SUMMARY REPORT

Obesity and the Built Environment:

Improving Public Health Through Community Design

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National Institute of Environmental Health Sciences

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EXECUTIVE SUMMARY

The built environment can be employed to help fight the nation's raging obesity epidemic, especially at the community level. This was the take-home message from the first-ever national conference on obesity and the built environment, held in May 2004 in Washington, D.C.

At the conference, titled "Obesity and the Built Environment: Improving Public Health Through Community Design," participants first probed how the built environment—which includes all aspects of the environment that we have built or changed, including homes, schools, workplaces, parks, industrial areas, and highways—currently contributes to obesity by affecting eating and physical activity habits and encouraging an increasingly sedentary lifestyle. Participants then discussed how the built environment can be changed to combat obesity, and how environmental health research and interventions can impact this growing public health problem.

The conference assembled more than 600 researchers, planners, health care providers, developers, policy makers, and community and business leaders to develop agendas for future research and policy implementation, and to facilitate partnerships among these disciplines. Highlighting evidence-based strategies for intervention, the conference also pointed to the need for interagency cooperation at all levels of government and for efforts to inform elected officials on the subject.

A consensus emerged from the conference that complex environmental health problems require an integrated response with strategies on multiple levels. Prevention is critical for children, families, communities, and workplaces because up to now obesity has been difficult to treat. We need greater investments in preventing obesity and translating science-based information into effective policy and action for the public. We also need national leadership to achieve these goals.

The conference was sponsored by the National Institute of Environmental Health Sciences (NIEHS).

Schools, Workplaces, and Communities at Large

Although obesity, like most other chronic health problems, is caused by complex interactions between genetics and environmental factors, the rapid increase in obesity over the past 30 years strongly suggests that environmental influences are responsible for this trend; the conference primarily focused on the environmental component.

The conference covered obesity and the built environment in the context of three cross-cutting themes**:** (1) schools and children; (2) communities and families; and (3) worksites, employers, and employees. Across these themes, participants identified key environmental factors, including intensive marketing of unhealthy foods, the cultural belief that junk food tastes best, the lack of full-service supermarkets and other healthy food outlets in many neighborhoods, and poorly designed communities that discourage walking, biking, and other physical activity.

Part of the environmental component of obesity is an overall package of unhealthy lifestyles and behaviors that contribute to the problem. These behaviors include anything that contributes to a more sedentary lifestyle (such as playing video games excessively) and eating excess calories (such as a high-sugar, high-fat diet). Often these behaviors start in childhood, speakers stressed, and childhood obesity is strongly associated with adult obesity.

Many economic and political forces contribute to the problem, from budget cuts that slash physical education and sports programs in schools to the proliferation of vending machines on school campuses. For example, candy and snack food manufacturers, soft drink bottlers, and fast-food restaurants heavily market in schools, and many schools depend on revenues from these and other sources, such as annual fundraisers selling doughnuts and candy bars.

Many issues regarding access to healthy food spill over into the community at large, as well. The evidence is clear that healthier foods such as lean meats and fresh fruits and vegetables often cost more and that lower-cost diets are often high in starches, added sugars, and added fats, which are known to contribute to weight gain.

Emerging evidence further shows a direct association between community design and residents' levels of physical activity. The likelihood of obesity declines with increases in mixed land use, but rises with increases in time spent in a car per day, according to recent research.

Obesity has become a growing concern for employers, as well, in terms of controlling health care costs and maintaining worker productivity. The numbers are daunting. Nationally, obesity costs U.S. companies $13 billion a year, including $8 billion for health insurance, $2.4 billion for sick leave, $1.8 billion for life insurance, and another $1 billion for disability insurance, according to some estimates.

In addition to the increased use of health services by obese employees, employees and employers alike incur additional costs from the impact of obesity on absenteeism, which results in lost employees' income and lower corporate productivity and profits. In fact, obese workers are almost twice as likely to be frequently absent as people of a healthy weight. Obesity-related illnesses cost employers 39.3 million lost workdays, 239 million days of reduced productivity, and 62.7 million doctor visits annually.

Setting a Research Agenda

The latest research is beginning to give new insights into the role of the built environment in obesity. But many research gaps remain. Some of the emerging findings, however, indicate key directions for obesity investigators to follow.

More and more studies are revealing interesting influences in terms of how the environment impacts nutrition and physical activity. In general, more compact communities and mixed-use communities have been shown to increase physical activity and lower Body Mass Index (BMI). Food pricing as well as labeling can reduce caloric

intake as well as fat consumption. Moreover, researchers have found that low cost diets are more conducive to overweight, while healthier diets are generally more expensive.

All of these emerging lines of evidence—whether linking environment to activity or environment to nutrition—are not only recent, but many show purely associations or relations. So far they have fallen short of demonstrating causality. A research emphasis should be placed on cause and effect studies.

The web of interdependent determinants that impact individual and community health needs to be evaluated in the context of both the built environment and social capital. In this sense, social capital refers to the level of respect, trust, and interaction that occurs in a given neighborhood or to the degree of public trust and civic responsibility that exists within a given community. The interaction between the built environment and social capital is key to determining community health and the factors that impact individual health.

An increasing number of community-based interventions are being shown to be effective in changing behavior related to obesity. Point of decision prompts can be effective in increasing physical activity. For example, cues in transportation settings work to encourage people to take the steps more often.

More research should expand upon recent results that indicate the promise of such interventions. Community-wide campaigns can at least have a small effect given that they're conducted in isolation in trying to start enhancing physical activity in a broad array of settings. Interventions related to social support, or those that take place outside the home or family setting, can increase physical activity and the degree of social capital within a given community. Improving access to places where physical activity can occur also improves opportunities for physical activities.

Other recent findings provide further lines of evidence that can be used to develop indicators as well as intervention studies. In one study, consumption of high fat, fast food meals resulted in a 200 percent increase in inflammatory factors and reactive oxygen species in plasma within three hours and the effect lasts for at least six hours. The implication is that continued exposure to such foods sets up the body to exist in an inflammatory and oxidative state that is associated with hypertension. The foods that impact health status can also provide new types of markers to track such impacts.

A second study found that obese 9- to 12-year-olds have the same arterial elasticity as 45-year-old smokers. But a six-week diet and exercise program intervention improved arterial elasticity by 20 percent. Another 20 percent improvement was seen if the intervention was maintained for a year. Interventions can be effective not only for decreasing obesity and overweight but also other adverse health outcomes on short- and long-term bases.

The conference produced a plethora of hypotheses and research questions for exploration. They include: Does exercise enhance academic achievement or worker productivity? Do

longer distances between children's homes and schools increase obesity? What kind of community design allows people to participate in physical activity?

More attention should be paid to cost-effectiveness studies and to accessing the impact of how changes to the built environment affect health in schools and workplaces. For example, measures of walkability should be developed to include such factors as sidewalks, transit modes, aesthetics, and safety. Multilevel analysis at the individual, interpersonal, family, community and society levels needs to be accommodated. The research community needs to develop a common set of instruments for researchers and practitioners so studies can be routinely compared. Better use needs to be made of existing food and nutrition measures such as BMI, insurance rates, school and work health records, supermarket data, and vehicle miles traveled. Geographical locator systems should be employed to more successfully gather data.

Better assessments need to be conducted of regulations and policies that affect the environment. More prospective longitudinal studies are needed because most studies conducted to date have been cross sectional in nature. This provides associations but misses the question of cause and effect. Qualitative and quantitative approaches need to be combined that include a focus on economics and cost-effectiveness.

The research community should meld this variety of approaches with knowledge about different population groups in designing studies. Education and intervention designs should be combined and applied to multiple levels. Different points along the life course should be examined, as well as sex and ethnicity, and attached to a viable interdisciplinary approach. Models that have had some element of success should continue to be identified and lessons learned from those. Natural experiments should be more widely utilized to explore the changes in our built environment to assess their impact.

The research and policy communities need to be able to visualize what the built environment should look like to achieve the desired outcome. Connections, partnerships, and cooperation should be fostered to realize that vision of the built environment that is health promoting.

A Coordinated Effort

Overall, research into the links between obesity and environment is in its infancy. To begin with, researchers to a large extent still can't clearly define what a healthy diet is; witness the debate over low- and high-carbohydrate diets. And the questions only get more complex from there. Relationships between community design, patterns of social interaction, and the formation of a sense of community cooperation are all factors, as are aspects of safety and security, air and water quality, mental health, and more.

Researchers admit much work remains to understand exactly how obesity and the built environment are connected. Moreover, there are differences between what works for adults and children.

Successful strategies require governments and local communities to work together to initiate programs in schools, workplaces, and communities, and to involve food producers, industries, and consumer associations. Examples of successful partnerships with industry that target physical activity and obesity include Gatorade's "Get Kids in Action" (which has research and education components, as well as outreach to elementary and middle school children), Nike's "NikeGO" (which funds physical activity programs and facilities for children), and General Motors' "Just a Bit Gets You Fit" (which emphasizes the concept of exercising in manageable chunks of time). All three work to change lifestyles and behaviors through interventions at schools or worksites.

Studies reveal that these and other interventions can be effective. "Social" marketing, which uses conventional marketing and advertising approaches to promote a change in behavior (for example, those related to overweight or obesity), can help reverse trends in weight gain. Food labeling has also been shown to decrease the amount of calories and fat consumed. Moreover, reducing prices of healthier foods increases their sale.

We still need to forge stronger links between seemingly unrelated disciplines—issues that seem unrelated to obesity may, in fact, be connected. For example, the brightness and number of lights lining a sidewalk or pathway could impact physical activity in a neighborhood. In addition, developers and planners should begin measuring and accounting for the health impact of proposed land use plans and future development projects. For example, we should factor in siting schools, and we should make bike trails and adequate walkways an inherent part of road and highway construction.

A growing body of evidence suggests that well-designed health promotion and disease prevention programs can improve workers' health, morale, work relations, and productivity, as well as lessen disease risk, save businesses money, and boost financial performance of organizations. However, much work remains to be done to uncover the relationships among the built environment, obesity, and nutrition for adults and children of all groups.

KEYNOTE PRESENTATIONS

Addressing the Environment to Reduce Obesity

Dr. James Hill, University of Colorado Health Sciences Center

An Epidemic of Obesity

Obesity has already reached epidemic proportions in the United States and is increasing at an alarming rate worldwide (1,2). Obesity rates are increasing in all segments of the population, regardless of age, ethnicity or education level (1).

While some obesity has always existed in the population, it is only in recent decades that obesity rates have risen to the level of becoming a major threat to public health. While it seems that the epidemic of obesity has "exploded" into the public health arena, the obesity epidemic likely developed gradually over a period of several decades. For example, Hill et al. (3) examined the rate of weight gain in the population over the past 7-10 years. Using both cross-sectional and longitudinal data sets, they found that the average America adult has gained an average of 1-2 pounds per year during that period. They further estimated that most of the weight gain in the population could be explained by a very small degree of positive energy balance, of the order of 100 kcal per day.

What has changed either in human physiology or in the environment to allow the degree of positive energy balance that has produced the gradual increase in the weight of the America population? While genetic factors contribute significantly to body weight and body weight regulation, it is difficult to ascribe the majority of the blame for the obesity epidemic to genes or even to biology. Our biology has just not changed sufficiently to explain the weight gain over time. Our gradual population weight gain is more likely due to factors within the environment that have influenced our behaviors in such a way as to "overwhelm" our physiological regulation of body weight. There are many examples of how our food and physical activity environments have changed over the past half century. Unlike our distant ancestors we have a constant food supply that readily accessible, very energy dense and inexpensive. Also unlike our distant ancestors, we have to expend very little physical activity to secure food. We also have to expend very little energy to secure shelter and very little physical activity for transportation. While our distant ancestors were challenged to get sufficient energy intake to meet a necessarily high level of energy expenditure, our challenge is the opposite. Most Americans are attempting to restrict energy intake in order to match a very low level of energy expenditure.

The recognition of the role of the environment in promoting weight gain and obesity is an important milestone in addressing the obesity epidemic (4). The answer to dealing with obesity may lie much more in "fixing" the environment than in "fixing" human biology.

Defining the environment

While we recognize that the environment in which we live facilitates weight gain, it may be useful to look at the difference components that constitute what we refer to as the "environment".

1. The **built environment** includes how we build our communities, our transportation systems, architectural design, use of land, parks, and public spaces.
2. The **commercial environment** includes the goods and services that we are constantly tempted to buy, including products that affect our energy intake and energy expenditure.
3. There is the **policy environment** that directly and indirectly affects patterns of food intake and physical activity in the population.
4. Finally there is the **social and cultural environment**. This could be the most powerful part of the environment since this is a reflection of our social and cultural norms, which dictate the strength of political will for change.

Our Current Environment

Let's first consider what today's environment looks like. Each component of our environment facilitates obesity. We build communities that discourage physical activity and encourage automobile use. We build neighborhoods without sidewalks, further discouraging walking. We design our buildings for elevator and escalator use and not for stair use. Our commercial environment involves having food available everywhere at low cost. We heavily advertise food, especially to children. Many schools contain vending machines with many high energy density foods and some schools even have fast food outlets. Our commercial environment also heavily promotes activities and products that discourage physical activity. We heavily advertise automobiles, home entertainment systems, and other sedentary forms of entertainment. Our current policy environment is one that encourages, through agriculture subsidies, consumption of high energy dense, manufactured foods and discourages consumption of fruits and vegetables. Our policies have allowed for the virtual elimination of physical education in schools. Our transportation policies have favored use of personal automobiles at the expense of other forms of more physically active transportation. Finally, our social and cultural environment is driven by our materialistic goals. Our society is currently devoted to increasing availability of goods and services – at the lowest possible price. Both political parties support increasing the GDP. In summary, our environment is uniformly one that promotes consumption of food and discourages physical activity. Our physiological systems for achieving energy balance and keeping body weight at a healthy level are not sufficiently strong to function within such an environment.

The Future: What would an environment that facilitated healthy lifestyles and healthy weights look like?

We have recognized that it is our environment that must be fixed if we are going reverse our epidemic of obesity. Where do we begin and what would success look like? We must begin to seriously investigate how to change each component of the environment to make

it conducive to healthy lifestyles and healthy weights. It may be helpful to begin to "paint a picture" of what such an environment would look like. Then we can develop strategies for getting there. We are in the early stages of understanding the relationship between the environment and obesity, and we need substantially more research in this area. But, because of the urgency of the issue, we must also encourage intervention projects based on our best available data and based on creative ideas. We must collect data to evaluate success of this research.

How do we get from here to there?

Our current environment does not encourage healthy lifestyles, and it will take time to create one that does. In the meantime, Americans get fatter each year, and we will soon lose the opportunity to prevent obesity. Changing the environment is the best long-term solution, but it is a decades-long effort. In the short-term we have to also put efforts into helping people make behavior changes to keep the problem from worsening. If we could simply achieve small behavior changes to prevent further weight gain in the population, this would give us a chance at "holding the line" while we have time to make environmental changes that can support and sustain the behavior changes.

America on the Move: A catalyst for Change

America on the Move (AOM; americaonthemove.org) is a grassroots, national initiative to inspire people to make two small changes to prevent further weight gain and improve lifestyle. AOM asks people to 1) walk an additional 2000 steps (about 1 mile) each day (burns about 100 kcal) , and; 2) choose one eating behavior each day that eliminates about 100 kcal. By engaging in these two simple behaviors, most of the population, regardless of age, can prevent further weight gain. For children, these changes can reduce excessive weight gain.

We can begin expanding the goals of America on the Move by working from the individual out. We can start by modifying the environment to make it easier to engage in the two simple behavior changes. Over time we can hopefully modify the environment sufficiently such that the equivalent of 2000 steps/day of walking and 100 kcal/day of less energy intake will happen with much less conscious effort. For example, the community of the future may make it more efficient to travel by foot or bicycle than by automobile. Further, the healthiest and least energy dense foods may be the "best deals" in restaurants, encouraging lower energy intake with little conscious effort. Our buildings and homes could be designed to maximize physical activity – all requiring little conscious effort on the part of the person.

Programs like America on the Move can be catalysts to get from here to there. The small changes message inspires individuals to begin to make small changes to improve lifestyle. At the same time, it allows the private sector to also begin making small changes to help support and sustain the small changes being made by individuals. Over time we may be able to shift the emphasis more from individual behavior to the environment. It is unlikely that we will be able to change the environment to such a degree that individual behavior change will be unnecessary. The healthy community of

the future will likely involve efforts directed both to modifying individual behavior change and the environment.

Summary

Recognition of the role of the environment in facilitating obesity is an exciting advancement in our quest to reverse the epidemic of obesity. The next years should bring a greater understanding of how the environment affects behaviors that impact obesity and new strategies to change components of the environment to facilitate healthy lifestyles. Understanding and changing the built environment has enormous possibilities to help, but we must understand that the built environment is only one part of a bigger environment that includes how we have constructed our society. While the task we face is daunting, success will only come if we can envision what a future state would look like and develop strategies to get us there.

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Poverty and Obesity

Dr. Adam Drewnowski, University of Washington

Summary

The obesity epidemic in the US has become much more than a biomedical problem. Obesity is the consequence of economic decisions – some voluntary and others not - that have much to do with social and economic resources, food prices, and diet costs. This presentation will focus on two aspects of the obesity epidemic – neighborhood resources and diet costs. Area-based measures of socioeconomic status supplement the conventional measures of education and income. The issue of diet costs represents a new look at the standard advice to consume "healthier" diets. Diets composed of refined grains, added sugars, and added fats are more affordable than are diets based on lean meats, fish, fresh vegetables, and fruit. There is an inverse relationship between energy density (kJ/g) and energy cost ($/MJ), such that energy-dense foods also provide the most dietary energy per dollar. Good taste, high convenience, and – even more important – the low cost of sweets and fats may indeed lead to overeating and weight gain. Not surprisingly, highest rates of obesity are found among population groups with highest poverty rates and the least education. Are the various sectors of the food, grocery, and restaurant business legally liable for providing low-income consumers with overly cheap food? Or does the broader problem lie with the current wage policies, employment practices, imports, tariffs and trade?

Introduction

Rising rates of obesity in the U.S. have been linked to the growing consumption of fast foods, snacks, caloric beverages, sweets and desserts. Studies have examined the contribution to rising obesity rates of added sugars, added fats, increased portion sizes, nutrient composition of foods away from home, and the energy density of the diet. Public health policies for the prevention of obesity increasingly call for taxes and levies on fats and sweets, both to discourage consumption and to promote alternative food choices. The new emphasis on the "toxic" or "obesogenic" food environment has led to legislative and policy measures to improve nutrition in workplaces, in neighborhoods, and in schools. In addition, various sectors of the food, grocery and restaurant business find themselves exposed to lawsuits for their alleged role in causing the obesity epidemic.

The basis of obesity lawsuits is that consumers are deceived or enticed by the food industry into overeating, if not actually made addicted to fast foods. The basis of obesity defense is that the consumers have a choice and are capable of saying no. The present economic argument is that not all diets cost the same, such that consumer choices are limited by the economic realities of life. Whereas "unhealthy" diets cost less, the recommended "healthful" diets are likely to cost more. As a result, the industry has no need to entice consumers through deceptive marketing practices to purchase "unhealthy" foods. Such purchases are, in many cases, driven by the families' economic circumstances, over which the food industry has no control. Not all consumers have the same degree of choice when it comes to purchasing more healthful fresh produce, fruit,

lean meats, and fish. There are some good economic reasons why poverty and obesity are so closely linked.

Poverty and obesity are linked

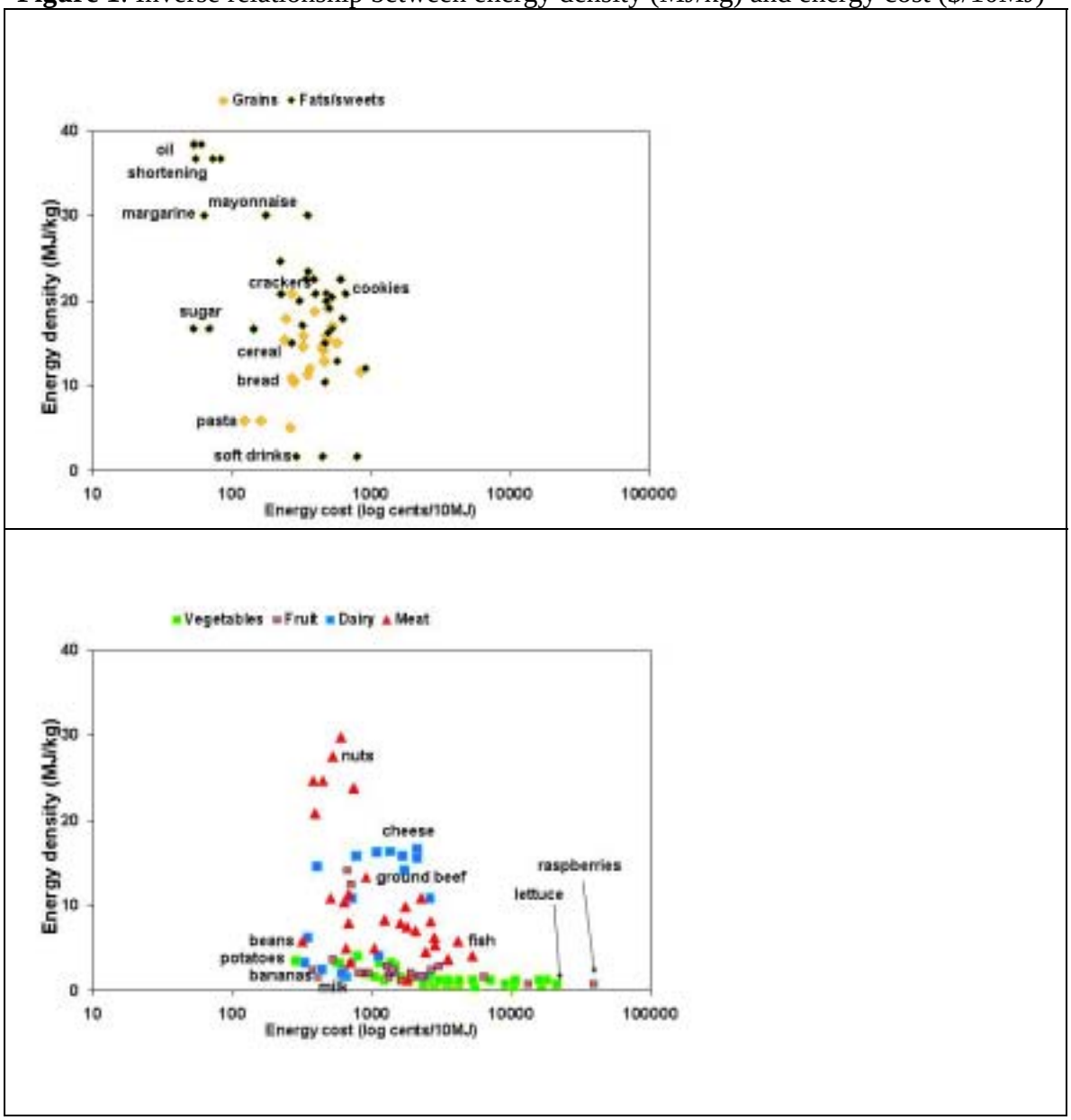
The rates of obesity and type 2 diabetes in the U.S. follow a socioeconomic gradient, with highest rates observed among racial/ethnic minorities and the poor. Among women, higher obesity rates tend to be associated with low incomes and low education. The association of obesity with low socioeconomic status (SES) has been less consistent among men. Obesity is defined as body mass index (BMI=kg/m^2) greater than 30, whereas overweight is defined as BMI greater than 25. Although obesity rates have continued to increase steadily in both sexes, at all ages, in all races, and at all educational levels, highest rates occur among the most disadvantaged groups. Obesity and food insecurity, defined as "limited or uncertain availability of nutritionally acceptable or safe foods," also appear to be linked. In particular, female recipients of USDA food assistance were more likely to be obese. Given that low-income families are the chief beneficiaries of food assistance programs, links between food insecurity and obesity have implications for food and nutrition policies in the U.S.

Energy dense foods cost less

Developments in agriculture and food technology have made energy-dense foods accessible to the consumer at a very low cost. **Figure 1** shows the inverse relationship between energy density (MJ/kg) of foods and their energy cost (cents/10MJ). Food prices were collected in early 2003 in a Seattle supermarket. Energy cost of cookies or potato chips was 20 cents/MJ (1,200 kcal/$), whereas that of fresh carrots was about 95 cents/MJ (250 kcal/$). Energy cost of soft drinks was, on average, 30 cents/MJ (875 kcal/$), whereas that of orange juice from concentrate was 143 cents/MJ (170kcal/$). Fats and oils, sugar, refined grains, potatoes, and beans provided dietary energy at the lowest cost. As indicated by the logarithmic scale, the differential in energy costs between lard and lettuce was several thousand percent.

Dry foods with a stable shelf life are generally less costly (per MJ) than are perishable meats or fresh produce with a high water content. As a rule, potato chips, chocolate, and locally-bottled soft drinks are less expensive – per calorie - than are lean meats, fish, fresh vegetables, and fresh fruit. Selecting refined grains, added sugars, and vegetable fats may represent a deliberate strategy to save money. Lower food costs may lead to more energy-dense diets, and total energy intakes may actually increase. Paradoxically, it is possible to spend less and eat more, provided that the extra energy comes in the form of added sugar and added fat. The association between poverty and obesity may be mediated, in part, by the low cost and high palatability of energy-dense foods.

Figure 1: Inverse relationship between energy density (MJ/kg) and energy cost ($/10MJ)



Obesity studies have stressed the sugar and fat content of snacks, fast foods, beverages, and confectionery. Epidemiologic studies have linked the consumption of fats and sweets, potatoes, and refined grains with higher glycemic load and higher risk of obesity and type 2 diabetes. Interestingly, foods implicated in promoting obesity were those that provided dietary energy at a very low cost. The same ingredients, when priced higher, have been immune from complaint. A case in point, sweetened soft drinks – principal ingredient sugar – are routinely associated with weight gain. Yet Slimfast – principal ingredient sugar (Slimfast is 66% sugar) – is generally associated with weight loss. Seemingly, the objection is not so much to sugar per se but to its excessively low price.

The standard dietary advice is to replace fats and sweets with more fruit, vegetables, whole grains, poultry, and fish. However, the more healthful foods are also more

expensive and beyond the reach of many. Some low-income families limit their food budget to $100 for 4 people per week, or less than 4 dollars per person per day. The only foods that can be obtained for this amount of money will be high in refined grains, added sugars and added fats.

Do healthier diets cost more?

Diet quality in the U.S. is very much a function of socioeconomic status. People who are older, wealthier and better educated are both thinner and have better diets than do the poor. This is not restricted to the U.S.: similar associations between higher incomes and higher quality diets were also found in Canada, France, the U.K. and other countries of the European Union. The impact of SES variables on diet quality has normally been ascribed to a higher educational level or greater awareness of health issues among higher-income groups. Another possibility is that food choices are driven by the economic realities of life.

That the share of income spent on food decreases as incomes rise is known in economics as Engel's law (1857). Because incomes have increased faster than food costs, average food expenditures in the U.S. have dropped to only 10.7% of incomes in 1997. In 1997, Americans spent 9.4% of disposable income on foods consumed at home and 4.1% on foods consumed away from home. The drop in food spending was disproportionately greater than the drop in spending on other goods. Despite spending less, low income families devoted a higher proportion of diposable income to food. By 1999, mean total expenditure on foods and beverages (including alcohol) was estimated at just under $8.00 per person per day. Assuming a daily ration of 10.5 MJ (2,500 kcal), the estimated mean energy cost of the total diet was 76.9 cents/MJ. In Western societies, lower energy costs are associated with higher energy intakes.

