The Roots of Good Health

Tree care for self care

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School of Environmental & Forest Sciences

2020 Tree Care Update
Philadelphia Flower Show
5 March 2020
The tree which moves some to tears of joy is in the eyes of others only a green thing that stands in the way.

Some see nature all ridicule and deformity . . . and some scarce see nature at all.

But to the eyes of the man of imagination, nature is imagination itself.

William Blake
City Trees/the Urban Forest & Health

What do we know? Research Evidence

What is it worth? Economic Value

What do we do? Programs!
How is urban nature associated with human health?
Health is...

A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity

(World Health Organization, 1946)
Green Cities: Good Health
www.greenhealth.washington.edu

Sponsors:
USDA Forest Service,
(U&CF Program + Pacific NW Research)
University of Washington
NGO partners

Thanks!

to U of WA students:
Katrina Flora
Mary Ann Rozance
Sarah Krueger

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.
Introduction

Writers, 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 1954, Roger Ulrich, professor and director of the Center for Health Systems and Design at Texas A&M University, published the results of a pioneering study that looked at the recovery rates of gall bladder surgery patients in relation to the views from their rooms in a Texas hospital. Some of the patients looked out over a garden and grove of trees, while others had a view of a brick wall. Ulrich found that patients with a natural view spent fewer days in the hospital and used fewer pain medications (Ulrich 1984).

Ulrich’s study helped open the door to a new field of inquiry focused on illuminating 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 human health value of nature, confirming that trees, parks, gardens, and other natural settings are as essential to livable and sustainable cities as the other critical systems that keep their residents moving and working.

Findings from the current literature indicate the wide range of effects.
Outside Our Doors
The benefits of cities where people and nature thrive.
Urban Trees & Human Health: A Scoping Review

Purpose:
To carefully collect and synthesize the peer-reviewed evidence concerning urban trees and human health.
Project Team

- Kathleen Wolf, Ph.D., University of Washington
- Sharon Lam, MSc, Ontario Climate Consortium
- Jennifer McKeen, MPH, Simon Fraser University
- Gregory Richardson, MUP, Health Canada
- Matilda Van Den Bosch, M.D, University of British Columbia
- Adrina Bardekkian, Ph.D., Tree Canada
Method

Keyword search (n=2563) → Abstract review (n=436) → Quality assessment (n=215) → Final article set (n=199) (201 studies)

Synthesize and present findings
What did we learn?

Publication Dates by Decade
What did we learn?

single & park trees

pollen

image/simulation

immersion

tree canopy/NDVI

credit: Univ of Utah
What did we learn?

Health Outcomes Themes:

- Tree Pollen and VOCs
- Active Living/Weight Status
- Psychophysiological Stress
- Excess Heat and Thermal Comfort
- Cardiovascular Function
- Mental Health, Anxiety and Mood
- Air Pollutants and Respiratory Condition
- Other Restoring Capacities (e.g., Birth...)
- Cognition and Attention Restoration
- Other Reducing Harm (Crime, UVR)
- Clinical Outcomes
Urban Forests & 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., 2011. Health & Place 2011; Hystad et al., 2014. Env Health Perspectives
Healthy Microbiome

- control obesity & asthma
- boost immune function
- improve mental health

"need contact with ‘Old Friends’"

Bloomfield et al. 2016 Perspectives in Public Health

put aside the Hygiene Hypothesis
intestinal microbiome development

~10 to 100 trillion microbes in healthy gastrointestinal (GI) tract

Arrieta et al. 2014. Frontiers in Immunology
GREEN SCHOOLYARDS HELP KIDS FEEL:

- Calmer & Less Stressed: Views of green landscapes from classroom windows helped high school students recover more quickly from stressful events.
- Positive & Restored: Forest schools enhanced positive and decreased negative emotions.
- Resilient: Natural areas enhanced feelings of competence and increased supportive social relationships that help build resilience.

GREEN SCHOOLYARDS PROMOTE SOCIAL-EMOTIONAL SKILLS

- Relationship Skills: Children demonstrated more cooperative play, civil behavior and positive social relationships in green schoolyards.
- Self-Awareness & Self-Management: Green schoolyards can reduce aggression and discipline problems. Gardening at school helped students feel proud, responsible & confident.

