



# Getting Middle-School Students Up and Moving: What's the Role of School and Neighborhood Environments...and the Weather

Studying the effect of neighborhood and school environments on youth physical activity levels

## SUMMARY

Researchers at the [Harvard Prevention Research Center](#) at Harvard University School of Public Health examined how physical and social environments of schools and neighborhoods shape routine physical activities of students attending 10 middle schools in the Boston area. They also analyzed the effect of weather conditions on student physical activity.

## Key Findings

- Larger school campuses, school buildings and play areas per enrolled student were associated with increased physical activity during the school day.
- Higher temperature on the weekends is associated with increased physical activity on the weekends.
- Higher density of land use in neighborhoods around schools is associated with increased physical activity on weekends. Density of use is the number and mix of resources that students value, such as stores, libraries or service organizations.

This project was part of the Robert Wood Johnson Foundation's (RWJF) *Active Living Research* program (for more information see [Program Results](#)). The program funds research that improves knowledge and policies regarding ways that environmental factors affect physical activity, particularly for children.

## Funding

RWJF supported the project with a solicited grant of \$97,927 between February 2004 and December 2006.

## THE PROBLEM

The 1996 *Surgeon General's Report on Health and Fitness* documented disparities in activity levels among youth defined by neighborhood, socioeconomic status, race/ethnicity, gender, age and geographic location. The Surgeon General's report also noted that:

- Almost half of people aged 12 to 21 are not vigorously active.
- Physical activity sharply declines during adolescence.
- Childhood and adolescence may be pivotal times for preventing sedentary behavior among adults.

Early research on youth physical activity focused on factors such as social support and self-efficacy. More recent studies have emphasized environmental factors such as access to facilities (e.g., Sallis JF et al., *American Journal of Public Health*, 91(4): 618–620, 2001), availability of programs (e.g., Gordon-Larsen P et al., *Pediatrics*, 105: e83, 2000) and neighborhood safety (also, Gordon-Larsen et al.). These studies suggest that researchers should be aware of the environmental context within which children are active.

## CONTEXT

RWJF has developed three integrated strategies to reverse the childhood obesity epidemic: evidence, action and advocacy.

### Evidence

Investments in building the evidence base will help ensure that the most promising efforts are replicated throughout the nation.

- The Foundation's major research efforts in this area—*Active Living Research*, *Healthy Eating Research* and *Bridging the Gap*—are contributing to the nation's collective knowledge about the changes to policies and to community and school environments that are most effective in increasing physical activity and improving nutrition for kids.

RWJF also seeks to evaluate innovative approaches under way in states, schools and communities across the country.

- For instance, RWJF supported an independent evaluation of efforts to implement [Arkansas Act 1220](#), which mandated a comprehensive approach to addressing childhood obesity in public schools.
- The Foundation also funded a separate initiative to analyze body mass index (BMI) data for all Arkansas public school students. Already, the BMI analysis has indicated

that, in just three years, Arkansas has halted the progression of the epidemic in the state.

## Action

RWJF's action strategy for communities and schools focuses on engaging partners at the local level, building coalitions and promoting the most promising approaches.

RWJF is working with the Food Trust, a Philadelphia-based advocacy organization whose mission is to ensure that everyone has access to affordable, nutritious food. The Food Trust has been [bringing supermarkets back to underserved communities in Pennsylvania](#), and with RWJF is working together to replicate those results nationwide.

RWJF is also working closely with the Alliance for a Healthier Generation (a partnership of the American Heart Association and the William J. Clinton Foundation) to support its efforts to improve nutrition, physical activity and staff wellness in schools nationwide.

## Advocacy

As staff learns from the evidence and action strategies, RWJF shares results by educating leaders and investing in advocacy, building a broad national constituency for childhood obesity prevention.

RWJF supported the National Governors Association when Arkansas Governor Mike Huckabee designated wellness in schools, homes, and workplaces as his Chairman's Initiative for 2005–2006.

Through the *Leadership for Healthy Communities* initiative, RWJF works closely with national organizations that represent elected and appointed officials—such as the National Conference of State Legislatures and the U.S. Conference of Mayors—to educate their members about successful approaches to increasing physical activity and healthy eating among kids. The goal is to support leaders and decision-makers in their efforts to create healthier states, counties and cities.

## THE PROJECT

Angie Lynn Irwin Cradock, ScD, MPE, at the Harvard School of Public Health Prevention Research Center examined how physical and social environments of schools and neighborhoods shape routine physical activities of students attending 10 middle schools in the Boston area. They also analyzed the effect of weather conditions on student physical activity.

The project was part of RWJF's *Active Living Research* program (for more information see [Program Results](#)). The program funds research that improves knowledge and policies

regarding ways that environmental factors affect physical activity, particularly for children.

