

Original article

Food and Park Environments: Neighborhood-level Risks for Childhood Obesity in East Los Angeles

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Manuscript received July 12, 2006; manuscript accepted October 10, 2006

Abstract

Purpose: The rapid increase in obesity over the past two decades suggests that behavioral and environmental influences, including poor nutrition and physical inactivity, are fueling what is now widely recognized as a public health crisis. Yet, limited research has been conducted to examine how environmental factors, such as neighborhood-level characteristics, may be associated with increased risk for obesity.

Methods: Community-level risk associated with childhood obesity was examined in East Los Angeles, a community with one of the highest rates of childhood obesity in Los Angeles by triangulating: 1) spatial data for the number and location of food establishments relative to the location of schools; 2) observations regarding the availability and quality of fruits and vegetables in local grocery stores; and 3) observations regarding the quality and utilization of local parks.

Results: The findings revealed that there were 190 food outlets in the study community, of which 93 (49%) were fast-food restaurants. Of the fast-food restaurants, 63% were within walking distance of a school. In contrast, there were 62 grocery stores, of which only 18% sold fresh fruits and/or vegetables of good quality. Of the stores that did sell fruits and/or vegetables, only four were within walking distance of a school. Although well maintained, the five parks in this community accounted for only 37.28 acres, or 0.543 acres per 1000 residents.

Conclusions: These findings suggest that children have easy access to fast food, and limited access to both healthy food options and parks in which to engage in physical fitness activities. This was particularly true in areas around schools. The implications for these findings with regards to policy-related prevention and future research are discussed. © 2007 Society for Adolescent Medicine. All rights reserved.

Keywords: Children; Obesity; Fast-food restaurants; Ethnography; Spatial analysis

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The prevalence of childhood obesity in the United States is increasing at alarming rates among both boys and girls of all ages, races, and ethnic groups [1]. Currently, it is estimated that 22% to 30% of children in the United States are overweight, representing a doubling since 1980 [2]. Overweight and obese children suffer from myriad health problems, ranging from

sleep apnea and orthopedic complications, to negative psychosocial interactions and repercussions from their peers. Overweight adolescents are also now presenting with type 2 diabetes, dyslipidemia, and hypertension, diseases not previously seen in this age group [3].

Although obesity is now a national and indeed an international public health concern, recent reports suggest that children and adolescents who live in multiethnic, low-income, inner-city neighborhoods are at particularly high risk for obesity [4,5]. This is certainly the case in Los Angeles, where it is estimated that 55% of adults and 40% of children are overweight or obese [6]. Rates of childhood obesity are particularly high in highly dense, low-income, inner-city “hot spot” areas such as East and South Los Angeles, where as much as 50% of children are overweight or obese. What accounts for higher rates of obesity within multiethnic, low-income, inner-city neighborhoods, and are there neighborhood-level characteristics that put children at increased risk for becoming obese? To address these questions, research was conducted in East Los Angeles to examine neighborhood-level sources of obesity risk. In this article, we present findings from spatial analyses and field observations conducted to examine whether there were distinct patterns regarding the accessibility of healthy (i.e., fresh fruits and vegetables available in grocery stores) and unhealthy (i.e., fast food) foods, as well as the availability of parks and recreational facilities within this community.

Obesity, like most other chronic health problems, is caused by complex interactions between genetics and environmental factors. However, the rapid increase in obesity over the past 20 years strongly suggests that behavioral and environmental influences, such as poor nutrition and a sedentary lifestyle, may be fueling this public health epidemic [1]. From an ecological perspective, individual-level behaviors are affected not only by personal characteristics (e.g., age, gender, genetic profile) but by interactions with the larger social, cultural, and environmental contexts in which children live [7,8]. According to this theoretical framework, characteristics within various settings, such as the home, school, and community, can either encourage or discourage healthy nutrition and physical activity. Research to test the assertions of this theory has sought to examine how aspects of the “built environment”—i.e., the man-made physical structures and infrastructure of communities—put some children at increased risk for obesity by encouraging the consumption of energy-dense foods [9] and discouraging physical activity [10]. Although there is now a growing literature that suggests that income inequity and neighborhood deprivation is strongly associated with obesity [11,12], the exact mechanism(s) by which environmental factors (e.g., poverty and deprivation) affect weight gain or dietary choices has largely been left to speculation [13]. Other research has begun to examine the availability and accessibility of both healthy and unhealthy food options within discrete neighborhoods. The findings from this research

