

Urban Sustainability and Health

The Search for Co-Benefits

Charles Branas

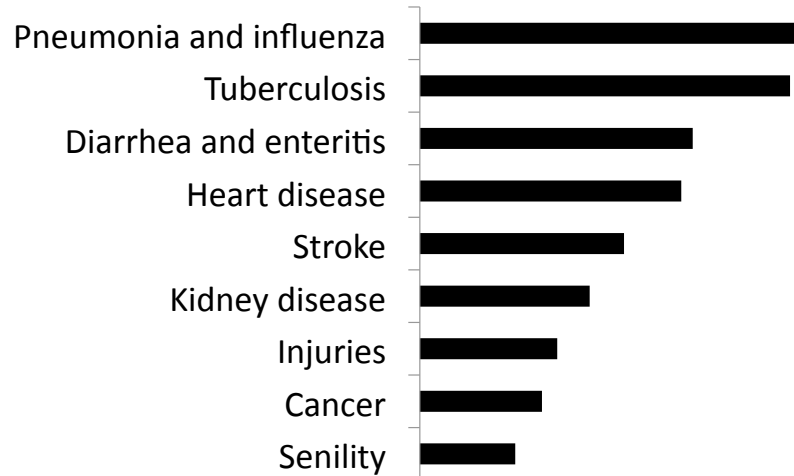
University of Pennsylvania

Philadelphia, USA

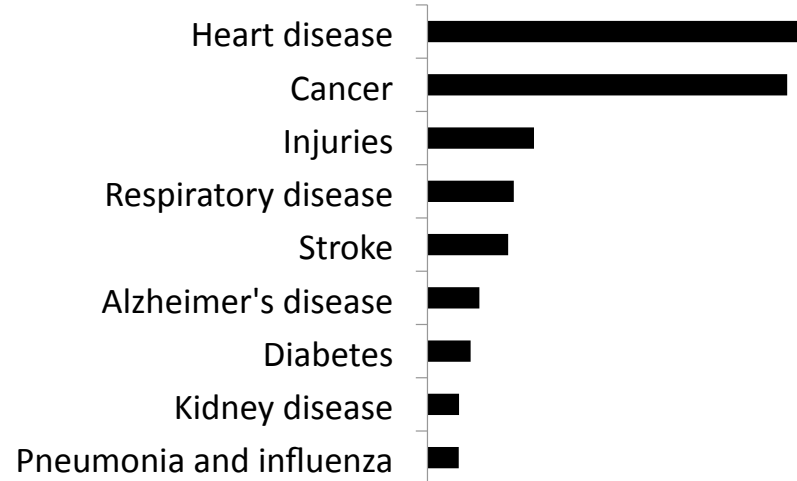


“Health is not merely the absence of disease”

