



## **The Role of Built Environments in Physical Activity, Eating, and Obesity in Childhood**

James F. Sallis; Karen Glanz

*The Future of Children*, Vol. 16, No. 1, Childhood Obesity. (Spring, 2006), pp. 89-108.

Stable URL:

<http://links.jstor.org/sici?sici=1054-8289%28200621%2916%3A1%3C89%3ATROBEI%3E2.0.CO%3B2-H>

*The Future of Children* is currently published by The Brookings Institution.

---

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/about/terms.html>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/journals/brookings.html>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

---

JSTOR is an independent not-for-profit organization dedicated to and preserving a digital archive of scholarly journals. For more information regarding JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

# The Role of Built Environments in Physical Activity, Eating, and Obesity in Childhood

---

*James F. Sallis and Karen Glanz*

---

## Summary

Over the past forty years various changes in the U.S. “built environment” have promoted sedentary lifestyles and less healthful diets. James Sallis and Karen Glanz investigate whether these changes have had a direct effect on childhood obesity and whether improvements to encourage more physical activity and more healthful diets are likely to lower rates of childhood obesity.

Researchers, say Sallis and Glanz, have found many links between the built environment and children’s physical activity, but they have yet to find conclusive evidence that aspects of the built environment promote obesity. For example, certain development patterns, such as a lack of sidewalks, long distances to schools, and the need to cross busy streets, discourage walking and biking to school. Eliminating such barriers can increase rates of active commuting. But researchers cannot yet prove that more active commuting would reduce rates of obesity.

Sallis and Glanz note that recent changes in the nutrition environment, including greater reliance on convenience foods and fast foods, a lack of access to fruits and vegetables, and expanding portion sizes, are also widely believed to contribute to the epidemic of childhood obesity. But again, conclusive evidence that changes in the nutrition environment will reduce rates of obesity does not yet exist.

Research into the link between the built environment and childhood obesity is still in its infancy. Analysts do not know whether changes in the built environment have increased rates of obesity or whether improvements to the built environment will decrease them. Nevertheless, say Sallis and Glanz, the policy implications are clear. People who have access to safe places to be active, neighborhoods that are walkable, and local markets that offer healthful food are likely to be more active and to eat more healthful food—two types of behavior that can lead to good health and may help avoid obesity.

[www.futureofchildren.org](http://www.futureofchildren.org)

---

James F. Sallis is a professor of psychology at San Diego State University and director of Active Living Research, a program of the Robert Wood Johnson Foundation. Karen Glanz is a professor of behavioral sciences, health education, and epidemiology at Emory University and the director of the Emory Prevention Research Center.

---

**A**ny effort to understand or reduce obesity must consider the “built environment.” Loosely defined, the built environment consists of the neighborhoods, roads, buildings, food sources, and recreational facilities in which people live, work, are educated, eat, and play. The way the built environment is created can affect many daily decisions. Whether people walk to work or school, eat frequently at fast-food restaurants, or take their children to parks may depend in part on how neighborhoods are built. When one studies the built environment in the context of the obesity epidemic, it is important to ask three questions. First, how does the built environment affect important lifestyle decisions? Second, would changing the infrastructure alter decisionmaking? And, third, would these changes affect Americans’ weight and overall health? For example, although much of America’s built environment has changed over the past forty years in ways that have promoted sedentary lifestyles, it is not known whether these changes have had a direct effect on obesity rates or whether changes in the built environment will lower these rates. In this paper, we attempt to shed some light on these issues.

Built environments affect children’s weight by shaping both their eating habits and their physical activity. Research into the links between the physical places where children live and children’s activity levels and eating habits, it must be said, is less conclusive than research in other areas covered in this volume. In the first place, research on youth is limited, though studies of adults can provide some insights for youth. A second important limitation of virtually all existing studies is the possibility of self-selection. A study may find that people who live near parks are more active than people who do not, but it cannot

confidently conclude that proximity to parks is the cause of that activity. Perhaps, instead, active people choose to live near parks. A better study design would focus on the effect of environmental changes in a neighborhood on the people living there, but so far such studies have been limited to small changes such as building trails.<sup>1</sup> Tracking major environmental changes is extremely difficult because the changes are not under the control of investigators, and most such changes take far longer to be completed than the typical research study does. The “ideal” study, the randomized trial, is simply not possible because people cannot be randomly assigned to live in particular neighborhoods.

Despite the limits of research in this area, leaders in public health have stressed the need for changes in the built environment to improve health.<sup>2</sup> New reports by two authoritative panels recognize that consistent links between environmental factors and physical activity provide valuable evidence that should inform policy change.<sup>3</sup> Both available evidence and common sense support four obesity-related goals: ensuring that all children have access to safe and convenient places to be physically active, ensuring that the bulk of food available to children in most settings meets nutritional guidelines, reducing promotion of unhealthful food and sedentary behaviors, and making it easy to identify and affordable to buy healthful foods.

## **The Built Environment and Physical Activity**

Children themselves know that characteristics of the built environment affect how active they can be: physical activity is welcome in certain places and is difficult, discouraged, or even prohibited in others. Buildings, transportation infrastructure, elements of land use and community design, and recre-

ational facilities, such as parks and trails, all affect citizens' physical activity.

### Active Recreation

Health and recreation researchers have focused on the link between access to recreation facilities and children's recreational physical activity. A handful of studies have shown what common sense would also suggest: children and adolescents with access to recreational facilities and programs, usually near their homes, are more active than those without such access.<sup>4</sup> Adolescent girls' physical activity is related to the proximity of recreational facilities.<sup>5</sup> The more often young adolescents use recreational facilities, the greater their total physical activity, with parks and the neighborhood most important for boys and with commercial facilities and the neighborhood most important for girls.<sup>6</sup> Preschool children are more active when there are more places nearby where vigorous play is welcome and when they spend more time in those places.<sup>7</sup> Three studies of preschool children using direct observation report that being outdoors is the strongest correlate of the children's physical activity.<sup>8</sup>

There are some contrary findings. Two studies, for example, reported no significant links between physical activity and such variables as environmental barriers, access to supervised programs, and distance to parks.<sup>9</sup> Both studies, however, were based on parental reports rather than direct observation. Another study of young children found no relation between their proximity to playgrounds and being overweight.<sup>10</sup>

To sum up, the broad conclusions of existing studies are consonant with a review of research on adults, which consistently linked physical activity with both access to and the

attractiveness of recreational facilities and programs.<sup>11</sup>

If further research confirms the associations between access to facilities and youth physical activity, the policy implication is clear: all children need places where they can be physically active on a regular basis. The most important such places appear to be outdoors and in the neighborhood and include both public parks and commercial facilities. Because children

---

*If further research confirms the associations between access to facilities and youth physical activity, the policy implication is clear: all children need places where they can be physically active on a regular basis.*

---

engage in such a variety of activities and because their recreational needs vary widely by age, providing many different types of facilities is a promising policy objective.

