

Designing for **Active Living** Among Children

Since the 1970s, there has been an alarming increase in the rate of obesity among children of all ages in the United States. The epidemic of childhood obesity is widely recognized as an immediate and long-term threat not only to children's health and quality of life, but also to the nation's health care system and economy. Changing the environments—homes, schools and neighborhoods—in which children live, learn and play is now seen as an essential strategy for reversing the obesity epidemic.

This summary provides a synopsis of the current state of research into the environmental factors and policies related to young people's physical activity and sedentary behavior patterns, and how these in turn may be linked to obesity. This research identifies potential strategies for addressing physical inactivity among youth and the childhood obesity epidemic.

The Childhood Obesity Epidemic

Obesity is one of the most pressing health threats facing children and families today. Current estimates show that more than 33 percent of children and adolescents, approximately 25 million kids, are overweight or obese.¹ Obese children are at higher lifetime risk for heart disease, stroke, asthma and some forms of cancer. They also are being diagnosed with conditions previously considered adult illnesses, such as type 2 diabetes and high blood pressure. Current estimates show that the obesity epidemic costs the United States \$117 billion per year in direct medical expenses and indirect costs, including lost productivity.² The 2004 Institute of Medicine report,

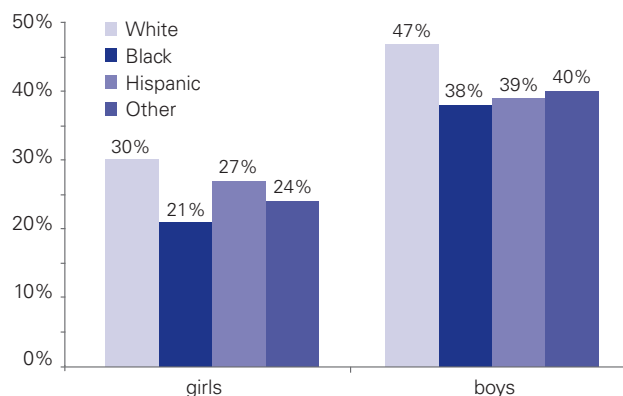


Preventing Childhood Obesity: Health in the Balance, concluded that childhood obesity should be treated with the same urgency as an infectious disease epidemic.³

Lack of Physical Activity Contributes to Obesity

Lack of physical activity contributes greatly to the prevalence of obesity among children today. The U.S. Surgeon General recommends that children engage in at least 60 minutes of moderate physical activity most days of the week. Yet, according to 2006 estimates, nearly two-thirds of adolescents do not meet these recommendations. African-American females reported the lowest levels of physical activity—79 percent do not meet the recommendations.⁴

Percentage of children who are active for 60 minutes five days a week⁴



The Role of the Built Environment

Characteristics of homes, schools and neighborhoods can influence children's daily physical activity levels.^{3, 5-7} The research indicates that children across the United States get little to no regular physical activity while in school, and that parents' concern over neighborhood safety affects how physically active their children are at home. The Institute of Medicine concluded that providing safe places for kids to play, increasing their opportunities for regular physical activity and supporting families' efforts to integrate physical activity into their daily routine are important strategies for reversing the childhood obesity epidemic.³

The Findings

This research summary presents an overview of studies that examine how environmental factors and policies affect young people's physical activity and sedentary behavior patterns. The summary also demonstrates how these factors may impact the dramatic rise in the rates of childhood obesity. As a result, these findings identify some of the most promising environmental and policy changes for increasing physical activity among young people, which may help to reverse the obesity epidemic.

Active Kids Need More Safe Places to Play

Children and adolescents living in communities with parks, playgrounds, trails and recreation programs tend to be more physically active than those living in neighborhoods with fewer recreational facilities.⁸ For example, a study conducted in 2006 involving 1,556 adolescent girls, found that teenage girls reported 35 additional minutes of physical activity per week for each park located within a half-mile from home.⁹ The teens also were more active when parks were lighted and had walking paths.