suggests that residents in urban settings, particularly inner-city, poor neighborhoods, are less likely than residents in the suburbs to have access to full-service supermarkets [14–16]. Instead, inner-city residents are forced to depend on smaller grocery and convenience stores that tend to have a limited selection of healthful foods and at higher prices [17,18].

Another factor believed to have played an important role in increasing rates of obesity among children is the increased availability and affordability of energy-dense foods, such as fast food, particularly in low-income neighborhoods [19–21]. Fast food, defined as foods designed for ready availability, use, or consumption and sold at eating establishments for quick availability or take-out, has been found to be associated with a diet that is high in total energy and energy density but low in micronutrient density [1]. From 1977 to 1995, the percentage of meals consumed out of the home and at a fast-food restaurant increased by 2000% [22–24]. This increase in out-of-home meals was paralleled by dramatic increases in proportion size [23,25] and soft drink consumption [26]. Currently, it is estimated that children and adolescents visit fast-food outlets on average twice a week [27], with this frequency being associated with increased intake of soft drinks, pizza, french fries, total fat, and total calories, and a decrease in intake of vegetables, fruit, and milk [9]. Although fast-food restaurants are located in every community throughout the United States, there is growing evidence that a disproportionate number of fast-food restaurants are located in poorer communities [28,29].

Although few studies have examined the relationship between community design and obesity, the findings that do exist underscore the importance of the proximity and density of fast-food restaurants. In one study, Maddock [30] found that U.S. states that ranked low in obesity tended to have more residents per fast-food restaurant than those that ranked high in obesity. In a second study, Sturm and Datar [31] found that children who lived in communities where fruits and vegetables were expensive were more likely to gain excessive amounts of weight than children who lived in areas where fruits and vegetables were less expensive. Clearly, research focused on the neighborhood food environment—i.e., the availability, proximity, and balance of both healthy and unhealthy food options—represents a new form of public health research related to childhood obesity, although the methodological approach used to define, characterize, and quantify the food environment are still very much under development [32].

Physical activity is another behavior that is likely to be influenced by the environment. Whereas the benefits of physical activity are well known [33], so are the negative consequences of inactivity, including obesity, diabetes, cardiovascular disease, certain forms of cancer, and depression [33]. Yet, levels of physical activity have declined nationwide, in part because of suburban sprawl and poor commu-

nity design, which makes walking and bicycling in some communities impractical if not impossible. A recent observational study examined the associations between community physical activity-related settings (e.g., athletic fields, parks, bike paths) and race, ethnicity, and socioeconomic status in 409 communities throughout the United States [34]. The researchers found that higher median household income and lower poverty rates were associated with a greater number of physical activity-related facilities and settings. Communities with higher proportions of ethnic minorities had fewer physical activity-related facilities and settings. Convenient access to recreational facilities has also been found to be a consistent correlate of physical activity, although this research has been conducted largely with adults [35,36].

Taken as a whole, these findings suggest that the community is an important environment that could potentially contribute to childhood obesity. The research conducted to date, however, has focused on the presence of fast-food restaurants without also examining the presence of healthy food outlets. Moreover, few studies have examined both food outlets and park space, which could both collectively contribute to childhood obesity. Finally, previous research has largely involved spatial analysis of business data, with little (if any) use of ground-level data to provide further context for the spatial findings. In this article, we summarize the findings from research that used a mixed-method study design to examine neighborhood-level risk in an inner-city neighborhood in Los Angeles. Spatial analyses and field observations were performed at food outlets and grocery stores within walking distance of a school within this community, as well as the quality of fruits and vegetables sold in each grocery store. Spatial analyses and observations were also performed to examine the availability, quality, and utilization of parks within this community.

