



GREEN INFRASTRUCTURE: WHY NATURE MATTERS FOR COMMUNITY HEALTH

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Community Health Challenges



- ▣ Obesity
- ▣ Physical Health
- ▣ Crime
- ▣ Domestic Violence
- ▣ Attention Deficit Disorder
- ▣ Asthma
- ▣ Mental health

Does nature matter?

- **Research evidence?** Do access to & views of nature make a difference in community health?
 - Nature → Health
 - Nature as a buffer: moderating health disparities
- **Green infrastructure:** What might you do in your city?
 - Physical examples
 - + a green program



I. Research Evidence

Views of nature speed surgery recovery

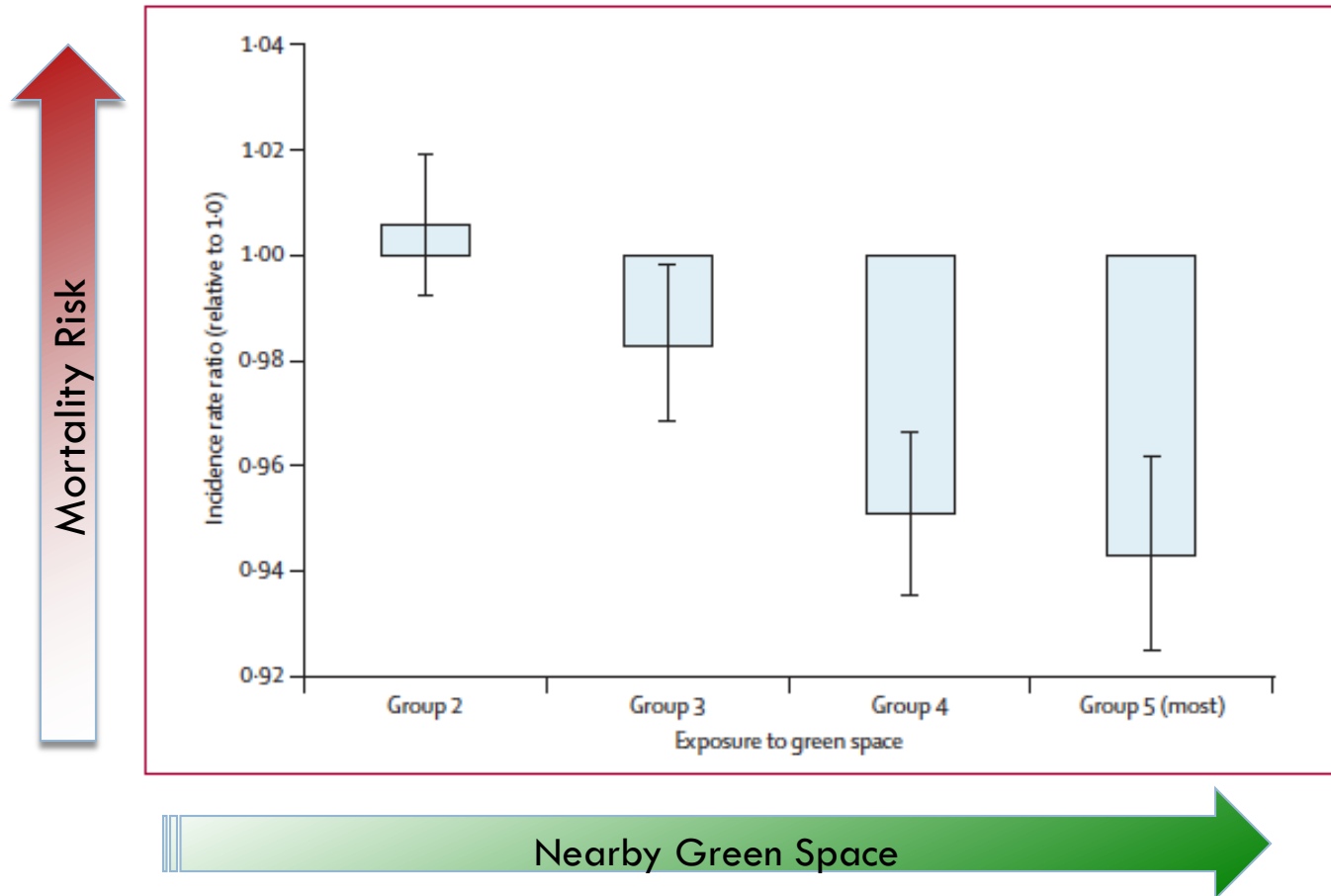


1980's study:

surgery patients with views of trees & grass recovered faster and requested less pain medication than patients with a view of a brick wall.