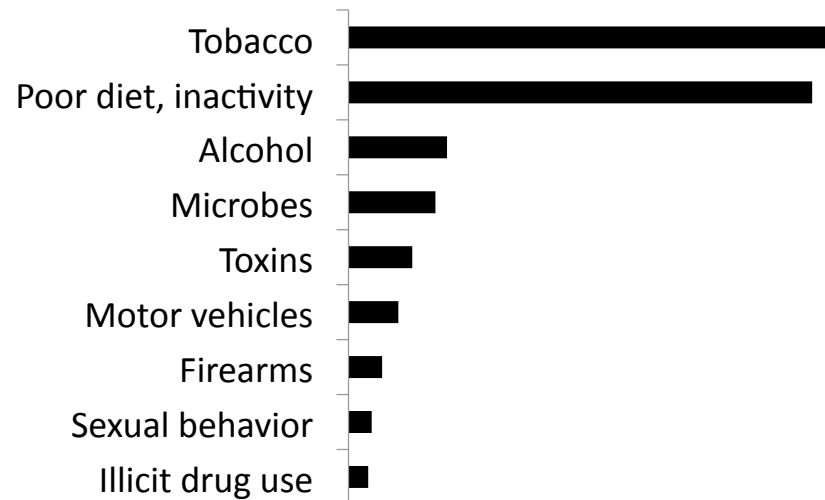
Leading Causes of Death, 1900



Leading Causes of Death, 2010



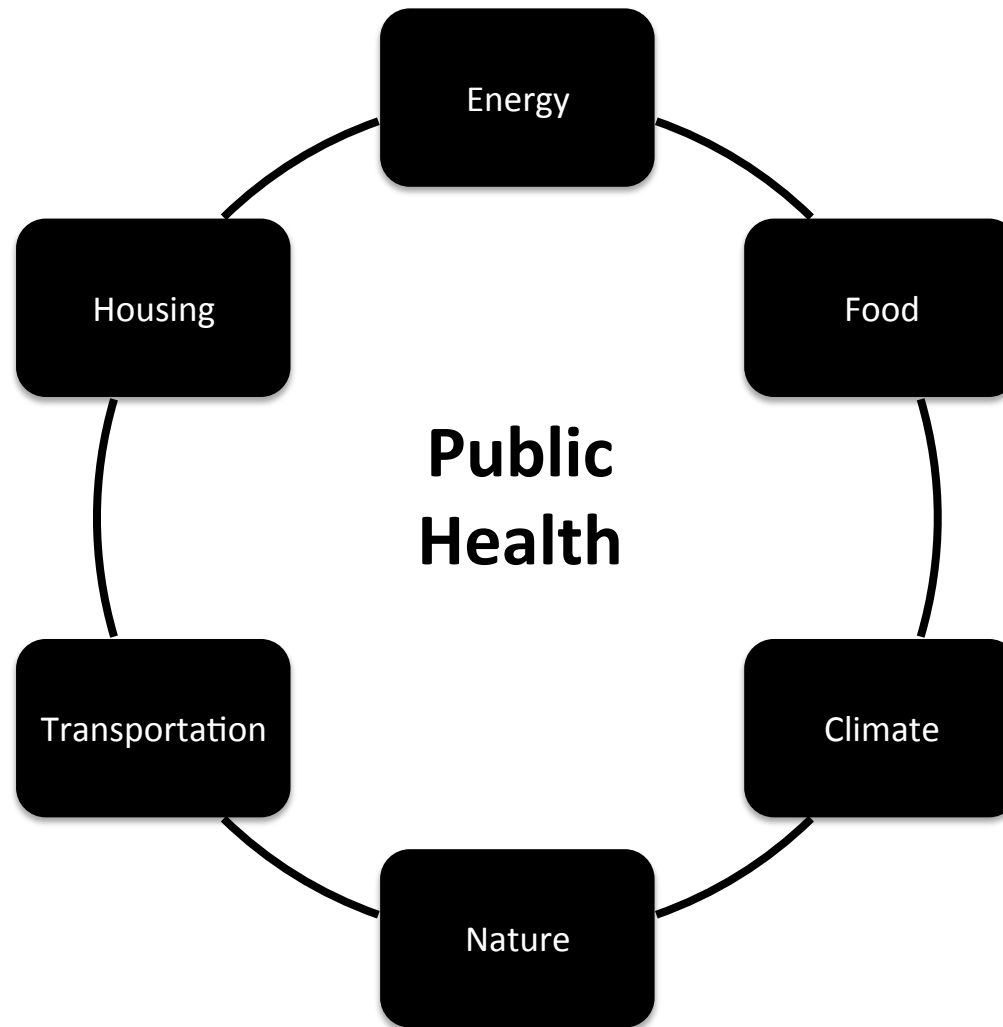
Actual Causes of Death, 2000



U.S. rates
per 100K



Dimensions of urban sustainability and potential health co-benefits



Energy and health

co-benefits

- Cities create 70% of global greenhouse gas emissions
- Electricity, particularly from coal combustion, is a large and increasing contributor to GHG emissions and air pollution
- Air pollution produces childhood pneumonia, asthma, COPD, cardiovascular disease, and lung cancer
- Electricity also one of the greatest contributors to health
- Potential Initiatives
 - Policies to reduce coal combustion
 - Energy-efficient buildings, land use, and transport systems also promote active living
 - Strategies to promote cool cities such as tree plantings to shade buildings and cool the air
 - Health facilities often have extremes of very high, inefficient energy consumption



Food and health co-benefits

- Food production associated with overconsumption of saturated fat (largely from animal products), or the misuse of certain veterinary drugs may produce human obesity, coronary heart disease, stroke, cancer, and diabetes
- Animal products and processed foods affect health and environment via water, air pollution, and deforestation.
- Ruminant meat production generates substantially more greenhouse gas emissions per protein unit than plant or poultry-based protein sources, as well as excess methane emissions
- Potential Initiatives
 - Change the scale, concentration and manner in which food animals are produced, including including the use of antibiotics and arsenical drugs
 - Raise awareness of alternative, sustainable methods of food production and access for cities in the context of regional farmers, e.g. aquaculture, local produce
 - Improve community food systems via increased access to low-cost, healthy food
 - Alter food opportunities and rezone “fat traps” that are designed into daily urban living
 - Health benefits of urban farming has yet to be established

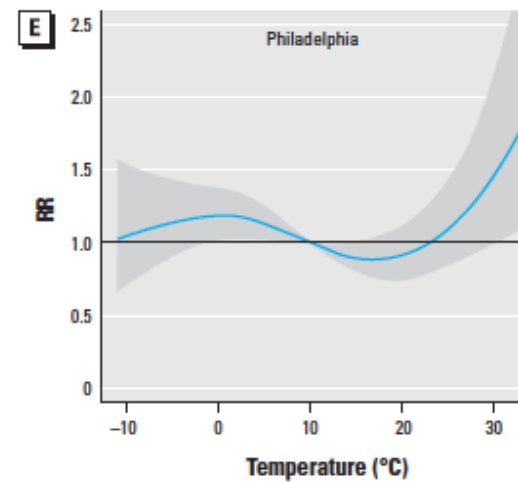
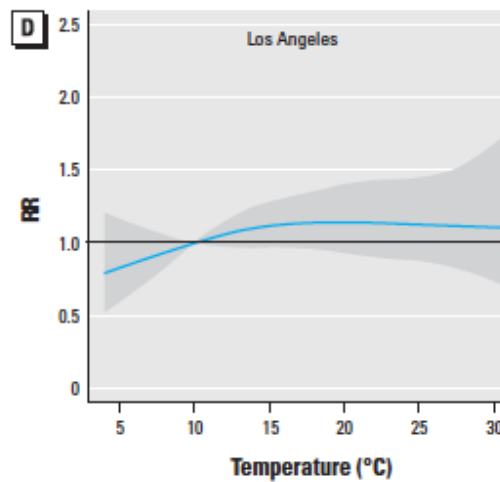
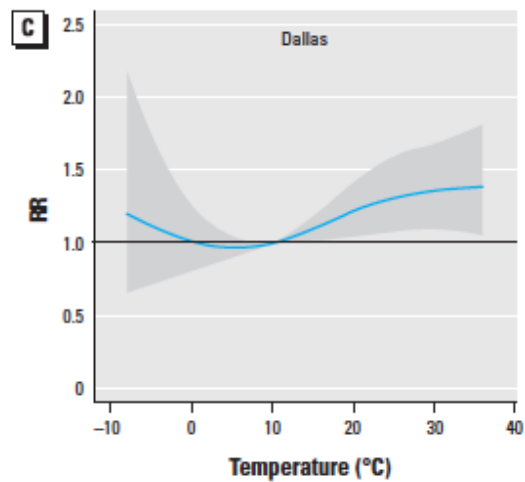
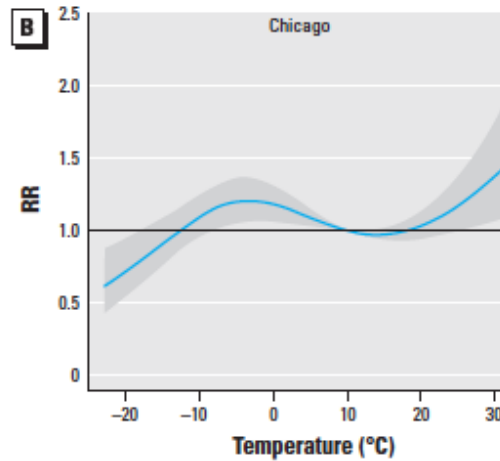
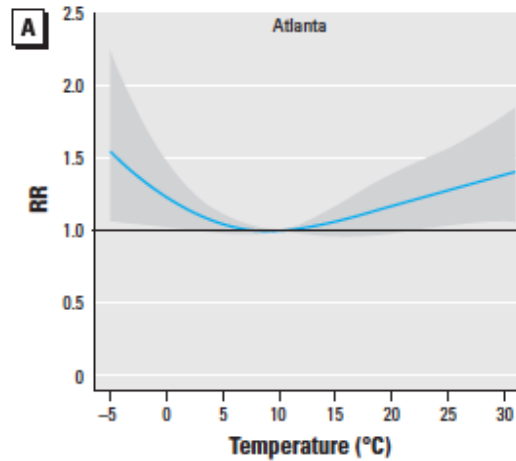


