



Nature for Health in Cities & Towns: the importance of trees

Kathleen Wolf, Ph.D.
Research Social Scientist

University of Washington (Seattle)
School of Environmental and Forest Sciences
College of the Environment

Vinterkonferanse

Oslo Norway
5 Februar 2019

The Gazette

Cedar Rapids
26°



Subscribe Now!
7 day delivery - as low
as \$4.80/wk

News Obituaries Sports Opinion Living Hoopla Photos Weather

Ask & Answer Rural Opinion

Trees serve as nature's engineers in cities



A house sparrow perches in a young budding tree in downtown Cedar Rapids on Friday, March 31, 2017. (Liz



**trees
in the
background**

**public awareness
& appreciation?**

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

City Trees & Health: the evidence



Economics



**Evidence Based
Goals & Measures**

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*





MEDPAGE TODAY*

[Home](#) [Specialties](#) [Education](#) [Health Policy](#) [Meetings](#) [Practice Mgmt](#) [Videos](#) [Columns](#) [Condition Centers](#) [Careers](#) [More](#)

Public Health & Policy > Environmental Health

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**

Janssen et al. 2015. International Journal of Behavioral Nutrition and Physical Activity

Sacramento Study :: LIDAR x CHIS data

7,900 adults, 250 m buffer, covariates



more tree cover
= better overall
health
= better social
cohesion

Ulmer et al. 2016. *Health & Place*. Multiple health benefits of urban tree canopy: The mounting evidence for a green prescription.

