

Fact Sheet: Children's Health and Nature

Current State of Children's Health

Our children may be the first generation at risk of having a shorter lifespan than their parents.¹

Sedentary lifestyle and physical inactivity have contributed greatly to the numerous health problems plaguing today's children. Chronic conditions such as childhood obesity, asthma, attention-deficit disorder, and vitamin D deficiency have all increased over the past few decades.^{2, 3} These conditions may lead to pulmonary, cardiovascular and mental health problems in adulthood. Outdoor activity in the



natural environment has taken a back seat to television, video games, the computer, and a demanding schoolwork and extracurricular schedule. Many low-income and minority children are often more cut-off from nature due to the 'built environment' around them: poor housing conditions, high-volume traffic, and a lack of parks and green space.⁴ While losing contact with the natural environment, today's youth are missing key opportunities for physical activity, stress reduction, attention restoration, and healthy development.

Childhood Obesity

Approximately 18.5% children age 2-19 years are obese, affecting about 13.7 million children and adolescents

Childhood obesity has doubled over the past 30 years for preschoolers and adolescents, and more than tripled for children aged 6-11 years old.⁶

Overweight= BMI \geq 85th percentile and \leq 95th percentile; childhood obesity = BMI \geq 95th percentile. BMI = Body- mass index; calculated using the formula: $\text{weight (lb)} / [\text{height (in)}]^2 \times 703$.

To calculate BMI, visit:

<http://apps.nccd.cdc.gov/dnpabmi/Calculator.aspx>.

Disparities in childhood obesity are also rising. African-American and Latino children displayed higher predicted mean BMI scores and differing mean BMI trajectories, compared with White children, adjusting for time-independent and time-dependent predictors.⁵ However, prevalence of childhood obesity has increased at all income and education levels.⁷

Obesity-Related Diseases

Type 2 Diabetes

The annual number of children and adolescents age 10 - 19 years diagnosed with type 2 diabetes was 5,758.⁸ Due to the drastic increase in the prevalence of pediatric diabetes over the past few decades, the definition has changed from "adult-onset" diabetes to type 2 diabetes.

Asthma

Currently 8.4% of children in the US have asthma.⁹ Overweight children are at an increased risk for developing asthma and other respiratory problems and for being hospitalized for asthma.^{10, 11, 12} Additionally, a dose-response relation between physical activity, sedentary behavior and health-related quality of life is observed in several studies suggesting that the higher frequency of physical activity or the less time being sedentary, the better the health-related quality of life.¹³

Hypertension

Based on BMI, the prevalence of hypertension was 19.2% in obese children and 4.1% in normal-weight children.¹⁴ Elevated blood pressure in children is also associated with TV viewing, video game, and computer use.¹⁵

Cardiovascular Disease

Overweight adolescents are at increased risk of coronary heart disease and earlier death.¹ Most overweight children have at least one risk factor for cardiovascular disease, including higher cholesterol levels, abnormal glucose tolerance, high blood pressure, and elevated triglycerides.¹⁶ 20% of youths aged 2-19 years have at least one abnormal lipid level.¹⁷ Screening overweight children for high cholesterol and prescribing cholesterol-lowering drugs if needed is recommended.¹⁸