Obesity: an economic hypothesis

Food choices in obesity have been explained in terms of biology, physiology, and behavior. The biological explanation has been that "cravings" for fats and sweets are driven by central metabolic events, serotonin imbalance, altered leptin levels, or by the endogenous opiate peptide system. Physiological explanations have invoked insulin resistance and the glycemic index of foods. Psychosocial explanations have addressed inadequate nutrition knowledge, an addictive personality, stress, or seeking comfort in high-fat foods. Environmental approaches have blamed the wide availability of snacks, fast foods, and soft drinks, "supersized" portions, and the presence of vending machines in schools

The present model holds that obesity is, to a degree, a socio-economic phenomenon. The lower cost diets tend to be higher in refined grains, added sugars and fat. Energy-dense foods are not only palatable, but satisfy hunger at the lowest cost. Access to healthy diets can be limited not only by economic limitations, but also by features of the built environment. Obesity in the US is an environmental problem and requires environmental and policy interventions.

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Recreating Communities to Support Active Living: A New Role for Social Marketing

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Synopsis

The lack of routine physical activity has become an all too pervasive health threat in the United States. Social marketing can be used directly to promote increased physical activity among people who have access to active living options (e.g., safe and convenient sidewalks or bike paths). A second, albeit indirect, use of social marketing to promote physical activity — and the focus of this article — involves promoting behaviors that influence the built environment for the purpose of increasing people's access to active living options. This use of social marketing involves changing the behavior of consumers, developers, distribution channels (e.g., real estate agents) and policy makers. The approach offers public health and other organizations a disciplined, consumer-focused means of mobilizing their available resources in a manner that maximizes the odds of creating active living communities. These means include understanding the competition, understanding target markets, creating mutually beneficial exchanges, segmenting markets and targeting them based on anticipated return. This article identifies specific opportunities for applying the social marketing approach to create active living communities, and identifies opportunities at the state and national level that will enhance the effectiveness of local efforts. (Am J Health Promot 2003;18[1]:114–119.)

INTRODUCTION

The design of the built environment can have substantial impact on human health, both beneficial and deleterious.[1] Although little recognized until recently, one now pervasive harmful impact of the built environment in the United States involves community development that ''may deter or entirely prevent individuals from making choices that promote healthy behaviors, especially routine physical activity.''[2] Unlike many lesser risks that have captivated the public's attention in the current postmodern era,[3] the negative impact of the built environment on our ability to live actively has thus far gone largely unnoticed by citizens and policy makers alike. This may reflect, in large measure, the fact that the health community has only recently awakened to the issue and its associated risks.[4] The lack of public outcry may also reflect inherent biases in both human information processing[5] and in media reporting patterns[6] that predispose the public to attend to risks that are novel and externally imposed (e.g., vaccine safety, food safety, potentially tainted mail), rather than risks that appear mundane and of our own creation (e.g., lack of physical activity).

Public outcry or not, changes can be made in the built environment to better support active living. *The Guide to Community Preventive Services* (Community Guide), for example, strongly recommends creating or improving access to places for physical

activity (e.g., sidewalks, walking and biking trails, community exercise facilities), in combination with informational outreach to make people aware of these resources.[7,8] Researchers with the Community Guide are also currently developing recommendations regarding transportation policy and infrastructure changes to promote nonmotorized transit, as well urban planning approaches such as zoning and land use. In specific terms, these recommendations are likely to include the following:

- Enabling active transportation, ideally walking or bicycling, alone or in combination with mass transit;
- Encouraging attractive medium- and high-density residential development options in mixed-use neighborhoods; and
- Increasing readily accessible greenspace that encourages recreational physical activity.

At the heart of each of these active-living community objectives is the need to influence and support people's behavior—including consumers, developers, policy makers, and others. Therefore, our ability to change the built environment for the purpose of promoting active living is intimately tied to our ability to influence behavior.

Continuum of Behavior Management Options

Rothschild[9] articulated a continuum of options through which to pursue population-based behavior change goals

Table 1
Continuum of Education, Marketing, and Law*

Use Educational Approaches to Manage Behavior When	Use Social Marketing Approaches to Manage Behavior When	Use Law-based Approaches to Manage Behavior When
• Target market is prone to behave as desired	• Target market is neither prone nor resistant to the behavior being promoted	• Target market is resistant to behave as desired.
• Self-interest and benefits of the behavior are easily conveyed to target market	• Self-interest and benefits can be conveyed to target market by enhancing and managing the offer	• Self-interest and benefits cannot be conveyed to target market
• There is no or weak competition.	• The competition is active.	• The competition is unmanageable.
Active-living examples	Active-living examples	Active-living examples
Consumers Inform motivated audiences about opportunities they were not previously aware of, or had not considered (e.g., the ability to take a bike onto the subway).	Consumers Enhance motivation by improving (e.g., installing bike carriers on the front of public buses) and promoting the available options (e.g., offering incentives to use bike carriers).	Developers Require the development of improved options (e.g., sidewalks and bike paths).
Policy makers Inform local officials of innovative approaches being used in other communities.	Policy makers Provide language for model policies based on an analysis of benefits and barriers as perceived by the targeted policy makers.	

* Adapted from Reference 9, Rothchild 1999.[9]

(Table 1). At one end of the continuum are people who are prone to adopt a recommended behavior because of their willingness to see it as being in their self-interest. Educational campaigns alone are generally sufficient to create behavior change among members of populations at this end of the continuum. In the middle of the continuum are those populations who are neither prone nor resistant to the recommended behavior. Social marketing can be used to elicit behavior change in these populations by increasing the perceived benefits, reducing the perceived barriers, or in other ways improving the opportunities to adopt the recommended behavior, thereby enhancing the perceived value of the recommended behavior. Populations at the far end of the continuum are resistant to the recommended behavior because they do not see it as being in their self-interest. To create behavior change in these latter populations, law- or policy-based approaches may be required (e.g., mandating seat belt use in automobiles).

Rothschild's[9] continuum assumes that the recommended behavior is a freely available option to consumers. This assumption is only partly true in the case of active living. Specifically, active-living options are not freely available when the built environment ''deter(s) or entirely prevent(s) individuals from making choices that promote . . . routine physical activity.''[2] Selecting a home that offers safe and convenient access to sidewalks, bikeways, trails, and mass transportation is a case in point: only 4% of the nation's roads are served by transit, and fewer than 50% of Americans live within a quarter mile of a

transit stop.[10] This may explain why nearly 75% of all excursions less than 1 mile are made in an automobile.[11]

This situation—that active-living options are not freely available to many Americans—necessitates that we consider two distinct uses of social marketing. Through the first approach, social marketing programs can be used to *directly* promote active-living behaviors among consumers who have access to these options. This traditional use of social marketing has been described by many authors[9,12,13] and is not the focus of this article. The second approach to social marketing involves *indirectly* promoting active living by promoting behaviors that shape the built environment in a manner that increases access to active-living options. This latter use of social marketing—changing behaviors that positively shape the built environment—is the principal focus of this article. It is the more challenging of the two approaches to promoting active living through social marketing in that it requires eliciting behavior changes from consumers (with regard to where to live, how to commute and shop, and how to spend recreational time); critical segments of the business community (including real estate developers and transportation operators); and public officials (for example, to create incentives for active commuting and mixed-used residential development). It may also, however, be the approach with the greatest potential to promote active living over the long-term.

Social Marketing Defined

A clear understanding of the social marketing concept is essential to grasping its potential for creating active-living communities. Maibach et al.[12] operationally define social marketing as

> . . . a process that attempts to create voluntary exchange between a marketing organization and members of a target market based on mutual fulfillment of self-interest. The marketing organization uses its resources to understand the perceived interests of target market members, to enhance and deliver the package of benefits associated with a product, service, or idea, and to reduce barriers that interfere with its adoption or maintenance. Target market members, in turn, expend their resources (e.g., money, time, effort) in exchange for the offer when it provides clear advantages over alternative behaviors.

Social marketing is generally used as a means of eliciting behavior change from consumers (e.g., people with suboptimal levels of physical activity); however, the approach has no such inherent limitations.[14] The target market in social marketing can also be policy makers, real estate developers, transportation planners, and others who influence the active-living options available to the public.

The role of the marketing organization invoked in the definition above can be played by any organization working in the public's interest, such as a local health department, transportation authority, community hospital, or even community members themselves. Doing so, however, may require the marketing organization to plan and execute programs in unfamiliar ways.[14] Moreover, adopting a marketing approach to promote active-living communities will also require public health organizations to work with a new group of partners including urban planners, transportation planners, architects, and real estate developers.[4]

Critical Attributes of a Social Marketing Approach

To promote active-living communities through a social marketing approach, marketing organizations must become facile with the following critical steps.

Understanding the Competition. Offers to the consumer are never made in a vacuum. The competition consists of the myriad offers being made to a target market (e.g., ''buy our SUV and you will be safe and feel secure''), as well as their preference for the status quo (e.g., ''I've always lived in a single family home in the suburbs.''). To effectively offer an option that shapes the built environment in a beneficial manner (e.g., higher density mixed-use housing or mass transit choices), the marketing organization must understand not only the perceived benefits and barriers associated with the recommended option, but also the benefits and barriers associated with competing options, as perceived by members of the target market. With regard to policy change, the competition is other policies— and their supporters—that preempt or undermine the recommended policy.

Understanding Target Markets. Consumer research is a critical part of social marketing in that it enables the marketing organization to understand how best to use its resources—and those of its partners—to make an attractive offer to members of a target market. Through consumer research, the marketing organization can identify

- The bundle of benefits associated with a given offer that is most attractive, and therefore motivating, to target market members;
- The costs (i.e., money, time, effort, self-concept) and other barriers to adoption or maintenance of the behavior that are most important to target market members, and how these costs might be reduced; and
- How best to communicate about, or promote, the offer so that target market members become aware of and interested in it.

Creating Mutually Beneficial Exchanges. Marketing transactions are entirely voluntary on the part of all involved parties. For consumers, producers, and distribution channels (i.e., individuals or organizations who facilitate the transaction between the marketing organization and the target market) to have sufficient motivation to participate in the transaction, they must perceive the benefits to them to outweigh the costs. To effectively create active-living community options, marketing organizations must consider and accommodate both the wants and needs of the end consumer, the developer (if applicable), and key distribution channels. Consider, for example, expanding market demand for walkable, mass transit accessible communities in a

metropolitan area where workers are becoming tired of long commutes on congested highways. Consumer demand can be thwarted, or redirected, without the active support of developers and members of the distribution channel. Home builders, for example, may prefer to build properties in low density suburban developments for a variety of reasons including fewer zoning restrictions, larger return on investment, and their perception of consumer preferences. Similarly, real estate agents may be reluctant to recommend nontraditional properties for fear that buyer satisfaction will be low. To harness home builders' and real estate agents' considerable enabling potential, their motivations must be understood and accommodated.

Segmenting Markets and Targeting Based on Anticipated Return. Segmentation is the process of using consumer research to identify groups of people (i.e., target markets stratified by age, income, geography, etc.) who share certain relevant attributes such that they are likely to respond to a given offer in a similar manner. Psycho-behavioral segmentation—segmenting audiences based on *what they are doing (i.e.,* their current behavior) and *why (i.e.,* the relevant psychosocial and environmental antecedents)—may offer a viable approach for marketing organizations seeking to promote offers that shape the built environment in an activity-friendly manner.[15,16] When a marketing organization conducts segmentation research, it can make informed decisions about how best to focus its resources on one or more of the identified target markets. Segmenting developers, distribution channel members, and policy makers can also help marketing organizations identify opportunities that are likely to have a high return on investment. For example, based on their advertisements that promote walking more and using the car less, Volvo, an automobile manufacturer, may be willing to collaborate with the public health community to share marketing insights and cross-promoting active living offers. Bicycle manufacturers, walking shoe manufacturers, and other companies in the recreation industry may also be prime prospects for comarketing initiatives.

Applying Social Marketing to Create Active-living Communities

Unfortunately, the published literature has few examples of social marketing programs intended to create active-living communities. McKenzie-Mohr[17,18] has published a number of excellent conceptual overviews on the potential to apply social marketing for sustainability, but there is little published empirical literature on the topic. Web-published case studies demonstrate that social marketing has been applied to promote active-living and sustainability objectives in a variety of municipalities with promising results,[19–21] including reductions in vehicle engine idling[22]; increased walking, cycling, and bus usage[23]; and reduction of single-occupant vehicle use.[24,25] For the potential of social marketing to promote active-living communities to be realized, however, it is critical to move beyond good case studies in selected (usually favorable) policy environments to develop marketing-based models that can be generalized and mainstreamed.

A number of major opportunities are ripe for immediate pursuit by the public health community. These include competitive analyses, segmentation analyses, developing target market profiles, and creating demand and reducing barriers for active living offers among consumers and policy makers.

Conduct Competitive Analyses. For any given active-living community objective (e.g., promoting mixed-use medium density developments), the competitive set must be identified and assessed. What are the competing options, and how do consumers see the benefits and costs associated with each? How did consumers reconcile benefits vs. costs to make the decision to pursue their current behavior? How do developers and distribution channel members (e.g., real estate agents) influence consumers' decisions?

Conduct Segmentation Analyses. For each market (i.e., individual home buyers, renters of commercial space, policy makers) and each potential group of distribution channel members (e.g., city planners, transportation planners, real estate agents, architects), who are the prime prospects for a given active-living community offering (e.g., a transit system, a mixed-use housing development, a network of sidewalks and bicycle trails)? In other words, which target markets are likely to yield the greatest return? Do certain target markets have a high propensity to adopt a spectrum of active-living community options, or must each objective be pursued through an objective-specific approach to segmentation?

Profile Target Markets. Once target markets are identified, their perceptions and predispositions regarding the full spectrum of active-living community objectives should be clearly described. Which health, leisure, financial, social, and other benefits do consumers most want? Which costs (e.g., time, money, effort) and other barriers serve as the most important impediments to motivation and action? Which incentives will most encourage consumers to adopt the behavior on a trial basis? How can convenience of the offer be improved? How should promotional efforts (e.g., advertising, news media, one-on-one conversations with intermediaries) be used to increase awareness of, and interest in, active-living options?

Create Demand. When there is consumer demand for a product, producers compete to bring that product to the market efficiently and effectively. As consumer demand grows, so grows the number of producers willing to invest resources to meet the demand. A recent national survey of home developers and builders indicates that producers perceive significant consumer demand for homes consistent with active living and ''smart growth'' objectives: 40% of the producers believed that 10% to 24.9% of the households in their market are interested in ''alternative development,'' and 37% of producers believed that 25% or more of the households in their market are interested.[26] Social marketing techniques (e.g., promotional campaigns) can be used to increase consumer demand beyond current rates; as demand increases, there will be increased incentive for developers to respond with appropriate active living–compatible home offerings.

Targeting policy makers is a second demand creation strategy wholly compatible with consumer demand creation initiatives. Social marketing techniques (e.g., polling, letter writing/call-in campaigns) can be used to make the benefits of supporting active-living community policies more salient to policy makers, thereby enhancing demand for such policies among relevant decision-makers. A simultaneous demand creation initiative that targets the public and policy makers (i.e., a push-pull marketing strategy) may offer the most expeditious path to change in the built environment because of multiple

potential synergistic effects including the reduction of policy-related barriers (see below).

Reduce Barriers (or Costs). Understanding the barriers to creating active-living communities, and how to reduce them, is a final important area of opportunity for social marketing approaches. For example, the survey of home developers and builders identified two critical barriers: local regulations (e.g., zoning ordinances, subdivision regulations, parking standards, or street width requirements) and neighborhood opposition. As described above, consumer demand can be used as a strategy to encourage policy makers to change prohibitive regulations. Targeting local zoning and ordinance officials with information on active-living community policies, and the benefits associated with those policies, is a second and more direct means of reducing barriers associated with local regulations. Neutralizing the opposition of neighbors can be accomplished by determining how best to demonstrate the self-interest (i.e., a compelling package of benefits) associated with active-living community offerings (such as transit stops, mixed-income housing, and sidewalks) in established neighborhoods.

Leadership Opportunities for State and National Organizations

Because most land use and transportation decisions are ultimately local decisions, the opportunities and burdens of creating active-living communities fall mostly on municipalities, local nongovernmental organizations (NGOs), and others at the local level. To adopt a social marketing approach, however, these organizations must be able to generate, or in some other manner have access to, the types of competitive and consumer research described above. Unfortunately, the time and dollar costs associated with conducting these analyses can be a critical barrier for municipalities and local NGOs that are otherwise willing to apply social marketing approaches to promote active-living communities.

This potentially pervasive local-level barrier, however, creates a substantial opportunity for federal and state agencies, philanthropic foundations, and national NGOs seeking to promote active-living communities. They can invest their financial resources in conducting and actively disseminating consumer and competitive research that will enable myriad local organizations to adopt a marketing based approach to planning and creating active-living communities. This type of investment at the state and national level can create enormous economies of scale for local program planning.

Creating demand for active-living options, and reducing neighborhood opposition to such options, is a second area in which state and national organizations can focus their investments to expedite progress by local organizations. Public awareness and promotion campaigns of this type, such as promoting the benefits of physical activity, have been the most visible manifestation of social marketing in the health arena to date.

Barrier reduction at the local public policy level represents a third promising area for investment by state and national organizations. Certain local barriers—for example, zoning and other development ordinances—are likely to be similar from community to community. Large-scale campaigns targeting the public officials responsible for these

ordinances may therefore offer a highly cost-effective means of reducing a critical set of barriers in numerous communities and in an expeditious manner.

Learning From Other Successful Initiatives

Two highly visible campaigns—one primarily targeting the public and health care professionals, and the other primarily targeting policy makers—can serve as useful case studies and provide direction on how to harness social marketing to create active-living communities.

The National High Blood Pressure Education Program, a program coordinated by the National Heart, Lung, and Blood Institute (NHLBI), provides an especially apt analogy for the consumer behavior change challenges associated with active living.[27] For 3 decades, NHLBI has invested in consumer research (with high blood pressure sufferers, family members, and health care professionals) and has shared this research and corresponding behavior change strategies widely with other health care organizations in the public, nonprofit, and for-profit sectors. In addition, NHLBI developed and implemented a series of national public education campaigns to stimulate public demand for blood pressure screening and for behaviors associated with blood pressure control. This sustained social marketing initiative significantly contributed to national improvements in blood pressure control and subsequent reductions in associated morbidity and mortality, largely because NHLBI's investments paved the way for synergistic investments in hypertension control on the part of myriad program partners.

The Campaign for Tobacco-Free Kids provides an excellent example of using social marketing approaches to create behavior change among policy makers. The campaign has focused relentlessly on the competition (i.e., the tobacco industry) and taken aggressive action to increase the cost to policy makers of supporting policies friendly to the competition. Through its actions, and by mobilizing the community of activists, the campaign also seeks to create benefits for pivotal policy makers who are willing to support critical antitobacco policies. Although little has been published on the campaign's strategies and tactics, internal documents,[28] reviews by funders,[29] and conversations with current and former staff (W. Novelli, personal communication, 2002) indicate that members of the public health community interested in active-living communities can learn much by making the effort to study the campaign's methods.

CONCLUSION

Killingsworth and Schmid[30] have argued that small changes in community design and transportation policies can lead to big changes in the amount of physical activity achieved by members of a population. Social marketing approaches can contribute to this effort both directly, by helping to enhance the perceived value associated with currently available active-living options, and indirectly, by helping to reshape communities so that more (rather than fewer) active-living options are available to every member of the community, regardless of socioeconomic status.

Adopting a marketing-based approach to program planning will not come easily for many

organizations that currently plan their programs using other approaches. Social marketing, however, is neither mysterious nor counterintuitive once it becomes clear that the approach is based on developing programs that help all parties involved advance their own self-interests.

Any organization can use the concepts described above to conduct competitive and segmentation analyses, profile target markets, create demand, and reduce barriers. Although social marketing is admittedly a research-intensive planning and program-development process, even organizations with few financial resources can benefit by applying the processes within their financial constraints.[13]

Hopefully, however, state and national organizations interested in promoting active-living communities will recognize their direct self-interests in the three recommendations made above. By conducting competitive and consumer research that can be applied at the local level, and by conducting large-scale demand creation and barrier reduction campaigns, state and national organizations may leverage their own resources, as well as the modest resources to be found in many local governments and NGOs, into large system-wide benefits for our citizens and our communities. In this manner, the potential of social marketing to create active-living communities can be fully realized.

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SESSION 1: SCHOOLS AND CHILDREN

Toxic Classrooms: Marketing to Children in Schools

Dr. Alex Molnar, Arizona State University

Introduction[1]

Schools in the United States have, over the past thirty years, taken on increasing responsibilities and at the same time have often seen a reduction in the resources available to them. They are under powerful political and economic pressure to find non-public funds to support their programs and to collaborate with corporations. In this environment, it is not surprising that many schools have turned a blind eye toward corporate advertising and in some instances have embraced it. As schools have become more vulnerable to special interest influence, they have also faced pressure to narrow the focus of their academic programs. High-stakes testing programs, for example, place a premium on reading and math, especially in elementary schools. This means that programs associated with health, nutrition, and fitness are likely to claim less time in the school day and have fewer resources than necessary to be effective. Although school health and nutrition programs may be under threat, billions of corporate dollars are spent in and out of school to promote a broad array of products and services that, among other things, encourage children to make nutritional choices that are most profitable for corporations though not necessarily the most healthful.

Commercial Activities in Schools

The Commercialism in Education Research Unit (CERU) of the Education Policy Studies Laboratory at Arizona State University has been monitoring media references to schoolhouse commercialism for more than a decade. For the July 1, 2002-June 30, 2003 period, in all but two of eight categories that CERU tracks, media references were up (see Figure 1 on the next page). Examination of those references shows that in-school commercialism and corporate activities designed to boost company profits, directly or indirectly, are as firmly entrenched as at anytime since CERU and its predecessor, the Center for the Analysis of Commercialism in Education (CACE) at the University of Wisconsin-Milwaukee, began its monitoring.

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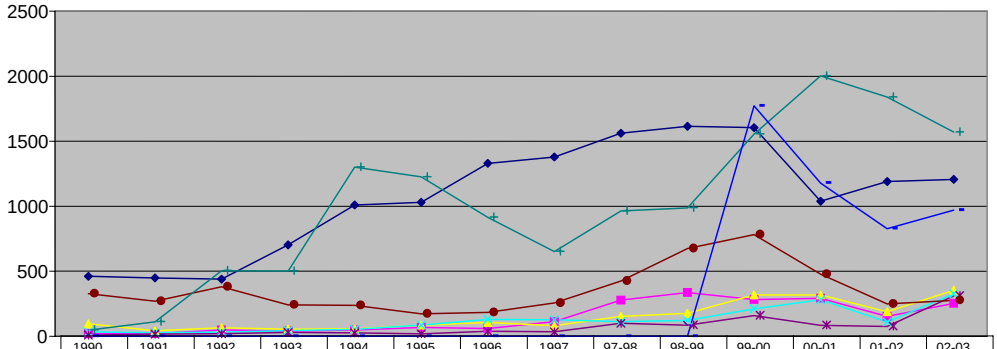
[1] This paper was prepared with research assistance from Daniel Allen of the Education Policy Studies Laboratory.

Figure 1: Overall Trend, By Commercializing Activity, All Presses 1990-2003



	1990	1991	1992	1993	1994	1995	1996	1997	97-98	98-99	99-00	00-01	01-02	02-03
Sponsored Activities	461	448	438	703	1009	1030	1330	1379	1562	1614	1604	1038	1190	1206
Exclusive Agreements	19	19	49	39	49	68	59	113	277	336	282	291	153	252
Incentive Programs	96	42	65	54	57	85	106	81	153	176	318	318	189	354
Appropriation of Space	33	27	32	43	53	86	129	126	112	122	211	281	110	326
SEMs	8	15	20	29	25	18	38	33	99	85	158	83	75	310
Electronic Mktg	327	269	380	241	238	172	183	256	425	674	782	478	248	276
Privatization	47	111	504	501	1301	1226	915	651	963	987	1554	2002	1839	1570
Fundraising	0	0	0	0	0	0	0	0	0	0	1772	1179	827	970

Source: Molnar, A. (2003, Sept.). *No Student Left Unsold: The Sixth Annual Report on Schoolhouse Commercialism Trends, Year 2002-03*. Tempe, AZ: Commercialism in Education Research Unit, Arizona State University. Online at: http://www.asu.edu/educ/epsl/CERU/Annual%20reports/EPSL-0309-107-CERU.doc

The rapid growth of commercially sponsored activities and materials promoting the consumption of foods of little or no nutritional value in particular schools raises fundamental issues of public policy. Although schools are, for example, important venues for teaching students about health and nutrition, they now commonly participate in marketing programs that undermine the health messages of their curriculum. Marketing has become part of the social and educational environment of America's public schools – and it is toxic.

Exclusive marketing arrangements with soft drink and fast food companies, placement of vending machines offering candy and high fat, salty snacks, "educational materials" sponsored by fast food outlets, incentive programs and contests that encourage the consumption of unhealthful foods, and direct advertising of junk food on Channel One and via other electronic marketing media constitute a pervasive informal curriculum that sends children powerful and harmful health messages.

Exclusive Agreements & Student Health

References to agreements that give marketers exclusive rights to sell a product or a service on school or district grounds and to exclude competitors were up by 65%, to 252 citations from 153 in 2002-03. Most of the citations referred to exclusive agreements with bottling companies. At least in part the increase is the result of such agreements coming under attack. On the one hand, a number of news reports covered new contracts between schools and marketers, usually soft drink companies. On the other, the problems with such agreements, particularly their potential for harm to children's health, drew increasingly critical scrutiny. In some communities or states, schools, school boards, or legislators enacted or sought limits on such agreements. In some communities

agreements were adopted without controversy. DeKalb County Georgia, for example, signed a $10 million five year contract granting Coca-Cola exclusive rights to supply drinks and sponsor certain programs in county schools.[1] In other communities there was considerable controversy. In 2002, parents in Charleston, South Carolina, were upset enough to threaten to challenge the local school district's approval of an 8.1 million, 5-year contract with Pepsi Bottling Group.[2]

It appears that exclusive agreements put pressure on school districts to increase the number of soft drink vending machines in schools in order to increase sales. In 2000, the U.S. General Accounting Office reported that in many cases, exclusive agreements with bottlers contained consumption clauses – i.e. schools got more when more soft drinks were sold.[3] Daniel Michaud, business administrator for the Edison, N. J., public schools, told the Washington Post in 1999 that prior to signing an exclusive contract with Coke few Edison schools had vending machines. After signing the contract, most district high schools had four machines, middle schools had three, and elementary schools one.[4] As Kelly Mullen, a student at a Rhode Island high school with an exclusive contract, commented, "There's really nothing else to drink."[5] That's exactly the way the bottlers that seek exclusive agreements want it.

As soft drink consumption has increased so too has the waist line of American children. The Washington Post reports that, according to the Beverage Marketing Corporation, annual consumption per capita of soda has increased from 22.4 gallons in 1970 to 56.1 gallons in 1998.[6] The Center for Science in the Public Interest found that a quarter of the teenage boys who drink soda drink more than two 12-ounce cans per day and five percent drink more than 5 cans. Girls, although they drink about a third less than boys, face potentially more serious health consequences.[7] With soda displacing milk out of their diets, an increasing number of girls may be candidates for osteoporosis.

Despite the health warnings aimed at limiting the availability of foods of minimal nutrition value, including soft drinks, on school campuses, it appears that an overwhelming majority of schools continue to place their students at risk. The Centers for Disease Control and Prevention (CDC) "School Health Policies and Programs Study" (SHPPS) survey, which assesses school health policies and programs at the state, district, school and classroom levels, found that the food products most often offered in school vending machines are soft drinks, sports drinks, fruit drinks, salty snacks not low in fat, and baked goods not low in fat.[8] Moreover, the CDC found only 12.4% of schools prohibit junk foods.

