

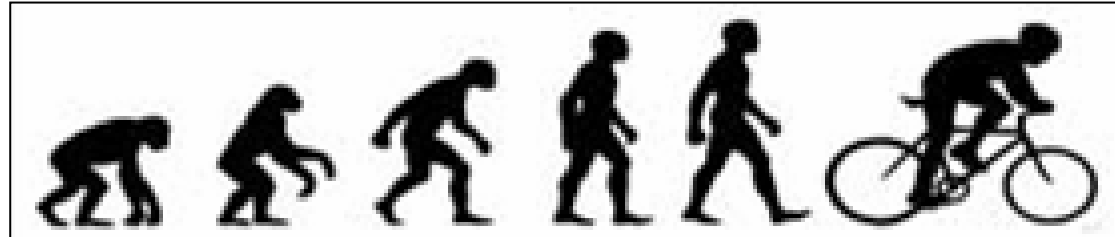
# Costs and Benefits of Bicycling



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# Why Ride a Bike?

- Feasibility



- Efficiency

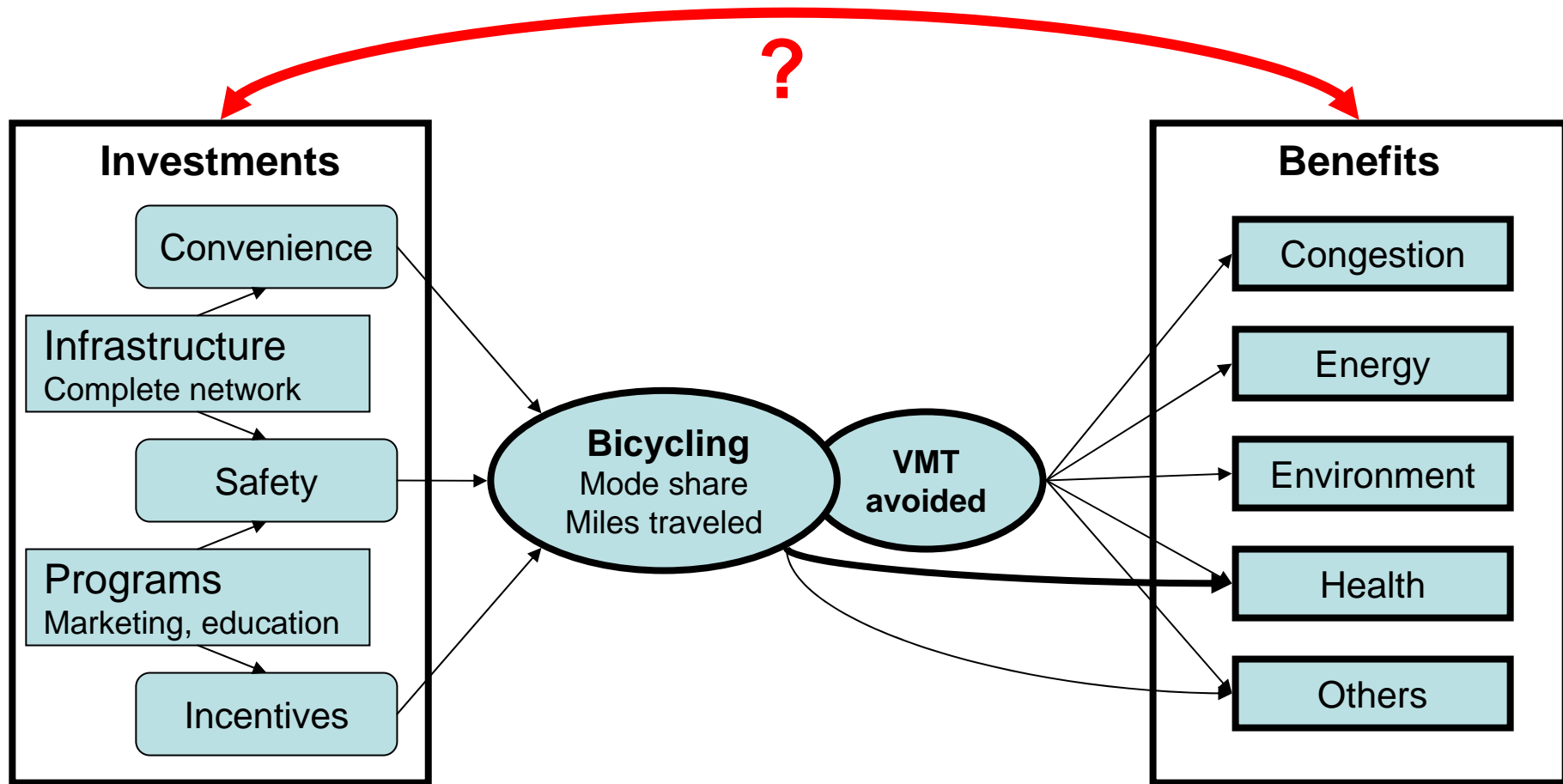


- Benefits