How accessible facilities are depends on how close they are to children's homes or schools, how costly they are to use, and how easily they can be reached. At least two U.S. studies found fewer parks, sports fields, fitness clubs, and trails in low-income neighborhoods than in more affluent ones, suggesting that low-income youth may face barriers to physical activity.<sup>12</sup> Interestingly, low-income neighborhoods had relatively fewer free than pay-for-use facilities, suggesting the possible influence of community tax bases and related spending policies. Because the distribution of

facilities is likely to vary across cities, researchers should examine more locations, focusing on the quality of facilities as well as access.

Although market forces primarily govern the distribution of private recreational facilities, cities and states could enact tax-based incentives, similar to those often used to spur economic and business development, to locate private facilities in low-income neighbor-

---

*Cities and states could enact tax-based incentives, similar to those often used to spur economic and business development, to locate private facilities in low-income neighborhoods.*

---

hoods. Publicly funded parks and trails generally garner strong support.<sup>13</sup> Some 90 percent of a national sample of U.S. adults supported using local government funds for walking and jogging trails, recreation centers, and bicycle paths. People may support spending for recreational facilities because they believe public open space improves their quality of life, but building more and better public recreational facilities could also promote youth physical activity.<sup>14</sup> Also health care savings could conceivably offset the government's costs of building such facilities. Several cities have recently taken steps to improve their parks. Voters in Los Angeles have approved major bond issues in recent years to upgrade urban parks. Denver's public schools have approved converting school playgrounds to community parks. And pub-

lic-private partnerships in metropolitan Atlanta have accelerated the pace of building a regional network of mixed-use walking and cycling paths.<sup>15</sup>

### Active Transportation

Transportation and urban planning researchers have for several decades been examining how a community's design encourages (or discourages) its citizens to walk and cycle for transportation (rather than for recreation), though until recently health professionals were unfamiliar with the researchers' work.<sup>16</sup> Though the original research focus was directed toward reducing traffic congestion and improving air quality, the findings have direct implications for physical activity.

Before the middle of the twentieth century, communities were designed to support convenient pedestrian travel for common activities, such as shopping and going to school. Indeed, many U.S. towns and cities developed before automobile use became widespread and were pedestrian oriented by necessity. These "traditional" neighborhoods are characterized by mixed land use, connected streets, and moderate to high density. Homes, stores, employment centers, and government services are located near one another, often with multiple uses in the same multistory building. Streets are laid out in a grid pattern that creates high levels of connectivity and offers pedestrians direct routes from place to place. High residential density, with a preponderance of multifamily dwellings, makes local stores financially viable. For obvious reasons, these traditional designs are termed "walkable."

As the twentieth century progressed and America's suburbs began to grow, however, a variety of policies were set in place to optimize automobile travel. Different forms of

land use were separated by zoning codes, so homes and stores were no longer within walking distance. The street network within residential areas was disconnected, and long blocks and many cul-de-sacs made pedestrian travel all but impossible. Low-traffic residential streets fed into multilane, high-speed arterial streets that presented serious barriers and dangers to pedestrians. Because the design of suburbs essentially requires the use of automobiles for all trips, such communities are often described as “unwalkable,” especially for transportation.

Many studies have examined components of walkability or compared walking and cycling for transportation in high- and low-walkable neighborhoods. They consistently show more walking and cycling for transportation in walkable neighborhoods.<sup>17</sup> Recent studies using objective measures of total physical activity have found that residents of high-walkable neighborhoods get one hour more of physical activity each week and are 2.4 times more likely to meet physical activity recommendations than residents of low-walkable neighborhoods.<sup>18</sup> Recent reports from the Transportation Research Board and Institute of Medicine and the Centers for Disease Control’s “Guide to Community Preventive Services” conclude that the design of communities is linked with physical activity, though causality cannot be established because of the self-selection problem already noted.<sup>19</sup>

Though most such research has not focused on children, several studies suggest that young people would be more likely to walk to nearby destinations in traditional neighborhoods. Kevin Krizek, Amanda Birnbaum, and David Levinson have argued that community design is relevant to youth physical activity and have recommended that researchers examine the specific destinations, activities at

those destinations, and travel modes that are most common for children.<sup>20</sup> An Australian study found that the way people perceive a neighborhood environment can affect the extent to which children in that neighborhood walk and cycle to destinations.<sup>21</sup> Perceptions of heavy traffic, a lack of public transit, a lack of street-crossing aids, the need to cross several roads, and a lack of nearby recreational facilities were all linked to lower rates of active transportation. One study of adolescents found that boys were more active when they lived near pedestrian-oriented shopping areas.<sup>22</sup> In an unexpected finding, girls were more active when streets were less connected, suggesting that low-traffic residential streets and cul-de-sacs may be play areas for some young people.<sup>23</sup> Researchers should also look into how community design variables may operate differently for children, adolescents, and adults.

Several investigators have examined how community design relates to the weight status of adults. Four studies have documented lower body mass index (BMI) or reduced risk of overweight and obesity in people living in more walkable areas.<sup>24</sup> The one study focusing on adolescents, however, found no link between neighborhood environment and BMI, so it would be premature to draw any final conclusions.<sup>25</sup>

Walking and cycling to school are of particular interest because both require substantial energy expenditures on a daily basis.<sup>26</sup> And, indeed, studies have found that children who walk to school are more physically active than those who travel to school by car, though we could locate none linking walking with weight status.<sup>27</sup> However, active commuting rates are low, ranging from only 5 to 14 percent.<sup>28</sup> Low-walkable suburban development patterns, such as the lack of sidewalks, long dis-

tances to schools, and the need to cross busy streets with fast-moving traffic, appear to create barriers to active commuting to school.<sup>29</sup>

The simple fact is that more children walk to school in neighborhoods with sidewalks.<sup>30</sup> An evaluation of the Marin County, California, Safe Routes to Schools program that combined promotional activities with built environment changes—more sidewalks and improved street crossings—found a 64 percent increase in walking and a 114 percent increase in cycling to school.<sup>31</sup> And an evaluation of statewide investments in sidewalks, crosswalks, and bike lanes in ten California schools found that 15 percent of parents of children who passed the improvements on their way to school reported their children walked or cycled more.<sup>32</sup> The Robert Wood Johnson Foundation's Active Living Leadership program has documented initiatives across the United States at the city, county, and state levels that are designed to create built environments that make it easy for people to be physically active for transportation and recreation purposes.<sup>33</sup>

With pedestrian injuries a major cause of childhood injuries and deaths, parents are understandably concerned about traffic safety.<sup>34</sup> Priority should thus be placed on designing roads, sidewalks, and crosswalks that make it safe for children to walk and cycle. The need for greater investment is clear. Rates of pedestrian death and injury are vastly higher in the United States than in Western European countries such as Germany and the Netherlands, where extensive networks of protected cycling and pedestrian lanes, along with laws that make drivers rather than pedestrians or cyclists liable in accidents, have dramatically improved pedestrian safety.<sup>35</sup> It is true that the development of safe sidewalks, crosswalks, and bike lanes

will not increase active commuting among children whose homes are too distant from their schools or who are driven to school to suit their parents' work schedules. However, the evidence suggests that rates of active commuting can be modified through environmental interventions.

