City Trees & Human Health: 
A Review of Evidence & Key Findings

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trees in the background

public awareness & appreciation?
Outline

1. Health & Nature: the evidence
2. Key Studies
3. Goals & Metrics
WHO Health Definition

A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (1946)
Social Determinants

Dahlgren and Whitehead 1991
Prison Inmates :: nature videos

solitary confinement, video room/exercise option

- felt significantly calmer, less irritable, more empathetic
- committed 26% fewer violent infractions

Green Cities: Good Health
www.greenhealth.washington.edu

Sponsors:
USDA Forest Service,
(U&CF Program + Pacific NW Research)
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Research Reviews & Summaries
Local Economics

Trees in cities are not grown and managed for products that can be bought and sold on markets, but they do provide many intangible services and functions! This article serves two purposes. First, it introduces valuation methods that are used to convert intangible benefits to dollar sums. Then, it shows how nonmarket valuations can support local decision-making.

Fast Facts

- The presence of larger trees in yards and as street trees can add from 3% to 15% to home values throughout neighborhoods.
- Averaging the market effect of street trees on all house values across Portland, Oregon yields a total value of $1.35 billion, potentially increasing annual property tax revenues $15.3 million.
- A study found 7% higher rental rates for commercial offices having high quality landscapes.
- Shoppers claim that they will spend 9% to 12% more for goods and services in central business districts having high quality tree canopy.
- Shoppers indicate that they will travel greater distance and a longer time to visit a district having high quality trees, and spend more time there once they arrive.
Green Cities: Good Health
database of >4,500 peer reviewed publications
Outside Our Doors
The benefits of cities where people and nature thrive.
Introduction

U.S. architects, philosophers, and naturalists have praised the benefits of nature for human health, happiness, and well-being for centuries, but only relatively recently have researchers begun studying and quantifying the complex relationship between human health and nature. In 2006, RobinUlrich, professor and director of the Center for Health Progress and Design at Texas A&M University, published the results of a pioneering study that looked at the recovery rates of post-surgery patients in relation to the views from their windows to a large hospital. Some of the patients looked out over a garden and green of trees, while others had a view of a brick wall. Ulrich found that patients with a natural view spent three days in the hospital and were discharged two days earlier (Ulrich 2000).

Clinic staff has observed that patients with a natural view spend fewer days in the hospital and are discharged two days earlier (Ulrich 2000).

Clinic's study helped open the door to a new field of inquiry focused on understanding the ways that nature influences our physical, mental, and social lives. More than three decades later, a broad and diverse body of scientific literature describes the broad health value of nature, ranging from trees, parks, gardens, and other natural settings as essential to health and sustainable cities as the other critical systems that keep our bodies strong and vibrant. In addition, the current evidence indicates the wide range of effects...

Kathleen A. Moss, PhD

also in Spanish! and Arabic!

design: milepost

author: US Forest Service

printing: The Nature Conservancy
Nearby nature experiences are important across the entire life cycle, from cradle to grave.

INFANTS

SOUTH WEIGHT

Research on early childhood concerns, such as obesity, brain development, and social-emotional development, has yielded mixed results. Some studies have linked early childhood experiences with later health outcomes, while others have found no significant associations.

IMMUNE FUNCTION

Families with young children often report feeling stressed and overworked. This can negatively impact their mental health and well-being. Some studies have suggested that children who are exposed to stressful situations may have weaker immune systems and are more prone to illness.

FAMILY DYNAMICS

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CHILDREN & TEENS

OVERALL HEALTH AND WELL-BEING

Research on the long-term effects of early childhood experiences on health and well-being is limited. However, some studies have suggested that children who are exposed to stressful situations may have weaker immune systems and are more prone to illness.

ADULTS

DEPRESSION AND STRESS

Research on the long-term effects of early childhood experiences on mental health is limited. However, some studies have suggested that children who are exposed to stressful situations may have weaker immune systems and are more prone to illness.

MOBILITY & QUALITY OF LIFE

Research on the long-term effects of early childhood experiences on physical health is limited. However, some studies have suggested that children who are exposed to stressful situations may have weaker immune systems and are more prone to illness.
Urban Forests for Human Health: A Focused Economic Valuation

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Outline

1. Health & Nature: the evidence
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Science Review

nearby nature & health evidence
~ 40 years
> 5,000 publications

what are the ‘stories’?
Story: Human Health Benefits Across the Life Cycle
Urban Forests and Newborns

The natural environment may affect pregnancy outcomes...

