting a driver’s license or working to earn money, they also have greater access to food in away-from-home settings. Previous studies have indicated that what youth consume can be influenced both by their peers and by food availability (Salvy, Elmo et al. 2010; Wouters, Larsen et al. 2010). Peer influences increase in adolescence, as do mobility and independence. Given that away from home foods are generally higher in SOFAS than food prepared at home (Lin and Frazao 1999; Todd, Mancino et al. 2010), we expected that more visits to food outlets would be associated with increased consumption of SOFAS. Until now travel studies focusing on mode of transport and physical activity have not included detailed information on diet. Similarly, dietary studies have not included detailed information with respect to the location where foods are consumed or contextual neighborhood characteristics. In order to understand the types of foods eaten when youth are not in school or at home, as well as the circumstances surrounding these eating occasions, we conducted a study with adolescent girls, previously enrolled in the control arm of a school-based physical activity intervention.

## Methods

Girls enrolled as control subjects during 8$^{th}$ grade in the multi-site TAAG (Trial of Activity for Adolescents Girls) trial from the San Diego and the Minneapolis/St. Paul metro areas

were invited to participate in a longitudinal follow-up (Stevens, Murray et al. 2005). Methods were approved by the IRBs of each participating institution. Of 532 eligible girls attending 7 different high schools we enrolled 303 respondents based upon a random order. After obtaining parental consent and their own assent, participants were asked to record their travel destinations and the foods they ate when not at home and not at school over a 7-day period. To minimize recall bias, we asked participants to record information in real time using a Neighborhood Places Log (NPL) using a personal digital assistant (PDA). Girls documented their time of arrival at a destination, time of departure, how they arrived (car, walking, or other), type of destination (friend's house, mall, restaurant, community activity facility, etc.), with whom they went, their level of activity at the destination, whether they ate there, and if so, what foods and beverages they consumed and how much of their own money they spent for food. If someone else paid, they were instructed not to record the food cost.

The girls completed the Youth Adolescent Questionnaire (YAQ), a validated and reliable food frequency questionnaire (Rockett, Wolf et al. 1995; Rockett, Breitenbach et al. 1997) reported a 0.54 average correlation with a 24 hour food recall. This instrument provides a general picture of usual food consumption over the past year. From the YAQ we were able to calculate the daily servings of fruits and vegetables as well as the percentage of foods listed as "snack foods/dessert" that are largely considered high in SOFAS (USDA 2010). We estimated the daily calories from snack/dessert items using the USDA National Nutrient database (USDA 2010), based upon the reported frequency of consumption. We classified foods reported on the NPL into 12 food categories, to aid in discerning whether foods were high in SOFAS or not. We identified eating occasions in which items classified as sugar sweetened beverages, candy, sweetened baked goods, salty snacks, frozen dairy treats, and fried side dishes were consumed. Because it was not possible to determine the SOFAS content for entrees without knowing specific ingredients, these were not counted among SOFAS eating occasions.

The girls also completed a supplemental questionnaire about factors associated with diet and physical activity including whether they had a license to drive, worked for pay, participated in sports teams or other physical activities after school, their time on computers or watching televisions (screen time), their household composition, and mother's education and employment (Table 1).

We also examined characteristics of the neighborhoods surrounding both the girls' homes and schools, defined as including the surrounding ½ mile radius. From the 2000 Census, we calculated the percentage of households in poverty, population density, and street density using the ½ mile street network buffer around each girl's home. We also calculated the distance from girls' homes to their schools using ARC GIS.

Height and weight were measured twice by trained field staff and body mass index (BMI) percentile was calculated using sex and age specific norms. We stratified girls into two groups, underweight and normal (<85% BMI) and overweight/obese (≥ 85%). Girls wore an accelerometer and GPS monitor to provide objective information on the amount of moderate-to-vigorous physical activity (MVPA) and travel routes taken over a 7-day period.

## Methods Validation

Prior to this study we conducted a pilot with 50 girls to validate the accuracy of the diary methods for recording food consumed by collecting seven consecutive days of real-time dietary and physical activity data using a PDA. During the week when girls completed the diary by recording only the foods consumed when they were neither at home nor at school, we called each girl on two randomly selected days to conduct a 24-hour recall to compare

the recall report with what was recorded in the diary. Forty-two girls had adequate data to test agreement. Girls recorded an average of 6.6 NPL days, of which 42% of the records kept were recorded in real time. An average of 33% of all eating occasions documented on the NPL were away from home and, thus, could be validated by the recall. Overall agreement in foods consumed between the recall and the NPL was 0.82 (SE .04).