The Backlash Against Sugar

As more attention focused on problems of childhood obesity and the fears that diets heavy in sugary snacks may contribute to Type 2 diabetes, attacks on exclusive soft-drink agreements and the marking of food of little or no nutritional value in schools increased. *US News & World Report* cited CDC studies showing that 73.9% of middle and junior high schools, and 98.2% of high schools, have vending machines or snack bars selling high-calorie snacks and soft drinks.[9] "Even Education Secretary Roderick Paige

negotiated a $5 million exclusive contract with Coca-Cola in 2000 when he headed the Houston school district," the magazine noted.[10]

A *San Diego Union-Tribune* writer charged that a local school board had "compromised the health of children in exchange for cash" when agreeing to a five-year, $800,000 Pepsi agreement.[11] The school district's contract, columnist Logan Jenkins wrote, would "make it more likely that the students under its charge will be fat, diabetic and wired."[12] An Alaska public health physician editorialized in favor of banning soda from schools and compared that effort with "the struggle to ban smoking from schools 20 years ago."[13] In Minnesota, high school coaches joined in condemnation of soft drinks and "are advising athletes to lay off the pop if they want to stay healthy and competitive."[14] One coach unplugged pop machines during practice; others posted signs warning machines were off limits at summer football camp.[15] In their opposition, these coaches followed in the footsteps of dentists, who had lobbied Minnesota's legislature unsuccessfully to ban soda sales during school hours.[16]

Bans and regulation have become more common. In 2003 Paul Vallas, the Philadelphia schools' chief executive officer, sought a ban on soda in schools.[17] New York City schools also banned soda, sweet snacks and candy from vending machines in 2003.[18] The Texas Education Agency directed districts as of the fall of 2002 to stop selling "foods of minimal nutritional value" in cafeterias, hallways, or common areas. [19] California legislation set standards for food sold in elementary schools that would shut out sodas, high-fat foods, and high-sugar, low-juice fruit drinks.[20] Separately, the state legislature passed a ban later signed into law on soda sales in California schools, a year after a similar ban was defeated.[21] The Los Angeles school district banned soft drink sales during school hours, effective in 2004 – while principals and students worried about how to fund the field trips, dances, and athletic programs the vending machine money had paid for.[22] The district's action drew worldwide attention. Capistrano Unified School District in South Orange County, California, went further, banning not only sodas but also junk foods from vending machines.[23] Perhaps the most comprehensive efforts to promote good nutrition in school have taken place in San Francisco schools, where snack bars and vending machines have recently been scrapped in favor of healthy snacks.[24]

A number of professional organizations have also spoken out against the promotion of commercialism in public schools, outlining the negative effects of commercial marketing on children, and developing voluntary guidelines to promote healthier food options on campus. In February, 2004, the American Psychological Association issued its guidelines for commercial marketing to children, including a recommendation to prohibit any type of marketing to young children while at school.[25] The National Association of State Boards of Education developed sample policies to promote healthy eating[26] and the American Academy of Pediatrics has taken a position critical of advertising aimed at children, in general, and critical of school-based advertising that promotes unhealthy lifestyle choices in particular.[27]

Competitive and Legal Challenges

Concern about the negative impact of soft drink consumption on children's health was a primary source of criticism of such agreements, but it was not the only one. In Utah, a local water bottler complained that exclusive Pepsi and Coke contracts at universities and high schools in the state kept his products out.[28] In New York, the Quality Beverage Association, joined by individual taxpayers and residents, filed a lawsuit challenging exclusive soft drink agreements on the grounds that the New York Education Commissioner, in authorizing such agreements, violated state law concerning the after-hours use of school property, the state constitutional prohibition on using public property for the benefit of a private corporation, the state law governing competitive bidding of public contracts, and the regulation prohibiting commercialism on school property.[29] While a ruling regarding the practice of commercialism on school property is still under consideration, the commissioner did rule in March 2004 that all future contracts must strictly comply with competitive bidding laws.[30] In Seattle, city school board members were warned that lawsuits could follow if the board went ahead in approving the extension of an exclusive vending machine contract with Coca-Cola. Lawyers who threatened the lawsuit noted that board members had a "fiduciary duty to protect students' health" and that approving the contract in spite of the health risks associated with carbonated soda consumption could be grounds for negligence.[31]

Defending Exclusive Agreements

Efforts to block exclusive agreements remain contentious. The California Teachers Association joined the food industry in blocking a California bill in 2002 to end soft-drink sales in all schools, complaining that the schools needed the revenue.[32] Pasco County, Florida, schools considered relaxing rules so that soda would be available any time of day in the high schools, rather than just at the end of the day.[33] An Ohio reporter's article on the sodas-in-schools controversy noted that soda was an overwhelming preference of students, who rejected milk and water in favor of soft drinks.[34] When in 2003 the Denver Public Schools considered ending an agreement with Pepsi that was up for renewal, the *Denver Post* editorialized against doing so. "With a down economy and extremely tight budgets everywhere, it's not the time to kiss off millions of private dollars," the newspaper said.[35] (It did advocate giving students "healthier options" at the same prices as soda.)

Still other districts sought compromise. Redlands East Valley High School in California proposed an agreement with Coke that would ensure a wider range of non-carbonated – and therefore presumed to be healthier – drinks.[36] Buffalo, New York, schools agreed to a 10-year, $4 million snack vending machine contract that excluded carbonated beverages. "District officials say the deal is both a substantial money-maker and a healthier option for children, because it will exclude carbonated beverages," the *Buffalo News* reported.[37] One board member wasn't convinced, voting against the agreement and having earlier complained of "the high sugar content and low nutritional value" of the products that would be sold.[38]

Conclusion

While there are little or no primary data available that systematically capture the breadth and impact of school-based marketing, school commercialism trends research utilizing secondary sources conducted by the Commercialism in Education Research Unit (CERU) broadly suggests that commercial activities in schools are increasing.[39] Additionally, candy and snack food manufacturers, soft drink bottlers, and fast food restaurants, are among the companies that market most heavily in schools. Taken together these trends suggest that the public school environment is increasingly shaped by marketing messages that undermine student health and create an unhealthy environment for children.

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The School as a Contributing Factor to Adolescent Obesity
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Unfortunately many people in the general population do not consider childhood obesity to be a problem of more than aesthetic dimensions. Adolescent obesity is thought of as contributing to other problems like being seen as a social outcast, lowering self-esteem, and contributing to bullying, but not as a physical health concern. Many in society don't understand why school health educators and the public health community are so concerned about the topic. Since the public perception of the problem is aesthetic, professionals will find it more difficult to initiate an energetic public response to adolescent obesity. Until we can make parents and adults in our communities understand just how serious the problem is, we will have little success dealing with obesity in schools and the community.

Despite the rather passive attitude of most Americans on the topic of obesity it is dangerous and expensive. "An estimated 300,000 deaths per year may be attributable to obesity. The risk of death rises with increasing weight. Even moderate weight excess (10 to 20 pounds for a person of average height) increases the risk of death, particularly among adults aged 30 to 64 years. Individuals who are obese (BMI > 30)* have a 50 to 100% increased risk of premature death from all causes, compared to individuals with a healthy weight." (1) In a study done by Sturm (2) he concluded obesity to be more dangerous than smoking, heavy drinking and poverty. The problem has not arisen suddenly nor have the effects of obesity been unknown until now. "Obesity is a serious public health threat that manifests itself in diseases and chronic disabling conditions such as diabetes, coronary heart disease and high blood pressure. This is not a newly identified phenomenon; the American Heart Association had identified obesity as a cardiac risk factor—modifiable through diet and exercise—as early as 1952. However, the situation half a century later is far worse." (3)

While professionals have accepted the role of obesity as a risk factor in coronary heart disease for some time it is frustrating that overweight continues to be a modifiable risk factor that increases in prevalence within the adult and adolescent populations. Among adolescents the prevalence has nearly tripled in the past 2 decades, (1) and the cost is not in lives and health only. In 2001, the Surgeon General announced that obesity and overweight cost U.S. taxpayers $117 billion per year in direct health care costs and indirect costs such as lost wages. (1)

While one might not think that schools would be a factor in the obesity problem faced by our children, a closer look at one day in the life of a youngster as he arises in the morning and heads off to school might prove to be enlightening:

A day at school with Joe

Joseph wakes up at 6:15 and statistics suggest he will probably not have breakfast. In Florida only 46.6% of students eat breakfast.(4) He will shower, get dressed, walk to the corner and wait for the school bus. He will get on and sit down for a 45-minute to an

hour ride to school. Once at school Joseph will go to his locker then to homeroom where he will sit and watch the morning announcements on closed circuit television. After homeroom Joe will walk to his first class and sit in one seat after another till noon. At noon Joseph will go to the lunchroom for a meal that may include a variety of choices of varying nutritional value. Lunch may well be at least partially provided by outside vendors who offer pizza, fried chicken fingers, tacos and burritos, hamburgers, etc. There are vending machines in the lunchroom and hallways of the school but Joseph cannot access them until 2:00 as a concession to reduce the amount of snack foods consumed on campus. After 2:00 Joe has access to a cornucopia of salted and high sugar snacks and carbonated drinks. During his day he may go to a physical education class for 1 hour where he will join in with 40 or more other students sitting in the bleachers or patiently waiting for a turn at throwing or kicking something. This experience neither provides Joe with physical activity nor does it prepare him to participate in physical activity after required physical education. At the end of the day he will go outside on the bus bell to the curb and get on the bus for a 45-minute to an hour bus ride home. When he gets home Joe will watch TV, use his computer or play video games for 3 or more hours during the remainder of the day and night.(3) Mom works outside the home so she gets to the house at 5:30 to 6:00 and is bushed. It is too late to start cooking so she has brought a bag of burgers or a pizza for dinner. After dinner it is homework, music and instant messaging till bedtime.

As a result of his day at school Joe has gotten little physical activity, a mixed nutritional experience and gone home to more of the same.

What we should learn from Joseph's day is that he exhibits 2 significant risks for becoming overweight and consequential health problems related to obesity, and that at least some of his risk is a result of attending school. The school contributes to Joseph's possible weight problem by exposing him to too much of the wrong nutrition and too little physical activity during his school day. For those engaged in the ongoing debate on obesity this fictional example of a school day demonstrates the seeming bifurcation of views on how the discussion should be framed. Vending machines have been under attack for the effect soft drinks play in providing excess sugars to children in schools.(5-8) and as a result many schools and school districts across the US are changing their policies regarding vending machines and sale of food items at school stores and so forth. This shift in policy demonstrates community concern with nutrition in the schools and a rising awareness of obesity as a major concern in the adolescent population. In response to criticism that carbonated soft drinks are contributing greatly to obesity the National Soft Drink Association replied on its website that soft drinks are a healthy part of a daily hydration program. This group attempts to re-direct the conversation to the issue of decreased physical activity as the major cause of obesity in young people while pointing to the positive part soft drinks play in the daily hydration needs of healthy people.(9) First a discussion of nutrition in the schools.

School nutrition

Public schools have a part to play in adolescent nutrition in 3 basic ways. The first way is in the area of the school nutrition program; the second way is access to vending

machines that provide sugar, salt and carbonation and the third way is access to educational activities that prepare students to make informed decisions about nutrition and foods now and in the future.

Much of what is served in school lunchrooms is the result of standards set by The National School Lunch Program, a federally funded program that provides assistance and funding to schools and other agencies so that they can provide nutritious meals at free or reduced rates. In addition to financial assistance, the program provides donated commodity foods to help reduce lunch program costs.(10) In part the federal school lunch program requires that milk be provided with each lunch served and in describing the grains allowed under the program there is no preference for whole grains over enriched grains. In fact whole grains are listed as a substitute.(10) Of course while school lunch programs are largely the result of USDA requirements, what is served is also very much a product of parental involvement and student choice. School districts have to balance the need to control cost with the need to offer appealing choices students will select. In order to strike this balance between cost and choice school lunch programs often turn to outside vendors that will come to campus and provide pizza, tacos and fried chicken fingers. In Leon County School District director of food services Tim Tankersly removed pizza (delivered by a national chain) from the menu only to have parents demand it be put back on the menu because their children liked it. Tankersly reinstated the pizza selection but only twice a week while demanding the pizza chain use low fat cheeses and reduced calorie and reduced fat meats.(11)

Vending Machines in Schools

One of the most debated topics of late regarding schools and obesity is school vending machines and the choices contained in those machines. In an American Academy of Pediatrics (AAP) Press Release, January 5, 2004 the academy put forth a new policy statement on school vending of soft drinks. In that press release the academy advocated, "that school districts should consider restricting the sale of soft drinks to safeguard against health problems that result from overconsumption."(5) The AAP policy points out that sweetened drinks constitute the primary source of added sugar in the daily diet of children, and that each 12-ounce serving of a carbonated, sweetened soft drink contains the equivalent of 10 teaspoons of sugar. Sugared soft drink consumption has been associated with increased risk of overweight and obesity, currently the most common medical condition of childhood.(5) The AAP further highlights the tension between revenue in the school lunchroom verses the damage done by poor nutritional choices found in vending machines. "…the high percentage of students drinking 1 or more soft drinks per day and the need to provide alternatives to high sugar and high fat snacks in school vending machines. The concept becomes a hard sell when schools see removing or restricting vending choices as a revenue loss. Lunchrooms in many schools find it difficult to operate without losing money so they feel they have to make sacrifices to nutrition as a result of monetary need."(5) The National Soft Drink Association defends against calls for reducing or eliminating soft drinks from schools by staking out the position that these "…are beverages that have existed for over 100 years. They can quench thirst and help fulfill daily fluid intake requirements that are needed to maintain proper hydration for individuals. Soft drinks are a complement to many types of foods

that together form a balanced diet."(9) They further contend that "…Consuming at least 67 ounces of fluid each day (even more for those who are physically active) is important to your health. Adults and children should consume a wide variety of fluids each day, including water, milk, juices, teas, sports drinks and soft drinks to maintain proper hydration."(9) The ASDA rightfully points to the need for increased physical activity as a needed change in controlling obesity in school aged children but does not accept complicity in the problem. Clearly businesses that make or distribute soft drinks or snacks look to develop brand loyalty while maximizing profits in the current market so it is important to them to have a presence in the schools. Some companies are willing to pay contracts for exclusive placement and brand rights while increasing the placement of different choices in the machines. Some school districts are restricting student access to vending machines during school hours and others are replacing some of the carbonated beverages with water and fruit juices replacing sugar and salt laden snacks with healthier choices. The results are mixed with some districts finding total revenue unchanged or increased while others find declining income from vending sales. In order to make an impact on this issue there will be a need for "…strong public advocacy …to ensure that schools are adequately funded from noncommercial sources."(8)

Physical Activity and Health Education

There are pressures schools must respond to in order to be successful. Some of the pressure points are public demands, political demands (at the school, district and state level), and legal pressures (state, local, and federal). The result of these internal and external pressures often restricts adequate physical activity and health education offerings. A very powerful example of these pressures is statewide testing. Some form of high stakes testing exists in nearly every state in the United States and impacts how schools are funded. In many states poor performance on Math, Science or Reading tests may result in dramatically lower funding to "failing" schools. In order to focus on key curriculum areas, "non-essential" subjects have lost funding to increase time devoted to subject areas that are tested. Schools have suffered losses in the arts, music, physical education, and school health among others to make way for time to improve math, science and reading instruction. Due to the strong connection between physical activity and positive academic outcomes (12), sacrificing Physical Education and Health Education, traditional areas for dealing with life decisions including tobacco use, alcohol and weight management may be too great a sacrifice. For example, in a study by Shepard it was found that a reduction of 240 minutes per week in academic class time to provide additional time for physical activity led to consistently higher math scores.(13)

While there is a call for increased physical activity to help reduce overweight among children, the activity should be focused more toward the goal of developing lifelong fitness. "For too long, some fitness experts say, physical education has not lived up to its name: Traditional phys-ed classes provide too little activity to too few students, offer little or no guidance for maintaining a healthful lifestyle, and can make less athletic children feel inadequate, which can further turn them off to exercise."(14) Though no doubt, many adults thrived on the competition provided in their physical education classes, many found the experience anxiety producing and humiliating. The result has been the creation of a generation of people who find most forms of exercise something to

be avoided. Most physical education experts agree that programs that focus on sport and competitive types of activities have fallen short of their goal to energize students to maintain an active healthy lifestyle. The call has gone out for a new physical education that places greater emphasis on lifelong fitness activities and less on sports and in the past several years, many physical education programs have been developed that stress fitness, health awareness, and lifelong exercise habits.(14) Sturm found that planned exercise is higher today than in the past but that "incidental" exercise has decreased. That is to say scheduled physical activities such as going to the fitness center have increased while walking to the store and walking to school have declined and much of that is due to the layout of residential areas, which are becoming more separated from stores and workplaces.(2) I would suggest it is also in part due to the dangerous nature of the communities in which we live. The days of baby boomers living naively in assured safety and security are over. In communities today safety of unsupervised children is not an accepted truth. In fact it is the opposite with kidnappings and murders and violence in our neighborhoods and schools it is not always reasonable for parents to send their children out to walk to school unsupervised. Neither is it always reasonable for all parents to send their children out to play without a responsible adult nearby. If we accept that we live in more dangerous times the problem becomes how to create environments where adolescents are encouraged to engage in vigorous activity in safe environments. The school can and should play a larger role in the development of this environment.

In conclusion

While the surgeon general called for us collectively to create more opportunities for physical activity at worksites and to make community facilities available and accessible for physical activity for all people, including the elderly,(1) his remarks seemed directed more to the business sector. This concept should be broadened to include public schools and public recreation facilities. We should be looking for ways to create alternative partnerships to provide cooperative use of facilities between the larger community and schools to provide a safe environment for physical activity. School gymnasia, sadly underutilized during school hours, can become a hub of physical activity for children and adults during non-traditional times. Partnerships should be forged between public and private agencies to make school fields, gymnasium facilities, and recreational facilities available to individuals and groups looking for a safe environment in which to meet, learn, recreate, and become physically fit. Lunchrooms need to become areas where children learn about healthy eating and make informed food choices that will provide the energy needed to be active learners. Schools need to decide what is more important, profits from vending machines filled with "junk" or the health of our next generation. Finally, Health Education must take a more prominent role in the curriculum rather than merely existing as intermittent embedded topics somewhere in the science or physical education program.

In order to convince schools to re-invest in the health and physical education of our youth we must provide more data to support the argument that healthier, more active children are better students. We must also focus on research that provides sound financial data on the impact of revenue from school vending machines on school budgets. I believe we

must fight against allowing the discussion to focus on either physical activity or school nutrition/vending as the answer to the problem.

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Healthy Schools, Healthy Communities: Opportunities and Challenges for Improving School Food Environments

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The food environment at Gratts Elementary school in the Pico Union neighborhood of Los Angeles, as with many other low-income schools in the Los Angeles Unified School District, leaves much to be desired. At Gratts, 97% of the students are Latino and 90% qualify for a free or reduced lunch. On any given day, the lunch menu at the school might consist of pizza, or a cheeseburger on a bun with French fries, and a fruit cup in heavy syrup. And while elementary school students are not allowed to have vending machines on the school grounds, just a few blocks away, at Belmont High School, you could, until recently, buy items like chips, a 20 ounce coke, or a candy bar.

But that's only part of the problem these children face when it comes to their food environment. Prior to this conference, some of the members of our school and community food assessment team had begun to document the food and physical activity resources in the immediate neighborhood around Gratts. Team members, including Belmont High School students, compiled information about food stores and food service places in the community such as store location, store type, restaurant health department grade, and restaurant type, among other information.

On one April afternoon, the food assessors encountered children leaving the Gratts' school grounds just as the buzzer had sounded, ending the school day. As the school children left the building, multiple mobile food vendors, selling a wide selection of sugary candy, chips, sodas, shaved ice, and chicharrones, greeted them. On the other side of the schoolyard there were hot dogs, more chips, chocolate covered frozen bananas, and other high sugar, high fat foods sold from carts and even from a first-floor apartment window. After the team members recorded these food options and made their way onto the next street, they witnessed several pigeons eating graham crackers and peanuts that someone had left for them— their food option. How ironic, team members commented, that the food fed to the pigeons might well have been a bit healthier – or at least not as objectionable -- as some of the choices available to the Gratts students.

For those elementary school students, the school lunch meal may well represent the only opportunity to have a more nutritious food choice. Even if the school lunch meal is problematic from a nutritional perspective, the choices outside the school cafeteria are often far worse, creating a *healthy food access dilemma.* This problem of the lack of access to healthy food environments, particularly in low-income communities, is often compounded by limited options for physical activity, such as lack of park and open space, reduced physical education activities, or unsafe streets for pedestrians or bicyclists. Unfortunately, an issue like obesity, associated with poor diet and lack of physical activity, tends to be reduced to a question of *behavior and choice*. However, as our research and intervention strategies indicate, the problem more significantly needs to be focused on the question of *access and environment* – and the community mobilization and policies necessary to address it.

The National School Lunch Program is a good place to start. The origins of the program, in fact, were related to another nutrition-related crisis sixty years ago that presents some interesting parallels – and some significant differences – with today's obesity and poor nutrition concerns. When the National School Lunch Act was passed in 1946, it was framed primarily as a nutrition-based program. During and shortly after World War II, the US Department of Agriculture had been instrumental in publicizing various studies documenting the health and education problems of military recruits; problems that were traced to Depression-era childhood dietary deficiencies. Of the first one million men called for induction in World War II, forty percent were rejected for general military service on medical grounds. The school lunch program was therefore conceived as serving national security needs as well as nutrition goals. The program's mission was defined as safeguarding "the health and well-being of the Nation's children" by "promoting health" and "preventing disease," while also emphasizing the link between childhood and adult dietary patterns. "What children eat helps determine not only how healthy they are as children, but how healthy they will be as adults," according to the program's framing document. [1]

Today, however, the original mission of the school lunch program has become significantly compromised due to a number of institutional constraints and outside pressures. To begin with, most school food service departments are now required to generate sufficient revenues to cover costs or return whatever profits they enjoy to the school district's general fund. Cost savings and bottom line considerations become paramount. For example, for each meal served in the cafeteria, schools obtain about 20% of their food through a federal commodities account that requires the Districts to only pay minimum transportation costs to obtain the food. Commodity purchases in turn may often substitute for fresh and locally sourced items. In addition, food services have increasingly contracted out services to organizations like Sodexo to run their entire school meal program, or have made arrangements with fast food chains like Pizza Hut and Taco Bell to operate on school grounds. In addition, kitchen facilities at individual school sites have been eliminated, further encouraging the use of pre-packaged and highly processed items. The amount of time available for lunch (as well as physical activity) has also been reduced, creating the need for an assembly line approach and quick meal options. And, perhaps most significantly, partly in response to the need to maintain or increase participation rates (revenues are primarily generated by a reimbursement from USDA per student meal), food service departments have increasingly turned to the fast food culture (branded items, fast food-style items like Chicken McNuggets, etc.) to attract students to the cafeteria for their school lunch.[2]

Beyond the school cafeteria, individual schools and districts now sell, through vending machines and a la carte offerings, a wide range of junk food options (candy, sodas, cookies) to generate funds, often for extracurricular activities that have been cut back. These "competitive foods" not only create problems with their sugar and caffeine fixes, but may also substitute for the school lunch. At the community level, schools in low-income neighborhoods experience the double bind of lack of access to fresh and healthy food choices and an overabundance of available fast food and junk food options, many located close to school grounds.

Community and school food environments (what's available, how the food is marketed, how food choices are framed) have become in recent years the arena for community action and policy initiatives. Alternative school food programs were first developed in the mid-1990s through USDA initiatives in North Carolina and Florida designed to create greater access to the school food market for local farmers. That concept, connecting farmers to schools or *farm to school,* was extended in 1997 with the opening of a farmers' market salad bar school lunch option in the Santa Monica-Malibu Unified School District in California. Farm to school introduced two revolutionary concepts in the school food area. First, students would choose fresh and tasty fruits and vegetables, if available and given the option; and second, that the mission of school food services should focus primarily on the health and well-being of the children while establishing relationships with local and regional farmers.

The success of the Santa Monica program and the earlier USDA initiatives helped stimulate farm to school programs around the country. These varied state by state, by seasonal items, local farmer capacity and delivery infrastructure, and perhaps most importantly the ability of a school food service department to reorient itself in this new direction. Programs were developed in two dozen states and nearly a thousand school districts with preliminary research indicating that farm to school programs have in turn generated an increase in student consumption of fresh fruit and vegetables. Based on this rapidly growing interest, new policy initiatives at the school district, state, and federal levels have also been introduced that strengthen opportunities for fresh and healthy access in schools.

School gardens are an additional aspect of farm to school that have important benefits, including an effective strategy for experiential learning, important physical activity benefits, and a source of fresh food, including items that children might not have been previously exposed to. Some school garden programs link directly to the farm to school program in the cafeteria, highlighting a "harvest of the month" including local and seasonal items. But, similar to farm to cafeteria programs, important barriers for school gardens also exist, including lack of green space, start-up costs (even if quite modest), and problems of maintenance and sustainability, including summer months when a school might not be in session. Perhaps most importantly, financially and resource strapped schools in low-income communities who are most lacking in open and recreational space, are particularly burdened by a lack of human and financial resources.

Furthermore, farm to school cafeteria and garden initiatives have been able to address only one aspect of the school food environment. Competitive foods, such as sodas and junk food in vending machines, have also become the focus of parent, student, and community mobilization in numerous school districts, cities, and states. In Los Angeles, community groups such as the Healthy School Food Coalition first challenged the sale in vending machines of sugary beverages such as sodas leading to a dramatic vote in August 2002 of the Los Angeles Unified School District (LAUSD) board to ban such drinks. Continuing mobilization by community and parent groups extended that policy, through an "Obesity Prevention" measure that was adopted unanimously by the LAUSD board in October 2003, that included anti-junk food criteria in vending machines and opportunities to pilot and ultimately institutionalize healthy food alternatives. In just two years, these

types of anti-soda and junk food initiatives have been duplicated and extended in hundreds of school districts, cities, and states around the country. In doing so, the debate has been transformed to a matter of *how* rather than *whether* school food sources – inside and outside the cafeteria – could be reoriented through policy as well as institutional change.

Since 2002, the focus on school food as a policy matter has also extended to the federal level. A provision in the 2002 Farm Bill provided seed funding for fruit and vegetable pilot programs in several communities in states in the Midwest and New Mexico, including one in Des Moines, Iowa. The Des Moines School District used their pilot funds not only to purchase fresh fruits and vegetables, but to purchase them from local sources. In testimony before Congress, Ms. Teresa Nece, the Des Moines school food service director, detailed the results of her pilot program that was undertaken in one elementary, middle, and high school in her district. The program featured a selection of fruits, vegetables, and dried fruits made available each day to the students from local and regional farmers. Each elementary school class received a basket of fruit at the beginning of the day that was usually empty at day's end. High school students could pick up their snack at the school cafeteria during passing periods, which, among other benefits, led to a decrease in school vending machine sales. This fresh produce initiative contrasted with the predominant school lunch entrees in the Des Moines schools that included three flavors of pizza, Chicken McNuggets, mini-corn dogs, fajitas, and tacos. And like the Los Angeles experience, students tried fruits and vegetables they had never tasted before. [3]

The passage of the 2002 farm to school pilot program and current farm to cafeteria legislation incorporated in the Child Nutrition reauthorization legislation have reflected the increasing organizing and mobilization at the community, regional, and national level. New community-based food organizations, including a number of groups in low-income communities, have sprouted in hundreds of communities. Community advocacy around such issues as lack of fresh food access have complemented the development of alternative community-based projects, such as CSAs (community supported agriculture), farmers' markets, and community gardens.

Increasingly, these community food groups have focused on the school food environment, from the cafeteria, to the vending machines inside school grounds, to, ultimately, the food environment adjacent to the school. The growing community mobilization in turn has laid the groundwork for the development of such healthy and fresh food policies and programs as the Santa Monica farmers' market salad bar or the Des Moines fruit basket.

To further that agenda, a framework for linking community mobilization, policy development, and research needs to be developed, an approach our Urban and Environmental Policy Institute recently initiated through a new collaborative called Project CAFE (or Community Action on Food Environments). Project CAFE partners include Latino and African-American community-based organizations, community health advocates or *promotoras*, parent and student groups, researchers, and physicians focused on the schools and surrounding neighborhoods in three South and Central Los Angeles communities. Using the methods of community food assessment as both a research and

organizing tool, local residents and students identify research targets and help frame the most appropriate research instruments, whether surveys, focus groups, or visual representations regarding community and school food environments. Research is designed to inform action (or intervention strategies to use the language of the researcher), but action (in the form of organizing and mobilization) also establishes the framework for the research.

