

# Walking and Biking to School, Physical Activity and Health Outcomes

Over the past few decades, a number of social and environmental changes have limited children's access to safe places where they can walk, bike and play. As a result, children and adolescents are less physically active than they were a generation ago.<sup>1</sup> For example, traffic dangers, neighborhoods that lack sidewalks and urban sprawl have contributed to a sharp decline in the number of students ages 5 to 18 who walk or bike to school, from 42 percent in 1969<sup>2</sup> to only 13 percent in 2001.<sup>3</sup>

This decrease in active transport to school coincided with an alarming increase in childhood obesity. During the past four decades the obesity rate for children ages 6 to 11 has more than quadrupled (from 4.2 to 17 percent), and the obesity rate for adolescents ages 12 to 19 has more than tripled (from 4.6 to 17.6 percent).<sup>4,5</sup> Policies and practices that address environmental barriers to daily physical activity are critical to preventing obesity among children of all ages, and supporting active transport to school presents an excellent opportunity to increase daily physical activity among youth.

Safe Routes to School (SRTS) is a federal program that creates safe, convenient and fun opportunities for children to bicycle and walk to and from their schools, and aims to help children be more physically active. SRTS focuses on increasing the number of children walking and bicycling to school and improving pedestrian and bicycle travel by building infrastructure such as sidewalks, crosswalks and bicycle lanes. The program also encourages changes in travel behavior, supports increased enforcement of traffic laws around schools and educates communities on the benefits and safety aspects of active transport.<sup>6-8</sup>

This brief summarizes research on active transport to school, physical activity levels and health outcomes. It also explores the factors that influence walking and biking to school, including the impact of SRTS programs.



## Key Research Results

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### Active transport, physical activity and health outcomes

**E**lementary and middle school-age boys and girls who walk to and from school are more physically active overall than those who travel to school by automobile.<sup>9–11</sup> For example, a study of 1,596 middle school-age girls in six states found that those who reported walking before and after school had 13.7 more minutes of total physical activity than those who did not report doing so.<sup>12</sup>

**S**tudies generally find that students who walk to and from school most days of the week have a higher level of moderate-to-vigorous physical activity (as measured by accelerometer) compared with students who inconsistently walk or travel by car, bus or train.<sup>13,14</sup> According to a study of South Carolina 5th-graders, those who walked to school five days a week had approximately 24 more minutes of moderate-to-vigorous physical activity per day than those who walked less than five days or traveled by car.<sup>15</sup>

**A** study of elementary students found that baseline body mass index (BMI) and skinfold measurements were lower among 4th-grade boys who actively commuted to school more than two days per week than they were among boys who did not. The same result was not seen among 4th-grade girls. Among boys and girls who were followed for two years (during 4th- and 5th-grade), changes in BMI or skinfolds were not significantly different based on commuting level.<sup>16</sup>