Climate and health co-benefits

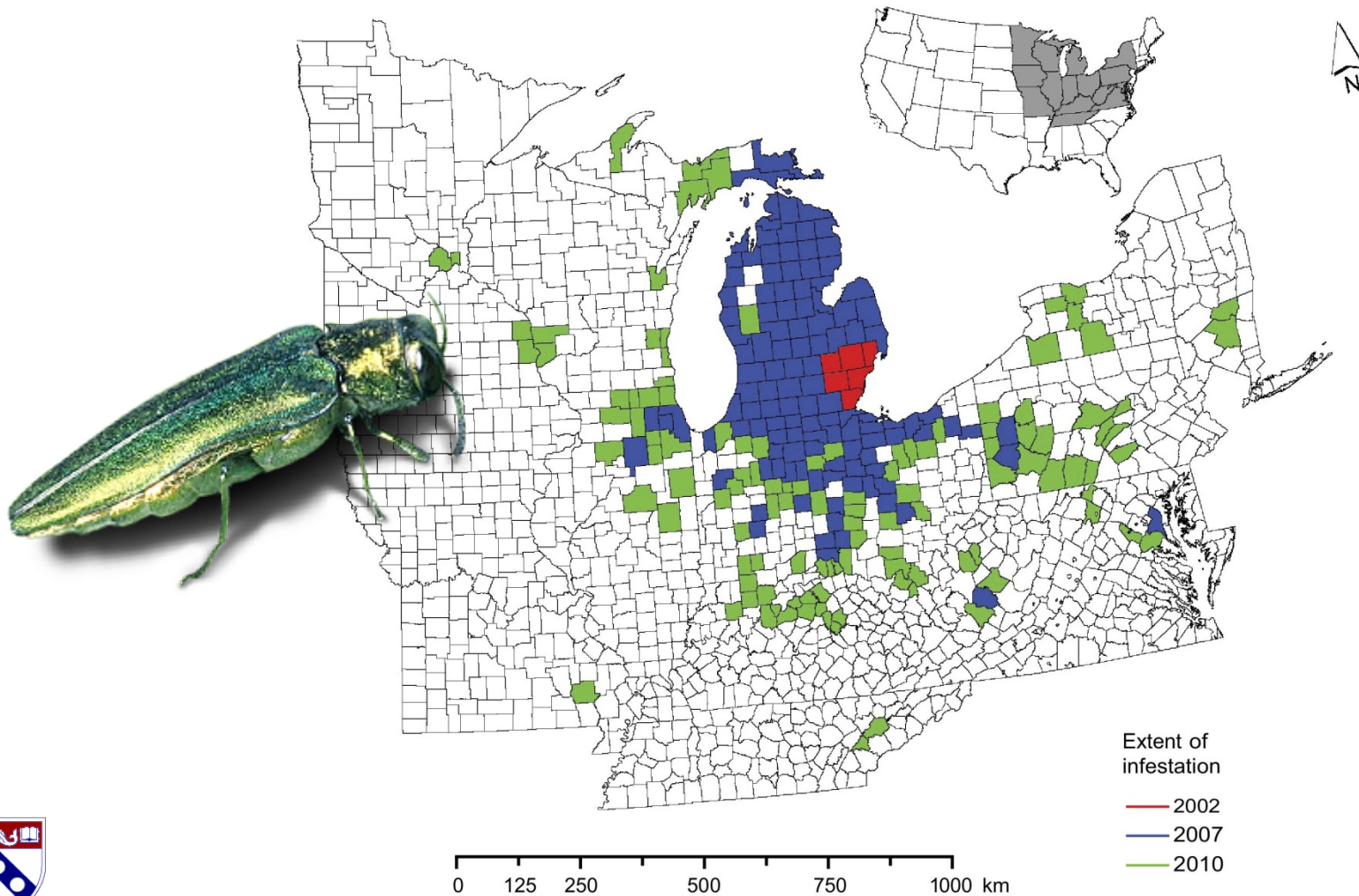
- Cities vulnerable to flooding due to impervious surfaces and sea level rise
- Cities also vulnerable to heatwaves, the biggest cause of US weather-related death, more than hurricanes, lightning, tornadoes, floods, and earthquakes combined
- About 700 US heat-related deaths a year expected to double by 2050 in cities
- Urban 'heat islands' - reduced vegetation, increased impervious, dark-color roads and rooftops add up to 10°F
- Higher temperatures may also increase kidney stone risks in cities
- “Cool Cities Initiative”
 - Roofs and pavements with reflective and lighter colored materials
 - Green roofs, pavement breaking, and tree plantings, aid in storm water management and provide shade
 - Reflective enhancements and new vegetation could reduce heat-related mortality by 40 – 99%
 - Also reduce exposure to UV radiation, skin cancer, eye disease
 - Also reduce certain crimes via beautification
 - Also reduce energy demand, greenhouse gas emissions, and air pollution