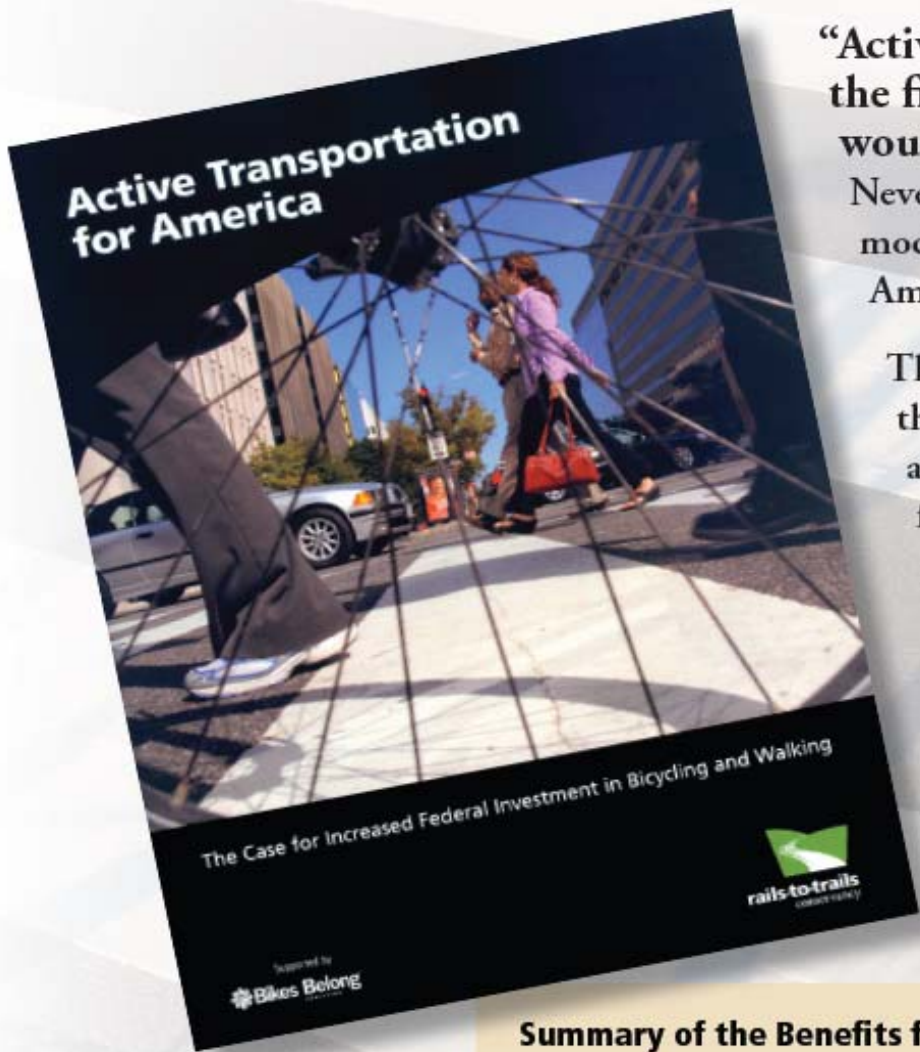




# Is it Worth Investing in Bicycling?



Cost-Benefit Framework for Bicycling



“Active Transportation for America” quantifies for the first time the profound benefits our nation would see with increased walking and bicycling.