THE STATISTICS on CHILDREN & NATURE
ADHD and nature contact

- 17 children aged 7-12 with diagnosed ADHD
- 20-minute guided walks
  - Park
  - Neighborhood
  - Downtown
- Pre-walk puzzles
- Post-walk cognitive test

Faber Taylor & Kuo. 2009. Journal of Attention Disorders
physically disabled & tree climbing!
Green High School Campuses

- cafeteria & classroom window views with greater quantities of trees and shrubs
- positively associated with:
  - standardized test scores,
  - graduation rates
  - %s of students planning to attend a four-year college
  - fewer occurrences of criminal behavior

Matsuoka. 2010. *Landscape & Urban Planning*

credit: NBC News
Encouraging Physical Activity

Review of studies of adults, natural environments vs indoors

Results of activity in natural environments:

- greater feelings of revitalization and positive engagement, increased energy
- decreases in tension, confusion, anger, and depression
- greater enjoyment and satisfaction, declared a greater intent to repeat the activity at a later date

Coon et al. 2011. *Environmental Science & Technology*
public health officials
moderate activity
recommendations

parks, active living, active transit
Pennsylvania Horticultural Society
Clean & Green Program

reduced heart rate = less stress
South et al. 2015. American Journal of Public Health

reduced reports of depression & worthlessness
South et al. 2018. JAMA Network
Improving Depression

20 adults with major depression walk in park setting or built setting

• 50-minute walks one week apart

• before-after testing:
  • Mood: Positive and Negative Affect
  • Cognition: Backward Digit Span

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

cognitive and affective improvements after walking in a nature setting
How Walking in Nature Changes the Brain

**rumination**: Maladaptive self-referential thoughts, heightened risk for depression and other mental illnesses

90-min walk in a natural setting decreased
- self-reported rumination
- neural activity in the subgenual prefrontal cortex
- no reduced effects from built environment walks

Bratman et al. 2015. *Proceedings of the National Academy of Sciences of the USA*
Group Walks Improve Mental Health

England, Walking for Health national program test Nature Group Walkers vs Non Group Walkers

results:

- lower depression, perceived stress, negative affect
- enhanced positive affect and mental well-being
- group walks synergize with physical activity to improve positive affect and mental well-being

Marselle et al. 2014. Ecopsychology
Tree cover shows an inverse relationship with depressive symptoms in elderly residents living in U.S. nursing homes

Matthew H.E.M. Browning a, b, c, Kangjae Lee b, Kathleen L. Wolf c
City Trees & Human Health

newborn & infant health
increased physical activity for kids
student therapy
overall adult health
social cohesion
respiratory & cardiovascular health
reduced depression
elder care improvements
Story: Trees for Human Health Benefits Across the Life Cycle
Yosemite National Park
California
City Trees/the Urban Forest & Health

What do we know? Research Evidence

What is it worth? Economic Value

What do we do? Programs!
Create Forests!
Fiddleheads Forest School
Washington Park Arboretum (Seattle)
cognitive social & physical learning
Walking Programs

children
elders
families
Walking Meetings

creativity, energy, communication, health
Parks Prescription

![Image of a doctor holding a prescription with a park scene]

**Rx for Health**

Date: _______________________

Dr: _______________________

Name: _______________________

I recommend:

☐ Walking  ☐ Other: __________

______________ minutes a day

______________ days per week

* Health Canada suggests moderate activity of 30 minutes per day, 5 days a week

**Benefits of daily activity**

- Improve overall physical and mental health
- Maintain a healthy weight
- Reduce the risk of diabetes and other chronic conditions
- Lower cholesterol levels
- Manage stress and anxiety

Signature: ___________________
A PLACE TO MEND HEARTS & HEAL MINDS

STROLLS FOR WELL-BEING

Experience the restorative powers of nature and join us for Strolls for Well-Being, a free 10-week program offered at Bloedel Reserve. If not already a member, participants are given a temporary membership to

DAY-USE STROLLS:
Since introducing the Strolls for Well-Being program in 2014, hundreds of people have benefited from the healing effects of nature.
Forest Bathing & Therapy  *Shinrin yoku*

more than a decade of research – Japan, South Korea, northern Europe
Forest Bathing & Therapy
multiple wellness benefits

results for forest vs built environments:
- reduced stress & diabetes symptoms
- improved pulse rate, blood pressure, mood
- improved nervous system activity – less fight or flight
- one influence? phytoncides (wood essential oils)

Park et al., 2010. *Environmental Health and Preventive Medicine*
Li et al. 2006. *Immunopharmacology and Immunotoxicology*
The medicine of being in the forest

We are the leading global voice for forest bathing and forest therapy

Santa Rosa, California
City Trees/the Urban Forest & Health

What do we know? Research Evidence

What is it worth? Economic Value

What do we do? Programs!
Forest Economics 101
Health Care Spending in U.S.