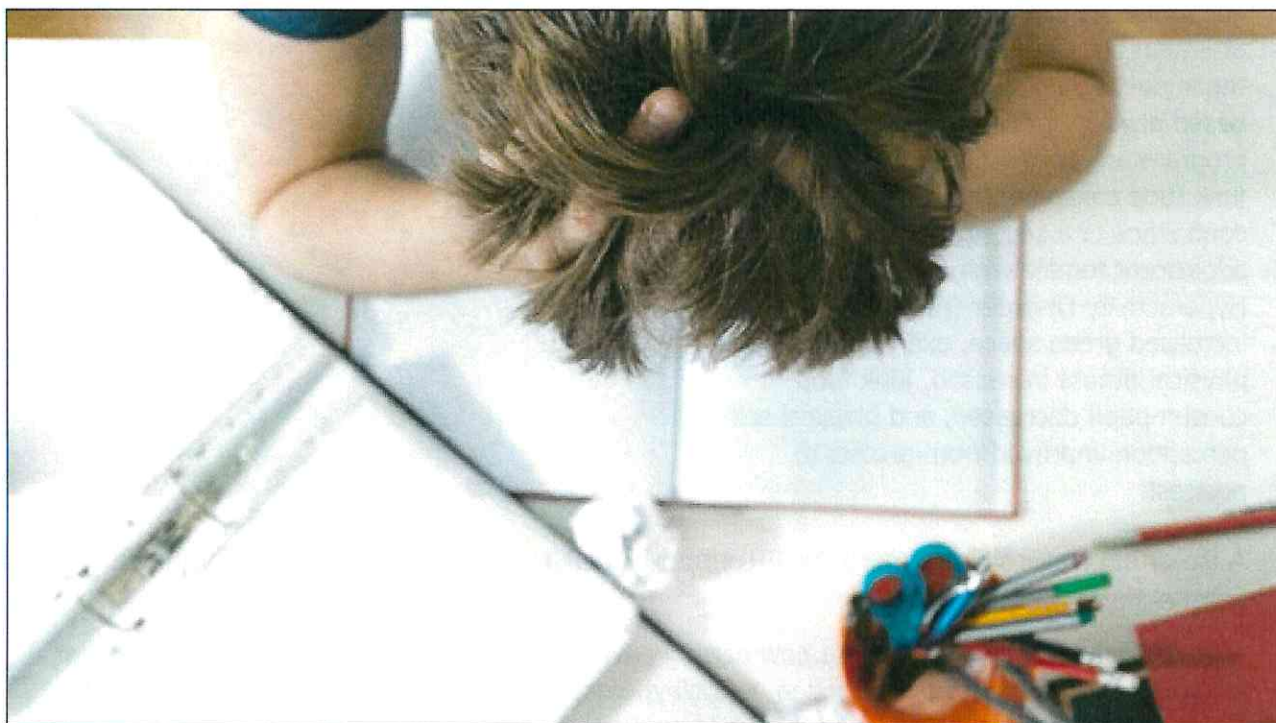
According to the U.S. Surgeon General, overweight adolescents have a 70% chance of becoming overweight or obese adults.¹⁹ Modifying known dietary and behavioral risk factors through behavior changing interventions (BCI) may help to reduce childhood overweight and obesity.²⁰ The prevalence of obesity was 40.0% among young adults aged 20 to 39 years, 44.8% among middle-aged adults aged 40 to 59 years, and 42.8% among older adults aged 60 and older.²¹ Adult health consequences of obesity also include coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea, as well as endometrial, breast, prostate, and colon cancers.²² Adults with obesity also have an increased risk of dementia and Alzheimer's disease.²³

Attention-Deficit/Hyperactivity Disorder (ADD/ADHD)

According to the Centers for Disease Control and Prevention (CDC), ADD/ADHD is a serious public health problem that impacts approximately 10% of children aged 4-17 years.²⁴ It impairs school performance and socialization and may persist into adulthood.²⁵ Watching television and playing video games may be associated with increased attention problems in children.⁶

Vitamin D Deficiency

70% (~58.4 million) of US children and adolescents have insufficient levels of vitamin D, which can cause rickets and eventually lead to osteoporosis.^{27, 28} Additionally, low levels of vitamin D may be associated with increased markers of asthma severity. 28% of children with asthma aged 6 to 14 have insufficient levels of vitamin D.²⁹ Vitamin D deficiency is also associated with cardiovascular disease, metabolic syndrome, hypertension, diabetes, myocardial infarctions, and peripheral arterial disease.^{30, 31} The body must receive at least 10-15 minutes of sunlight exposure twice a week to produce the necessary amount of vitamin D.²⁷



Nature and Health

Unstructured outdoor play time is important for children's overall well-being. How does nature play a role in children's health? Highlights of published literature supporting the health benefits of the natural environment are presented below.