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

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

🌿 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



City Trees & Human Health



newborn & infant health

increased physical activity for kids

overall adult health

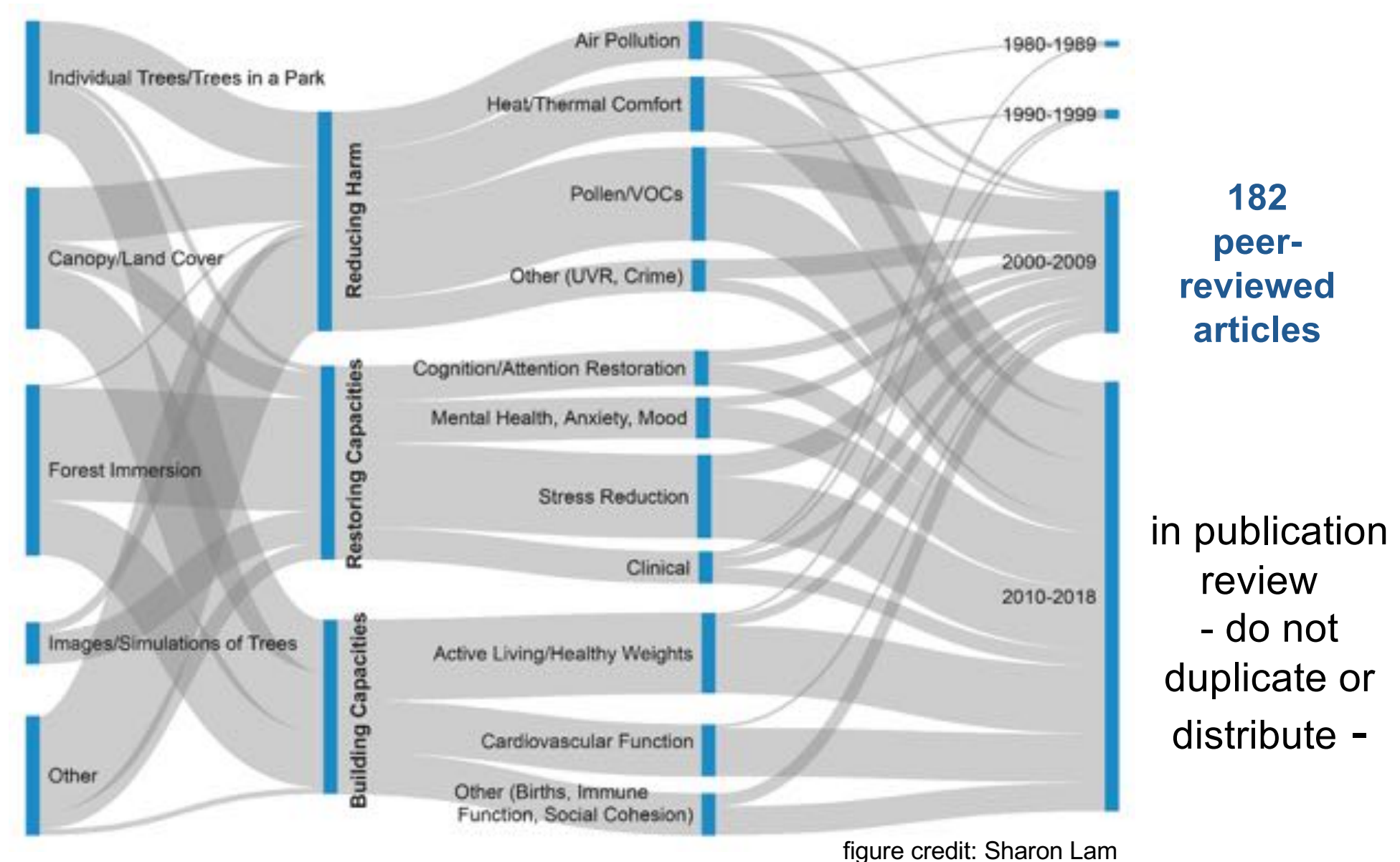
social cohesion

respiratory & cardiovascular health

reduced depression

Literature Review – City Trees & Human Health

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



Outline

City Trees & Health: the evidence



Economics



**Evidence Based
Goals & Measures**



healthy trees.
happy people.

www.leaflimb.com | 919.787.9551

UNIT 245628

What causes the most deaths in Norway?



source: Institute for Health Metrics and Evaluation, Univ of Washington



Economics!

2016

2017

Norway

United States

annual per capita
spending (USD)