In addition, teens who live in communities that make school and recreational facilities accessible on weekends may have lower risk for being overweight.^{10, 11} A national study conducted in 2006 with 20,745 adolescents found communities with seven recreational facilities located within a five-mile radius had 32 percent fewer overweight teens than did communities with no facilities.¹¹

In an experimental study conducted in a low-income New Orleans neighborhood in 2003, researchers opened a school yard with play equipment to the public outside of school hours and provided adult supervision for kids at play. Researchers observed the intervention playground and a school playground that remained closed outside of school hours, which was

located in a nearby neighborhood. At the end of the two-year intervention, the number of children who were observed to be physically active was 84 percent higher in the intervention neighborhood than in the comparison neighborhood.¹²

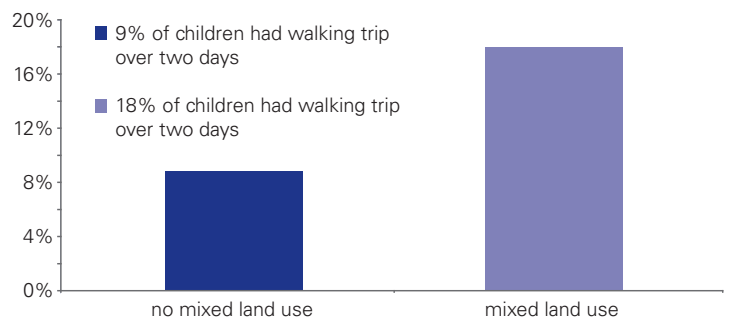
Low-income communities typically offer fewer opportunities for residents to be physically active. In minority communities where only 5 percent of residents have a college education, teens have access to about half of the recreation facilities as teens living in predominately white communities with college-educated residents.¹¹

Neighborhoods Can Promote Active Living

A walkable neighborhood makes it safe and easy for residents to walk or bike from home to places they need to go, such as schools, shops and work. Many studies show that adults living in walkable neighborhoods are more physically active.¹³ New evidence also shows that children engage in more regular, sustained physical activity when they are able to walk or bike from home to school or other local destinations.

Researchers analyzed 2001-2002 data from 3,161 children and teens living in the Atlanta region and found that young people ages 5 to 18 were more likely to walk if they lived in a mixed use neighborhood, with parks, schools and commercial destinations within one kilometer of where they live.¹⁴

Youth ages 5 to 18 who live in mixed-use neighborhoods walk more for transportation¹⁴



A review of 33 studies in 2006 showed that sidewalks and destinations within walking distance were linked with greater physical activity among children, while traffic hazards and unsafe intersections were linked with lower levels of physical activity.⁸

A study conducted in 2006 with 98 adolescents living in San Diego found that Mexican American and non-Hispanic white teens who lived in walkable neighborhoods were more physically active than teens who lived in suburbs.¹⁵

Physical Activity Environments at School

Research shows that school environments and policies influence children's activity levels.^{6, 22} For example, school campuses can offer opportunities for students to be active through physical education (PE) classes, recess periods and after-school programs.

A systematic review in 2002 of 13 studies conducted from 1983 to 1999 among elementary and high school students found that increasing the length of PE classes, or the amount of vigorous physical activity required from students throughout the class, consistently improved students' physical activity and fitness levels.²³

An experimental study conducted in 2007 redesigned playgrounds at 15 schools in low-income communities in England using colored lines to stimulate play. Researchers monitored students' physical activity levels with electronic devices. Students from the intervention schools increased their physical activity by about 30 minutes per week, compared to students from 11 schools where playgrounds were not updated. Researchers noted that these effects lasted for at least six months after the redesign.²⁴

As part of a statewide study conducted in California in 2007, researchers observed K-12 students during PE classes. The researchers found that children were not receiving the state-required minimum minutes of PE and that students were inactive for more than half of their time spent in PE. Low income and minority students received poorer quality PE due to lack of teacher training, large class sizes and inadequate facilities.²⁵