Nearby Nature: A Buffer of Life Stress Among Rural Children³²

Childhood stress has become an increasing issue of concern for pediatricians in America. The workload of school and extracurricular activities has the potential to create more stress upon a child, which can affect the child's development. Evidence has shown that the outdoors is a stress reliever to highly stressed children. Contact with nature not only decreased their stress, but higher amounts of exposure to natural environments indicated lower levels of stress in a child.

Coping with ADD: The Surprising Connection to Green Play Settings³³

An increasing amount of evidence is showing that exposure to natural environments can mitigate a child's attention disorder. A 2018 study explored the impact of a goal-directed, nature-based physical activity (NBPA) training program on exercise time, physical fitness, junk food consumption, and social confidence of a sedentary, overweight pre-adolescent female with Attention-Deficit Hyperactivity Disorder (ADHD). With increased green space, exercise time and physical fitness increased, junk food consumption decreased, and physical self-perception improved from pretest to posttest.



A Potential Natural Treatment for Attention-Deficit/Hyperactivity Disorder. Evidence from a National Study³⁵

A 2018 study aimed to investigate how natural environments influence the cognitive processes of children with and without attention deficit/hyperactivity disorder (ADHD). Using mobile eye-tracking glasses, it was also found that children fixated more often while walking in natural environments, which may reflect an ease in shifting attentional focus or a higher level of fascination induced by viewing natural scenery. A systematic review also demonstrated that access to green space was associated with improved mental well-being, overall health and cognitive development of children. It promotes attention restoration, memory, competence,

supportive social groups, self-discipline, moderates stress, improves behaviors and symptoms of ADHD and was even associated with higher standardized test scores.³⁶

Morbidity is Related to a Green Living Environment³⁷

A 2016 study aimed at determining the role of proximity to specific types of green spaces as well as their spatial location in the relationship with the most morbid cardiovascular diseases (CVD) and diabetes. Significantly higher prevalence of diabetes and cerebrovascular diseases as well as lower access to green spaces equipped with sports facilities were found in suburban areas. The authors imply that green space can advantageously be used to prevent some CVDs and their risk factors, but there may be a need to reconsider their types and location.

Outdoor Activity Reduces the Prevalence of Myopia in Children³⁸

A systematic review aimed to understand the role of outdoor time in relation to the prevalence of Myopia in children. Outdoor time is considered to reduce the risk of developing myopia, an eye condition. With dose-response analysis, an inverse nonlinear relationship was found with increased time outdoors reducing the risk of incident myopia. Increased time outdoors is effective in preventing the onset of myopia as well as in slowing the myopic shift in refractive error.

Children Living in Areas with More Street Trees Have Lower Prevalence of Asthma³⁹

Urban trees play a key role in reducing greenhouse gas emissions, cleaning air, promoting physical activity, and improving mental health. One study analyzed the impact of the spatial distribution of street trees by species in New York City by combining crowd-sourced tree census data – which includes geolocation, species, size, and condition for each of 652,169 street trees – with pollen activity, allergen severity, land use, housing conditions, and neighborhood demographic data. The results indicate that a greater concentration of trees contributes to better local air quality.



The Mental and Physical Health Outcomes of 'Green Exercise'⁴⁰

Green space can provide mental health benefits and possibly lower risk of psychiatric disorders. One study examined the impacts of children who grew up with the lowest levels of green space had up to 55% higher risk of developing a psychiatric disorder independent from effects of other known risk factors. Stronger association between cumulated green space and risk during childhood constitutes evidence that prolonged presence of green space is important.

Does Participating in Physical Activity in Outdoor Natural Environments Have a Greater Effect on Physical and Mental Wellbeing than Physical Activity Indoors? ⁴¹

Exercising outdoors in nature may bring additional positive effects on mental wellbeing than exercising indoors. One study explored the beneficial effects of dancing in an outdoor, natural environment. The study also explored the mechanism responsible for the effect natural environments have on emotions by testing the mediational role of objective engagement in physical activity. The dancers in the park, compared to the indoor group, reported a greater increase in positive emotions after the salsa session.