- $11,172 annual per capita (2018)
- $3.6 trillion total
- 17.7% of Gross Domestic Product

Pennsylvania (2014): $9,258 per capita
17.6% of GSP (higher than U.S. average)
15 Leading Causes of Death in U.S., 2017

- Diseases of heart
- Cancer
- Accidents (unintentional injuries)
- Chronic lower respiratory diseases
- Cerebrovascular diseases
- Alzheimer's disease
- Diabetes mellitus
- Influenza and pneumonia
- Nephritis, nephrotic syndrome and nephrosis
- Intentional self-harm (suicide)
- Chronic liver disease and cirrhosis
- Septicemia
- Essential hypertension & renal hypertension
- Parkinson's disease
- Pneumonitis due to solids and liquids

source: U.S. Centers for Disease Control and Prevention
Cumulative U.S. DALYs for the Leading Disease/Disorder Categories by Age (2010)

(Disability Adjusted Life Year)

costly chronic diseases

Data courtesy of WHO
Nature & Health Annual Savings

Millions of U.S. Dollars (2012)

<table>
<thead>
<tr>
<th>Benefit (geographic scope)</th>
<th>Minimum ($)</th>
<th>Maximum ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn Health (U.S.)</td>
<td>5.3</td>
<td>5.3</td>
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<tr>
<td>Attention Deficit Hyperactivity Disorder (U.S.)</td>
<td>383.5</td>
<td>1,917.7</td>
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<td>Schools (U.S.)</td>
<td>20.4</td>
<td>1,262.9</td>
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<tr>
<td>Crime (U.S.)</td>
<td>340.6</td>
<td>899.4</td>
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<td>Cardiovascular Disease (U.K., U.S.)</td>
<td>1,220.0</td>
<td>1,220.0</td>
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<tr>
<td>Alzheimer’s Disease (U.S.)</td>
<td>724.6</td>
<td>1,449.2</td>
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<tr>
<td>Totals</td>
<td>2,694.4</td>
<td>6,754.5</td>
</tr>
</tbody>
</table>

Nearby nature experiences are important across the entire life cycle, from cradle to grave.

INFANTS

BIRTH WEIGHT

ECONOMIC IMPACT

$5.05 SAVINGS ON ANNUAL HEALTH CARE COSTS.

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 longer hospital stays and increased illness in young adulthood.

IMMUNE FUNCTION

IMMEDIATE IMPACT

STRENGTHENED IMMUNE SYSTEM LEADS TO REDUCED ILLNESS AND CHRONIC DISEASE ACROSS A LIFETIME.

We are most vulnerable in the early months of our lives, as the body and mind are growing and developing at an astonishing rate. The ‘hippocampus hypothesis’ suggests that early contact with natural environments stimulates the development of a healthy immune system.

FAMILY DYNAMICS

ECONOMIC IMPACT

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 these changes can bring stress and anxiety. Nature walks and outdoor activities can help reduce stress and improve the quality of family life.

Note: All economic values are in 2021 U.S. dollars, and are potential annual savings across the entire U.S.

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.

Contributing analysts:
Dr. Stephen Grado & Marcus Measells, MSU; Dr. Alicia Robbins, Weyerhaeuser
Urban Forests for Human Health: A Focused Economic Valuation

Healthy trees are rooted in research!
Donate at www.treefund.org

Cultivating Innovation in Arboriculture and Urban Forestry
TREE Fund • 552 S. Washington St., Ste. 109, Naperville, IL 60540
- Human scale: individual to community

- Screen for benefits

- Green condition:
  - Urban forestry
  - Parks
  - Gardens, etc.

- Market
- Non-market

Nature & Health Economics Analysis Process
Trees & Health Review
What did we learn?

**Clinical Treatment & Therapy**
- cardiovascular disease
- mental illness
- ADHD
- diabetes
- respiratory illness
- autism
- hospital healing & recovery
- cancer

**Health Protection**
- stress/anxiety reduction
- mental function
- immune function
- birth outcomes
- pain relief
- crime reduction
- thermal comfort
- social cohesion
- physical activity
- weight control
- UV exposure
- better sleep
City Trees/the Urban Forest & Health

What do we know? Research Evidence

What is it worth? Economic Value

What do we do? Programs!
Build Knowledge Into Practice

- nearly 40 years of research about health: city trees, nearby nature
- evidence to counter negative messages
- knowledge to inform allies & advocates
- possible identity messaging
Human Dimensions of Urban Forestry and Urban Greening

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
Integrating 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

Projects Director
Kathleen L. Wolf, Ph.D.