### Data analysis

We summarized the socio-demographic, diet, and physical activity characteristics of the girls, the availability of different types of food at home, and the characteristics of the girl's residential neighborhood using frequency and percentage distribution, or mean and standard deviation (Table 1). We computed and standardized the number of weekly trips so that if a girl recorded fewer than 7 days on the NPL her results could still be expressed in the unit of one week. In Table 2 we show the association of consumption of specific foods with particular destinations, overall and by site. The reported numbers for the two sites were tested for significant differences using a t-test. We computed the average number of weekly trips and standard deviation overall, and by destination and activity level at destination in Table 3, and tested for significant differences across site using a t-test. We also examined the association of trips with BMI. Counts of weekly trips were highly skewed, so we log-transformed them for the regression analysis.

Using multivariate analyses (Table 4), we modeled the associations between logged total number of trips taken per week and logged total number of trips to a destination, and frequency of consumption of snacks high in SOFAS, percentage of calories from low-nutrient snacks, and consumption of fruits and vegetables, with linear regression models that controlled for covariates including socio-demographic, home environment and neighborhood characteristics. We specifically included race/ethnicity, study site, dollars spent on food, screen time, availability of fruits, vegetables and snacks high in SOFAS at home, whether milk, fruits and vegetables were served at home, and neighborhood poverty level. Variables that were not significant predictors of the outcome (population density, street density, distance to school from home, household composition, parent employment, mother's education, whether the girls had a driver's license, and BMI) were excluded for parsimony.

The linear regression models included a school-level random effect to account for clustering among girls in the same school. We assumed an exchangeable correlation structure within girls in the same cluster or school. The cluster-adjusted standard errors were used to compute the significance for regression coefficients, with a p-value of .05 or less as the criterion for statistical significance. All models were fit with PROC Mixed in SAS. We used model diagnostics (including the log likelihood, AIC and BIC) to select the best parsimonious model. To make the effect sizes for the log-transformed trip variables easy to interpret, we predicted each outcome (snacks high in SOFAS, percent calories from snacks or fruits and vegetables consumed) at the $25^{th}$ and $75^{th}$ percentiles of each trip variable -- the number of total trips, trips to someone else's house or trips to food outlets – using the linear regression model mentioned above, setting all other covariates at their mean value. We reported the difference between these two estimated values as a practically meaningful effect size.

## Results

### Description of the cohort

Detailed background characteristics of the sample are presented in Table 1 for all study participants, and by site. Participants included 303 girls with 152 (50.2%) in $10^{th}$ grade and

151 (49.8%) in 11th grade. Nearly 53% were White, 29% Latina, and 8% Asian. Educational attainment of the girls' mothers was 17% with less than a high school degree, 23% had a high school degree. 14% had some college and 36% had a college degree. The majority of girls (73%) lived with both parents. Thirty percent of the girls were overweight and 14% were obese. The majority of girls reported having fruits and vegetables available at home (87.5%), and vegetables served at dinner (82.5%) and milk served at meals (69.0%). Additionally, a substantial minority (22–37%) reported having sodas, salty snacks, candy and other junk food available at home. The food frequency questionnaire indicated that 86% of girls consumed nearly double the maximum recommended calories from snack foods. (The Dietary Guidelines for Americans (DGA) recommends <15% of calories from SOFAS (USDA 2010), with SOFAS and sugar-sweetened beverages comprising 27% of all calories consumed and 40% of all foods mentioned in their food diaries. Average time spent daily at a screen (computer/television) was 212 minutes (3.5 hours) and average time spent daily on moderate or vigorous physical activity outside school was 21.4 minutes. Also, 27.1% reported having a driver's license or permit. The average amount of money spent on food away from home was $9.32 per week (range $0 to $96.76), with 10% of purchases made using debit or credit cards.

We stratified the analyses by BMI percentile (< or ≥ 85%), but did not see significant difference in trips away from home and only minor differences in dietary consumption reported on the NPL. The main differences were that normal-weight girls reported eating fewer fruits and vegetables in food outlets and more frozen desserts than over-weight and obese girls. On the YAQ, overweight girls reported consuming about 200 fewer daily calories than normal weight girls (p=0.01).

### Food eaten away from home and school

The findings indicate that the girls frequently consumed snacks high in SOFAS away from home. Table 2 lists the percentage of girls who reported consuming a specific food item, mean number consumed per week for each food grouping, and compares girls in Minneapolis/St. Paul to those in San Diego. Girls ate entrees such as burgers, tacos, burritos, chicken nuggets, and pizza away from home averaging nearly four times per week. After entrees, the most common items consumed were sugar-sweetened beverages, baked goods (cookies, doughnuts), salty snacks, candy and other beverages (like diet soda, juice-like drinks, specialty coffees). When combined, items high in SOFAS comprised 40% of all items reported being eaten away from home; the mean frequency of consumption was 5.8 times per week with 88% of girls eating at least one item high in SOFAS away from home per week. This compares to about half of the girls eating fruits or vegetables away from home, with a mean frequency of 2.3 times a week. Also, girls in the Minneapolis/St. Paul metro area tended to eat more fruits and vegetables, more dairy products such as milk, and fewer fried side dishes than girls in San Diego.

