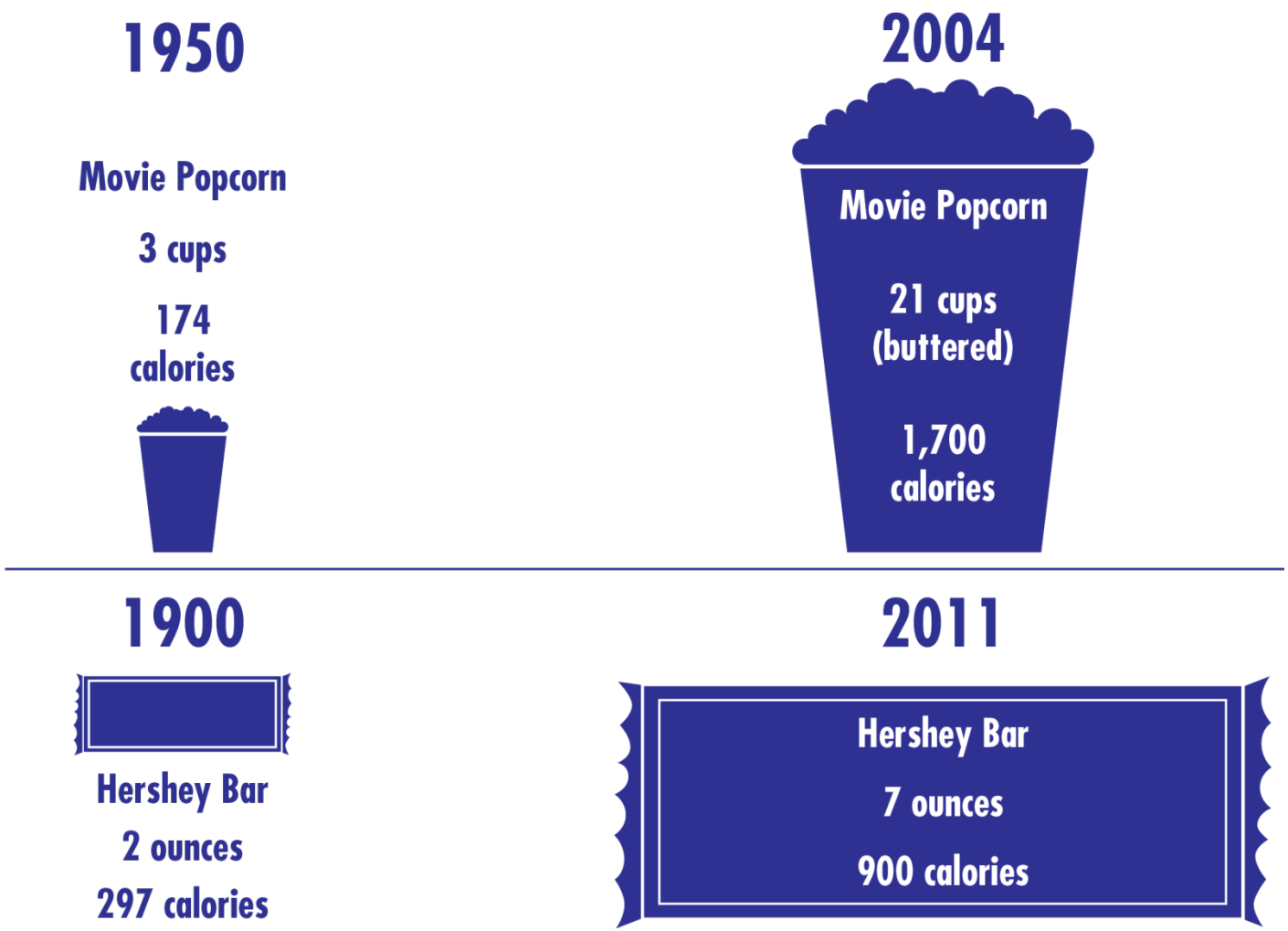
An Innovative Performance Based Approach to the Health Impacts of Transit Investments

Sean Co
Transportation planner
Metropolitan Transportation Commission

Obesity and physical activity linked

Food or Exercise?

Changing Portion Sizes in America



Sweet Tooth

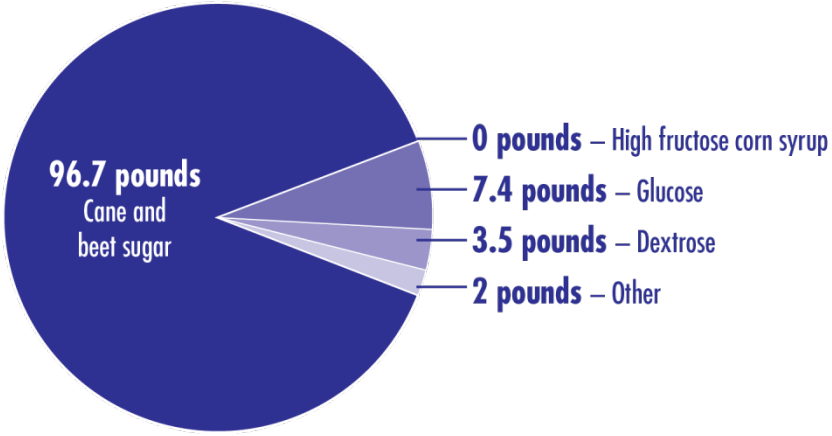
America's sugar consumption increased by 39 percent between the 1950s and 2000.

