

Creating a Robust Public Health Infrastructure for Physical Activity Promotion

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Abstract: The essential role of physical activity both as an independent protective factor against numerous common chronic diseases and as a means to maintain a healthy weight is gaining increasing scientific recognition. Although the science of physical activity promotion is advancing rapidly, the practice of promoting physical activity at a population level is in its infancy. The virtual absence of a public health practice infrastructure for the promotion of physical activity at the local level presents a critical challenge to control policy for chronic disease, and particularly obesity. To translate the increasing evidence of the value of physical activity into practice will require systemic, multilevel, and multisectoral intervention approaches that build individual capability and organizational capacity for behavior change, create new social norms, and promote policy and environmental changes that support higher levels of energy expenditure across the population. This paper highlights societal changes contributing to inactivity; describes the evolution and current status of population-based public health physical activity promotion efforts in research and practice settings; suggests strategies for engaging decision makers, stakeholders, and the general public in building the necessary infrastructure to effectively promote physical activity; and identifies specific recommendations to spur the creation of a robust public health infrastructure for physical activity.

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Introduction

Physical inactivity is an important contributor to the risk profiles for many chronic diseases and is an independent primary risk factor for cardiovascular disease, similar to smoking and hyperlipidemia in importance.¹ Insufficient physical activity also contributes to the risk of obesity,² type 2 diabetes,^{3,4} osteoporosis,⁵ breast and colon cancer,^{6,7} and other chronic conditions.^{8,9} In fact, many studies implicate reduction in energy expenditure through increasing occupational sedentariness and growing reliance on labor-saving devices, motorized transportation, and sedentary entertainment, as key drivers of the chronic disease epidemic during the past several decades.^{10–14} Leisure-time phys-

ical activity levels, on the other hand, have remained fairly constant during this period.¹⁴

The costs of the chronic disease epidemic are soaring, in dollars, health, and premature deaths.^{15–17} Physical inactivity has become so commonplace^{13,18} that the costs imposed on society by people with sedentary lifestyles may be greater than those imposed by smokers and heavy drinkers, and are similar to and likely independent of those imposed by overweight and obesity.^{19–23} Regular activity, even in late middle age, is linked to substantially decreased healthcare costs,^{24,25} and may ameliorate the adverse health consequences of less severe levels of obesity.^{26–28}

The Opportunity and Challenge of Physical Activity Promotion

The cornerstone of health promotion, embodied in successful tobacco control policy efforts led by public health, is making the healthy choices the easy choices^{29–31} and the unhealthy choices increasingly difficult. Consistent with its roots and Institute of Medicine (IOM)-defined role of ensuring the conditions necessary for good health,³² public health is positioned to take the lead in instigating the structural changes necessary to restore adequate population levels of physical activity. Urban blight, white flight, inexpensive suburban housing, and public policy favoring motorized over nonmotorized

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transport and private transportation over mass transit, have created hazardous and unappealing residential areas.³³ Walking to school and playing outdoors are no longer the childhood norm.³⁴ Several conditions have, in fact, been met that generally precipitate government intervention to change personal behavior: evidence of a commercial “market failure,” such as lack of rationality (exploitative advertising to children), and externalities, described as production or consumption/utilization of sedentary entertainment and transportation imposes external costs on society, whereas internal costs borne by the producers/consumers are proportionately less than the benefits they gain³⁵; and inequities in distribution of public goods and services, such as fewer recreational facilities and poorer sidewalk and park maintenance in medically underserved communities.^{36–39} Ethnic disparities in sedentariness and chronic disease linked to these adverse environmental conditions provide another compelling impetus for public health leadership in this arena.^{40,41}

The preventive and therapeutic benefits of physical activity are well established. Physical fitness is an independent protective factor against all-cause and cardiovascular disease mortality,^{42,43} and the metabolic syndrome.^{44,45} Recent evidence suggests that physical activity may also protect mental⁴⁶ and physical agility,^{47,48} improve sleep quality,^{49,50} elevate mood,^{48,51} improve affect and energy,^{52,53} enhance sexual enjoyment,⁵⁴ serve as a relative appetite suppressant,⁵⁵ and decrease preference for highly sweetened beverages.^{56,57} Physical activity is important in weight loss, especially for long-term maintenance,^{58,59} and in the prevention of weight gain.^{60–65} In addition, physical activity contributes substantively to cardiac and musculoskeletal injury rehabilitation^{66,67} and to long-term breast cancer and depression treatment.^{68–70}

Thus, increasing physical activity is essential to advancing the public’s health. There is considerable opportunity for even small increases in average energy expenditure to have a large positive population impact.^{71,72}

While the role of individual choice in, and personal/familial responsibility for health-constructive behavior change is undisputed, individual motivation and volition to be physically active are increasingly difficult to sustain in a society characterized by a proliferation of step- and labor-saving devices, along with fragmented public transportation and aggressive and pervasive commercial marketing of seductive sedentary entertainment and transportation.^{73,74} Decreasing levels of fitness, accompanied by increasing rates of obesity, are associated with greater perceived exertion at modest exercise intensities, further deterring energy expenditure.^{75,76} In addition, conserving energy is likely evolutionarily programmed, in that the high energy expenditure levels necessary to escape predators and find

food tilted energy imbalance toward starvation for most of human history.^{4,77,78}

Inadequacy of Current Policy Efforts to Promote Physical Activity

Current U.S. tobacco control policy has been facilitated by hundreds of epidemiologic and corroborative laboratory studies over more than four decades that have made a clear connection between smoking and many cancers, heart diseases, and other health problems.^{79,80} Unlike nutrition or physical activity, which are necessary parts of daily life, tobacco is a nonessential, addictive substance. Furthermore, most smokers were habituated when they were minors and, in theory, legally barred from purchasing or using tobacco.⁸¹ In addition, smoking affected nonusers by subjecting them to secondhand smoke.^{82,83} The harm and discomfort to nonsmokers caused by this involuntary exposure was strategically leveraged in enlisting public support and outrage.^{84–87}

These conditions have not been met to the same degree for poor nutrition and sedentary lifestyle, although the ultimate societal impact may be comparable to the now well-documented toll of tobacco use. Attacks on tobacco, a product with no social value, garner a very different public response than do attacks on the multiple industries that have arisen to address societal needs (e.g., the movement of women into the workforce),¹⁴ produce goods and services used daily by most of the population, and may readily modify their offerings to assist in achieving social goals.⁸⁰ Unlike tobacco, there are no consensus biomarkers that accurately capture physical activity participation. In addition, policy solutions are not as politically or logistically straightforward. Intervening to actively engage the majority in a protective behavior in a democratic and individualistic society is considerably more complex than intervening to passively prohibit a health-compromising behavior in a minority.

