



Research and Studies

Volume Three September 2008

Annotated Bibliography
by Alicia Senauer
Yale University

This annotated bibliography updates research compiled in volume one and volume two of the Children & Nature Network (C&NN) research resources. The studies selected for this annotated bibliography are either reports of original research or syntheses of existing research. All studies meet criteria for scholarly excellence. This document includes a summary of each research report, a full citation, and information on each document's availability. While this bibliography includes many notable studies, it is not exhaustive and recommendations are welcome on additional research to include. Please send suggestions to the attention of Cheryl Charles, Ph.D., President, Children & Nature Network, Cheryl@childrenandnature.org.

Update to Volume One: Benefits to children & youth from contact with nature

This section provides an update to Volume One of the Children & Nature Network research resources. Its focus is on evidence related to the physical, mental, and social benefits that contact with nature provides to children and youth.

Contact with nature provides a variety of health benefits

In this report, C. Maller and colleagues reviewed published literature demonstrating health and well-being benefits from contact with nature, with an emphasis on park settings. Particularly in urban areas, parks play an important role in providing people with access to nature. The authors encourage a reframing of our traditional view of parks as places for leisure and sport towards one that emphasizes a full range of physical, mental, and social health benefits. Maller and colleagues provide valuable background material on the concept of health and the connection between nature and health. The authors then review evidence of the health benefits of various forms of contact with nature, including viewing nature, being in nature, contact with plants, and contact with animals. Maller and colleagues provide a number of recommendations, including the need for additional research, the repositioning of parks, and the integration of parks and nature into public health strategies and management actions.

The authors present a number of useful summary tables, which provide quick access to major findings about the health benefits of contact with nature.

Maller, C., Townsend, M., St.Leger, L., Henderson-Wilson, C., Pryor, A., Prosser, L., and Moore, M. (2008). "The health benefits of contact with nature in a park context: A review of relevant literature." Deakin University and Parks Victoria. The original 2002 review and annotated bibliography are available online at: http://www.parkweb.vic.gov.au/1process_content.cfm?section=99&page=16. The updated 2008 review is available for a nominal fee by contacting Mardie Townsend at mardie.townsend@deakin.edu

Readers may also be interested in the following documents:

A fact sheet on the health benefits of the natural environment by the National Environmental Education Foundation. This fact sheet is available online at: <http://www.neefusa.org/assets/files/NIFactSheet.pdf>

An article by Howard Frumkin and Richard Louv about the important role natural landscapes play in protecting public health. This article is available online at: <http://atfiles.org/files/pdf/FrumkinLouv.pdf>

Play is critical to healthy child development

In this paper, Kenneth R. Ginsburg and colleagues review key health benefits that play provides to children, including the development of new competencies and decision-making skills, resiliency, and the ability to share with others and resolve conflicts. In addition, the authors highlight the importance of play to the development of strong parent-child relationships. While play offers many critical benefits, Ginsburg and colleagues review evidence highlighting the reduced opportunities many children today have for child-driven play. The authors discuss several key factors that have led to this decline and maintain that solutions to enhance child-driven play must be addressed at multiple levels (from families to communities to schools) and that each child will vary in his or her needs with regard to play and the balance between play and other activities. Ginsburg and colleagues conclude this paper with specific advice for pediatricians to enhance their ability to best guide and support parents.

Ginsburg, K. R. (2007). "The importance of play in promoting healthy child development and maintaining strong parent-child bonds." *Pediatrics*, 119(1), 182-191. This paper is available online at: <http://www.aap.org/pressroom/playFINAL.pdf>

Children's play in natural settings provides a suite of benefits

In this report, Stuart Lester and Martin Maudsley provide an extensive review of the literature related to children's natural play. The authors begin by examining the human relationship with the natural world and the importance of play and direct interaction with the physical environment to children. Lester and Maudsley then review the important opportunities that natural play provides, such as the creation of special places, and the numerous documented and potential benefits of children's play in natural settings, including the development of a sense of self and independence. The authors discuss

evidence demonstrating a decline in children's access and opportunities to play in natural spaces and provide a range of suggestions to support children's opportunities to play in natural settings, such as through the design of effective playgrounds, school grounds, and environmental play projects, as well as ensuring adequate access to parks and nature reserves.