The bottom of the table compares the frequency of eating snacks high in SOFAS versus fruits and vegetables by destination. The most common locations where girls consumed foods categorized as high in SOFAS were at someone else's house, followed by food outlets, "other" locations and then malls or stores. "Other" locations included widely varying destinations such as personal services like a hairdresser, post office, driving school and veterinarian's office. There was no significant difference between the girls in Minneapolis/St Paul metro area and San Diego in away-from-home locations where foods were obtained. Of all occasions during which girls consumed foods high in SOFAS, 91.3% were with other people: 50.6% were with 2 or more, 26.9% with one other person, and 13.8% with a team or other organized activity (data not shown).

### Association between travel activity and food eaten

The number of trips per week, by destination, mode of transportation and activity level for trips other than to home and school is shown in Table 3. Eighty percent of the trips were by car, with only 11% walking trips. Girls reported being active at about half of the destinations other than school and home, but this should be considered in light of total daily MVPA measured at an average of 21 minutes, with 25% occurring at school. Among the 11.4 total trips per week to places other than home and school, food was consumed at 5.4 (47%), with the top destination being someone else's house (24%). Table 4 shows the results of multivariate modeling of the number of occasions girls eat SOFAS away from home (Models 1 and 2), percentage of total calories from snack items high in SOFAS (Models 3 and 4), and daily servings of fruits and vegetables (Models 5 and 6). The total number of trips that girls took was positively associated with the consumption of SOFAS ($\beta = 3.05$, p-value < .001). The effect size indicates that a girl taking 15 trips per week ($75^{th}$ percentile) compared to another girl taking 7 trips per week ($25^{th}$ percentile), with all of the other characteristics equal, would consume an additional 2.3 servings of foods high in SOFAS, relative to the sample mean of 5.8 servings consumed per week (Table 2). In stratifying the destination of the trips (Model 2), someone else's house was the destination most strongly associated with eating more foods high in SOFAS ($\beta = 1.50$, p-value < .001). Similarly, the effect size indicates that taking 4 trips to someone else's house ($75^{th}$ percentile) compared to 1 trip ($25^{th}$ percentile) corresponds to an additional 2.1 extra servings of high SOFAS foods per week, relative to the sample mean of 3.5 per week (Table 2). The strength of the association between a visit to someone else's house and eating a food high in SOFAS was twice as large as that of going to a retail food outlet and eating foods high in SOFAS.

Models 1 and 2 both show that having fruits and vegetables available in the home was significantly associated with lower consumption of SOFAS in locations away from home. Model 1 indicates the mean screen time of 212 minutes (3.5 hours) per day translates to an additional 0.85 servings per day or 5.9 SOFAS per week with a trend toward significance (p <.07).

The total trips recorded in the travel diary was unrelated to the calories associated with snack consumption recorded in the YAQ food frequency measure (Model 3); however, when stratified by type of destination (Model 4), the trips to someone else's home was associated with snacks comprising a higher percentage of all calories consumed ($\beta = 1.29$, p-value < .05). Both Models 3 and 4 show that being of Asian ancestry and having vegetables served at dinner were associated with consuming a reduced percentage of total calories from snacks. Surprisingly, having "junk food" available at home was associated with a reduced consumption of calories from snacks. Screen time and calories from snacks were positively associated. Watching the average minutes of screen time was equivalent to consuming 2.8% more of one's total calories from low nutrient snacks (p=.016).

Models 5 and 6 have similar results: serving vegetables at dinner was associated with the consumption of an additional 0.8 daily servings of fruits and vegetables (p=.011). Living in a high poverty neighborhood was associated with reduced consumption of fruits and vegetables, but not with more items high in SOFAS (Models 1–4). The magnitude of the coefficient .07 can be translated to 1 less serving of fruits and vegetables per day among girls living in a neighborhood with 24% of households in poverty compared to what girls would consume if they lived in a neighborhood with 10% of households in poverty. When we explored this association further, we found that girls in low-income neighborhoods were no less likely to report having fruits and vegetable available in the home. Nevertheless, they reported a lower frequency of having vegetables served at dinner compared to girls in higher income areas (p=0.011) (data not shown).