### **Sedentary Behavior**

Sedentary recreational behaviors, such as watching television and videos, using computers, and playing video games, are important parts of young people's daily lives. They are also risk factors for obesity in youth, and reducing such behaviors is another strategy for preventing childhood obesity.<sup>36</sup> Research is beginning to document connections between the built environment and sedentary behaviors. Without safe places to play near home, for example, children may spend more time being inactive indoors. Likewise, heavy traffic reduces the likelihood of children's walking and may thus keep children indoors, where they remain sedentary.<sup>37</sup> Time spent riding in a car is associated with a risk of overweight in adults, and residents of low-walkable neighborhoods spend more time driving, so community design is likely to have a similar effect on children.<sup>38</sup> These and other hypothesized associations between children's sedentary behavior and community design need to be more closely examined.

### **Strategies for Change**

Making the multiple environmental changes supported most consistently by the limited but rapidly expanding evidence will require leadership from many sectors.<sup>39</sup> The strongest evidence links access to recreational facilities and programs with child and adolescent physical activity. Recreation departments in local and state governments are a primary interest group for intervention in

this area. They could promote physical activity among youth of all ages by designing and outfitting parks to provide diverse opportunities for popular physical activities, ensuring equitable distribution of recreational facilities, and emphasizing physical activity over other programs. Because achieving these goals may require increased funding, government leaders could be targeted for advocacy. The Cleveland Parks Department could be a model for other cities. As another possible model, the National Recreation and Park Association has partnered with the National Heart, Lung, and Blood Institute to develop, evaluate, and disseminate the Hearts N' Parks program across the nation.<sup>40</sup>

Commercial groups, such as dance and martial arts studios, and community organizations, such as youth sports leagues, churches, and after-school programs, all manage or interact with places for youth physical activity. Such groups could boost physical activity in children of all skill and income levels. Youth groups could use these facilities for their social and recreational programs, using sliding-scale fees to increase access for low-income youth. Increasing physical activity opportunities for low-income youth is a priority, because these children have few options. Providing tax breaks for commercial physical activity providers, such as dance studios and health clubs, to build facilities in low-income areas is a strategy worth exploring.

Since 1990, the federal government has made transportation funds available for pedestrian and bicycling infrastructure. State and local transportation funds support sidewalks, trails, traffic calming, and crosswalks. Safe Routes to Schools construction funding is available from the U.S. Department of Transportation and from the transportation departments of California and a few other

states. Organized advocacy, however, may be needed to shift priorities within transportation departments to ensure adequate funding of pedestrian and bicycle facilities.

Creating the mixed-use, highly connected communities found to be associated with more physical activity requires changes in zoning codes and development regulations. Such organizations as Congress for the New Urbanism and Smart Growth America are

---

*Priority should thus be placed  
on designing roads,  
sidewalks, and crosswalks  
that make it safe for children  
to walk and cycle.*

---

promoting these reforms.<sup>41</sup> To improve the comfort and safety of pedestrians and bicyclists, changes are needed to improve road design guidelines. The "complete streets" concept would make all streets suitable for pedestrians, cyclists, and motorists.<sup>42</sup> Subsequent research must determine whether walkable neighborhoods and complete streets are health-promoting for youth as well as adults. However, many initiatives are under way nationwide to advocate for policy changes that will make environments more supportive of physical activity. They should be carefully evaluated.

## **The Built Environment and Nutrition**

The nutrition environment is widely believed to contribute to the epidemic of childhood and adult obesity in the United States and globally.<sup>43</sup> Research on nutrition environments is less advanced than that on physical



activity environments, though several studies have examined schools as sources of food and found, for example, that the availability of fruits and vegetables in school lunches is linked with youngsters' overall consumption of fruits and vegetables.<sup>44</sup> (See the article in this volume by Mary Story, Karen Kaphingst, and Simone French for more details on nutrition in schools.) Few researchers have explored how other neighborhood environments may affect children's eating patterns, and even

---

*The obesity epidemic makes it essential to improve our understanding of the effect of food environments on children as rapidly as possible.*

---

fewer have looked into their possible links with childhood obesity. Thus we draw mainly from research on neighborhoods in relation to adults' dietary behaviors. The obesity epidemic makes it essential to improve our understanding of the effect of food environments on children as rapidly as possible.

Several aspects of the broad nutrition environment in the United States and other industrialized countries may help explain the increasing prevalence of childhood obesity. Cost concerns and time pressures often lead parents and their children to rely on convenience foods and fast foods. The increasing popularity of dining out over the past two decades has raised the proportion of nutrients consumed away from home. Because convenience foods and restaurant meals are typically higher in calories and fat and lower

in valuable nutrients than meals prepared at home, frequent consumption of such food increases the chances of obesity in children and adolescents as well as in adults.<sup>45</sup> A lack of access to and the high cost of fruits, vegetables, and other nutritious foods may keep children from consuming them. Expanding portion sizes also appear to be contributing to the obesity epidemic.<sup>46</sup>

Parents and school administrators are usually called on to provide more healthful foods to children. Evidence indicates, however, that there is a great deal of support for community-level policies that affect local food environments. In a recent survey in California, 50 percent of respondents rated their neighborhoods as being only fair, poor, or very poor in offering healthful food for children, with residents of large cities most likely to give negative ratings.<sup>47</sup> Eighty-seven percent of respondents favored requiring fast-food and chain restaurants to post nutritional information, and 46 percent favored limiting the number of fast-food restaurants in a community.<sup>48</sup> Respondents generally favored a community approach to reducing childhood obesity rather than leaving it to individual children and families. They rated parents, health care providers, and schools as more important than churches and faith-based organizations in helping to reduce childhood obesity, although relatively more African Americans and Latinos favored a major church role.<sup>49</sup>

Is the consumers' perception that childhood obesity can be altered through changes in the nutrition environment supported by evidence? Though the literature to date is limited, diverse studies support the principle that nutrition environments may be important influences on eating behavior and may help explain disparities in behavior and dis-

ease. The available research on nutrition environments outside schools and homes is based on concepts and empirical data from the fields of public health, health psychology, consumer psychology, and urban planning. It falls generally under two headings: *community* nutrition environments, which include the number, type, and location of food outlets, and *consumer* nutrition environments, which cover the availability and cost of, as well as information about, healthful and less healthful foods inside those food outlets. The distinction is important because each could have broad effects on child health, and the opportunities for modifying each can be quite different.