Never before has the case been made so clearly that relatively modest federal investment in bicycling and walking can save Americans tens of billions of dollars each year.

The report pulls success stories from communities across the country that are actively engaged in improving their active transportation networks. These stories come from community case statements that are part of their participation in Rails-to-Trails Conservancy’s 2010 Campaign for Active Transportation.

For more about the report, including access to case-making graphs, summaries and opportunities to take action, visit the report Web site:

[www.railstotrails.org/ATFA](http://www.railstotrails.org/ATFA)

For more information, contact: Thomas Gotschi (thomas@railstotrails.org)

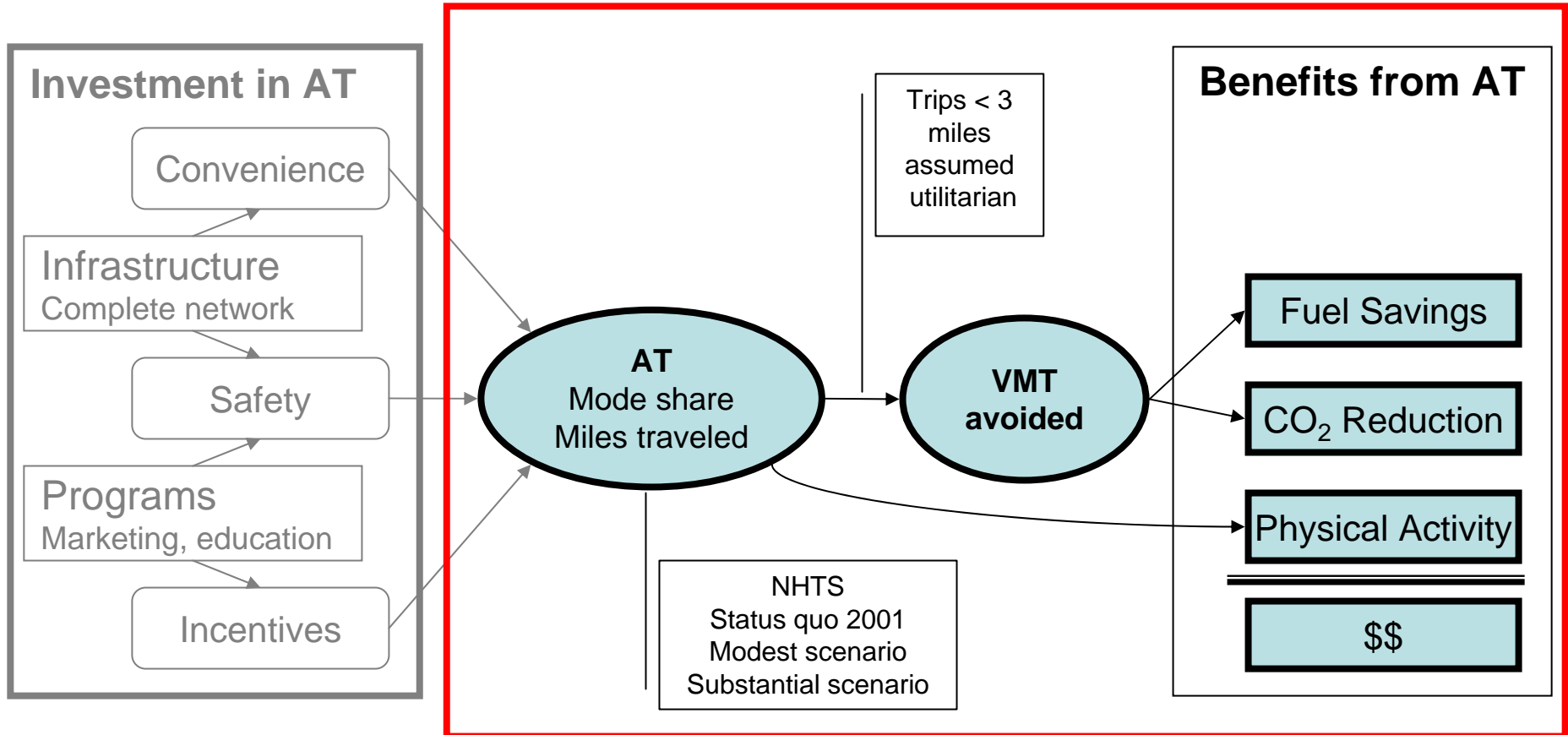
### Summary of the Benefits from Bicycling and Walking Quantified in this Report

- This report provides quantitative assessments and an overall estimation of the monetary value of the benefits of current and future bicycling and walking in the United States.
- The main premise of the analysis is that short trips of three miles or less, which currently make for about half of all trips taken in the United States, can, to some extent, be shifted from driving to bicycling and walking.