## Discussion

This study found that girls frequently consume low-nutrient foods outside of school at about half of their destinations away from home. Foods high in SOFAS appear to be the snack of choice when visiting someone else's house. Even though these low-nutrient snacks are recommended to be limited in the diet, they are selected twice as often as fruits and vegetables (USDA 2010). Our finding of high SOFAS consumption away from home is similar to that of another study showing that children in grades K-2 consumed more sugar-sweetened beverages if they visited other people's homes more frequently (Ayala, Rogers et al. 2008). Food is frequently interwoven in social interactions and during adolescence, making, keeping, and impressing friends becomes an important developmental task. Other studies have also found an association between peer influences and the type of food youth consume. In one observational study youth ate more nutritious food when dining with their mothers and less nutritious food when dining with friends (Salvy, Elmo et al. 2010). Other studies have shown the availability of non-nutritious food plays a critical role in peer influences on consumption (Wouters, Larsen et al. 2010); (Feunekes, de Graaf et al. 1998).

The high prevalence of SOFAS in the home is consistent with the high levels of SOFAS consumption across the U.S. Although our sample included girls from both lower and upper socio-economic strata (with Minnesota having more girls from upper socioeconomic areas), girls in both strata appeared to be equally as likely to be purchasing and/or consuming low-nutrient foods frequently away from home and school. And when girls are not buying such foods themselves, they are obtaining them as guests at other people's homes, so economic barriers do not appear to have a major influence on their snacking frequency.

However, one surprising finding was the association between having junk food available at one's own home and low-nutrient snacks comprising a smaller percentage of daily caloric intake. It is possible that when people stock junk food at home, households may have rules that consider them to be for visitors, rather than for routine consumption by the occupants. Keeping SOFAS at home for guests may even be a parental strategy to keep their adolescents at home where they can be supervised, and/or to limit spending money at retail outlets, where the products have a higher mark-up.

Associations between screen time and obesity have also been found elsewhere (Gortmaker, Must et al. 1996; Crespo, Smit et al. 2001; Coon and Tucker 2002), explained as the consequence of a combination of increases in sedentary behavior as well as snacking. In our study the amount of screen time was associated with consumption of foods high in SOFAS, but not at all with fruit and vegetable consumption. The association between screen time and low nutrient food consumption may be a reflection of the priming phenomenon, which results in greater consumption as a consequence of being exposed to commercial advertising (Halford, Gillespie et al. 2004; Harris, Bargh et al. 2009) that is dominated by promotion of low-nutrient foods (Rivkees 2007). Therefore, this study supports the general recommendation to reduce screen time, as it appears to promote snacking.

We did not see an increase in SOFAS consumption associated with poverty, but did find an association between poverty and reduced vegetable consumption. Other studies have shown that low-income neighborhoods have lower access to fresh fruits and vegetables (Morland, Wing et al. 2002; Horowitz, Colson et al. 2004; Laraia, Siega-Riz et al. 2004). However, because the availability of fruit and vegetables at home did not differ by neighborhood poverty levels, social and cultural factors other than accessibility that influence diet quality may be responsible.

## Limitations

The most important limitation is that our data are cross-sectional, so associations between the different predictors and dietary outcomes cannot be considered causal relationships. The travel diary data indicating what youth consume outside the home were qualitative, rather than quantitative. While some of the data were recorded in real time, most were documented some time later. Recording food intake may affect what people consume, since the act of recording increases awareness. However, the ability to collect real time data on consumption patterns has the advantage of improved memory recall, in spite of the possibility that keeping a diary may alter the experience and impact the eating behavior of girls. Although we know the frequency and types of foods consumed away from home and school as recorded on the NPL, we do not know their quantity, which is the most important factor related to caloric impact. We also recognize that our findings underestimate total SOFAS, by excluding the fat calories from items like meat, cheese, and whole milk and missing the added sugars in entrees and cereals. In contrast, the YAQ's purpose was to quantify the amount of food consumed. However, the total amount consumed appeared to be underreported, which is typically the case in studies using FFQs and dietary recalls (Bachman, Reedy et al. 2008; Reedy and Krebs-Smith 2010). Subar documented that using FFQs to measure dietary intakes resulted in underreporting total energy by about 34–38% (Subar, Kipnis et al. 2003), which is about the adjustment that would have been necessary for the reported amounts to be consistent with the expected caloric consumption for our sample. Consistent with Subar's study, our sample of overweight girls reported consuming less than the normal weight girls, reflecting either under-reporting or their attempts to lose weight by eating less. Because under-reporting of food consumption is common and has been measured at 34% among overweight and obese adolescent girls (Singh, Martin et al. 2009), the lack of a relationship of food consumption and BMI is not surprising.

