

# Green Prescription: The Link Between Urban Tree Canopy Cover & Health Behaviors and Outcomes

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# Collaborators

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- Teri Duarte, MPH, WALKSacramento
- Greg McPherson, PhD, US Forest Service
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- Glennah Trochet, MD, Former Sacramento County Public Health Officer
- Jared Ulmer, AICP, MPH, PhD (candidate), Urban Design 4 Health
- Kathleen Wolf, PhD, University of Washington

# Financial Support



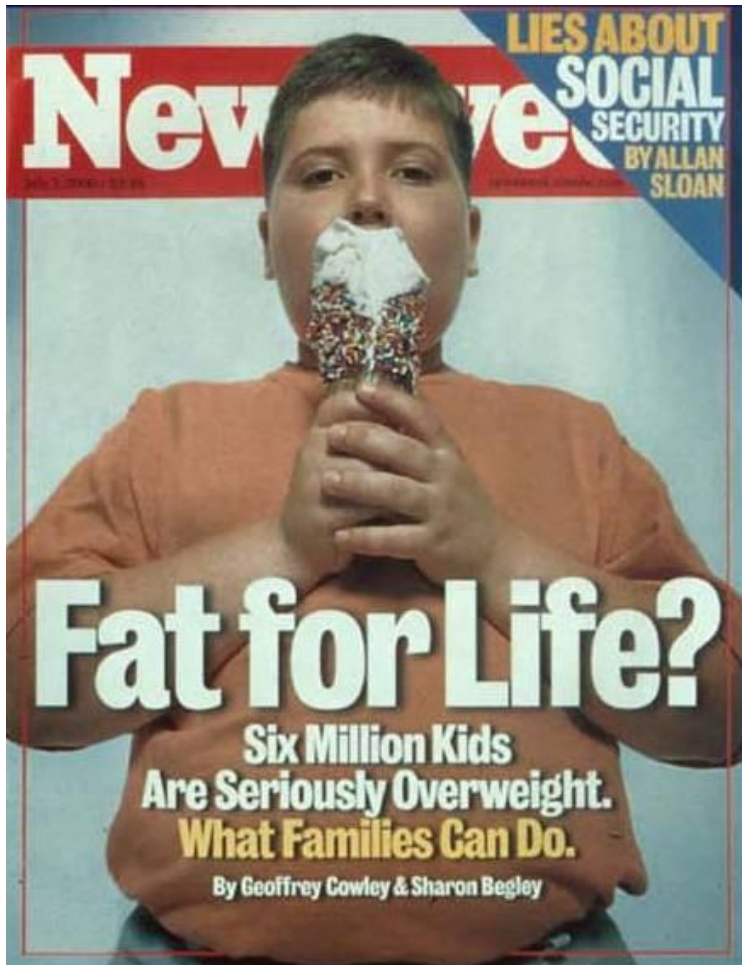
Health is the state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.

— World Health Organization





# Our Health and the Health of Our Children are Hanging in the Balance



- Over 1.4 million lives were lost due to heart disease, cancer, chronic lower respiratory diseases, and stroke — CDC, 2011
- About 68% of adults and 33% of children and teens are overweight or obese — NHANES, 2009-2010
- Lifestyle habits play a major role
- The most common chronic diseases are costing the economy more than \$1 trillion annually — Milken Institute, 2007



# Busy, Sedentary, and Exhausted



# Stressed Out





# Marketing, Marketing Everywhere!



# Walking the Dog Takes on New Meaning



# Escalators and Fitness?





# And the Commute Goes On and On...



# Community Design Matters



Vs.