Lester, S., & Maudsley, M. (2006). "*Play, naturally: A review of children's natural play.*" Children's Play Council. This report is available online at: <http://www.playday.org.uk/PDF/play-naturally-a-review-of-childrens-natural%20play.pdf>

Childhood nature experiences may be an important pathway to adult environmental attitudes and behaviors

In this study, Nancy M. Wells and Kristi S. Lekies examine linkages between childhood nature experiences and adult environmental attitudes and behaviors. Data for this study were collected as part of a large telephone survey, which interviewed about 2,000 individuals, 18-90 years of age, in over 100 urban areas in the United States. In this survey, participants answered a number of questions about their nature-related experiences during childhood and their current environmental attitudes and behaviors. To analyze the survey data, Wells and Lekies used structural equation modeling, which enabled them to test complex relationships between childhood nature experiences and adult environmental attitudes and behaviors. In their analysis, the authors controlled for a number of socio-demographic variables (e.g., gender and race). Wells and Lekies found that childhood participation with "wild" nature (e.g., hiking, camping, or playing in the woods), had a significant, positive effect on both adult environmental attitudes and behaviors. That is, people who participated in "wild" nature activities as children were more likely to have pro-environmental attitudes and behaviors as adults. Additionally, Wells and Lekies found that childhood participation with "domesticated" nature (e.g., picking flowers or planting seeds), while having a significant, positive effect, did not have as great an influence as that of "wild" nature on environmental attitudes and had only a marginal effect on environmental behaviors. While additional research is needed to demonstrate causality between childhood experiences and adult environmental attitudes and behaviors, this study is one of the first to investigate the long-term impacts of childhood contact with nature and provides an important contribution to the field by demonstrating that early experiences with the natural environment, and specifically "wild" nature, may be an important pathway toward adult environmentalism.

Wells, N. M., & Lekies, K. S. (2006). "Nature and the life course: Pathways from childhood nature experiences to adult environmentalism." *Children, Youth and Environments*, 16(1). This study is available online at: http://www.colorado.edu/journals/cye/16_1/16_1_01_NatureAndLifeCourse.pdf

The importance of designing spaces that support children's contact with nature

In this book chapter, Robin Moore and Clare Cooper Marcus review health threats that face many of today's children, including sedentary behavior and attention deficit disorder; the benefits that contact with nature provides to children's mental, social, and physical health; and current barriers limiting children's access to nature. The authors provide examples of designed environments, specifically in urban areas, that support children's contact with nature, including examples of innovative childcare centers and preschools, school grounds, neighborhood parks, and community institutions. Moore

and Marcus emphasize the importance of the residential environment and the need to understand and incorporate children's ideas and preferences into the planning and design of spaces. The authors discuss four models of child-friendly residential neighborhood layouts with specific national and international case studies, including clustered housing and shared outdoor space, cul-de-sacs and greenways, alleys, and home zones. Moore and Marcus conclude by providing a number of key recommendations to help ensure children's access to nature in residential environments.

Moore, R. C., & Cooper Marcus, C. (2008). "Healthy planet, healthy children: Designing nature into the daily spaces of childhood." In S. Kellert, J. Heerwagen & M. Mador (Eds.), *Biophilic design: Theory, science and practice*. Hoboken, NJ: John Wiley & Sons, Inc. This book chapter is available online at: http://www.naturalelearning.org/docs/MooreCooperMarcus_Healthy.pdf

Hands-on outdoor learning benefits students

This report by Janet E. Dymnt presents findings from her 2003 study on the impacts of green school ground initiatives at 45 elementary, middle, and high schools in the Toronto District School Board. As part of this study, Dymnt surveyed nearly 150 parents, teachers, and principals about the impact of greening initiatives on a variety of outcomes, including curriculum delivery, student learning and academic achievement, teaching practices, and student behavior. The author also conducted in-depth interviews with 21 respondents from 5 schools. Despite the variety of schools studied, Dymnt found a number of common benefits of greening initiatives. For example, 90% of respondents reported that student enthusiasm and engagement in learning increased on green school grounds as compared to teaching indoors and 70% of respondents reported that their motivation for teaching increased on green school grounds as compared to teaching indoors. Dymnt also questioned participants about key challenges and opportunities for improvement with regard to green school ground initiatives. Commonly identified barriers included availability of funding and adequate logistical support and human resources. Respondents also provided a variety of suggestions for improvement, including professional development and training opportunities, assistance with physical design, and additional funding support for construction and maintenance. Importantly, this study demonstrates that the benefits of school ground greening initiatives are numerous and varied, and can be realized by different schools with a variety of different types of greening projects. Dymnt concludes the report by providing a series of high-level policy recommendations to assist schools across Ontario in successfully implementing and realizing the full benefits of school ground greening initiatives.

Dymnt, J. (2005). "*Gaining ground: The power and potential of school ground greening in the Toronto District School Board: Evergreen.*" This report was commissioned by Evergreen, a charitable organization focused on bringing communities and nature together and is available online at: http://www.evergreen.ca/en/lq/gaining_ground.pdf

Spending time outdoors, among other factors, is associated with higher levels of physical activity in preschool children

Physical activity provides important health benefits to children. Unfortunately, not much is known about the prevalence of preschool children's physical activity levels and the factors that most influence physical activity in this age group. In this paper, T. Hinkley and colleagues review 24 studies published between 1980 and 2007 that investigated factors related to physical activity levels in preschool children. The authors examined a total of 39 different variables, such as gender and time spent outdoors, and coded the results to identify consistency/inconsistency across studies. In the end, Hinkley and colleagues found support for the following findings: 1) boys are more active than girls, 2) a child's age and body mass index are not related to physical activity, 3) children who have parents that participate in physical activity with them are more active than children who have parents that do not participate with them in physical activity, and 4) children who spend more time outdoors are more active than children who spend less time outdoors. The authors also found that psychological, cognitive, emotional, and behavioral variables have not been studied enough to yield conclusive results with regard to their association to physical activity levels in preschool children. Hinkley and colleagues review the strengths and weaknesses of studies to date, compare their results to those found for older children and adolescents, and highlight future research needs in order to better understand the many factors that influence preschool children's physical activity.