Methods

Study community

The research was conducted in East Los Angeles, defined by the boundaries of a single zip code, which closely mirror residents' own perceptions of the natural boundaries of this neighborhood [37]. According to the U.S. Census, East Los Angeles has a land area of 4.4 square miles. It is home to 68,688 residents, of which 61,983 or 95% are Hispanic. Of those residents who are 18 years and older, 41% have attained less than a ninth grade education, 23% attended high school but did not obtain a high school diploma, and 19% obtained a high school diploma. The median household income in 2000 was \$27,471.

Study design, data analysis and data sources

The study used a mixed-methods design, including spatial analyses to assess density and proximity of food estab-

lishments relative to schools; ethnographic observations to assess the availability and quality of fruits and vegetables, meats, and dairy in grocery stores; and spatial analyses and ethnographic observations of the availability and quality of local parks.

Geographic area, parks, fast-food outlets, grocery stores, and schools

The geographic boundaries for the targeted zip code, including streets and parks contained within, were obtained through ArcGIS and ESRI's Geographic Network. The address, as well as the longitudinal/latitude coordinates, for each food outlet located within the targeted zip code was obtained using the Business Analyst extension of ArcGIS. Business Analyst uses data obtained through InfoUSA, a for-profit company that compiles proprietary databases with detailed information for businesses within the United States and Canada. These databases are compiled using public sources, such as yellow pages, white pages, newspapers, incorporation records, real estate deed transfers and various other sources; they are then continually updated with annual phone calls to each business to verify the accuracy of the data.

For the purpose of this research, we focused on the following food outlets, which were grouped into six outlet types: 1) fast-food restaurants; 2) bakery, donut, cookie stores; 3) ice cream stores; 4) convenience stores; 5) fish and meat stores; and 6) grocery stores.

The addresses for public schools located within the zip code were obtained from the California Department of Education and then geocoded to assign longitude/latitude coordinate points for each address. Proximity analyses were then performed by creating a 300- and 500-meter buffer around each school, and then calculating the number of food outlets by outlet type that were located within each buffer around the schools.

Ethnographic observations

Systematic observations were performed in each grocery store located within the study community using a field survey. Two members of the field research team were given the address of the grocery stores and asked to walk through the store and record the availability and quality of fresh fruits and vegetables. Data were recorded and coded yielding a score regarding the availability (not available, limited selection of one or two items, good variety/selection) and quality (not available, poor quality, fresh and good quality) of fruits and vegetables.

Systematic observations were also performed in each of the parks located within the study community. Again, two members of the field research team walked through the park and recorded their observations using a field survey instrument. Observations were recorded in the afternoon (between 2:00 p.m. and 4:30 p.m.) during a 3-week period of time.

Table 1
Proximity of food outlets relative to schools

	Total count	Distance from a school	
		Within 300 meters	Within 500 meters
Fast-food restaurants*	93	14 (15%)	39 (42%)
Bakery, donut, cookie stores*	21	4 (19%)	13 (62%)
Ice cream store*	1	0	1 (100%)
Convenience store*	1	1 (100%)	1 (100%)
Fish, meat store	12	3 (25%)	8 (67%)
Grocery stores	62	10 (16%)	30 (48%)
Total food outlets:	190	32	86
Total fast-food/snack outlets (sum of *):	116 (61%)	19 (59%)	54 (63%)

Researchers recorded the availability of designated space and facilities for sports and other physical activity (e.g., basketball court); water features (e.g., ponds, fountains); trees and shade or partial shade in rest areas; walking and bike paths, and the quality of these paths; available parking; amenities, such as access to public transportation, BBQ grills, garbage cans, drinking fountains; and blight, such as graffiti, vandalism, litter, and/or abandoned building(s). Observations were also made to record use of the park and its facilities, characteristics of the people using the park, and perceived safety of the grounds.