10 Teaspoons of added sugars Americans are advised not to exceed daily

20 Teaspoons of added sugars Americans actually consume

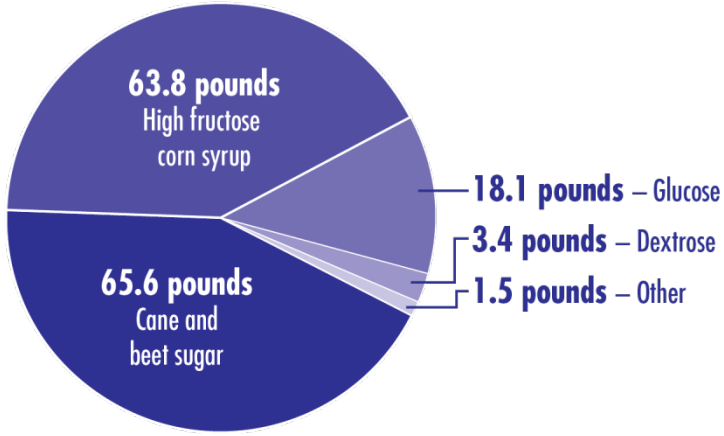
1950-59

Total caloric sweeteners:
109.6 pounds, per capita, annually

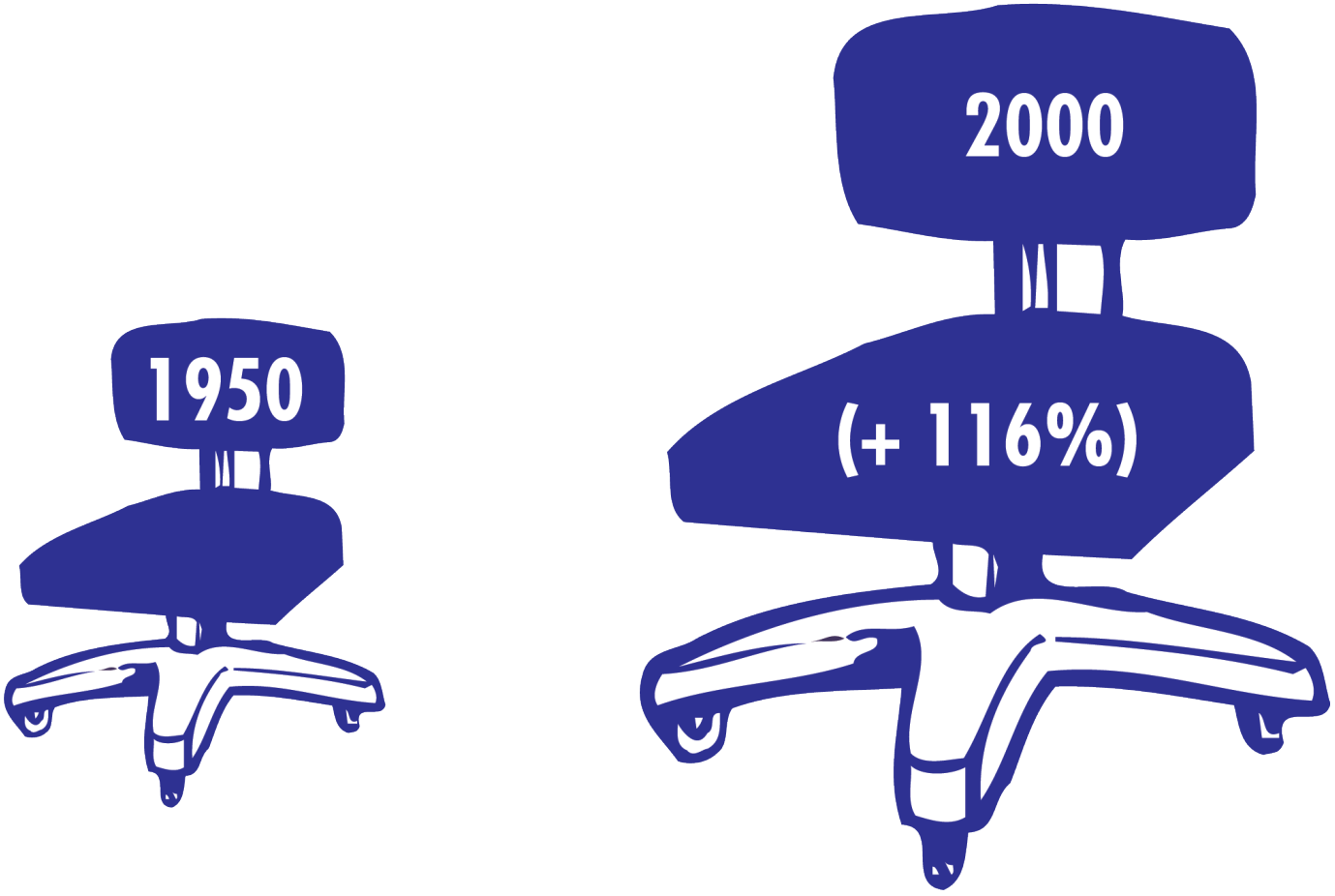


2000

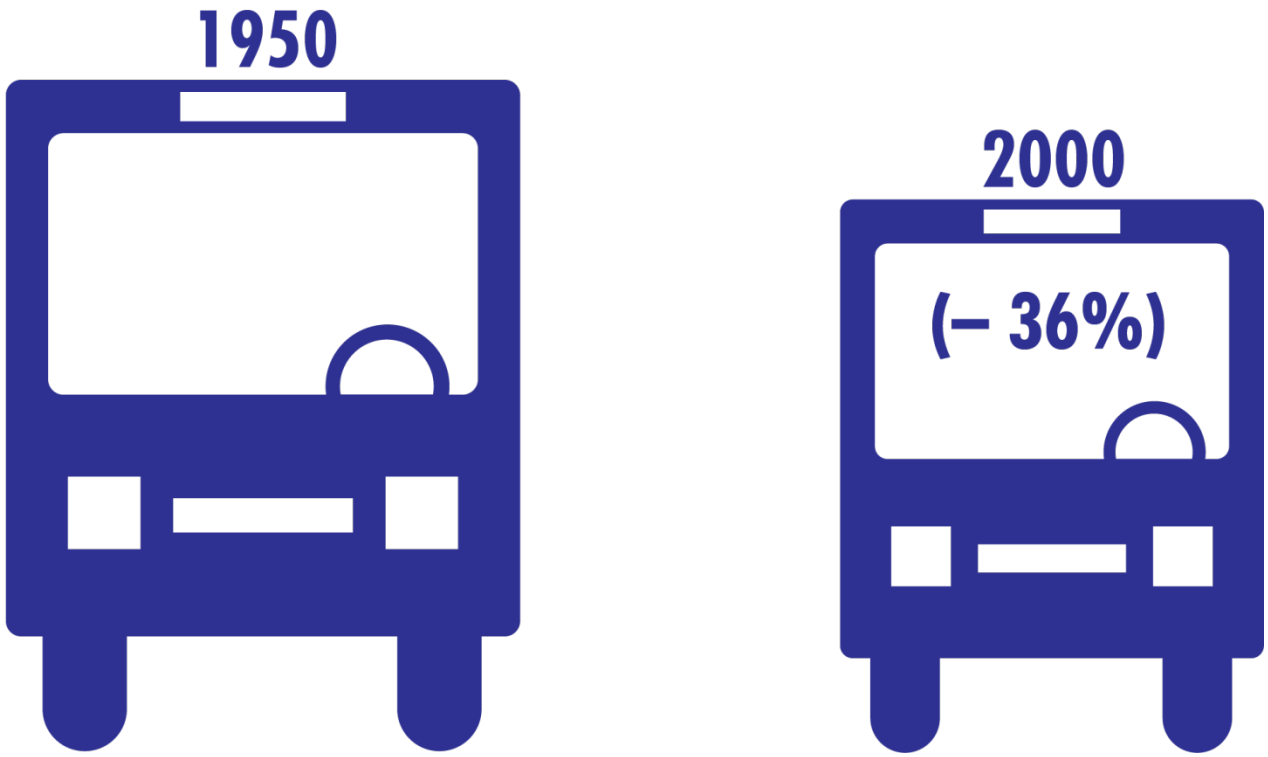
Total caloric sweeteners:
152.4 pounds, per capita, annually