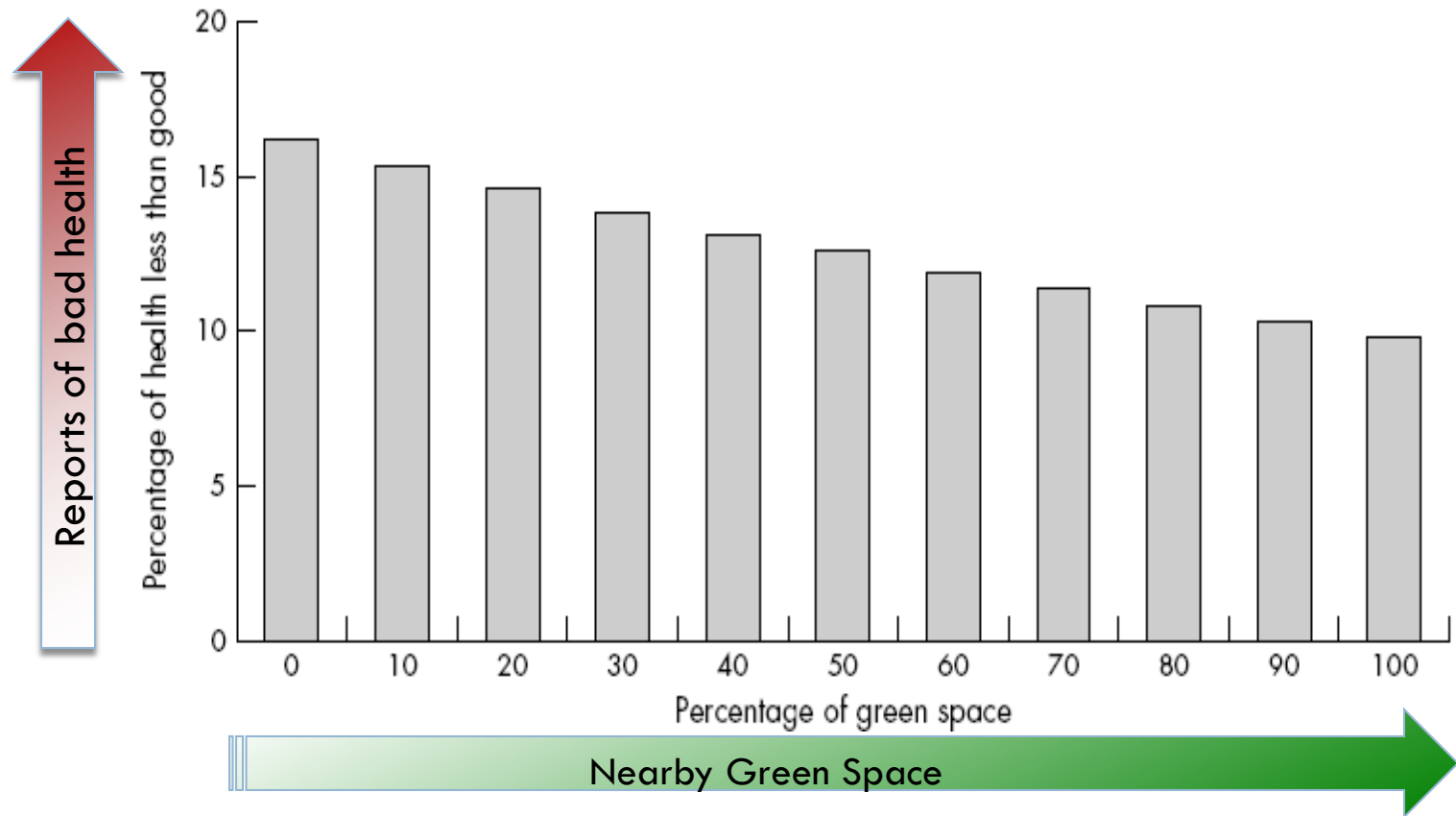
Nature is linked to health

Green space



Nature is linked to self-reported health

In a study of more than 250,000 people, Dutch researchers found an association between the % green space near home and perceived health



Maas et al (2006) Green space, urbanity, and health: how strong is the relation? *J. of Epidemiology and Community Health*, 60, 587-592.

Street trees associated with less asthma

New York City:
street tree density linked to
lower prevalence of
asthma among 4-5 year
olds, even after adjusting
for confounders.



Lovasi et al (2008). Children living in areas with more street trees have lower prevalence of asthma. *J. Epidemiol Community Health*, 62; 647-649.

A natural experiment...

Examined treed v. barren spaces in Chicago public housing.

- Architecturally identical buildings
- Residents did not have choice in where they lived
- Trees around some buildings thrived, around others died

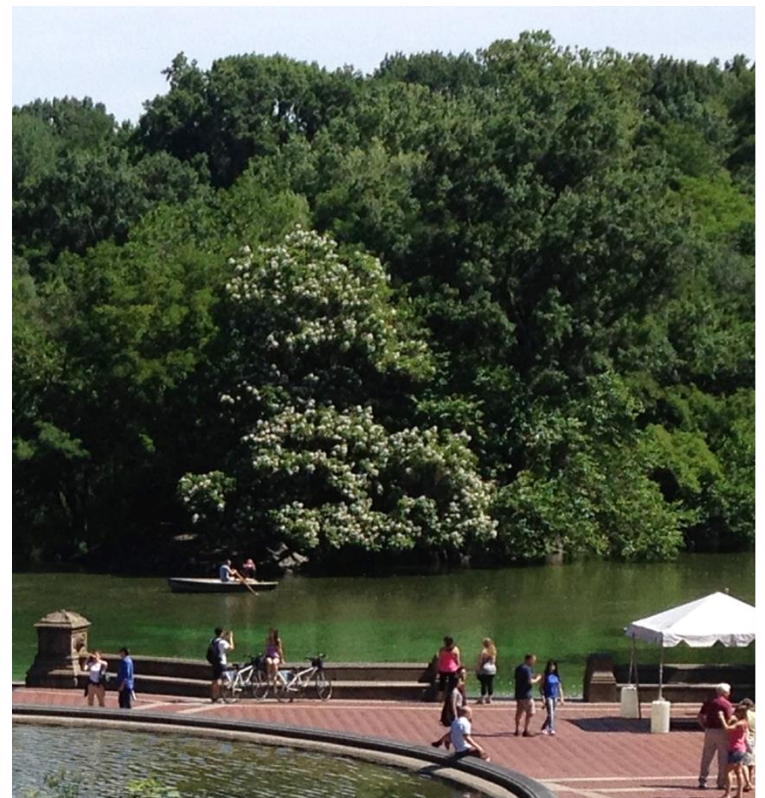


Nature fosters social interaction

Treed spaces within urban public housing communities are associated with more use & social interaction (Coley et al., 1997).

Twice as many people used green spaces compared to barren spaces (Sullivan et al, 2004)

Green spaces support children's play and intergenerational interaction (Faber Taylor et al., 1998)



Nature fosters community cohesion

In Chicago public housing:

Residents living in buildings surrounded by trees had greater social cohesion – they knew each other better and had more social support from their neighbors (Kweon et al, 1998; Kuo et al., 1998)



Images from Kuo et al (1998)

Vegetation is associated with less crime

Crime is lower in areas of high vegetation (i.e., grass and high-canopy trees) than in areas of low vegetation (controlling for building height, number of apartments per building, vacancy rate).