Hinkley, T., Crawford, D., Salmon, J., Okely, A. D., & Hesketh, K. (2008). "Preschool children and physical activity - A review of correlates." *American Journal of Preventive Medicine*, 34(5), 435-441. This study may be available in a library near you or can be purchased online through the publisher at: <http://www.elsevier.com>

Readers may also be interested in a 2000 review by Sallis and colleagues that summarizes research on correlates of physical activity behaviors in children and adolescents.

Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). "A review of correlates of physical activity of children and adolescents." *Medicine and Science in Sports and Exercise*, 32(5), 963-975. This study may be available in a library near you or can be purchased online through the publisher at: <http://www.ms-se.com/>

Neighborhood parks play an important role in promoting physical activity in children

Although the American Academy of Pediatrics has recommended that children be physically active for at least 60 minutes a day and limit sedentary activity to less than 2 hours a day, many children do not meet these recommendations. In this article, Victoria Floriani and Christine Kennedy review the latest research findings with regard to the promotion of physical activity in children. For example, the authors discuss a number of studies which have found that access to a neighborhood park or playground is associated with higher levels of physical activity in children and that specific park amenities, such as lighting after dark, may be important in facilitating park use. Floriani and Kennedy also summarize research on sedentary behavior and how evidence, while often inconclusive, indicates that the less time children spend in sedentary behaviors, the more physically active they may be. In addition, the authors highlight recent

research exploring the relationship between mental health and physical activity. While there is still much to be learned about this relationship, preliminary research has found a positive relationship between higher levels of physical activity and positive mental health outcomes, such as increased feelings of self-efficacy and confidence. Floriani and Kennedy conclude the article by encouraging pediatric health care providers to discuss physical activity with their patients and strategize with them on ways to incorporate activity into their daily lives.

Floriani, V., & Kennedy, C. (2008). "Promotion of physical activity in children." *Current Opinion in Pediatrics*, 20(1), 90-95. This article is available online at:
http://www.parks.sfgov.org/wcm_recpark/SPTF/Floriani.pdf

Readers may also be interested in the following recent articles that investigate specific factors related to physical activity in children and adolescents.

Babey, S. H., Hastert, T. A., Yu, H. J., & Brown, E. R. (2008). Physical activity among adolescents – "When do parks matter?" *American Journal of Preventive Medicine*, 34(4), 345-348. This study may be available in a library near you or can be purchased online through the publisher at:
<http://www.elsevier.com>

de Vries, S. I., Bakker, I., van Mechelen, W., & Hopman-Rock, M. (2007). "Determinants of activity-friendly neighborhoods for children: Results from the SPACE study." *American Journal of Health Promotion*, 21(4), 312-316. This study may be available in a library near you or can be purchased online through the publisher at: <http://www.healthpromotionjournal.com/>

Roemmich, J. N., Epstein, L. H., Raja, S., & Yin, L. (2007). "The neighborhood and home environments: Disparate relationships with physical activity and sedentary behaviors in youth." *Annals of Behavioral Medicine*, 33(1), 29-38. This study may be available in a library near you or can be purchased online through the publisher at:
<http://www.springer.com/psychology/health+and+behavior/journal/12160>

Street trees may help prevent early childhood asthma

The prevalence of childhood asthma in the U.S. has increased dramatically in the past 20 years and is particularly high in poor urban communities. While the exact cause for this increase remains unknown, environment and lifestyle changes are believed to be possible contributors. Trees may help prevent asthma by changing local air quality or by encouraging children to play outdoors, exposing them to a variety of microbes. In this study, G.S. Lovasi and colleagues investigate whether there is an association between street trees and childhood asthma by examining data, grouped by specific hospital geographic areas, on the prevalence of asthma for 4-year-old and 5-year-old children, hospitalizations as a result of asthma for children younger than 15, number of street trees, census data, and proximity to pollution sources. In analyzing the data, the authors found that higher street density was associated with a lower prevalence of childhood asthma, but that there was not a significant association between street trees and hospitalizations. In their analysis, Lovasi and colleagues controlled for a number of other factors that may have influenced the results, such as proximity to pollution sources and sociodemographic characteristics. Based on these findings, the authors estimate that an increase in tree density of 343 trees per square kilometer would be associated with a 29% lower prevalence of early childhood asthma. It is important to note that this analysis does not demonstrate that trees cause or prevent asthma for an

individual child. While the results of this study are encouraging, additional research is needed to better understand the effects of trees on the prevalence of childhood asthma.