### **Community Nutrition Environments**

In the community nutrition environment, stores and restaurants are the most numerous food outlets. Accessibility can include large issues, such as whether and to what extent these outlets are located in certain communities, as well as such smaller issues as whether they have drive-through windows and what their hours of operation are. Other food sources, such as cafeterias in schools, work sites, churches, and health care facilities, are considered “organizational nutrition environments,” although the nonschool sources may be more influential for adults than for children and youth.

The community nutrition environment may explain some of the racial, ethnic, and socioeconomic disparities in nutrition and health, such as the increasing prevalence of overweight in low-income children.<sup>50</sup> Supermarkets, for example, are less common in lower-income and minority neighborhoods than in other neighborhoods.<sup>51</sup> And recent evidence links access to supermarkets with such indicators of healthful eating as fruit and vegetable intake among African American

adults, household fruit consumption, and a diet quality index for pregnancy.<sup>52</sup>

Evidence related to restaurants is intriguing but less consistent than that related to stores. A study in New Orleans found higher fast-food restaurant density in minority and lower-income neighborhoods, and a study in Australia found that people living in poorer areas had twice the exposure to these restaurants.<sup>53</sup> A state-level analysis in the United States found only a modest link between obesity and the prevalence of fast-food restaurants: the density of such restaurants accounted for only 6 percent of the variance in state obesity rates out of a total of 70 percent explained by a model that included many variables.<sup>54</sup> In another Australian study, the availability of take-away food and restaurants was not linked with obesity.<sup>55</sup> And in one of the only studies known to explore community nutrition environments and children, overweight was not linked with proximity to fast-food restaurants among urban low-income preschoolers.<sup>56</sup>

### **Consumer Nutrition Environments**

Data on consumer nutrition environments, by contrast, reflect what consumers encounter within and around a store or restaurant, including the availability of healthful choices, price, promotions, placement, and nutritional information. Price is an influential feature of the nutrition environment. A study of why Americans eat what they do found that cost was the second most important factor, behind taste; convenience was ranked fourth, just after nutrition.<sup>57</sup>

The availability of healthful foods is also important. Some healthful foods, such as low-fat dairy products and fruits and vegetables, are less available and of poorer quality in minority and lower-income areas. Three studies have

documented that disadvantaged neighborhoods have a proportionally lower availability of healthful options and produce of poorer quality than do more affluent and white neighborhoods.<sup>58</sup> A study in Los Angeles compared healthful food options and food preparation at restaurants in poorer neighborhoods and at restaurants in higher-income neighborhoods and found fewer healthful menu selections in the lower-income areas.<sup>59</sup>

---

*Most low-income consumers had access to the healthier substitutes but at significantly greater cost than the less healthful options.*

---

A recent study compared the availability and cost of a standard “market basket” of foods from the U.S. Department of Agriculture’s Thrifty Food Plan for low-income consumers with a market basket of healthier foods, such as whole wheat bread and lean ground beef. Most low-income consumers had access to the healthier substitutes but at significantly greater cost than the less healthful options.<sup>60</sup>

Few studies have examined the connection between consumer nutrition environments and eating behaviors. Allen Cheadle and several colleagues found positive links between the availability of healthful (low-fat and high-fiber) products at the grocery store and individuals’ consumption of these foods.<sup>61</sup> Follow-up surveys two years later, however, found that changes in food availability made relatively little difference to individuals’ food consumption over time.<sup>62</sup> Researchers must develop better measures to use grocery store

surveys to track community-level dietary changes over time.

Indeed, to better understand in general how the nutrition environment affects eating behavior, analysts must continue to improve their measures of how consumer nutrition environments vary. In a food availability study completed in 1990, Cheadle and his colleagues included calculations of the percentage of shelf space used for healthful food options, such as low-fat milk and cheese and lean meats, but such measures may be difficult to apply in contemporary grocery stores, which are now larger and more varied in layout than stores were only a decade ago.<sup>63</sup> Other opportunities for consumer measures in stores include assessing product promotion and placement related to children, such as displaying energy-dense foods and placing unhealthy products on lower shelves. The complexity of the research area is clear, but given the public health imperative to improve eating behaviors, it must be a high priority to enhance the public’s understanding of the food environments’ impact on their eating habits.

An important omission in these studies is that none makes it possible to evaluate the relative contribution of environmental and demographic, psychological, and social factors to diet and obesity. Such multilevel studies are critically necessary to better inform policymakers, researchers, and communities about the potential of environmental change strategies to make a genuine difference in the childhood obesity problem.

### **Strategies for Change**

Although researchers are well informed about which eating patterns will help avoid or reduce obesity, they as yet know relatively little about how environmental change can af-

fect eating patterns. Nevertheless, we can suggest promising strategies, many of which have already been shown to be feasible. Some of these strategies come from recent online and newspaper reports; although they are innovative, they have usually not been carefully evaluated. Others come from previously reported efforts to promote healthful eating, such as reducing fat intake or eating more fruits and vegetables. They provide interesting case examples, though, again, most have not been rigorously evaluated.<sup>64</sup>

At the community nutrition level, increasing the number of supermarkets (and the variety of fresh produce they sell) in low-income and minority neighborhoods could lead to healthier eating behaviors. Several cities have shown that it is feasible to increase the presence of supermarkets in disadvantaged areas through community advocacy and political action.<sup>65</sup> Providing transportation to food sources for poor families who do not own cars appears to be both feasible and popular with shoppers. Locating farmers' markets in low-income neighborhoods has also been well received, although whether the markets affect children's fruit and vegetable consumption or energy balance remains unclear.<sup>66</sup>

The Urban Nutrition Initiative in West Philadelphia combines the physical activity of gardening with the promotion of healthy eating. This university-community partnership has been recognized as a model health-promotion effort.<sup>67</sup> Similar grassroots efforts under the umbrella of community-supported agriculture connect local farmers and consumers to increase the production and consumption of fresh produce.<sup>68</sup>

Zoning and tax policies can also improve the types and quality of food sold at neighborhood stores. Some restaurant chains, includ-

ing fast-food restaurants, are increasing their menu of healthful foods by offering side orders of salad or vegetables as part of "combo meals."<sup>69</sup> A Produce for Better Health Foundation study is exploring opportunities to implement healthful menu changes in fast-food and fast-casual restaurant chains and family style restaurants.