A national study of 500 schools and 54,000 students conducted in 2003-2005 found school sports were providing few students with physical activity. Thirty-three percent of girls and 37 percent of boys participated in varsity sports, and many fewer were involved in intramural sports. Participation was particularly low among low-income and minority students.²⁶

Only 3.8 percent of elementary schools, 7.9 percent of middle schools and 2.1 percent of high schools provided daily PE to students in 2006.²⁷

Neighborhoods Need Safe Routes to Schools

Walking or bicycling to school—which can add up to 24 additional minutes¹⁶ of physical activity each day—is now rare. National data indicate a sharp decline in the number of students ages 5 to 18 who walk or bike to school, from 42 percent in 1969¹⁷ to only 16 percent in 2001.¹⁸ According to a 2005 study of eight elementary schools in South Carolina, only 5 percent of students walked or biked to school.¹⁹

Safe Routes to School (SRTS) is a national program that creates safe, convenient and fun opportunities for children to bicycle and walk to and from their schools. The program aims to help children be more physically active, and seeks to increase the number of children walking and bicycling to schools by providing sidewalks and improving traffic safety.

Recent evaluations of neighborhood projects in California suggest that implementing Safe Routes to School programs increases the number of students who walk to school. In Marin County, new safety policies and promotional activities increased the number of children walking to school by 64 percent in two years.²⁰ In a similar analysis of 10 elementary schools in California, some routes were improved by slowing traffic and adding sidewalks and crosswalks. Schools whose routes were improved had a 15 percent increase in the number of students who walked to school, compared to a 4 percent increase in walking among students of schools whose routes were not improved.²¹



In 2006, researchers observed 197 students at 11 preschools in Stockholm, Sweden, and found that step counts among children ages 4 to 6 increased by 20 percent when the children had access to natural areas with trees, shrubbery and dirt.²⁸

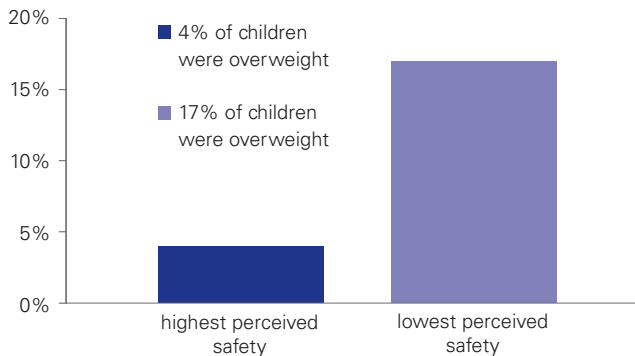
Better Safety Means Increased Physical Activity

A number of studies have examined the relationship between neighborhood safety and physical activity levels among residents. Traffic hazards, crime rates and parental perceptions of safety have been explored. Research indicates that parental concerns about traffic and crime have a strong influence on children’s physical activity levels,^{6, 8} and that child and parent perceptions of the environment are as important as the actual environment.^{6, 10, 29} For example children were five times more likely to walk to school if their parents felt their neighborhoods and streets were generally safe.²⁹

In 2007 researchers analyzed a nationally representative sample of 8,000 elementary students using data collected from 1998 to 2002. According to the study, children who lived in neighborhoods perceived as less safe for outdoor play were 32 percent more likely to be overweight at each of the four yearly assessments.³⁰

In 2006 researchers assessed the body mass index (BMI) of 768 children in 10 urban and rural communities and found that seven-year-old children were more likely to be overweight if their parents perceived their neighborhood to be unsafe.³¹

First-grade children are less likely to be overweight when they live in neighborhoods their parents perceive to be safe³¹



A study involving 1,378 youth ages 11 to 16 who were living in Chicago from 1995 to 1996, found that youth were physically active for 49 additional minutes per week if they lived in neighborhoods that were both perceived as safe by parents and had fewer occurrences of physical and social disorder, such as graffiti, trash and drug use.³²