Lovasi, G. S., Quinn, J. W., Neckerman, K. M., Perzanowski, M. S., & Rundle, A. (2008). "Children living in areas with more street trees have lower prevalence of asthma." *Journal of Epidemiology and Community Health*, 62(7), 647-649. This study may be available in a library near you or can be purchased online at: <http://jech.bmj.com/>

Spending time outdoors helps prevent myopia in 12-year-olds

In recent decades, myopia or nearsightedness has become increasingly common in young children. While the cause(s) of myopia remain unknown, environmental factors, such as reading that requires children to focus at a close distance, are thought to play an important role. Using data from the Sydney, Australia Myopia study, Rose and colleagues investigate the relationship between near work, midworking distance, and outdoor activities with the prevalence of myopia in 6- and 12-year-old children. Between 2003 and 2005, 1,765 6-year-olds and 2,367 12-year-olds received a comprehensive eye exam and completed questionnaires about their activities during weekdays and weekends (parents completed the questionnaires for the 6-year-old children). The authors grouped children's activities into near work (e.g., drawing and reading), midworking distance (e.g., watching television and using the computer), and outdoor activities (e.g., bicycle riding and outdoor sport). After adjusting for a number of potentially confounding factors (e.g., parental myopia and ethnicity), Rose and colleagues found that while there was no association between the prevalence of myopia and activity among 6-year-olds that higher levels of total time spent outdoors were associated with a lower prevalence of myopia among 12-year-olds. The authors found that 12-year-olds with the highest levels of near work activity and lowest levels of outdoor activity were two to three times more likely than their peers to develop myopia, whereas 12-year-olds with the lowest levels of near work activity and highest levels of outdoor activity were less likely than their peers to develop myopia. The authors also found that participation in sports did not seem to be a significant factor in explaining this protective effect. Rose and colleagues suggest that light intensity may be an important factor in explaining the impact of outdoor activity on the development of myopia and that additional research is needed to help understand this relationship.

Rose, K. A., Morgan, I. G., Ip, J., Kifley, A., Huynh, S., Smith, W., et al. (2008). Outdoor activity reduces the prevalence of myopia in children. *Ophthalmology*, 115(8), 1279-1285. This study may be available in a library near you or can be purchased online at: <http://www.ajo.com/>

Children with ADHD concentrate better after walking in a park

Building off of their recent work related to children with Attention-deficit hyperactivity disorder (ADHD) and different types of activity settings, in this study, Faber Taylor and Kuo investigate the impacts of three different outdoor environments on the attention of seventeen 7- to 12-year-old children diagnosed with ADHD. After completing a series of puzzles that required focused attention, each child, over the course of three different weeks, participated in a 20 minute guided walk in three different outdoor settings (an urban park, a downtown area, and a residential area). After each guided walk, children completed a concentration test and answered several questions about their walking experience. Importantly, the authors controlled for a number of potential confounding

factors, including the order of environments experienced, the time of day and day of week, terrain, and season. In analyzing the data, Faber Taylor and Kuo found that children concentrated better after walking in a park setting as compared to either a downtown or residential setting and that the effect of walking in a park on concentration helped close the gap between children with ADHD and those without ADHD with regard to the concentration measure used and that the effect was similar to that of two common types of ADHD medication. In addition, the authors found that children rated their experiences more positively in the park setting than in the other two settings. Faber Taylor and Kuo discuss these findings in light of Attention Restoration Theory and their previous studies related to different environments and children with ADHD and suggest additional avenues for research and the potential of using nature in the treatment of ADHD.

Faber Taylor, A., & Kuo, F. E. (2008). Children with attention deficits concentrate better after walk in the park. *Journal of Attention Disorders OnlineFirst*. This article will be published in print in 2009 and may be available in a library near you or can be purchased online at: <http://jad.sagepub.com>.

Update to Volume Two: Children's experience of nature

This section provides an update to Volume Two of the Children & Nature Network research resources. Its focus is on evidence related to the type and amount of contact that children have with nature. While there are few studies documenting this contact directly, this section highlights a number of potentially related factors that provide valuable insight on this topic.

Childhood experiences in natural spaces are strong predictors of adult use and attitudes toward natural spaces

C.W. Thompson and colleagues investigate factors contributing to adult outdoor access and activity in two survey-based projects that explored people's use and attitudes toward natural spaces near their homes in Central Scotland and the East Midlands of England. As part of these projects, the authors questioned a large and diverse sample of individuals (339 adults in Scotland and 459 in England) in public venues and green spaces to obtain information about their background, use and attitudes toward natural spaces, demographic status, and frequency of childhood visits to green spaces. In analyzing the survey data, Thompson and colleagues found that most people used natural spaces for walking and that over 35% of respondents visited woodlands at least once a week. Using a variety of statistical techniques, the authors examined which factors best explained the frequency with which adults visited natural spaces and found that frequency of childhood visits to natural spaces and distance from home to natural spaces were the most important factors. These results indicate that people who have had frequent childhood experiences in natural spaces are more likely to visit such places as adults. Thompson and colleagues also found that people who have had frequent childhood experiences in natural places tend to feel more comfortable visiting these places alone and have a more positive attitude towards these spaces as adults (e.g., they feel more energetic and restored in these spaces). The authors discuss several limitations to their study, including the possibility that adult memories of

childhood may be distorted, and the implications their study findings might have given the increasing restrictions children face today with regard to outdoor access and play.