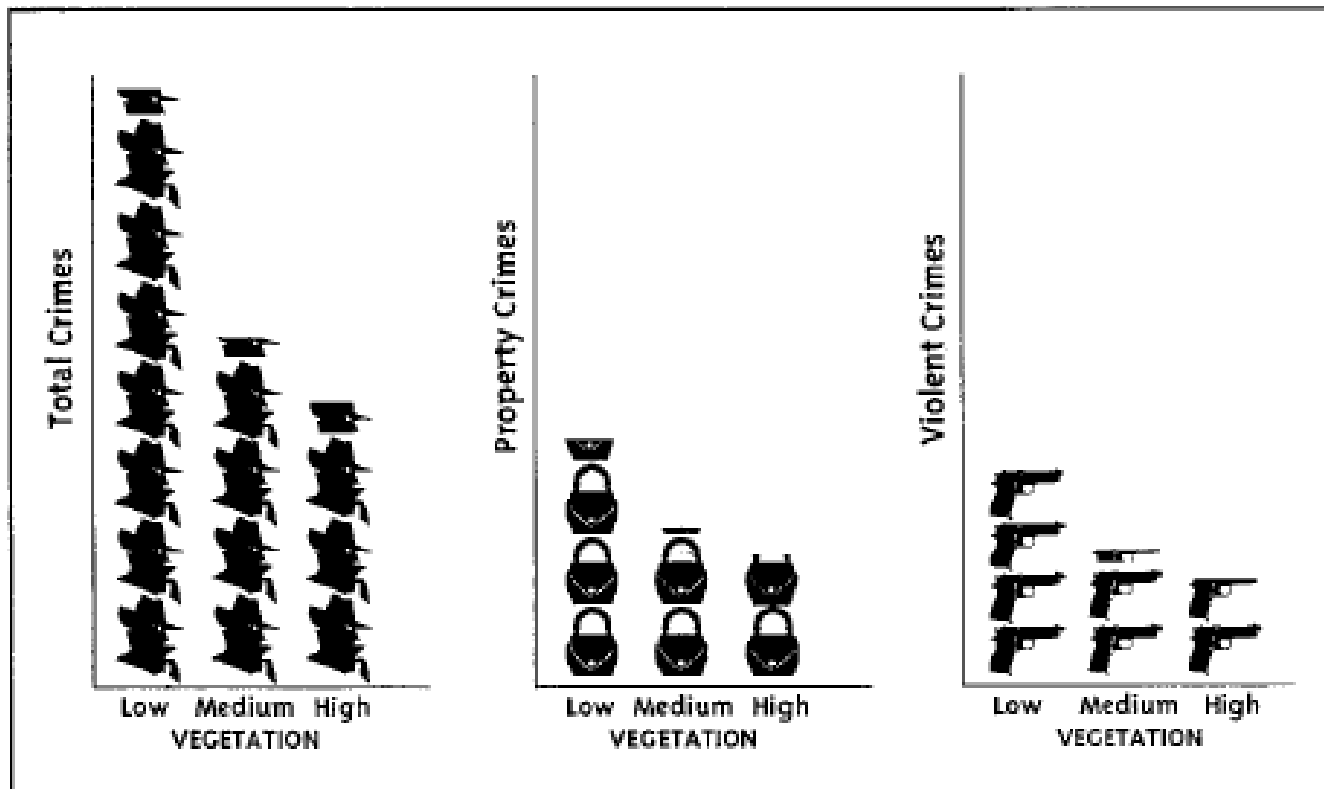
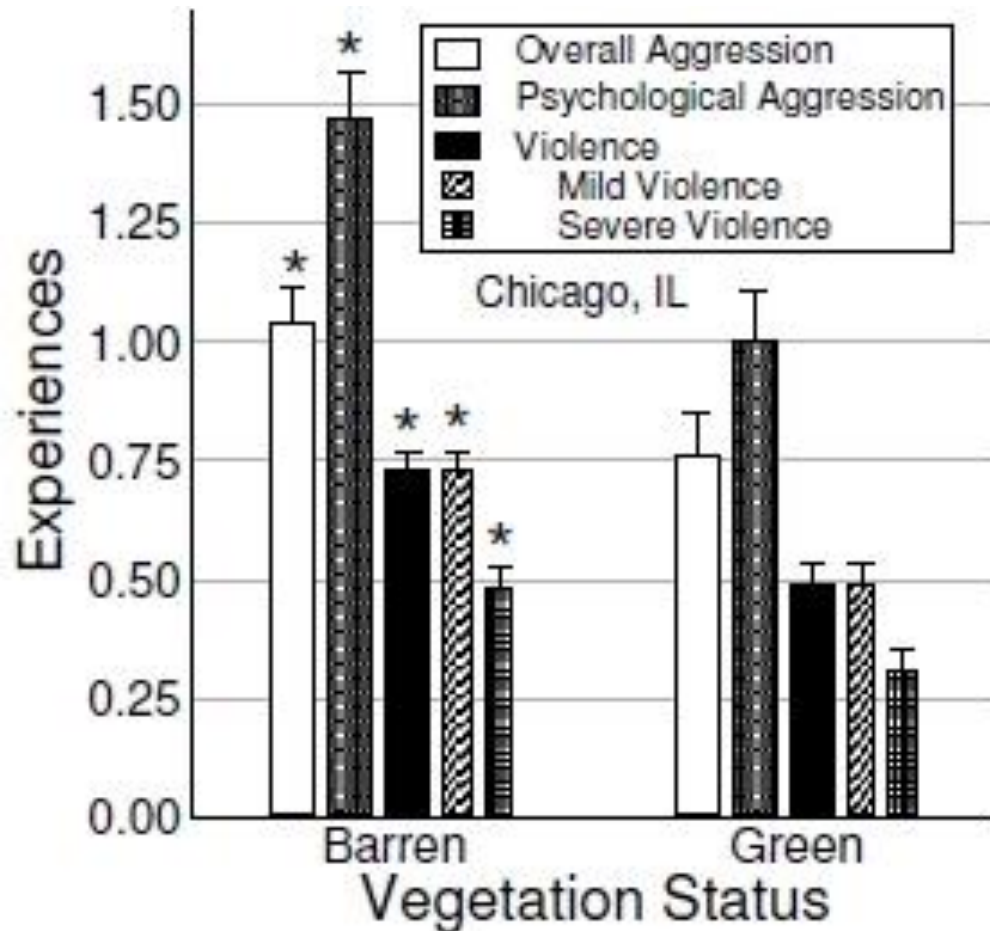


Figure from Kuo + Sullivan (2001b)

Nature linked to less domestic violence



Nature → less aggression

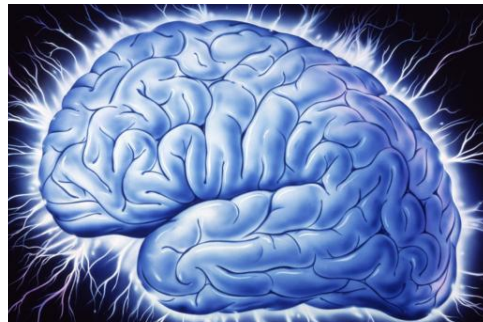
Figure from Kuo + Sullivan (2001a)

Nature linked to less domestic violence

Nature → ? → less aggression

The connection is explained by of cognitive restoration:

Nature → better Cognitive Function → less aggression



Attention Restoration Theory: Nature enhances recovery from “directed attention fatigue” (Kaplan + Kaplan)

Nature bolsters cognitive functioning

College students with natural views from their dorm rooms perform better on cognitive tasks than those with views of streets, buildings, & cars.