Physically active children need to be protected from traffic hazards. Pedestrian accidents are a leading cause of injury or death for children five years and under.³³ Studies show that speed humps reduce the chance of child injury,^{34, 35} and that it is more important to reduce speed than to reduce traffic volume.³⁶

Reducing Screen Time Makes More Time for Physical Activity

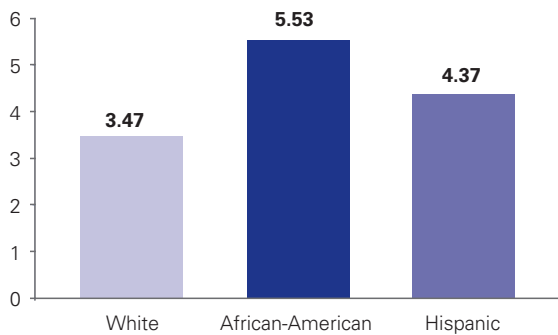
The built environment, especially safe parks and streets, could also attract children away from sedentary time spent watching television, playing video games and using the Internet. Thirty-seven percent of children in the United States spend three or more hours a day watching television.⁴ Evidence from rigorous, experimental studies shows that decreasing children’s TV time may be causally related to lowering their BMI levels—primarily because watching TV displaces time for physical activity and exposes children to advertisements for high-calorie, low-nutrition foods.^{37, 7, 38} In fact, the American Academy of Pediatrics and Healthy People 2010 recommend no more than two hours of TV per day for children and adolescents.

A 2005 review of 10 studies conducted with children and teens found that school-based interventions aimed at increasing physical activity effectively reduced TV viewing hours and reduced the prevalence of obesity.³⁹ For example, Planet Health, which focuses on reducing TV time, increasing physical activity and encouraging a healthy diet among middle school students, resulted in a significant decrease in the prevalence of obesity among girls, as well as a reduction in TV viewing for both boys and girls.⁴⁰

According to a study conducted in 1999 with 200 elementary school students, eliminating screen time for 10 days, and then restricting it to seven hours per week was linked to lower BMI among third- and fourth-grade students. The participating students also received classroom lessons and take-home materials about reducing TV time, and were given a “TV budget” device to limit their screen time at home.⁴¹

Interventions aimed at decreasing sedentary behavior can also help to increase physical activity and reduce BMI. For example, in 2004 researchers used a family-based behavioral intervention with 63 obese boys and girls ages 8 to 12, and found that reducing sedentary behaviors significantly increased physical activity and lowered BMI levels.⁴²

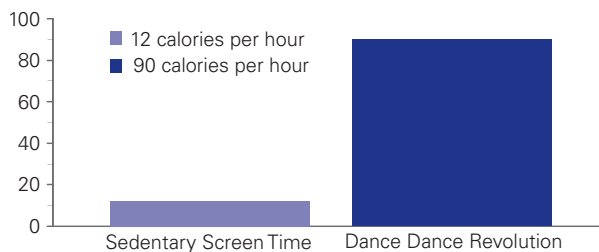
Daily average screen time in hours for youth ages 8 to 18⁴



A study conducted in 2001 with 10 obese children ages 8 to 10 required the children to ride a stationary bicycle in order to activate their TV at home. The children were able to view two minutes of TV for every one minute of pedaling. Among children in the intervention group, time spent watching TV dropped dramatically—by as much as 19.4 hours per week compared to TV viewing time for the control group.⁴³

There is also a growing body of evidence that demonstrates how technology can help counteract sedentary behavior. Research has shown children who play video games that require physical activity during gaming sessions, like the popular Dance Dance Revolution, can burn seven to eight times as many calories as children who engage in sedentary screen time. One study, for example, found that children burned 90 calories more per hour during a game of Dance Dance Revolution than did children who played inactive video games.⁴⁴