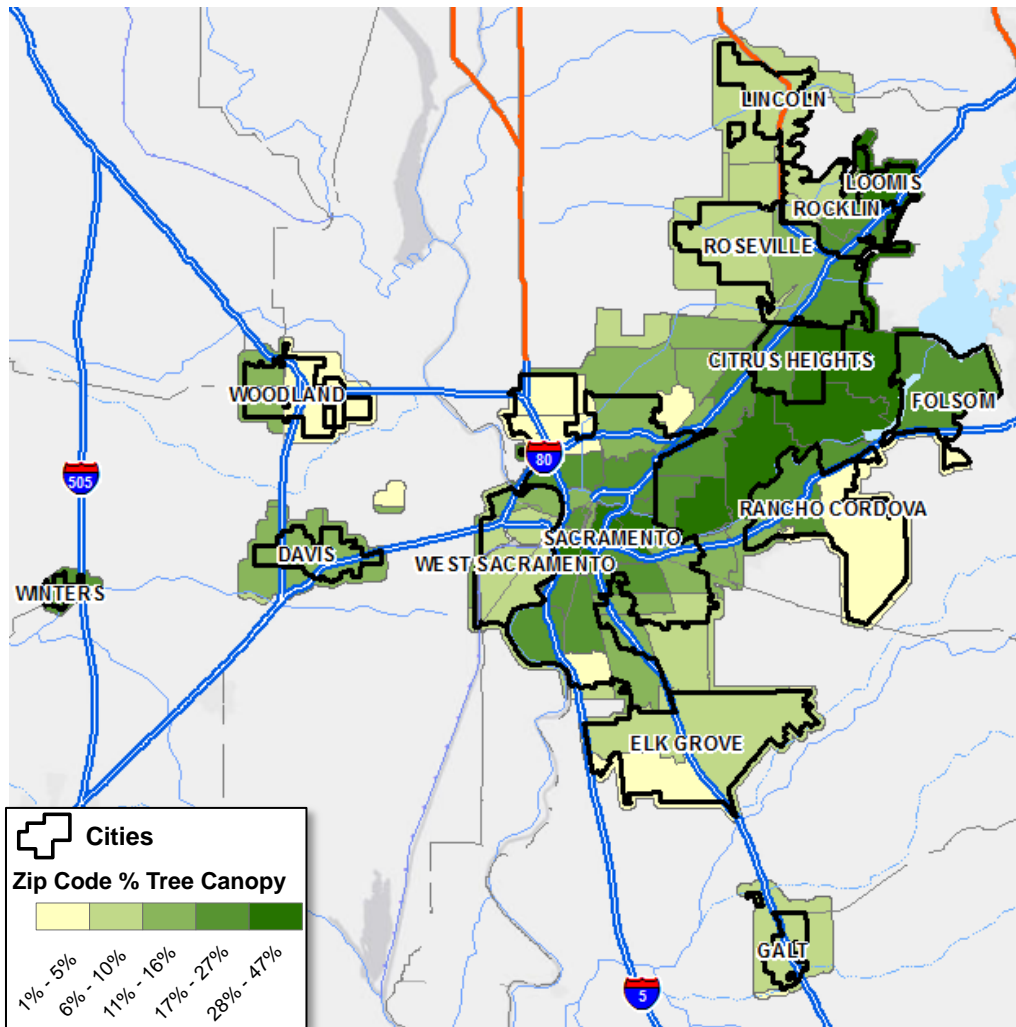
# Green Prescription



# Specific Aims

1. Explore the relationships between neighborhood tree canopy in the greater Sacramento region and multiple measures of health among adults, teens, and children
  - Physical activity
  - Body mass index
  - Type 2 diabetes
  - Cardiovascular disease
  - Asthma
  - Mental/emotional health
  - Attention Deficit Hyperactivity Disorder
  - Social cohesion
  - General health status
2. Estimate the differences in health outcomes of two hypothetical neighborhoods, one with 18% tree canopy cover and the other with 28%