Kidney stones and heat



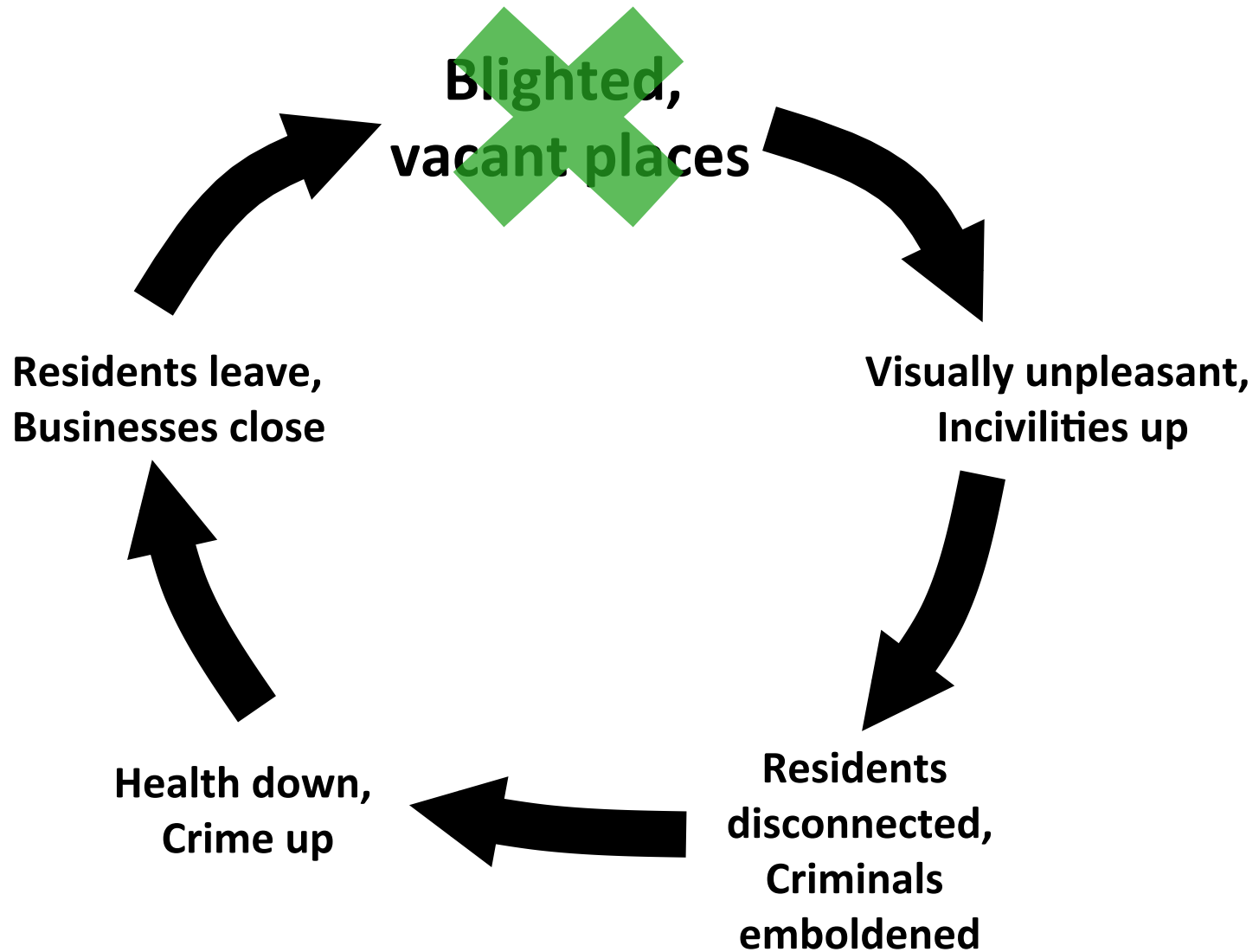
EAB beetle kills 100 million trees, cardiovascular & respiratory deaths increase



Nature and health co-benefits

- Urban 'heat islands' and heat-related deaths from reduced vegetation and impervious surfaces
- Correlational evidence that absence of nature and vegetation increases all-cause mortality and mortality from cardiovascular disease, respiratory illness, cognitive deficits, mental illness, and social anomie
- Natural experiments showing that exposure to nature and vegetation decrease stress, heart rate, inactivity, and violent crime
- Potential Initiatives
 - “Cool Cities Initiative” aid in storm water management, provide shade, reduce heat-related mortality, exposure to UV radiation, skin cancer, eye disease
 - Land banks and greening of blighted urban land lead to less stress, inactivity, and violence
 - Create appealing locations that encourage outdoor physical activity potentially increasing vitamin D, melatonin production, cognitive function, and social cohesion among members of local community
 - Land banks and greening of blighted urban land leads to local economic development
 - Potentially reduced energy demand, greenhouse gas emissions, and air pollution





Vacant Lot Greening

“Park of a Thousand Pieces”