View Through a Window May Influence Recovery from Surgery⁴²

Nature has always been known to have a restoring or therapeutic power on humans. There has been evidence showing that people can recover from a surgery or deal with pain better if exposed to a natural environment. The objective of one study was to examine the impact of landscape from window views on quality of care for women who underwent Cesarean Section (C-section). A total of 296 women who underwent C-sections and used patient-controlled analgesic (PCA) for pain control after their surgery during the 10-month data collection period were recruited for this study. The study found that increasing satisfaction with window views might decrease the use of pain medicine and is significantly associated with larger improvement in many dimensions of perceived pain. This further demonstrated that windows are a key supportive design feature for urban landscape in health care settings.

The effect of nature as positive distractibility on the Healing Process of Patients with cancer in therapeutic settings⁴³

Natural environments can also act in reducing pain. Environmental design has a positive effect on patient health. The aim of one study was to examine the effect of nature on positive distraction on the Healing Process of Patients with Cancer. Findings of the study indicated that admitted patients viewing natural scenery had less anxiety and pain than admitted patients viewing no natural scenes.

Exposure to green areas: Modelling health benefits in a context of study heterogeneity⁴⁴

Although the beneficial health effects of green areas are gaining recognition, epidemiological studies show mixed results with significance varying considerably by study and context, indicating that there is no unique and clear evidence. One study used a model that aggregated outcomes of different studies and allows an assessment of both significant and non-significant results from the literature in order to correct for unobserved selection bias. The results show significant health benefits associated with increased exposure to green areas, where higher risk reductions are observed for old and adult age groups, as well as in poorer countries, taking into account the correction for the publication bias.

Neighborhood Greenness and Changes in Body Mass Index of Children and Youth⁴⁵

One study used data on Nurses' Health Study participants living in the Northeastern United States in 2006, and estimated associations between neighborhood walkability (a composite of population density, street connectivity, and business access), greenness (from satellite imagery), and ambient air pollution. Increasing walkability was associated with increasing BMI at lower levels of walkability, while increasing walkability was linked to lower BMI in areas of higher walkability. Neighborhood walkability was non-linearly linked to lower BMI independent of air pollution and greenness.

The Importance of Play in Promoting Healthy Child Development and Maintaining Strong Parent-Child Bonds⁴⁶

Changes in current societies are affecting childhood experiences. Time for outdoor play is diminishing, contributing to more sedentary lifestyles, disconnected from the natural world. One study aimed to transform educational practices, moving from frequent indoor activities to a regular use of the outdoor environment. The authors highlighted the role of professionals and families in creating quality outdoor play opportunities.

Active Healthy Living: Prevention of Childhood Obesity Through Increased Physical Activity⁴⁷

Allowing children free, unstructured outdoor play is an important way to help them get physically active. The AAP issued a policy statement in 2006 to pediatric health care providers on ways to increase physical activity in children and adolescents. The authors stated that lifestyle-related physical activity, as opposed to aerobics or calisthenics, is critical for sustained weight loss in children, and recommended free, unorganized outdoor play as a method of physical activity. Infants and toddlers should be allowed outdoor physical activity, unstructured free play, and exploration. The AAP encourages parents to get their children outside as much as possible.

A Prospective Examination of Children's Time Spent Outdoors, Objectively Measured Physical Activity and Overweight⁴⁸

Identifying ways to promote physical activity and decrease sedentary time during childhood is a key public health issue. Using cross-sectional data, researchers aimed to understand the influences on children's physical activity and sedentary behavior. It was found that personal factors were found to have the greatest influence on physical activity, whereas environmental factors had the greatest influence on sedentary behavior.

Grounds for Movement: Green School Grounds as Sites for Promoting Physical Activity⁴⁹

"Green" school grounds may affect the quantity and quality of physical activity among elementary school children. Engagement with the natural world is evolving as a new defining criterion for enhancing the benefits of physical activity, particularly for children and young

people. Researchers studying childhood and youth behaviors have repeatedly found a positive relationship between outdoor physical activities and improvements in health and wellbeing. In this context, schools become more accessible and safe options for children to engage actively in outdoor physical activity, especially with nature features.