Several metropolitan areas have convened forums to brainstorm ways to address their regional childhood obesity problems, with changes to the built environment among the options. Chicago leaders have come together in the Consortium to Lower Obesity in Chicago Children to identify local solutions with special attention to low-income communities and "urban re-design."<sup>70</sup> California health care organizations are promoting more healthful food environments in workplaces, hospitals, and clinics in models that might be adopted regionwide.<sup>71</sup> And in San Diego County, a community forum is planning to combat childhood obesity by, among other things, promoting better food labeling and by creating partnerships between the school system and farmers' markets.<sup>72</sup>

### **Common Issues for Physical Activity and Nutrition**

Few studies simultaneously address both physical activity and nutrition within neighborhoods, though such work could advance understanding of how the built environment influences childhood obesity. Studies linking community design and adult weight raise the possibility that land use could work through both physical activity and eating.<sup>73</sup> Not only are people more physically active in traditional neighborhoods, such neighborhoods may also provide more convenient access to healthful foods or less dominance of fast-food restaurants.<sup>74</sup> Zoning laws can be used to require certain forms of destinations within

walking distance of most residences, to limit the number of convenience stores and fast-food restaurants, or to encourage farmers' markets and family style, sit-down, or "slow-food," restaurants.

Because community design is related to walking for transportation and because food outlets are among the most common destinations for walkers, incentives for offering more healthful choices at food stores could affect both healthful eating and physical activity.<sup>75</sup> Neighborhoods that have community gardens can promote both physical activity and healthful eating.<sup>76</sup> Although urban planners are primarily motivated to reduce sprawl because of concerns about traffic congestion, air pollution, the cost of new infrastructure, and a lack of active transportation, reducing sprawl would also preserve agricultural areas near cities and thus maintain farmers' abilities to provide local produce.<sup>77</sup> In turn, more locally grown produce could reduce the cost of getting healthful foods to market and could support local economic development.

Drive-through windows at fast-food restaurants make food purchasing more convenient and may encourage consumers to eat while they drive. Drive-through windows are also symptomatic of the type of building design that discourages pedestrian activity. Restricting drive-through windows might improve both eating and physical activity. The politics of such restrictions could be complex, but demonstration projects could test how acceptable they are and what effects they might have.

Researchers hypothesize that social cohesion is higher in traditional neighborhoods, where people are more likely to see and talk with their neighbors while walking.<sup>78</sup> In socially cohesive neighborhoods, parents may also be more likely to feel comfortable letting their

children play outdoors and walk or cycle to nearby stores for minor food-shopping errands. Socially cohesive communities may also be better advocates for more physical activity opportunities and for better access to healthful foods.

Problems with crime and traffic safety are likely to counter some of the benefits of traditional neighborhoods. Though we could locate no data on this topic, parental concerns about safety could keep children from taking advantage of walkable neighborhoods, recreational facilities, and healthful food sources such as community gardens and farmers' markets. Parents who are concerned about risks of violence or abduction are likely to act on those fears, regardless of real crime rates or an absolute risk of abduction. Likewise, parents who are concerned about heavy or fast vehicular traffic are likely to restrict a child's movements. Both types of concerns may be more prevalent and have greater impact among low-income families, who may not have cars to transport children to recreational and healthful eating opportunities. Researchers should focus on both objectively assessed and perceived safety issues as they relate to physical activity, eating, and built environments.

### **Lessons Learned and Challenges**

Changing the built environment to increase children's physical activity for recreation and transportation, to improve access to healthful foods, and to reduce access to less healthful foods can help provide long-term solutions to the childhood obesity epidemic. Unlike the often-transitory effects of motivational and educational approaches to addressing obesity, changes in behavior prompted by changes in the built environment should be long lasting. Although research generally links aspects of the built environment with physical activity and eating behaviors, most data are from

studies of adults, and findings to date are unable to pinpoint which specific variables would have the greatest effect on childhood eating, physical activity, and obesity. Nevertheless, we can draw some lessons from the studies to date and offer some tentative policy recommendations. Given the urgency of the childhood obesity epidemic, we cannot wait for optimal evidence and must instead base actions on the best available evidence.<sup>79</sup>

Children of all ages need and want places to play. To support the diversity of their physical activities, they need many types of recreational facilities, both public and private, near their homes and schools. To remedy the relative scarcity of such facilities in low-income neighborhoods, policymakers must ensure that these facilities are more equitably distributed.

Adults who live in walkable communities are more physically active and less likely to be overweight than those who do not. A few studies suggest that adolescents living in walkable neighborhoods may be more active and more likely to walk to school than their counterparts in unwalkable communities, but more studies of youth are needed. Combining physical improvements to enhance the safety of routes to school with activities that promote walking and cycling appears to increase active commuting to school. Improving the safety of roads, sidewalks, and crosswalks may reduce parental concerns about traffic danger and encourage more active transportation among children.

Low-income and minority neighborhoods not only have less access to healthful foods but also may face higher food costs. Evidence linking access to healthful foods with dietary intake in children is limited; more studies should be a high priority. But enough studies

document inequitable access to healthful foods to justify corrective efforts. With obesity rates among low-income children and adults much higher than those among well-to-do citizens, there is a strong rationale for grassroots efforts, public-private partnerships, and even public subsidies of healthful food sources in targeted areas.<sup>80</sup> Increasing the number of healthful, affordable food choices in a variety of food outlets is a complementary strategy that may be largely

---

*Combining physical improvements to enhance the safety of routes to school with activities that promote walking and cycling appears to increase active commuting to school.*

---

driven by commercial considerations. In this instance, public pressure and consumer demand can make a difference.

### **Challenges of Translating Research into Change**

Conducting research on built environments and childhood obesity and implementing changes based on the findings will be challenging. Researchers will probably not find a single “smoking gun.” It is more likely that many built environment variables will show a strong cumulative effect on diet, physical activity, and weight status in children than that any single variable will have a dominant influence. Further, different environmental variables are likely to be operating for children of different ages and genders as well as for those of different racial, ethnic, and cultural

groups and socioeconomic backgrounds. Thus changing the built environment in all the ways needed to combat obesity may be a complex task. Research is further complicated by the paucity of reliable and valid measures of food and physical activity environmental factors. And changing the built environment alone is unlikely to induce large changes in eating habits and physical activity. Educational programs, promotional activities, incentives, and policies will all be necessary to support the physical changes.