Results

Spatial analyses of food establishments

As summarized in Table 1, there were a total of 190 food outlets in the study community, of which 93 (49%) were fast-food restaurants, 23 (12%) were bakery, donut, cookie, ice cream, or convenience stores, 12 (6%) were a fish or meat store, and 62 (32%) were grocery stores, of which five were supermarkets. As presented in Figure 1, the majority of these food outlets, including both fast-food and other food outlets, were located along two major boulevards that intersect at the heart of the study community, although nearly half ($n = 86$, 45%) of all food outlets were also located within walking distance, or 500 meters, of a school.

Of the 93 fast-food restaurants, 39 (42%) were located within walking distance of a school; 15 (65%) of the 23 bakery, donut, cookie, ice cream, and convenience stores were located within walking distance of a school. Of the 62 grocery stores, 30 (48%) were located within walking distance of a school. Of all the food outlets within walking distance of a school, 63% were outlets that generally offer unhealthy food and snack choices to children (i.e., fast-food restaurants; bakery, donut, and cookie stores; ice cream; convenience stores). In contrast, as summarized in Table 1 and presented in Figure 2, only 35% of all food outlets within walking distance of schools were grocery stores,

which have the potential to offer healthier food and snack choices to children.

Observations of grocery stores

Ethnographic observations were conducted in all 62 of the grocery stores. Nearly half (45%) of the grocery stores sold fruits; however, 33% of these stores sold fruit that was observed to be poor both in terms of variety and quality (i.e., sale of just a single piece of fruit, such as a banana or apple, that was overripe or rotting). Similarly, although over half of the grocery stores (53%) sold vegetables, a third (35%) of the stores sold poor variety and quality vegetables. In total, only 11 (18%) of the grocery stores offered a wide variety of fruit and vegetables that were fresh, refrigerated, and of high quality, and only four (6%) of these were within walking distance of a school (Table 2). The vast majority (74%) of grocery stores were observed to sell dairy products (e.g., milk, yogurt, cheese) and 69% sold some type of sandwich or snack meat, such as cold cuts, sausage, or hot dogs.

Parks observations

Six relatively small parks are located on the outskirts of the study community, accounting for just 37.28 acres or 0.543 acres per 1000 residents. Findings from the ethnographic observations revealed enormous similarity across the six parks with respect to their structural design, available athletic space and equipment, facilities, and amenities offered by each park. Indeed, central within each park was space designated for sports and other recreational activities, including a soccer, football and/or baseball field; basketball courts and/or tennis courts; and a playground with equipment intended for young children (e.g., slide, swings, monkey bars). Three of the six parks also had a swimming pool and offered swim lessons to community residents, and two of the parks had a pond or some other water features. Each park offered benches for sitting in shaded or partially shaded areas along walking paths through the park or around the perimeter of the athletic field. All of the parks were well maintained and offered amenities, such as picnic tables, fountains, garbage cans, and public restrooms. Only two of the six parks had graffiti, and in only one park was there a visible display of litter. Additionally, all of the parks were well used by adults and families with young children (under age 13 years), although adult males predominantly used three of the parks. Interestingly, few teenagers or young adults were observed in any of the parks. In all cases, surveyors perceived the park to be safe, engaging, and inviting during the afternoon hours. Based on the physical layout and structural design of these parks, it was determined that all offer quality space for young children to play and a variety of opportunities for residents to participate in