Nearby nature boosts cognitive functioning

Children who moved to greener neighborhoods showed corresponding increases in cognitive functioning (Wells, 2000)

Wilderness vacations (v. “staycation” or urban vacation); & nature walks → improved performance on proofreading and other cognitive tasks (Hartig et al, 1991; Berman et al., 2008)



Natural views from school linked to success

101 public high schools in Michigan: views of trees & shrubs from the cafeteria & classrooms associated with higher standardized test scores, graduation rates, percentage of students planning to attend college, and few occurrences of criminal behavior.



Matsuoka, R. (2010). Student performance and high school landscapes: Examining the links. *Landscape and urban planning*, 97, 273-282.

Nature reduces attention deficits symptoms

Several studies document that time spent in nature reduces symptoms among children with attention deficits.



Neighborhood greenness & lower BMI's

Children in greener neighborhoods were less likely to increase their BMI's (Bell et al., 2008)

Neighborhoods with more park area associated with more physical activity among children (Roemmich et al., 2006, 2007)

and among adults (Ellaway et al 2005; Deshpande et al, 2005; Giles-Corti et al., 2005)



Bell, Wilson & Liu (2008). Neighborhood greenness and 2-year changes in body mass index of children and youth. *American Journal of Preventive Medicine*, 35 (6), 547-553. Roemmich et al. (2006) Association of access to parks and recreational facilities with physical activity of young children. *Preventive Medicine*, 43, 437-441; Roemmich et al., (2007). The built environment... *Annals of Behavioral Medicine*, 33 (1), 29-38. Ellaway et al 2005; Deshpande et al, 2005; Giles-Corti et al., 2005

School gardens promote physical activity

A 2-year study of school gardens: children with school gardens spent more of the school day in moderate-to-vigorous physical activity than students in schools without gardens.



Wells, Myers, & Henderson (under review). School gardens and physical activity. A randomized controlled trial of low-income elementary schools.

If the last 2 million years of our species' history were scaled to a single human lifetime of 70 years, then the first humans would not have begun settling into villages until 8 months after the 69th birthday. ... We have broken with long-established patterns of living rather late in our life as a species