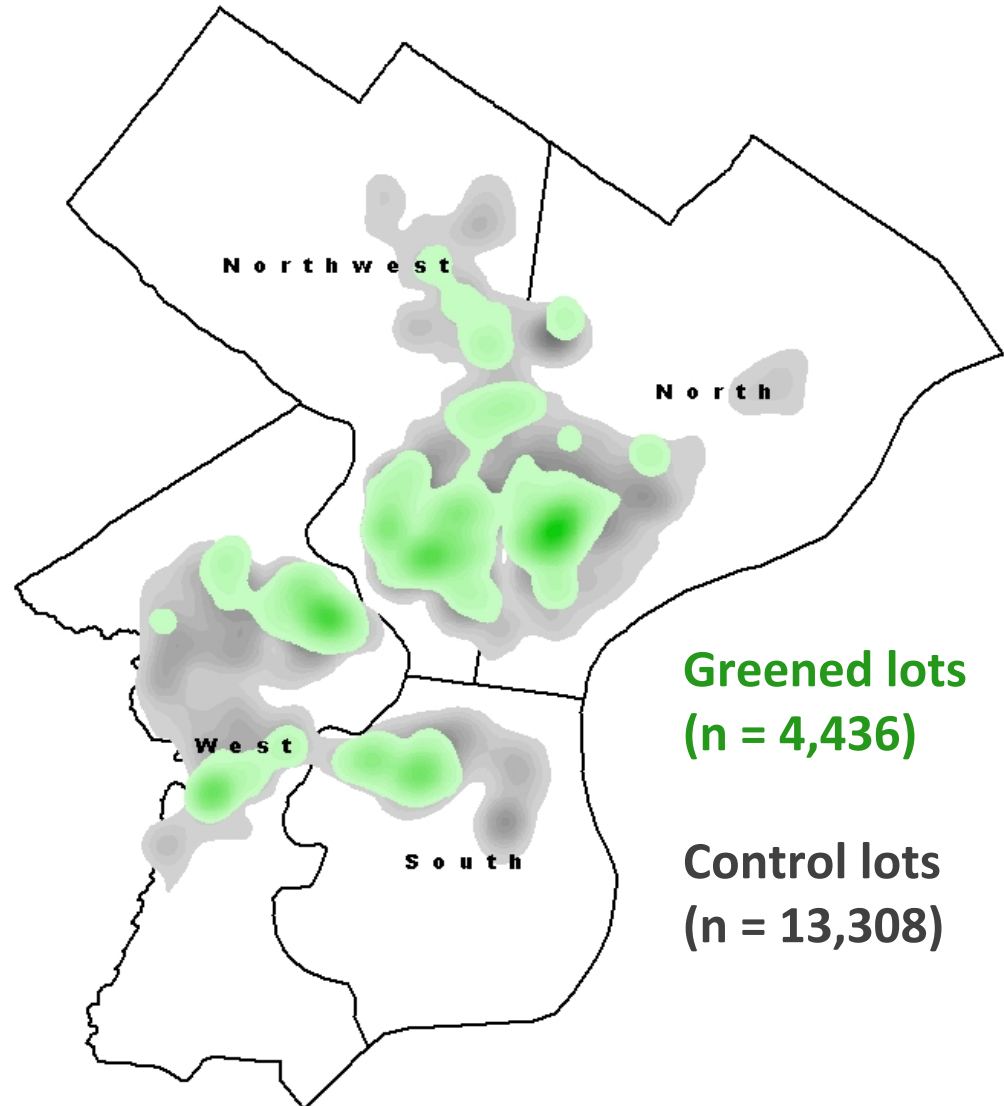


Difference-in-differences:

About 8 million ft² greened, 1999-2008



- Gun assaults
- Vandalism
- Stress
- Inactivity



Walking Trial



Significant drop in heart rate when in view of newly greened lots



Randomized community trial

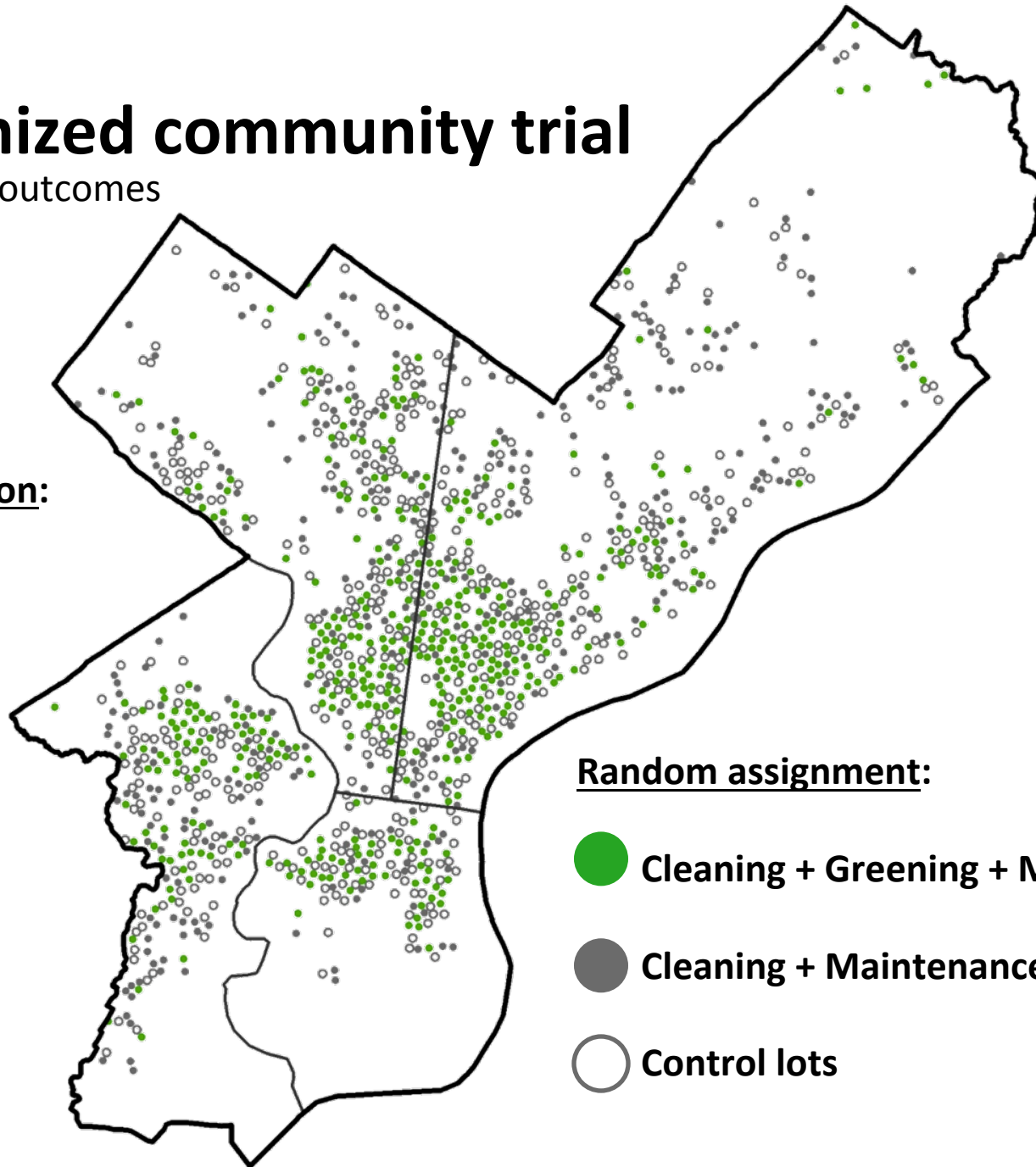
many health outcomes

Random selection:

≈ 600 / 30,000
vacant lots

Random assignment:

- Cleaning + Greening + Maintenance
- Cleaning + Maintenance
- Control lots



Transportation and health

- “Cars are the new tobacco” - private cars linked to physical inactivity, obesity, death and injury from crashes, cardio-respiratory disease from air pollution, noise, community severance and climate change
- Bad metropolitan design decisions and horizontal expansion of cities (urban sprawl) have reinforced car dependence, with ownership and use greatly increasing in recent decades
- New employment opportunities typically in low-density edge-of-town business parks predicated on high car use
- Potential initiatives
 - Reduce GHG emissions and improve health through more compact, efficient co-design of housing, employment and transport, capitalizing on high urban population densities
 - Efficient public transport and safe walking and cycling networks, combined with regulatory restrictions on high-emission vehicles
 - Active travel - elimination of short car trips (<5 miles) by walking or bicycling could improve air quality, health, and safety and save billions \$ each year
 - Taking public transport is about one day of exercise a week and has been shown to reduce obesity and BMI
 - Roadway redesign, “road diets” greatest contributor to safety and injury prevention
 - “Driving ambivalence” among millennials who are returning to cities