This action research model, or what Jason Coburn has called "street science" in a new book by that name, is at the same time an important tool in developing new forms of community power in the school food arena. The eventual goal of the Project CAFE approach, to establish community-based capacity to help change the food environment, is critical to an agenda around obesity. To reverse current trends around overweight and obesity requires not simply an individual's change in eating patterns but action at the community scale where individual choice is reframed as a question of access. The rise of farm to school programs, the impressive popularity of farmers' markets, and the willingness of students to challenge a fast food culture are all illustrations that such a community action model is not only feasible but best suited to community groups, students, researchers, and policymakers alike.

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SESSION 2: COMMUNITIES AND FAMILIES

Community Design and Physical Activity: What Do We Know? – and What DON'T We Know?

Dr. Susan Handy, University of California at Davis

Introduction

Motivated by different concerns, urban planners and public health officials have joined together in the last several years to advocate for community design that promotes walking, biking, and other forms of physical activity. The Active Living by Design Program, for example, funded by the Robert Wood Johnson Foundation, aims to increase physical activity through community design by "providing leadership in promoting environments that offer choices for Active Living, a lifestyle that easily integrates physical activity into daily routines" (1). Although these efforts do not explicitly focus on families, their emphasis on neighborhood design raises an interesting and important question: how can community design effectively be used as a strategy for increasing physical activity for both children and their parents? In this presentation, I review what we know – and what we don't know – about the link between community design and physical activity for both adults and children and offer initial recommendations as well as questions for further research on what forms of community design most effectively increase physical activity for families.

Definitions and Model

To understand the link between community design and physical activity, it helps to separate physical activity into three categories. Each category of physical activity may be affected by community design in different ways. Active travel includes walking and biking for the purpose of reaching a particular destination. Walking, biking, running and other forms of exercise that involve movement over some distance fall into a second category, and more stationary forms of physical activity fall into a third category. These types of physical activity can also be differentiated by the settings in which they take place, for example, home, street, or neighborhood more generally. For families, physical activity can be further differentiated by whether the parent engages in physical activity without children, whether children engage in physical activity without parents, and whether they engage in physical activity together.

The concept of community design must also be defined. The term more commonly used by researchers is the "built environment." I define this term as consisting of three elements: land use, transportation system, and design (2). Land use refers to the spatial distribution of activities throughout the community, in other words, what kinds of activities are located where. The transportation system provides the physical connections between activities and determines the quality of those connections in terms of travel times, safety, comfort, and other characteristics. Design refers to aesthetic qualities of the built environment and overlays both land use patterns and the transportation system, particularly in terms of the design of buildings and the design of streetscapes, respectively. More broadly, the "physical environment" refers not just to the built environment but also to the natural landscape and to human use of public spaces, elements that have the potential to influence choices about physical activity as well.

The link between community design and physical activity has often been studied using an ecological framework that differentiates between three or more levels of explanatory factors:

intrapersonal (e.g. self-efficacy), interpersonal (e.g. social norms), and environmental (e.g. built environment) (3). For families, further articulation of the interpersonal level may be important, in particular with respect to relationships between parents and children. Studies have shown that parents influence physical activity levels in their children, by establishing rules, providing opportunities, or setting examples (e.g. 4, 5). On the other hand, the time demands of being a parent may restrict their ability to engage in physical activity. In addition, community design may interact with family relationships to influence levels of physical activity. Traffic levels in the neighborhood, for example, may lead a parent to put greater restrictions on a child's activity outside the home.

Adults and Physical Activity

The literature on the built environment and physical activity for adults comprises two bodies of work: studies from the travel behavior literature that examine the connection between the built environment and walking and biking as a mode of travel, and studies from the physical activity literature that examine the connection between the built environment and walking and biking and/or other forms of physical activity (2). In contrast to the physical activity studies, the travel behavior studies are motivated by a desire to shift travel from driving to walking or biking in the interest of reducing environmental impacts. The two bodies of work have used different theories and measurement techniques, though in both cases the studies are almost all cross-sectional.

Several general conclusions can nevertheless be drawn from these studies. Travel behavior studies show that walking (and biking, although it has been less frequently studied) is positively associated with higher population densities, shorter distances to destinations, higher levels of accessibility, and with traditional neighborhood design, though specific design variables have generally been insignificant. Physical activity studies show that total physical activity is positively associated with higher levels of accessibility, that use of a trail or bikeway is negatively associated with distance to the facility, and that walking is positively correlated with presence of sidewalks and perceived neighborhood aesthetics. These studies together point to the importance of accessibility (determined by land use patterns and the transportation system together); to a lesser extent, they also support the importance of design and aesthetics.

Although these cross-sectional studies produce evidence of correlations, they have often been interpreted as providing evidence of causality. The assumption in this case is that community design causes increases in physical activity, for example, that a walkable environment leads to more walking or that access to a gym leads to more exercise. Researchers increasingly acknowledge, however, that causal relationships may be considerably more complicated. Some evidence is available that shows that preferences may be more important than community design in explaining levels of physical activity and that preferences may in effect determine community design by influencing decisions about residential location. In other words, individuals who prefer to engage in physical activity may "self-select" into neighborhoods with better opportunities for physical activity. In addition, it is possible physical activity levels influence preferences for physical activity and even community design itself. Several new studies are underway that aim to sort out the direction and strength of the relationships between these variables.

The available research thus leaves us with many unanswered questions. Of much current interest to researchers is the question of self-selection: to what degree does self-selection explain the observed correlations between community design and physical activity? The limited evidence available so far suggests that self-selection may be an important factor (2). If so, then community

design at least has a role to play in facilitating physical activity for those who want it. Researchers have not yet addressed whether community design might play a subtler causal role by encouraging physical activity in those who prefer not to exercise or even by changing their preferences for exercise over time. Such questions demand more sophisticated longitudinal studies than researchers have so far undertaken.

Children and Physical Activity

What we know about community design and physical activity for children is even more limited. A substantial body of research on physical activity in children has so far focused little attention on the influence of community design on physical activity for children. Travel behavior researchers, largely focused on problems of automobile dependence, have infrequently studied the travel behavior of children. The limited evidence available is often contradictory, and it is unclear if the findings that have emerged for adults will hold for children.

A number of studies have examined the link between neighborhood safety and physical activity for children but have produced counter-intuitive results. One study found that perceived neighborhood safety was not correlated with vigorous exercise outside of school for 9th and 11th graders (6). Another study found that perceptions of neighborhood hazards were positively associated with physical activity for 4th graders, suggesting that higher levels of physical activity may lead to greater awareness of neighborhood hazards (7). The evidence on proximity to playgrounds is also mixed. One study found that proximity to playgrounds was positively associated with physical activity in children (8), while another found that proximity to playgrounds was not associated with overweight for preschool children in low-income neighborhoods (9). Few conclusions can be drawn from the limited studies available and their inconsistent findings.

Findings from traffic safety studies provide clearer direction on community design. Studies have shown that traffic speed is a key determinant of pedestrian injury risk for children (10) and that speed humps, used to lower traffic speeds in residential areas, are associated with lower odds of children being injured within their neighborhoods and being struck by cars in front of their homes (11). These studies suggest that if streets are designed to limit traffic speeds, children will be safer. It then stands to reason that if children are safer, their parents are more likely to let them walk, bike, or play within the neighborhood. Recently completed studies of the California Safe Routes to School program provide further evidence of the link between traffic safety and physical activity. In Marin County, the number of children walking to school increased by 65% and the number of children biking increased by 114% following completion of traffic safety improvements around seven schools (12). In Southern California, the number of children walking or bicycling to school increased for five out of nine schools following completion of traffic safety improvements (13). In addition, evidence shows that boys who walk to school are more physically active over all than those who are driven (14).

A review by Sallis, et al. of the correlates of physical activity points reaches two conclusions related to community design: time spent outdoors is positively associated with physical activity for children, and opportunities to exercise are positively associated with physical activity for adolescents (15). These findings lead to the next question: how do we most effectively create opportunities for children and adolescents to get outside and play? Community design clearly plays a role, but whether backyards, front yards, streets, parks, community centers, or other facilities are most effective in encouraging outdoor play remains uncertain, as does the most

effective community design for encouraging outdoor play for different ages and genders. New studies are needed to address these questions.

Compatibility?

We also don't currently know whether the most effective community design for promoting physical activity in parents is the same as or at least compatible with the most effective community design for promoting physical activity in their children. Let me share some new evidence that suggests that the needs of the two groups may be different. Patricia Mokhtarian and I are in the midst of a study of the relationships between residential location choice, neighborhood design, travel behavior, and physical activity. We selected eight neighborhoods in Northern California, four "traditional" neighborhoods and four "suburban" neighborhoods, and drew random samples of residents from each. We collected data on the variables of interest using a mail-out, mail-back survey and achieved a 25% response rate for a total sample of 1670 respondents. I present preliminary bivariate findings here for four measures of physical activity for respondents with children under the age of 16:

- The number of days in the last 7 days that the children living with the respondent played outdoors somewhere in the neighborhood (besides their backyard).
- The number of days in the last 7 days that the respondent exercised somewhere in the neighborhood hard enough to breathe somewhat harder than normal for at least 10 minutes.
- The number of times in the last 30 days that the respondent took a walk or a stroll around the neighborhood.
- The number of times in the last 30 days that the respondent walked from his or her residence to a local store or shopping area.

A comparison of the results for traditional neighborhoods and suburban neighborhoods shows statistically significant differences (Table 1). Physical activity for the respondent, whether in the form of exercise within the neighborhood, walking or strolling around the neighborhood, or walking to a local store or shopping area, is consistently higher in traditional neighborhoods. The differences for walking to the store are especially dramatic, reflecting differences in accessibility to stores in each of these neighborhoods. However, the frequency of children playing outdoors somewhere in the neighborhood is significantly higher for suburban neighborhoods than traditional neighborhoods. These data thus suggest a trade-off between physical activity for children and for their parents: suburban neighborhoods may be more conducive for physical activity for children than traditional neighborhoods, while the reverse may be true for their parents.

A comparison of the results for respondents who live on cul-de-sacs to those who don't is more mixed. As expected, a higher share of respondents in suburban neighborhoods lives on cul-de-sacs than in traditional neighborhoods: 24% versus 9%. The results for respondents living on cul-de-sacs may thus reflect other characteristics of suburban neighborhoods. Physical activity for the respondent in the form of exercise within the neighborhood or walking or strolling within the neighborhood is not significantly different for these two groups. The frequency of walking to the store appears higher for respondents who do not live on a cul-de-sac, though the difference is only marginally significant. The difference for the number of days that children played outdoors somewhere in the neighborhood is significantly different, however, with children living on cul-de-sacs playing outdoors over 50% more often than children not living on cul-de-sacs.

Although we have much additional analysis still to do, these results suggest the possibility that suburban neighborhoods are more effective in promoting physical activity in children than traditional neighborhoods and that cul-de-sacs are more effective than through streets. Although I suspect that most parents would say this finding is consistent with their experience, the trend within the planning field has been to promote more traditional forms of development, at least in part in the interest of promoting more walking and biking among adults and children alike. If our results hold after controlling for other variables (e.g. income, age of children, etc.), then new questions must be addressed: to what degree does the increase in physical activity for children in suburban neighborhoods make up for the decrease in physical activity for their parents, and, more importantly, what forms of community design can most effectively encourage physical activity for both parents and children?

Conclusions

Given the questions that remain about the link between community design and physical activity for both adults and children, we cannot safely say that certain changes in community design will lead to increases in physical activity. What we can safely say is that certain changes in community design will increase the opportunities for physical activity. The two clearest recommendations I can make based on the available evidence are to design streets for slow speeds and low levels of traffic and to put potential destinations, including parks and commercial areas, within walking distance. The first recommendation is most clearly needed for children, the latter most clearly for adults, but both groups should benefit from both recommendations. In carrying out these recommendations, however, planners need to be conscious of potential trade-offs between what is most effective for adults and what is most effective for children and find a solution that is optimal for both.

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Table 1. Physical Activity in Traditional vs. Suburban Neighborhoods
Respondents with Children Under Age 16

	Traditional Neighborhoods	Suburban Neighborhoods	Probability
Times in last 7 days that children played outdoors somewhere in neighborhood	1.54	2.24	0.00
Time in last 7 days that respondent exercised somewhere in neighborhood	2.13	1.55	0.03
Times in last 30 days that respondent walked in the neighborhood	9.71	7.75	0.03
Times in last 30 days that respondent walked to a store	4.67	1.60	0.00

Table 2. Physical Activity for Living on Cul-de-Sac vs. Not Living on Cul-de-Sac
Respondents with Children Under Age 16

	Living on Cul-de-Sac	Not Living on Cul-de-Sac	Probability
Times in last 7 days that children played outdoors somewhere in neighborhood	2.68	1.75	0.00
Time in last 7 days that respondent exercised somewhere in neighborhood	1.75	1.83	0.82
Times in last 30 days that respondent walked in the neighborhood	8.08	8.77	0.55
Times in last 30 days that respondent walked to a store	2.27	3.16	0.09

Community Design and Individual Well Being: The Multiple Impacts of the Built Environment on Public Health

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Overview

Emerging evidence suggests that many of the ways in which we design our communities impact our health (Srinivasan et al 2003; Frumkin et al 2004). Each of the singular strands of research, whether it be how community design impacts physical activity and body mass index (Ewing et al 2003; Frank et al 2004a; Saelens et al 2003) or how the built environment impacts how much we drive (Ewing and Cervero 2001) and if we have healthy air to breathe (Frank et al 2000a) presents a powerful argument for stronger connections to be forged between currently disparate professional boundaries. Major events such as the *Obesity and Built Environment Conference* are important steps whereby the built environment and public health professions can begin to meld a new lexicon. Moreover, to move towards a collective understanding of how to create new, and how to recreate existing communities, that are more health promoting. Healthy air, physical activity and associated body mass index are just a couple of the ways that community design impacts our health. While perhaps not well understood, other areas include relationships between community design and patterns of social interaction and the formation of social capital, sense of safety and security, mental health, and important aspects of water quality (Frumkin et al 2004). Ironically, planning was borne out of health related concerns at the turn of the 20th Century, and it is these common roots that will help to bring us back together (Frank et al 2003).

The importance of considering multiple outcomes of how the built environment impacts our health is perhaps best expressed through the findings of some recent research. In our recent assessment of the relationships between the built environment, physical activity and obesity for 10,898 Atlantans, we found that every additional 30 minutes spent in a car was associated with a 3 percent increase in the odds of being obese (Frank et al 2004a). This same study, known as SMARTRAQ, also found that the amount of Oxides of Nitrogen and Volatile Organic Compounds generated by a household that leading to the formation of harmful troposphoric ozone (Boubel et al 1994), a function of the vehicle use, is also associated with the similar measures of street network layout, residential density, and land use mix found to impact body mass index amongst whites (Frank et al 2004a). Therefore, as we begin to dig into the relationships between community design and public health, it will likely become increasingly apparent that taking into account these multiple outcomes will help to explain the variation within individual outcome measures such as body mass index, but also will bring to the table important partners to address much needed public policy responses.

Approach

In keeping with the goals of the *Obesity and Built Environment Conference*, this paper will highlight some evidence-based strategies for intervention and identify some research-based strategies to enhance interagency coordination. In light of the new research that is presented, it will conclude with some notions for future research that may be most strategic. Results are presented from three components of the Atlanta based SMARTRAQ (www.smartraq.net) program. Strategies for Metropolitan Atlanta's Regional Transportation and Air Quality (SMARTRAQ) represent a unique 5 plus year partnership between public health, transportation, and environmental organizations.[1] The project was initiated by the Georgia Department of Transportation in partial response to the Atlanta region's inability to demonstrate conformance with the requirements of the Clean Air Act in 1997. Once funding was in place by transportation agencies to address linkages between land use, transportation, and air quality; the Centers for Disease Control and Prevention's Physical Activity and Nutrition Division chose add to a Physical Activity Module and also to support the inclusion of questions of height and weight, within the larger travel survey of 8,000 households (17,000 participants). The physical activity module includes an in-depth questionnaire on activity patterns, and two sub surveys, one including a global positioning system and electronic travel diary and another including the usage of accelerometers to ensure the objective measurement of physical activity. Figure 1 provides an overview of the study design.

[1] Funded by the Georgia DOT, Georgia Regional Transportation Authority, Atlanta Regional Commission Centers for Disease Control and Prevention, Environmental Protection Agency, and the Turner Foundation. Total project budget is estimated at $4.6 million.

Figure 1 – Conceptual Framework

As a result, agencies across several disciplines leveraged one another's resources and shared in A the cost of data collection and now have the opportunity to partner on the approaches taken to implement the results. A regional advisory committee was formed that included a wide range of interests, such as local governments, the Metro Atlanta Chamber of Commerce, the Urban Land Institute, Sierra Club, and many others. Quarterly meetings were held throughout the 5-year study period where study design and goals, research methods and survey design materials, and project results and findings were presented and reviewed – and views were shared. Through this interactive process, an increased understanding of the perspectives and areas of commonality were identified across disciplinary lines. A panel of experts guided the project from urban transportation, public health, urban planning, real estate, and environmental planning. At the project's inception the expert panel convened and identified possible additions to the study beyond the scope and resources of the initial Georgia DOT investment of $1.4 million, including

a larger sample size for the travel survey and a residential preference survey to gauge the underlying demand for different types of community environments. Additional funding ($2.4 million) was provided by the Georgia Regional Transportation Authority (GRTA) to add these components to the study through the Congestion Mitigation and Air Quality Program (CMAQ) as an experimental pilot project.

Pursuant to the code of federal regulations, CMAQ projects must produce measurable air quality benefits. To meet this requirement, SMARTRAQ applied the findings of the project to the Atlanta Regional Commission's Livable Centers initiative (see www.atlantaregional.com) and modeled the travel behavior and air quality benefits of proposals to create more walkable communities within the Atlanta Region. This exercise tested several community design interventions through a comparison of building out three communities within the Atlanta Region (Perimeter Center, West End, and Marietta) under the current auto-oriented versus a more walkable pedestrian-oriented design. The results suggest important benefits of adding sidewalk infrastructure, street connectivity, mixed use, and residential and employment density on air quality, promotion of transit and non-motorized forms of travel and air quality. Results of this assessment will be released as part of a final set of reports from the study this summer.

As shown in figure 1, SMARTRAQ included an outreach program, which, between 1997 and 2000 convened 4 major events with area developers, local and national real estate financiers and bankers, and local government officials including two keynote addresses from then Governor Roy P. Barnes. This interdisciplinary effort identified the barriers and best practices to creating walkable environments in the Atlanta region culminated in a report, *Trends, Implications, and Strategies for Balanced Growth,* which can be downloaded at www.smartraq.net. In summation, many of these approaches and partnerships, and research methods presents a model shown in figure 2, that seeks to build off the synergy that is inherent between transportation, the environment, and public health that other regions can adapt.

Figure 2 – Interdisciplinary Collaboration

Research Methods

Study participants were recruited from the 13-county Atlanta region, using a computer aided telephone interview that screened and selected based on household income, household size, and residential density (the number of households per square kilometer) in which the household was located. Phone numbers were obtained through a commercial reverse directory of listed phone numbers and addresses and computer-generated phone number based on area codes. The 13county region in Atlanta, Georgia has a low proportion of high density, mixed use, interconnected environments that support walking for utilitarian travel.[25] Past research shows that the choice to walk vary considerably across these measures of urban form (Sallis et al 2004; Saelens et al 2003; Frank 2000b). Recruitment of participants included an over-sampling in more walkable locations to ensure a statistically significant sample of households within a range of different types of urban environments. This over sampling of higher density environments supported the project's goal of inclusion of minority participants within the study and resulted in a representative sample by ethnicity.

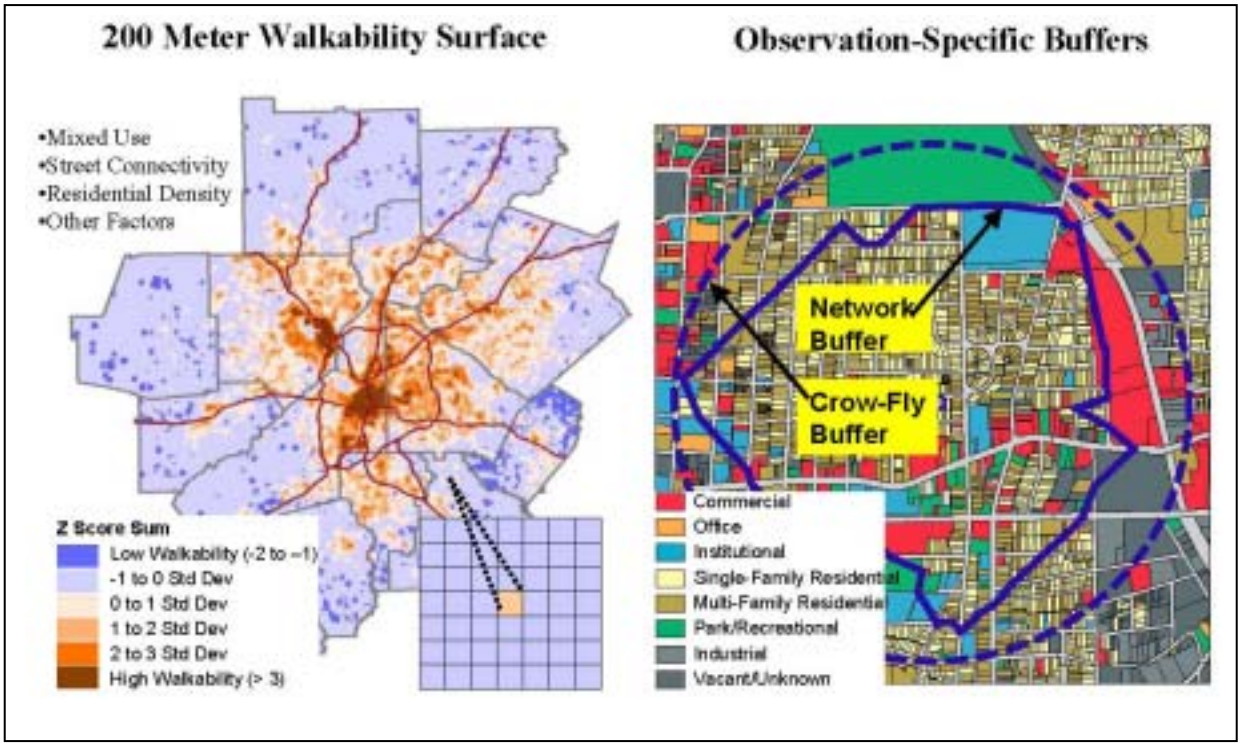
Dependent measures of body mass index, objectively assessed physical activity levels, self reported travel patterns and activity patterns were collected. Criteria air pollutants resulting from reported vehicular travel were subsequently modeled. Body mass index was obtained for all of the travel survey participants above 15 years of age. Accelerometers were deployed on 524 participants to objectively assess physical activity as part of the physical activity sub-survey shown in figure 1 (Frank et al 2004b). Travel and activity patterns were obtained over a two-day period through a diary

and then retrieved via a computer aided telephone interview. Emissions modeling was conducted on over 100,000 trips using regional travel demand model data on network performance to capture vehicle speeds based on the assumed routes and times of travel. Demographic data was obtained during recruitment via a computer-aided telephone interview.

Independent measures of the built environment were developed in a Geographic Information System (GIS). Individual measures of urban form were calculated for the region as a whole as shown in Figure 3 (left panel) and for each participant's place of residence (right panel). Discrete measures of net residential density, mixed use, street connectivity and regional accessibility to employment were calculated and tested within a cross sectional research design as predictors of the outcome measures noted above when controlling for socio-demographic factors and relative travel times across available modes of travel. More information on the procedures used to develop these measures is provided in project documentation. Figure 3 (left panel) illustrates a walkability surface or index for the region based on the combined effect of several measures of walkability.

An index has several advantages over using individual measures of urban form in predicting behavior including a high degree of spatial multi-collinearity between urban form measures (Frank et al 2000a). However, research presented here documents that it is not always possible to use a walkability index as a predictor of physical activity or of obesity. This is particularly the case if one or more of the component measures of walkability are not related with a particular outcome variable. The premise being that a truly walkable environment requires each of these, and several other components including supportive pedestrian infrastructure along block faces and at intersections. Many areas of our sprawling suburbs are dense and mixed use, but provide little in the way of pedestrian connectivity (Moudon et al 1996). Such places are difficult to traverse even short "crow-fly" distances on foot.

Figure 3 – Measuring Urban Form in the Atlanta Region



Conclusion

Findings are presented on analyses testing relationships between urban form and objective measures of physical activity; between urban form, self-reported activity patterns, and body mass index and obesity; and between urban form, self reported travel patterns, and air pollution. Results in each of these analyses confirm important relationships between community design and direct and indirect predictors of health and quality of life. Moreover, the results suggest important synergies between strategies that would promote physical activity, weight loss, and potentially improve respiratory function. Important areas of future research include:

- Impacts of pedestrian features along block faces including sidewalk presence, completeness, and placement, building facades and design details, street trees, and many other features on the walking and of design alternatives at intersections on the real and perceived safety;
- Impacts of urban form and pedestrian environmental attributes on transportation related physical activity for youth, elderly, and across gender and ethnicity;
- Assessment of the impacts of urban design attributes, including scale, uses, and sightlines on the perception of travel distance;
- Detailed assessment of the intra-regional variation in air toxics and small particulate matter and the ability to offset increased levels of these pollutants in walkable centers where growth would be focused to promote physical activity (Frank and Engelke 2004c);
- Systematic assessment of the variation in food environments
- Assessment of the demand relative to the supply of walkable environments (Levine and Frank, 2004)
- Assessment of the effect of self-selection of community environments on physical activity patterns; and
- Relationships between transit use, auto ownership, walking and biking.

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Rethinking Community Planning and School Siting To Address the Obesity Epidemic

Ms. Marya Morris, American Planning Association

Since the late 1990s, the planning profession has found itself to be a very important player in efforts to address the issues of health, obesity, and physical activity. Much of this recent attention paid to the effects of community design and transportation choice on physical activity and health has come from the health field rather than from the planning profession or from developers and builders. Noting the tremendous increase in the rate of obesity in the U.S. and the limited effectiveness of encouraging individuals to change their behavior to reverse the trend, public health policymakers and researchers turned their attention in the last several years to factors in the built environment that affect people's ability to be active. This new emphasis has spawned numerous research studies, policy analyses, debates, and, increasingly, direct action to address the problem through local planning more focused on the health and physical activity aspects of development patterns.

Indeed, the growing epidemic of obesity creates an imperative for policy changes in planning and practical, on-the-ground modifications to the built environment to happen sooner rather than later. The percentage of American adults who are obese has doubled since 1980, from 15 percent in 1980 to 31 percent in 2000 (NHANES 1999-2000). The widely disseminated maps depicting obesity trends in the 50 states illustrate the extent of the problem.

The health profession's efforts to highlight the importance of the built environment and its effects on making possible higher levels of physical activity comes at an opportune time for planning, especially for smart growth initiatives. Community efforts in the last decade to revise plans, development regulations, and development patterns to curb sprawl, reduce congestion, and protect the environment—all under the rubric of smart growth—are also creating communities with more opportunities for walking, biking, and routine physical activity.

Also energizing the policy shift to active communities is the burgeoning number of advocacy groups pushing for changes in public investments in transportation spending, land development, street design, and traffic calming in an effort to make their communities safer and more walkable. Such groups have been instrumental, for example, in getting "safe routes to school" legislation introduced, educating the public about existing and potential opportunities for physical activity, implementing traffic calming plans on neighborhood streets, and engendering public support for pedestrian- and bicycle-friendly policies.