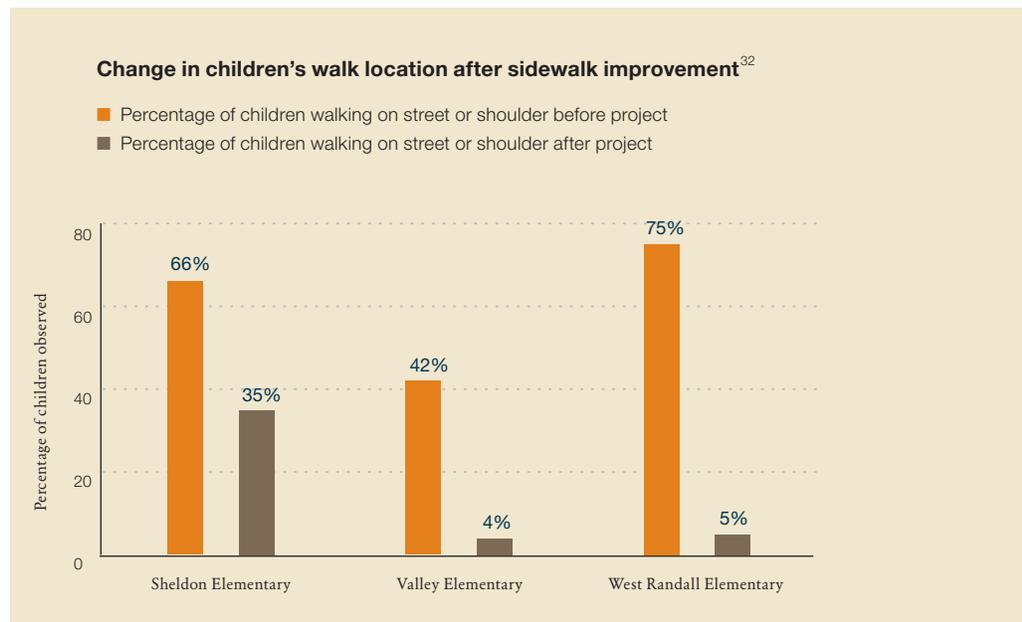
**A** study of 919 children and adolescents living in Denmark found that those who cycled to school had greater cardiorespiratory fitness (as measured by a cycle ergometer test for youth) than those who traveled to school by motorized vehicle or walking.<sup>17</sup>

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### Factors influencing active transport to school

**T**welve studies from the United States and abroad show that the distance between home and school is the strongest influence on whether kids walk or bike to school—as travel distance increases, the number of children walking or biking decreases.<sup>18–29</sup> For example, a study of 16 California elementary schools found that students living within one mile of school were three times more likely to walk to school than to travel by automobile.<sup>30</sup>

**A** study of SRTS projects at three California schools showed that after the sidewalk system on their child's route to school was completed, parents reported a 38 percent increase in how often their child walked to school. The same study found that 75 percent of the students at one school were walking in the road or on the shoulder before the sidewalk was constructed, and 95 percent of the students used the sidewalk upon project completion.<sup>31</sup>



**S**tudents were less likely to walk or bicycle to school if they had to travel along and/or cross a road with busy traffic and no lights or crossing points, according to a study of 19 elementary schools in Australia.<sup>33</sup> Similarly, the odds of walking to school decreased by 60 percent among California elementary students if the route to school had traffic traveling over 30 mph.<sup>34</sup>

**A** number of recent studies indicate that neighborhood characteristics such as trails, physical activity facilities, houses with windows facing the street, walking or bicycling access to nearby transit and mixed land uses have a positive association with active transport to school.<sup>35-39</sup>

**A** study of 259 Seattle parents found that children living in high-income neighborhoods with high walkability were twice as likely to walk or bike to school than were children in high-income neighborhoods with low-walkability. The same difference was not seen among residents living in low-income neighborhoods. Walkable neighborhoods are defined as places where residents can conveniently walk from home to nearby destinations, such as shops.<sup>40</sup>

**T**he same Seattle study found that children were five times more likely to actively commute to school when parents had few concerns about traffic danger and neighborhood safety.<sup>41</sup> Other studies found that children with parents who walk regularly and feel physical activity is important also are more likely to walk or bike to school.<sup>42-44</sup>

**B**oys are generally more likely to actively travel to and from school than girls.<sup>45</sup> For example, a study of North Carolina middle school students found that boys were almost twice as likely to walk to school as girls.<sup>46</sup>

## Conclusion

A growing body of research indicates that youth who consistently walk and bike to and from school are more physically active across the day, and have higher intensities of physical activity than those who do not actively commute to school. Data also show that the physical environment has a significant influence on whether young people actively commute to school. Findings related to the overall impact of walking and biking to school on BMI and other health outcomes are largely inconclusive at this time. Research in this area would benefit from more consistent methodologies and definitions of active commuting.

Data presented in this brief review of the state of science can inform policies and programs that aim to support active transport to school and an increase in physical activity among youth.