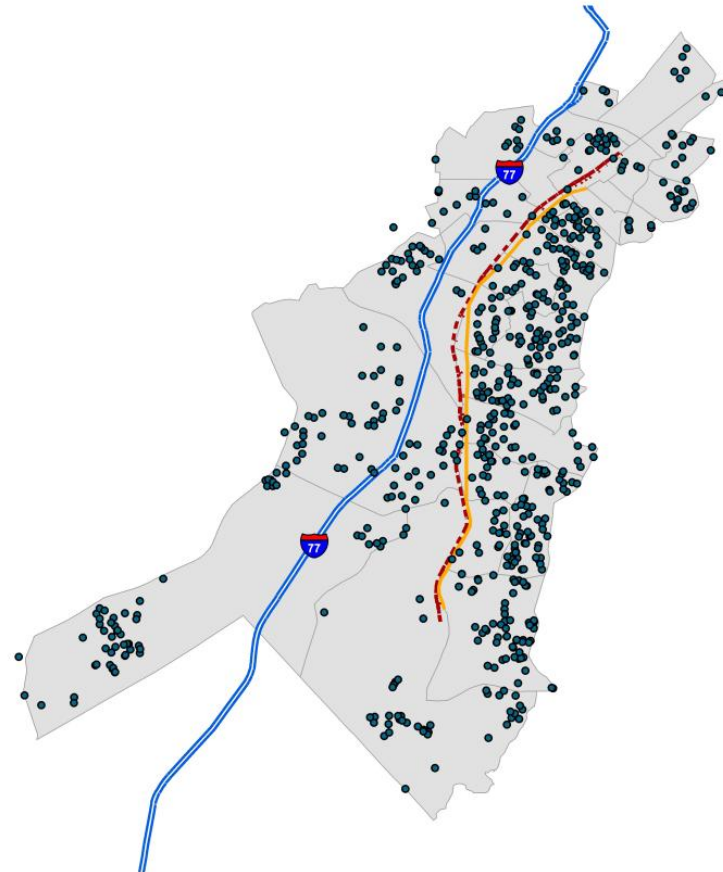


Light rail

660 rail riders and 660 car drivers, before-after installation



- BMI
- Obesity
- Inactivity



- Surveyed households
- South Boulevard
- Interstate 77
- South Corridor Light Rail
- 1-mile census tracts

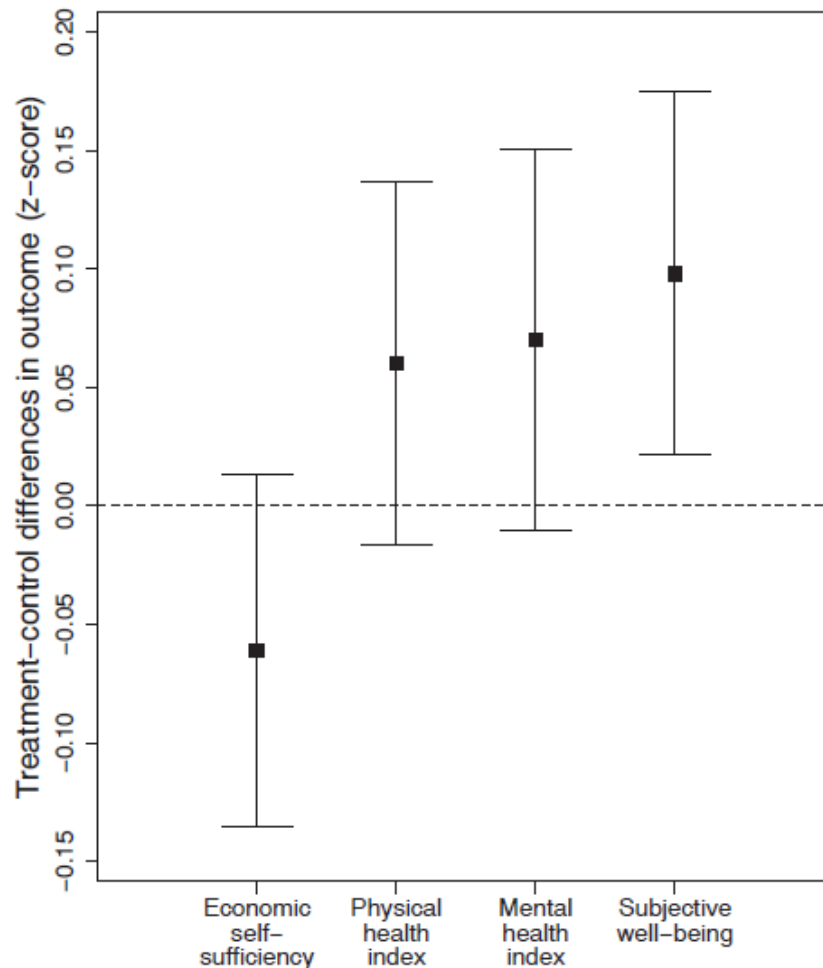


Housing and health

- Horizontal expansion of cities (urban sprawl) may mean more driving, physical inactivity, obesity, and injury
- Poor urban housing design can exacerbate non-communicable and communicable diseases
- Dilapidated housing stock in many US legacy cities shown to increase obesity, diabetes, unhappiness, and violence for residents
- Potential initiatives
 - Reduce GHG emissions and improve health through more compact, efficient co-design of housing, employment and transport, capitalizing on high urban population densities
 - Energy-efficient, climate-adapted housing (including good lighting, noise control, and ventilation) can reduce indoor air pollution, dampness, and mould; airborne infectious disease transmission; heat and cold exposure; and poor sleep quality
 - Inexpensive abandoned housing remediation can reduce crime, violence, and illicit drug abuse
 - Mixed income, live where you work (LWYW) housing has potential health benefits