\$6,647

\$10,224

U.S. dollars

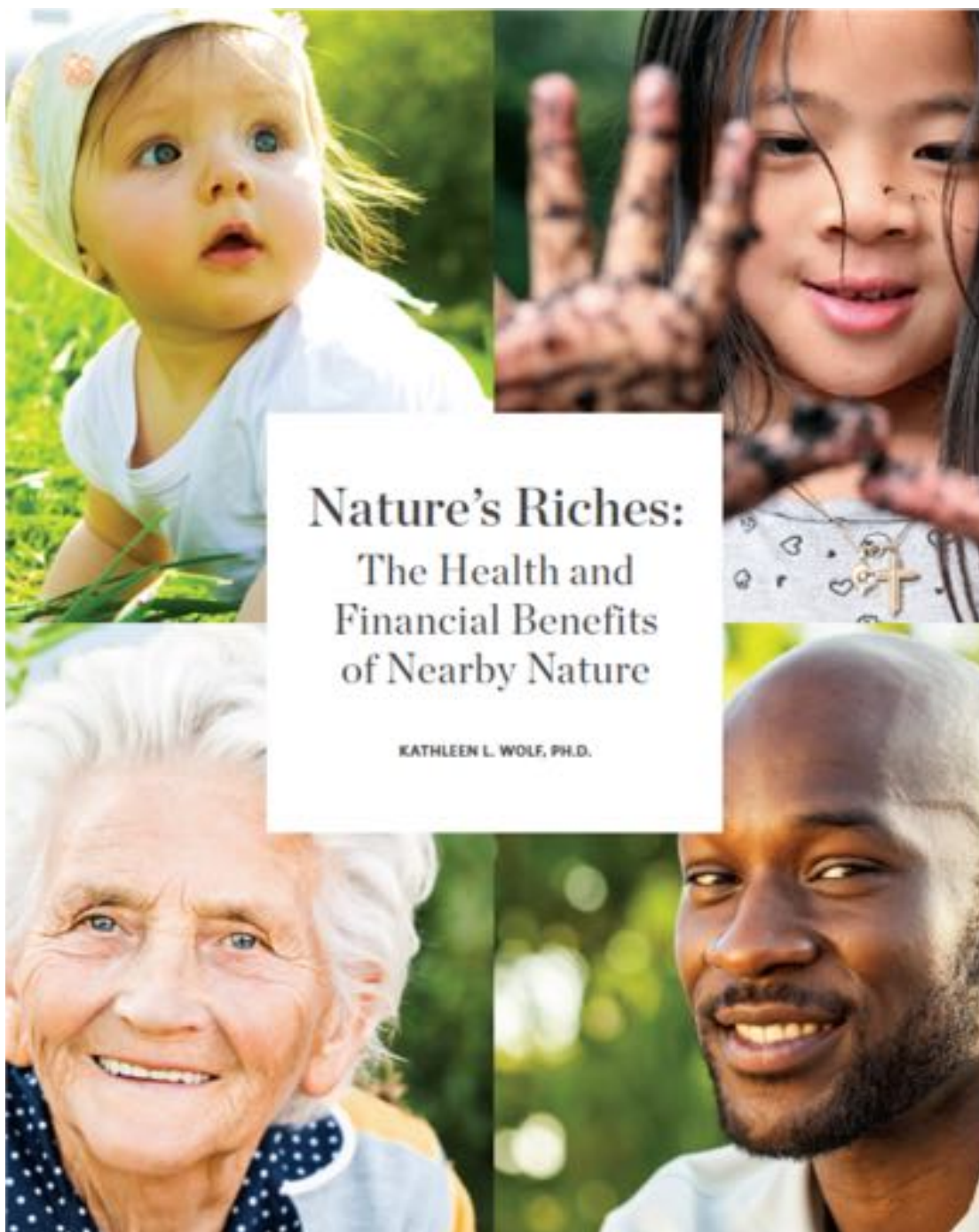
Gross Domestic
Product GDP

9.9%

17.9%

Nation ranking

average for all
high income countries = 11.5%



design: milepost

author: 

printing:
The Nature Conservancy 

**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
\$1.6M 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 that have more tree canopy and green space near their homes generally have babies with healthier birth weights.

IMMUNE FUNCTION

ECONOMIC IMPLICATIONS
STRONGER IMMUNE SYSTEM LEADS TO REDUCED RUNDS 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 stimulates the development of a healthy immune response.

FAMILY DYNAMICS

ECONOMIC IMPLICATIONS
IMPROVED FAMILY DYNAMICS, PERHAPS REDUCING MENTAL HEALTH TREATMENT AND COUNSELING SERVICES

As infants' 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 2010 U.S. dollars and are potential annual savings across the entire U.S.

CHILDREN & TEENS



OVERALL HEALTH AND WELL-BEING

ECONOMIC IMPLICATIONS
INCREASED PHYSICAL ACTIVITY, REDUCED AUTISM (A LEADING CAUSE OF EMERGENCY DEPARTMENT VISITS, HOSPITALIZATIONS, AND MISSED SCHOOL DAYS), AND REDUCED RISK OF ADULT SICK CONDITIONS

Regular routines in a child's surroundings can cause both beneficial and negative health impacts. Nature is a positive influence; playing in nature helps children develop learning, social, and intellectual skills that improve both health and later life achievement. Green spaces close to our children and teens breathe, give them space for moderate to vigorous activity, and shield them from too much sun exposure.

ADHD

POTENTIAL ECONOMIC VALUE
\$10M-\$16M ON MEDICATION SAVINGS PER YEAR

Millions of children ages 3-17 are treated for Attention Deficit Hyperactivity Disorder (ADHD) in the U.S. Nature exposure is a potential alternative treatment; studies show that activity within nature or green spaces, such as play or just 30 minutes of walking, can reduce symptoms.

FUTURE FINANCIAL SUCCESS

POTENTIAL ECONOMIC VALUE
\$1.38 INCREASE IN HIGH SCHOOL GRADUATES' LIFETIME ANNUAL INCOMES

School performance affects both near-term self-worth 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.

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 IMPLICATIONS
REDUCES FRUSTRATION, MENTAL DISTRESS AND DEPRESSION DISORDERS, AND IMPROVED 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 respite and rehabilitation for improved mental health, mood, and life function. Improved mental health and function reduces disease treatment costs, and improves worker productivity.

CARDIOVASCULAR DISEASE

POTENTIAL ECONOMIC VALUE
\$1.7-\$1.36 ANNUAL SAVINGS, BASED ON A 1-2% REDUCTION IN MEDICINE 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. Quarterly tree canopy, however, if it is worth noting the majority of studies have focused on trees.

CRIME & SAFETY

POTENTIAL ECONOMIC VALUE
\$10M 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 vacant lots - is associated with reduced personal and property crime.