Making so many changes in the built environment would affect not only many government departments at all levels, but also the food industry, the real estate industry, many transportation-related industries, recreation-related industries, and entertainment industries. Some of these industries will actively oppose policies that threaten their current operating practices.<sup>81</sup> Stimulating health-oriented policy change in government agencies not normally focused on health will require creative and sustained effort. Public support for changing the built environment to combat childhood obesity has seldom been studied but may be decisive in adopting and implementing both promising and evidence-based policies.<sup>82</sup>

Enhancements to encourage more active commuting in communities and potential

subsidies for healthful foods may well be costly. Those costs must be better understood and balanced against the costs of continuing current policies that may be driving the youth obesity epidemic. Careful economic analyses must inform policy decisions.<sup>83</sup>

Making major changes in government policy and industry practice will require a substantial investment in advocacy that will in turn require people, organization, and funding. Although many organizations have interests consistent with the built environment's changes already noted, their capacity is not sufficient to achieve even the initial policy changes supported by existing data. Continuous evaluation will be required to learn whether the changes that are made lead to the expected outcomes and contribute to reducing the obesity epidemic.

Finally, there is an urgent need for the next generation of studies on how the built environment affects youth physical activity, eating, and obesity. Because simply identifying built environment risk factors is not sufficient to create change, advancing the science of policy change is also a high priority. A new research emphasis must be to improve the understanding of policy change processes of greatest relevance to youth physical activity, eating, and obesity.

## Notes

1. Kelly R. Evenson, Amy H. Herring, and Sara L. Huston, "Evaluating Change in Physical Activity with the Building of a Multi-Use Trail," *American Journal of Preventive Medicine* 28 (2S2) (2005): 177–85.
2. U.S. Department of Health and Human Services, *Healthy People 2010* (2000); Jeffrey P. Koplan and William H. Dietz, "Caloric Imbalance and Public Health Policy," *Journal of the American Medical Association* 282 (2000): 1579–81; World Health Organization, *Obesity: Preventing and Managing the Global Epidemic* (Geneva, 1998); Jeffrey P. Koplan, Catharyn T. Liverman, and Vivica I. Kraak, eds., *Preventing Childhood Obesity: Health in the Balance* (Washington: National Academies Press, 2004.)
3. Transportation Research Board–Institute of Medicine, *Does the Built Environment Influence Physical Activity? Examining the Evidence* (Washington: National Academies Press, 2005); Gregory W. Heath and others, "The Effectiveness of Urban Design and Land Use and Transport Policies and Practices to Increase Physical Activity: A Systematic Review," *Journal of Physical Activity and Health* (forthcoming).
4. James F. Sallis, Judith J. Prochaska, and Wendell C. Taylor, "A Review of Correlates of Physical Activity of Children and Adolescents," *Medicine and Science in Sports and Exercise* 32 (2000): 963–75.
5. Gregory J. Norman and others, "Community Design and Recreational Environmental Correlates of Adolescent Physical Activity and BMI," *Journal of Physical Activity and Health* (forthcoming).
6. Wendy R. Hoefler and others, "Parental Provision of Transportation for Adolescent Physical Activity," *American Journal of Preventive Medicine* 21 (2002): 48–51.
7. James F. Sallis and others, "Correlates of Physical Activity at Home in Mexican-American and Anglo-American Preschool Children," *Health Psychology* 12 (1993): 390–98.
8. Sallis, Prochaska, and Taylor, "A Review of Correlates" (see note 4).
9. James F. Sallis and others, "Correlates of Physical Activity in a National Sample of Girls and Boys in Grades Four through Twelve," *Health Psychology* 18 (1999): 410–15; James F. Sallis and others, "Correlates of Vigorous Physical Activity for Children in Grades 1 through 12: Comparing Parent-Reported and Objectively Measured Physical Activity," *Pediatric Exercise Science* 14 (2002): 30–44.
10. Hillary L. Burdette and Robert C. Whitaker, "Neighborhood Playgrounds, Fast-Food Restaurants, and Crime: Relationships to Overweight in Low-Income Preschool Children," *Preventive Medicine* 38 (2004): 57–63.
11. Nancy Humpel, Owen N. Neville, and Evie Leslie, "Environmental Factors Associated with Adults' Participation in Physical Activity: A Review," *American Journal of Preventive Medicine* 22 (2002): 188–99.
12. Paul A. Estabrooks, Rebecca E. Lee, and Nancy C. Gyurcsik, "Resources for Physical Activity Participation: Does Availability and Accessibility Differ by Neighborhood Socioeconomic Status?" *Annals of Behavioral Medicine* 25 (2004): 100–04; Linda M. Powell, S. Slater, and Frank J. Chaloupka, "The Relationship between Community Physical Activity Settings and Race, Ethnicity, and Socioeconomic Status," *Evidence-Based Preventive Medicine* 1 (2004): 135–44.
13. Ross C. Brownson and others, "Environmental and Policy Determinants of Physical Activity in the United States," *American Journal of Public Health* 91 (2001): 1995–2003.



14. Geoffrey C. Godbey and others, "Contributions of Leisure Studies and Recreation and Park Management Research to the Active Living Agenda," *American Journal of Preventive Medicine* 28 (2S2) (2005): 150–58.
15. Los Angeles park bond info: [http://eng.lacity.org/projects/prop\\_k/aboutus.htm](http://eng.lacity.org/projects/prop_k/aboutus.htm) (accessed October 18, 2005); Denver school playground conversions: Lois Brink and Bambi Yost, "Transforming Inner-City School Grounds: Lessons from Learning Landscapes," *Children, Youth, and Environments* 14, no. 1 (2004).
16. Lawrence D. Frank, Peter O. Engelke, and Thomas L. Schmid, *Health and Community Design: The Impact of the Built Environment on Physical Activity* (Washington: Island, 2003); Brian E. Saelens, James F. Sallis, and Lawrence D. Frank, "Environmental Correlates of Walking and Cycling: Findings from the Transportation, Urban Design, and Planning Literatures," *Annals of Behavioral Medicine* 25 (2003): 80–91.
17. Saelens, Sallis, and Frank, "Environmental Correlates of Walking and Cycling" (see note 16).
18. Brian E. Saelens and others, "Neighborhood-Based Differences in Physical Activity: An Environment Scale Evaluation," *American Journal of Public Health* 93 (2003): 1552–58; Lawrence D. Frank and others, "Linking Objectively Measured Physical Activity with Objectively Measured Urban Form: Findings from SMARTRAQ," *American Journal of Preventive Medicine* 28 (2S2) (2005): 117–25.
19. Transportation Research Board–Institute of Medicine, *Does the Built Environment Influence Physical Activity?* (see note 3); Heath and others, "The Effectiveness of Urban Design" (see note 3).
20. Kevin J. Krizek, Amanda S. Birnbaum, and David M. Levinson, "A Schematic for Focusing on Youth in Investigations of Community Design and Physical Activity," *American Journal of Health Promotion* 19 (2004): 33–38.
21. Anna Timperio and others, "Perceptions about the Local Neighborhood and Walking and Cycling among Children," *Preventive Medicine* 38 (2004): 39–47.
22. Norman and others, "Community Design and Recreational Environmental Correlates" (see note 5).
23. Ibid.
24. Saelens and others, "Neighborhood-Based Differences" (see note 18); Billie Giles-Corti and others, "Environmental and Lifestyle Factors Associated with Overweight and Obesity in Perth, Australia," *American Journal of Health Promotion* 18 (2003): 93–102; Reid Ewing and others, "Relationship between Urban Sprawl and Physical Activity, Obesity, and Morbidity," *American Journal of Health Promotion* 18 (2003): 47–57; Lawrence D. Frank, Martin A. Andresen, and Thomas L. Schmid, "Obesity Relationships with Community Design, Physical Activity, and Time Spent in Cars," *American Journal of Preventive Medicine* 27 (2004): 87–96.
25. Norman and others, "Community Design and Recreational Environmental Correlates" (see note 5).
26. Catrine Tudor-Locke, Barbara E. Ainsworth, and Barry M. Popkin, "Active Commuting to School: An Overlooked Source of Children's Physical Activity?" *Sports Medicine* 31 (2001): 309–13.
27. Ashley R. Cooper and others, "Commuting to School: Are Children Who Walk More Physically Active?" *American Journal of Preventive Medicine* 25 (2003): 273–76.
28. John R. Sirard and others, "Prevalence of Active Commuting at Urban and Suburban Elementary Schools in Columbia, SC," *American Journal of Public Health* 95 (2005): 236–37; Centers for Disease Control and