Thompson, C. W., Aspinall, P., & Montarzino, A. (2008). "The childhood factor - Adult visits to green places and the significance of childhood experience." *Environment and behavior*, 40(1), 111-143. This study may be available in a library near you or can be purchased online through the publisher at: <http://eab.sagepub.com/>

Neighborhood safety influences children's physical activity

Physical activity during childhood and adolescence provides many health benefits. In light of research suggesting that children are participating less frequently in active transport (e.g., walking and cycling), are spending less time outdoors, and that time spent outdoors is associated with increased physical activity, A. Carver and colleagues review research that investigates specific aspects of neighborhood safety and their association with the physical activity of children and adolescents. Studies to date have identified road safety and harm from strangers (or "stranger danger") as being key concerns for parents. While evidence suggests that lower levels of neighborhood physical activity are associated with lack of perceived neighborhood safety, the authors found that more research is needed to examine specific associations between road safety and "stranger danger" on physical activity among children. Carver and colleagues also highlight studies examining differences between parents' and children's perceptions of neighborhood safety and the potential for parents to fall into various "social traps," where by trying to protect their children, parents actually end up contributing to the problem. The authors review research related to physical and social interventions that have been implemented to improve neighborhood safety, including traffic calming initiatives (e.g., speed humps, reduced speed limits) and a Walking School Bus, and identify future research needs, including longitudinal studies to better explore associations and determine causality, objective measurement of safety, and investigation of specific aspects of neighborhood safety.

Carver, A., Timperio, A., & Crawford, D. (2008). "Playing it safe: The influence of neighbourhood safety on children's physical activity - A review." *Health & Place*, 14(2), 217-227. This study may be available in a library near you or can be purchased online through the publisher at: <http://www.elsevier.com>

As children get older they are less physically active

In this study, P.R. Nader and colleagues investigate physical activity patterns in youth from 9 to 15 years of age. The authors collected physical activity data using accelerometers for 1,032 youth over a 6-year period (starting when the children were 9 years old), as well as height, weight, and demographic information. Nader and colleagues were particularly interested in the amount of time youth engaged in moderate-to-vigorous physical activity (MVPA) as experts currently recommend that youth engage in at least 60 minutes per day of MVPA. In analyzing the data, the authors found that youth spent significantly less time engaged in MVPA as they got older. For example, at 9 years of age, youth engaged in MVPA for about 3 hours a day on weekdays and weekends, whereas at 15 years of age, adolescents engaged in MVPA for 49 minutes a day on weekdays and 35 minutes a day on weekends. Consequently, the percentage of children who met the recommended activity guidelines of 60 minutes

of MVPA per day decreased significantly with age. While almost all 9- and 11-year-old children met the guidelines, only 31% of 15 year-olds met the guidelines on weekdays and only 17% of 15 year olds met the guidelines on weekends. Nader and colleagues found that boys tended to be more active than girls and that girls fell below the recommended activity guidelines at a younger age than boys (13.1 years versus 14.7 for weekdays and 12.6 years versus 13.4 for the weekends). The authors conclude by discussing study limitations and future research needs, including investigation into the amount of MVPA needed to positively impact child health and the environmental factors that impact MVPA.

Nader, P. R., Bradley, R. H., Houts, R. M., McRitchie, S. L., & O'Brien, M. (2008). "Moderate-to-vigorous physical activity from ages 9 to 15 years." *Jama - Journal Of The American Medical Association*, 300(3), 295-305. This study may be available in a library near you or can be purchased online through the publisher at: <http://jama.ama-assn.org/>

Readers may also be interested in a recent assessment conducted in Texas schools of physical fitness levels among nearly 2.6 million students in grades 3-12. This assessment found that elementary-age children were the most physically fit and that fitness levels declined with each increase in grade level. While a report is not currently available, the press release for this assessment can be found online at: <http://www.tea.state.tx.us/press/08fitnessresults.pdf>

There is an on-going national movement away from nature-based recreation

As a follow-up to their recent work demonstrating about a 25% decline in per capita visits to U.S. National Parks between 1987 and 2003, in this study, Oliver R.W. Pergams and Patricia A. Zaradic test whether this decline in U.S. National Park visits is an isolated incident or a good indicator with regard to how much people are visiting natural areas more generally. The authors examined 16 large national and international nature-related visitor and activity data sets, including visitation to Japanese national parks, recreational visits to all U.S. state parks, and total number of U.S. hunting and fishing licenses. In analyzing these data sets, Pergams and Zaradic found that nature-based recreation peaked between 1981 and 1991, and has been declining at a rate of between 1 and 1.3% per year since this peak, for a total decline of 18-25% to date. The similarities among these multiple and different measures suggest a general decline in visits to natural areas in the U.S. and potentially in other countries, such as Japan. It is important to note that the impact of this decline varies for each variable. For example, many more people visit National Parks per year than finish the Appalachian Trail. The authors found that the most popular nature-based recreation activity in the U.S. is camping, followed by fishing and hunting, all of which show a declining trend. Pergams and Zaradic found only one countertrend to nature use decline: a slight increase in hiking and backpacking. While the cause(s) for this over-arching decline requires further investigation, this study demonstrates a fundamental shift away from visits to natural areas, with potentially important implications for health, well-being, and conservation.