## Conclusion

Adolescent girls have substantial independence in determining their intake away from home, so efforts to improve their diet quality will need to address food availability in away from home settings. Yet what parents serve at dinner and whether they offer fruits and vegetable at home appears to make a difference in the overall relative quantity of unhealthy snacks consumed. Given that social time at the homes of others does trigger snacking and, often, the consumption of unhealthy foods, parents could potentially reduce the consumption of SOFAS among youth by not making low-nutrient foods available to young visitors and by providing healthier snacks when they visit. There are many snack foods that are both tasty and have healthy nutrient profiles. Given the relatively high frequency of social occasions in which young people participate, the foods that are routinely made available at home and in away from home settings should meet nutritional standards, such as those developed by the Institute of Medicine (IOM) for school meals and snacks (IOM 2009).

Another approach to address over-consumption of SOFAS would be to discourage eating as entertainment and snacking in general. There is a great deal of controversy as to the optimal frequency of eating occasions or even whether it is truly necessary for healthy individuals to eat between meals. Snacking is generally associated with excess calorie consumption, but for some groups it increases the ability to meet guidelines for milk and fruit consumption (Bertéus Forslund, Torgerson et al. 2005; Sebastian, Cleveland et al. 2008). Given that youth typically consume insufficient fruits and vegetables, these should be preferentially made available, if snacking is necessary. Snacking has been recommended for children over 3 to only 1–2 times per day (FAO 2004). In contrast, many in the diet industry advocate eating small, frequent meals as an effective strategy for weight control (Smith 2009). Clarifying recommendations for eating frequency as well as the nutrient profile for appropriate snacks for adolescents may be critical to guide both eating and serving behaviors, including eating

during screen time and when others visit, since these contribute disproportionately to unhealthy snack consumption. Parents should consider reducing the availability of foods high in SOFAS at home and in away from home settings that they organize.

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## Highlights

- Eat junk food at someone else's house more often than at retail food outlets.
- Choose low-nutrient snacks in 40% of eating occasions away from home and school
- Consume less junk food away from home if fruits and vegetables are available at home
- Eat more junk food when they spend more time watching TV and other electronic media

## Table 1

Baseline Characteristics of Study Participants (Frequency (percentage) and Mean (standard deviation)

| | TOTAL (n=303) | MINNEA-POLIS (n=150) | SAN DIEGO (n=153) |
|---|---|---|---|
| **Mean Age (std)** | 16.3 (0.5) | 16.4 (0.4) | 16.3 (0.5) |
| **Race** | | | |
| White | 160 (52.8%) | 123 (82.0%) | 37 (24.2%) |
| Latina | 89 (29.4%) | 6 (4.0%) | 83 (54.3%) |
| Asian | 23 (7.6%) | 11 (7.3%) | 12 (7.8%) |
| Other | 31 (10.2%) | 10 (6.7%) | 21 (13.7%) |
| **Grade** | | | |
| $10^{th}$ | 152 (50.2%) | 75 (50.0%) | 77 (50.3%) |
| $11^{th}$ | 151 (49.8%) | 75 (50.0%) | 76 (49.7%) |
| **Mother's Education** | | | |
| Less Than High School | 50 (16.5%) | 4 (2.7%) | 46 (30.1%) |
| High School/GED/Vocational | 70 (23.1%) | 34 (22.7%) | 36 (23.5%) |
| Some College | 42 (13.9%) | 18 (12.0%) | 24 (15.7%) |
| College or Graduate Degree | 110 (36.3%) | 83 (55.3%) | 27 (17.7%) |
| Unknown | 31 (10.2%) | 11 (7.3%) | 20 (13.1%) |
| **Parents in Household** | | | |
| Both Parents | 222 (73.3%) | 121 (80.7%) | 101 (66.0%) |
| Single Parent | 68 (22.4%) | 28 (18.7%) | 40 (26.1%) |
| No Parent | 13 (4.3%) | 1 (0.7%) | 12 (7.8%) |
| **Neighborhood** | | | |
| Percent White | 70.6 (22.7) | 93.2 (2.4) | 48.5 (5.0) |
| Percent Hispanic | 14.9 (13.2) | 1.6 (0.5) | 27.9 (1.4) |
| Percent Households in Poverty | 5.6 (3.8) | 3.3 (2.4) | 7.9 (3.6) |
| Population Density (1000/sq mile) | 36.3 (24.9) | 16.5 (12.1) | 55.6 (18.2) |
| BMI ≥ 85th Percentile | 92 (30.4%) | 39 (26%) | 53 (34.6%) |
| BMI ≥ 95th Percentile | 41 (13.5%) | 11 (7.3%) | 30 (19.6%) |
| **Availability of Foods in Home** | | | |
| Fruits and Vegetables | 265 (87.5%) | 134 (89.3%) | 131 (85.6%) |
| Vegetables Served at Dinner | 250 (82.5%) | 133 (88.7%) | 117 (76.5%) |
| Milk Served at Meals | 209 (69.0%) | 129 (86.0%) | 80 (52.3%) |
| Soda and Sports Drinks | 85 (28.1%) | 45 (30.0%) | 40 (26.1%) |
| Salty Snack Foods | 86 (28.4%) | 27 (18.0%) | 59 (38.6%) |
| Candy | 112 (37.0%) | 43 (28.7%) | 69 (45.1%) |
| Junk Foods | 67 (22.1%) | 24 (16.0%) | 43 (28.1%) |
| Eats 5+ Daily Servings of Fruits and Vegetables | 53 (17.5%) | 26 (17.3%) | 27 (17.7%) |
| Snack Foods and/or Sugar-Sweetened Beverages | 260 (85.8%) | 126 (84%) | 134 (87.6%) |
| Account for Greater Than 15% of Total Daily Calories | | | |
| Percent of Calories from Snack Foods (std) | 21.4 (10.1) | 20.6 (8.7) | 22.2 (11.2) |