OLDER ADULTS



MOBILITY & QUALITY OF LIFE

POTENTIAL ECONOMIC VALUE
\$1.7-\$2.4M SAVINGS ON HEALTH CARE COSTS FROM FALLS PER YEAR

Older adults often suffer falls each year, giving rise to fatal and nonfatal injuries. Residents' falls within older care facilities are particularly expensive medical situations. Being out in nature maintains 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 healthier lifestyles and quality of life.

HYPERTENSION

POTENTIAL ECONOMIC VALUE
\$1.3-\$2.4M 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" (careful walks in naturalistic forest settings) decrease diastolic rates.

COGNITIVE DISORDERS

POTENTIAL ECONOMIC VALUE
\$1.2-\$1.36 ANNUAL SAVINGS ON MEDICAL SERVICES NOT COUNTING THE VALUE OF HOME CAREGIVER SERVICES

About one in five older adults experience mental and cognitive disorders, with age being the greatest risk factor. In 2010, 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.

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

Outline

City Trees & Health: the evidence



Economics



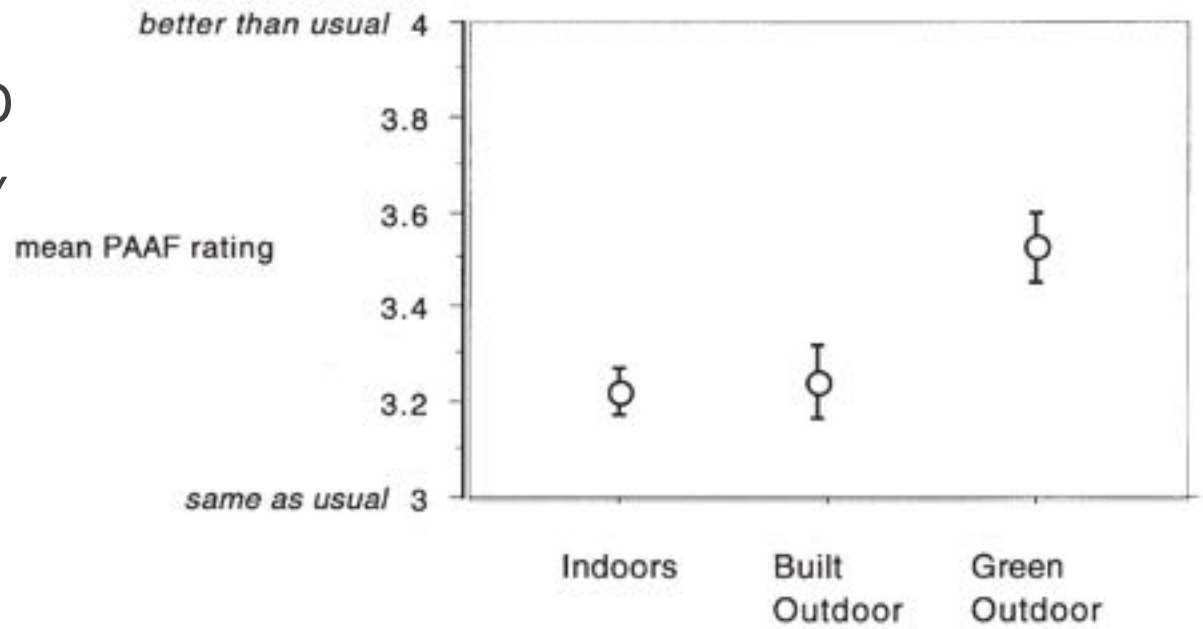
**Evidence Based
Goals & Measures**

Story: Human Health Benefits Across the Life Cycle



ADHD and nature contact

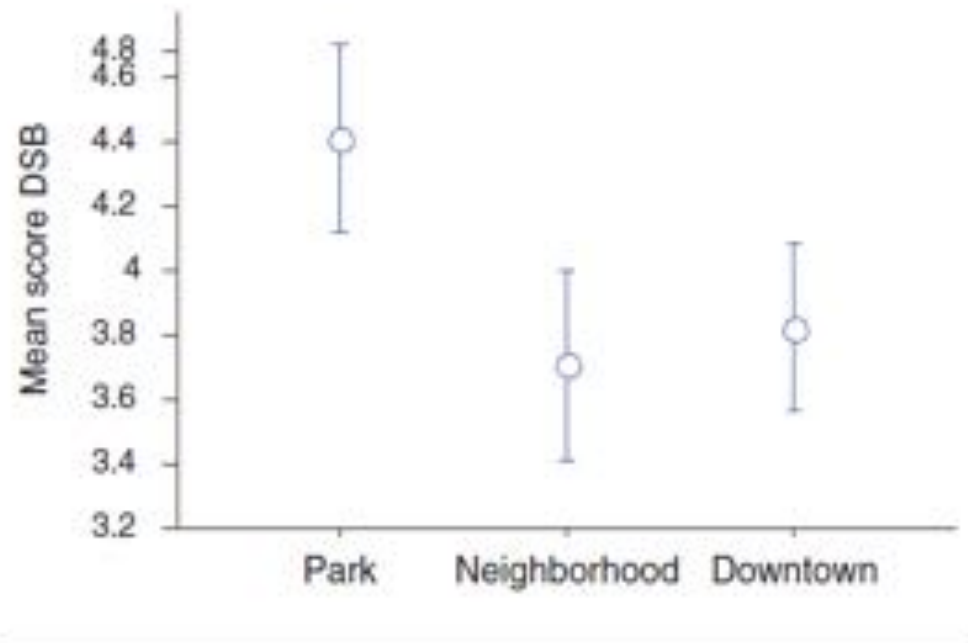
- 96 children aged 7-12 diagnosed ADD or ADHD
- Parents gave *postactivity attentional functioning ratings* (PAAF) –
- 4 measures:
 - Can't stay focused on unappealing tasks (homework or chores)
 - Can't complete tasks
 - Can't listen and follow directions
 - Easily distracted