Thus, policy and environmental physical activity promotion strategies, while a burgeoning area of interest to policymakers, are still in an early phase of development. Individual-level intervention alone, such as one-to-one or group nutrition counseling or exercise instruction, has been the target of most chronic disease control efforts to date, and its limitations are increasingly apparent.^{88–91} Changing environments by influencing organizational practice and legislation has yet to permeate health policy in a way that is likely to engage the majority of Americans in regular physical activity.^{71,92–95}

Physical activity promotion policies, to date, have focused nearly exclusively on specifying school physical education (PE) requirements.⁹⁶ As a primary approach, this is of questionable value because PE requirements already exist in 48 states and the District of Columbia. However, they are rarely enforced or sufficiently funded because of competition for students’ time,

which results from government priorities on academic achievement.⁹⁷ For example, in 1997 only 29% of adolescents participated in daily PE.⁹⁸

Promising Avenues for Population-Based Physical Activity Promotion

Evidence is mounting that built environmental attributes influence physical activity and weight status. Numerous studies have demonstrated that adults walk/cycle more for transportation, and weigh less, in “walkable” communities, characterized by mixed land use, connected streets, and higher density, than in sprawling suburbs.⁹⁹ Adults and youth who live near aesthetically appealing recreational facilities engage in more physical activity.^{100–105} An evaluation of programs to increase “pedestrian friendliness” (e.g., sidewalk construction, traffic calming) supported their positive influence on children’s active commuting.¹⁰⁶

“Active living” initiatives are under exploration by federal, state, and local governments. Motivations include interest in reducing traffic congestion, preserving open space, enhancing quality of life, and, sometimes, improving air quality and promoting physical activity. Initiatives include developing parks, urban redevelopment and planning new development to promote pedestrian and bicycling activity, and “smart growth” (e.g., “green space” and Brownfield development, density-promoting land use).¹⁰⁷ The most developed of the initiatives, Safe Routes to Schools, included \$1 billion in the 2005 federal highway bill for distribution to states to facilitate bicycle and pedestrian commuting.^{96,107,108}

However, the field of public health is missing opportunities to champion and accelerate such efforts in the multiple sectors that influence physical activity at the population level. Physical activity may be effectively fostered through community-scale urban design and government land use regulations, policies, and practices, including zoning, building codes, and fiscal incentives.¹⁰⁹ The pace of development is rapid, often with little opposition to walkable community construction and rising demand for and receptivity to such residential areas on the parts of urban planners and consumers.¹¹⁰ School siting presents another development opportunity that may be more feasible in underserved communities than most “smart growth.” These “windows of opportunity” for coordination between public health and urban planning are fleeting. Once communities are built, reconfiguring them is expensive.

Considerations for Advocacy of Physical Activity Promotion Policy

A number of policy analysts have proposed that lessons from the public health campaign against the tobacco industry inform antiobesity efforts.^{13,80} One approach

frames the battle against obesity primarily as public health versus the food industry.^{81,111} The new focus on physical activity promotion by food-industry public relations efforts has created a competitive backlash by public health nutrition advocacy groups. Many assert that these efforts are intended to deflect attention from the industry’s role in the obesity epidemic’s genesis and deter policy solutions involving increased regulation or taxation.¹¹² These groups argue that healthy eating is more important than physical activity in stemming obesity, undermining (perhaps inadvertently) the importance of physical activity.¹¹³ Demonizing the food industry as the cause of the obesity epidemic, however, deflects attention from physical activity–restricting and sedentary behavior–promoting consequences of other industries, such as the highway, oil, tire, and automobile manufacturers/retailers; television/film industries; video game manufacturers/distributors; and spectator sports franchises. Also, aligning physical activity promotion too closely with obesity control advocacy may be a liability, risking under-appreciation of its full spectrum of benefits and the ineffectiveness of weight loss as a motivator of physical activity engagement in many sociodemographic groups.¹¹⁴

Organizing advocacy to promote physical activity is quite complex, however. Advocacy for substance control organizes those with similar interests (health, safety) around preventing the use of a single product. On the other hand, convergent and even competing agendas are sometimes directed at policies to create opportunities for physical activity. A “zero sum gain” attitude explains some of the inertia: concessions to walkable community design increase development costs, investment in fitness staff/equipment channels funds away from behavioral interventions, investment in PE at school may be seen as a diversion of resources from academic missions, and personal expenditures of time and money in health club memberships or lunchtime exercise (necessary to translate workplace incentives into activity) compete with health/beauty treatments and other self-care services, with more immediate gratification for the latter. Consequently, efforts to focus diverse interests on a unifying agenda to advance population physical activity have been difficult and slow to evolve. Because large-scale expansion of locations to engage in physical activity such as bike paths/lanes, parks, and playgrounds will require substantial public funding, broad-based policy advocacy efforts are critical to establishing a sustainable base of support.

Building advocacy for public investment in physical activity will likely require multiple leverage points using such tools as social marketing.¹¹⁵ Opportunism might help as well with the greatest current challenge: to leverage public opinion in support of community versus individual solutions to address childhood obesity. This would parallel the successful effort against second-hand smoke. Another promising strategy advanced by

advocates is targeting educators, parent groups, and policymakers to highlight the growing evidence that physical education can improve academic performance.¹¹⁶ An advocacy tool used in successfully driving passage of aggressive school nutrition policy in California is aggregating student fitness data by assembly district to engage legislators.¹¹⁶

As organizational leadership is critical in driving change—one decision by an “early adopter” may influence the environments of thousands—advocates may also target employers, documenting the healthcare and productivity savings from investments in workplace physical activity integration.^{25,117} Leaders at the forefront of change in this arena often have a personal stake in health promotion, including the Los Angeles school superintendent helping to pass a districtwide soda ban in 2002, after being diagnosed with type 2 diabetes,¹¹⁸ President Clinton’s partnering with the American Heart Association after his myocardial infarction to engage the beverage industry in voluntarily withdrawing sodas from schools,¹¹⁹ and the Arkansas governor’s weight loss after being diagnosed with diabetes, and the Arkansas House Speaker’s myocardial infarction, which, combined, precipitated legislation to create healthy school environments.^{120,121} Last, exposing inequities in distribution of public recreation “goods” may galvanize grassroots advocacy in low-income communities, as has supermarket and fast food franchise maldistribution.^{122–126}

Existing Infrastructure for Physical Activity Promotion

The public health practice infrastructure needed to translate, support, and disseminate research findings, and to design, organize and deliver services related to physical activity, especially at the local level, is undeveloped and untested. Characteristics of this rudimentary infrastructure are described below.

Existing Infrastructure Within Public Health Practice

Public health priorities at the state and local level are driven by a variety of factors, including categorical funding from the Centers for Disease Control and Prevention (CDC) or regulatory requirements for health protection. Physical activity promotion did not explicitly appear among the core functions of public health until the introduction of the Health Security Act of 1993, as one of a number of health risks about which to educate the public.¹²⁷ Federal attention to physical activity promotion through organized public health at the national level was primarily channeled through the President’s Council on Physical Fitness and the 1995 Surgeon General’s Physical Activity and Health recommendation,¹²⁸ which couched physical activity as an

issue of individual responsibility. The establishment of a physical activity unit at the CDC in 1996 marked an elevation in priority, helping both to legitimize parallel structural foci at state and local health departments and to broaden the debate to include aspects of the physical and social environments.

As demand has grown, physical activity promotion has often been relegated by default to nutrition, tobacco control, or health education staff in public health departments and community organizations, with few additional resources and highly variable levels of interest or training. These staff sometimes view physical activity promotion as competition for scarce resources. In addition, the cultures surrounding nutrition and physical activity promotion are very different, with values that sometimes conflict.