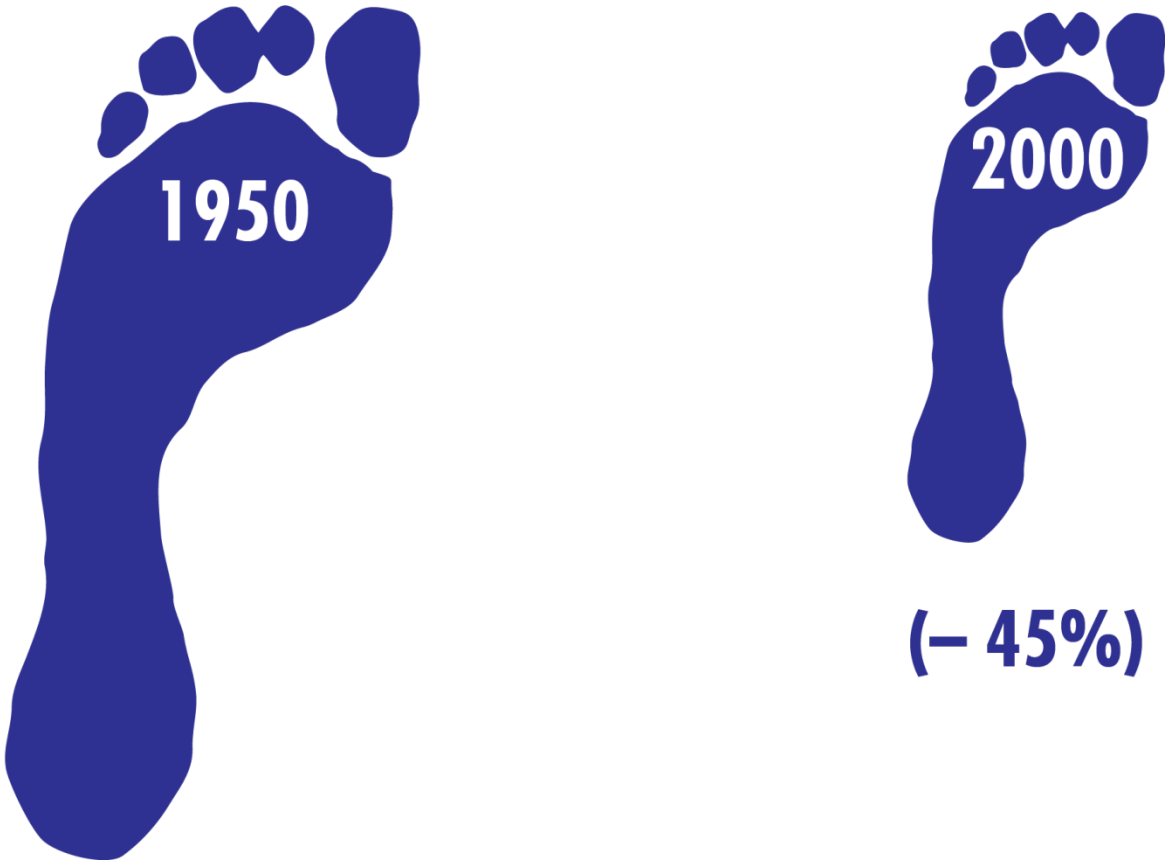
Work in low physical activity occupation



Proportion of Trips to Work by Public Transit

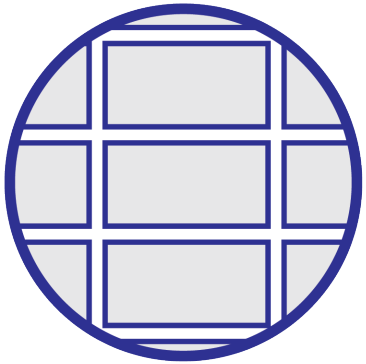


Proportion of Trips to Work by Walking

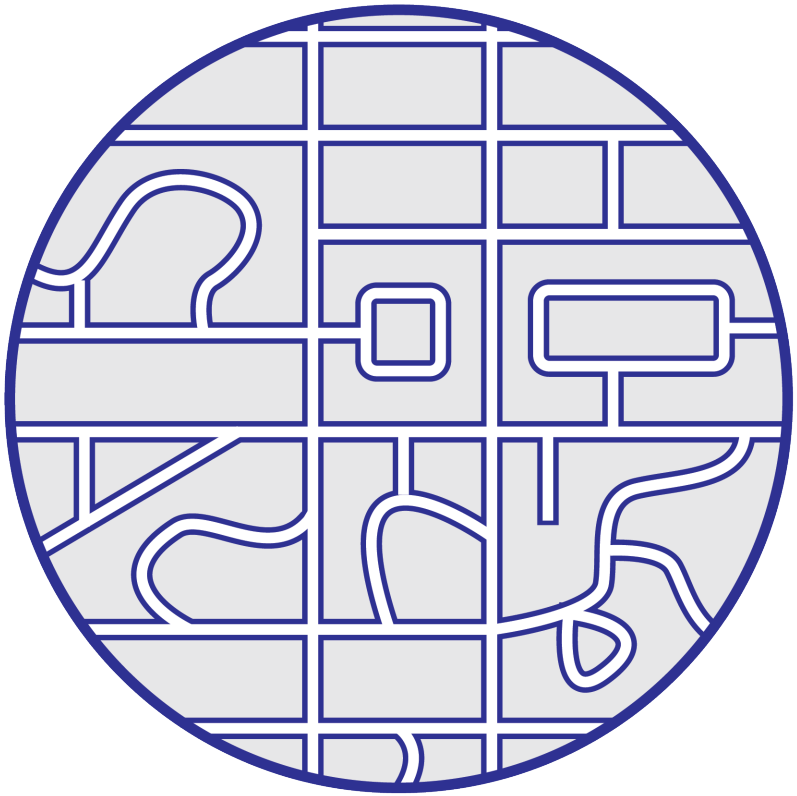


Average Daily Vehicle Miles Traveled Per Person

1950



2000

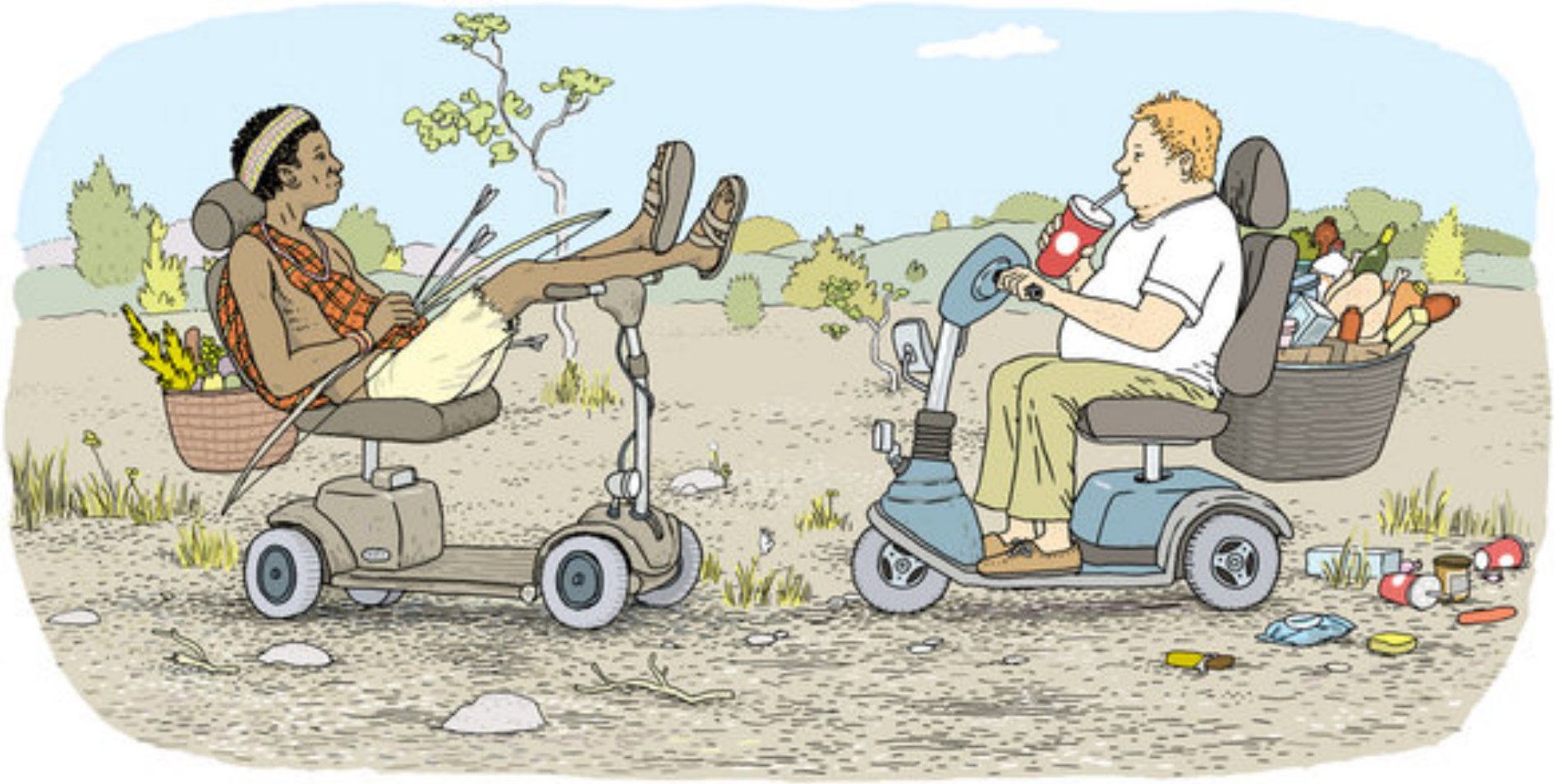


(+224%)