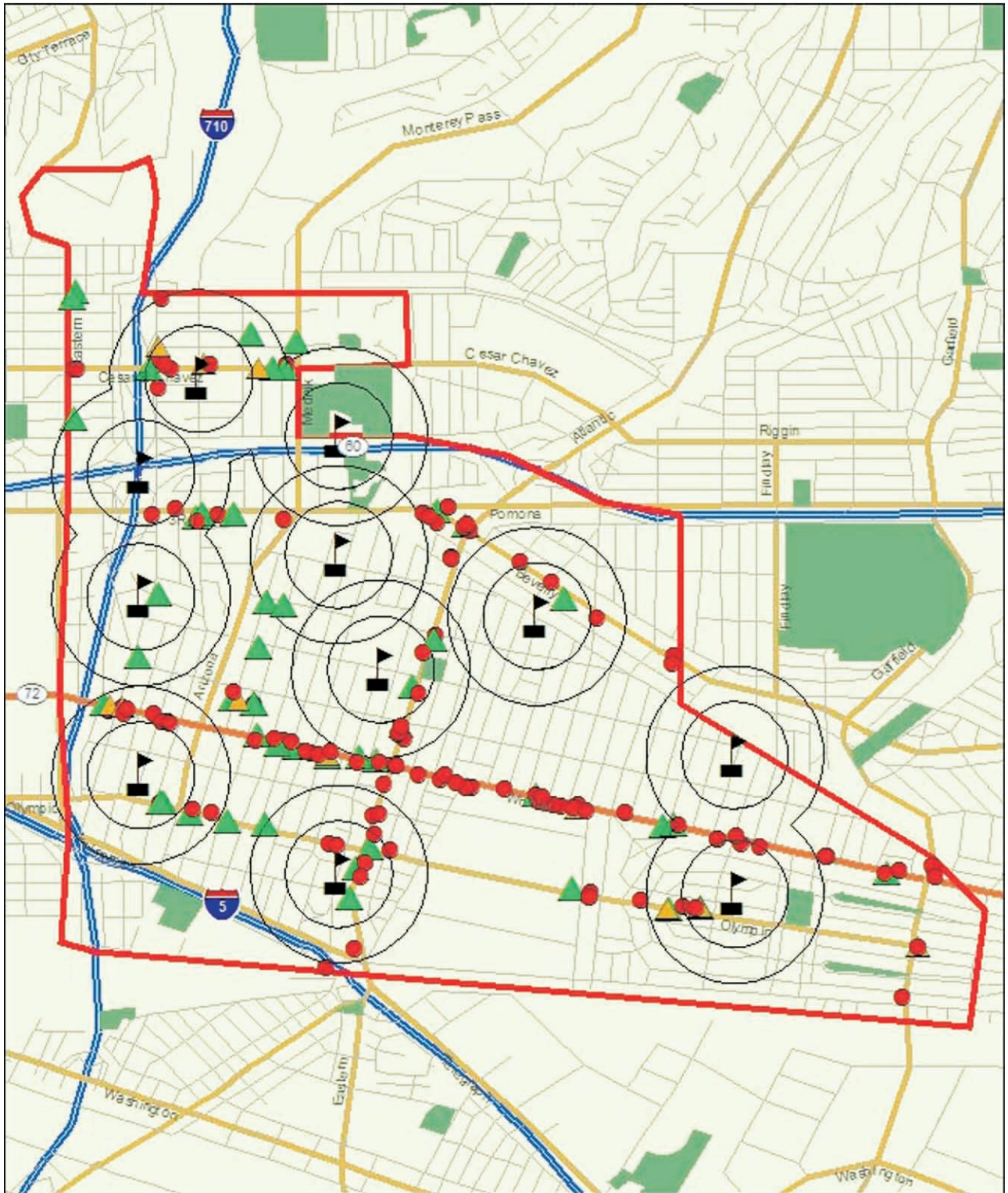


Figure 1. Food outlets relative to schools. Flagpole = school; red dot = fast-food outlet; orange triangle = fish and meat market; green triangle = grocery store; gray line = 300–500-meter buffer.

team sports. Shaded seating, BBQs, and picnic areas also provided a pleasant and inviting environment in which residents could congregate. However, the layout of the parks offered fewer opportunities for individual fitness activities,

such as walking, jogging, and cycling. Although small and few in number, each park was assessed to offer safe and comfortable space in which to engage in a range of recreational and physical activities.

