Healthy Cities for Healthy People: the importance of trees

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So the tree rustles in the evening . . .

Trees have long thoughts, long-breathing and restful, just as they have longer lives than ours.

Hermann Hesse, *Trees: Reflections and Poems*
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
Outline

1. City Trees & Health: the evidence
2. Nearby Nature & Health: the evidence
3. Goals & Measures
4. Reflections
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
Trees & Physical Activity

- School children in cities grades 6 to 8
- Relationship of tree cover to outside-of-school physical activity
- 5% increase in treed area cover = 5% increase in free-time physical activity

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
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
City Trees & Human Health

newborn & infant health
increased physical activity for kids
overall adult health
social cohesion
respiratory & cardiovascular health
reduced depression
Literature Review – City Trees & Human Health

USDA Forest Service, U of WA, Health Canada, Natural Resources Canada, Tree Fund

182 peer-reviewed articles

figure credit: Sharon Lam

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Outline

1. City Trees & Health: the evidence
2. Nearby Nature & Health: the evidence
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Metro Nature & Human Health

Nearby nature includes a variety of spaces and places:

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

evidence of nearby nature & human health

> 40 years

> 5,000 publications
Green Cities: Good Health
database of >4,500 peer reviewed publications
strength of evidence; causal mechanisms?

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 1984, 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.
### Causes of Death in California

source: U.S. Centers for Disease Control and Prevention

<table>
<thead>
<tr>
<th>CA Leading Causes of Death, 2016</th>
<th>Deaths</th>
<th>Rate***</th>
<th>State Rank*</th>
<th>U.S. Rate**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Disease</td>
<td>61,573</td>
<td>143.1</td>
<td>40th</td>
<td>165.5</td>
</tr>
<tr>
<td>Cancer</td>
<td>59,515</td>
<td>139.7</td>
<td>45th</td>
<td>155.8</td>
</tr>
<tr>
<td>Stroke</td>
<td>15,680</td>
<td>36.9</td>
<td>13th</td>
<td>37.3</td>
</tr>
<tr>
<td>Alzheimer’s Disease</td>
<td>15,570</td>
<td>36.2</td>
<td>31st</td>
<td>30.3</td>
</tr>
<tr>
<td>Chronic Lower Respiratory Diseases</td>
<td>13,710</td>
<td>32.6</td>
<td>43rd</td>
<td>40.6</td>
</tr>
<tr>
<td>Accidents</td>
<td>13,213</td>
<td>32.0</td>
<td>50th</td>
<td>47.4</td>
</tr>
<tr>
<td>Diabetes</td>
<td>9,124</td>
<td>21.4</td>
<td>22nd</td>
<td>21.0</td>
</tr>
<tr>
<td>Influenza/Pneumonia</td>
<td>5,981</td>
<td>14.0</td>
<td>25th</td>
<td>13.5</td>
</tr>
<tr>
<td>Chronic Liver Disease/Cirrhosis</td>
<td>5,287</td>
<td>12.2</td>
<td>15th (tie)</td>
<td>10.7</td>
</tr>
<tr>
<td>Hypertension</td>
<td>5,100</td>
<td>11.8</td>
<td>2nd (tie)</td>
<td>8.6</td>
</tr>
</tbody>
</table>
### Economics! 2014 data

<table>
<thead>
<tr>
<th></th>
<th>California</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>annual per capita spending (USD)</td>
<td>$7,549</td>
<td>$8,045</td>
</tr>
<tr>
<td>Gross Domestic Product GDP</td>
<td>12.6%</td>
<td>18%</td>
</tr>
<tr>
<td>State ranking (1 is least expensive)</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

- CA GDP = annual $2.35 trillion
- 5th largest economy in world

GDP:
- high: Maine @ 22.3%
- low: Wyoming @ 9.3%
download at:
https://www.naturewithin.info/
KWolf.pdf

http://www.naturewithin.info/
New/2018.3.TNC_Natures%20Riches_Economic%20benefits%20of%20nature_Spanish.pdf

also in Spanish! and Arabic!
Nearby nature experiences are important across the entire life cycle, from cradle to grave.

INFANTS

BIRTH WEIGHT

Potential economic value: $5.78M savings on annual health care costs.

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

IMMUNE FUNCTION

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 "nature hypothesis" suggests that early contact with nature microbes enhances 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-rich parks and walks help reduce these conditions and improve interactions between people within the household.