Physical activity promotion programs funded by the CDC, at varying stages of development, exist in at least 28 state health departments.¹²⁹ The California Department of Health Services, for example, has five dedicated positions (two filled, none state-funded) to assist in addressing the physical activity needs of the state’s 35 million residents (Susan Foerster, California Department of Health Services, personal communication, April 3, 2006). Very few dedicated positions exist in local health departments. No professional standards have been developed for recruitment or training purposes for these positions. For example, in a 1999 local public health agency infrastructure survey, respondents did not identify an occupational classification for exercise scientists or physical activity promotion specialists. In comparison, means of three to five full-time equivalents (FTEs) were reported for related positions in nutrition, occupational safety and health, policy analysis, and health education.

Existing Infrastructure Within Public Health Education

In schools of public health and public health master’s degree programs in medical schools or university health sciences departments, few public health physical activity promotion course offerings exist and almost none are mandatory. Those in existence are generally electives taught by the small number of faculty with related research interests. Of the 35 accredited schools of public health, only two identify exercise science as a program area or department, compared with 13 identifying nutrition as a program area.

Evolution of Physical Activity Promotion Field

Physical activity promotion research is dominated by scientists trained in fields related to, but outside of public health, with different traditional missions and foci, such as exercise physiology and kinesiology (optimizing athletic performance), physical therapy (reha-

bilitation of injured patients), psychology (understanding and changing individual behavior), physical education (increasing sports knowledge and skills), and sports medicine (treatment of injured athletes or elderly patients). Scientists who are runners have often preferentially studied and established the benefits of aerobic activity at the expense of attention to resistance training or flexibility enhancement. Physicians have tended to “medicalize” physical activity promotion with disease risk admonitions and noninteractive/prescriptive exercise counseling. Public health recommendations developed by this set of professionals predate more contemporary knowledge of the psychosocial correlates and determinants of physical activity. Thus, they assume many characteristics, such as motivation for physical activity, that do not generalize well to the entire population. For example, the 1975 “vigorous exercise” recommendation from the American College of Sports Medicine was over-generalized to become a public health message, and little population-level change resulted.⁸

However, change is evident as public health professionals become more engaged in physical activity research and practice. The 1995 “moderate physical activity” recommendations were designed to be more relevant to public health.¹³⁰ New collaborators have brought additional perspectives—urban planners, transportation professionals, recreation and leisure researchers, and a variety of behavioral scientists have created the broader concept of “active living” that promotes physical activity for multiple purposes.^{131,132} Recently, the National Society of Physical Activity Practitioners in Public Health was formed to further coalescence around effective population physical activity promotion. It is still noteworthy, though, that two mid-2006 reviews of new challenges in strengthening the public health workforce¹³³ and transforming governmental public health¹³⁴ did not mention physical activity promotion at all.

Knowledge About Physical Activity Promotion Is Advancing Rapidly

The science of population-based physical activity promotion is early in its development, but advancing rapidly.^{60,135,136} A systematic review of community interventions to increase physical activity¹³⁷ recommended six: two informational approaches (community-wide campaigns and point-of-decision prompts to encourage use of stairs), three behavioral and social approaches (school-based physical education, social support interventions in community settings, and individually adapted health behavior change programs), and one environmental/policy approach (creation of or enhanced access to places for physical activity, combined with informational outreach). However, the evidence base for population approaches from the public health literature is

limited by the predominantly individual-level interventions and affluent white participants of most funded research published to date. Emerging areas of research in physical activity promotion include the following:

- Identifying physical and built environmental attributes associated with active and sedentary behavior and designing and evaluating changes which might increase activity^{131,138–141}
- Identifying physical activity facilitators and barriers within the school environment and intervening,^{142–145} primarily through PE and other structurally integrated physical activity participation^{146–149}
- Changing the workplace to incorporate and support physical activity,^{150–153} particularly to influence the professional and personal behaviors of health professionals^{154–156}
- Integrating physical activity into the structure of a broader range of community-based organizations^{18,157–159}
- Examining media influences on physical activity and policy implications of these findings^{73,160,161}
- Identifying barriers to and facilitators of physical activity promotion within the healthcare environment, and designing appropriate interventions^{162–165}
- Implementing and evaluating state and local community-level policy and environmental change initiatives to increase physical activity levels population-wide, including cultivating “active living” leadership in the public sector^{115,131,136,166–170}
- Crafting, shaping and evaluating the influence of expert recommendations, reports, and guidelines, such as infusing the concepts of energy balance, energy expenditure, and fitness promotion into the nutrition dialogue in the U.S. Department of Agriculture (USDA) Dietary Guidelines,¹⁷¹ developing the IOM’s childhood obesity report,² and commissioning the IOM’s scientific review of the diffusion of obesity control approaches¹²⁰

Creating A Robust Infrastructure for Physical Activity Promotion

A public health infrastructure sufficiently robust to anchor and sustain effective physical activity promotion intervention must be developed. Public health resources are typically constrained, with further constriction evident in recent cuts in the federal block grants that have been used to support physical activity programs. Thus, reallocation of existing resources, as well as identification of new funding streams, will be necessary. We believe that the following recommendations will lead to the development of a lasting and meaningful public health infrastructure for physical activity.

Educational Recommendations

1. Federal and private funders should support the design and implementation of educational curric-

Table 1. Individual solutions versus environmental approaches*

	Tobacco	Auto crashes	Guns/violence	Alcohol	Nutrition	Physical activity
Individual solutions	Cessation programs Public education School-based programs	Educate drivers and encourage defensive driving	Educate gun users School-based education Alternative youth programs	Educate drinkers and future drinkers Designated-driver programs	Public education School-based programs	Public education School-based programs Fitness center-/community center-based (including faith-based) programs
Environmental solutions	Excise taxes Smoking bans Enforce access laws Marketing restrictions/regulation Liability <i>Federal funding agency mandates for smoke-free workplaces</i>	Redesign cars Redesign roads Liability	Reduce access to guns Restrict types of guns that can be manufactured Liability "Smart" personalized guns (bio-recognition of owner)	Reduce access to alcohol, especially to minors Restrict marketing Excise taxes Liability	Nutrition labeling Zoning restrictions Marketing restrictions Excise taxes on junk food ("external costs") Restricted vending in schools Portion control Access to healthy food in all communities Liability <i>Federal funding agency mandates for healthy/fit workplaces</i>	<i>Sedentary product labeling</i> <i>Activity prompts using various media, e.g., posters, signs, broadcast voice-mail, e-mail including streaming video, stair riser banners, mounted or web-posted walking route maps</i> <i>Land-use policy and planning</i> <i>Marketing restrictions, e.g., limits on advertising sedentary video games during children's TV programming</i> <i>Excise taxes on sedentary entertainment and transportation</i> <i>Restricted gaming (i.e., decreasing the ratio of sedentary to physical gaming such as Dance Dance Revolution and Sony Eye Toy) in schools and businesses, e.g., video arcades, movie theaters</i> <i>Physical education policy mandates</i> <i>Environmental redesign to make obligatory PA, e.g., near-parking and elevator restrictions</i> <i>Access to active leisure opportunities in all communities</i> <i>Partial liability protection ("Good Samaritan" laws) for PA provision; litigation targeting sedentary entertainment and transportation industries, or municipalities for inequitable distribution of public goods</i> <i>Federal funding agency mandates for healthy/fit workplaces, e.g., required adoption of such policies as providing nondiscretionary time for short walking or exercise breaks, stair prompts and improved access</i>

