Human Health and Happiness: Benefits of the Urban Forest

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Are Our Urban Forests Ready
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Human Health & Happiness

public & community health
disease prevention
wellness promotion
social determinants
WHO Health Definition

A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (1946)
Determinants of Health
Green Cities: Good Health
www.greenhealth.washington.edu

Sponsors:
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Thanks!
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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.\textsuperscript{1,2} 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 \text{ billion}, potentially increasing annual property tax revenues $15.3 \text{ million}.\textsuperscript{9}
- A study found 7\% higher rental rates for commercial offices having high quality landscapes.\textsuperscript{24}
- Shoppers claim that they will spend 9\% to 12\% more for goods and services in central business districts having high quality tree canopy.\textsuperscript{34}
- 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.\textsuperscript{34}
design: milepost

co-author: The Nature Conservancy

co-author & printing: U.S. Forest Service
Diversity in Metro Nature

Nearby nature includes a variety of spaces and places:

- Urban Forest Canopy
- Biophilic Design
- Parks and Gardens
- Green Stormwater Infrastructure
Sacramento Study :: LIDAR x CHIS data
7,900 adults, 250 m buffer, covariates

Prison Inmates :: nature videos

solitary confinement, video room/exercise option

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

Science Review

nearby nature & health evidence

> 40 years

> 4,200 publications

what are the ‘stories’?
Discovery: Human Health Benefits Across the Life Cycle
Urban Forests and Newborns
the natural environment affects 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
🔍 may alleviate depression
🔍 dirt or Prozac?

Lowry et al. 2007. Neuroscience
Eat Dirt!
Fiddleheads Forest School
Washington Park Arboretum (Seattle)

cognitive
social & physical learning
Classroom Views & Stress

Classroom Views & Stress
high school student response

Fig. 2. Attention scores at the end of class activity and break (Means and SE).

Fig. 3. Physiological stress at the end of class activity and break (Mean and SE).
CDC moderate activity recommendations

parks, active living, active transit
Shinrin yoku (forest bathing)

- extensive research
- restorative experiences
- workers retirees
- networked system, 52 bases in Japan
Green Streets for Walkability

evidence of lower frustration and higher meditation when moving into the greener streets

Aspinall et al. 2013. The Urban Brain: Analysing Outdoor Physical Activity with Mobile EEG. British Journal of Sports Medicine
Improving Depression

20 adults with major depression walk in a park setting and a built setting

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

Berman et al. 2012. *Journal of Affective Disorders*

cognitive and affective improvements after walking in a nature setting
Walking Programs

children
elders
families

walking meetings
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
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*
economics

wellness
health promotion
disease prevention

U.S. health costs $3 trillion
~ 17% of U.S. GDP

Kathleen L. Wolfe, Ph.D.
Nearby nature experiences are important across the entire life cycle, from cradle to grave.

### INFANTS

**BIRTH WEIGHT**

**ECONOMIC IMPACT:**
- **Savings on annual health care costs:** 36.52%

Birth weight influences long-term childhood health and development, and has been linked to some adult diseases. Low birth weight is associated with both short- and long-term health care costs, such as hospital stays and increased illness. Pregnant women who have more tree canopy and green space near their homes generally have babies with healthier birth weights.

**IMMUNE FUNCTION**

Elevated levels of natural killer (NK) cells and nonspecific immunity are associated with a stronger immune system leads to reduced illness and chronic disease across a lifetime.

We are most vulnerable in the early months of our lives, when the body and mind are growing and developing at an astonishing rate. The hypothesis is that early contact with outdoor environments stimulates the development of a healthy immune response.

**FAMILY DYNAMICS**

- **Improved family dynamics:** Perhaps reducing mental health treatment and counseling services.

An infant's parents and siblings adjust their lives after a baby arrives, and the changes can bring on stress and anxiety. Nature visits and walk may help reduce these conditions and improve interactions between people within the household.

Note: All economic savings are from 2015 U.S. dollar, and are present annual savings across the entire U.S.

### CHILDREN & TEENS

**OVERALL HEALTH AND WELL-BEING**

**ECONOMIC IMPACT:**
- **Increased physical activity:** Reduced asthma or leading cause of emergency department visits, hospitalizations and missed school days.
- **Reduced risk of adult skin conditions:**

Research about nature benefits and economic value is fairly new. Some of the quantified health benefits of nature in cities are easier to convert to economic value than others. Here are some preliminary valuations - estimated for the entire U.S., on an annual basis.