10% increase in tree-canopy cover within 50m of a house

= lower number of low weight births (1.42 per 1000 births)

Donovan et al., Health & Place 2011; Hystad et al., Env Health Perspectives 2014
Hygiene Hypothesis

- presence of soil bacteria in body, *Mycobacterium vaccae* = increased serotonin
- boost immune function
- may alleviate depression (dirt or Prozac?)

Lowry et al. 2007. Neuroscience
Eat Dirt!
physically disabled & tree climbing!
recreational tree climbing – youth therapy
Sacramento Study :: LIDAR x CHIS data
7,900 adults, 250 m buffer, covariates

more tree cover
= better overall health
= better social cohesion

EAB Tree Loss & Public Health

1990 to 2007, 1,296 counties in 15 states infected areas vs. no bugs
15,000 more deaths from cardiovascular disease
6,000 more deaths from lower respiratory disease
controlled for demographic, human mortality, and forest health data at the county level

Toledo, Ohio in 2006, pre EAB

2009, EAB in neighborhood

photo credits: Dan Herms, Ohio State U
The Green Heart Project: Studying the impact of trees and green space on cardiovascular health

Wednesday, March 14, 2018 / 1:00 - 2:15pm ET

Louisville Kentucky’s urban laboratory is embarking on a study of how environmental differences within the city’s neighborhoods give rise to health disparities, and how local social networks and personal environments created by lifestyle choices bear upon individual health and well-being. This study will specifically examine the impact that urban forests and green spaces have on cardiovascular disease (CVD) risk. While previous studies have shown that exposure to air pollutants like those found in urban areas increases CVD risk and mortality, the impact of the urban forest and overall green spaces on CVD has not been directly assessed. This presentation will discuss the pragmatic, interventional trial known as The Green Heart Project, designed to test the hypothesis that exposure to neighborhood greenery diminishes CVD risk by decreasing the levels of local air pollution.
Improving Depression

Berman et al. 2012. Journal of Affective Disorders

20 adults with major depression walk in a park setting and an urban setting

- 50-minute walks one week apart
- before-after testing:
  - Mood: Positive and Negative Affect (PANAS)
  - Cognition: Backward Digit Span (BDS)

cognitive and affective improvements after walking in a nature setting
Shinrin yoku (forest bathing)

- extensive research
- restorative experiences
- workers retirees
- networked system, 52 bases in Japan
Alzheimer’s Disease & Dementia
Provide wander gardens & horticulture therapy

- 10.5% reduction in amount of medications used in dementia facility
- 30% fewer falls, accompanied by a reduction in fall severity

Detweiler et al. 2009. *American Journal of Alzheimer’s Disease and Other Dementias*
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Trees, Income & Health

11 more trees in a city block decreased cardio-metabolic conditions = increase in annual personal income of $20,000, or moving to a neighborhood with $20,000 higher median income

Kardan, et al. 2015. Scientific Reports 5, 11610
Canopy Cover & Stress

images of canopy cover varied 0-60%

Vegetation & Mental Health

• vegetation cover and afternoon bird abundances

• lower prevalence of depression, anxiety, and stress:
  - depression, more than 20% cover,
  - anxiety, more than 30% cover,
  - stress, more than 20% cover

“dose” at which health issue is lower

Trees & Physical Activity

• grades 6 to 8, urban residents, 2009/10 Canada Health Behaviour in School-Aged Children survey
• proportion of neighborhood land covered by trees associated with physical activity outcome
• 5% increase in treed area cover - 5% increase in relative odds of increasing free-time physical activity outside of school hours

Summary: Knowledge to Practice

- nearly 40 years of research
- critical mass of evidence – next
- policy, programs, equity
- integrating urban forest goals with broader urban systems needs
Everyday Need & Value

NEARBY NATURE INCLUDES A VARIETY OF SPACES AND PLACES

- Urban Forest Canopy
- Biophilic Design
- Parks and Gardens
- Green Stormwater Infrastructure