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

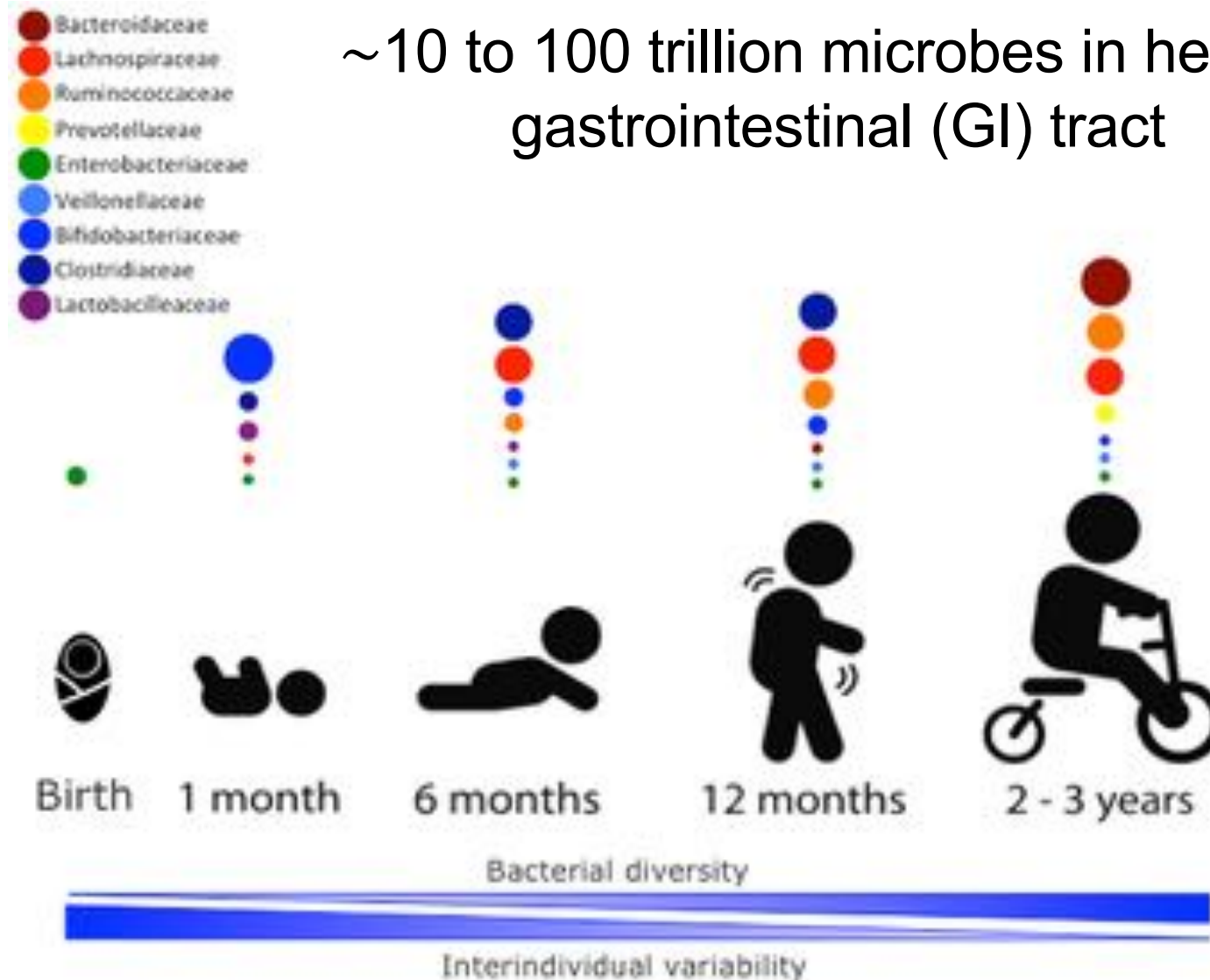
🌿 improve mental health

put aside
the
Hygiene
Hypothesis

need contact with ‘Old Friends’



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



intestinal microbiome development

Arrieta et al. 2014. Frontiers in Immunology

Eat Dirt!



Create Forests!



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



R_x 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: _____

**doctors
of bc**

Doctors of BC

Parks Prescription