The current flurry of policy analyses and interdisciplinary research on the environmental barriers to physical activity and potential solutions to overcoming them are helping to lay a solid foundation for change. But there is much more work needed to determine which specific modifications to the built environment, or combinations thereof, will be most effective in reversing current health and obesity trends.

What are the current conditions in most jurisdictions that run counter to the goal of creating active communities? Here is a sampling that ranges from the very broad to the very specific:

- The perpetuation (through zoning and subdivision regulations) of low-density development—e.g., one dwelling unit per acre or less—which is not conducive to walking or bicycling and thus is not conducive to incorporating activity into daily routines.

- The regulatory and market barriers to mixed-use developments and districts. Regulatory barriers include development standards that prohibit combining various land uses within a single building or in a zoning district and building codes that discourage adaptive reuse of older buildings. Market barriers include bankers' resistance to providing developers financing for any project that constitutes a fundamental departure from conventional subdivision, strip shopping center, or big box retail development. Plus, there are trends in retail, office, and industrial development—such as the proliferation of big box retail stores—that reflect the development industry's need to continually adapt and change to household shopping preferences. In many instances such adaptations do not fit with a community's smart growth objectives and the vision of its citizens.

- The vast majority of streets and street environments in American cities and towns are, by design, unsafe and even hostile toward anything except the automobile. Conventional street design and engineering aims for the safe and efficient movement of vehicles to the exclusion of most other objectives, such as sharing the right-of-way with pedestrians and bicyclists. In private developments, priority is given to the location and size of parking lots, while transit users and pedestrians are left to navigate their way through parking lots and moving vehicles.

- The lack of street connectivity is another problem. Isolated, single-use subdivisions with no direct connections to surrounding shopping areas, schools, or other destinations make it very difficult for people to walk to their destination, even if they choose to do so.

- Not all new subdivisions are required to include sidewalks on both sides or the street or to address safe routes to local schools and shopping areas for people who live in the subdivision. Even where a developer is required to install sidewalks, planners may waive such requirements in exchange for a development "amenity" unrelated to neighborhood walkability. It is also the case that developers argue about the costs sidewalks add to development. Even some neighbors may prefer the rural feel of a neighborhood without sidewalks. But in suburban settings, residential streets without sidewalks send a clear message: no one walks here. Planners need to recognize the health consequences of such tradeoffs or what might seem a fairly inconsequential requirement.

The American Planning Association/Robert Woods Johnson Project: Planning and Designing the Physically Active Community

Planning and Designing the Physically Active Community, sponsored by The Robert Wood Johnson Foundation, is an APA project addressing the land-use planning challenges and opportunities related to the U.S.'s growing problem of obesity and sedentary lifestyles. Specifically, the project is focusing on how planning processes, development regulations, and methods of community participation and collaboration can be modified and used to ensure that physical activity is a significant goal underlying the plans, provisions, and negotiations that lead to the development of a community.

Regrettably, even in an era of planning marked by greater awareness and commitment to "smart growth"—plans and regulations discouraging development patterns that destroy community character, harm the environment, promote social inequities, and lead to an even greater reliance on automobiles—there are very few comprehensive and functional (e.g., transportation, land use, trails) plans even mentioning health or physical activity as a basis for smart growth. By overlooking health and activity as a key impetus for good planning or smart growth, planners are clearly missing an opportunity to coordinate their efforts with health practitioners to educate the public and to actively accomplish other progressive planning goals, like reducing traffic congestion and minimizing sprawl.

Despite the fact that there has been seemingly inattention to the various relationships between land-use planning, health, and physical activity in plans, a survey APA conducted as part of its project indicates growing public and planning profession awareness of the need to reconnect the disciplines.

This survey, conducted by APA in 2003 of 1,000 city planners, explored the extent to which planners and the local officials in their jurisdictions recognize the impacts of plans and land-use controls on physical activity.

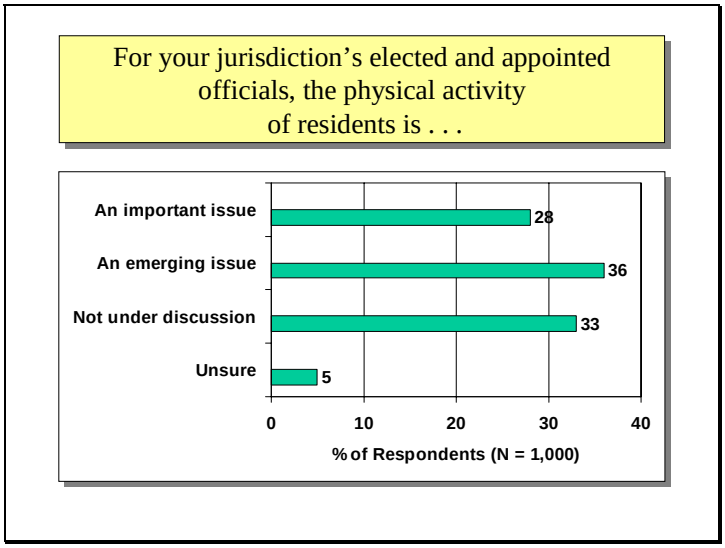

Figure 1

Inasmuch as new public policy at the local level derives from how the mayor, the city council, or other officials react to specific events, trends, or new information, it is clear local officials see they have a policy making role in this area (Figure 1). Twenty-eight percent of respondents said local appointed and elected leaders in their jurisdiction regard the physical activity of residents as an important public policy issue. An additional 36 percent said officials regard it as an emerging issue.

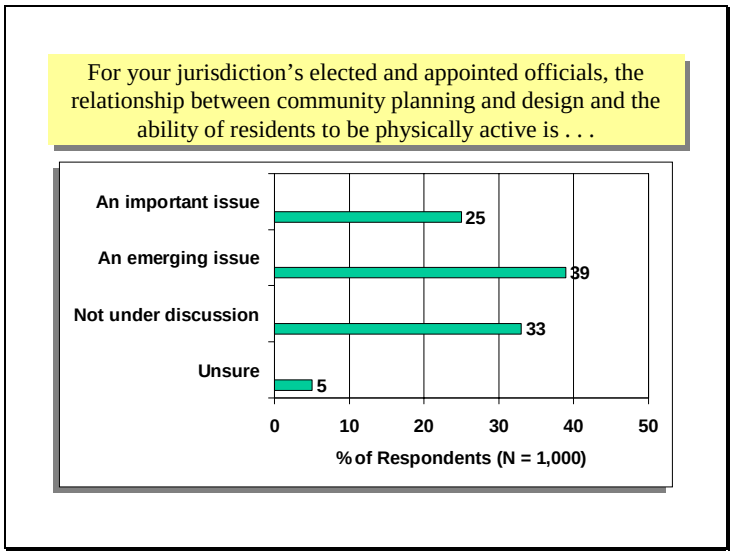

Figure 2

To improve the built environment to encourage physical activity, local officials must recognize that community planning and design—including land use, development patterns, transportation choice, and neighborhood design—are all part of the solution. According to the survey, 25 percent of respondents reported that local officials did recognize the relationship between planning and public health, and another 39 percent said local officials' awareness of the relationship was emerging.

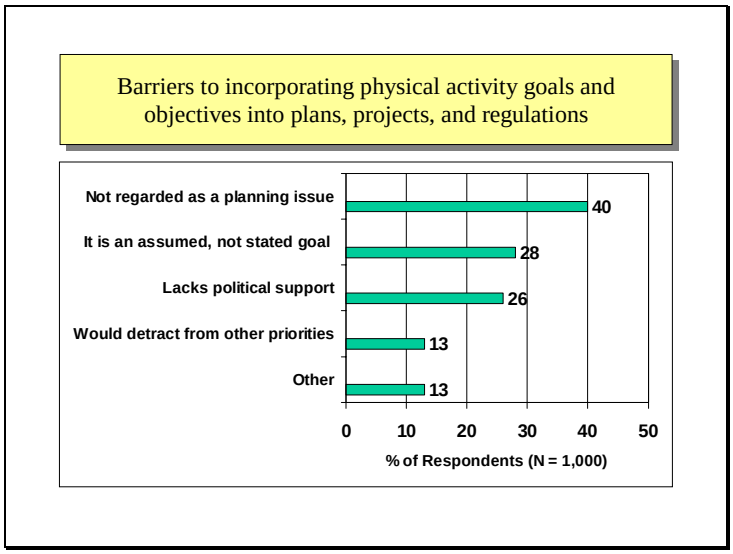

Figure 3

By their nature, comprehensive plans and land development regulations address a broad scope of community issues, including land use, housing, transportation, the environment, urban design, and economic development, among other elements. Despite the fact that approximately two-thirds (64 percent) of these plans recognize the importance of community planning and design as a key part of the solution, barriers remain to full incorporation of the explicit goal of promoting or allowing for physical activity in plans, projects, and regulations (Figure 3). The largest barrier, according to 40 percent of the respondents, is that physical activity is not yet regarded as a planning issue. The second greatest barrier (reported by 28 percent of respondents) was that physical activity is an assumed, not a stated, goal. Like most local government agencies, planning departments are perpetually faced with limited resources to tackle complex work programs and responsibilities. In that vein, 13 percent of respondents said the barrier to incorporating physical activity was that it would detract from other departmental priorities.

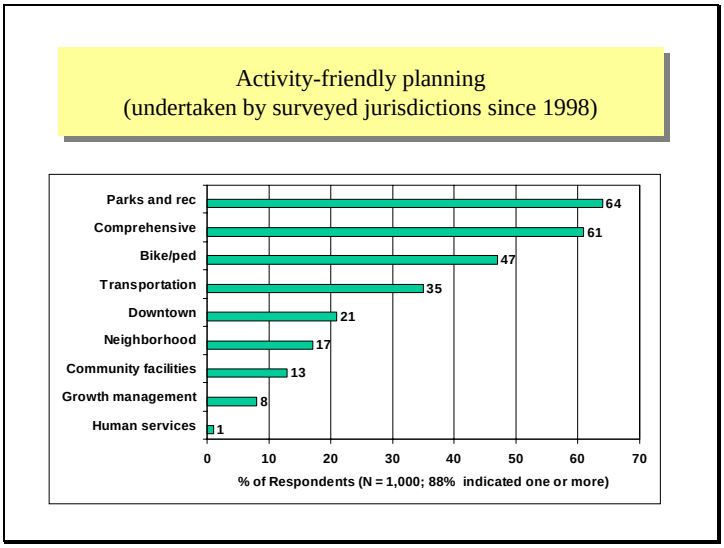

Figure 4

Next APA asked planners which of the common types of plans in their jurisdiction contain *explicit* policies, goals, or objectives related to increasing physical activity opportunities for residents (Figure 4).

Based on the findings of other research APA has done on such plans, very few jurisdictions have such explicit policies. In this survey, however, many more respondents than expected said that several of their jurisdiction's plans contain such explicit policies. As shown in Figure 4, 64 percent indicated that the parks and recreation plan contains such explicit policies, 61 percent indicated that the comprehensive plan contains them, and 47 percent said the bicycle and pedestrian plan contains them.

A closer examination of the actual plan documents in question revealed that most plans did not contain specific policies. Respondents were most likely characterizing any policies, goals, and objectives related to walkability, alternate transportation modes, and quality of life enhancement—all of which are commonly found in the plans listed in the survey—as explicitly directed at increasing the physical activity levels of residents. While it is significant that planners *perceive* that physical activity and health of residents

is being addressed in these plans, expressly stating such goals would be a stronger commitment to health on the part of the local jurisdiction and would result in programming and resources being directed at creating active communities. And, of course, broadening plans and the plan-making process to include health issues could help leverage substantial and previously untapped support for smart growth reforms jurisdictions have undertaken or will be undertaking.

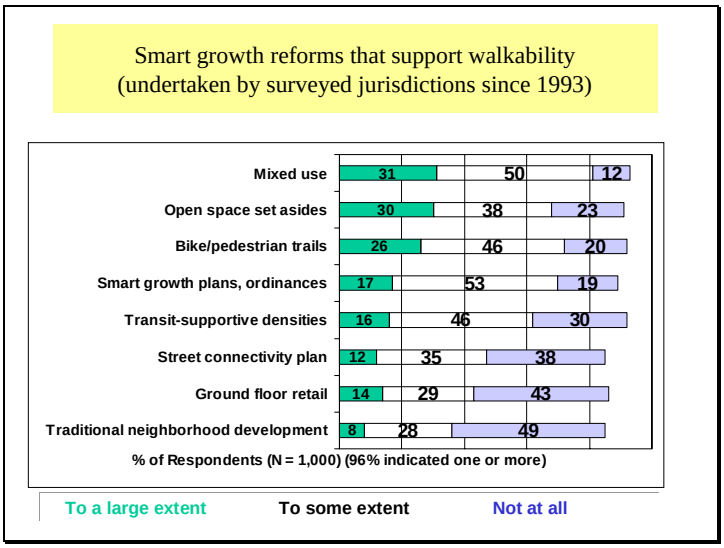

Figure 5

Focusing on elements found in walkable communities, respondents were asked to indicate the specific measures their jurisdiction had implemented to support walking and physical activity. Since many codes are revised and reformed incrementally, respondents were asked whether the actions had been implemented to a large extent, to some extent, or not at all (Figure 5). Mixed-use development was the most commonly implemented measure, with 31 percent indicating their jurisdiction permits it and an additional 50 percent having included such provisions to some extent (presumably they allowed it in some but not all districts). Also scoring high were bicycle and pedestrian trails, with 26 percent indicating they had required or encouraged the incorporation of such facilities into subdivisions since 1993, with an additional 46 percent having done so to some extent. Increasing development density near transit also scored high—16 percent indicated it had been implemented to a great extent, and 46 percent said it had been done to some extent. Perhaps the most broadly encouraging finding was the results for smart growth plans and policies. Seventeen percent indicated the jurisdiction had incorporated smart growth polices into plans, ordinances, and development review processes, and more than half (53 percent) said they had done so to some extent.

A New Planning Paradigm for Active Communities: Points of Strategic Intervention in the Planning Process

What role do planners have in modifying the built environment to encourage physical activity? APA's work with the Robert Wood Johnson Foundation has centered "five strategic points of intervention" where planners can affect change.

1. Visioning and goal setting
2. Plans and planning
3. Implementation tools
4. Site design and development
5. Public facility siting

Point 1. Visioning and goal setting. When citizens, planners, and stakeholder groups come together to prepare a new plan, the conversation typically begins with a discussion of shared values. Such groups brainstorm about how they would like their neighborhood, city, parks, or transportation system to look in the future and how it will function.

Protecting and improving one's family's health and one's own health is a universally shared value. But in the thousands of jurisdictions, agencies, and other entities that prepare land-use plans, it is the exception for health and physical activity advocates or public health professionals to be present as stakeholders at visioning session. Their absence results in several missed opportunities. First, planners and public health practitioners could use such sessions to educate the public about how communities develop and the effect development patterns have on their ability to be physically active when following their daily routines.

Point 2. Plans and planning. As described above, smart growth planning—a major focus of which is the creation of walkable, compact, mixed-use neighborhoods and a multimodal transportation network—are inherently supportive of increasing the physical activity of residents. In other words, smart growth has laid solid groundwork for planning to address health.

But it is important for health to be elevated to the level of other land-use and comprehensive plan goals (e.g., creating affordable housing, supporting economic development, and protecting open space) if jurisdictions are to be successful in creating active, healthy communities. Without direct involvement by health experts in the planning process, health has not been, nor is it likely to be, addressed in plans to any substantive degree. Creating opportunities for citizens to be physically active needs to be an explicit, not simply implied, goal in comprehensive plans, as well as many of the functional plans and plan elements that most jurisdictions prepare, including the transportation and circulation plan, bike and trails plan, housing plan, and parks and recreation plan, among others. It is not enough for planners and local officials to assume that, when implemented, a new bicycle and pedestrian plan will result in people becoming more active and healthier. Such plans need to document baseline health conditions and describe how such conditions will be addressed as the plan is implemented. They also need to prescribe how and when the effects of such change will be measured, monitored, and reported.

Smart growth plans have also been touted as a potential solution to other health problems. For example, promoting compact, walkable developments and increasing transportation choices beyond the automobile can reduce car dependence for some families and thus improve air quality. A balanced plan for transportation would likely advocate or require narrower-than-typical streets as well as traffic calming in residential areas, which can

reduce the incidence of motor vehicle/pedestrian accidents. Such accidents are the leading causes of death among persons 1 to 34 years old. Each year, motor vehicle crashes are to blame for 42,000 deaths, 3 million nonfatal injuries, and $230 billion in costs (CDC 2003; NHTSA 2002).

On the environmental front, urban service limits or growth boundaries, which delineate the outermost points of an urbanized area to be served by sewer and water utilities, can help stem groundwater contamination by cutting down on the number of septic systems and redirecting future growth to areas already served by municipal utilities.

Point 3. Implementation tools. There are numerous modifications that can be made to zoning and subdivision regulations to produce neighborhoods where residents have more opportunities to be active. First, jurisdictions can revise ordinances to permit mixed-use development where housing, shopping, and offices can coexist in the same building or in the same zoning districts. Going a step farther, zoning ordinances should be revised to include New Urbanist or traditional neighborhood development (TND) provisions, either as an overlay district, as a requirement in certain districts, or communitywide. Such provisions, like other smart growth provisions, promote compact communities with services and principal locations within walking or biking distance.

Other tools include:

- increasing required development densities which set forth a minimum number of dwelling units per acre;
- requiring sidewalks and/or trails in new developments and retrofitting already developed areas with sidewalks, trails, and bike paths: instituting traffic calming measures;
- requiring new developments to include usable parks or open spaces that ideally connect to similar spaces in adjacent neighborhoods; and
- requiring street connectivity, where a grid or modified grid street network allows persons on foot, bike, or behind the wheel to travel from one neighborhood to another and one destination to another without having to depend on a crowded arterial street.

In larger metropolitan areas, the provision of public transit and transit-oriented development around stations can add to residents' transportation choices.

Point 4. Site design and development. There are factors of building design, site design, and the relationship of a building to its surroundings that determine whether an

Schools as Centers of the Community

A 2003 report by the National Clearinghouse for Educational Facilities and other allied organizations addressed the critical backlog of school investment needs in the U.S. The report acknowledged that the pressing need to renovate, replace, and create many new schools presents a compelling opportunity to evaluate existing research about what constitutes an optimum learning environment. What they found was that all creative solutions, such as reducing school size, reconfiguring classrooms, and emphasizing lifelong and experiential learning, have one common theme: schools should be the centers of community. At their best, community-centered schools should:

- help meet a community's leisure, recreational, and wellness needs;
- be accessible to people of all ages;
- encourage more parental involvement in school activities; and
- contain shared public spaces that are accessible year round.

Community-centered schools are supportive of activity-friendly objectives. They would generally be smaller and located within neighborhoods, they could increase opportunities for kids to walk to school, and they would provide opportunities for all members of the community to use and enjoy recreational facilities and public spaces.

Source: National Clearinghouse for Educational Facilities (2003)

area allows or promotes physical activity. These factors include the orientation of a building to the street, architectural details, building materials, windows, and sidewalks. For the most part, these elements are chosen or decided upon by the developer in concert with the planning agency, and, depending on their design, can either promote or prohibit pedestrian activity.

Many jurisdictions have also invested in new sidewalks, crosswalks, street lighting, public art, transit shelters, and street furniture to create pedestrian-oriented settings and public gathering places. Further, zoning and planned unit development regulations commonly contain provisions for developers to provide other amenities, such as landscaping, on-site pedestrian paths, awnings, and variety in building design. Such regulations often require that buildings be built right to the sidewalk rather than setback beyond surface parking and also require retail on the ground floor of multifamily residential and office buildings, multiple entrances for pedestrian convenience, and transparent windows on the first floor, all to create a lively street scene conducive to walking.

Ordinances can prohibit long expansive blank walls that deter people from walking by requiring large buildings to vary the blank wall by creating more inviting facades with windows, awnings, architectural features, and entrances. And finally, ordinances governing development in pedestrian-friendly areas now commonly allow developers to build less parking and to locate all or some of it on the side or rear of commercial buildings. The object is to minimize the amount of surface parking overall and to shape the public realm in a way that puts the people's safety and comfort ahead of the movement and accommodation of cars.

Point 5. Public facility siting. The location of public facilities and the design of the environments around them are keys to creating active communities. Unlike the other strategic points of intervention, planners tend to have much less influence over public facility siting and design. , Instead, those decisions are made by other local or federal government agencies with preemptive powers that override local plans and zoning rules.

Post offices, schools, city hall, courthouses, and libraries serve as frequent destinations, popular community gathering places, and as visual, architectural focal points of a community. Post offices on Main Street provide a destination for residents interested in "purposeful" walking; that is, getting some exercise while accomplishing a few errands at the same time. But in the last several decades, many such post offices in many small towns and suburbs have relocated to new, single-story processing facilities outside the city. Schools, in particular, as the sidebar above noted, can serve as community centers. There are many reasons that schools are no longer focal points. The section that follows focuses on this particularly important aspect of public facility siting in the goal to allow and promote more physical activity and better health—especially the health of children.

School Siting and Walkability

With respect to schools, the trend in the last several decades has been for school districts to build fewer and larger schools on sites disconnected from the places students live. At

the same time, many smaller, older neighborhood-based schools are more likely to be accessible to kids on foot or by bike are shutting their doors. Community planning and design and decisions by school boards regarding new school siting and rehabilitation and reuse of older schools, and the impact of this problem on how children get to school are the focal point of the rest of this paper.

According to the CDC, in 2000 just 13 percent of school children walked to school, as compared to 1969, when 66 percent of kids walked to school (CDC 2000). According to parents, the two primary reasons why kids are driven rather than walk to school are that, first, schools are too far for kids to walk, and two, the route they would have to walk is too dangerous (e.g., inadequate sidewalks, no crosswalks). At the high school level, the increasing rate of car ownership per household in recent decades means that kids are driving themselves to school in ever-growing numbers.

For younger children, the shift from a walk to a ride to school is, in part, prompted by changes in American family life. Households with two parents working full-time often lack the time to walk their children to school. Single working parents also opt to drive their kids to school rather than let them walk there unsupervised. Even kids that live within close proximity to their school are not walking or bicycling. The CDC has also found that 31 percent of kids that live within one mile of school walk or bike to school; in 1969, 90 percent did so (MMWR 2002).

For mothers, the effect of serving as the family taxi driver is troubling. *High Mileage Moms*, a 1999 report by the Surface Transportation Policy Project, found that, on average, a typical mother travels 29 miles a day, taking 5 or more trips, spending more than an hour behind the wheel each day. That is 20 percent more driving than the amount of driving done by either single women or men, and constitutes time that mothers could be spending with their family or getting exercise.

School Siting and Land-Use Planning

Until a few years ago, smart growth advocates and planners overlooked the issue of school size and siting as a generator of sprawl. But considering the factors in the built environment that may contribute to sedentary lifestyles and obesity has focused the discussion on how large, sprawling schools have precluded the option of walking or biking to school for students.

A lot of attention is being paid to widely disseminated guidelines for school facility and site size produced by the Council for Educational Facilities Planning International (CEFPI). States are not required to use the standards, although more than half do use a formula based on them. As more and more attention is paid to the impact of these standards, several states have opted to stop using them or to set them as maximum size standards. Further, CEFPI is in the process (as of spring 2004) of revising the guidelines to reflect new objectives in school planning, including the effects on sprawl and transportation mobility, and to create the highest quality environment for learning in the context of myriad changes in school financing formulas, federal mandates (e.g., No Child

Left Behind Act), and a growing demand for smaller, neighborhood-based schools. While change is underway in many states, most school districts follow these guidelines:

- Elementary schools = 10 acres, plus 1 acre for every 100 students;
- Junior high/middle schools = 20 acres, plus 1 acre for every 100 student;
- Senior high schools = 30 acres, plus 1 acre for every 100 students (CEFPI 2003).

As mentioned, there is also a significant parallel movement throughout the U.S. to revitalize and reuse small, neighborhood schools. The intent is to improve the environment for learning and to reverse the trend of disinvestment in older school buildings. Proponents of these initiatives point to the importance of keeping schools open in neighborhoods within walking distance of students, capitalizing on existing public infrastructure, restoring and modernizing historic school properties, and allowing schools to serve as centers of community life.

There are, however, many examples of how—in pursuit of their respective mandates—the local government planning function and the school district planning function work at cross purposes with one another.

School districts are mandated to use tax dollars in the most efficient manner possible while providing the best learning environment possible. Land-use planners are charged with guiding development in a fiscally and environmentally responsible manner, limiting unnecessary sprawl and using public infrastructure efficiently. From a planning standpoint then, rehabilitating a school or siting in an already urbanized area is an obvious goal of meeting planning and smart growth policies. But even in those states where local governments do have a say about the siting of schools, urban land costs and the size standards cited above require massive land purchases, which means the only possible sites are “greenfield” sites on the urban edge where land is available and cheaper.

In states where local governments have no control over school siting, the lack of coordination creates significant problems, not just as regards siting and its effect on community character, design, and opportunities for physical activity, but also tremendous economic inefficiency. In Michigan, for example, state law exempts schools from local planning and zoning. The Michigan Land Use Institute found that even though the school-age population in Southeast Michigan is projected to decline by 1.5 percent in the next 30 years, $6.2 Billion has been spent in that region on new schools since 1996.

New school sprawl creates a ripple effect whereby new subdivision and commercial development is drawn outward toward the school. The result is excess land consumption, added pressure on exiting roads, sewers, and water utilities. The converse effect then occurs for older, in-town schools, which suffer from declining enrollment, weakened tax base, and an skewed funding formulas and size standards that make modernization and rehabilitation of old buildings a near impossibility.

The Michigan study also found that some sprawling schools engage in aggressive marketing programs to lure new students away from older schools to help justify the investment (Michigan Land Use Institute 2003). The resultant decline of urban school systems couple with declining tax base as result of families leaving, create even greater hardships in an already cash-poor school system, which leads to even more families leaving for the suburbs as school facilities and programs degenerate.

Another factor that raises questions about the wisdom of locating new schools on the suburban fringe is the changing demographics of suburbia. A report by the Brookings Institution found that new immigrants to the U.S. are bypassing central cities and settling directly in the suburbs (Singer 2004). Furthermore, evidence suggests that poverty is spreading beyond the urban core as the low-wage service economy moves to the suburbs attracting low-wage workers there as well. This likely outcome will be that low-income families and immigrant families who rely most on public transportation, carpooling, or walking are settling or resettling in areas designed to accommodate driving only. Jurisdictions will be pressed to address the safety and transportation needs of both adults getting to work and children getting to school safely.

Some local governments have the authority to impose adequate public facilities requirements for schools, which means new school facilities must be available to serve new students that move into new subdivisions. But, in Maryland communities, which have aggressively implemented APFO under the statewide smart growth program, the attempts to fully connect adequate facilities requirements to future school enrollment projections, capital budgets, and mitigation measures (which allow developers to build schools themselves when public capital will not be available to build schools when new demand comes on line) have created a “regulatory quagmire” (Donnelly 2003).

Exacerbating the complexities of coordination is the push in many places towards school choice, charter schools, and private schools. Such new school paradigms will render traditional school enrollment and capital spending forecasting methods obsolete when school districts and planners will no longer be able to assume that the children who live in new residential developments will be attending the schools being built to accommodate that new residential development.

Improving Coordination between School Siting and Land-Use Planning: Examples from Several States

Most state laws provide statutory authority for planning agencies to use zoning to review and approve new schools sites. But clearly a lot of local governments have abdicated the zoning authority that would influence school siting. School sprawl continues to occur despite local planning objectives calling for smart growth and compact, walkable communities. Further, a number of states, such as Michigan, preempt local governments from applying zoning requirements to the school siting process.

In states and localities actively working to connect planning with school facilities siting, the key theme is the need to improve communication between planning officials and

school districts. Better communication will lead to better sharing of data; coordination of land-use planning and school siting plans; and agreements on school design and use.