*Adapted from Dorfman L, Wilbur P, Lingas EO, Woodruff K, Wallack L. Accelerating Policy on Nutrition: lessons from tobacco, alcohol, firearms, and traffic safety. Berkeley, CA: Berkeley Media Studies Group of the Public Health Institute, 2005. Available at: www.bsmg.org. (Added bullets are in italics.)
PA, physical activity.

ula, courses, and degree programs in schools of public health to prepare practitioners and researchers to develop and appropriately utilize the evidence needed to increase population physical activity. The CDC-funded "Physical Activity and Public Health" course offered annually for recruitment, training, and continuing education may serve as a model.¹⁷²

The development of undergraduate and graduate courses related to physical activity should also be underwritten for dissemination to and promotion within the wide variety of fields relevant to physical activity policy and systems, such as communications, organizational development and management, education, public policy, law, youth development, exercise science, urban planning, architecture, and public administration. Finally, these funding agencies should create scholarships and other financial support mechanisms for targeted recruitment of students and professionals from sociodemographic groups experiencing low prevalence of physical activity and high prevalence of sedentary behavior, such as from ethnic minority, low-income, Southern regional, and rural backgrounds.

2. Public health accrediting bodies and professional organizations should develop professional standards and certification requirements for physical activity promotion specialists, including core competencies in health promotion, exercise science, policy analysis, organizational change management, injury prevention, and urban design.

Organizational and Workforce Recommendations

1. Federal and state public health agencies should institutionalize physical activity promotion within local health departments, preferably as a separate program area from nutrition. Dissemination and evaluation of policy and environmental "push" strategies integrating "hard-to-avoid" physical activity experiences in high-exposure settings (worksites, schools, day care centers) should be prioritized, such as elevator restrictions with enhanced stair access, near-parking restrictions, incorporation of exercise breaks into organizational routine on non-discretionary time, and hosting walking meetings. Both internal and external leverage should be used in this effort, paralleling funding agency-mandated smoke-free workplaces (Table 1). The resulting improvements, albeit modest, in aerobic conditioning, movement skills, self-efficacy, enjoyment, and mood/energy at the individual level, and in employee retention, medical costs, and productivity at the organizational level, may assist in generating demand and resources for active living goods and services in the near term, and political will for aggressive policy change in the long term.

2. Schools of public health should develop and market physical activity promotion certification programs for video game designers, urban planners, educators, human resources managers and other outside professionals, modeling public health fellowship programs for journalists.

Community Recommendations

1. State and local health departments should cultivate "boisterous" grassroots leadership in advocacy, engaging tobacco and alcohol control, neighborhood safety and improvement, and immigrants'/civil rights organizations,^{80,81,173,174} to lobby for student fitness monitoring through evaluation and reporting requirements comparable to math and reading, among other initiatives.
2. Federal food and nutrition agencies should provide resources for physical activity promotion, such as USDA funding of local policy development and program implementation through the Women, Infants, and Children (WIC), food stamps, and school nutrition programs, consistent with their current obesity control mission.

Conclusion

Physical activity promotion constitutes a critical role for public health practice, given the increasing prevalence of inactivity and sedentary behavior, the substantial protection against obesity and chronic disease conferred by regular physical activity, the major contribution of sedentariness and obesity to health disparities, and the increasing understanding of the central role that physical activity plays in overall health and quality of life. The public health infrastructure for physical activity promotion, while undeveloped and untested, is not unlike the public health infrastructure for other major health concerns before they were recognized as such. Given the evidence, the time is right to move forward with putting the infrastructure into place. To not do so is to place future generations at grave risk.¹⁷⁵

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References

1. Thompson D, Edelsberg J, Colditz GA, Bird AP, Oster G. Lifetime health and economic consequences of obesity. *Arch Intern Med* 1999;159: 2177-83.
2. Institute of Medicine. Preventing childhood obesity: health in the balance. Washington DC: National Academies Press, September 2004.