- Howard Frumkin (2001), page 235



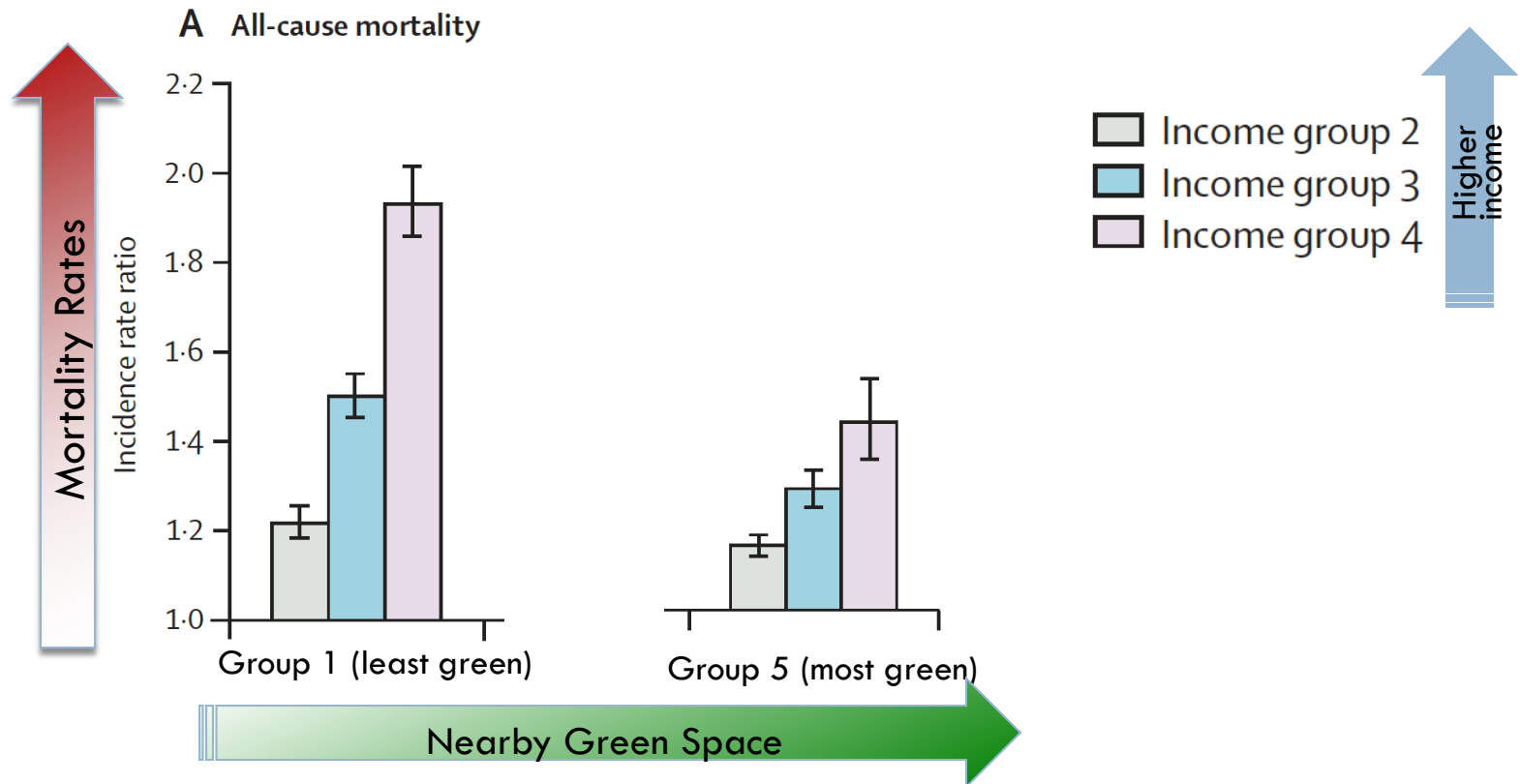
Nature moderates health disparities



bolsters resilience

Nature dampens health disparities

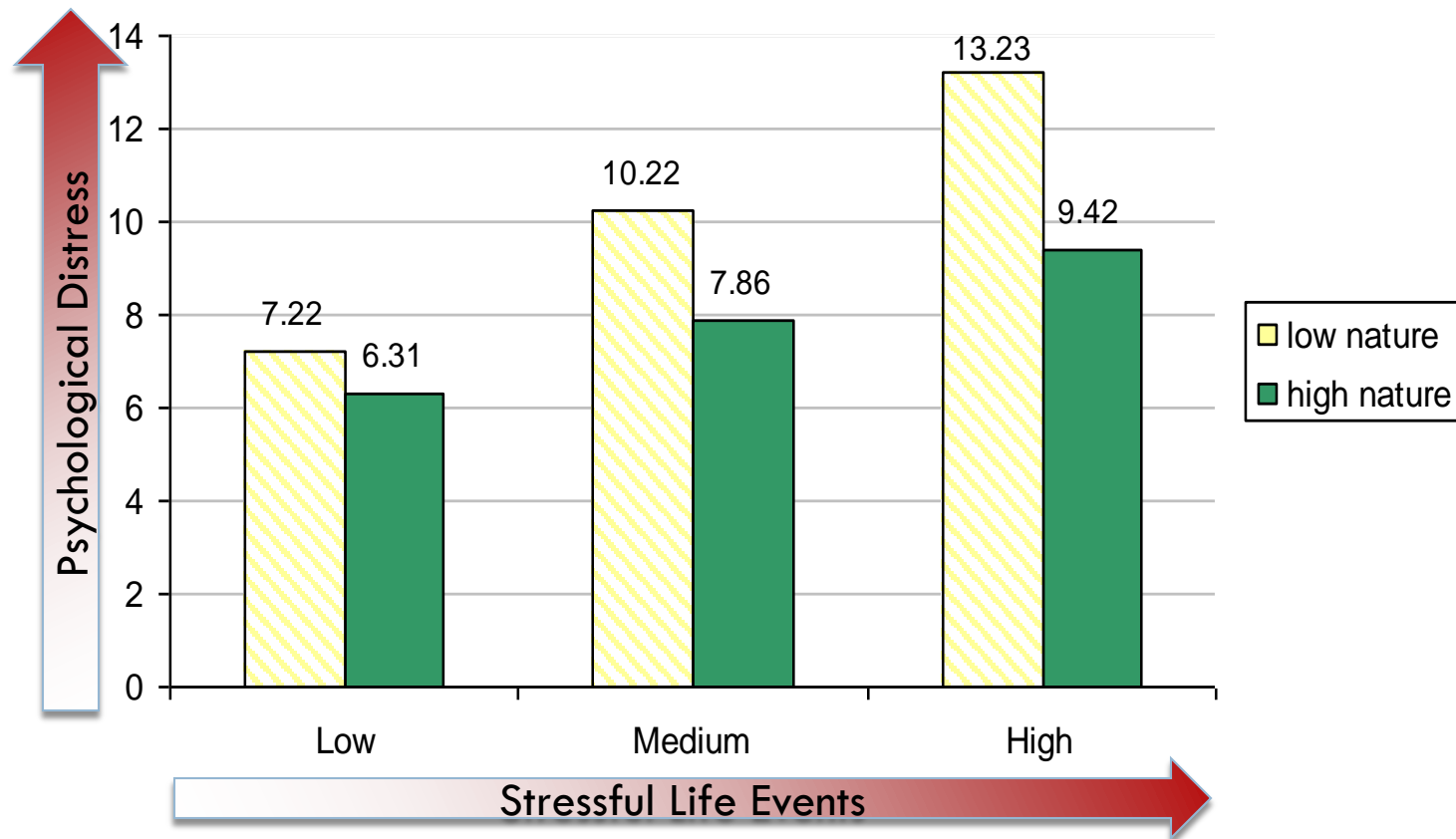
Green space reduces the influence of poverty on health.



Mitchell & Popham (2008). Effect of exposure to natural environment on health inequalities: An observational population study. *Lancet*, 372: 1655–60

Nature as a buffer: green boosts resilience

Green space reduces the effect of stress on mental health.