| | TOTAL | MINNEA-POLIS | SAN DIEGO |
|---|---|---|---|
| | (n=303) | (n=150) | (n=153) |
| Percent of Calories from Sugar-Sweetened Bev. (std) | 5.6 (6.1) | 4.7 (5.3) | 6.5 (6.7) |
| Mean Daily Minutes of Screen Time (std) | 212.4 (116.6) | 215.8 (113.0) | 208.9 (120.6) |
| MVPA Minutes per Day (std) | 21.0 (11.3) | 21.1 (11.1) | 20.9 (11.6) |
| Participates in Sports teams or other Physical Activity after school | 219 (72.3%) | 128 (85.3%) | 91 (59.5%) |
| Has a Driver's License or Permit | 82 (27.1%) | 61 (40.7%) | 21 (13.7%) |
| Girls that Spent Money on Food | 208 (68.7%) | 105 (70.0%) | 103 (67.3%) |
| Mean Weekly Dollars Spent (std) | $9.32 (13.23) | $9.82 (12.40) | $8.84 (13.95) |
| Distance between Home and School (std) | 2.7 (2.0) | 3.5 (2.2) | 1.8 (1.4) |

(Std)= Standard deviation

**Table 2**

NEIGHBORHOOD PLACES LOG: MEAN WEEKLY FOODS PER GIRL AND BY TRIP DESTINATION

| | TOTAL N=303 | | MINNEAPOLIS N=150 | | SAN DIEGO N=153 | |
|---|---|---|---|---|---|---|
| | % of Girls That Had Any Food | Mean Number of Eating Occasions (std) | % of Girls That Had Any Food | Mean Number of Eating Occasions (std) | % of Girls That Had Any Food | Mean Number of Eating Occasions (std) |
| **Food Category** | | | | | | |
| Sugar Sweetened Beverage | 75.2 | 2.9 (2.1) | 72.7 | 2.6 (2.0) | 77.8 | 3.2 (2.1) |
| Other Beverage | 34.0 | 1.9 (1.5) | 32.0 | 1.8 (1.2) | 35.9 | 2.0 (1.8) |
| Baked Goods | 52.1 | 2.4 (1.7) | 57.3 | 2.3 (1.6) | 47.1 | 2.4 (1.9) |
| Candy | 36.3 | 2.4 (2.0) | 37.3 | 2.2 (1.8) | 35.3 | 2.5 (2.3) |
| Salty Snacks | 54.1 | 2.0 (1.3) | 54.7 | 2.0 (1.3) | 53.6 | 2.1 (1.3) |
| Fruits and Vegetables | 50.7 | 2.3 (1.5) | 54.0 | 2.4 (1.5) | 46.4 | 2.1 (1.5) |
| Frozen Desserts | 36.0 | 1.6 (1.0) | 35.3 | 1.6 (0.9) | 36.6 | 1.7 (1.1) |
| Dairy, Non-Frozen | 29.7 | 1.7 (1.1) | 38.7** | 1.7 (1.1) | 20.9 | 1.7 (1.2) |
| Entrees | 84.8 | 3.9 (2.7) | 82.0 | 3.3 (2.1) | 87.6 | 4.3 (3.0) |
| Cereals and Grains | 37.3 | 1.8 (1.3) | 36.7 | 1.6 (0.8) | 37.9 | 2.1 (1.6) ** |
| Nuts and Seeds | 6.6 | 1.4 (0.7) | 5.3 | 1.3 (0.7) | 7.8 | 1.4 (0.7) |
| Fried Side Dishes | 38.9 | 1.6 (0.9) | 32.0 | 1.4 (0.7) | 45.8* | 1.7 (1.0) ** |
| **Total SOFAS**[1] | 87.8 | 5.8 (4.3) | 88.7 | 5.7 (4.5) | 86.8 | 5.9 (4.1) |
| **Trip Destination** | | | | | | |
| **Someone Else's House** | | | | | | |
| SOFAS | 47.5 | 3.5 (2.7) | 49.3 | 3.9 (3.0) | 45.8 | 3.1 (2.3) |
| Fruits and Vegetables | 22.4 | 1.8 (1.2) | 26.7 | 1.9 (1.4) | 18.3 | 1.6 (0.9) |
| **Food Outlet** | | | | | | |
| SOFAS | 57.8 | 3.0 (2.3) | 52.7 | 2.6 (2.0) | 62.7 | 3.4 (2.5) * |
| Fruits and Vegetables | 16.8 | 1.5 (0.7) | 20.0 | 1.4 (0.6) | 13.7 | 1.6 (0.8) |
| **Mall or Store** | | | | | | |
| SOFAS | 26.1 | 2.3 (1.9) | 23.3 | 1.8 (1.0) | 28.8 | 2.7 (2.4) * |
| Fruits and Vegetables | 3.3 | 1.9 (1.0) | 1.3 | 2.3 (1.8) | 5.2 | 1.9 (0.9) |
| **Other** | | | | | | |