Some of the techniques that authorities are using to foster coordination include school siting ordinances; interlocal agreements; joint-use agreements; joint school board and regional/county/local work sessions; and consideration of school siting in the land-use and public facilities elements in the comprehensive plan (LeBeau 2004).

Florida

The state of Florida has considerably experience in trying to coordinate land-use planning and school siting. Florida requires local governments to prepare comprehensive plans and land development regulations (i.e., zoning and subdivision ordinances) consistent with statewide goals for planning, land development, environmental conservation, natural hazard mitigation, transportation, and interagency and interjurisdictional cooperation. The state recognized more than 20 years ago that addressing school siting in local plans was important because schools are a "vital organizing element in building communities." Regrettably, what the state came to recognize in its early efforts, which included two state enabling laws—one for planning agencies and the other for school boards, was a failure to communicate that led to misinterpretation and a lack of coordination (Hubbard 2004).

In 2002, the state stepped in and mandated interlocal agreements between school districts and localities and provided small grants to facilitate agreements and provide technical assistance. According to the law, there must be a school board representative (in a nonvoting capacity) on the local and regional planning commission. The agreements must lead to sharing of:

- student enrollment and population projections (the mismatch between the different projections of planners and school board authorities was noted as a particular problem);
- data about planned residential growth and public facilities;
- information about school site selection decisions;
- school facility infrastructure siting; and
- statistics about the capacity for growth in the jurisdiction.

Furthermore, the agreements mandate that there be local government input in the school facility work plan.

The penalty for not achieving an interlocal agreement is a state financial sanction. And the process seems to be working. These mandated interlocal agreements are in place in all but two Florida counties (they were required to be in place by 2004). Some of the immediate changes have resulted in jurisdictions banking land for future school sites and increased adherence to the provisions of the existing state enabling legislation requiring local input on school decisions, which to this time had been applied inconsistently and inappropriately.

Maine

Since the late 1990s, the State of Maine has been a leader in tracking the cross-cutting effects of school siting, sprawl, and state and local growth management laws. Between 1970 and 1995, Maine's public school enrollment declined by 27,000 pupils. From 1975 to 1995, Maine state government spent $727 million on new school construction and additions (Del Valle 2003). Prior to 1998, Maine's school financing system was unaccountable to other state or local agencies affected by its decisions. School districts were not required to plan for or invest in the maintenance of existing facilities; in fact, state funds were available only for new school construction, not renovations.

In 2000, the legislature requested that the State Planning Office and the State Board of Education submit a joint report with recommendations regarding land-use ordinances and zoning ordinances near new schools (State of Maine 2001). That report, *Making Schools Important to Neighborhoods Again*, contains very detailed recommendations for local governments. First are recommendations on which zoning districts schools should be permitted as of right and where they should be allowed as a conditional use. The report also contains guidance on appropriate land-use and zoning classifications for the environment near schools, including the type and intensity of development in adjacent neighborhoods. For example the report recommends relatively high residential densities within one-half mile of the school, which ideally would put many kids within walking distance.

The Maine report also recommends pedestrian-oriented development in neighborhoods around schools and suggests that such neighborhoods be developed with narrow lots and narrow streets to make the area walkable. Finally, the report contains recommendations on street connectivity, pedestrian and bicycle connections, and open space and parks for areas near schools, with the aim of centering the school in a safe, walkable location.

At the committee's recommendation, the Department of Education passed a school siting approval rule, which applies to all Maine schools receiving state funding. The state also did away with the CEFPI minimum school-size requirements and instituted a maximum size provision. Among other recommendations, the rule requires school boards to consider of the impact of siting on student transportation, vehicular traffic, and student safety. Perhaps most importantly, the report requires school boards to consider locating a proposed new school in a locally designated growth area identified in the municipality's comprehensive plan. In the absence of a plan, a school board must consider locating the school in an area served by a public sewer system or in a compact neighborhood. If a school board fails to locate a school as such, it must provide a written explanation of why it did so (Maine Revised Statutes, 05-071 Department of Education, Chapter 50 New School Siting Approval.).

New Jersey

The 2001 revision of the New Jersey State Development and Redevelopment Plan incorporated new policies to coordinate school facility planning, management, and

financing that are coordinated with the plan's overall goal of stopping sprawl, preserving land, and allocating state resources in a fiscally responsible manner. The objective is to direct school construction and financing into existing urban areas and to foster a more integral role for schools in the context of the entire community. Local units of governments that prepare plans pursuant to the statewide plan will coordinate local land-use decisions with local school funding and siting decisions.

The state plan envisions local schools in New Jersey communities as providing various services, such as libraries, health clinics, arts centers, and housing. This new state planning for schools policy coincided with Educational Facilities Construction and Financing Act, which authorized the sale of $8.6 billion in bonds to pay for construction and reconstruction of schools throughout New Jersey.

North Carolina

In 2003 the Center for Urban and Regional Studies at the University of North Carolina at Chapel Hill undertook a study of trends in school construction in North Carolina. The report, *Good Schools—Good Neighborhoods*, identified the key factors affecting school location and design and provided recommendations to local governments, school boards, and to the North Carolina Department of Public Instruction on how to overcome obstacles to building and maintaining, walkable neighborhood level schools (Salvesen and Hervey 2003).

Similar to other studies, the key findings on the factors that influence school siting and design in North Carolina are: suburbanization, economics, land-use regulation, and state size and siting guidelines that have resulted in large, consolidated schools and the closure of older smaller schools in established neighborhoods.

The report concludes with recommendations directed at school boards, local governments (i.e., planning departments), and the State Department of Public Instruction. The theme that runs through each set is the need for all three entities to consult with one another early in the school siting process. The recommendations in the report were as follows.

School Boards

- Consult with municipal and county governments early in the planning process.
- Emphasize saving older school buildings rather than building new schools.
- Build small schools on compact sites.
- Seek creative solutions for achieving compact school sites for the main school building.
- Provide safe and adequate bicycle and pedestrian connections.
- Factor in walk-zone compatibility in selecting school sites.
- Work with the community to identify solutions to improving connections to schools.

Local Governments

- Adopt local development standards that allow developments to be built that maximize the potential for walkable neighborhood schools.
- Work with the local school board to identify school sites in advance.
- Facilitate connections to schools.
- Explore joint use of school and public recreational facilities.

North Carolina Department of Public Instruction

- Recommend small school prototypes and examples of renovations rather than sprawling school designs using the Prototype School Design Clearinghouse
- De-emphasize the CEFPI minimum acreage guidelines in facility planning guides.
- Provide staff expertise at the state level to help communities with land use and urban design planning decisions as they are related to promoting walkable schools.

Washington

The state of Washington enacted the Growth Management Act in 1990, which instituted mandatory land-use planning for all cities and counties larger than 25,000 people. Local land-use plan policies are now required to be consistent with statewide planning goals, and cities and counties are required to draw urban growth boundaries around urbanized areas to contain sprawl, use public infrastructure efficiently, and keep development out of sensitive environmental lands. The law was prompted by rapid population growth, haphazard sprawl, an overtaxed transportation system, and loss of open space in the Puget Sound region.

As originally drafted, the law would have made special purpose districts, including school districts, accountable to state growth policies and to local plans. However, then Governor Booth Gardner vetoed that provision because it contained an exemption to the law for port facilities, something he did not want to bargain away. As an alternative, the state directed county-level growth management councils (made up of representatives of each local unit of government whose chief purpose is to coordinate the urban growth boundary delineation process) to provide guidance on how school districts and local planning functions should be coordinated.

After the growth management law had been in place for several years, residents in the rural areas of King County raised concerns that school district and utility services were extending into rural areas, thus undermining the growth management act. In response the King County Growth Management Planning Council approved a policy to request schools districts to take into consideration the proximity of the proposed school to the urban growth boundary.

The Puget Sound Regional Council has prepared a list of other potential strategies also to coordinate growth management and land use decisions. These include:

- requiring local governments should help identify vacant and buildable sites within already developed areas to keep schools from leap-frogging to rural sites that will invite sprawl;
- expanding King County's Green Schools program to other school districts. The program allows schools to select from a list of environmental protection actions to pursue, including several that relate to improving pedestrian and bicycle access to schools and reducing the number of driving trips to schools and CO_2 emissions near schools;
- integrating schools and land-use planning policy; namely, requiring or strongly encouraging consideration of infill sites for school construction and promoting multistory school buildings to maximize the use of land;
- eliminating minimum size requirements;
- revising policy to favor school renovation over new construction; and
- expanding the use of school buildings to make them centers of community (Raker 2004).

Conclusions

Fostering integration of school-siting policies and local land-use planning policies is imperative if walking and bicycling to school are to serve as part of the solution to getting kids moving and physically active again. So too must comprehensive plans, zoning, and building site designs be created and designed in a way that supports the goal of improving health and creating active communities.

There is much work to be done to determine exactly which modifications in the built environment will be the most effective in this area. The lack of action on these issues to date is due in part to the lack of understanding by planners and others about the health consequences of how we shape the built environment (Srinivasan 2003). That said, given the mutually supportive nature of smart growth policy and active living policy, local jurisdictions should not wait to see what ongoing and future research says about relative benefits of the recommended strategies for creating active communities. Planners and public health professionals too have a responsibility to formalize their collaboration on health and activity issues. Such collaboration could include educational sessions for the respective sectors on their responsibilities to the community, their processes for engaging the public in decision making, and opportunities to leverage the knowledge and resources of each profession to ultimately create healthy, active communities.

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SESSION 3: WORKSITES, EMPLOYERS AND EMPLOYEES

Assessing the Financial Impact and Return on Investment from Ecological and Environmental Interventions at the Workplace

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The Problem of Obesity

More than half of all Americans are overweight or obese, and the prevalence of these risk factors has increased dramatically in the past decade. Obesity is a risk factor for several chronic disease conditions including type-2 diabetes, cardiovascular disease, several cancers (endometrial, post-menopausal breast, kidney, and colon), musculoskeletal disorders, depression, sleep apnea, and gallbladder disease.

The national medical cost burden attributable to overweight and obesity is estimated to be between $60 and $93 billion (in 2002 dollars), or 5.7 to 9.1% of U.S. spending on healthcare (Wolf and Colditz, 1998 and Finkelstein et al., 2003). Employers pay about a third of the total nation's $1.6 trillion annual medical bill, including an estimated $13 billion on obesity related disorders (Koretz, 2000). In addition, obesity is estimated to cause 39 million lost workdays and 239 million restricted activity days (Koretz, 2000).

Business leaders are becoming increasingly aware of the human and economic burden that poor health imposes on their workers and their companies' competitiveness. Many employers have invested in health promotion and disease prevention programs aimed at reducing the prevalence of obesity in the workplace through encouragement of physical activity, healthy diet, and improved management of health risk factors. Employers continue to seek innovative and evidence-based interventions that can be imported into the workplace to address a growing public health epidemic that also adversely affects worker productivity. A large body of literature supports the application of individualized health promotion interventions directed at reducing employees' health risk factors including overweight and obesity, but there is growing interest in interventions that support individual change efforts through the creation of more supportive environments.

The Obesity Epidemic in the Workplace

In the U.S. labor force, it is estimated that 38.8% of men and 20.7% of women, between the ages of 25 and 54.9, are classified as overweight (Thompson, Eldelsberg, Kinsey, & Oster, 1998), compared with 40.7% of men and 23.1% of women in the U.S. general population (Must et al., 1999). Further, within the same age group, 19.4% of men and 25% of women are classified as obese (Thompson et al., 1998), compared with 29.9% of men and 23.4% of women in the general population (Must et al., 1999). Thus, although the prevalence of overweight and obesity in the workforce is slightly lower than in the general adult population, still over half of all workers are either overweight or obese.

Economic Impact of Overweight and Obesity

The Centers for Disease Control and Prevention estimates the annual national medical cost burden attributable to overweight and obesity to be $117 billion, in direct and indirect costs (CDC, 2003). Of that amount, an estimated $75 billion in direct medical expenditures (Finkelstein, Fiebelkorn, & Wang, 2004) is spent on treating obesity-related disorders (DHHS, 2003). Studies have shown that obese employees take more sick leave than their non-obese counterparts and that they are twice as likely to experience high levels of absenteeism, defined as seven or more absences due to illness over a six month period (Tucker & Freidman, 1998). Other research examining medical claims data indicates that as BMI increases, so does health care utilization and associated expenditures (Pronk et al., 2004; Goetzel et al., 2000; Heithoff, Cuffel, Kennedy, & Peters, 1997).

Strum (2002) estimated annual excess medical costs attributable to obesity and overweight to be $395 (36%) higher than for those of normal weight. Goetzel et al. (1998) analyzed person-level medical claims and health risk data for approximately 46,000 employees of six large private and public sector organizations. They calculated the annual excess costs of being overweight or obese to be $747 (in 1998 dollars) or 21% higher than those not overweight. The analysis controlled for demographics, job type and medical plan as well nine other modifiable risk factors (Erfurt et al., 2001). An environmental analysis of the same database (Anderson, Whitmer, Goetzel, et al., 2000) found that the dollar impact for each high-risk factor was multiplied by the prevalence of that risk factor in the population.

In total, obesity-related disorders cost employers an estimated 39.3 million lost workdays, 239 million restricted activity days, and 62.7 million visits to the doctor. Obesity-related conditions are estimated to cost U.S. business $13.0 billion dollars annually, with $8.0 billion spent on health insurance expenditures, $2.4 billion for sick leave, $1.8 billion for life insurance, and $1.0 billion for disability insurance (DHHS, 2003).

Obesity and the Environment

Physical inactivity and unhealthy eating behaviors have long been associated with obesity. Recently, however, researchers have started exploring obesity from a social-ecological framework (Stokols, 1996), suggesting that varying degrees of biological, psychological, behavioral and environmental factors are associated with obesity and overweight in healthy adults. While there is not an extensive existing body of literature on the environment as a determinant for obesity or overweight, there is research to support the contention that accessibility of sidewalks, street lights, fitness facilities, parks (Bourdeaudhuji, Sallis, & Saelens, 2003), cycling paths (Sharpe, Granner, Hutto, & Ainsworth, 2004), and overall aesthetics (Humpel, Owen, Marshall, Bauman, & Sallis, 2004) are associated with increased physical activity. Furthermore, perceptions of a safe neighborhood are also positively associated with increased physical activity (Humpel, Owen, & Leslie, 2002). Similarly, negative perceptions of environment (Catlin, Simoes, & Brownson, 2003; Giles-Corti, Macintyre, Clarkson, Pikora, & Donovan, 2003), no

sidewalks (Humpel et al., 2002), sedentary jobs, decreased household physical activity, accessibility of restaurants, (Franklin, 2001), and leisure time spent watching TV or surfing the Internet, (Humpel et al., 2002) have all contributed to overweight and obesity among American adults.

Workplace-Based Health Promotion Interventions

According to the *Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*, workplaces offer a unique opportunity to promote health behavior change and the adoption of a healthier lifestyle (DHHS, 2001). Most adults spend at least eight hours a day at the workplace, therefore creating an opportunity to provide individual, group and organizational level interventions to a large number of adults in one setting. Existing reviews of workplace healthy promotion literature suggest that the majority of workplace health interventions, to increase physical activity or change dietary habits, have utilized individual behavioral approaches of short duration and minimal intensity, report variable amounts of weight loss, and fail to report maintenance data (Bull, Gillette, Glasgow, & Estabrooks, 2003; Dishman, Oldenburg, O'Neil, & Shepard, 1998; Heaney & Goetzel, 1997; Hennrikus & Jeffery, 1996; Wilson, Holman, Hammock, 1996). However, a recent review of the clinical and cost-effectiveness of comprehensive health promotion interventions in the workplace by Pelletier (2001) indicates that when well-executed large-scale corporate initiatives, such as those implemented at Johnson and Johnson, Dupont, Bank of America, Tenneco, Duke University, and the California Public Retirees System, are well integrated into the human resources strategy of the organization, they are more likely to be well accepted and effective.

Return on Investment for Workplace Health Promotion Programs

Goetzel et al. (1999) conducted a comprehensive literature review on the return on investment (ROI) for health, demand, and disease management programs. The review found that ROI estimates ranged from $1.40 in benefits per dollar spent on the program, to a high of $13 per dollar spent, with traditional health promotion programs garnering a median ROI of 3.14 to 1.0. More recently, Aldana (2001) performed a comprehensive literature review of the financial impact of health promotion and disease prevention programming on health care costs. In his analysis, only four of the 28 studies reported no effects of health promotion and disease prevention programming on health care costs. The average ROI for studies reporting ROI was $3.48 for every dollar expended. In a widely cited example of a rigorous ROI analyses, Citibank reported a savings of $8.9 million in medical expenditures attributable to their comprehensive health promotion program as compared to their $1.9 million investment on the program, thus achieving an ROI of 4.56 to 1.0 (Ozminkowski et al., 1999).

Physical Environmental Interventions

Evidence suggests that physical environmental interventions are successful in increasing physical activity (French, Story, & Jeffery, 2001; Russell, Dzewaltowski, & Ryan, 1999; Anderson et al., 1998; Blamey, Mutrie, & Aitchison, 1995; Brownell, Stunkard, & Albaum, 1980) and altering dietary habits (French et al., 2001; Biener, Glanz, McLerran,

Sorensen, Thompson, Basen-Enquist, Linnan, & Varnes, 1999; Holdsworth & Haslam, 1998; French, Story, Jeffery, Synder, Eisenburg et al., 1997; Jeffery, French, Raether, & Baxter, 1994; Sorenson, Morris, Hunt, Herbert, Harris, Stoddard, & Ocklene, 1992; Zifferblatt, Wilbur, & Pinsky, 1980). For example, signs that prompt staircase use been shown to significantly increase such use in a train station by 63% (Blamey et al., 1995, Brownell et al., 1980), in a shopping mall by 113% (Brownell et al., 1980) and a in a library by 5.5% (Russell et al., 1999). Furthermore, an intervention to reduce the price of healthy foods in vending machines increased sales of those foods by 78% (French et al., 1997) and interventions to reduce the price of healthy foods in cafeterias produced similar results (Biener et al., 1999; French et al., 1997; Jeffery et al., 1994). In addition, interventions in which food labels were included in cafeterias produced a 5% decrease in caloric intake (Zifferblatt et al., 1980) and a 5% reduction in fat consumption (Sorenson et al., 1992).

Environmental Workplace Interventions

While the aforementioned research on physical environmental interventions is applicable to workplace settings, there is other relevant research supporting the use of multi-level organizational and environmental interventions. A recent study examined the effects of increasing organizational support for employee heart health in twenty companies. The intervention consisted of seven training sessions designed to increase awareness and support for the "Healthy Heart" program implemented in 1995 by the New York State Department of Health. Following the intervention period, administrative and organizational support for the program increased significantly compared to control sites and the program was shown to be cost-effective (Golaszewski, Barr, & Cochran, 1998).

The Working Well Trial investigated the effects of changing social and physical environments in order to promote a reduction in smoking and poor dietary behaviors by employees. Significant effects were observed on all nutrition outcomes, including a 5.5% increase in access to healthy foods, a 56% increase in nutrition information provided, a 24% increase in perceptions of co-worker support for low-fat diet, and a 28% increase in perceptions of management concerns about employees' nutrition. While significant outcomes were observed for nutrition, significant benefits were not found for smoking norms or smoking policies (Biener, et al., 1999). However, a recent review on the health impact of worksite smoking cessation programs by Erikson & Gottlieb (1998) found that the existing literature was suggestive for group and incentive interventions; indicative for minimal interventions, competitions, and medical interventions; and acceptable for the testing of incremental effects. In other words, these results suggest that the social environment of a worksite helps foster behavior change.

Research also supports the use of individual and group competitions, financial incentives (Pescatello, Murphy, Vollono, Lynch, Berne, & Constanzo, 2001; Poole, Kumpfer & Pett, 2001), and/or goal setting at workplaces to increase participation in weight loss interventions (Glanz, Sorenson, & Farmer, 1996). Thus, it appears that interventions that combine both educational and environmental strategies produce greater effects than only individual approaches (Biener et al., 1999; Erikson & Gottlieb, 1998; Golaszewski, et al., 1998; Sorenson, Hunt, Cohen, Stoddard, Stein, Phillips et al., 1998; Glanz et al., 1996;

Hennrikus & Jeffery, 1996). These implications are consistent with approaches, outlined in the *Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity,* that encourage workplaces to move beyond traditional health education and awareness to include worksite policies, and physical and social environments (DHHS, 2001).

Finally, Erfurt et al. (2001) compared the relative effectiveness of four randomly assigned levels of health promotion interventions at four different automobile assembly plants. Site 1 received a "wellness screening" during which blood pressure, height, weight and smoking status were measured. Employees at risk were referred to treatment or risk reduction resources in the community. At site 2, employees participated in the same screening activities and then referred to on-site health improvement classes. Site 3 added personalized counseling and outreach to high-risk employees. Site 3 also offered a "menu" of health promotion interventions including self-help materials, on-on-one consultations, and mini group interventions. Site 4 offered the most comprehensive program of all. In addition to all the programs offered at site 3, site 4 also provided organized activities and peer support for behavioral change (e.g., buddy systems and informal health networks) and programs to increase awareness of health issues throughout the plant (e.g., weight loss contests and plant-wide smoke-outs). Results from a 3-year follow-up showed that all four sites experienced reductions in risk but that sites 3 and 4 achieved the greatest amount of risk reduction. The two sites that included individualized risk reduction, a menu of risk reduction programs, and a social setting that supported behavior change experienced significantly greater gains in the areas of blood pressure control, weight loss, and smoking cessation.

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Creating Workplace Environments to Combat Obesity

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Obesity has reached epidemic proportions in the United States (CDC, 2004) and most weight control efforts have not been very successful in helping people loose weight (Wadden, 1989). The purpose of this paper is to provide a framework to guide efforts to on create environments that combat obesity, with emphasis on the physical aspects of workplace environments that impact health behaviors. It is important to stress that the physical environment is just one part of the workplace environment that influences employees' health. Furthermore, creating supportive environments is just one part of stimulating positive health behaviors. Therefore physical environments are discussed within the context of a framework for comprehensive workplace health promotion programs. The paper starts with a brief discussion on the behavioral psychology context in which these issue should be considered, then provides a short review the levels of programming in a comprehensive program and concludes with a report of the findings of a recent literature review on the policy and environmental interventions that promote physical activity and nutrition.

Behavioral Psychology Context

One of the primary reasons for the failure of many health promotion programs is their basis on the faulty assumption that changing knowledge, attitudes and beliefs through education is sufficient to change behavior and the resulting health conditions. Practitioners have understood that education has limited impact for decades. In 1986, the *American Journal of Health Promotion* advocated for a broader approach to health promotion which encompassed three levels of impact: awareness, behavior change or skill building, and supportive environments (O'Donnell, 1986) . Nevertheless, academics have been slow to understand the limitations of education guided approaches. For example, the Health Belief Model guided many early academically driven health promotion efforts through the 1990's, even though a meta-analysis (Harrison, et al 1992) showed that the mean effect size of its four elements were able to account for only .1% to 9% of the variance in outcome. More recent scholarly work has helped to provide a theoretical explanation of why education does not work very well, especially in weight control. The stages of change construct advanced by Prochaska and DiClemente (1992) postulates that people at risk fall into one of five or six stages: Precontemplation, Contemplation, Preparation, Action, Maintenance (and sometime Termination for addictive behaviors). People in precontemplation are not thinking about changing a behavior; people in contemplation are thinking about changing a behavior some time in the next six months; people in preparation are planning to change a behavior within the next month; people in action have started to change the behavior, people in maintenance are working to maintain the behavior; and people in termination have been practicing the behavior for more than 6 to 12 years, and are not tempted to revert to the old behavior. Educational or awareness programs would be expected to be screened out or ignored by people in precontemplation, might help move people in contemplation toward preparation, would probably enhance the behavior and self efficacy of people in preparation, but probably would not provide the skills necessary to help them move from preparation to action, might reinforce the self efficacy and behavioral necessary to help

people in action move to maintenance and would probably help people in maintenance remain motivated to avoid relapse to earlier stages. Weight control as a risk factor is complicated by the fact that it is not a behavior, but the outcome of the interaction between two behaviors, eating and physical activity, and a physical condition, metabolism. Therefore, the target of any education based weight control programs must be changing eating and physical activity behaviors, not producing weight loss. If we assume that 40% of overweight people who do not exercise regularly and eat an unhealthy diet are in precontemplation to improve their eating and exercise on regular basis, 40% are in contemplation and 20% are in preparation are action. So at maximum we would expect education programs to be of some value in helping 60% of people who are don't exercise regularly or eat an unhealthy diet advance to the next stage of readiness to change, but stimulate no new practices and produce no weight loss.

An effective health promotion must do far more than educate people. It must engage them in ongoing behavioral change processes and create an environment that encourages them to continue these new health practices. Each of these elements is described below.

Elements of a Comprehensive Program: Awareness, Behavior Change, Supportive Environments

A comprehensive health promotion program has three basic elements, awareness programs, behavior change programs and supportive environments (O'Donnell, 2002). Each of these is discussed briefly with the focus on supportive environments.

Awareness. Awareness programs help people understand the relationship between lifestyle and health, and make them aware of opportunities to improve their lifestyle. In the obesity area, awareness programs help people understand the health risks of being overweight, the impact of eating and physical activity on weight, the complex relationships between eating, social norms, emotions and eating habits, and the components of a good exercise program.

Behavior change or skill building. Behavior change or skill building programs engage people in a process of setting goals, learning the skills necessary to achieve those goals, and providing reassessment and reinforcement over time. In the weight control area, an ideal program would start with an assessment including measurement of height, weight, and circumference measurements of arms, chest, waist, hips, and legs, and possibly body fat composition, as well as a nutritional assessment, fitness assessment including cardiovascular condition, muscle strength and flexibility, a physical activity assessment, and possibly an interest assessment. This would be followed by setting goals in body fat composition, target weight, eating and physical activity, and developing a plan to achieve those goals. Skill building would be very specific to the goals and be experiential, not theoretical. It might include how to plan healthy meals, how to purchase, prepare and serve these foods. It would also include how to overcome family and societal pressures, how to manage emotions related to eating, how to order healthy foods in restaurants and other settings, and other skill -ocused training. On the physical activity side of the equation, skill building programs would help the person incorporate physical activity into their routine transportation, work practices and period chores. It would also show them

how to walk, run, cycle, or perform some other calorie burning activity, and how to maintain this activity on a long term basis.

Supportive environments. Supportive environments have four basic elements: the physical environment, policies and programs, organizational norms, and group processes. These elements work synergistically to reach employees at all stages of readiness to change. For employees in precontemplation, environments can cause them to perform the desired behavior without any cognitive processing. For example if stairways are easily accessible and elevators are hard to find, a sedentary employee is more likely to use the stairs. If smoking in not allowed in the workplace, the employee is not likely to smoke in the workplace. If junk food is not available at work, the employee will be less likely to eat junk food during the work day. After performing these new behaviors, the employee in precontemplation might become more aware of these new behaviors, understand they can be performed without difficulty and consider performing them in other settings. The employee in contemplation is likely to be aware of changes caused by the environment and may move more quickly to the preparation stage. Employees in preparation and action will actively engage the environment to help them reinforce the behavior changes they are intentionally making. Employees in maintenance will appreciate the reinforcement when they are conscious about maintaining their behaviors, and still be reinforced even when they are not conscious. Supportive environments thus impact people at all stages of readiness to change.

An environment supportive of combating obesity will not address obesity directly. Instead it will need to encourage behaviors related to obesity, physical activity and good nutrition. Table 1 lists a variety of strategies to create a supportive environment through the physical environment, policies and programs, and organizational norms. The process through which programs are developed can also have a significant impact in on the overall supportiveness of the environment. A process which allows employees opportunities to be involved in all aspects of program conceptualization, development, management and governance is more likely to instill a sense of employee ownership, and lead to higher participation and adoption levels. A program developed by management without employee involvement is less likely to be accepted by employees.