### ADULTS

**DEPRESSION AND STRESS**

- **Economic impact:**
  - **Savings on health care costs from falls per year:** 36.52%

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### OLDER ADULTS

**MOBILITY & QUALITY OF LIFE**

**ECONOMIC IMPACT:**
- **Savings on health care costs from falls per year:** 36.52%

Use in older adults falls each year, giving rise to fatal and nonfatal injuries. Residences/ falls within older care facilities are particularly sensitive to falls. Further, those who are actually treated are more likely to be unhealthy, age, and nature walking activities that promote social interactions support positive lifestyles and quality of life.

**HYPERTENSION**

**ECONOMIC IMPACT:**
- **Savings on treatment costs annually:** 36.52%

Hypertension, or high blood pressure, is one of the five most significant conditions impacting older adults. Views of nature, particularly forests and 'forest bathing' (walks in natural forest settings) decrease diastolic rates.

**COGNITIVE DISORDERS**

**ECONOMIC IMPACT:**
- **Savings on medical services, not counting the value of home care services:** 36.52%

About one in five older adults experience mental and cognitive disorders, with age being the greatest risk factor. In 2015, about 12% of people aged 65 or older were affected with Alzheimer's disease. Those with dementia have three times as many hospital stays per year as other elders. Exposure with nature improves symptoms related to cognitive disorders, such as agitation, depression, and reduced mobility.

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**contributing analysts:**
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Neighborhoods with Trees

10 more trees on a city block?
health benefits comparable to $10,000 household income increase OR being 7 years younger

Kardan et al., 2015, Scientific Reports
annual value of $11.7 billion U.S. (2015 dollars)

- cradle to grave human life cycle
- varied expressions of urban greening (metro nature)
- evidence based human health and wellness benefits
- just beginning the analysis!
Celebrating Canada’s 150

Are Our Urban Forests Ready for the Next 150?
sanitary city

efficient and hygienic supply & removal of materials and services
natural systems disconnect
Industrial Age – city squalor

credit: BlendSpace

credit: blogs.isb.bj.edu.cn

‘Filthy Cities’
sustainable city

ecological function, green infrastructure, & ‘revealed’ processes

Pincetl, S. 2010. From the sanitary city to the sustainable city. Local Environment
in the background
trees & forests provide many benefits!
credit: American Planning Association
measure the canopy of a city
Eco (UFORE)  
Streets (STRATUM)  
Hydro  
Vue  

tools provided by USDA  
Forest Service  

STRUCTURE  
FUNCTION  
VALUE  
MANAGEMENT  

photo credits: Seattle i-Tree Training by Al Zelaya
Reducing Stormwater Runoff

Image courtesy of the Center for Urban Forest Research
Grey Infrastructure

Drain, direct, dispatch

Green Infrastructure

Slow, spread, soak

Source: Low Impact Development: A Design Manual for Urban Areas, 2010
stormwater retention
Stormwater Management

Thornton Creek Water Quality Channel (Seattle, SvR Design)

1 hectare, treats runoff from 275 hectares (1 hectare = 2.47 acres)
Tanner Springs Park
Portland OR
linked to active living network
neighborhood social cohesion

environmental education & social learning
green infrastructure & reduced crime

Philadelphia

reduction in narcotics arrests (18–27 %) for green not gray

vs. 65% increase across city

Kondo et al. 2015. Journal of Public Health
management for co-benefits - retail
Summary

sanitary city (hygiene for health)
sustainable city (ecology and wellness)
urban nature = health & wellness
(40 years of research)

= economic value
= expanded partnerships
Human Dimensions of Urban Forestry and Urban Greening

featuring research on peoples' perceptions and behaviors regarding nature in cities

What's New?

Nature and Consumer Environments
Research about how the urban forest influences business district visitors.

Trees and Transportation
Studies on the value of having quality landscapes in urban roadsides.

Civic Ecology
Studies of human behaviors and benefits when people are active in the environment.

Policy and Planning
Integration of urban greening science with community change.

Urban Forestry and Human Benefits
More resources, studies and links...

Green Cities: Good Health
Human health & well-being research

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