GAINS IN HEALTH OFFSET BY LIFESTYLE

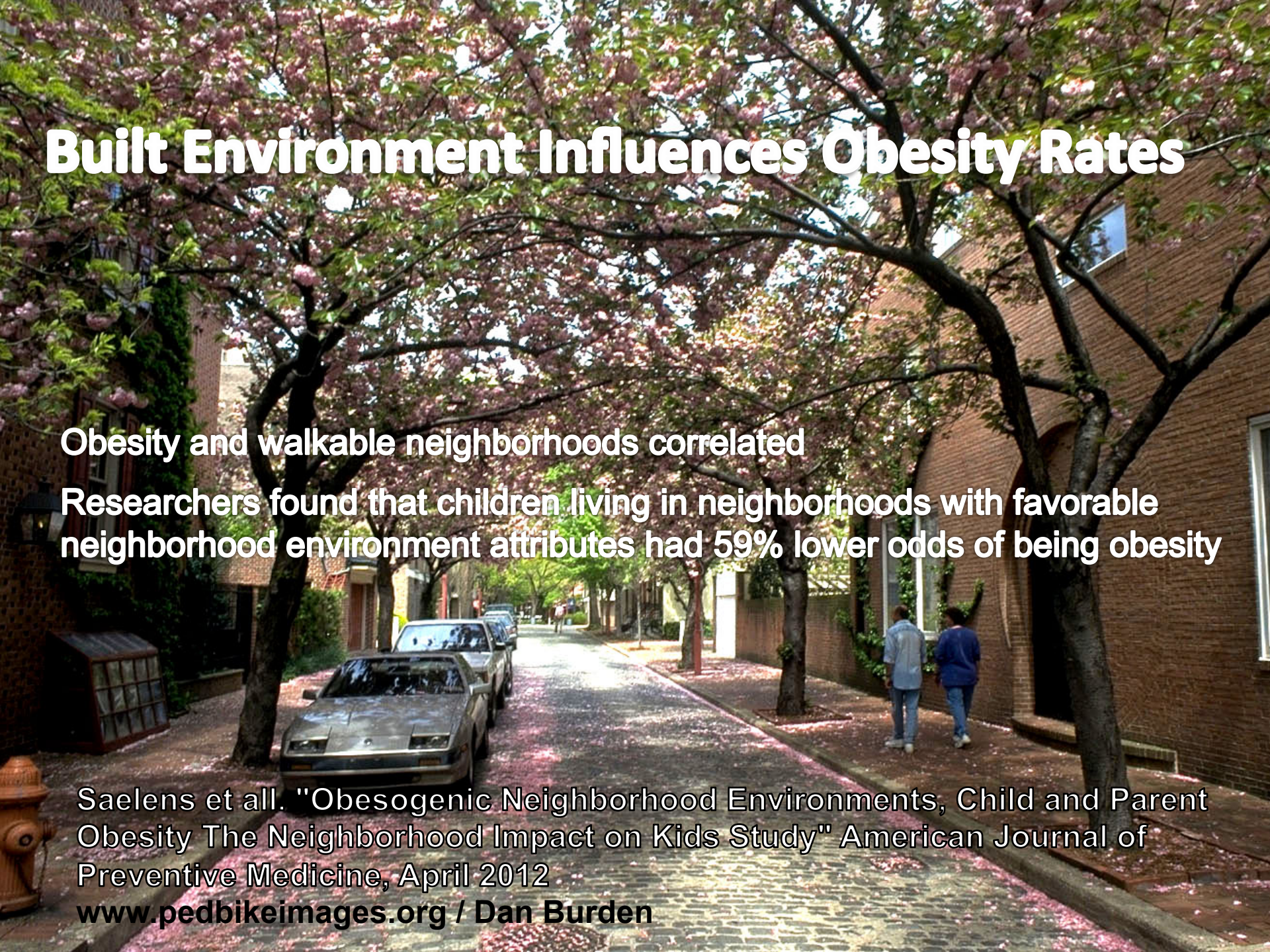
reductions in smoking, high cholesterol and high blood pressure since 1988 have been offset by weight gain, diabetes, and pre-diabetes.

Daily energy expenditures of hunter-gatherers same as Westerners



Pontzer H, Raichlen DA, Wood BM, Mabulla AZP, Racette SB, et al. (2012) Hunter-Gather Energetics and Human Obesity. PLoS ONE 7(7)

Built Environment Influences Obesity Rates



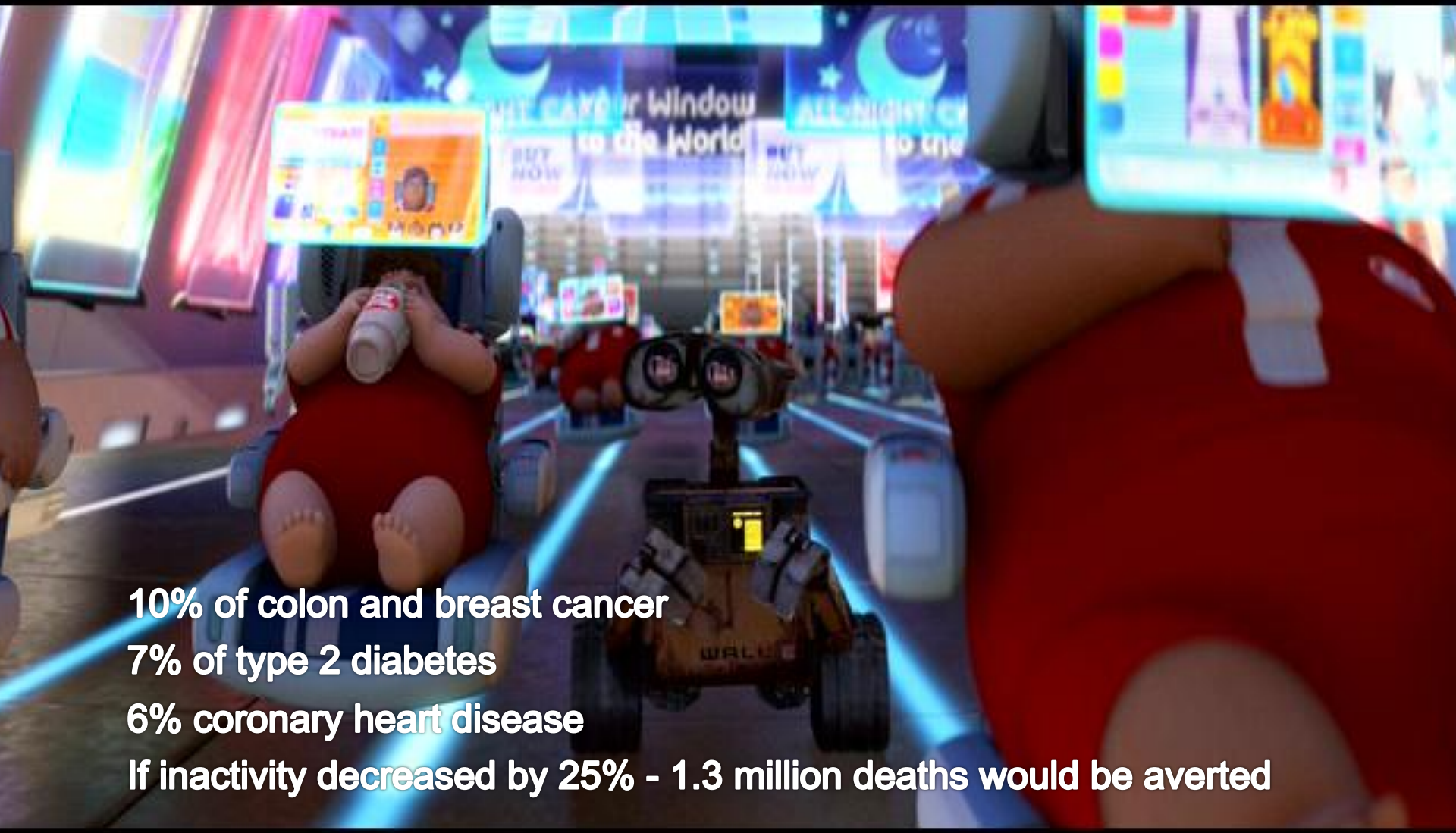
Obesity and walkable neighborhoods correlated