Children can burn up to 90 calories per hour during active screen time⁴³



Another study found that children who played a dance simulation video game increased their heart rate above the minimum recommendation for cardiovascular fitness as suggested by the American College of Sports Medicine.⁴⁵

Conclusions

- > Obesity rates have increased dramatically among children of all ages in the United States, and physical inactivity contributes to the epidemic. Today, two thirds of adolescents do not meet the Surgeon General's recommendation of 60 minutes of physical activity daily.
- > Children and teens living in low-income communities and African-American, Latino, Native American, Asian and Pacific Islander children have a low percentage of physically active youth and are especially vulnerable to obesity.
- > There is strong evidence linking access to facilities like parks, playgrounds and recreation programs with increased physical activity and reduced risk for obesity among kids. Studies also show that low-income and minority communities offer significantly fewer opportunities for residents to be active than do higher income communities.
- > Young people living in neighborhoods that provide sidewalks, safe streets and destinations within walking distance from home are more physically active than those living in low-walkable suburbs.
- > Safe Routes to School (SRTS) projects improve facilities like sidewalks and crosswalks, slow traffic and encourage policies that make it safer and easier for children to walk and bike to school. There is initial evidence that SRTS programs result in more students walking and biking to and from school.
- > Schools can offer many opportunities for children to be physically active, including effective PE programs, updated playgrounds, well-maintained equipment and supervised activity breaks throughout the school day.
- > Research-based PE programs have been shown to improve students' physical fitness levels, yet many studies reveal a significant lack of PE programming in U.S. schools, especially among high school students and students living in low-income communities.
- > Parental concern over traffic safety and neighborhood crime is a significant barrier to physical activity among children, especially in low-income communities.
- > There is evidence linking excessive TV viewing to increased risk for obesity among children, and minority children are especially vulnerable. School-based interventions that promote physical activity and encourage students and parents to limit TV time show promise for reducing the risk of childhood obesity.