3. Meisinger C, Lowel H, Thorand B, Doring A. Leisure time physical activity and the risk of type 2 diabetes in men and women from the general population: the Monica/Kora Augsburg Cohort Study. *Diabetologia* 2005;48:27–34.
4. Stannard SR, Johnson NA. Energy well spent fighting the diabetes epidemic. *Diabetes Metab Res Rev* 2006;22:11–9.
5. Cummings SR, Nevitt MC, Browner WS, et al. Risk factors for hip fracture in white women. Study of Osteoporotic Fractures Research Group. *N Engl J Med* 1995;332:767–73.
6. Gotay CC. Behavior and cancer prevention. *J Clin Oncol* 2005;23:301–10.
7. Friedenreich CM. Physical Activity and cancer prevention. from observational to intervention research. *Cancer Epidemiol Biomarkers Prev* 2001;10:287–301.
8. U.S. Department of Health and Human Services. Physical activity and health: a report of the Surgeon General. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996.
9. Bull FC, Armstrong T, Dixon T, Ham SA, Neiman A, Pratt M. Burden attributable to physical inactivity: examination of the 2002 World Health Report estimates. *Med Sci Sports Exerc* 2003;35(suppl 1):S359.
10. Rieu M. Rôle des activités physiques dans une politique de santé publique. *Bull Acad Natl Med* 1995;179:1417–26, discussion 26–8 (French).
11. Prentice AM, Jebb SA. Obesity in Britain: gluttony or sloth? *BMJ* 1995;311:437–9.
12. Biddle SJ, Fox KR. Motivation for physical activity and weight management. *Int J Obes Relat Metab Disord* 1998;(suppl 2):S39–47.
13. Davey RC. The obesity epidemic: too much food for thought? *Br J Sports Med* 2004;38:360–3, discussion 363.
14. Sturm R. The economics of physical activity: societal trends and rationales for interventions. *Am J Prev Med* 2004;27(suppl 3):126–35.
15. Nesmith JD. Type 2 diabetes mellitus in children and adolescents. *Pediatr Rev* 2001;22:147–52.
16. Visscher TL, Scidell JC. The public health impact of obesity. *Annu Rev Public Health* 2001;22:355–75.
17. Whitmer RW, Pelletier KR, Anderson DR, Baase CM, Frost GJ. A wake-up call for corporate America. *J Occup Environ Med* 2003;45:916–25.
18. Yancey AK, Wold CM, McCarthy WJ, et al. Physical inactivity and overweight among Los Angeles County adults. *Am J Prev Med* 2004;27:146–52.
19. Sturm R. The effects of obesity, smoking, and drinking on medical problems and costs: obesity outranks both smoking and drinking in its deleterious effects on health and health costs. *Health Aff (Millwood)* 2002;21:245–53.
20. Keeler EB, Manning WG, Newhouse JP, Sloss EM, Wasserman J. The external costs of a sedentary life-style. *Am J Public Health* 1989;79:975–81.
21. Anderson LH, Martinson BC, Crain AL, et al. Health care charges associated with physical inactivity, overweight, and obesity. *Prev Chronic Dis* 2005;2:a09.
22. Chenoweth D. The economic costs of physical inactivity, obesity, and overweight in California adults: health care, workers' compensation, and lost productivity. Sacramento: California Department of Health Services, 2005.
23. Wang F, Schultz AB, Musich S, McDonald T, Hirschland D, Edington DW. The Relationship between National Heart, Lung, and Blood Institute weight guidelines and concurrent medical costs in a manufacturing population. *Am J Health Promot* 2003;17:183–9.
24. Andreyeva T, Sturm R. Physical activity and changes in health care costs in late middle age. *J Phys Activ Health* 2006;3:S6–19.
25. Schult TM, McGovern PM, Dowd B, Pronk NP. The future of health promotion/disease prevention programs: the incentives and barriers faced by stakeholders. *J Occup Environ Med* 2006;48:541–8.
26. Hu FB, Willett WC, Li T, Stampfer MJ, Colditz GA, Manson JE. Adiposity as compared with physical activity in predicting mortality among women. *N Engl J Med* 2004;351:2694–703.
27. Wang F, McDonald T, Champagne LJ, Edington DW. Relationship of body mass index and physical activity to health care costs among employees. *J Occup Environ Med* 2004;46:428–36.
28. Pescatello LS, VanHeest JL. Physical activity mediates a healthier body weight in the presence of obesity. *Br J Sports Med* 2000;34:86–93.
29. Milio N. A framework for prevention: changing health-damaging to health-generating life patterns. *Am J Public Health* 1976;66:435–9.
30. Nutbeam D. Health promotion glossary. In: *Health promotion: an anthology*. Washington DC: World Health Organization, 1998:36.
31. Stokols D, Grzywacz JG, McMahan S, Phillips K. Increasing the health promotive capacity of human environments. *Am J Health Promot* 2003;18:4–13.
32. Institute of Medicine. Committee on Assuring the Health of the Public in the 21st Century. The future of the public's health in the 21st century. Washington DC: National Academies Press, 1988.
33. Kunstler JH. The geography of nowhere: the rise and decline of America's man-made landscape. New York: Simon and Schuster, 1993.
34. Sirard JR, Ainsworth BE, McIver KL, Pate RR. Prevalence of active commuting at urban and suburban elementary schools in Columbia, SC. *Am J Public Health* 2005;95:236–7.
35. Pratt M, Macera CA, Sallis JF, O'Donnell M, Frank LD. Economic interventions to promote physical activity: application of the sloth model. *Am J Prev Med* 2004;27(3 suppl):136–45.
36. Day K. Active living and social justice: planning for physical activity in low-income, black, and Latino communities. *J Am Plann Assoc* 2006;72:88–99.
37. Gordon-Larsen P, Nelson MC, Page P, Popkin BM. Inequality in the built environment underlies key health disparities in physical activity and obesity. *Pediatrics* 2006;117:417–24.
38. Sloane DC. From congestion to sprawl: planning and health in historical context. *J Am Plann Assoc* 2006;72:10–18.
39. Wolch J, Wilson JP, Fehrenbach J. Parks and park funding in Los Angeles: an equity mapping analysis. *Urban Geography* 2005;26:4–35.
40. Los Angeles County Department of Health Services. Physical activity among adults in Los Angeles County. L.A. Health 2000;3:1–8.
41. Yancey AK, Bastani R, Glenn B. Racial/ethnic disparities in health status. In: Andersen R, Rice TH, Kominski GF, eds. *Changing the U.S. health care system: key issues in health services, policy, and management*. 3rd ed. San Francisco: Jossey-Bass, 2007. In press.
42. Haapanen-Niemi N, Miilunpalo S, Pasanen M, Vuori I, Oja P, Malmberg J. Body mass index, physical inactivity and low level of physical fitness as determinants of all-cause and cardiovascular disease mortality—16 y follow-up of middle-aged and elderly men and women. *Int J Obes Relat Metab Disord* 2000;24:1465–74.
43. Blair SN, Kohl HW 3rd, Barlow CE, Paffenbarger RS Jr, Gibbons LW, Macera CA. Changes in physical fitness and all-cause mortality: a prospective study of healthy and unhealthy men. *JAMA* 1995;273:1093–8.
44. Lee S, Kuk JL, Katzmarzyk PT, Blair SN, Church TS, Ross R. Cardiorespiratory fitness attenuates metabolic risk independent of abdominal subcutaneous and visceral fat in men. *Diabetes Care* 2005;28:895–901.
45. Kriska AM, Saremi A, Hanson RL, et al. Physical activity, obesity, and the incidence of type 2 diabetes in a high-risk population. *Am J Epidemiol* 2003;158:669–75.
46. Singh-Manoux A, Hillsdon M, Brunner E, Marmot M. Effects of physical activity on cognitive functioning in middle age: evidence from the Whitehall II Prospective Cohort Study. *Am J Public Health* 2005;95:2252–8.
47. Gass M, Dawson-Hughes B. Preventing osteoporosis-related fractures: an overview. *Am J Med* 2006;119(suppl 1):S3–11.
48. Fox KR. The influence of physical activity on mental well-being. *Public Health Nutr* 1999;2:411–8.
49. King AC, Oman RF, Brassington GS, Bliwise DL, Haskell WL. Moderate-intensity exercise and self-rated quality of sleep in older adults: a randomized controlled trial. *JAMA* 1997;277:32–7.
50. de Jong J, Lemmink KA, Stevens M, et al. Six-month effects of the groningen active living model (GALM) on physical activity, health and fitness outcomes in sedentary and underactive older adults aged 55–65. *Patient Educ Couns* 2006;62:132–41.
51. Wise LA, Adams-Campbell LL, Palmer JR, Rosenberg L. Leisure-time physical activity in relation to depressive symptoms in the Black Women's Health Study. *Ann Behav Med* 2006;32:68–76.
52. Bixby WR, Spalding TW, Hatfield BD. Temporal dynamics and dimensional specificity of the affective response to exercise of varying intensity: differing pathways to a common outcome. *J Sport Exerc Psychol* 2001;23:171–90.
53. Ekkekakis P, Hall EE, VanLanduyt LM, Petruzzello SJ. Walking in (affective) circles: can short walks enhance affect? *J Behav Med* 2000;23:245–75.
54. U.S. Department of Health and Human Services. The Surgeon General's call to action to prevent and decrease overweight and obesity. Washington DC: Public Health Service, Office of the Surgeon General, 2001.
55. Prentice AM, Jebb SA. Physical activity level and weight control in adults. In: Bouchard C, ed. *Physical activity and obesity*. Champaign IL: Human Kinetics, 2000. pp. 247–262.
56. Passe DH, Horn M, Murray R. Impact of beverage acceptability on fluid intake during exercise. *Appetite* 2000;35:219–29.