Researchers found that children living in neighborhoods with favorable neighborhood environment attributes had 59% lower odds of being obesity

Saelens et all. "Obesogenic Neighborhood Environments, Child and Parent Obesity The Neighborhood Impact on Kids Study" American Journal of Preventive Medicine, April 2012

www.pedbikeimages.org / Dan Burden

Physical Inactivity Worldwide on Life Expectancy



I-Min Lee, Eric Shiroma, Felipe Lobelo, Pekka Pushka, Steven Blair, Peter Katzmarzyk, Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy, The Lancet, July 2012

Links land use and housing to transportation

Region must show how it can house all the population in the next 30 years

Preservation of open space and agricultural land

Show how development pattern and transportation network can reduce greenhouse gases


Plan Bay Area to achieve a
15%
CO_2 reduction per capita by 2035


House 100% of growth without displacing low income residents by 2035

700
Projects analyzed

BENEFITS & COSTS

Personal Choice

Travel Time

Vehicle Operating Costs

Health Costs

Externalities

CO_2/PM
ROG/NOX

Fatal and Injury Collisions

Noise

100 Projects with benefit/cost analysis

Activity-Based Travel Model

Active Transportation Target Development

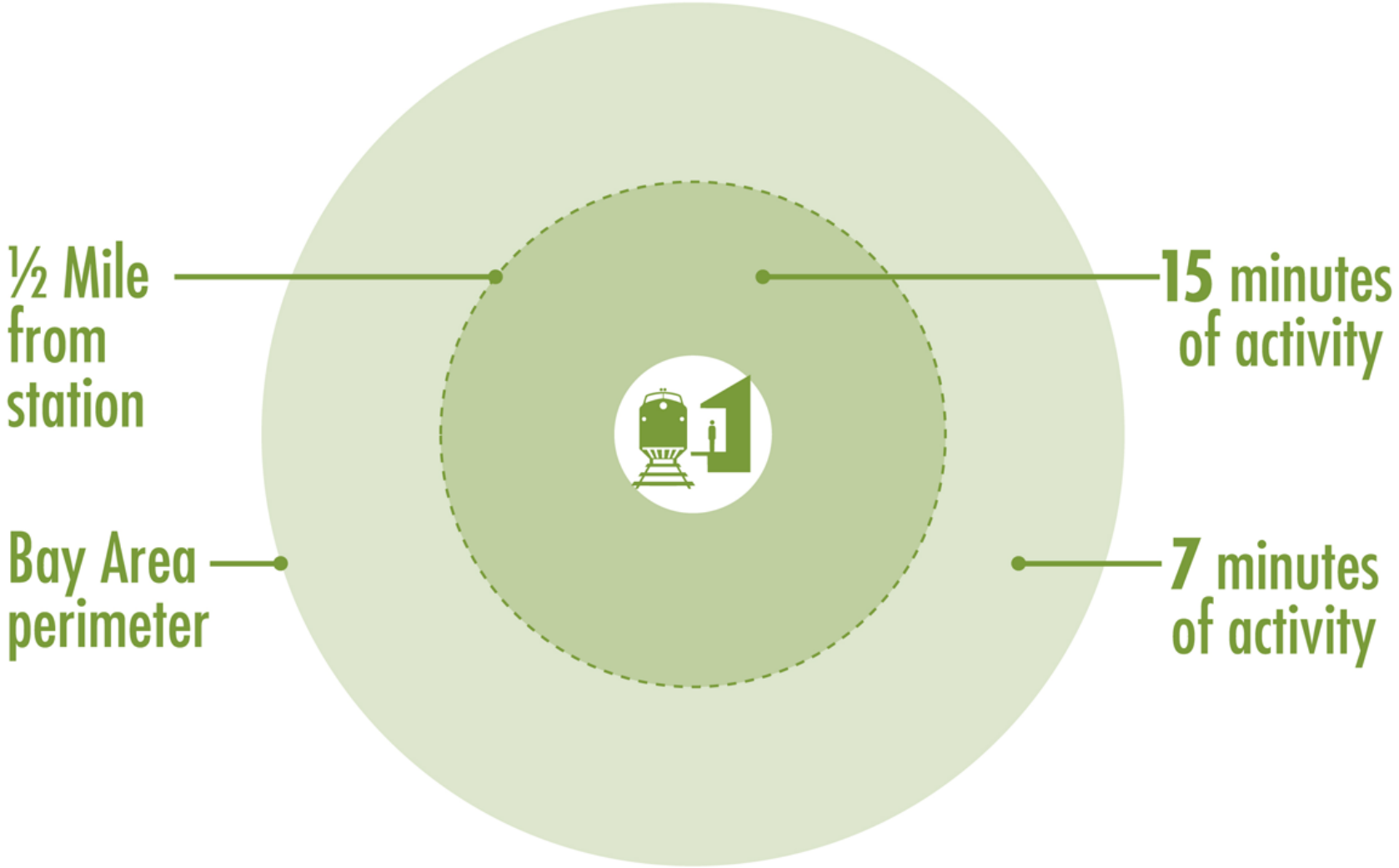
No metrics for active transportation

Where does walking and cycling fit within the 30 min/day of moderate to vigorous activity?

No performance standards from the CDC Community Guide – insufficient evidence that transportation policies increase physical activity

What is the expected increase in active transportation in 30 years?

How much physical activity should transportation take credit for?