References

- Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999-2004. *Journal of the American Medical Association* 2006; 295(13):1549-1555.
- Preventing Chronic Diseases: Investing Wisely in Health. Preventing Obesity Through Good Nutrition and Physical Activity*. Atlanta, GA: Centers for Disease Control and Prevention, Revised July 2005. Available at: <http://www.cdc.gov/nccdphp/publications/factsheets/Prevention/obesity.htm>
- Koplan JP, Liverman CT, Kraak VI, Eds. *Preventing childhood obesity: Health in the balance*. Washington: Institute of Medicine, 2005. Available at: <http://www.nap.edu/catalog/11015.html>.
- Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance—United States, 2005. Surveillance Summaries, June 9. *MMWR* 2006;55(SS-5):1-108.
- The Surgeon General's call to action to prevent and decrease overweight and obesity*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General, 2001.
- Ferreira I, van der Horst K, Wendel-Vos W, Kremers S, van Lenthe FJ, Brug J. Environmental correlates of physical activity in youth - a review and update. *Obesity Reviews* 2007; 8(2): 129-154.
- Sallis JF, Glanz K. The role of built environments in physical activity, eating, and obesity in childhood. *Childhood Obesity. The Future of Children* 2006; 16(1): 89-108.
- Davison KK, Lawson CT. Do attributes in the physical environment influence children's physical activity? A review of the literature. *International Journal of Behavioral Nutrition and Physical Activity*. 2006; 3(19).
- Cohen DA, Ashwood JS, Scott MM, Overton A, Evenson KR, Staten LK, Porter D, McKenzie TL, Catellier D. Public parks and physical activity among adolescent girls. *Pediatrics* 2006; 118(5): 1381-1389.
- Scott MM, Cohen DA, Evenson KR, Elder J, Catellier D, Ashwood JS, Overton A. Weekend schoolyard accessibility, physical activity, and obesity: the Trial of Activity in Adolescent Girls (TAAG) study. *Preventive Medicine* 2007; 44(5): 398-403.
- 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(2): 417-424.
- Farley TA, Meriwether RA, Baker ET, Watkins LT, Johnson CC, Webber LS. Safe play spaces to promote physical activity in inner-city children: results from a pilot study of an environmental intervention. *American Journal of Public Health* 2007; 97(9): 1625-1631.
- Heath G, Brownson R, Kruger J, Miles R, Powell KE, Ramsey LT. The Task Force on Community Preventive Services. The effectiveness of urban design and land use and transport policies and practices to increase physical activity: a systematic review. *Journal of Physical Activity and Health* 2006; 3(1S): S55-S76.
- Frank L, Kerr J, Chapman J, Sallis J. Urban Form Relationships with Walk Trip Frequency and Distance among Youth. *American Journal of Health Promotion* 2007; 21(4S): 305-311.
- Kligerman M, Sallis JF, Ryan S, Frank LD, Nader PR. Association of neighborhood design and recreation environment variables with physical activity and body mass index in adolescents. *American Journal of Health Promotion* 2007; 21(4): 274-277.
- Sirard JR, Riner WF Jr, McIver KL, Pate RR. Physical activity and active commuting to elementary school. *Medicine and Science in Sports and Exercise* 2005; 37(12): 2062-2069.
- Transportation Characteristics of School Children: Report No. 4, Nationwide Personal Transportation Study*. Washington, DC: Federal Highway Administration (FHWA), 1972.
- National Household Travel Survey*. Washington, DC: Bureau of Transportation Statistics, 2003.
- Sirard JR, Ainsworth BE, McIver KL, Pate RR. Prevalence of active commuting at urban and suburban elementary schools in Columbia, SC. *American Journal of Public Health*. 2005; 95(2): 236-237.
- Staunton CE, Hubschmidt D, Kallins W. Promoting safe walking and biking to school: The Marin County success story. *American Journal of Public Health* 2003; 93(9): 1431-1434.
- Boarnet MG, Anderson CL, Day K, McMillan T, Alfonso M. Evaluation of the California Safe Routes to School legislation: Urban form changes and children's active transportation to school. *American Journal of Preventive Medicine* 2005; 28(2): 134-140.
- Young DR, Felton GM, Grieser M, Elder JP, Johnson C, Lee JS, Kubik MY. Policies and opportunities for physical activity in middle school environments. *Journal of School Health* 2007; 77(1): 41-47.
- Kahn EB, Ramsey LT, Brownson R, Heath GW, Howze EH, Powell KE, Stone EJ, Rajab MW, Corso P, Task Force on Community Preventive Services. The effectiveness of interventions to increase physical activity. *American Journal of Preventive Medicine* 2002; 22(4S): 73-107.
- Ridgers ND, Stratton G, Fairclough SJ, Twisk JW. Long-term effects of a playground markings and physical structures on children's recess physical activity levels. *Preventive Medicine* 2007; 44(5): 393-397.
- Failing Fitness: Physical Activity and Physical Education in Schools, A policy brief from The California Endowment*. Los Angeles, CA: UCLA Center to Eliminate Health Disparities and Samuels & Associates, January 2007. www.calendow.org