Pergams, O. R. W., & Zaradic, P. A. (2008). "Evidence for a fundamental and pervasive shift away from nature-based recreation." *Proceedings of the National Academy of Sciences of the United States of America*, 105(7), 2295-2300. This study is available online at: <http://www.videophilia.org/uploads/PNAScomplete.pdf>

Children's street play has declined and is threatened by a number of barriers

Playday, an annual celebration of children's right to play, commissioned a series of four studies in the United Kingdom (UK) related to children's play in streets and areas near their homes. These four studies are summarized briefly below.

- ICM Research interviewed over 2,000 children, youth, and adults across the UK by telephone about various aspects of street play. While it can be difficult to compare adult memories of childhood to children's current day experiences, the survey found that 71% of adults reported playing near their home everyday when they were a child as compared to just 21% of children today. A few key additional findings include: 1) about 1 in 4 children and young people reported that traffic prevents them from playing close to home, 2) adults consider traffic, "stranger danger," and other fears (e.g., property damage) as the primary barriers to neighborhood play, and 3) the street is the second most common place to play outside the home (parks are the most common place).
- ICM held a series of focus groups to investigate adult attitudes toward street play (a total of 32 adults participated). The results from this study stress the benefits that play provides and reveal the many interconnected factors that negatively influence children's outdoor play, including loss of green space, intolerant adults, the appeal of indoor activities, and youth crime.
- Dr. Amanda Henshall and Lauren Lacey used focus groups to investigate children and young people's views about playing on local streets (a total of 64 children between the ages of 8 and 18 participated). A few findings include: 1) while the majority of participants reported using streets and areas around their home to play, 10 of the 64 children said that they had never played outside in areas near their home, 2) children and youth valued spending time outside near their homes because it allowed them to spend time with friends and engage in activities that were not structured or under adult supervision, and 3) participants reported fear of crime and other adults (e.g., neighbors) as barriers to playing around their homes.
- Lacey developed a literature review of UK-based studies to date related to the frequency and amount of children's play around the home, barriers to children's play, and initiatives to encourage children's use of streets for play.

This series of studies on children's street play is available online at:

http://www.playday.org.uk/playday_campaigns/2007_our_streets_too.aspx

Young children are growing up in a media-saturated environment

In this study, E.A. Vandewater and colleagues investigate young children's media use in the United States. Data were collected by the Kaiser Family Foundation and included telephone interviews with over 1,000 parents of children aged 6 months to 6 years from a variety of demographic backgrounds. Vandewater and colleagues found that over 98% of the families surveyed owned at least one television and that the average number of working televisions was over 2.5 per household. In addition, the researchers found that many children had a television in their bedroom, including 18% of 0- to 2-year-olds and 43% of 3- to 4-year-olds. The most common reasons parents provided for having a television in their child's bedroom were to allow other family members to watch their own shows and to keep their child occupied. With regard to frequency of electronic media and technology use, Vandewater and colleagues found that most children watch some television everyday and the length of viewing averaged 1 hour and 10 minutes

across age groups. While television is the dominant source of children's media use, the authors also report results related to videos or DVDs, video games, and computer use. In determining whether children met the American Academy of Pediatrics (AAP) media-use recommendations, Vandewater and colleagues found that only 32% of 0- to 2-year-olds met the AAP recommendation of no television, while 56% of 3- to 4-year-olds and 70% of 5 to 6-year-olds met the AAP recommendation of 2 hours or less of television per day. In examining various factors that might influence whether children fell within or outside of these guidelines, the authors found that media factors (e.g., whether there was a television in a child's bedroom) were significant predictors at all ages and that certain demographic factors (family structure and child gender) were important predictors for older children. In addition, Vandewater and colleagues found that there were no differences in the time children spent reading or playing outdoors between those who met the AAP guidelines and those who did not. The authors conclude the article by emphasizing the importance of additional research aimed at better understanding children's electronic media use and its potential impact on children's development.

Vandewater, E. A., Rideout, V. J., Wartella, E. A., Huang, X., Lee, J. H., & Shim, M. S. (2007). "Digital childhood: Electronic media and technology use among infants, toddlers, and preschoolers." *Pediatrics*, 119(5), E1006-E1015. This study may be available in a library near you or can be purchased online through the publisher at: <http://www.elsevier.com>

Readers may also be interested in the following paper by Patricia Zaradic and Oliver Pergams that discusses videophilia (a term developed by the authors to describe people's increasing use of electronic media) and its implications for child health and development, as well as conservation.