Empirical Support

The empirical support for policy and environmental interventions is growing. Diane Matson Koffman and colleagues (in press, shared here with author's permission) recently completed a comprehensive systematic review of the literature on policy and environmental interventions to promote physical activity and good nutrition. The review included articles published from 1970 through October 2003 that provided a description of the intervention; and reported behavioral, physiological, or organizational change outcomes. Studies that had inadequate intervention descriptions or that focused on determinants research, individual-level interventions only, the built environment (community planning and design, land development patterns, urban sprawl and transportation systems), or media-only campaigns were excluded. A total of 65 studies were published before 1990 and 64 were published 1990-2003 Data were synthesized by

topic (i.e., physical activity or nutrition), by type of intervention (i.e., point-of-purchase) and by setting (i.e., community, health care facility, school, work site).

Strong evidence showed that environmental interventions, including point-of-purchase strategies, menu modifications, price reductions, and offering/labeling healthier food selections in various settings, are effective in improving nutrition and that signs are effective in increasing stair use.

Moderately good evidence showed that providing people more access to places and opportunities for physical activity is associated with improvements in exercise; and giving students more opportunities for PE classes taught by better-trained PE teachers is effective in increasing students' physical activity levels while at school.

Preliminary evidence showed that systematic office reminders combined with physician training is effective in increasing physician nutritional counseling of patients and that comprehensive work site programs that combine health promotion counseling, education, peer support, incentives, and access to fitness facilities are effective in increasing employees' physical activity levels.

The authors also noted a number of gaps in the literature including the following: fewer studies on physical activity than nutrition; a lack of studies in health care settings; strategies are not tested against each other, or compared to non-environmental approaches; intervention are not described in detail; there are many design and measurement limitations, most studies have short duration, and there are a lack of studies on underserved groups.

Based on these findings, the authors recommended that health care practitioners should consider incorporating policy and environmental interventions into comprehensive health promotion programs, and that researchers should conduct rigorous studies to evaluate the long-term effectiveness of policy and environmental interventions alone and in combination with other more traditional approaches to meet physical activity and nutrition goals, while continuing to disseminate the results and lessons learned from previous intervention studies. They concluded by saving that these efforts need adequate funding and a sustained commitment from the public and private sectors in order to build the science base and support professional and public awareness.

Conclusion

Obesity is a serious health condition that impacts as many people as virtually any other health condition, and kills far more people than are killed by toxic chemicals in the air, water and other aspects of the environment. Most people who try to loose weight fail in part because they work and live in a toxic environment in which activity has been engineered out of their lives and unhealthy food in large quantities are readily available at low cost. Most weight control strategies fail because they are based on obsolete educational principles instead of engaging participants in the actions they need to perform, and neglecting to account for, let alone harness the physical and social environment. Environmental change strategies have the potential to help people be more

successful in achieving and maintaining healthy weights, especially in the context of comprehensive health promotion programs. Some changes, like providing healthy food in cafeterias and making stairways more appealing, are simple and inexpensive to implement. Other changes, like designing new buildings to engineer actively INTO employees' work days, increasing the availability of public transportation and providing access to healthy foods for all people probably have no net societal cost, be will required shifting of existing resources and the societal and political will to make that happen. Other changes, like retrofitting the existing physical infrastructure to create walkable communities, will have a significant net cost.

The first step in this process is clarifying the magnitude of our societal priorities to make these types of changes.

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Table 1
Interventions to Create Supportive Environments to Combat Obesity

Enhancing Physical Activity

Physical Environment

Transport Related

•Work location adajacent to public transportation and in walkable neighborhoods
•Parking lot location that requires people to walk from the car to the door
•Small parking lot size that encourages people to take public transportation or walk/bike/run to work bike lockers to store bikes road to work
•Showers and lockers for people to freshen up after walking, biking, or running to work or during lunch

Stairs Related

•Stairs that are centrally located, well lite, attractive, allow women wearing dresses to be modest, with prompts to encourage use
•Elevators that are efficient but smaller, less inviting, slower, less conveniently located

Architecture Related

•Floor plans that stimulate moving around and mingling
•Manufacturing, administrative floor plans and structures that require MORE exertion or activity.....a challenge if they decrease efficiency or increase safety hazards.

Fitness Facility Related

•Rooms available for aerobic classes and other types of exercise
•Campus with walking trails, Parcourse, etc.
•Onsite fitness facility
•Bulk discount memberships and subsidies at local fitness centers

Policy

•Encourage stretching/walking during breaks
•Conduct walking and standing meetings
•Subsidize public transportation
•Do not subsidize parking costs
•Flexible schedule to allow working out before, after, or during work

Enhancing Nutritious Eating

Physical Enviroment

•Healthy food in cafeteria and vending machines
•Refrigerators to store meals brought from home
•Water fountains instead of soda fountains or coffee machines
•Serving healthy foods in department meetings, social functions, etc
•Point-of-purchase incentives and education,
•Labeling healthier food selections

Policy

•Discount pricing for healthy foods in cafeteria
•Bulk purchase discounts agreements with local restarants and stores
•Serving free healthy food eg. Natural Ovens Bakery, Manitowoc, Wisc (reference)

Enhancing Overall Health

Organization Norms

•Creating new support networks: healthy food cooking clubs, activity clubs/sports leagues
•Integrating concepts into existing networks: department meetings, employee clubs
•Measuring and reporting targeted factors, eg program participation rates, norms and values related to activity and nutrition
•Integrating fitness and activity features in internal publications
•Public recognition of people making progress at each stage of change
•Visible participation by top management
•Grooming of program "Champions"
•Normative Systems Approach to Culture Change

Policy

•Wellness days instead of absense days
•Funding awareness and behavior change/skill building programs

Incentive Programs

•Small prizes to participate and achieve goals
•Group and individual competitions with prizes
•Including program fees in cafeteria benefits offerings
•Waiving health insurance premium copayments for participants (J&J)
•Gain sharing of medical cost savings or productivity gains

Using Obesity-Specific Medical Claims Cost Analysis to Guide Obesity Prevention Strategies in Worksite Environments

Dr. David Chenoweth, Worksite Health Promotion, East Carolina University

Burden of Obesity

Obesity, defined as Body Mass Index (BMI) greater than or equal to 30.0, is a serious health problem in the United States. Approximately 97 million adults are obese (BMI 30+) or overweight (BMI 25.0 –29.9).[1] According to the National Center of Health Statistics, the incidence of obesity in U.S. adults has increased from 19.4% in 1997 to 24% in 2003.[2] Moreover, in the last 20 years, obesity rates have increased by more than 60 percent in adults resulting in today's epidemic.[3]

Obesity is a major public health problem with both genetic and environmental causes. A major environmental factor that contributes to obesity risk is the amount of physical inactivity. Technological improvements at home and in the workplace – through use of energy saving devices such as remote control switches, automatic doors, electric dishwashers, escalators, e-mails, and the universal access to public transportation have reduced physical activity among the population and made many workers sedentary .[4]

In particular, the burden placed on our society by obesity and related chronic diseases is enormous. The prevalence of obesity and its related conditions have a major negative impact on industries in the United States due to increased use of health services by employees. Moreover, obesity and its complications cost the nation $117 billion annually.[5] By way of comparison, obesity has roughly the same association with chronic health conditions as does 20 years of aging, and the costs of obesity were recently estimated to exceed the health care costs of smoking and problem drinking.[3] Yet, even a modicum weight loss can mitigate some of these unhealthy consequences. For example, using a dynamic model of the relationship between BMI and the risks and costs of five diseases, Oster and colleagues found that a sustained 10% weight loss would make significant reductions in the incidence of chronic obesity-related illness. For a man or woman aged 45-64 years, the lifetime savings of treatment costs for such a reduction ranged from $2,500 to $5,300, depending on the level of severity of the initial obesity.[6]

In addition to the preceding medical care cost liabilities, employees and employers alike incur additional cost from the impact of obesity on absenteeism, which inextricably results in lost employees' income and lower corporate profits. For example, Tucker and Freidman's epidemiological study found that obese employees were 1.74 times more likely to experience high-level of absenteeism (seven or more absences due to illness during the past 6 months), and 1.61 times more likely to report moderate absenteeism (defined as three to six absences due to illness during the past 6 months).[7] Moreover, obese workers also tend to incur greater productivity losses than non-obese employees.[8]

A number of leading health authorities and researchers agree that in order to reverse the weight gain trend, collective national action and commitment is necessary to support healthy lifestyles.[9] Others agree and propose that the main factors responsible for obesity in industrialized nations are environmental and assert, "there is strong evidence that the

environment contributes to obesity by promoting problematic dietary and activity patterns."[10] For example, negative perceptions of the physical environment and the absence of enabling infrastructure were found in one study to be associated with overweight status, in comparison with other risk factors.[11]

Nationally, the overweight and obese population that need to be reached is too large for actions that rely solely upon individual interventions, which target one person at a time. Instead, preventing obesity will require coordinated policy and environmental changes that affect large populations simultaneously.[3]

Worksite Interventions

Worksites can be receptive settings for health promotion (i.e., weight control) programs because they provide access to specific populations that have unique and professional identities in an established organization.[12] In addition, worksite interventions provide opportunity for change since communication channels have been created and can reach large numbers of people at a relatively low cost.[13] In particular, changes in policies, work structure, benefits, incentives, healthy food offerings, and physical activity opportunities can deliver healthy options for employees to choose from at their worksites.[14]

The *Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity* identified action steps to prevent and/or decrease obesity as well as to modify inappropriate dietary behaviors. Some of these action steps include the developing more opportunities for physical activity at work sites. Yet, in reality, many worksites are not environmentally conducive for workers to be physically active or eat healthy foods in their quest for good health health and weight control. Unfortunately, many worksites were built without sidewalks or bike trails to support obesity prevention strategies such as physical activity. And, many office buildings where millions of Americans work, tend to have inaccessible and uninviting stairwells that are seldom used. Yet, point-of-decision prompts that encourage workers to use the stairs instead of elevators or escalators can be effective in getting people to be more physically active. For example, a longitudinal study of four sequential environmental interventions (installing new carpet and painting the walls; adding framed art work on the stair landings; displaying motivational signs throughout the worksite; and, adding a stereo system and playing various types of music) showed that motivational signs and music significantly increased stair use nearly 9% over baseline usage.[15] Point of decision prompts are signs that encourage people to use nearby stairs for health benefits or weight loss. In addition, efforts made in worksite settings to provide social support for weight loss via exercise can be effective. These interventions focus on building, strengthening, and maintaining social networks that provide supportive relationships for behavior change (e.g., setting up a buddy system, making contracts with others to comply with dietary modifications, and setting up walking groups to provide friendship and support. For example, employees participating in three weight loss competitions in business and industrial settings lost an average of 12 pounds.[16] One competition was between three banks; the other two were within industries, either between employee teams selected at random or between divisions of each worksite. All employees attended an orientation session and weekly educational sessions and paid $5 into a monetary pool that was dispensed to the winning teams at the end of the

competition. Each team's weekly weight loss performance was displayed weekly on a large board at each of the respective worksites. Attrition in the competition was less than 1 percent. Both employees and management reported positive changes in morale and employee/management relations, and both considered the element of competition important to the success of the program. The cost-effectiveness ratio ($2.93 per 1 percent reduction in percentage overweight) is reportedly one of the best.

The work site treatment of obesity has now been studied more thoroughly than any other form of worksite treatment. For example, three consecutive studies of weight reduction at the worksite were conducted with 172 female union members, who participated in 16-week behavioral group programs may reveal some strategic implications for decision-makers.[17] There was a high rate of attrition and a striking consistency in the very high dropout rates over very short periods of time. This phenomenon occurred in programs that varied widely in setting and in the nature of the populations under treatment. The attrition rates were more than four times higher than those in clinical programs that employ precisely the same program. There were several factors responsible for this attrition rate. The first one is the work site programs are usually offered at no cost and the participation is convenient. Second, social pressures from management or from fellow employees may induce some persons to enroll in programs that would otherwise not attract them. Third, participants in clinical program are more often of a higher socioeconomic status than those in worksite program. The notable finding was that non-professional group leaders performed as well as experienced professional groups. The availability of non-professional leaders in the work site and in self-help groups makes these two very important vehicles for the delivery of interventional programs. A surprising finding was the degree of acceptance of the program by both leaders and union members. Not only did the union request continuing help in establishing programs but also it paid future program costs. Future worksite programs will doubtless pay attention to these other outcomes as well as to the health benefits. Finally, using today's computerized technology may also be a viable way to promote better eating habits as a means to reduce obesity. For example, weekly communication for 6 months via a totally automated, computer-based voice system increased dietary fiber intake and decreased saturated fat intake, as a proportion of energy intake, among adults who were sedentary and had an unhealthy diet.[18]

Call to Action

Published research shows that environmental and policy interventions promoting opportunities for employees to be physically active and eat right can reduce the prevalence of overweight and obesity. Yet, we have to expand the scope of these opportunities by helping worksite personnel throughout the nation identify safe, affordable, and environmentally-suitable strategies for their respective workforces. In particular, linking environmental change strategies with social marketing techniques may offer the greatest potential for future impact.[3] Although most worksites do not have an on-site fitness center, there are many other strategies that employers can adopt such as on-site walking trails, stair climbing prompts, heart healthy entrées, healthy vending machine choices, healthy food discounts in the cafeteria, providing stationary bikes and treadmills in break areas, offering incentives for distance parking, extending lunch times

for noon-time walkers, collaborating with local organizations (e.g., schools) that have recreational facilities, offering health premium discounts for obesity prevention actions, and requiring all health plan providers prescribe exercise and dietary modifications to employees and dependents, when appropriate.

The current media publicity on the perils of obesity may provide a good "teachable moment" for employers to take action against this troubling dilemma. Simultaneously, we need to strengthen our research efforts to identify best practices for obesity prevention and intervention that can be tailored to worksites of all sizes, demographic constituencies, and on-site resource capabilities. Given the multidimensional causation of today's obese culture – from genetic predisposition and environmental barriers to automation and technological advances and – well crafted worksite strategies represent an important *part* of an overall comprehensive effort that will be necessary if we are to successfully mitigate the troubling trend of obesity in our nation.

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BREAKOUT SESSIONS

What is the current state of science for potentially modifiable environmental factors associated with obesity among children and adults?

Research gaps regarding the link among the built environment, obesity and nutrition loom large. The evidence is clear that children and adults are getting heavier and related health effects are on the rise. Moreover, researchers know the built environment affects behavior. But teasing out exactly how remains an open area of inquiry.

Researchers seem to have bits and pieces of the puzzle, a conclusive study here or there, such as a known link between increased television viewing and obesity or commuting time and obesity. But overall, not enough research has been done on obesity to clearly state what works to combat it in terms of the built environment and over a person's entire life cycle.

To continue progress on this front, we need more scientific tools and ways to measure how the built environment affects health and nutrition. There is no "gold standard" for defining obesity, and existing measurement tools are inadequate. For example, BMI has flaws as a measure of obesity--a higher BMI does not always mean a person has too much body fat.

Moreover, the problem of obesity is highly complex. Everything from zoning codes to housing costs to safety issues to project budgets can contribute to decreased activity and overeating. It's clear that changing social norms to improve health is a difficult task. Meanwhile, individual differences are wide. Attempts to design top-down features such as legislation mandating weight standards or physical activity requirements will probably fail.

For the most part, there are no simple answers or silver bullets to halt this epidemic. Myriad factors can result in decreased physical activity and poor nutrition, which in turn lead to obesity. But some interventions have been effective in modifying behavior. According to the CDC, point of decision prompts increase stair use by more than 50 percent in a variety of places and subgroups. Some community-wide campaigns can increase the proportion of the population who is physically active by 5 percent. Community-based social support interventions have increased time spent being physically active by 44 percent and increased frequency of physical activity by 20 percent. Improving access to places for physical activity can increase the percent of individuals who exercise at least three times a week by 25 percent, CDC reports.

There is an insufficient evidence base to demonstrate what works with the built environment to fight obesity.

For a given environmental or behavior factor what has changed over the last 40 years to explain the increase in overweight and obesity?

In the last several decades, social, cultural, technological, and economic forces have conspired to increase obesity nationally. Americans have grown accustomed to foods that taste sweet and salty. Individually, we consume 30 pounds of sugar a year and 25 percent more calories than we need to. Food is readily available and eating habits have changed drastically with more snacking and fewer regular meals.

Time pressures have created a "grab-and-go" society. With more families where two parents work and more single parent families, fewer people cook meals and more people eat more meals away from home. Convenience often means consumption of more processed foods, which are generally lower quality and higher in carbohydrates and fat.

Corporate drives to increase profit margins have boosted marketing of processed and convenience foods and cheap carbohydrates. For example, society has come to value getting as much food as possible for the dollar. So the conventional wisdom has held that "supersizing" everything is better, but portions have proven simply too big for proper nutrition. Meanwhile, federal policy has reinforced trends such as offering subsidies to corn growers that provide the source for high fructose corn syrup used in most processed foods linked to weight gain and giving tax breaks to companies that support sprawling development.

During the same period, U.S. society has become increasingly safety conscious. For this reason, citizens are often fearful to use walkways and bike paths and even to let their children play in parks in some neighborhoods. Real and perceived safety issues affect exercise habits. The media have also escalated concern over safety.

Urban sprawl has also contributed to people spending more time in cars, which has been linked with obesity. Increased commute time means less time to exercise and eat right. At the same time, many communities have failed to build user friendly walkways and bike paths. Those that have been built often are dangerous, are not well maintained, or are disconnected and impractical for use.

Technology has led to decreased levels of physical activity. Most homes have several TVs with remotes. Email, instant messaging, and more computer use contribute to a sedentary lifestyle. Children engage in computer games instead of outdoor play. Air conditioning has led to increased time indoors in climates with hot weather, especially in summer.

While technology was supposed to create more leisure time for physical activity, often employees are working longer hours. This has contributed to changes in the family structure, which has changed how people eat. This work/life imbalance has encroached on personal time and family activities.

Financial pressures have also affected schools. For example, physical education and after school athletics have been cut from budgets. Meanwhile, siting of schools on cheaper

lands has contributed to school children spending more time on buses. Walking or biking to school often is no longer feasible. Schools are also overcrowded and located in more dangerous areas.

Developing a better understanding of how these factors have changed over recent decades will provide insight for reversing the trend in obesity.

How do environmental or behavioral factors differ across age, sex, ethnic and socioeconomic groups?

While all groups are becoming increasingly obese, there are clear differences across age, sex, ethnic and socioeconomic groups. The highest rates of obesity occur in the most disadvantaged groups.

Economic factors are key. The working classes often can't participate in exercise groups during the work day and often can't afford health insurance. Children from higher income families are enrolled in after school programs, while low socioeconomic status (SES)-children stay at home more and are generally more sedentary. Transportation, housing, and safety constraints all likely contribute to this imbalance.

Structural factors across communities can make lifestyles more about access than about free choice. "Structure" refers to everything from access to urban parks to farmer's markets and high quality food. Free-market forces such as advertising and profit motives also factor into choices.

Sex differences are also apparent. Women often face greater challenges than men because more burdens are placed on them in terms of nurturing roles such as care giving and cooking, which detracts from time for physical activity and increases stress levels. Women often must work longer hours to earn a livable income. Minority women, except for Asian Americans, also have higher rates of obesity than do white women. The association with low socioeconomic status and obesity is not as clear-cut for men. Physical activity levels are generally lower for adolescent girls than in previous years, some studies indicate.

There are also age differences. For example, some features of suburbia such as cul-de-sacs increase activity levels for children but decrease them for adults. The elderly have their own set of issues for physical activity and access to quality diets**.** Mobility may decrease as people age, and the built environment may not accommodate lower mobility. For example, many sidewalks are unsuitable for wheel chairs.

Because of these differences, there will likely be no one-size-fits-all solution for addressing the obesity epidemic. Although factors like safety affect all sexes, ages, races, and educational levels, they may not affect them equally. Some groups may be better reached by focusing on physical activity, not obesity. For this reason, it is important to look across all segments of society to evaluate what has changed over the past few decades to cause the increase in obesity.

Can specific hypotheses and study designs help us examine how the built environment contributes to obesity?

Yes—conference participants proposed several avenues of research to help uncover the relationships among the built environment, health, nutrition, and obesity and to identify what are the most important factors for ensuring successful changes to the built environment.

Suggested hypotheses for investigating causal links and intervention strategies related to the built environment, food intake, and physical activity are listed below, in four categories: general approaches; schools; communities; and worksites.

General Approaches

Limited access to high-quality foods may be linked to obesity. Access to and availability of nutritious food, especially in low-income populations in a broad sense, may contribute to obesity. What foods are available and what choices are made? How does the environment affect hunger and food choices? How does the financial environment affect food choices? How close are food sources? How easy are they to reach? Do community gardens and access to farmer's markets help? Are there alternate suppliers and access strategies? Is cost more or less of a factor in overeating as education? Since canned vegetables are affordable and high-quality meats can be cheaper than some junk foods, is it just a misperception that healthier foods are not affordable?

Food subsidy policies may contribute to obesity. To what extent have guidelines, regulations, and policies for school lunch programs and food stamp programs contributed to the obesity epidemic? Is it possible to subsidize fruits and vegetables instead of starches and sugars? Would low-cost sustainable farms increase fruit and vegetable consumption? Can we locate them in urban or rural communities, since everyone needs to increase fruit and vegetable intake?

Climate may contribute to obesity. How do seasonal variations and other climate conditions affect physical activity levels? Can this question be approached from an urban heat island standpoint? Can we eliminate cold, rainy, or snowy weather as a barrier to physical activity by building indoor parks and encouraging outdoor winter activities?

Transportation policies may contribute to obesity. Study the price of gasoline and see how it affects non-automobile dependent transportation and influences planning efforts.

Different incentives may be required to motivate different populations to change behaviors. What incentives or social support mechanisms are required to motivate people to make and sustain lifestyle changes? How do low-income groups, ethnic groups, and cultural groups differ regarding incentives that motivate change?

Different interventions may be needed for different causes of obesity. Does obesity induced by suburban sprawl and urban poverty require different interventions? How can we incorporate individual and public health costs into urban sprawl research?

There may be merit to focusing on individuals and families. What interventions are effective in reducing overweight within households? How can we gain a better understanding of interactions between a person's will and desire to change and the surrounding environmental factors? How do we change social norms to change people's behavior? How can we motivate parents to change their kids' behaviors, and how can parents motivate kids to change behaviors? How are exercise and eating habits passed on from parents to children?

Different physical activity and nutrition approaches may work differently for different people. How do individual differences in values and personal interests affect the success of different obesity interventions? Can specific research approaches, such as epidemiological studies with stratified groups, shed light on such differences?

New policies may induce change in the population to increase physical activity and eat properly. For example, a financial incentive for losing weight and keeping it off, or for using a personal trainer or belonging to a gym to encourage people to lose weight? What urban design requirements can we incorporate into transportation policy that addresses infrastructure maintenance to encourage more active lifestyles? Should physical education be incorporated into the "No Child Left Behind" Act?

Schools

School siting may affect obesity. Does siting of schools on cheap lands farther from communities affect obesity? Is there a link between longer bus rides and obesity? Are there differences between public and private schools regarding physical activity, nutrition, and obesity? Can we develop a qualitative approach to looking at decision-making processes for siting at the school and community level?

Increased physical activity may enhance academic achievement. Would introducing regular periods of exercise to schools improve academic performance? Are academic outcomes of schools that incorporate exercise different from those that do not?

Education about obesity, when used in conjunction with required school programs, may reduce obesity. What are the costs and benefits of improving school education regarding obesity, health, and nutrition? How effective is education in schools on issues of nutrition and physical activity? How can we incorporate cultural components into interventions within schools? Can we use data on BMI, attendance, nurse visits, lesson uses, physical activity (formal and informal), food choices, grades, support strategies, or principal leadership to assess the effect of educational materials on obesity?

After-school physical activity programs for low-income children may prevent overweight and obesity. How can the schools help reduce obesity in low-income children? What are barriers to this? Would supervised after-school or weekend exercise and nutrition education programs for families reduce weight gain in adults and overweight in young children?

Limiting the locations of candy, convenience stores, fast food restaurants, and vending machines near schools and in specific neighborhoods may reduce obesity. If food choices change in schools, will we see changes in BMIs? What is the impact of food sources outside the school on children's BMIs? How cost-effective is changing the contents of vending machines to provide healthier choices but maintain revenues?

Communities

Community design may affect physical activity and food choices. What effects would various changes to the built environment, for example, providing new bike trails and bike racks, narrowing roads, or planting trees, have on activity levels across different communities? How would granting zoning variances to encourage more and better facilities for walking and biking in neighborhoods affect physical activity? How would educating local land use leaders on the dynamics of health, obesity, and the built environment change decisions regarding land use? What encourages local governments to build walkways and bike paths?

Mixed-use housing may decrease obesity. What are the health and social impacts of changes in planning policies that mandate mixed-use housing, parks, recreation facilities, public transit, and other public goods in order to encourage physical activities such as biking and walking? What are the barriers to changing the built environment to allow experimental designs, for example, small interventions in existing neighborhoods?

There may be identifiable relationships between the built environment and levels of physical activity. Can we turn existing communities into laboratories? For example, can we make physical changes to an existing suburban neighborhood to see which changes best affect physical activity and health? Can we compare these factors with other, unchanged communities, for example, adding parks or easements for trails between houses, providing a community center with fitness programs, or adding trees to shade sidewalks?

Employing smart growth principles may improve health. What are the impacts of redesigning a block according to smart growth principles (mixed-use housing, well-designed sidewalks, etc.) on residents' physical activity, obesity, and health? Can we do this as part of a new public housing development or by retooling an existing part of a neighborhood?

The amount of green space in the built environment may affect obesity. Can we track the relationships of tree canopy, urban heat islands, and stream buffers to physical activity and community health?

If stress contributes to obesity by increasing cortisol levels and other factors, what happens if we move families to a more healthy built environment? Can we move a small group of families, either in an existing program to move families in transition or in a new housing program, from an unsafe, stressful built environment to a safe environment with functional physical activity opportunities? Do cortisol levels decrease? Do people use the

new built environment for functional and recreational physical activity? Does diet change?

The longer immigrant populations are in the United States, the more obesity rates may increase due to acculturation. Can we track immigrant households over time, controlling for social and economic factors, to capture characteristics of neighborhoods and identify environmental factors? Can we examine culture-specific attitudes toward nutrition and physical activity?

Access to exercise facilities may affect obesity. Does the availability of facilities for physical activity, including gyms, parks, community centers, work sites, and schools, affect health, nutrition, and obesity? Can we sample residents to learn about their physical activity opportunities/access, perception of time, work hours, commute time, neighborhood type, design, and destinations, to learn what factors contribute to or protect against obesity?

Exposure to advertising may relate to obesity, especially in children. What are the effects of advertising on the consumption of fattening foods? Is it possible to use knowledge of sales and advertising to sell healthy foods instead of high-profit, unhealthy ones? Can we use images of proper weight and size to promote social norms? Do weight loss messages have adverse effects?

Community policing and crime prevention strategies may affect physical activity levels. What is the community's role in supporting safety in physical activity? How do we change perceptions of safety to encourage walking and outdoor play? How does police presence have different meanings for different people and communities? When does it not instill a sense of security?

Using a community-based participatory research model to change the built environment may increase physical activity and healthy eating. Is a participatory action research model or engaging the community—both geographically and ideologically—the most effective way to change the built environment to reduce obesity in a community? How do we engage the community to identify important factors in the built environment that relate to obesity?

Community-led, built environment initiatives may have an effect on overweight and obesity. What is the role of faith communities in helping make neighborhoods walkable? Does involving children and parents in assessing neighborhoods promote positive change?

If more sidewalks, paths, and parks are built, people may increase physical activity. How important is "connectivity" or continuous routes that enable transportation to key destinations for increasing physical activity? Can we establish fundamental standards for safe intersections and establish buffer areas from busy streets? How much does traffic safety contribute to activity? What is the cost-benefit of parks? What are people willing to pay for such benefits?