57. Westerterp-Plantenga MS, Verwegen CR, Ijzerman MJ, Wijkman NE, Saris WH. Acute effects of exercise or sauna on appetite in obese and nonobese men. *Physiol Behav* 1997;62:1345-54.
58. Jeffery RW, Drewnowski A, Epstein LH, et al. Long-term maintenance of weight loss: current status. *Health Psychol* 2000;19(suppl 1):5-16.
59. Miller WC, Koceja DM, Hamilton EJ. A meta-analysis of the past 25 years of weight loss research using diet, exercise or diet plus exercise intervention. *Int J Obes Relat Metab Disord* 1997;21:941-7.
60. Hill JO, Thompson H, Wyatt H. Weight maintenance: what's missing? *J Am Diet Assoc* 2005;105(suppl 1):S63-6.
61. Parsons TJ, Manor O, Power C. Physical activity and change in body mass index from adolescence to mid-adulthood in the 1958 British cohort. *Int J Epidemiol* 2006;35:197-204.
62. Donnelly JE, Smith B, Jacobsen DJ, et al. The role of exercise for weight loss and maintenance. *Best Pract Res Clin Gastroenterol* 2004;18:1009-29.
63. Sternfeld B, Wang H, Quesenberry CP Jr, et al. Physical activity and changes in weight and waist circumference in midlife women: findings from the Study of Women's Health across the Nation. *Am J Epidemiol* 2004;160:912-22.
64. Jeffery RW, Wing RR, Sherwood NE, Tate DF. Physical activity and weight loss: does prescribing higher physical activity goals improve outcome? *Am J Clin Nutr* 2003;78:684-9.
65. Jakicic JM, Otto AD. Physical activity considerations for the treatment and prevention of obesity. *Am J Clin Nutr* 2005;82(suppl 1):226S-9S.
66. Bellelli G, Guerini F, Trabucchi M. Body weight-supported treadmill in the physical rehabilitation of severely demented subjects after hip fracture: a case report. *J Am Geriatr Soc* 2006;54:717-8.
67. Jolly K, Taylor RS, Lip GY, Stevens A. Home-based cardiac rehabilitation compared with centre-based rehabilitation and usual care: a systematic review and meta-analysis. *Int J Cardiol* 2006;111:343-51.
68. Pickett M, Mock V, Ropka ME, Cameron L, Coleman M, Podewils L. Adherence to moderate-intensity exercise during breast cancer therapy. *Cancer Pract* 2002;10:284-92.
69. Pinto BM, Maruyama NC. Exercise in the rehabilitation of breast cancer survivors. *Psychooncology* 1999;8:191-206.
70. Singh NA, Clements KM, Singh MA. The efficacy of exercise as a long-term antidepressant in elderly subjects: a randomized, controlled trial. *J Gerontol A Biol Sci Med Sci* 2001;56:M497-504.
71. King AC, Jeffery RW, Fridinger F, et al. Environmental and policy approaches to cardiovascular disease prevention through physical activity: issues and opportunities. *Health Educ Q* 1995;22:499-511.
72. Sorensen G, Emmons K, Hunt MK, Johnston D. Implications of the results of community intervention trials. *Annu Rev Public Health* 1998;19:379-416.
73. Yancey AK. Weight-related lifestyle influences and interventions in adolescence. Southern California Public Health Association Annual Meeting, Alhambra CA, March 10, 2006.
74. Yancey AK, Leslie J, Abel EK. Obesity at the crossroads: feminist and public health perspectives. *Signs* 2006;31:425-43.
75. Hills AP, Byrne NM, Wearing S, Armstrong T. Validation of the intensity of walking for pleasure in obese adults. *Prev Med* 2006;42:47-50.
76. Mattsson E, Larsson UE, Rossner S. Is walking for exercise too exhausting for obese women? *Int J Obes Relat Metab Disord* 1997;21:380-6.
77. Eaton SB, Strassman BI, Nesse RM, et al. Evolutionary health promotion. *Prev Med* 2002;34:109-18.
78. Levine JA, Vander Weg MW, Hill JO, Klesges RC. Non-exercise activity thermogenesis: the crouching tiger hidden dragon of societal weight gain. *Arterioscler Thromb Vasc Biol* 2006;26:729-36.
79. Flodmark CE, Marcus C, Britton M. Interventions to prevent obesity in children and adolescents: a systematic literature review. *Int J Obes (Lond)* 2006;30:579-89.
80. Mercer SL, Green LW, Rosenthal AC, Husten CG, Khan LK, Dietz WH. Possible lessons from the tobacco experience for obesity control. *Am J Clin Nutr* 2003;77(suppl 4):1073S-82S.
81. Kersh R, Morone J. The politics of obesity. seven steps to government action. *Health Aff (Millwood)* 2002;21:142-53.
82. Benowitz NL. Cotinine as a biomarker of environmental tobacco smoke exposure. *Epidemiol Rev* 1996;18:188-204.
83. Brennan P, Buffler PA, Reynolds P, et al. Secondhand smoke exposure in adulthood and risk of lung cancer among never smokers: a pooled analysis of two large studies. *Int J Cancer* 2004;109:125-31.
84. Hopkins DP, Briss PA, Ricard CJ, et al. Reviews of evidence regarding interventions to reduce tobacco use and exposure to environmental tobacco smoke. *Am J Prev Med* 2001;20(suppl 2):16-66.
85. McCarthy WJ. Cigarette advertising: setting the stage for addiction. *Tobacco and Youth Reporter* 1988;3:3.
86. Ong EK, Glantz SA. Tobacco industry efforts subverting International Agency for Research on Cancer's Second-Hand Smoke Study. *Lancet* 2000;355:1253-9.
87. Wong-McCarthy WJ, Gritz ER. Preventing regular teenage cigarette smoking. *Pediatr Ann* 1982;11:683-9.
88. Hill JO, Wyatt HR, Reed GW, Peters JC. Obesity and the environment. Where do we go from here? *Science* 2003;299:853-55.
89. Koplan JP, Dietz WH. Caloric imbalance and public health policy. *JAMA* 1999;282:1579-81.
90. Swinburn B, Gill T, Kumanyika S. Obesity prevention: a proposed framework for translating evidence into action. *Obes Rev* 2005;6:23-33.
91. Lobstein T, Baur L, Uauy R. Obesity in children and young people: a crisis in public health. *Obes Rev* 2004;(suppl 1):4-104.
92. Emmons KE. Health behaviors in a social context. In: Berkman LF, Kawachi I, eds. *Social epidemiology*. New York: Oxford University Press, 2000. p. 242-66.
93. Yancey AK. Building capacity to prevent and control chronic disease in underserved communities: expanding the Wisdom of WISEWOMAN in intervening at the environmental level. *J Womens Health (Larchmt)* 2004;13:644-9.
94. Marcus B, Williams D, Dubbert PM, et al. Physical activity interventions: what we know and what we need to know. A statement from the Council on Clinical Cardiology (Subcommittee on Exercise, Rehabilitation, and Prevention) and the Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Activity) of the American Heart Association. 2006. In Press.
95. Yancey AK, Ory MG, Davis SM. Dissemination of physical activity promotion interventions in underserved populations. *Am J Prev Med* 2006;31:582-91.
96. Trust for America's Health. *F as in fat: how obesity policies are failing in America*. Washington DC: Trust for America's Health, 2004.
97. School Health Policies and Programs Study (SHPPS) 2000: a summary report. *J Sch Health* 2001;71:251-350.
98. U.S. Department of Health and Human Services. *Healthy people 2010: understanding and improving health*. Washington DC: Government Printing Office, 2000.
99. Saelens BE, Sallis JF, Frank LD. Environmental correlates of walking and cycling: findings from the transportation, urban design, and planning literatures. *Ann Behav Med* 2003;25:80-91.
100. Babey SH, Brown ER, Hastert TA. Access to safe parks helps increase physical activity among teenagers. Los Angeles CA: UCLA Center for Health Policy Research, 2005.
101. Humpel N, Owen N, Leslie E. Environmental factors associated with adults' participation in physical activity: a review. *Am J Prev Med* 2002;22:188-99.
102. Sallis JF, Prochaska JJ, Taylor WA. A review of correlates of physical activity of children and adolescents. *Med Sci Sports Exerc* 2000;32:963-75.
103. Ewing R, Schmid T, Killingsworth R, Zlot A, Raudenbush S. Relationship between urban sprawl and physical activity, obesity, and morbidity. *Am J Health Promot* 2003;18:47-57.
104. Frank LD, Andresen MA, Schmid TL. Obesity relationships with community design, physical activity, and time spent in cars. *Am J Prev Med* 2004;27:87-96.
105. Saelens BE, Sallis JF, Black JB, Chen D. Neighborhood-based differences in physical activity: an environment scale evaluation. *Am J Public Health* 2003;93:1552-8.
106. Boarnet MG, Anderson CL, Day K, McMillan T, Alfonzo M. Evaluation of the California Safe Routes to School legislation: urban form changes and children's active transportation to school. *Am J Prev Med* 2005; 28(2 suppl 2):134-40.
107. Trust for America's Health. *F as in fat: how obesity policies are failing in America*. Washington DC: Trust for America's Health, 2005.
108. Reed DF, Karpilow KA. *Understanding nutrition: a primer on programs and policies in California*. Berkeley: California Center for Research on Women and Families, Public Health Institute, 2004. Available at: www.ccrwf.org.
109. Heath GW, Brownson RC, Kruger J, et al. The effectiveness of urban design and land use and transport policies and practices to increase physical activity: a systematic review. *J Phys Activ Health* 2006;3:S55-76.
110. Schmitz A. *Creating walkable places: compact, mixed uses solutions*. Washington DC: Urban Land Institute, 2005.