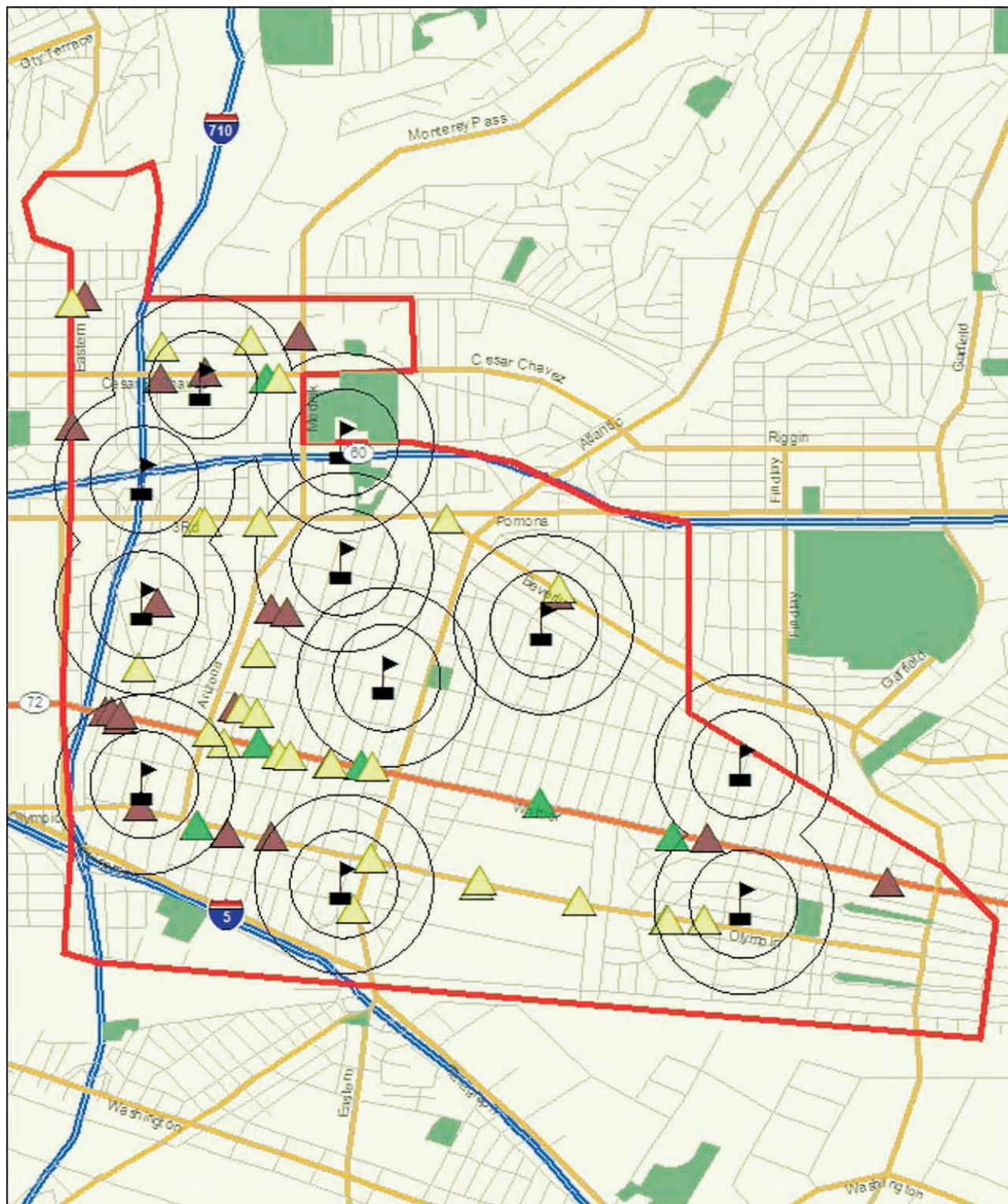


Figure 2. Grocery stores relative to schools. Flagpole = school; yellow triangle = markets with no fruits/vegetables; purple triangle = markets with poor variety/quality; green triangle = markets with good variety/quality; gray line = 300- and 500-meter buffer.

Discussion

There are many reasons to be concerned about the increasing prevalence of obesity; of primary concern is the

fact that obese children are significantly more likely to become obese adults, particularly if obesity is present during adolescence, and the epidemic of obesity is closely linked to the rise in type 2 diabetes. Although it was pre-

Table 2
Availability of fruits and vegetables near schools

	Total count	Distance from a school	
		Within 300 meters	Within 500 meters
Grocery stores	62	10 (16%)	30 (48%)
Fruit			
No fruit	34 (55%)	4 (12%)	16 (47%)
Poor variety/quality	17 (27%)	4 (29%)	10 (59%)
Good variety/quality	11 (18%)	2 (18%)	4 (36%)
Vegetables			
No vegetables	29 (47%)	4 (14%)	12 (41%)
Poor variety/quality	22 (36%)	5 (23%)	14 (63%)
Good variety/quality	11 (18%)	1 (9%)	4 (36%)

viously found almost exclusively among adults, diabetes is now one of the most common chronic diseases of childhood. If current estimates hold true, *one in three* children born in 2000 will develop diabetes during their lifetime, with the greatest risk experienced by Hispanic children [38].

Although it is clear that obesity is caused by complex interactions between genetics and environmental factors, there is growing recognition that the built environment is likely to play an important role with respect to childhood obesity. Indeed, decisions about zoning, transportation, land use, and community design all have the potential to influence the distances people travel to work or school, the convenience of purchasing healthy and unhealthy foods, and the safety and attractiveness of neighborhoods for walking. There is also growing evidence to link the built environment with chronic health conditions among adults. For example, physical inactivity has been found to significantly contribute to a number of health problems, including obesity, diabetes, cardiovascular disease, certain forms of cancer, and depression [39]. Physical inactivity is estimated to be responsible for over 200,000 deaths each year in the United States [40].