## **Methodology**

Researchers used an ecosocial model to analyze both the physical activities of students and the characteristics of the schools and neighborhoods around the schools. Ecosocial theory holds that patterns of youth physical activity are determined by the interaction between individual and environmental characteristics.

To determine physical activities of students, researchers:

- Analyzed data on 248 students who participated in an unrelated 1997 study of their nutrition and physical activity behaviors. During that study students:
  - Wore accelerometers that measured their activity levels, including periods of inactivity and low activity.
  - Completed questionnaires regarding their activities, parental support for physical activity, perceived safety and self-perceptions of physical abilities.

To determine characteristics of schools and the neighborhoods around them, researchers:

- Constructed measures of activity-friendly schools by analyzing land records, aerial photographs and architectural plans, and by visiting schools. They used these sources to define campus size, building square footage, distance between classrooms, flights of stairs, sports and recreation facilities, pedestrian access to the street and crosswalks.
- Constructed measures of activity-friendly neighborhoods by creating operational definitions of population density, land-use mix, road and block networks, road and sidewalk width, speed limit, elevation change and density of open space.

To determine weather patterns, researchers recorded average temperature and precipitation using data from the National Weather Service Forecast Office for the days in which students in the 1997 study wore accelerometers.

## **RESULTS**

Cradock reported the following result of the project in a personal interview:

- The tools and definitions created under this project provided accurate and detailed information. These tools and definitions can be used in a variety of settings and are helped by advances in technology (such as Google Earth) that are now widely available.

## FINDINGS

Cradock and colleagues reported the following findings from analyzing data from the 1997 study in an article (available [online](#)) published in 2007 in the *American Journal of Preventive Medicine*, in a report to RWJF and in a personal interview. See Bibliography for details about the article.

- Larger school campuses, school buildings and play areas per enrolled student were associated with increased physical activity during the school day. This translates into about 34 calories per day or about two miles per week of walking. (Journal article)
- On average, students were more active on Mondays than they were on other days. (Journal article)
- Female students were less active than male students on school days. (Journal article)
- Higher temperature on the weekends is associated with increased physical activity on the weekends. (Report to RWJF)
- Higher density of use in neighborhoods around schools is associated with increased physical activity on weekends. Density of use is the number and mix of resources that students are likely to value: local stores, libraries or service organizations. (Report to RWJF and personal interview)

## Limitations

Cradock and colleagues reported the following limitations of the study in the article in the *American Journal of Preventive Medicine*:

- The study relied on existing data to calculate school campus areas and youth physical activity. Strategies used for collecting those data were not developed in order to address this study's objectives.
- Given the lapse in time between data collection and this analysis, researchers were not able to account for changes in school practices (e.g., addition of block scheduling, quality of the physical education program) that might affect physical activity.
- Researchers averaged physical activity over 15-minute intervals. Newer analytic methods could provide better tools to analyze outcomes in different increments.
- Measures used to assess school campus and building characteristics were fairly crude, and measures of physical activity could not be attributed to particular spaces within a building or campus.

## Conclusions

Cradock and colleagues reported the following conclusion in the article in the *American Journal of Preventive Medicine*:

- "Given the substantial number of students attending schools, these subtle shifts in physical activity levels associated with the amount of space per student on school campuses, in school buildings and in areas for play merit further consideration."

## Communications

- The project team created a [website](#) that provides detailed information on and examples of the methods used in the study. They also prepared a report entitled *Environment Around Schools and Physical Activity: GIS Protocol* (available [online](#)). See [Bibliography](#) for details.

## LESSONS LEARNED

1. **When collecting data regarding physical activity patterns in more than one school, collect data from all schools simultaneously and over time so as to address potential influences of weather and seasonal school program activities.** School programs or activities may differ across semesters, thus making it harder to draw conclusions about activities across schools. (Project Director)
2. **When using accelerometers to collect data regarding physical activity patterns in schools, collect information as to school characteristics in place on the days of monitored activity.** These characteristics include whether the student walked to school on the day(s) monitored. (Project Director)

## AFTERWARD

Other researchers in the Boston area are using the measurement tools developed for this project to study attributes of schools.

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### Articles

Cradock AL, Melly SJ, Allen JG, Morris JS and Gortmaker SL. "Characteristics of School Campuses and Physical Activity Among Youth." *American Journal of Preventive Medicine*, 33(2): 106–113, 2007. Available [online](#).

### Reports

Harvard prevention Research Center, *Environment Around Schools and Physical Activity: GIS Protocol*. Available [online](#).

### Grantee Websites

[www.hsph.harvard.edu/research/gis](http://www.hsph.harvard.edu/research/gis). "Geographic Information Systems (GIS) in Public Health Research" on the Harvard School of Public Health's website includes PDF versions of GIS protocols for collecting and creating the school and neighborhood variables.