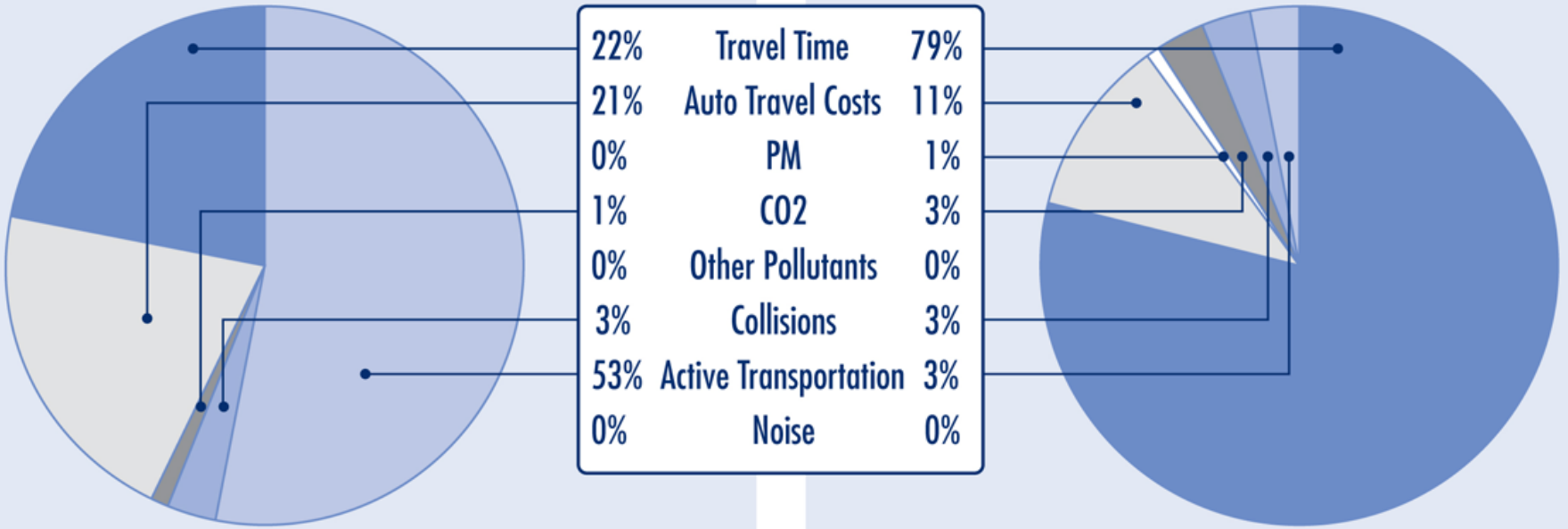
Methodology of Evaluating Active Transportation

% of Active Individuals

$$\frac{\text{(Change in minutes/person/day) * (inactive population 62\%)}}{\text{(Minutes to become active -30)}}$$

Active individuals from the project

Percent of active or inactive individuals
*
Projected Bay Area Population



Regional Bicycle Nework

Summary of Total Benefits

62% **Bay Area Inactive** <30 minutes of activity
California Health Interview Survey

$717 **Savings From Lost Productivity**
Per person

$326 **Health Care Cost Savings** Per person
(Disease types attributable to physical inactivity)

Physical Activity Benefits

What happens when everyone meets the 15 minutes per person per day target?