Public Parks and Physical Activity Among Adolescent Girls⁵⁰

This longitudinal study described park usage and assessed the contribution of parks to moderate to vigorous physical activity among adolescent girls. On days when a park was visited, physical activity was higher than on days when a park was not visited. On average, 1.9% (baseline) and 2.8% (follow-up) of MVPA occurred in parks. In this study, parks were an under-used resource for adolescent girls, particularly for physical activity. Other studies have also shown that living near a park increases physical activity.^{51, 52}

Recommendations

Centers for Disease Control and Prevention:

The CDC encourages children to get at least 60 minutes of physical activity most days of the week, preferably daily. Because nature has the potential to improve one's physical, mental, and social health, the CDC advises children to engage in healthy outdoor activities in nature and parks. The CDC also provides a toolkit about the important role of communities, schools, and families in promoting physical activity for youth, available at: <http://www.cdc.gov/healthyyouth/physicalactivity/guidelines.htm>.

U.S. Department of Health and Human Services:

The Physical Activity Guidelines advise children to be physically active at least one hour a day through age-appropriate, enjoyable activities such as hiking, bicycling, climbing trees, or going to the park. These guidelines can improve children's cardiorespiratory fitness, cardiovascular and metabolic health, bone health, and body composition. The "Step It Up! The Surgeon General's Call to Action to Promote Walking and Walkable Communities."⁵³ calls for action. For more information, follow <https://www.cdc.gov/physicalactivity/walking/call-to-action/pdf/partnerguideline.pdf>

American Academy of Pediatrics:

The American Academy of Pediatrics (AAP) recommends that pediatricians promote free, unstructured play and discourage excessive passive entertainment such as TV, internet, and video games to 2 hours a day⁵⁴. AAP also recommends that children be physically active at least 60 minutes/day. In addition, AAP issued a policy statement about the crucial role of recess in school⁵⁵. AAP states that recess is a necessary break for children during the school day to provide a mental rest and to optimize a child's social, emotional, physical, and cognitive development. Children are more attentive and have better cognitive performance after a recess

break. Recess also contributes to the recommended 60 minutes of activity per day. Furthermore, AAP recommends that pediatricians ask patients and families about opportunities for recreational and incidental physical activity in nearby parks, playgrounds, or open spaces and advocate for environmental improvements that will promote physical activity.

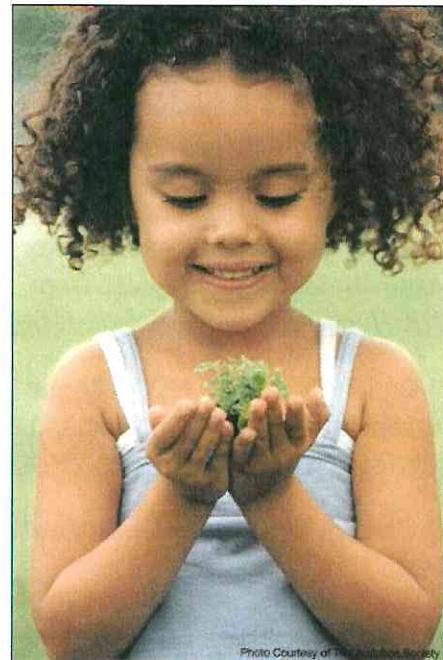
American Medical Association and American College of Sports Medicine:

A program was launched by the American Medical Association and the American College of Sports Medicine to encourage physicians to prescribe exercise to their patients. Two-thirds of patients from a survey suggested that they would be more inclined to exercise if told by a physician. The program recommends 30-40 minutes of physical activity, five days a week. For more information, visit <http://www.exerciseismedicine.org/>.

Conclusion

There is a strong body of evidence attributing improved health with physical activity. In addition, there is evidence suggesting that nature specifically can improve attention and other psychological aspects of health. Playing in nature can positively impact children's health and well-being. We encourage parents and caregivers to get your children out into the natural environment. Together we can teach them how to protect their health and the environment.

"Time in nature is not leisure time; it's an essential investment in our children's health." Richard Louv, author of *Last Child in the Woods*.⁵⁶



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