Urban sprawl may contribute to obesity. Do overweight and obesity change in people who move between communities? Can we involve Realtors to help track residential mobility and housing choices? Would comparisons between urban and rural environments be helpful? What factors determine where first-time home buyers purchase homes? Do obese people simply gravitate toward suburbs?

Existing social structures may prohibit or discourage construction of healthy communities. Do local zoning regulations make healthy interventions difficult? How do some residents' block progress? Can we develop strategies to reverse trends such as not allowing stairwells in many office and public buildings?

Worksites

The American work week may be conducive to developing obesity. What impacts do work sites with more flexible works schedules have on rates of obesity? How do U.S. work weeks and practices compare with those in Europe and Canada?

Increased physical activity may boost worker performance and reduce absenteeism and health care costs. Can we study more carefully programs already in place at General Motors and other corporations, to gain insights into interventions that work? Would incentives to encourage employees to exercise, such as extra time at lunch to walk, be successful? How can we promote successful programs elsewhere? Can legislation encourage that exercise time be structured into the workday?

Women's additional responsibilities as care givers and lower average incomes may increase their risk for obesity. How do women's roles in the work force and time for physical activity affect their risk for obesity?

Reducing distance for trips coupled with the availability of bicycle and pedestrian facilities may affect physical activity. Can we gain insight into obesity risk and prevention by studying how employees commute, take lunch, and engage in physical activity, especially as more and more workers move to suburban areas and workplaces relocate from cities to the suburbs? How do live-near-your-work programs influence walking and other health measures? How do employer policies regarding parking and transportation affect physical activity? How does commuting time of people in different residential areas affect health, nutrition, and obesity?

Use of public transportation may reduce obesity. How do perceptions differ for different kinds of transportation? What is the influence of permissive and coercive factors on decisions to drive or walk? Which transportation policies encourage use of automobile versus public transit systems?

Linking insurance rates to positive health behaviors may reduce obesity. Besides promoting exercise, would such policies create social pressure to maintain a healthy weight and keep health care costs down nationally? Can we further develop medical claims cost analysis to help formulate worksite interventions? How can we identify major claim and cost drivers?

Measuring how the built environment influences obesity

At the conference, questions arose regarding what valid indicators exist to assess how the built environment influences obesity, on individual and population levels. How and where have they been applied? What steps are needed to develop appropriate markers?

Participants listed the following indicators that could be potentially valid for monitoring risk of obesity in the built environment: population density, overcrowding, zoning, census data on housing and transportation, and other demographic data on education and economic status. Other candidate measures include data on supermarket consumption, stocking, and distribution; TV viewing time; park and recreation facility density and use; data from the National Health and Nutrition Examination Survey; accelerometer or pedometer data; miles spent in individual cars versus miles in public transportation per person; hours spent commuting and/or distance to office or school from home; concentration of fast food restaurants; miles of bike and walking trails; acreage of parks; sales data from vending machines in schools; degree of connectivity; hours spent working and type of work; and crime statistics, both real and perceived.

Conference participants would like to see new measures of neighborhoods and zones beyond census data, to include everything from lifestyle factors to aesthetics to social organizations and social capital in order to understand how these factors influence health. We need to develop better measures of overweight and obesity to move beyond self-reported height and weight and even BMI. Perhaps markers detectable by a blood test are possible. More sensitive measures of physical activity and actual nutritional intake are also needed. For example, we can track fruit and vegetable consumption in some communities.

To evaluate how effective health interventions are for individuals and for populations, we need to develop common measures for factors related to the built environment and obesity, to establish a baseline and measure change from that baseline. Moreover, we need to better define the built environment itself. Generally, indices of the built environment that we can apply across social, cultural, and age groups are desirable. For example, examining how energy consumption and production differs in different locations and their influence on health could help shed light on these questions. Ultimately, obesity programs might be reviewed state by state.

Ideally, we can establish indicators of healthy communities, perhaps started at the block-by-block level and tracked by ZIP code. Cost-benefit analyses may be one way to measure outcomes to understand how specific aspects of the built environment affect individual and community health. Developing better indices will help untangle how nutrition and physical activity affect health. We also need to improve the collection and use of existing data.

Current strategies

At the conference, questions arose regarding the current strategies (either research or policy) to address environmental determinants of obesity. Have these strategies been effective? If not, what is needed to guide more successful strategies?

The current strategies are scattered and uncoordinated and often narrow in focus. There are few established valid ways to assess the effectiveness of such strategies, especially quantitatively, and they have been little studied.

There are many local endeavors underway. One example is "Colorado on the Move," a program for physical activity intervention in high-risk populations in a rural and an urban community, which encourages participants to walk an additional 2,000 steps and receive pedometers to help them keep track. There are scores of other organizations and programs working locally to combat obesity. They include everything from the Pennsylvania Advocates for Nutrition and Activity, which is a communication clearinghouse and statewide resource for improving nutrition and physical activity, to the Congress for New Urbanism, which aims to reform all aspects of real estate development to rein in sprawl and traffic congestion.

National campaigns promoting physical activity include Active Living by Design (funded by the Robert Wood Johnson Foundation), America on the Move, Choose to Move, Eat Smart, Play Hard, Get Kids in Action, Girl Power!, Go Red For Women, Hearts N' Parks, KaBOOM!, NikeGO, Operation FitKids, P.E. 4 Life, President's Challenge, Shape up America!, Shaping America's Youth, Small Steps, Big Rewards, and VERB, among many others.

While many of these and other such interventions are being implemented, we have no good way to measure how well they work. Developing the indicators suggested at this conference will help establish ways to evaluate how effective they are. Many potentially fruitful strategies were put on the table at the conference, but they have yet to be put into action. In general, there is a lack of research on how effective interventions are in addressing the connection between the built environment and obesity.

How can we best identify how the built environment impacts obesity?

Several research study designs may be appropriate for investigating this issue, given how many factors may affect the complex relationships between the built environment and obesity. They include prospective, intervention studies, longitudinal studies, case studies, focus groups, surveys, and natural experiments, as well as cross-disciplinary research and community-based participatory research.

Educational and environmental approaches should be combined at multiple levels: individual, interpersonal, family, community, and society. Assessments should also be focused on youth, elderly, and across gender and ethnicity lines.

Qualitative and quantitative research designs, including those that examine cost effectiveness should also be included. Model programs should be identified. Environmental health scientists, epidemiologists, transportation specialists, crime prevention experts, mental health workers, architects, social scientists, historians, psychologists, real estate agents, developers, interventionists, policy makers, food scientists, civic planners, agriculturists, educators, marketing and communications specialists, community members, parents, students, insurers, physicians, and more should all be involved.

How can we develop rational and effective prevention efforts to decrease obesity?

We need to answer many key research questions before prevention efforts may be put in place and research translated into action. Besides the hypotheses discussed above, we need to answer the following:

- What drives hunger—what are the internal and external cues, both physiological and psychological?
- What factors cause childhood overweight, and what are their impacts on later adult health and obesity?
- Can we connect indicators such as access to bike trails and farmer's markets to evidence-based outcomes in obesity?
- How should the research community identify and single out the most important factors related to obesity and the built environment?
- Can infrastructure planning be more effective in helping to reduce obesity by integrating health objectives?
- How do federal subsidies affect different communities?
- How can we motivate people and communities to change lifestyles?
- What are the social indicators of the built environment?
- What is the economic impact of obesity in the context of the built environment? What is the cost of doing nothing?
- What role does economics play overall in contributing to obesity in the built environment?
- What insights can we gain from examining issues of both under- and over-nutrition within long-term studies in developing countries?
- Can changing the built environment produce long-term change?

RECOMMENDATIONS

- Key features need to be prioritized. Researchers and policy makers need to determine whether some features of the built environment are more important than other factors in influencing obesity, physical activity, and nutrition. We need to prioritize research questions, as well, to expedite closing the research gaps identified.

- Emphasis on analyses of larger groups are needed. Studies should focus more on neighborhoods and communities rather than on individuals. What can we change at the community level? Community-level intervention studies on tobacco use might serve as models.

- Community-based participatory research is essential. Researchers need to develop creative cross-disciplinary approaches that include communities in order to understand the relationship between the built environment and obesity.

- Better use should be made of existing group studies. Can we retrospectively examine existing large prospective studies; for example, the Nurses' Health Study, for effects from the built environment? Might data from twin studies where twins have grown up in different environments be useful? We should compile existing resources; for example, establish a database of questionnaires on the built environment and physical activity.

- Built environment effects should be included in future large prospective studies. Built environment parameters could be easily and inexpensively incorporated into future studies.

- Cost-benefit analyses need to be conducted. Researchers should evaluate the economic implications of health interventions within all sectors of the population.

- Researchers should capitalize on natural experiments when possible. These may be used to compare communities with and without obesity problems and investigate differences. For example, studying Amish communities could be useful.

- Existing science-based measures need to be more broadly implemented. Although science will someday unravel the genetics of obesity, it is critical to focus on prevention and translation today of what the research community already knows works.

- Weight maintenance strategies should be a top priority. Since treating obesity has proven difficult so far, we need to emphasize strategies to prevent weight gain. Instilling positive lifestyle behaviors from childhood is important.

- Improving education at all levels of society will improve awareness. We can improve nutrition and physical activity education from kindergarten through medical school. Often health professionals and medical providers receive little or outdated nutrition training. Urban planners and politicians should also be educated about how the built

environment contributes to obesity. We need to develop clear educational messages regarding obesity.

- Programs should be holistic when appropriate. Public health officials and researchers need to develop an approach that integrates both nutrition and physical activity. We need to combine education and outreach. Gatekeepers from school nurses to family doctors to corporate physicians should help get the message out.

- Better coordination among federal agencies is required across research, intervention, and prevention efforts. How, for example, are the NIEHS, CDC, and the National Heart, Lung, and Blood Institute (NHLBI) working together to address problems related to the built environment? The NIH Obesity Task Force should create a database that covers all studies by U.S. agencies on obesity and specifically the built environment. One agency or federal entity should assume a leadership role.

- A business case should be made for health promotion. We need to study and imitate obesity interventions that have been shown to improve health in the workplace. Information on financial benefits and return on investment needs to be more broadly disseminated to industry leaders to boost implementation.

- Marketing strategies can be employed to combat obesity instead of contributing to it. We can develop programs to market a physically active lifestyle, healthy communities, public transportation, and more. Point-of-decision prompts can encourage smarter food purchases and behaviors, such as taking the stairs instead of the elevator. We might also use marketing to change social norms. A coordinated social marketing effort should be devised.

- More partnerships should be fostered. More academic institutions should partner with community groups to help with interventions and evaluations. We should also encourage corporate partnerships like the "NikeGO" program. Corporations and communities might work together to design products that change behavior.

- Better assessment indicators and tools are needed to evaluate current and future interventions.

- Policy incentives need better implementation and evaluation. For example, we can add provisions to major transportation bills to encourage building more and better walkways and bike paths that are well lit and well maintained. We should design funding formulas to accommodate built environment concerns, and explore public investment in physical activity and healthy eating programs.

- New urbanism standards should be developed. Guidelines should recognize the complexities and challenges of changing land use in order to help bridge public health and civic planning arenas to develop integrated, comprehensive, and feasible interventions.

CONCLUSION

In the United States and elsewhere, the obesity epidemic is spreading virtually unchecked. Today, one-third of Americans are obese (defined as having a BMI of 30 or more), and about 65 percent are overweight (BMI of 25 or more), said NIEHS deputy director Samuel Wilson, citing figures from the CDC's National Health and Nutrition Examination Survey. If the trend continues, 40 percent of the U.S. population will be obese within the next five years. By 2008, 75 percent will be overweight or obese. Meanwhile, the cost of treating obesity-related illnesses and conditions such as cardiovascular disease, cancer, and type 2 diabetes mellitus exceeds $76 billion annually in direct costs, by some estimates. When indirect costs such as lost wages are factored in, the number already exceeds $117 billion a year, according to the CDC.

In 2001, Surgeon General David Satcher issued a "Call to Action to Prevent and Decrease Overweight and Obesity," which has largely gone unheeded. In fact, the average American adult has continued to gain 1–2 pounds a year since then, according to a study led by James O. Hill, director of the Human Nutrition Center at the University of Colorado Health Sciences Center in Denver, and published in the journal *Science* in 2003. And the obesity rate continues to climb among young people, currently affecting about 15 percent of children 6-18 years of age. The Surgeon General asserted that today's youth may be the first generation not to outlive their parents. Currently, an estimated 300,000 deaths per year may be attributable to obesity in the United States alone. Meanwhile, the World Health Organization added "overweight/obesity" to its list of the top 10 preventable health risks worldwide.

The highest rates of obesity are found among groups with the highest poverty rates and the least education. Indeed, obesity may be the ultimate environmental justice issue in some regards. Yet all income and education groups are steadily becoming more obese. Along with social and economic phenomena, features of the built environment also limit access to healthy diets and lifestyle choices.

APPENDIX I: Meeting Agenda

Obesity and the Built Environment:
Improving Public Health Through Community Design

May 24-26, 2004

Marriott Wardman Park Hotel
2660 Woodley Park
Washington, DC

Monday, May 24, 2004		
		Exhibition Level
10:00 – 12:00 PM	**Registration**	**Atrium, Exhibit Hall C**
	Opening Session	**Exhibit Hall C**
12:00 – 12:05	Dr. Samuel Wilson, National Institute of Environmental Health Sciences, NIH	
12:05 – 12:15	Dr. Elias Zerhouni, National Institutes of Health	
12:15 – 12:35	Secretary Tommy Thompson, Department of Health and Human Services	
	Chair: Dr. Allen Dearry, National Institute of Environmental Health Sciences, NIH	
12:35 – 1:35	**Federal Activities Addressing Environment and Obesity** Mr. Geoffrey Anderson, U.S. Environmental Protection Agency Ms. Cindy Burbank, Federal Highway Administration Ms. Kate Coler, U.S. Department of Agriculture Dr. Henry Falk - National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, CDC Mr. Peter Ashley – U.S. Department of Housing and Urban Development Dr. Allen Spiegel, National Institute of Diabetes and Digestive and Kidney Diseases, NIH	
	Keynote Speakers	
1:35 – 2:05	*Addressing the Environment to Reduce Obesity* Dr. James Hill, University of Colorado Health Sciences Center	
2:05 – 2:40	**Afternoon Break**	**Atrium, Exhibit Hall C**
2:40 – 3:10	*Epidemiology, Engineering, and Environments: Designing Healthy Futures* Dr. J. Michael McGinnis, Robert Wood Johnson Foundation	
3:10 – 3:40	*Poverty and Obesity* Dr. Adam Drewnowski, University of Washington	

3:40 – 4:10	*A New Role for Social Marketing* Dr. Edward Maibach, National Cancer Institute, NIH	
4:10 – 4:30	**Fighters for Fitness – Fitness Fighters** Mr. Ian Ellis James	
4:30 – 5:30	**Physical Activity and Obesity Campaigns** Chair: Mr. Rich Killingsworth, Active Living by Design, UNC Life Steps Program – Mr. Tim McDonald, General Motors Get Kids in Action – Ms. Caryn Altman, Gatorade NikeGO – Ms. Molly White, Nike	
Tuesday, May 25, 2004		
		Exhibition Level
7:00 – 8:00 AM	**Registration**	**Atrium, Exhibit Hall C**
8:00 – 9:00	**Plenary Session I: Schools and Children** Chair: Dr. Shobha Srinivasan, National Institute of Environmental Health Sciences, NIH *Toxic Classrooms: Marketing to Children in Schools* Dr. Alex Molnar, Arizona State University *The School as a Contributing Factor to Adolescent Obesity* Dr. David F. Foulk, Florida State University *Healthy Schools, Healthy Communities: Opportunities and Challenges for Improving School Food Environments* Dr. Robert Gottlieb, Occidental College	**Exhibit Hall C**
9:00 – 9:30	Open Discussion with Panel Members Panelists: Mr. Tim Torma, U.S. Environmental Protection Agency Ms. Sherée Thaxton, NC Department of Health and Human Services	
9:30 – 10:00	**Morning Break**	**Atrium, Exhibit Hall C**
10:00 – 11:30	**Breakout Session I – State of the Science**	
		Exhibition Level
	Breakout Group 1	**Exhibit Hall C1**
	Breakout Group 2	**Exhibit Hall C2**
	Breakout Group 3	**Exhibit Hall C3**
	Breakout Group 4	**Exhibit Hall C4**
	Breakout Group 5	**Washington I**
		Mezzanine Level
	Breakout Group 6	**Cotillion South**
	Breakout Group 7	**Truman**
	Breakout Group 8	**Kennedy**
		Wardman Tower Level
	Breakout Group 9	**Embassy**
	Breakout Group 10	**Ethan Allen**
	Breakout Group 11	**Thomas Paine**

		Exhibition Level
11:30 – 12:00	**Keynote Speaker** *Addressing the Overweight/Obesity Epidemic: The Role of the Environment* Dr. David Satcher, National Center for Primary Care, Morehouse School of Medicine	**Exhibit Hall C**
12:00 – 1:30 PM	**Lunch (*on your own*)**	
1:30 – 2:30	**Plenary Session II: Communities and Families**	**Exhibit Hall C**
	Chair: Dr. Andrew Dannenberg, National Center for Environmental Health, CDC	
	Community Design and Physical Activity: What do we know? Dr. Susan Handy, University of California at Davis	
	Community Design and Individual Well Being: The Multiple Impacts of the Built Environment on Public Health Dr. Lawrence D. Frank, University of British Columbia,	
	Rethinking Community Planning and School Siting to Address the Obesity Epidemic Ms. Marya Morris, American Planning Association	
2:30 – 3:00	Open Discussion with Panel Members	
	Panelists: Dr. Reid Ewing, University of Maryland (*confirmed*) Ms. Megan Susman, U.S. Environmental Protection Agency	
3:00 – 3:30	**Afternoon Break**	**Atrium, Exhibit Hall C**
3:30 – 5:00	**Breakout Session II – Setting the Research Agenda**	
		Exhibition Level
	Breakout Group 1	**Exhibit Hall C1**
	Breakout Group 2	**Exhibit Hall C2**
	Breakout Group 3	**Exhibit Hall C3**
	Breakout Group 4	**Exhibit Hall C4**
	Breakout Group 5	**Washington I**
		Mezzanine Level
	Breakout Group 6	**Cotillion South**
	Breakout Group 7	**Truman**
	Breakout Group 8	**Kennedy**
		Wardman Tower Level
	Breakout Group 9	**Embassy**
	Breakout Group 10	**Ethan Allen**
	Breakout Group 11	**Thomas Paine**
		Exhibition Level
5:00 – 5:30	**Keynote Speaker** *Addressing Health Disparities* Dr. Louis W. Sullivan, Morehouse School of Medicine	**Exhibit Hall C**
6:00 – 7:00	**Afternoon Exercise Program** Ms. Jacqueline Jackson, Department of Health and Human Services	**West Lawn**

Wednesday, May 26		
7:00 – 7:30 AM	**Morning Exercise Program** Ms. Jacqueline Jackson, Department of Health and Human Services	**West Lawn**
		Exhibition Level
7:00 – 8:00 AM	**Registration**	**Atrium, Exhibit Hall C**
8:00 – 9:00	**Plenary Session III: Worksites, Employers and Employees** <u>Chair:</u> Mr. David Brown, National Institute of Environmental Health Sciences, NIH *The Financial Impact of Health Promotion and Risk Reduction Programs in the Workplace: Establishing a Business Case for Increased Investment in Employee Health and Well-Being* Dr. Ron Goetzel, Cornell University and Medstat *Creating Workplace Environments to Combat Obesity* Dr. Michael O'Donnell, American Journal of Health Promotion, Inc. *Using Obesity-Specific Medical Claims Cost Analysis to Guide Obesity Prevention Strategies in Worksite Environments* Dr. David Chenoweth, Worksite Health Promotion, East Carolina Univ.	**Exhibit Hall C**
9:00 – 9:30	Open Discussion with Panel Members Panelists: Dr. James Sallis, San Diego State University Dr. David McCarron, Academic Network	
9:30 – 10:00	**Morning Break**	**Atrium, Exhibit Hall C**
10:00 – 11:30	**Breakout Session III – Developing Intervention Strategies**	
		Exhibition Level
	Breakout Group 1	**Exhibit Hall C1**
	Breakout Group 2	**Exhibit Hall C2**
	Breakout Group 3	**Exhibit Hall C3**
	Breakout Group 4	**Exhibit Hall C4**
	Breakout Group 5	**Washington I**
	Breakout Group 6	**Washington II**
		Mezzanine Level
	Breakout Group 7	**Truman**
	Breakout Group 8	**Eisenhower**
		Wardman Tower Level
	Breakout Group 9	**Embassy**
	Breakout Group 10	**Ethan Allen**
	Breakout Group 11	**Thomas Paine**
11:30 – 12:00	**Synthesis and Discussion** Dr. Allen Dearry, National Institute of Environmental Health Sciences, NIH	***Exhibition Level*** **Exhibit Hall C**
12:00 – 12:30 PM	**Closing Remarks** Dr. Kenneth Olden, National Institute of Environmental Health Sciences, NIH	

APPENDIX 2: Conference Planning Committee

Mr. David Brown, MPH
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National Institutes of Health

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National Institutes of Health

Emily E. Williams, MS
Office of Healthy Homes and Lead Hazard Control
U.S. Department of Housing and Urban Development

APPENDIX 3: Breakout Session Questions and Facilitators

Tuesday, May 25, 10:00 – 11:30 AM

Breakout Session I – State of the Science

1. What is the current state of the science for potentially modifiable environmental factors associated with obesity among children and adults?
2. For a given environmental or behavioral factor, what has changed over the last 40 years to explain the increase in overweight/obesity?
3. Does a given environmental or behavioral factor play a similar role across age, sex, ethnic, and socioeconomic groups?

List of Facilitators:

David Belluck	FHWA/USDOT
David Berrigan	NCI/NIH
David Brown	NIEHS/NIH
Gilman Grave	NICHD/NIH
Wendy Johnson-Taylor	NIH
Neal Kaufman	Cedars-Sinai Medical Center
Abby King	Stanford University School of Medicine
Liam O'Fallon	NIEHS/NIH
Charlotte Pratt	NHLBI/NIH
Kristine Suozzi	Bernalillo Co. Environmental Health Department
Richard Troiano	NCI/NIH

Tuesday, May 25, 3:30 – 5:00 PM

Breakout Session II – Setting the Research Agenda

1. What specific hypotheses can be advanced to examine how the built environment has contributed to obesity? What study designs would be appropriate to address these hypotheses?
2. Are there existing valid indicators, on both individual and population levels, to assess how the built environment influences obesity? If so, what are these measures? How and where have they been applied? If not, what steps are needed to develop appropriate markers?
3. What are the best approaches to identifying modifiable environmental determinants?

List of Facilitators:

Audie Atieza	NCI, NIH
David Berrigan	NCI/NIH
Wendy Johnson-Taylor	NIH
Robert Karch	American University
Emil Malizia	University of North Carolina
Louise Masse	NCI/NIH
Claudia Miller	University of Texas, Health Science Center – San Antonio
Liam O'Fallon	NIEHS/NIH
Sarah Strunk	Active Living by Design, UNC
Kristine Suozzi	Bernalillo Co. Environmental Health Department
Richard Troiano	NCI/NIH

Wednesday, May 26, 10:00 - 11:30 AM

Breakout Session III – Developing Intervention Strategies

1. What specific hypotheses can be advanced to examine the effectiveness of built environment interventions in reducing the extent of the obesity? What study designs would be appropriate to address these hypotheses?
2. What are the current strategies (either research or policy) to address environmental determinants of obesity? Have these strategies been effective? If not, what is needed to guide more successful strategies?
3. What remains to be determined to develop rational and effective prevention efforts to decrease obesity?

List of Facilitators:

David Belluck	FHWA/USDOT
David Brown	NIEHS/NIH
Wendy Johnson-Taylor	NIH
Abby King	Stanford University, School of Medicine
Emil Malizia	University of North Carolina
Claudia Miller	University of Texas, Health Science Center – San Antonio
Nadejda Mishkovsky	Smart Growth Program/International, City/County Management Association
Charlotte Pratt	NHLBI/NIH
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Sarah Strunk	Active Living by Design, UNC
Kristine Suozzi	Bernalillo Co. Environmental Health Department

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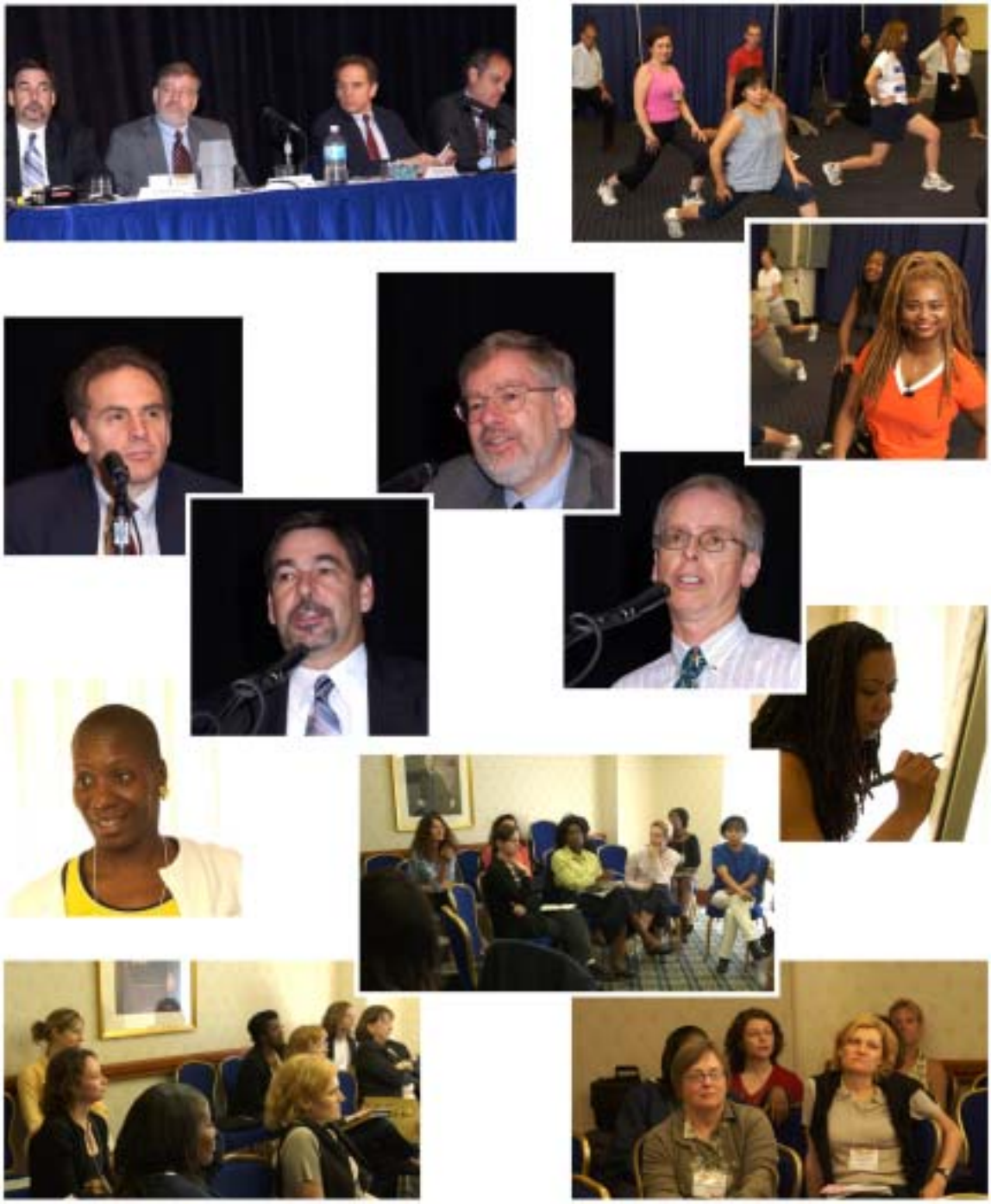
Appendix 5: Conference Photos