$1.1 Billion Lost productivity and health care cost savings

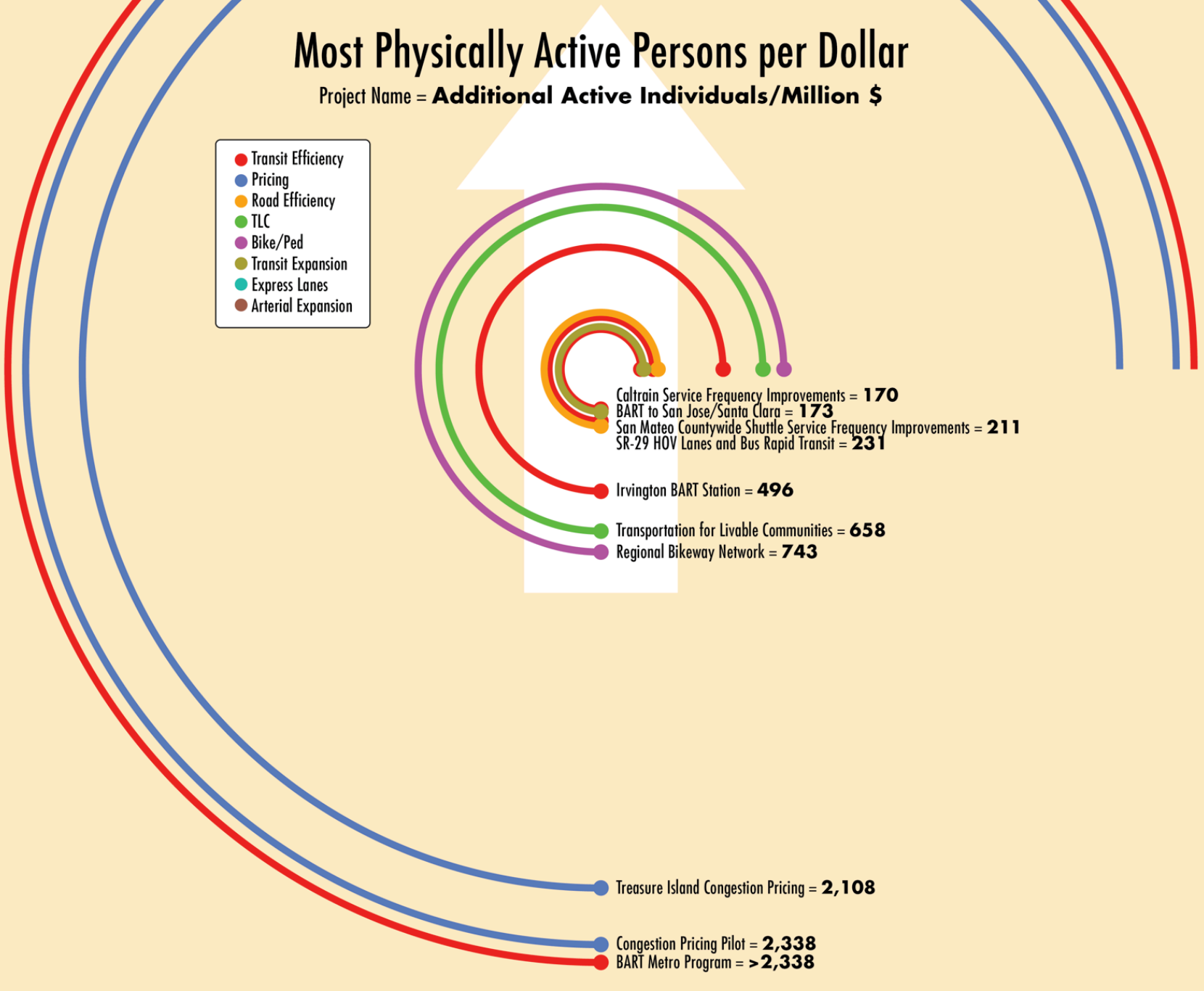
10.6% Become active

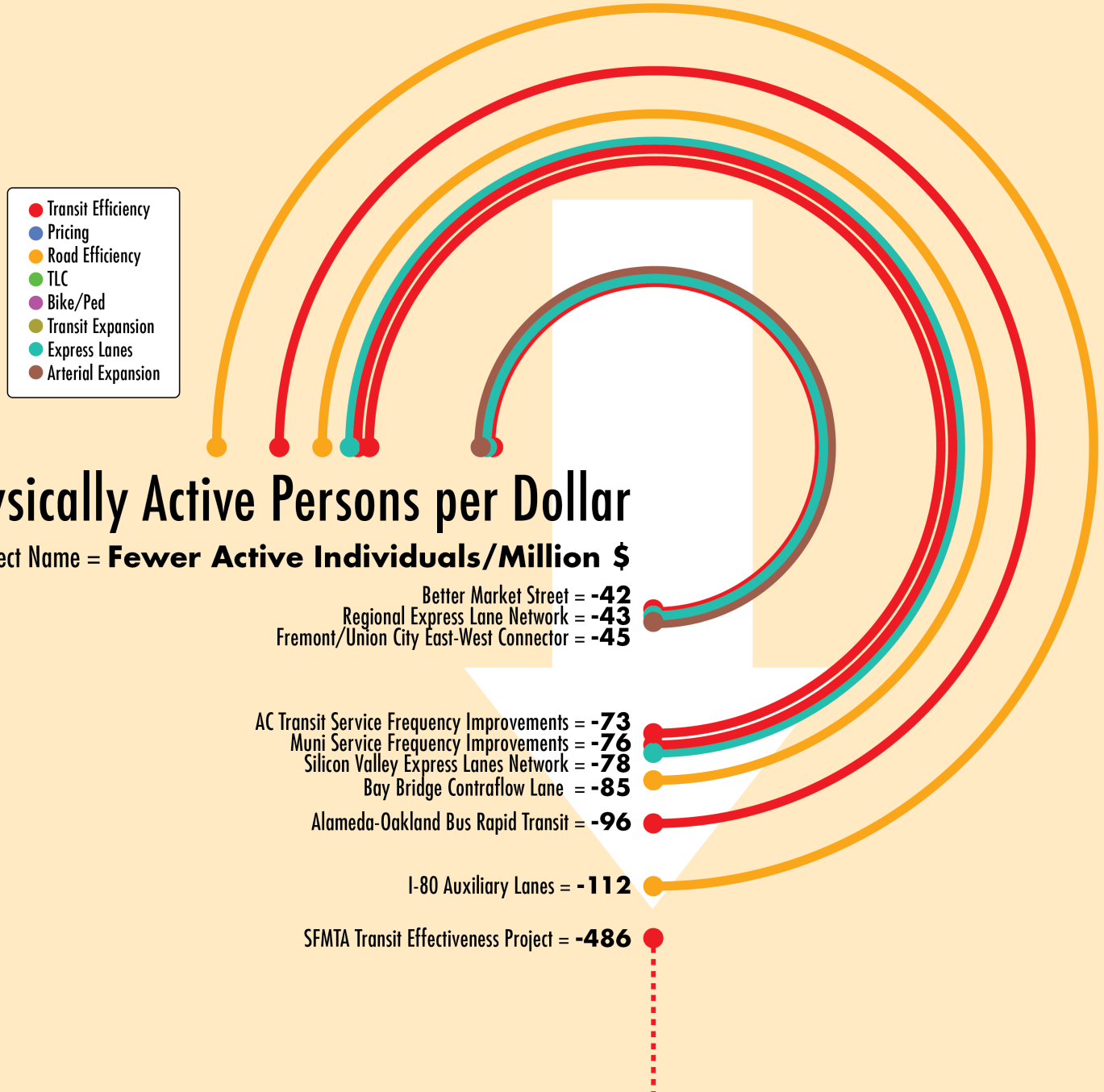
$3.2 Billion Saved based on theValue of Statistical Life (VSL)

650 LIVES SAVED

Most Physically Active Persons per Dollar

Project Name = **Additional Active Individuals/Million $**





Fewest Physically Active Persons per Dollar

Project Name = **Fewer Active Individuals/Million $**

Better Market Street = **-42**
Regional Express Lane Network = **-43**
Fremont/Union City East-West Connector = **-45**

AC Transit Service Frequency Improvements = **-73**
Muni Service Frequency Improvements = **-76**
Silicon Valley Express Lanes Network = **-78**
Bay Bridge Contraflow Lane = **-85**
Alameda-Oakland Bus Rapid Transit = **-96**

I-80 Auxiliary Lanes = **-112**

SFMTA Transit Effectiveness Project = **-486**

Transit projects that compete with bicycle trips can make people less active

Transit projects that have travel time savings make people more active

Limitations

- **Travel models don't capture all bike and pedestrian trips**
- **Land use changes as a result of transportation investments not captured**
- **Premature mortality benefit not quantified**
- **Other physical activity not considered**

How can this be applied?

Individual projects evaluation

WHO Health Economic Assessment Tool (HEAT)

What's Next?

Integrated Transportation Health Impact Model (ITHIM)

Groundbreaking Health Co-Benefits Research

- **2009 London Study: health impacts of alternative strategies to reduce carbon dioxide emissions from transport.**
  - Lower carbon emission motor vehicles/fuels
  - Increased active travel
    - Replacing urban car and motorcycle trips with walking or bicycling

---

Woodcock J, Edwards P, Tonne C, Armstrong BG, Ashiru O, Banister D, et al. Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport. The Lancet 2009;374:1930-1943.

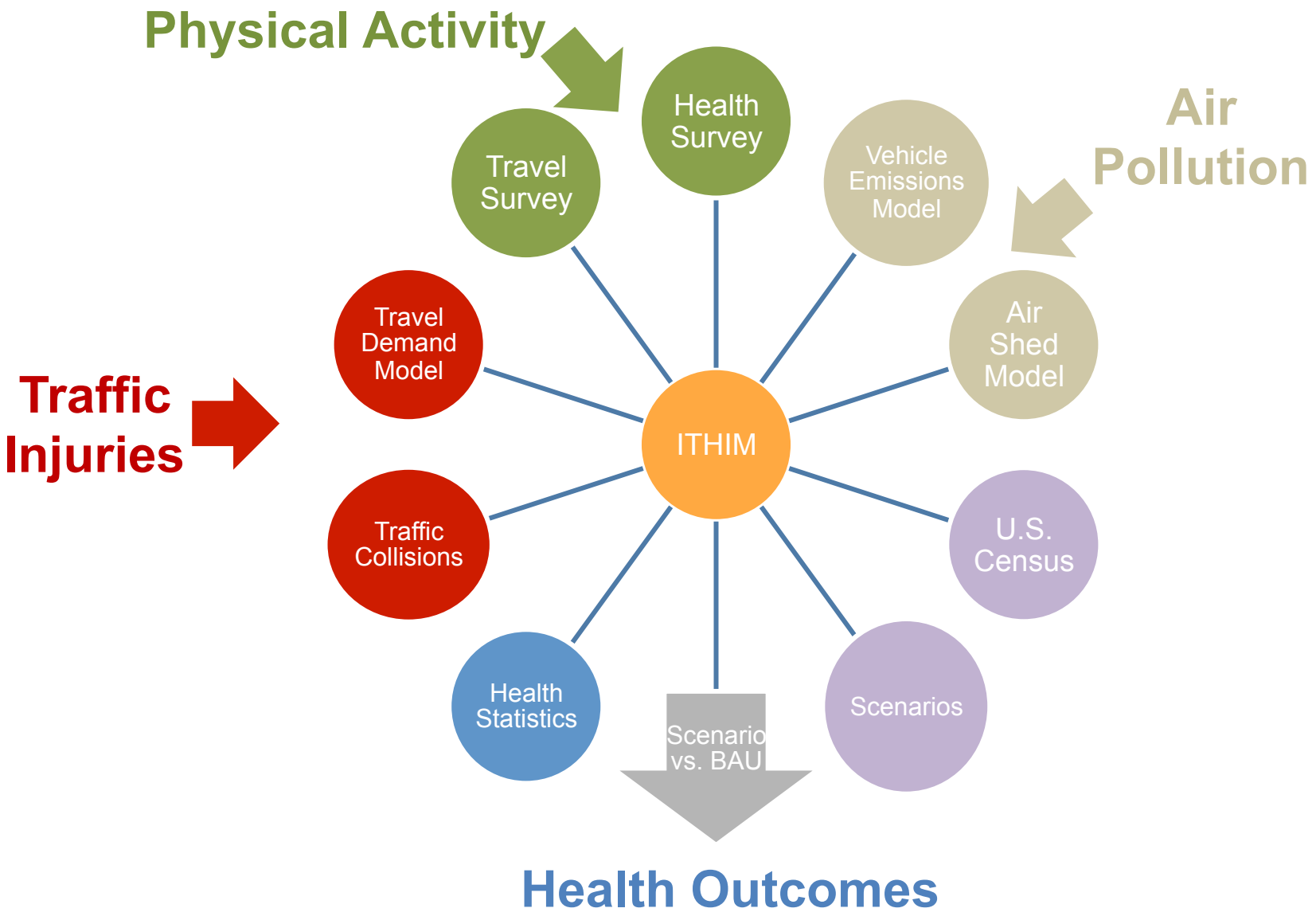
Shift from ten to thirty minutes/day of walking and bicycling

