trees in the background

public awareness & appreciation?
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*
People, Health & Trees
Trees: A Matter of Life & Death?

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US Forest Service, Pacific NW Research Station

The New Jersey Shade Tree Federation
93rd Annual Conference
18 October 2018
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 & Metrics
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)

Cognitive and affective improvements after walking in a nature setting

Berman et al. 2012. Journal of Affective Disorders
City Trees & Human Health

newborn & infant health
increased physical activity for kids
overall adult health
social cohesion
respiratory & cardiovascular health
reduced depression
Outline

1. City Trees & 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

IMAGE BY MIG / SvR
Green Cities: Good Health
www.greenhealth.washington.edu

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

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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
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 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.
New Jersey State Health Assessment Data
New Jersey State Health Assessment Data
Economics!

- U.S. spending on health care
  - $3.3 trillion
  - ~ 18% GDP

- NJ spending on health care (2014 Kaiser Family Foundation)
  - Per capita annual spending
    - $8,859 NJ
    - $8,045 US
  - NJ up 18% in 2012-16 (vs 15% US)

KATHLEEN L. WOLF, PH.D.

also in Spanish! and Arabic!

design: milepost

author:

printing:

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

**INFANTS**

**Birth Weight**

*Potential Economic Value: $5.5M 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. Pregnant women who have more tree canopy and green space near their homes generally have babies with healthier birth weights.

**Immune Function**

*Economic Implication: 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 'hygiene hypothesis' suggests that early contact with outdoor microorganisms stimulate the development of a healthy immune response.

**Family Dynamics**

*Economic Implication: 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 views and walks help reduce these conditions and improve interactions between people within the household.

Note: All economic values are in 2017 U.S. dollars, and are potential annual savings across the entire U.S.

**CHILDREN & TEENS**

**Overall Health and Well-Being**

*Economic Implication: Increased physical activity, reduced asthma, and reduced risk of adult skin conditions.*

Negative conditions in a child's surroundings can cause both immediate and ongoing health impacts. Nature is a positive influence; playing in nature helps children develop learning, social, and intellectual skills that improve both present and future health and life satisfaction. Green spaces clean the air, our children and teens breathe, give them space for moderate to vigorous activity, and shade them from too much sun exposure.

**ADHD**

*Potential Economic Value: $554.8K-$6.0B on medication savings per year.*

Millions of children ages 3-17 are affected by Attention Deficit Hyperactivity Disorder (ADHD) in the U.S. Nature exposure is a potential alternative treatment, studies show that activity near nature or green spaces, such as play or just 20 minutes of walking, can reduce symptoms.

**Future Financial Success**

*Potential Economic Value: $1.38 increase in high school graduates’ lifelong annual incomes.*

School performance affects a child's self-esteem and long-term success. Having green views from classrooms and common spaces in schools can improve students' capacity to direct attention and feel less stressed. Green high school campus landscapes are linked to higher graduation rates.

**ADULTS**

**Depression and Stress**

*Economic Implication: Reduces frustration, mental distress and depression disorders, and improves body image, self-esteem and life satisfaction.*

Busy, highly scheduled lifestyles take their toll. Nature experiences reduce stress. Nearly 16 million adults experience major depression each year in the U.S., and mental, behavioral, and neuropsychiatric disorders are a leading cause of disability. Nature experiences support reduced stress and improve mental health, mood, and life function. Improved mental health and function reduce depression treatment costs, and improves worker productivity.

**Cardiovascular Disease**

*Potential Economic Value: $1.2-$2.8B annual savings, based on a 1-2% reduction in historic expenditures.*

Cardiovascular Disease is the leading cause of premature death in the U.S. People show slightly reduced risk of CVD if their neighborhoods have greater nature coverage (particularly tree canopy), however it is worth noting the majority of studies have focused on men.

**CRIME & SAFETY**

*Potential Economic Value: $980 in reduced costs of crime for victims and property owners per year.*

Personal safety and security are important conditions for quality of life. The presence of nature in neighborhoods – community gardens, forest canopy, and landscaped green spaces – is associated with reduced personal and property crime.

**OLDER ADULTS**

**Mobility & Quality of Life**

*Potential Economic Value: $1.7-$2.4B savings on health care costs from falls per year.*

One in three older adults falls each year, giving rise to fatal and nonfatal injuries. Resident's falls within elder care facilities are particularly expensive medical situations. Being out in nature sustain personal mobility, leading to reduced falls and reduced need for medications. Further, those who are socially isolated are more likely to be unhealthy, so gardening and nature walking activities that promote social interactions support positive lifestyles and quality of life.

**Hypertension**

*Potential Economic Value: $1.3-$2.6B savings on treatment costs annually.*

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

**Cognitive Disorders**

*Potential Economic Value: $1.2-$2.9B annual savings on medical services, not counting the value of home caregivers’ services.*

About one in five older adults experience mental and cognitive disorders, with age being the greatest risk factor. In 2016, about 11% of people aged 65 or older were afflicted with Alzheimer’s disease. Those with dementia have three times as many hospital stays per year as other elders. Encounters with nature improve symptoms related to cognitive disorders, such as agitation, depression, and reduced mobility.

Contribution analysts:
Dr. Stephen Grado & Marcus Measells, MSU; Dr. Alicia Robbins, Weyerhaeuser
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*
Fiddleheads Forest School
Washington Park Arboretum (Seattle)
cognitive social & physical learning
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
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
   2. Enter your zip code
   3. Click

3. Pick your park

4. Exercise in the park and share outcomes with your healthcare provider.

Parks Rx
Your Prescription For Better Health

www.REACHforbetterhealth.com/ParksRx
Made possible with funding from the Centers for Disease Control and Prevention.
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.
Outline

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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

“dose” at which health issue is lower

Canopy Cover & Stress

images of canopy cover varied 0-60%

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
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

1. City Trees & Health: the evidence
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3. Goals & Metrics
4. Reflections
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
sacred forests of temples & shrines, Japan
Ascending the Giants, Portland OR
Walter Reed National Military Medical Center, Bethesda, MD

- Iraq/Afghan wars: Brain injury and PTSD in 30% of those deployed
- Military/Vet suicides: 20% of all U.S. suicides
- Drugs and surgery relatively ineffective

project support: The TKF Foundation

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

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

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.

www.naturewithin.info