- Prevention, "Barriers to Children Walking and Biking to School—United States, 1999," *Journal of the American Medical Association* 288 (2002): 1343–44.
29. Howard Frumkin, Lawrence Frank, and Richard Jackson, *Urban Sprawl and Public Health: Designing, Planning, and Building for Healthy Communities* (Washington: Island, 2004).
  30. Reid Ewing, W. Schroeder, and W. Greene, "School Location and Student Travel: Analysis of Factors Affecting Mode Choice," *Transportation Research Record* 1895 (2004): 55–63.
  31. Catherine E. Staunton, Deb Hubsmith, and Wendi Kallins, "Promoting Safe Walking and Biking to School: The Marin County Success Story," *American Journal of Public Health* 93 (2003): 1431–34.
  32. Marlon G. Boarnet and others, "Evaluation of the California Safe Routes to School Legislation: Urban Form Changes and Children's Active Transportation to School," *American Journal of Preventive Medicine* 28 (2S2) (2005): 134–40.
  33. Robert Wood Johnson Foundation ([www.activelivingleadership.org](http://www.activelivingleadership.org) [accessed October 18, 2005]).
  34. D. C. Grossman, "The History of Injury Control and the Epidemiology of Child and Adolescent Injuries," *Future of Children* 10, no. 1 (2000): 23–52; Transportation Research Board—Institute of Medicine, *Does the Built Environment Influence Physical Activity?*<sup>2</sup> (see note 3).
  35. John Pucher and Lewis Dijkstra, "Promoting Safe Walking and Cycling to Improve Public Health: Lessons from the Netherlands and Germany," *American Journal of Public Health* 93 (2003): 1509–16.
  36. Brian E. Saelens, "Helping Individuals Reduce Sedentary Behavior," in *Obesity: Etiology, Assessment, Treatment, and Prevention*, edited by Ross E. Anderson (Champaign, Ill.: Human Kinetics, 2003), pp. 217–38.
  37. Timperio and others, "Perceptions about the Local Neighborhood" (see note 21).
  38. Frank, Andresen, and Schmid, "Obesity Relationships with Community Design" (see note 24).
  39. James F. Sallis, Adrian Bauman, and Michael Pratt, "Environmental and Policy Interventions to Promote Physical Activity," *American Journal of Preventive Medicine* 15 (1998): 379–97.
  40. [www.nhlbi.nih.gov/health/prof/heart/obesity/hrt\\_n\\_pk/](http://www.nhlbi.nih.gov/health/prof/heart/obesity/hrt_n_pk/) (October 18, 2005).
  41. The website for the Congress for the New Urbanism is [www.cnu.org](http://www.cnu.org). The website for Smart Growth America is [www.smartgrowthamerica.org](http://www.smartgrowthamerica.org).
  42. See [www.americabikes.org/bicycleaccommodation\\_factsheet\\_completestreets.asp](http://www.americabikes.org/bicycleaccommodation_factsheet_completestreets.asp). [October 18, 2005].
  43. Karen Glanz and others, "Healthy Nutrition Environments: Concepts and Measures," *American Journal of Health Promotion* 19 (2005): 330–33.
  44. Simone A. French and G. Stables, "Environmental Interventions to Promote Vegetable and Fruit Consumption among Youth in School Settings," *Preventive Medicine* 37 (2003): 593–610; Leslie A. Lytle and J. A. Fulkerson, "Assessing the Dietary Environment: Examples from School-Based Nutrition Interventions," *Public Health Nutrition* 5 (2002): 893–99; Mary Story, Diane Neumark-Sztainer, and Simone French, "Individual and Environmental Influences on Adolescent Eating Behaviors," *Journal of the American Dietetic Association* 102 (2002): S40–S51.