Nature Access & health equity/social equity

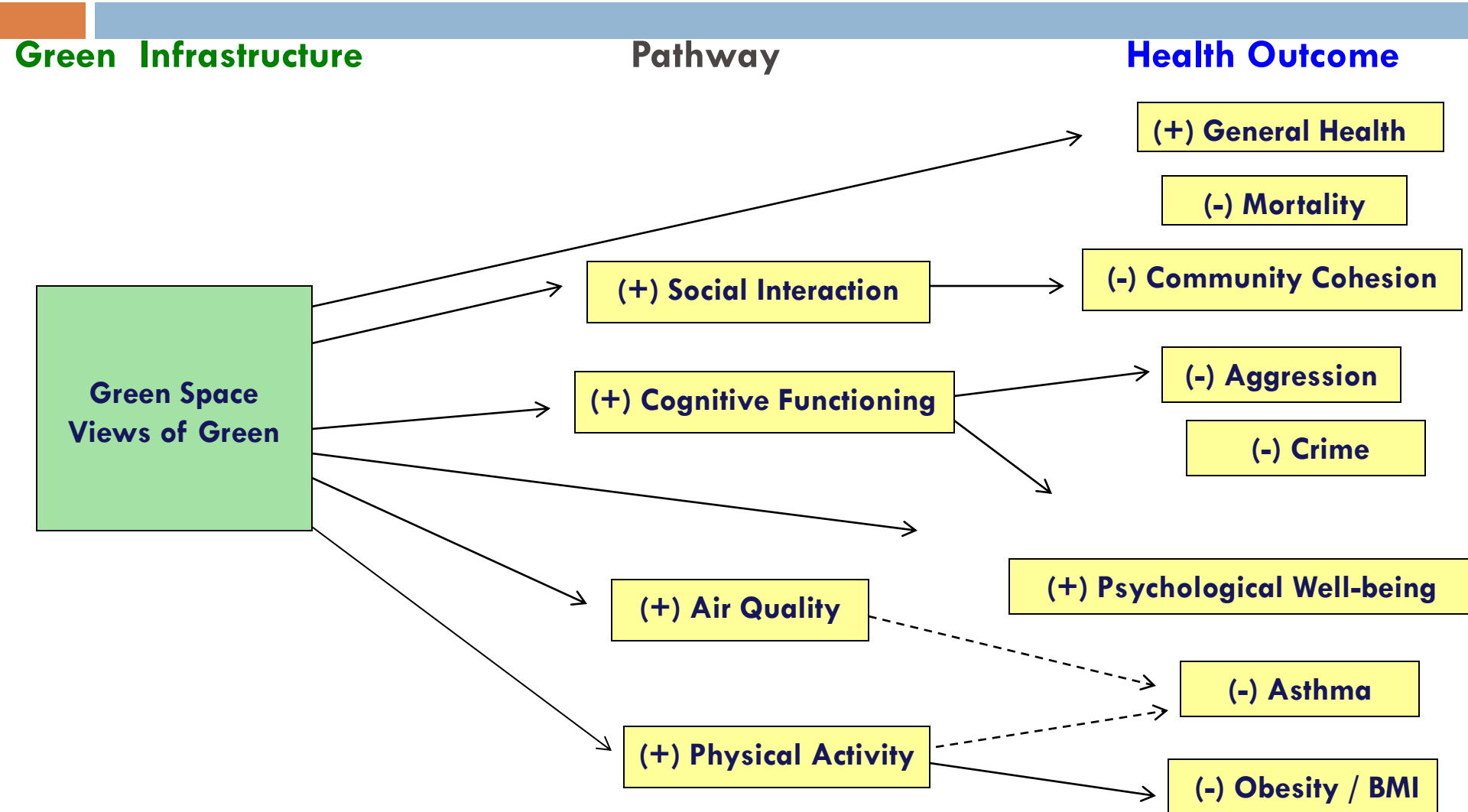
- Nature access can help mitigate linkage: poverty / disadvantage → health.



And yet, *lack* of access to nature is often one more inequity

- ▣ Poor children – access to fewer yard² park space than non-poor children in NYC
- ▣ Whites – access to more park acreage than blacks in Baltimore
- ▣ Street trees – less prevalent in black, low-income, renter neighborhoods in Tampa, FL

Green Infrastructure: Pathways to Health



II. Green Infrastructure



green roofs

green alleys

green streets

... green program

Chicago, IL: Green City

Striving to become the U.S.'s greenest city:

- ▣ Mayor- & cabinet-level leadership
- ▣ Action plans with measureable outcomes
- ▣ Incentives for innovation & adoption of green practices
- ▣ Linking green infrastructure w/ green economy -- to improve business climate and quality of life