- Johnston L, Delva J, O'Malley P. Sports Participation and Physical Education in American Secondary Schools: Current Levels and Racial/Ethnic and Socioeconomic Disparities. *American Journal of Preventive Medicine* 2007; 33(4S): 195-208.
- Lee S, Burgeson C, Fulton J, Spain C. Physical Education and Physical Activity: Results from the School Health Policies and Programs Study 2006. *Journal of School Health* 2007; 77: 435-463.
- Boldemann C, Blennow M, Dal H, Martensson F, Raustorp A, Yuen K, Wester U. Impact of preschool environment upon children's physical activity and sun exposure. *Preventive Medicine* 2006; 42(4): 301-308.
- Kerr J, Rosenberg D, Sallis JF, Saelens BE, Frank LD, Conway TL. Active commuting to school: Associations with environment and parental concerns. *Medicine and Science in Sports and Exercise* 2006; 38(4):787-794.
- Gable S, Chang Y, Krull JL. Television watching and frequency of family meals are predictive of overweight onset and persistence in a national sample of school-aged children. *Journal of the American Dietetic Association* 2007; 107(1): 53-61.
- Lumeng JC, Appugliese D, Cabral HJ, Bradley RH, Zuckerman B. Neighborhood safety and overweight status in children. *Archives of Pediatrics and Adolescent Medicine* 2006; 160(1): 25-31.
- Molnar BE, Gortmaker SL, Bull FC. Unsafe to play? Neighborhood disorder and lack of safety predict reduced physical activity among urban children and adolescents. *American Journal of Health Promotion* 2004; 18: 378-386.
- Grossman DC. The history of injury control and the epidemiology of child and adolescent injuries. *Unintentional Injuries in Childhood: The Future of Children* 2000; 10(1): 23-52.
- Tester JM, Rutherford GW, Wald Z. A matched case control study evaluating the effectiveness of speed humps in reducing child pedestrian injuries. *American Journal of Public Health* 2004; 94(4): 646-650.
- Foxhall K. Speed humps work well in Oakland. *Better Roads* 2004; 74: 66-67.
- Jacobsen P, Anderson CL, Winn DG. Child pedestrian injuries on residential streets: Implications for traffic engineering. *ITE Journal* 2000; 70: 71-75.
- The role of media in childhood obesity*. Washington, DC: Henry J. Kaiser Family Foundation, 2004. Available at: <http://www.kff.org/entmedia/7030.cfm>.
- O'Brien M, Nader PR, Houts RM, Bradley R, Friedman SL, Belsky J, Susman E. The ecology of childhood overweight: a 12-year longitudinal analysis. *International Journal of Obesity* 2007; 31(9): 1469-1478.
- Centers for Disease Control and Prevention. Public health strategies for prevention and controlling overweight and obesity in school and worksite settings: a report on recommendations of the Task Force on Community Preventive Services. *MMRW* 2005;54 (No. RR-10): 1-12.
- Gortmaker SL, Peterson K, Wiecha J, Sobol AM, Dixit S, Fox MK, Laird N. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Archives of Pediatrics and Adolescent Medicine* 1999; 153: 409-418.
- Robinson T. Reducing children's television to prevent obesity: A randomized control trial. *Journal of the American Medical Association* 1999; 282(16): 1561-1567.
- Epstein LH, Paluch RA, Kilanowski CK. The effect of reinforcement or stimulus control to reduce sedentary behavior in the treatment of pediatric obesity. *Health Psychology* 2004; 23(4): 371-380.
- Faith MS, Berman N, Moonseong H. Effects of contingent television on physical activity and television viewing in obese children. *Pediatrics* 2001; 107(5): 1043-1048.
- Lanningham-Foster L, Jensen TB, Foster RC, Redmond AB, Walker BA, Heinz D, Levine JA. Energy expenditure of sedentary screen time compared with active screen time for children. *Pediatrics* 2006; 118(6): 1831-1835.
- Unnithan VB, Houser W, Fernhall B. Evaluation of the energy cost of playing a dance simulation video game in overweight and non-overweight children and adolescents. *International Journal of Sports Medicine* 2006; 27(10): 804-809.

Active Living Research, a national program of the Robert Wood Johnson Foundation, stimulates and supports research to identify environmental factors and policies that influence physical activity for children and families to inform effective childhood obesity prevention strategies, particularly in low-income and racial/ethnic communities at highest risk. Active Living Research wants solid research to be part of the public debate about active living.

This report was prepared by Jacqueline Kerr, PhD, Research Scientist, San Diego State University and University of California San Diego, with support from the Active Living Research staff, Burness Communications and Pyramid Communications.

For updates and a web-based version, visit www.activelivingresearch.org.

Active Living Research
San Diego State University
3900 Fifth Avenue, Suite 310
San Diego, CA 92103
www.activelivingresearch.org