Note: All economic values are in 2012 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.

COST SAVINGS ON MEDICATION SPENDING PER YEAR.

CHILDREN & TEENS

OVERALL HEALTH AND WELL-BEING

Potential economic value: $1.29 billion savings.

Increased physical activity, reduced asthma, leading cause of emergency department visits, hospitalizations and missed school days, and reduced risk of adult skin conditions.

ADHD

Potential economic value: $1.24 billion savings.

Reduced frustration, mental distress, and depression disorders, and improved body image, self-esteem and life satisfaction.

DEPRESSION AND STRESS

Potential economic value: $1.20 billion savings.

Reduced anxiety, mental distress, and depression disorders, and improved body image, self-esteem and life satisfaction.

CARDIOVASCULAR DISEASE

Potential economic value: $1.18 billion savings.

Reduced risk of heart disease and stroke.

CRIME & SAFETY

Potential economic value: $1.16 billion savings.

Reduced costs of crime for victims and property owners.

Note: All economic values are in 2012 U.S. dollars and are potential annual savings across the entire U.S.

contributing analysts:
Dr. Stephen Grado & Marcus Measells, MSU; Dr. Alicia Robbins, Weyerhaueser
Outline

1. City Trees & Health: the evidence
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4. Reflections
Story: Human Health Benefits Across the Life Cycle
ADHD and nature contact

- 96 children aged 7-12 diagnosed ADD or ADHD
- Parents gave postactivity attentional functioning ratings (PAAF) –
- 4 measures:
  - Can’t stay focused on unappealing tasks (homework or chores)
  - Can’t complete tasks
  - Can’t listen and follow directions
  - Easily distracted

Faber Taylor. 2001. *Environment & Behavior*
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*
Healthy Microbiome

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

need contact with ‘Old Friends’

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
Create Forests!
Fiddleheads Forest School
Washington Park Arboretum (Seattle)

cognitive
social &
physical
learning
CDC moderate activity recommendations

parks, active living, active transit
Walking Programs

children
elders
families
Walking Meetings

creativity, energy, communication, health
Parks Prescription

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: ____________________________
Parks Prescription

1. Get a prescription for ParksRx from your healthcare provider.
2. Visit www.REACHforbetterhealth.com
3. Click
   - Pick your park
4. Exercise in the park and share outcomes with your healthcare provider.

PARKS Rx
Your Prescription For Better Health

This information is provided for educational purposes and is not to be considered medical advice.
credit: healthy central florida

credit: CNN.com

credit: healthy central florida

credit: CNN.com
Green Streets for Walkability

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

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.
Shinrin yoku (forest bathing)

- extensive research
- restorative experiences
- workers retirees
- networked system, 52 bases in Japan
Santa Rosa, California
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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

Canopy Cover & Stress

images of canopy cover varied 0-60%

Summary: Knowledge to Practice

• nearly 40 years of research: city trees, nearby nature
• critical mass of evidence – now what?
• integrate greening and health programming
• integrate urban forest goals with broader urban systems needs
Outline

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Trees are the earth's endless effort to speak to the listening heaven.

Rabindranath Tagore, *Fireflies*, 1928
Gulfport, MS :: Hurricane Katrina survivors
England’s Ancient Oaks
Ascending the Giants, Portland OR
Iraq/Afghan wars: Brain injury and PTSD in 30% of force
Military/Vet suicides: 20% of all U.S. suicides
Drugs and surgery relatively ineffective

project support: The TKF Foundation, Nature Sacred program

slides credit: Frederick Foote, M.D.
Project Manager for the Green Road Project
The Green Road: Healing with *Wild* Nature

- Natural woodland
- Maximum encounter, minimum disruption
- Highlight core elements
- Water – Stone – Trees – Animals
The Green Road Project
A model program of the Institute for Integrative Health
Naval Support Activity Bethesda
Home of Walter Reed National Military Medical Center
Stream restoration heals the landscape and invites access to the water
woody debris :: fallen tree trunks symbolize the fallen soldiers’ legacy in conflicts
Green Road Research Team

measures of veterans (and associates):
cognition
mental health
physiology and healing
social & emotional health
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...

Projects Director
Kathleen L. Wolf, Ph.D.

www.naturewithin.info