Healthy Cities & Healthy People: the importance of trees

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Minnesota Shade Tree Short Course
Minneapolis, Minnesota
20 March 2019
Declining urban and community tree cover in the United States

David J. Nowak, Eric J. Greenfield

Highlights

- Between c. 2009-2014, US urban tree cover dropped from 40.4% to 39.4%.

- During that same period, US urban impervious cover increased from 25.6% to 26.6%.

- Nationally, annual urban/community tree cover loss is 175,000 acres or 36 million trees.
trees in the background

public awareness & appreciation?
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
New Climate Change Warning: More Infant Heart Defects
— Heat extremes seen raising incidence of congenital abnormalities

published 31 January 2019
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

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

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
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

- General socio-economic, cultural and environmental conditions
  - Living and working conditions
    - Work environment
    - Unemployment
  - Social and community networks
    - Education
    - Agriculture and food production
    - Water sanitation
    - Health care services
    - Housing
  - Individual lifestyle factors
    - Age, sex & hereditary factors
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
Outside Our Doors
The benefits of cities where people and nature thrive.

design: milepost

co-author: US Forest Service

co-author & printing: The Nature Conservancy
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
Outline

City Trees & Health: the evidence

Evidence Based Goals & Measures

Economics
healthy trees.
happy people.
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
Prison Inmates :: nature videos

solitary confinement, video room/exercise option

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

What causes the most deaths in Minnesota?

<table>
<thead>
<tr>
<th>MN Leading Causes of Death, 2014</th>
<th>Deaths</th>
<th>Rate***</th>
<th>State Rank*</th>
<th>U.S. Rate**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cancer</td>
<td>9649</td>
<td>152.6</td>
<td>40th</td>
<td>161.2</td>
</tr>
<tr>
<td>2. Heart Disease</td>
<td>7659</td>
<td>116.5</td>
<td>50th</td>
<td>167.0</td>
</tr>
<tr>
<td>3. Accidents</td>
<td>2385</td>
<td>39.4</td>
<td>40th</td>
<td>40.5</td>
</tr>
<tr>
<td>4. Chronic Lower Respiratory Disease</td>
<td>2277</td>
<td>36.0</td>
<td>40th (tie)</td>
<td>40.5</td>
</tr>
<tr>
<td>5. Stroke</td>
<td>2202</td>
<td>34.0</td>
<td>34th (tie)</td>
<td>36.5</td>
</tr>
<tr>
<td>6. Alzheimer’s disease</td>
<td>1628</td>
<td>24.2</td>
<td>30th</td>
<td>25.4</td>
</tr>
<tr>
<td>7. Diabetes</td>
<td>1193</td>
<td>18.7</td>
<td>38th (tie)</td>
<td>20.9</td>
</tr>
<tr>
<td>8. Suicide</td>
<td>686</td>
<td>12.2</td>
<td>41st (tie)</td>
<td>1.03</td>
</tr>
<tr>
<td>9. Kidney Disease</td>
<td>676</td>
<td>10.4</td>
<td>36th</td>
<td>13.2</td>
</tr>
<tr>
<td>10. Flu/Pneumonia</td>
<td>638</td>
<td>9.8</td>
<td>47th</td>
<td>15.1</td>
</tr>
</tbody>
</table>

source: National Center for Health Statistics
## Economics!

<table>
<thead>
<tr>
<th></th>
<th>State of MN</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>annual per capita spending (USD)</strong></td>
<td>$8,871</td>
<td>$10,224</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>2017</td>
</tr>
<tr>
<td><strong>Gross Domestic Product GSP/GDP</strong></td>
<td>15.1%</td>
<td>17.9%</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>2017</td>
</tr>
<tr>
<td><strong>Nation ranking</strong></td>
<td>average for all states = 11.5%</td>
<td>2017</td>
</tr>
</tbody>
</table>

**U.S. annual spending $3.3 trillion; $48.4 billion in MN**

|                          | 2017        | 2014          |
KATHLEEN L. WOLF, PH.D.

The Nature Conservancy

also in Spanish! and Arabic!

design: milepost

author:

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

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.

INFANTS

- **Birth Weight**
  - Potential Economic Value: $81.3 billion 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 costs, such as longer 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**
  - 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. For children, the immune system plays a role in helping children develop learning, social, and intellectual skills that improve both health and life satisfaction. Green spaces can help our children and teens develop, giving them space for moderate to vigorous activity, and shade them from too much sun exposure.

- **Behavioral-Emotional Impacts**
  - ADHD
    - Potential Economic Value: $2.8 billion savings on medication costs per year.

- **Family Dynamics**
  - Improved family dynamics, perhaps reducing mental health treatment and counseling services.

- **Future Financial Success**
  - Potential Economic Value: $81.3 billion increase in high school graduates’ lifetime annual income.

- **Cardiovascular Disease**
  - Hypertension
    - Potential Economic Value: $81.3 billion savings on treatment costs annually.

- **Cognitive Disorders**
  - Potential Economic Value: $81.3 billion savings on medical services not counting the value of home caregiver services.

CONTRIBUTING ANALYSTS:
Dr. Stephen Grado & Marcus Measells, MSU; Dr. Alicia Robbins, Weyerhaeuser
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 & wellness benefits (ADHD, cardiovascular, Alzheimers)
• just beginning the analysis!

Outline

City Trees & Health: the evidence

Economics

Evidence Based Goals & Measures
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 Spaces for Nature Contact
Fiddleheads Forest School
Washington Park Arboretum (Seattle)
cognitive
social &
physical
learning
public health officials 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
4. Pick your park
5. 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.

www.REACHforbetterhealth.com/ParksRx
Made possible with funding from the Centers for Disease Control and Prevention.
Walk with a doc
Step into FREE fitness fun.

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
The medicine of being in the forest
We are the leading global voice for forest bathing and forest therapy

Santa Rosa, California
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*

www.rph.org/eden.html
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, *, Kangjae Lee b, Kathleen L. Wolf c
Outline

City Trees & Health: the evidence

Economics

Evidence Based
Goals & Measures
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

Canopy Cover & Stress

images of canopy cover varied 0-60%

Summary: Knowledge to Practice

- nearly 40 years of research, 1,000s of studies: city trees, nearby nature
- critical mass of evidence – now what?
- integrate greening and health programming
- integrate urban forest goals with broader urban systems needs
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
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.

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