Moving to Opportunity: Housing relocation experiment



- 3-arm, 5-city HUD randomized trial:
 - (1) **Experimental group** – family housing vouchers to move out of poverty (n=1700)
 - (2) **Comparison group** – family housing vouchers to move anywhere (n=1300)
 - (3) **Control group** – no vouchers (n=1400)
- Less obesity, diabetes, unhappiness
- More depression and conduct disorder for boys
- Landmark scientific work
- But are we really going to move people en masse as official policy?
- Cost and other considerations



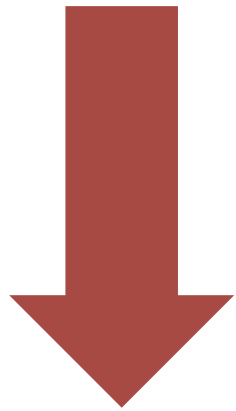
Abandoned Housing Remediation

“In Situ” Changes

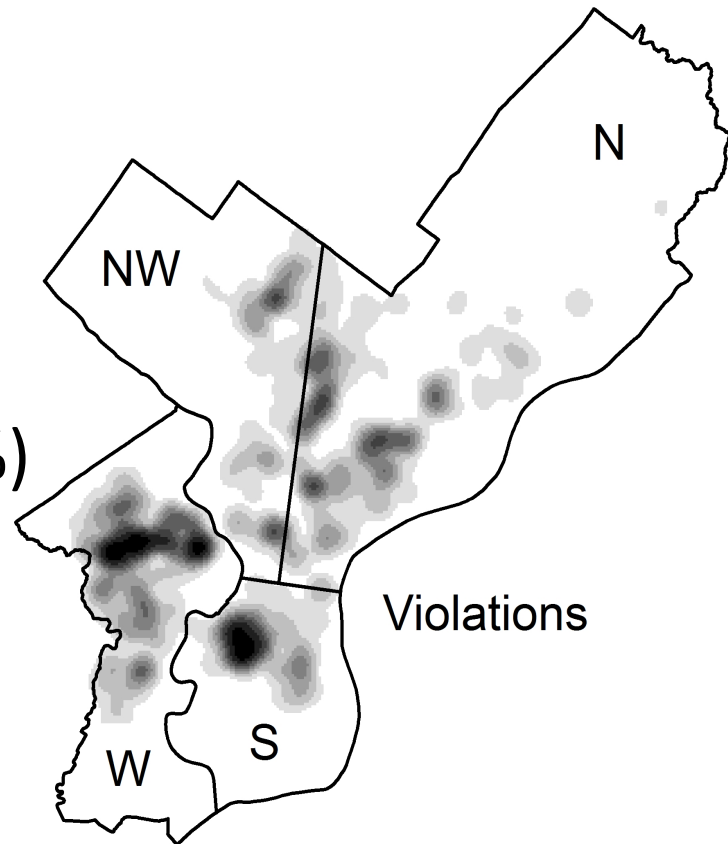


Difference-in-differences:

676 remediated buildings,
676 wait-list control buildings



- Violent crime (-19%)
- Gun assaults (-39%)
- Nuisance crime (-16%)





- Three-way mechanism:
 - (1) Visual cue that space is cared for
 - (2) Appearance of “eyes on street” looking out, and looking in
 - (3) Forced entry difficult: need to break glass or polycarbonate



<http://secureviewusa.com/videos>

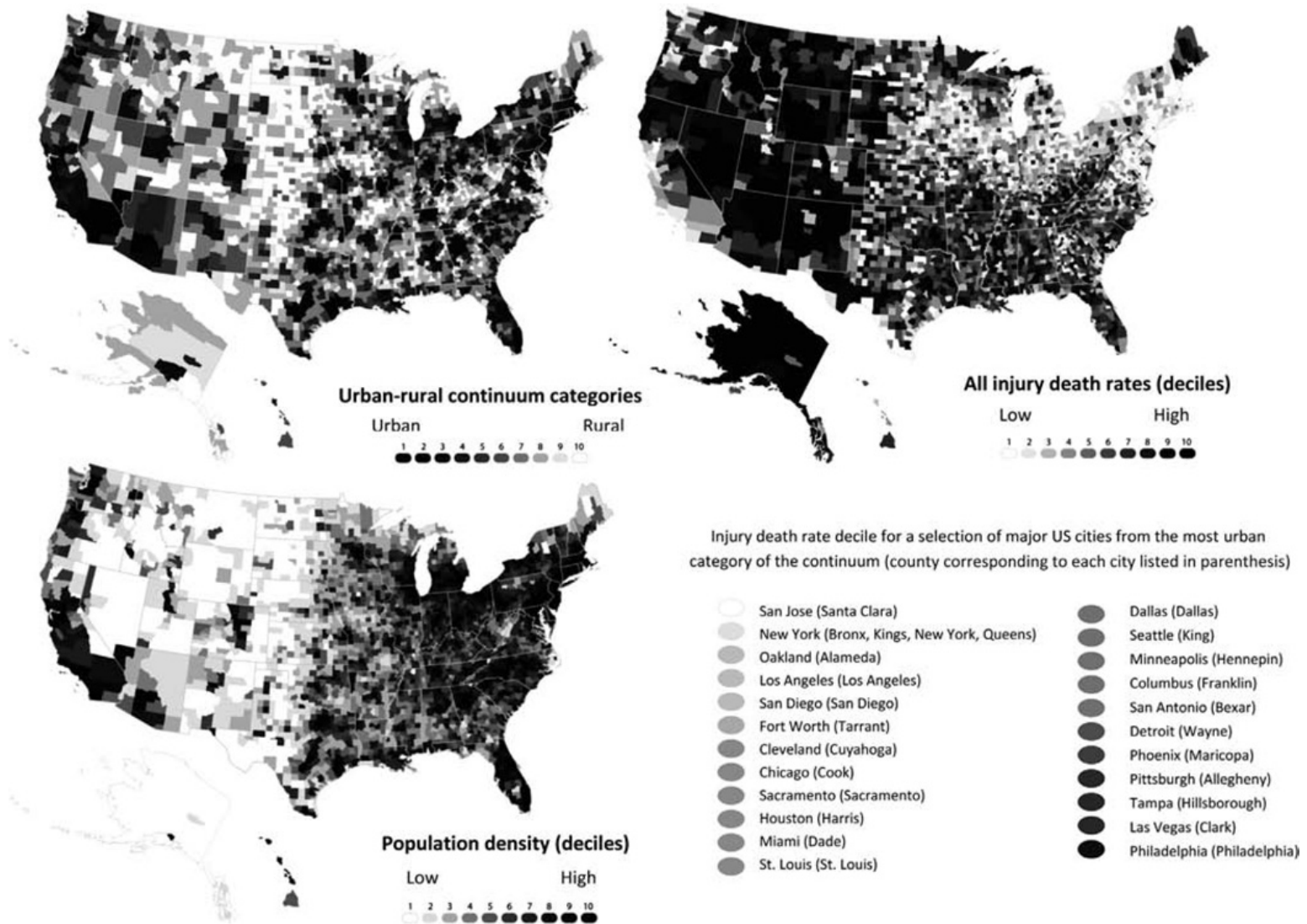
- Trials forthcoming – Philadelphia and perhaps Chicago, Cleveland, Detroit, etc.