111. Mello MM, Rimm EB, Studdert DM. The Mclawsuit: the fast-food industry and legal accountability for obesity. *Health Aff (Millwood)* 2003;22:207-16.
112. Rigby NJ, Kumanyika S, James WP. Confronting the epidemic: the need for global solutions. *J Public Health Policy* 2004;25(3-4):3-4418-34.
113. Public Health Institute. Is physical activity by itself the answer? In: California's obesity crisis. Focus on solutions: what schools can do. Policy brief 4. Oakland CA: Public Health Institute, 2004. Available at: www.phi.org.
114. Yancey AK, Simon PA, McCarthy WJ, Lightstone AS, Fielding JE. Ethnic and gender differences in overweight self-perception: relationship to sedentariness. *Obesity (Silver Spring)* 2006;14:980-8.
115. Maibach EW. Recreating communities to support active living: a new role for social marketing. *Am J Health Promot* 2003;18:114-9.
116. California Center for Public Health Advocacy. Dropping the ball: schools fail to meet physical education mandates. Oakland: California Center for Public Health Advocacy, 2006. Available at: <http://publichealthadvocacy.org/droppingtheball.html>.
117. Backman DR, Carman JS, Aldana SG. Fruits and vegetables and physical activity at the worksite: business leaders and working women speak out on access and environment. Sacramento: California Department of Health Services, 2004.
118. Hayasaki E. Schools to end soda sales. L.A. Unified: the soft drinks won't be allowed on campuses starting in 2004. They may be replaced by more healthful beverages. *Los Angeles Times*, August 28, 2002, p. B-1.
119. Matthews K. Clinton unveils healthy schools effort. *AP Online*, February 13, 2006.
120. Institute of Medicine. Progress in preventing childhood obesity: how do we measure up? Washington DC: National Academies of Sciences, September 2006.
121. Gebbie KM, Turnock BJ. The public health workforce 2006: new challenges. *Health Aff* 2006;25:967-78.
122. Morland K, Wing S, Diez Roux A, Poole C. Neighborhood characteristics associated with the location of food stores and food service places. *Am J Prev Med* 2002;22:23-9.
123. Block JP, Scribner RA, DeSalvo KB. Fast food, race/ethnicity, and income: a geographic analysis. *Am J Prev Med* 2004;27:211-7.
124. Cummins SCJ, McKay L, MacIntyre S. McDonald's restaurants and neighborhood deprivation in Scotland and England. *Am J Prev Med* 2005;29:308-10.
125. Morland K, Diez Roux AV, Wing S. Supermarkets, other food stores, and obesity: the Atherosclerosis Risk in Communities Study. *Am J Prev Med* 2006;30:333-9.
126. Algert SJ, Agrawal A, Lewis DS. Disparities in access to fresh produce in low-income neighborhoods in Los Angeles. *Am J Prev Med* 2006;30:365-70.
127. Novick LF. A framework for public health administration and practice. In: Novick LF, Mays GP, eds. *Public health administration: principles for population-based management*. Gaithersburg MD: Aspen Publishers, 2001. p. 34-62.
128. Pate RR, Pratt M, Blair SN, et al. Physical activity and public health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA* 1995;273:402-7.
129. Yee SL, Williams-Pichota P, Sorensen A, Roussel A, Hersey J, Hamre R. The Nutrition and Physical Activity Program to Prevent Obesity and Other Chronic Diseases: monitoring progress in funded states. *Prev Chronic Dis* 2006;3:A23.
130. Association of Schools of Public Health. Home page, 2005. Available at: www.asph.org.
131. Sallis JF, Linton L, Kraft MK. The First Active Living Research Conference. Growth of a transdisciplinary field. *Am J Prev Med* 2005;28(suppl 2):93-5.
132. Booth SL, Sallis JF, Ritenbaugh C, et al. Environmental and societal factors affect food choice and physical activity: rationale, influences, and leverage points. *Nutr Rev* 2001;59:S21-39, discussion S57-65.
133. Gebbie KM, Turnock BJ. The public health workforce 2006: new challenges. *Health Aff* 2006;25:967-78.
134. Salinsky E, Gursky EA. The case for transforming governmental public health. *Health Aff* 2006;25:1017-28.
135. Cawley J. An economic framework for understanding physical activity and eating behaviors. *Am J Prev Med* 2004;27(suppl 3):117-25.
136. Sallis JF, Kraft K, Linton LS. How the environment shapes physical activity: a transdisciplinary research agenda. *Am J Prev Med* 2002;22:208.
137. Kahn EB, Ramsey LT, Brownson RC, et al. The effectiveness of interventions to increase physical activity: a systematic review. *Am J Prev Med* 2002;22(suppl 4):73-107.
138. Booth KM, Pinkston MM, Poston WS. Obesity and the built environment. *J Am Diet Assoc* 2005;105(suppl 1):S110-7.
139. Estabrooks PA, Lee RE, Gyuresik NC. Resources for physical activity participation: does availability and accessibility differ by neighborhood socioeconomic status? *Ann Behav Med* 2003;25:100-4.
140. Krizek KJ, Birnbaum AS, Levinson DM. A schematic for focusing on youth in investigations of community design and physical activity. *Am J Health Promot* 2004;19:33-8.
141. Zimring C, Joseph A, Nicoll GL, Tsepas S. Influences of building design and site design on physical activity: research and intervention opportunities. *Am J Prev Med* 2005;28(suppl 2):186-93.
142. Lloyd LK, Cook CL, Kohl HW. A pilot study of teachers' acceptance of a classroom-based physical activity curriculum tool: Take 10! *TAHPERD Journal* 2005;73:8-11.
143. Sallis JF, Conway TL, Prochaska JJ, McKenzie TL, Marshall SJ, Brown M. The association of school environments with youth physical activity. *Am J Public Health* 2001;91:618-20.
144. Stewart JA, Dennison DA, Kohl HW, Doyle JA. Exercise level and energy expenditure in the Take 10! in-class physical activity program. *J Sch Health* 2004;74:397-400.
145. Veugelers PJ, Fitzgerald AL. Effectiveness of school programs in preventing childhood obesity: a multilevel comparison. *Am J Public Health* 2005;95:432-5.
146. Datar A, Sturm R. Physical education in elementary school and body mass index: evidence from the Early Childhood Longitudinal Study. *Am J Public Health* 2004;94:1501-6.
147. Metzler MW, Williams S. A classroom-based physical activity and academic content program: more than a pause that refreshes? *J Classroom Interaction* 2006. In press.
148. Gortmaker SL, Peterson K, Wiecha J, et al. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch Pediatr Adolesc Med* 1999;153:409-18.
149. Sallis JF, McKenzie TL, Alcaraz JE, Kolody B, Faucette N, Hovell MF. The effects of a 2-year physical education program (SPARK) on physical activity and fitness in elementary school students: sports, play and active recreation for kids. *Am J Public Health* 1997;87:1328-34.
150. Kerr NA, Yore MM, Ham SA, Dietz WH. Increasing stair use in a worksite through environmental changes. *Am J Health Promot* 2004;18:312-5.
151. Pronk SJ, Pronk NP, Sisco A, Ingalls DS, Ochoa C. Impact of a daily 10-minute strength and flexibility program in a manufacturing plant. *Am J Health Promot* 1995;9:175-8.
152. Elbel R, Aldana S, Bloswick D, Lyon JL. A pilot study evaluating a peer led and professional led physical activity intervention with blue-collar employees. *Work* 2003;21:199-210.
153. Pohjonen T, Ranta R. Effects of worksite physical exercise intervention on physical fitness, perceived health status, and work ability among home care workers: five-year follow-up. *Prev Med* 2001;32:465-75.
154. Crawford PB, Gosliner W, Strode P, et al. Walking the talk: Fit WIC wellness programs improve self-efficacy in pediatric obesity prevention counseling. *Am J Public Health* 2004;94:1480-5.
155. Yancey AK, McCarthy WJ, Taylor WC, et al. The Los Angeles Lift Off: a sociocultural environmental change intervention to integrate physical activity into the workplace. *Prev Med* 2004;38:848-56.
156. Hammond SL, Leonard B, Fridinger F. The Centers for Disease Control and Prevention director's physical activity challenge: an evaluation of a worksite health promotion intervention. *Am J Health Promot* 2000;15:17-20, ii.
157. Wilcox S, Laken M, Anderson T, et al. The Health-e-AME faith-based physical activity initiative: program description and baseline findings. *Health Promot Pract* 2006. In press.
158. Hooker SP, Seavey W, Weidmer CE, et al. The California Active Aging Community Grant Program: translating science into practice to promote physical activity in older adults. *Ann Behav Med* 2005;29:155-65.
159. Yanez LR, Becker DM, Moy TF, Gittelson J, Koffman DM. Project Joy: faith based cardiovascular health promotion for African American Women. *Public Health Rep* 2001;116(suppl 1):68-81.
160. Alcalay R, Bell RA. Promoting nutrition and physical activity through social marketing, current practices and recommendations. Davis: Center for Advanced Studies in Nutrition and Social Marketing, University of California-Davis, 2000.
161. Neiger BL, Thackeray R, Merrill RM, Miner KM, Larsen L, Chalkey CM. The impact of social marketing on fruit and vegetable consumption and physical activity among public health employees at the Utah Department of Health. *Social Marketing Q* 2001;7:10-28.