- Proximity of homes and schools is the most important influence on walking and biking to school. Building schools in the middle of neighborhoods would make them more accessible to children and may help encourage walking and biking among many students and families.
- Programs like Safe Routes to School that include infrastructure changes and parent-child education can increase safe and active travel to school.
- Neighborhoods that have many facilities for walking, biking and physical activity promote and support active commuting among students.
- Parental perceptions of traffic safety, personal safety and the importance of physical activity influence how likely it is that their children will walk or bike to school.

- 1 *Policy Statement on the Prevention of Pediatric Overweight and Obesity*. Elk Grove Village, IL: American Academy of Pediatrics, 2003 Reaffirmed 2006. (No authors given.) Available at <http://aappolicy.aappublications.org/cgi/content/full/pediatrics;112/2/424>.
- 2 *Transportation Characteristics of School Children: Report No. 4, Nationwide Personal Transportation Study*. Washington, DC: Federal Highway Administration (FHWA), 1972. (No authors given.)
- 3 *2001 National Personal Transportation Survey*. Washington: U.S. Department of Transportation, Federal Highway Administration, 2001. (No authors given.) Available at [www.fhwa.dot.gov/policy/ohpi/nhts/index.htm](http://www.fhwa.dot.gov/policy/ohpi/nhts/index.htm).
- 4 Ogden CL, Flegal KM, Carroll MD, et al. "Prevalence and Trends in Overweight Among US Children and Adolescents, 1999-2000." *Journal of the American Medical Association*, 288(14): 1728-1732, 2002.
- 5 Ogden CL, Carroll MD and Flegal KM. "High Body Mass Index for Age Among US Children and Adolescents, 2003-2006." *Journal of the American Medical Association*, 299(20): 2401-2405, 2008.
- 6 Boarnet MG, Anderson C, Day K and McMillan T. "Evaluation of the California Safe Routes to School Legislation: Urban Form Changes and Children's Active Transportation to School." *American Journal of Preventive Medicine*, 28(2S2): 134-140, 2005.
- 7 Boarnet MG, Day K, Anderson C, et al. "Can Urban Planning Enhance Walking to School? Evaluating California's Safe Routes to School Program." *Journal of the American Planning Association*, 71(3): 301-317, 2005.
- 8 Staunton CE, Hubsmith D and Kallins W. "Promote Safe Walking and Biking to School: The Marin County Success Story." *American Journal of Public Health*, 93(9): 1431-1434, 2003.
- 9 Alexander LM, Inchley J, Todd J, et al. "The Broader Impact of Walking to School Among Adolescents: Seven Day Accelerometry Based Study." *British Medical Journal*, 331(7524): 1061-1062, 2005.
- 10 Cooper AR, Andersen LB, Wedderkopp N, et al. "Physical Activity Levels of Children Who Walk, Cycle or Are Driven to School." *American Journal of Preventive Medicine*, 29(3):179-184, 2005.
- 11 Fulton JE, Shisler JL, Yore MM, Caspersen CJ. "Active Transportation to School: Findings From a National Survey." *Research Quarterly for Exercise and Sport*, 76(3): 352-357, 2005.
- 12 Saksvig BI, Catellier DJ, Pfeiffer K, et al. "Travel by Walking Before and After School and Physical Activity Among Adolescent Girls." *Archives of Pediatrics and Adolescent Medicine*, 161(2):153-158, 2007.
- 13 Alexander LM, et al.
- 14 Saksvig BI, et al.
- 15 Sirard JR, Riner WF, McIver KL and Pate RR. "Physical Activity and Active Commuting to Elementary School." *Medicine and Science in Sports and Exercise*, 37(12): 2062-2069, 2005.
- 16 Rosenberg DE, Sallis JF, Conway TL, et al. "Active Transportation to School Over 2 Years in Relation to Weight Status and Physical Activity." *Obesity*, 14(10): 1771-1776, 2006.
- 17 Cooper AR, Wedderkopp N, Wang H, et al. "Active Travel to School and Cardiovascular Fitness in Danish Children and Adolescents." *Medicine and Science in Sports and Exercise*, 38(10): 1724-1731, 2006.
- 18 Cohen D, Ashwood S, Scott M, et al. "Proximity to School and Physical Activity Among Middle School Girls: The Trial of Activity for Adolescent Girls Study." *Journal of Physical Activity and Health*, 3(S1): S124-133, 2006.
- 19 DiGuseppi C, Robert I, Li L, Allen D. "Determinants of Car Travel on Daily Journeys to School: Cross Sectional Survey of Primary School Children." *British Medical Journal*, 316(7142): 1426, 1998.
- 20 Martin S and Carlson S. "Barriers to Children Walking To and From School: United States, 2004." *Journal of the American Medical Association*, 294(17): 2160-2162, 2005.
- 21 McDonald NC. "Travel and the Social Environment: Evidence from Alameda County, California." *Transportation Research Part D: Transport and Environment*, 12(1): 53-63, 2007.
- 22 McDonald, NC. "Critical Factors for Active Transportation to School Among Low-Income and Minority Students Evidence from the 2001 National Household Travel Survey." *American Journal of Preventive Medicine*, 34(4): 341-344, 2008.
- 23 McMillan TE, Day KM, Boarnet MG, et al. "Johnny Can Walk to School—Can Jane? Examining Sex Differences in Children's Active Travel to School." *Children, Youth and Environment*, 16(1): 75-89, 2006.
- 24 McMillan, TE. "The Relative Influence of Urban Form on a Child's Trip to School." *Transportation Research Part A: Policy and Practice*, 41(1): 69-79, 2007.