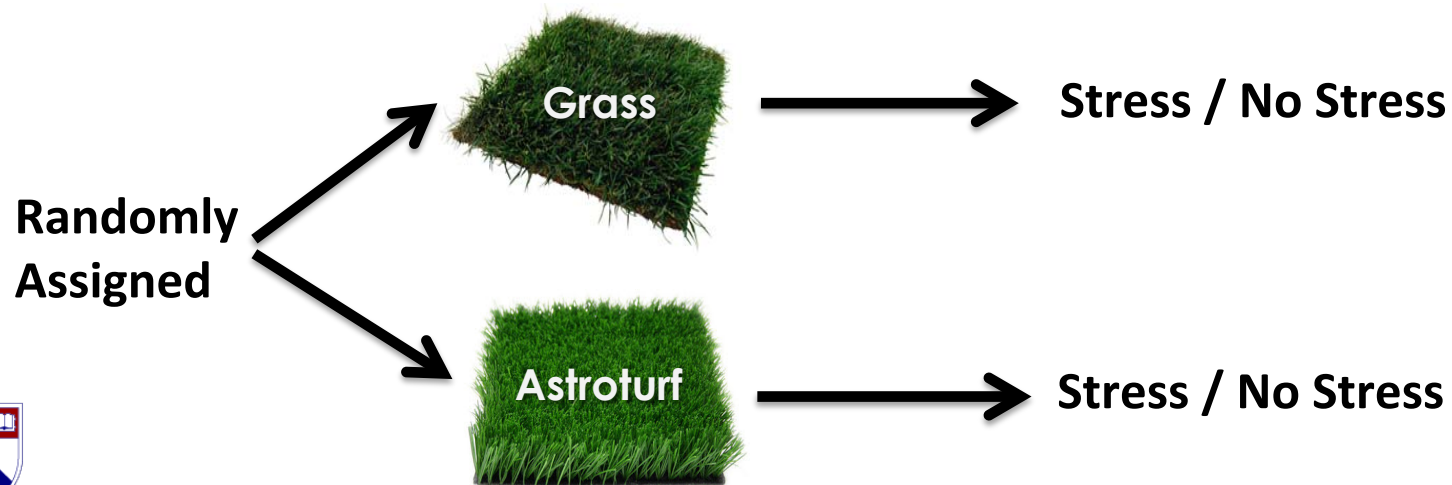
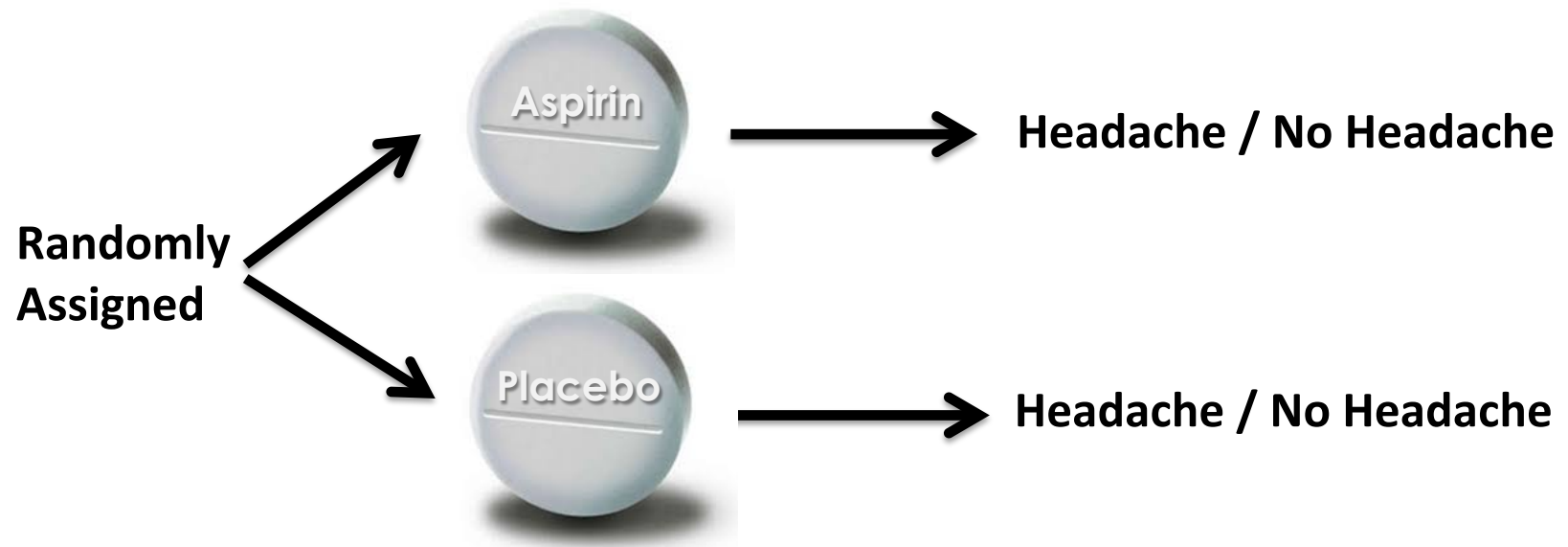
Mixed income LWYW housing



Promote repopulation - cities safest places in US



Need better, causal evidence for initiatives



Penn
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