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**
educate. exercise. empower.



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

Aspinall et al. 2013. The urban brain: Analysing outdoor physical activity with mobile EEG. British Journal of Sports Medicine





BLOEDEL
RESERVE

VISIT

EXPERIENCE

EVENTS

STROLLS FOR WELL-BEING

CREATIVE RESIDENCY

GET INVOLVED

ABOUT

CONTACT



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.

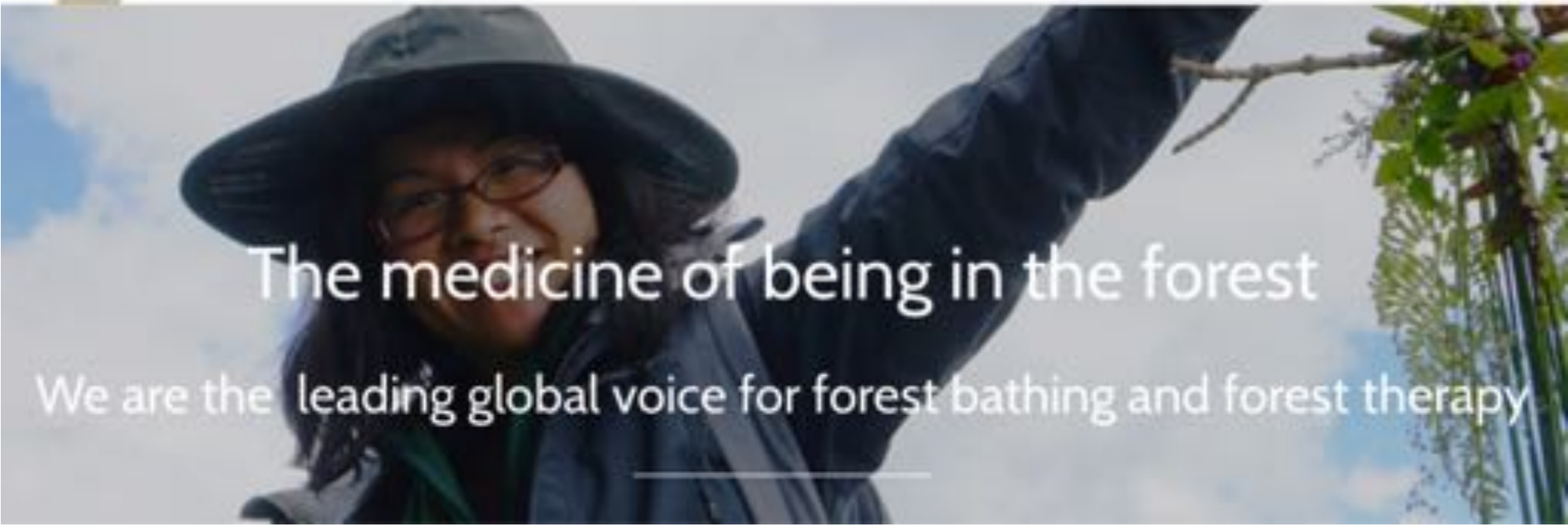
Shinrin yoku (forest bathing)