REDUCTIONS

19%	**Cardiovascular Disease**
15%	**Diabetes**
13%	**Breast Cancer**
8%	**Dementia**

38% CO_2 Emissions

The ITHIM Model Integrates Data on Health and Travel



Active Transport and Low Carbon Driving Scenarios

1. **Bay Area Benchmarks**
   - Scenario: All Bay Area cities achieve by 2035 the walking and biking levels of the 2009 Bay Area leaders (SF, Oakland, Palo Alto, Berkeley, Mtn. View, Rohnert Park, Morgan Hill)

2. **Replace short car trips with active transport**
   - Scenario: 1/2 of trips <1.5 miles walked and 1/2 of trips 1.5 to 5 miles bicycled

3. **Attaining Carbon and Physical Activity Goals**
   - Back cast the amount of active transport time and distance to reduce car VMT and increase active transport to optimum levels (no more than average commute time to work ~25 minutes); land use and infrastructure exit to support changes

4. **Low Carbon Driving**
   - Fuel efficiency increases, low carbon fuels and low/no emissions cars and light trucks become more widespread, but there are no changes in physical activity or driving patterns

Comparative Risk Assessment

Population Attributable Fraction

How much would the disease/injury burden change if the risk factor were eliminated?

Comparative Risk Assessment

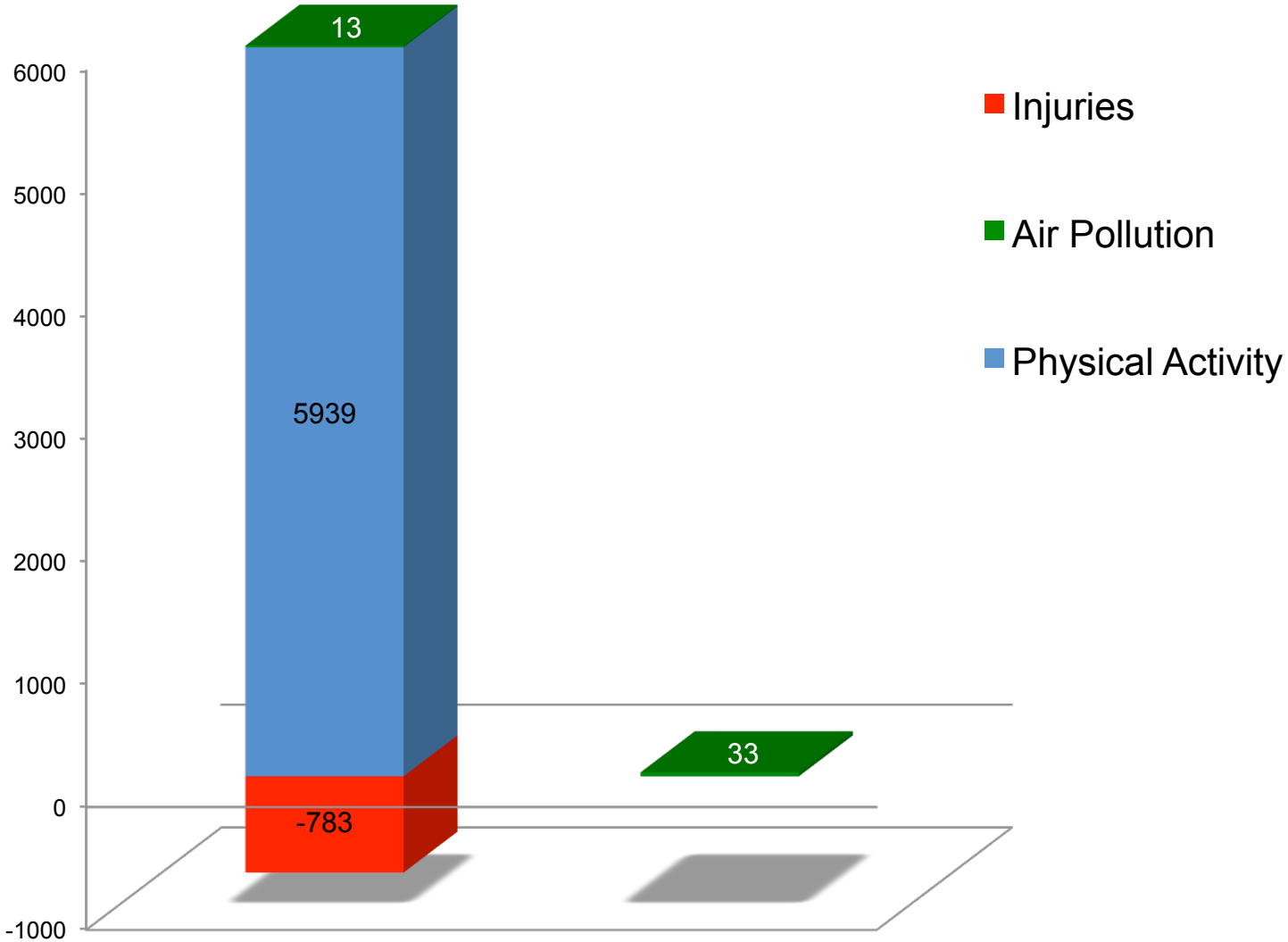
How much would the disease/injury burden change if exposure distribution were altered?

Health Impacts of Active Transport Scenarios

	Change in disease burden	Change in premature deaths
Cardiovascular Dis.	6-15%	724-1895*
Diabetes	6-15%	73-189
Depression	2-6%	<2
Dementia	3-10%	63-218
Breast cancer	2-5%	15-48
Colon Cancer	2-6%	17-53
Road traffic crashes	10-19%	60-113

* Range reflects range of physical activity in scenarios

Annual Health Benefits of Active Transport and Low Carbon Driving in the Bay Area: Predictions from the ITHIM Model



Summary & Conclusion

A shift in active transport from 4.5 to 22 minutes/day:

- **Major reductions in chronic disease**
- **Major public health impact**
  - $1.4-21.8 billion annual Bay Area health cost savings
  - Adds about 9.5 months of life expectancy
- **Injuries to pedestrians and bicyclists significant concern**

15% reductions in CO_2 emissions

Low carbon driving is not as important as physical activity for generating health co-benefits

★**Together, low carbon driving and active transport can achieve California's carbon reduction goals and optimize the health of the population**

Daily walking or cycling is essential to meet the recommended physical activity levels


Sean Co
Metropolitan Transportation Commission
sco@mtc.ca.gov
@seanaco