162. Perrin EM, Flower KB, Ammerman AS. Pediatricians' own weight: self-perception, misclassification, and ease of counseling. *Obes Res* 2005;13:326-32.
163. Patrick K, Calfas KJ, Sallis JF, et al. A randomized controlled trial of a primary care and home-based intervention for physical activity and nutrition behaviors: Pace+ for adolescents. *Arch Pediatr Adolesc Med* 2006;160:128-36.
164. Will JC, Farris RP, Sanders CG, Stockmyer CK, Finkelstein EA. Health promotion interventions for disadvantaged women: overview of the WISEWOMAN projects. *J Womens Health (Larchmt)* 2004;13:484-502.
165. Wilcox S, Parra-Medina D, Thompson-Robinson M, Will J. Nutrition and physical activity interventions to reduce cardiovascular disease risk in health care settings: a quantitative review with a focus on women. *Nutr Rev* 2001;59:197-214.
166. Lewis CE, Raczynski JM, Heath GW, Levinson R, Hilyer JC Jr, Cutter GR. Promoting physical activity in low-income African-American communities: the PARR Project. *Ethn Dis* 1993;3:106-18.
167. Fortmann SP, Flora JA, Winkleby MA, Schooler C, Taylor CB, Farquhar JW. Community intervention trials: reflections on the Stanford Five-City Project experience. *Am J Epidemiol* 1995;142:576-86.
168. Yancey A, Jordan A, Bradford J, et al. Engaging high-risk populations in community-level fitness promotion: ROCK! Richmond. *Health Promot Pract* 2003;4:180-8.
169. Brownson RC, Housemann RA, Brown DR, et al. Promoting physical activity in rural communities. walking trail access, use, and effects. *Am J Prev Med* 2000;18:235-41.
170. Grier S, Bryant CA. Social marketing in public health. *Annu Rev Public Health* 2005;26:319-39.
171. U.S. Department of Agriculture. Dietary guidelines for Americans, 2005. Available at: www.healthierus.gov/dietaryguidelines.
172. Franks AL, Brownson RC, Bryant C, et al. Prevention research centers: contributions to updating the public health workforce through training. *Prev Chronic Dis* 2005;2. Available at: www.cdc.gov/pcd/issues/2004/apr/03_0019.htm.
173. Golaszewski T. Calling all academics to advocacy. *Art Health Promot* 2005;19:8-9.
174. Daynard RA. Lessons from tobacco control for the obesity control movement. *J Public Health Policy* 2003;24:291-5.
175. Kumanyika SK. Minisymposium on obesity: overview and some strategic considerations. *Annu Rev Public Health* 2001;22:293-308.