The food environment in East Los Angeles offers far greater access to fast foods than healthy food choices, such as fruits and vegetables. As a result, the neighborhood food environment makes it difficult if not nearly impossible for children to make healthy dietary choices when not at home. Although the parks in East Los Angeles were found to be inviting and of high quality during the daytime hours, parks and other recreational facilities were few in number, limited in size, and located only along the outskirts of the neighborhood, thus not easily accessible without some form of transportation. This pattern is not unique to East Los Angeles. Indeed, in inner-city areas throughout Los Angeles there is limited available park or green space. Whereas the City of Los Angeles offers just 152 square feet of parkland per person, the parkland ratio in other urban areas, such as Boston (166 sq feet per person), New York City (300 sq feet per person), and Minneapolis (756 sq feet per person) is considerably higher.

Although this study provides striking findings regarding neighborhood-level risks with respect to the food and park environments of East Los Angeles, there are a number of limitations of this research that need to be acknowledged. First, there were a number of assumptions that were made when conducting this research, including an assumption that fast-food restaurants, bakeries, and donut stores offer only unhealthy meals and snacks. We did not, however, make the assumption that grocery stores are a source of healthy food options without verifying this with field observations. Second, licensed businesses are not the only source of healthy and unhealthy food choices in a community. Indeed, in East Los Angeles, there are many small vendors that sell both healthy and unhealthy foods (e.g., fried churros, ice cream, fruits, and vegetables) from their van, the back of their pick-up truck, or from vending carts. These vendors sell their goods in well-populated areas within this community, particularly in front of parks and schools. Given the methodology that we used, we were not able to include these food sources in our analyses.