# Study Area

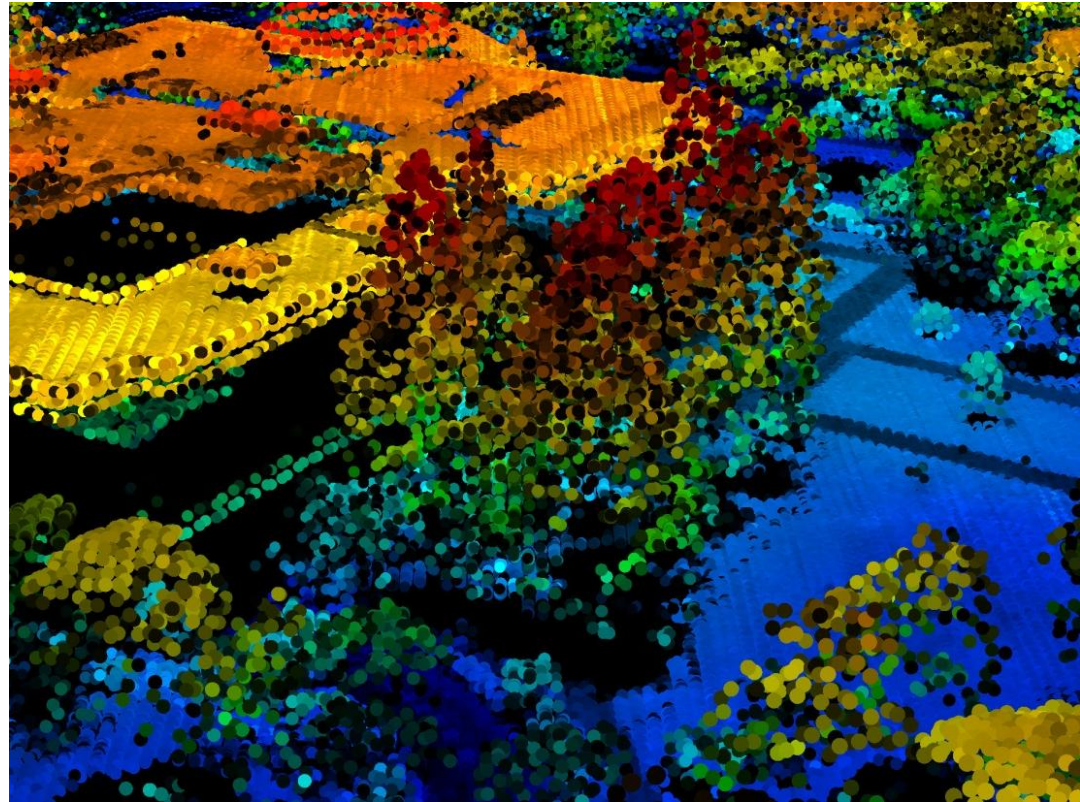


# Methods

- Health behavior and outcome measures
  - California Health Interview Survey (CHIS)
    - Largest state health survey in the United States
    - Samples over 50,000 California households every two years
    - Statistically representative of the California population
    - Used 2003, 2005, 2007, and 2009 CHIS survey results

# Methods

- Tree canopy measure
  - Light Detection & Ranging (LiDAR) and high-resolution satellite imagery (1 meter) in the urbanized areas of the Sacramento region
    - Central Valley Floodplain Evaluation and Delineation Program, 2008
    - National Agricultural Imagery Program, 2009



# Methods

- Multiple regression models were used to estimate the association between tree canopy cover and each health behavior/outcome
- Adjusted for selected covariates
  - Demographics (age, gender, race/ethnicity)
  - Socioeconomic status
  - Household composition (size, number of children, marital status)
  - Housing (type of dwelling, owner/renter status, length at current residence)
  - Smoking status
  - Health insurance status
  - Walkability of neighborhood, etc.







# Results

- Increased neighborhood tree canopy was associated with self-reported better general health among adults, teens, and children
- The greater the neighborhood tree canopy:
  - The less likely children, teens and adults were to be overweight or obese
  - The more likely adults were to participate in vigorous physical activity
  - The more likely adults experienced higher levels of social cohesion
  - The less likely adults were to have asthma
  - The more likely teens had improved mental health

# Results

- If two neighborhoods are the same in all respects, but one has 28% tree canopy cover and the other 18% canopy cover, do the residents differ in their health?

Health measure	Adults	Teens	Children
Number of people either overweight or obese	-10%	-23%	-13%
Number of people obese	-18%	-15%	-20%
Number of people currently suffering from asthma	-10%	-3%	-11%
Number of adults with Type 2 diabetes	-20%	NA	NA
Number of adults participating in vigorous physical activity	+11%	NA	NA

NA = not applicable (i.e., this was not a component of the study)

# Conclusions

- Greater tree canopy cover is important to health
  - Trees contribute to healthier lives and better health outcomes: general health, healthier weight, activity levels, social cohesion, asthma, and mental health
  - The link between health and environment is supported by a growing body of scientific evidence
  - Trees play a role in improving the environment: removing air pollutants, reducing storm water runoff, reducing energy use, offering habitats to wildlife, and so much more

Nurture trees now in the ground and plant new ones







“When one tugs at a single thing in nature, he finds it attached to the rest of the world.”

— John Muir