Zaradic, P. A., & Pergams, O. R. W. (2007). Videophilia: Implications for childhood development and conservation. *The Journal of Developmental Processes*, 2(1), 130-147. This paper is available online at: <http://www.videophilia.org/origins.html>

Prevalence of overweight among children and adolescents did not change between 2003-2006

Recent research found an increase in the prevalence of overweight among children between 1998 and 2004. In this study, C.L. Ogden and colleagues investigate the prevalence and trends in overweight among children between 2003 and 2006. As part of the National Health and Nutrition Examination Survey, height and weight measurements, as well as basic demographic information, were obtained for over 8,000 children and adolescents. From these measurements, researchers calculated each participant's Body mass index (BMI) and categorized it according to the Centers for Disease Control BMI-for-age growth charts. In analyzing data for 2003-06, Ogden and colleagues found 11.3% of children and adolescents were at or above the 97th percentile of BMI, 16.3% had a BMI at or above the 95% percentile, and 31.9% had a BMI at or above the 85th percentile. In addition, the authors found that high BMI differed significantly by age and racial/ethnic group, but did not differ by sex. For example, 2- to 5-year-olds were significantly less likely to have high BMI than 12- to 19-year-olds. Ogden and colleagues investigated changes over time and found no significant changes in the prevalence of high BMI between 2003-04 and 2005-06. Additional data will be helpful in further investigating any trends.

Ogden, C. L., Carroll, M. D., & Flegal, K. M. (2008). "High body mass index for age among U.S. children and adolescents, 2003-2006." *Jama-Journal of The American Medical Association*, 299(20), 2401-2405. This study may be available in a library near you or can be purchased online through the publisher at: <http://jama.ama-assn.org/>

With economic growth comes loss of ecological knowledge

Ecological knowledge, accumulated knowledge about nature, is an important factor in people's ability to manage and conserve the environment. S.E. Pilgrim and colleagues conducted a cross-cultural, large-scale study to investigate whether there is an association between economic growth and ecological knowledge. The authors examined two levels of ecological knowledge (the names of living components of ecosystems and the functions and uses of these components) within a diversity of communities from India, Indonesia, and the United Kingdom. Using ethnobotanical surveys with photographs of local species, Pilgrim and colleagues interviewed more than 1,000 people across the three countries, documenting their ability to identify local plant species and their uses. The authors found a strong negative correlation between ecological knowledge and income levels—as income increased, ecological knowledge decreased. They also found that as a community's wealth increased, the difference in knowledge between the most and least knowledgeable community members and the difference between old and young people's knowledge increased. These findings suggest that as communities become wealthier, ecological knowledge becomes concentrated in fewer people and that these people tend to be either older members of the community or experts. Pilgrim and colleagues caution that as more of the world becomes urbanized, ecological knowledge will become increasingly threatened, communities' connectivity to their local environment more distant, and the capacity of local communities to manage their environment will decline. This study has important implications for conservation efforts and demonstrates the importance of protecting the knowledge and capacities of local people.

Pilgrim, S. E., Cullen, L. C., Smith, D. J., & Pretty, J. (2008). "Ecological knowledge is lost in wealthier communities and countries." *Environmental Science & Technology*, 42(4), 1004-1009. This study may be available in a library near you or can be purchased online through the publisher at: <http://pubs.acs.org/>

Children can identify few local species

Knowing about one's environment is an important foundation to being able to understand various issues and act in an informed and responsible manner. In a recent study, BBC Wildlife Magazine asked 700 children between the ages of 9 and 11 from 17 schools in Bristol (United Kingdom) to identify a number of local wild species. The magazine also asked participants a number of questions related to wildlife and their activities more generally. While 70% of children could correctly identify blackberry and magpie, only 8% could identify goldfinch and 12% a primrose. Additional research is needed to better understand this study's findings and whether or not these numbers might represent a significant lack of or decline in environmental knowledge.

Information on this study can be found online at:
<http://www.bbcwildlifemagazine.com/newsread.asp?id=45018>

Schoolyards are dominated by turf grass and impervious surface

Increasingly, research is demonstrating the benefits that greenspace can provide to children's health and well-being and to environmental quality (e.g., reduced urban runoff and moderation of climate). Children spend about one third of their day at school; however, little is known about the actual physical structure of school property. In this study, Alexis Schulman and Catherine A. Peters classified and compared landcover on 258 U.S. public elementary and middle schoolyards in three major U.S. cities (Baltimore, Boston, and Detroit). The authors used aerial photographs from the mid- to late 1990s and Geographic Information System software to classify and analyze schoolyard landcover. Schulman and Peters found that, on average, schoolyards covered more than 68% of the school property and that they were dominated by turf grass and impervious surface, with very little tree cover (on average, less than 10%). The authors also found that schoolyard size had an important influence on cover type in that larger schoolyards tended to have lower levels of impervious surface. Schulman and Peters contend that the amount of tree cover found in most schoolyards is inadequate given health and environmental quality research findings to date. In concluding their article, the authors discuss important opportunities and obstacles to greening schoolyards and provide a number of recommendations.