Whether increased exposure to fast foods actually carries an increased individual risk of obesity is a question that highlights another limitation of this and previous research. Certainly, one cannot conclude that the greater density of fast-food outlets in lower socioeconomic areas is the cause of the observed obesity among individuals of lower personal income. Indeed, the findings from this and similar research can only point to an association, leaving still unanswered questions about the nature of this association. The lack of individual level measures, and specifically the lack of individual data regarding those factors that influence dietary choices, nutrition, and physical activity relative to body weight (and height) limits the explanatory power of the study [13]. To be sure, analysis of individual data could reveal alternative explanations for these associations.

Despite these limitations, the findings do have a number of important implications with respect to prevention, both from the perspective of policy and community intervention. First, these findings suggest the need to increase the availability of healthy food snacks and food items, particularly within close proximity of schools. Whether it be by providing incentives to fast-food restaurants to offer healthy meals, or to small grocery stores to offer affordable and high-quality healthy foods, children cannot make wise dietary choices without the availability of such foods. Second, these findings again emphasize the need for thoughtful community design, to ensure that communities offer sufficient park space for recreational activities, including safe crosswalks, walking paths, and bike paths. Finally, increased availability of healthy food choices and park space will not necessarily lead to healthier behaviors without public health educational campaigns and individual-, family-, and school-based interventions to promote healthier life choices. For example, frequent fast-food restaurant users might be targeted for intervention around increasing fruit and vegetable

intake and decreasing fat intake at other eating occasions during the day.

The relationship between the environment, nutrition, and physical activity is deserving of more attention given that both diet and physical activity are complex behaviors that operate through many mediating factors, such as sociodemographic characteristics, personal, familial and cultural values and practices, safety and security, and time allocation. Clearly more research is needed to determine the specific elements of the environment that influence nutrition, dietary choices, and physical activity in children and youth [1]. Given the growing diversity that exists throughout the United States but particularly in urban settings, more research is needed regarding the role that culture (including cultural norms, values, and beliefs) play with respect to an individual's choices regarding health, diet, and physical activity. Such cultural values or norms might become important targets for interventions designed to promote healthy life choices. In addition, new research is needed to more comprehensively and holistically examine the broader array of individual (e.g., genetics; temperament; knowledge and expectations; time spent watching television, playing on the computer, or doing homework), familial (e.g., family members' weight, dietary choices, and involvement in physical activity; cultural norms and values related to meals), institutional (e.g., healthy and unhealthy food choices offered at schools/work; exposure to health promoting and educational messages), and community-level (e.g., community design; violence; perceptions regarding community safety) risk and protective factors that individually and collectively influence dietary choices, involvement in physical activity, and associated health outcomes. The research to date has almost exclusively focused on adults. Thus, more research is needed regarding risk and protective factors associated with overweight and obesity among children and adolescents.

Finally, community-based research is also needed to examine what impact changes to the environment might have on diet and physical activity. Methods such as those used in this study—i.e., the collection and integration of multiple sources of data, including spatial, quantitative, qualitative interviews, and field observations—are ideal for use in research that is addressing problems as complex as obesity, and therefore are encouraged in future research.

Acknowledgments

This study was funded by the WK Keck Foundation. The authors wish to acknowledge the contributions of the many staff members who contributed to this project: Francisca Angulo Olaiz, Ph.Dc., Jabar Akbar, Adriana Armenta, Samika Bowick, Leo Castillo, Turusew Gedebu-Wilson, R.D., M.S., Mandy Graves, R.D., M.P.H., Tamika Lewis, M.S.W., Donna Luebbe, and Lucy Montoya.

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