| | TOTAL N=303 | | MINNEAPOLIS N=150 | | SAN DIEGO N=153 | |
|---|---|---|---|---|---|---|
| | % of Girls That Had Any Food | Mean Number of Eating Occasions (std) | % of Girls That Had Any Food | Mean Number of Eating Occasions (std) | % of Girls That Had Any Food | Mean Number of Eating Occasions (std) |
| SOFAS | 39.6 | 2.7 (2.0) | 49.3 | 2.8 (2.2) | 30.1 | 2.7 (1.6) |
| Fruits and Vegetables | 9.2 | 1.8 (1.2) | 12.7 | 1.9 (1.3) | 5.9 | 1.6 (0.8) |

*$p < .05$;

**$p < .01$ difference between Minnesota and San Diego, * is on the larger of the two

[1]Foods high in Solid Oils, Fats and Added Sugars

## Table 3

NEIGHBORHOOD PLACES LOG: MEAN WEEKLY TRIPS PER GIRL

| | TOTAL (n=303) | MINNEA-POLIS (n=150) | SAN DIEGO (n=153) |
|---|---|---|---|
| | Mean (std) | Mean (std) | Mean (std) |
| **All Trips** | 24.7 (9.1) | 25.8 (98) * | 23.6 (8.2) |
| **Destination** | | | |
| Home | 6.9 (4.1) | 6.9 (4.5) | 6.8 (3.6) |
| School | 6.4 (2.3) | 6.3 (2.1) | 6.5 (2.5) |
| Trips Other than to Home or School | 11.4 (6.2) | 12.6 (6.5) * | 10.4(5.7) |
| **Mode of Transportation** | | | |
| Car | 19.5 (9.4) | 20.6 (10.4) * | 18.2 (8.2) |
| Walking | 2.6 (3.8) | 1.7 (3.2) | 3.5 (4.1) ** |
| School Bus or Public Transit | 1.7 (3.1) | 2.4 (3.1) ** | 1.0 (2.9) |
| Other | 0.2 (1.2) | 0.3 (1.6) | 0.2 (0.6) |
| Missing | 3.2 (na) | 2.4 (na) | 4.2 (na) |
| **Trips Other than Home/School** | | | |
| Someone Else's House | 2.7 (3.0) | 3.1 (3.2) | 2.5 (2.7) |
| Fast Food, Coffee, or Conv. Store | 1.7 (1.9) | 1.4 (1.8) | 2.0 (1.9) * |
| Sit-Down Restaurant | 0.6 (0.9) | 0.7 (1.0) * | 0.4 (0.8) |
| Mall or Store | 1.9 (2.0) | 2.0 (1.9) | 1.8 (2.1) |
| Community Activity Facility | 0.7 (1.3) | 1.0 (1.5) ** | 0.5 (1.1) |
| Place of Worship | 0.6 (1.1) | 0.6 (1.1) | 0.5 (1.1) |
| Grocery Store | 0.6 (1.0) | 0.5 (0.8) | 0.6 (1.1) |
| Other | 2.6 (2.6) | 3.3 (3.0) ** | 2.0 (1.8) |
| Trips where food was consumed | 5.4 (3.6) | 5.0 (3.2) | 5.7 (3.8) |
| **Mode of Transportation** | | | |
| Car | 19.5 (9.4) | 20.6 (10.4) * | 18.2 (8.2) |
| Walking | 2.6 (3.8) | 1.7 (3.2) | 3.5 (4.1) ** |
| School Bus or Public Transit | 1.7 (3.1) | 2.4 (3.1) ** | 1.0 (2.9) |
| Other | 0.2 (1.2) | 0.3 (1.6) | 0.2 (0.6) |
| Missing | 0.7 (na) | 0.8 (na) | 0.7 (na) |
| **Activity Level at Destination (other than home or school)** | | | |
| Inactive (Sedentary) | 5.5 (4.0) | 6.0 (4.3) | 5.0 (3.7) |
| Active (Moderate) | 4.2 (3.4) | 4.5 (3.5) | 3.8 (3.2) |
| Very Active (Vigorous) | 1.1 (1.6) | 1.4 (1.7) | 0.9 (1.2) |
| Missing | 0.7 (na) | 0.8 (na) | 0.6 (na) |