45. Bing-Hwan Lin, Elizabeth Frazao, and Joanne Guthrie, *Away-from-Home Foods Increasingly Important to Quality of American Diet*, Agriculture Information Bulletin no. 749 (Washington: U.S. Department of Agriculture, 1999); Eric A. Finkelstein, Christopher J. Ruhm, and Katherine A. Kosa, "Economic Causes and Consequences of Obesity," *Annual Review of Public Health* 26 (2005): 239–57.
46. Lisa R. Young and Marion Nestle, "The Contribution of Expanding Portion Sizes to the U.S. Obesity Epidemic," *American Journal of Public Health* 92 (2002): 246–49.
47. Field Research Corporation, "A Survey of Californians about the Problem of Childhood Obesity" (San Francisco: The California Endowment, 2003).
48. Ibid.
49. Ibid.
50. Bettylou Sherry and others, "Trends in State-Specific Prevalence of Overweight and Underweight in 2-through 4-Year-Old Children from Low-Income Families from 1989 through 2000," *Archives of Pediatric and Adolescent Medicine* 158 (2004): 1116–24.
51. Kimberly Morland and others, "Neighborhood Characteristics Associated with the Location of Food Stores and Food Service Places," *American Journal of Preventive Medicine* 22 (2002): 23–29; Shannon N. Zenk and others, "Neighborhood Racial Composition, Neighborhood Poverty, and the Spatial Accessibility of Supermarkets in Metropolitan Detroit," *American Journal of Public Health* 95 (2005): 660–67.
52. Kimberly Morland, Steve Wing, and Ana Diez Roux, "The Contextual Effect of the Local Food Environment on Residents' Diets: The Atherosclerosis Risk in Communities (ARIC) Study," *American Journal of Public Health* 92 (2002): 1761–67; Donald Rose and Rickelle Richards, "Food Store Access and Household Fruit and Vegetable Use among Participants in the U.S. Food Stamp Program," *Public Health Nutrition* 7 (2004): 1081–88; Barbara A. Laraia and others, "Proximity of Supermarkets Is Positively Associated with Diet Quality Index for Pregnancy," *Preventive Medicine* 39 (2004): 869–75.
53. Jason P. Block, Richard A. Scribner, and Karen B. DeSalvo, "Fast Food, Race/Ethnicity, and Income: A Geographic Analysis," *American Journal of Preventive Medicine* 27 (2004): 211–17; Daniel D. Reidpath and others, "An Ecological Study of the Relationship between Social and Environmental Determinants of Obesity," *Health and Place* 8 (2002): 141–45.
54. Jay Maddock, "The Relationship between Obesity and the Prevalence of Fast-Food Restaurants: State-Level Analysis," *American Journal of Health Promotion* 29 (2004): 137–43.
55. D. Simmons and others, "Choice and Availability of Takeaway and Restaurant Food Is Not Related to the Prevalence of Adult Obesity in Rural Communities in Australia," *International Journal of Obesity* 29 (2005): 703–10.
56. Burdette and Whitaker, "Neighborhood Playgrounds, Fast-Food Restaurants, and Crime" (see note 10).
57. Karen Glanz and others, "Why Americans Eat What They Do: Taste, Nutrition, Cost, Convenience, and Weight Control as Influences on Food Consumption," *Journal of the American Dietetic Association* 98 (1998): 1118–26.
58. Howell Wechsler and others, "The Availability of Low-Fat Milk in an Inner-City Latino Community: Implications for Nutrition Education," *American Journal of Public Health* 85 (1995): 1690–92; David C. Sloane

- and others, "Improving the Nutritional Resource Environment for Healthy Living through Community-Based Participatory Research," *Journal of General Internal Medicine* 18 (2003): 568–75; Carol R. Horowitz and others, "Barriers to Buying Healthy Foods for People with Diabetes: Evidence of Environmental Disparities," *American Journal of Public Health* 94 (2004): 1549–54.
59. LaVonna B. Lewis and others, "African Americans' Access to Healthy Food Options in South Los Angeles Restaurants," *American Journal of Public Health* 95 (2005): 668–73.
60. Karen M. Jetter and Diana L. Cassady, "The Availability and Cost of Healthier Food Items," *AIC Issues Brief*, University of California Agricultural Issues Center 29 (2005): 1–6.
61. Allen Cheadle and others, "Community-Level Comparison between the Grocery Store Environment and Individual Dietary Practices," *Preventive Medicine* 20 (1991): 250–61.
62. Allen Cheadle and others, "Can Measures of the Grocery Store Environment Be Used to Track Community-Level Dietary Changes?" *Preventive Medicine* 22 (1993): 361–72.
63. Allen Cheadle and others, "Evaluating Community-Based Nutrition Programs: Assessing the Reliability of a Survey of Grocery Store Product Displays," *American Journal of Public Health* 80 (1990): 709–11.
64. Leslie Mikkelsen, "The Links between the Neighborhood Food Environment and Child Nutrition" (Oakland, Calif.: Issue paper for the Robert Wood Johnson Foundation, 2004); Karen Glanz and Amy Yaroch, "Strategies for Increasing Fruit and Vegetable Intake in Grocery Stores and Communities: Policy, Pricing, and Environmental Change," *Preventive Medicine* 39 (2004): S75–S80.
65. Karen Glanz and Deanna Hoelscher, "Increasing Fruit and Vegetable Intake by Changing Environments, Policy, and Pricing: Restaurant-Based Research, Strategies, and Recommendations," *Preventive Medicine* 39 (2004): S88–S93.
66. Mikkelsen, "The Links between the Neighborhood Food Environment" (see note 64).
67. Robert Wood Johnson Foundation News Digest: Childhood Obesity, July 15, 2005. ([www.rwjf.org/obesity](http://www.rwjf.org/obesity) [August 7, 2005]).
68. [www.umassvegetable.org/food\\_farming\\_systems/csa/index.html](http://www.umassvegetable.org/food_farming_systems/csa/index.html) (August 7, 2005).
69. Glanz and Yaroch, "Strategies for Increasing Fruit and Vegetable Intake" (see note 64).
70. Robert Wood Johnson Foundation News Digest: Childhood Obesity, August 5, 2005 ([rwjf.org/obesity](http://rwjf.org/obesity)).
71. Robert Wood Johnson Foundation News Digest: Childhood Obesity, July 15, 2005 ([rwjf.org/obesity](http://rwjf.org/obesity)).
72. Robert Wood Johnson Foundation News Digest: Childhood Obesity, May 27, 2005 ([rwjf.org/obesity](http://rwjf.org/obesity)).
73. Saelens and others, "Neighborhood-Based Differences in Physical Activity" (see note 18); Giles-Corti and others, "Environmental and Lifestyle Factors" (see note 24); Ewing and others, "Relationship between Urban Sprawl" (see note 24); Frank, Andresen, and Schmid, "Obesity Relationships with Community Design" (see note 24).
74. Saelens, Sallis, and Frank, "Environmental Correlates of Walking and Cycling" (see note 16).
75. Frank, Engelke, and Schmid, *Health and Community Design* (see note 16).

76. Mikkelsen, "The Links between the Neighborhood Food Environment" (see note 64).
77. Frumkin, Frank, and Jackson, *Urban Sprawl and Public Health* (see note 29).
78. Frank, Engelke, and Schmid, *Health and Community Design* (see note 16).
79. Koplan, Liverman, and Kraak, eds., *Preventing Childhood Obesity* (see note 2).
80. Ibid.
81. Gus Cannon, "Why the Bush Administration and the Global Sugar Industry Are Determined to Demolish the 2004 WHO Global Strategy on Diet, Physical Activity, and Health," *Public Health Nutrition* 7 (2004): 369–80.
82. Brownson and others, "Environmental and Policy Determinants" (see note 13).
83. Finkelstein, Ruhm, and Kosa, "Economic Causes and Consequences of Obesity" (see note 45).