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





[HOME](#) [ABOUT](#) [THE ASSOCIATION](#) [THE SCIENCE](#) [GET STARTED](#) [WORKSHOPS AND RETREATS](#) [BECOME A GUIDE](#) [BLOG](#) [MORE...](#)



The medicine of being in the forest

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

Santa Rosa, California

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,

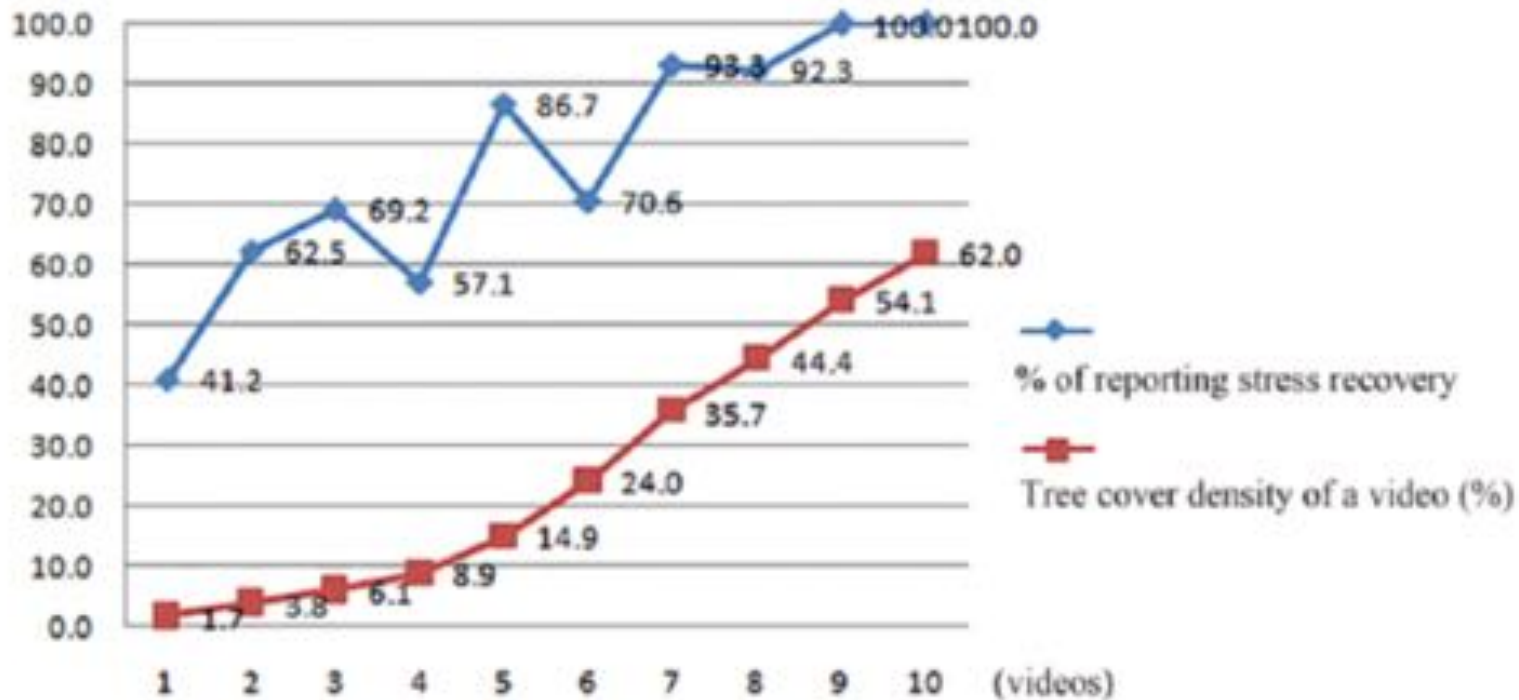
stress, more than 20% cover

“dose” at
which health
issue is
lower

Cox et al. 2017. BioScience 67, 147-155.

Canopy Cover & Stress

images of canopy cover varied 0-60%



Jiang, et al. 2016. Environment and Behavior 48,607-629.

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

www.naturewithin.info

College of the Environment University of Washington

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.

Sponsors