Schulman, A., & Peters, C. A. (2008). "GIS analysis of urban schoolyard landcover in three U.S. cities." *Urban ecosystems*, 11(1), 65-80. This article is available online at:
<http://www.princeton.edu/~cap/papers/Schulman%20Peters%20urban%20ecosystems.pdf>

Many children and adolescents are vitamin D deficient

Worldwide, there is a high prevalence of vitamin D deficiency among infants, children, and adolescents. Vitamin D deficiency is a risk factor for rickets and may be a risk factor for development of a number of chronic diseases, such as cardiovascular diseases and cancer. In this paper, S.Y. Huh and C.M. Gordon review the sources of vitamin D, which includes endogenous synthesis (the first step of which is the absorption of ultraviolet B radiation), how vitamin D deficiency is defined and measured, and the prevalence of and risk factors for vitamin D deficiency, which includes reduced sun exposure. In addition, the authors review the health effects of vitamin D deficiency and its prevention and treatment. Huh and Gordon stress the importance of additional research to determine the optimum concentration of vitamin D for children of different ages and to compare different regimens designed to prevent and treat vitamin D deficiency as well as to better understand short and long-term impacts on critical health outcomes.

Huh, S. Y., & Gordon, C. M. (2008). "Vitamin D deficiency in children and adolescents: Epidemiology, impact and treatment." *Reviews in Endocrine & Metabolic Disorders*, 9(2), 161-170. This study may be available in a library near you or can be purchased online through the publisher at:
<http://www.springer.com/medicine/internal/journal/11154>

Many children experience limits on their adventurous play

Playday, an annual celebration of children's right to play, commissioned a series of four studies in the United Kingdom (UK) on risk and play to better understand the benefits and challenges of enabling children to manage their own risks while playing. These four studies are summarized briefly below.

- ICM Research interviewed over 1,000 children (aged 7-16) and over 1,000 adults (aged 18+) across the UK by telephone about various aspects of risk and play. A few of the findings from the children's survey include that 51% of children (aged 7-12) reported that they are not allowed to climb a tree without an adult present and 42% reported that they are not allowed to play in local parks without an adult. In addition, they found that 77% of children would like more opportunities to take risks while playing and that this type of play makes 90% of children feel happy. While it can be difficult to directly compare adult memories of childhood to children's current day experiences, the survey also found that 1) 70% of adults experienced most of their adventurous play in natural environments when they were children whereas only 29% of children today experience most of their adventurous play in natural environments and 2) while both adults (when they were young) and children today found bike riding/skateboarding and exploring new/unfamiliar places to be among the most adventurous activities, adults also found playing with nature to be among the most adventurous while children today identified electronic/computer games. Adult respondents identified an increasing concern with health and safety regulations and a perception of it being more dangerous for children to play as being key reasons why there has been a decline in opportunities for children to challenge themselves while playing.
- Denise Coster and Josie Gleave used focus groups to investigate children and young people's experiences and perceptions of risk in play (a total of 62 children and young people aged 8-13 participated). In this report, the authors explore the risks and challenges children and young people take, the nature of these risks, how children think about risk, the benefits of risk taking, and opportunities and constraints on engaging in adventurous play. Some of their findings include that children and young people enjoy and benefit from taking risks; the majority of these risks occur outside; more risks are taken when adults are not present; risks can occur in either organized, commercial, or unstructured play situations; and that children tended to focus more in discussions on managed and commercially provided risks than unstructured play situations.
- Paul Greateorex conducted a survey and focus groups to investigate play providers' experience and views on adventurous play (a total of 144 survey respondents). In this report, he describes play providers' opinions on a range of issues, such as whether there are sufficient opportunities for challenging play, the benefits of risk in play, barriers to challenging play, and ways to provide more opportunities for challenging play. Some of the key findings highlighted in this report include: 1) 92% of respondents felt that there were not enough play opportunities that allowed children to engage in challenging activities, 2) 97% of respondents felt that it was acceptable for children to engage in activities where the risk involved minor and easily recovered injuries, but that the limits of acceptable risk in play depended on

the nature of each individual child, 3) respondents identified fear of litigation, insufficient resources, and restrictions by insurers and health and safety officers as the key barriers to providing more challenging play, and 4) respondents identified a more realistic view of risk, better design of play areas, and training as key ways to increase play opportunities involving challenge and risk.

- Gleave developed a literature review on the benefits of risk-taking in play, attitudes towards risk in play, the nature of risk-taking behavior and accidents and injuries associated with play, risk management in play, and policies related to play.

This series of studies on risk and play is available online at:

http://www.playday.org.uk/playday_campaigns/2008_give_us_a_go/2008_research.aspx