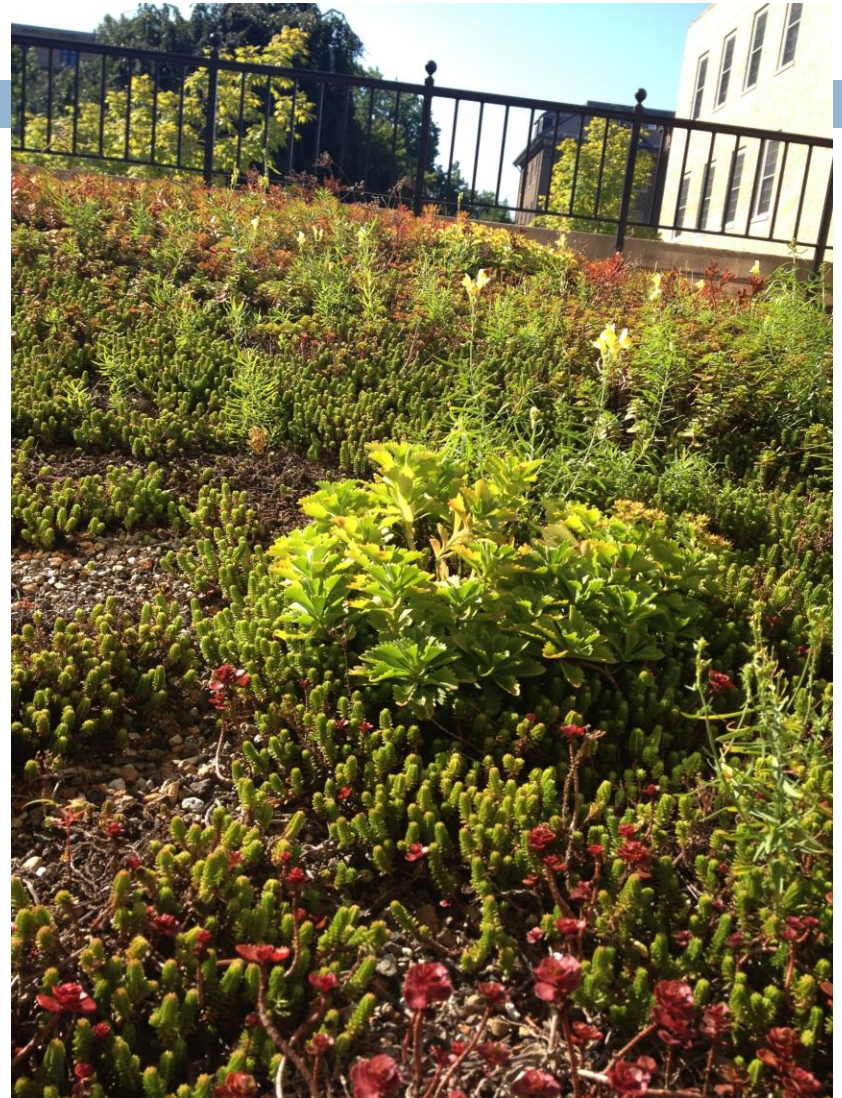
Chicago

Green Roofs: Green on Top



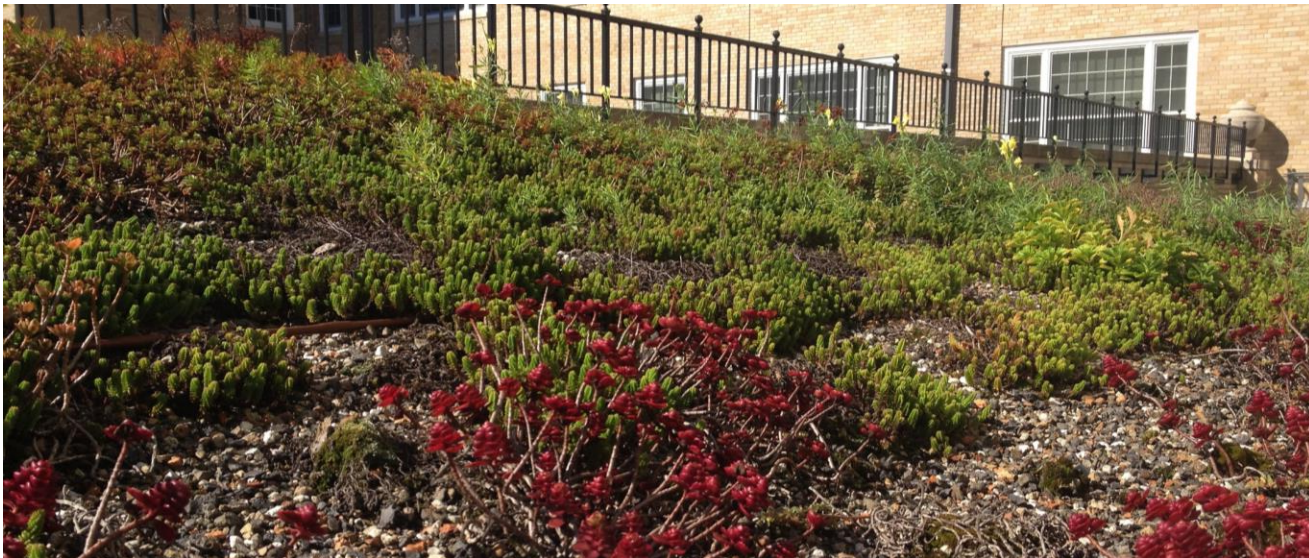
Green Roofs

- Offer economic, environmental & societal benefits
 - ▣ Stormwater management
 - ▣ Reduce urban heat island
 - ▣ Aesthetics / natural views / quality of life
 - ▣ Roof longevity



Green Roofs

- Reduce flooding & combined sewer overflows
- Reduce water runoff from roof – up to 65%
- Can add 3 hours to time it takes runoff to leave roof



Chicago

Green Alleys: Green In Between...



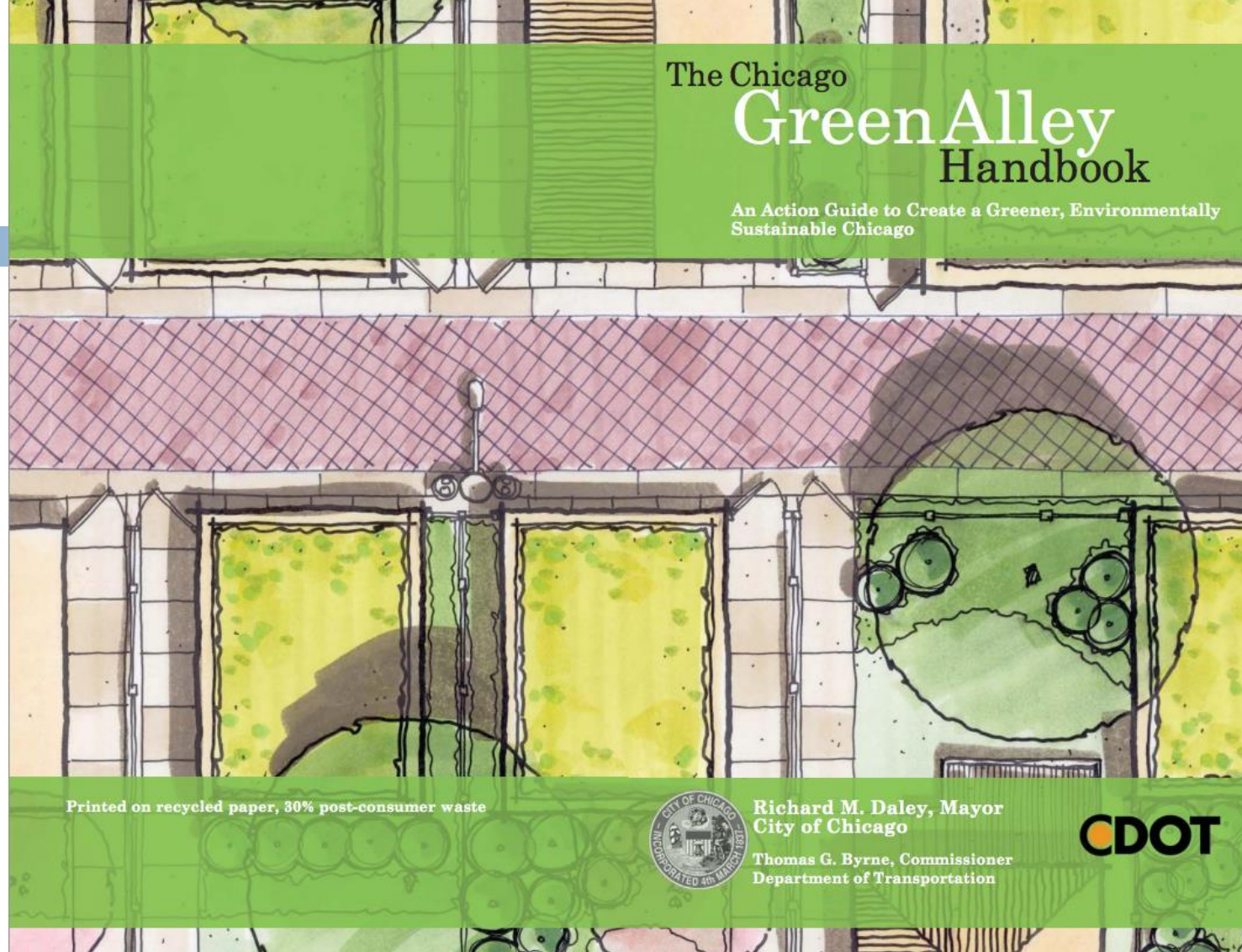
Greening & activating downtown alleys as public spaces