- 25 Schlossberg M, Greene J, Phillips PP, et al. "School Trips: Effects of Urban Form and Distance on Travel Mode." *Journal of the American Planning Association*, 72(3): 337–346, 2006.
- 26 Timperio A, Ball K, Salmon J, et al. "Personal, Family, Social, and Environmental Correlates of Active Commuting to School." *American Journal of Preventive Medicine*, 30(1): 45–51, 2006.
- 27 Yeung J, Wearing S, Hills AP. "Child Transport Practices and Perceived Barriers in Active Commuting to School." *Transportation Research: Part A, Policy and Practice*, 42(6): 895–900, 2008.
- 28 Ziviani J, Scott J, Wadley D. "Walking to School: Incidental Physical Activity in the Daily Occupations of Australian Children." *Occupational Therapy International*, 11(1): 1–11, 2004.
- 29 Martin SL, Lee SM and Lowry R. National Prevalence and Correlates of Walking and Bicycling to School. *American Journal Preventive Medicine*, 33(2): 98–105, 2007.
- 30 McMillan TE, 2007.
- 31 Boarnet MG, et al. "Can Urban Planning Enhance Walking to School? Evaluating California's Safe Routes to School Program."
- 32 Ibid.
- 33 Timperio A, et al.
- 34 McMillan TE, 2007.
- 35 Evenson KR, Birnbaum AS, Bedimo-Rung AL, et al. "Girls' Perception of Physical Environmental Factors and Transportation: Reliability and Association with Physical Activity and Active Transport to School." *International Journal of Behavioral Nutrition and Physical Activity*, 3(28): 1–16, 2006.
- 36 Kerr J, Rosenberg D, Sallis JF, et al. "Active Commuting to School: Associations with Environment and Parental Concerns." *Medicine and Science in Sports and Exercise*, 38(4): 787–794, 2006.
- 37 Martin SL, et al.
- 38 McMillan TE, 2007.
- 39 Timperio A, et al.
- 40 Kerr J, et al.
- 41 Ibid.
- 42 McMillan TE, 2006.
- 43 McMillan TE, 2007.
- 44 Ziviani J, et al.
- 45 McMillan TE, 2006.
- 46 Evenson KR, Huston SL, McMillen, BJ, et al. "Statewide Prevalence and Correlates of Walking and Bicycling to School." *Archives of Pediatrics and Adolescent Medicine*, 157(9): 887–892, 2003.

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*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.

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