* $p < .05$;

** $p < .01$ difference between Minnesota and San Diego, * is on the larger of the two

**Table 4**

Association of Trips with Consumption of Foods High in SOFAS[i], Fruits and Vegetables Consumption

| | Eating Occasions of Foods High in SOFAS[i] | | PERCENT OF TOTAL CALORIES FROM Snacks High in SOFAS | | DAILY SERVINGS OF FRUITS AND VEGETABLES | |
|---|---|---|---|---|---|---|
| | Model 1: OVERALL TRIPS | Model 2: TRIPS BY DESTINATION | Model 3: OVERALL TRIPS | Model 4: TRIPS BY DESTINATION | Model 5: OVERALL TRIPS | Model 6: TRIPS BY DESTINATION |
| | Beta (p-value) | Beta (p-value) | Beta (p-value) | Beta (p-value) | Beta (p-value) | Beta (p-value) |
| **TRIPS** | | | | | | |
| Total Trips (Log Transformed) | **3.045 (<0.001)** | | −0.722 (0.625) | | −0.081 (0.786) | |
| Trips to Someone Else's House (Log Transformed) | | **1.501 (<0.001)** | | **1.291 (0.037)** | | −0.047 (0.709) |
| Trips to Food Outlets (Log Transformed) | | **0.753 (0.006)** | | −0.808 (0.242) | | −0.091 (0.518) |
| Trips to Other Destinations (Log Transformed) | | **0.532 (0.045)** | | −0.279 (0.676) | | 0.136 (0.317) |
| Weekly Dollars Spent | **0.072 (<0.001)** | **0.055 (0.003)** | 0.021 (0.642) | 0.020 (0.671) | 0.007 (0.463) | 0.007 (0.452) |
| **SITE** | | | | | | |
| San Diego | 0.381 (0.606) | 0.528 (0.475) | −0.009 (0.997) | 0.479 (0.834) | 0.405 (0.326) | 0.485 (0.256) |
| **RACE** | | | | | | |
| Latina | 0.208 (0.767) | −0.146 (0.829) | 2.766 (0.107) | 2.580 (0.131) | 0.279 (0.421) | 0.255 (0.463) |
| Asian | −1.393 (0.149) | −0.743 (0.426) | **−5.848 (0.014)** | **−5.261 (0.027)** | −0.247 (0.604) | −0.284 (0.555) |
| Other | −1.184 (0.181) | −0.842 (0.323) | 3.212 (0.136) | 3.810 (0.078) | 0.165 (0.705) | 0.178 (0.685) |
| **POVERTY** | | | | | | |
| Percent of Neighborhood households below poverty | 0.040 (0.607) | 0.051 (0.495) | 0.207 (0.281) | 0.184 (0.337) | **−0.077 (0.046)** | **−0.075 (0.054)** |
| **AVAILABILITY OF FOODS IN THE HOME** | | | | | | |
| F&V Available in the Home | **−2.458 (0.001)** | **−2.144 (0.003)** | 0.961 (0.601) | 0.886 (0.628) | 0.660 (0.078) | 0.656 (0.080) |
| Vegetables Served at Dinner in the Home | 0.541 (0.423) | 0.416 (0.522) | **−7.207 (<0.001)** | **−6.982 (<0.001)** | **0.832 (0.013)** | **0.852 (0.011)** |
| Milk Served at Meals in the Home | 0.499 (0.385) | 0.254 (0.645) | **−2.783 (0.046)** | **−2.844 (0.041)** | 0.214 (0.449) | 0.204 (0.472) |
| Junk foods available in the Home | −0.260 (0.187) | −0.131 (0.490) | **−2.340 (<0.001)** | **−2.359 (<0.001)** | 0.147 (0.130) | 0.130 (0.185) |
| **SCREEN TIME** | | | | | | |
| Mean Daily Minutes (computer/tv) | 0.004 (0.071) | 0.003 (0.164) | **0.013 (0.016)** | **0.013 (0.016)** | −0.001 (0.519) | −0.001 (0.569) |

[i] Solid oils, fats and added sugars