Green Alleys



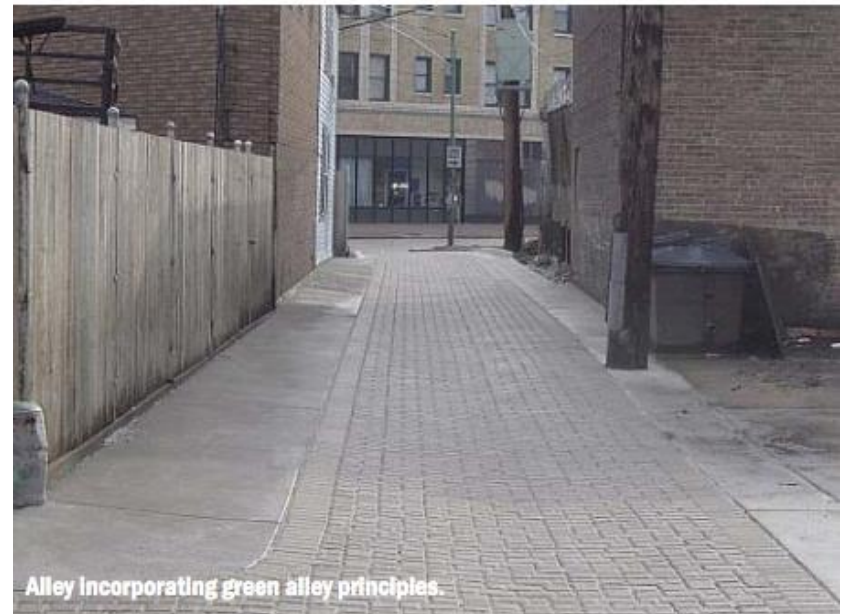
- Chicago's goal: make 1,900 miles of alleys permeable, green
- Reduces storm water run off
 - ▣ → reduces pollution of lakes & rivers
 - ▣ → reduces need for bigger water treatment plants
 - ▣ → reduces flooding; enhances storm preparedness

Green Alleys



- removed asphalt from one 630 x 16 foot alley
- Infiltrates & retains water = 3", 1-hour rain

- Porous pavement or pavers allow up to 80% of rainwater to return to filter into the soil, refill the aquifer and ultimate into the lake.



Detroit Alleys



Before



After

Green Streets



Portland, Oregon

- Manage storm water runoff from street through vegetated planters

Green Streets

Green Street facility

- Small rain garden collects stormwater runoff from streets
- Keep stormwater out of local streams and sewer system
- Increase urban green space
- Volunteer green street steward



www.portlandoregon.gov/bes/GreenStreets.

<http://www.portlandoregon.gov/BES/article/414873>

Parks Rx: Prescribing Nature

- Docs in the Park, Baltimore MD
physicians + hospitals partner with
Parks + Rec to help families
engage in nature.
- Rx Play, Portland links overweight
youth to the parks department
through physician referrals



CONCLUSIONS



Nature Matters.

Nature has broad ranging benefits to human health and well-being.

Nature can mitigate health disparities; if access is equitable.

Green infrastructure.

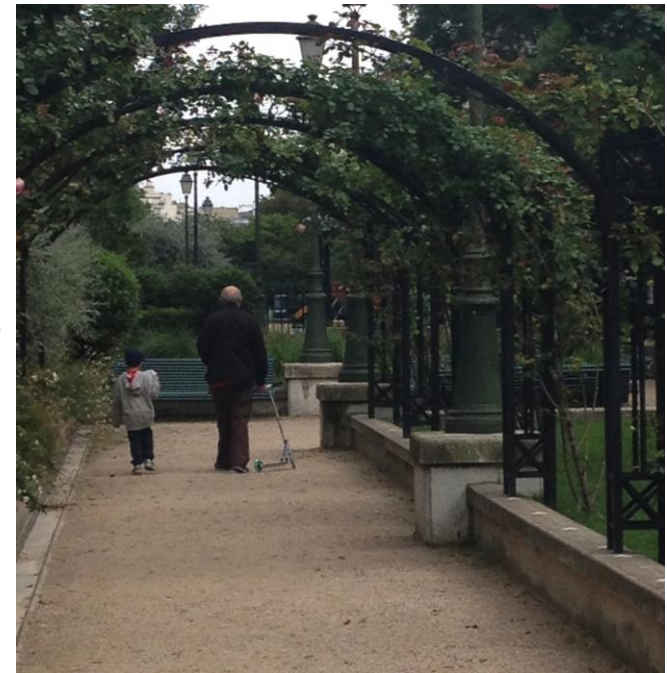
Contributes to residents' access to nature, health & well-being

Green infrastructure...

“... an essential service for all...”

Regarding NYC parks, councilmember Levine advocated:

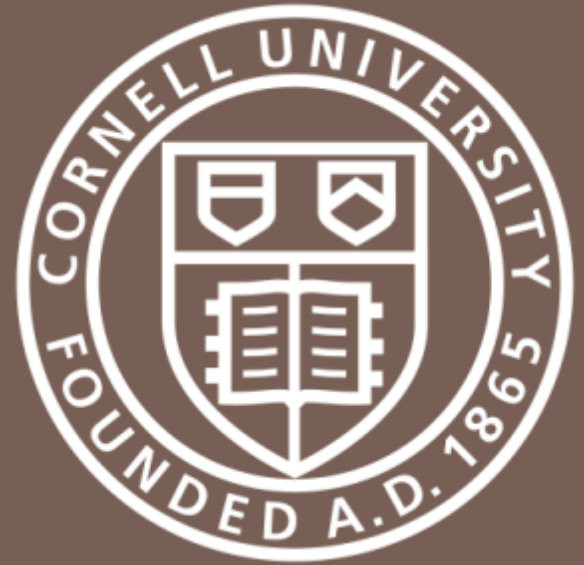
“we have to push back on the idea that parks are a luxury and an amenity. We need to make the case that they are an essential service for all...” “We should be describing our parks as essential infrastructure, just as we describe our subways” (Mark Levine in Dolesh, 2014, p. 4)



Thank you

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The enjoyment of scenery employs the mind without fatigue and yet exercises it; tranquilizes it and yet enlivens it; and thus, through the influence of the mind over the body gives the effect of refreshing rest and reinvigoration to the whole system.

- Frederick Law Olmsted, 1865