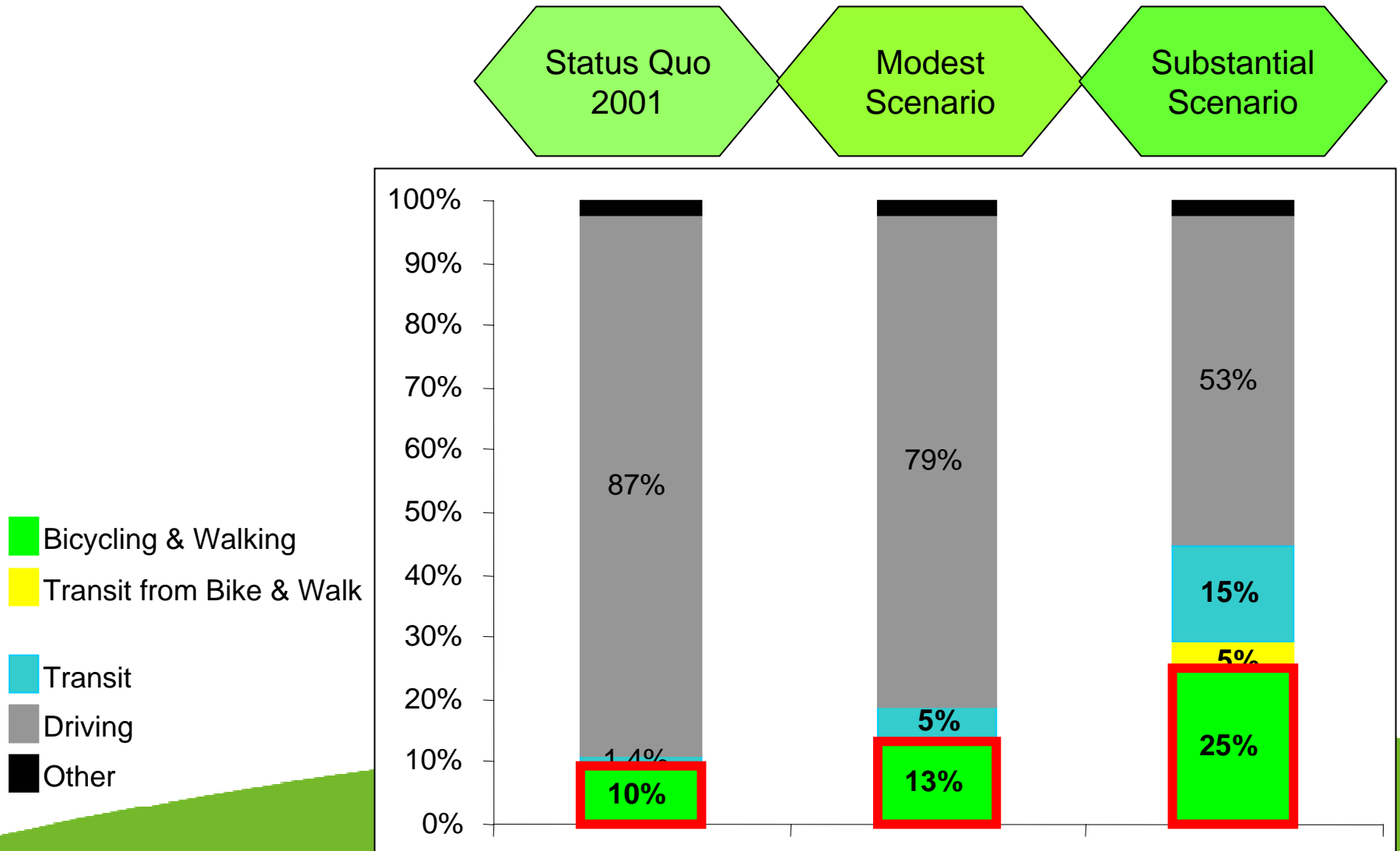
Benefits from bicycling and walking are quantified in the areas:

- transportation
- oil dependence
- climate change
- public health

# “Active Transportation for America” Framework



# Mode Share Assumptions for Benefits Calculations in “Active Transportation for America”

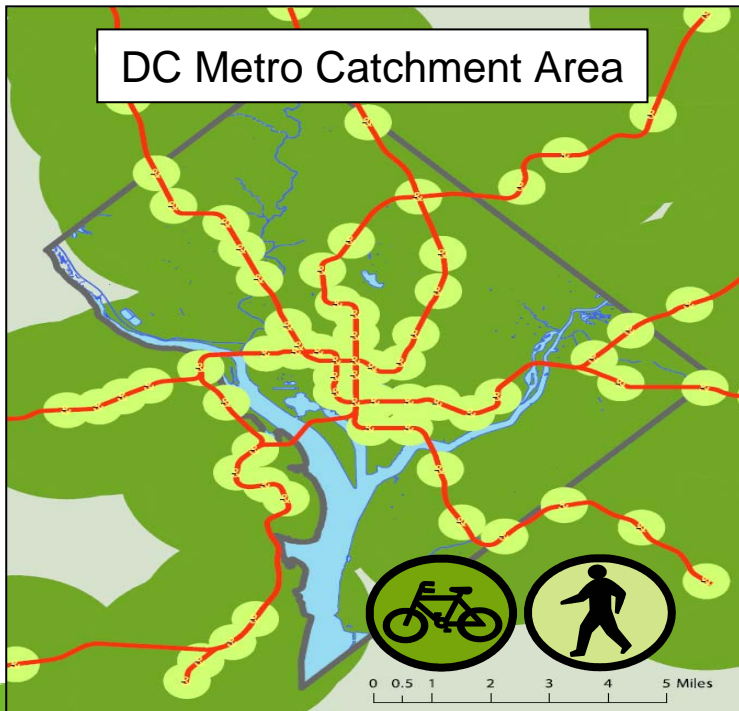


# VMT Reduction Mechanisms

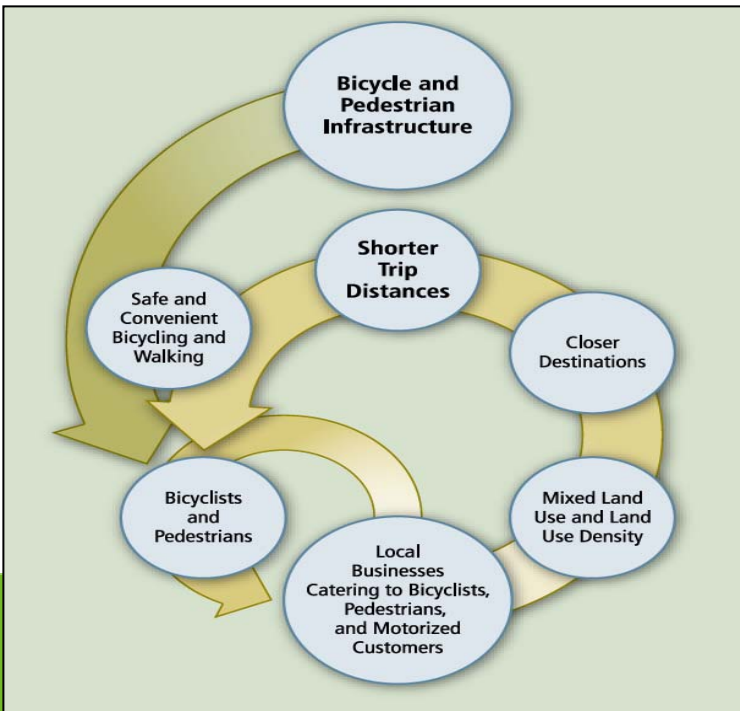
Replace Short Car Trips

< 1 mile  
< 3 miles

Synergy with Transit



Induced Smart Growth



# Monetary Value of Benefits in “Active Transportation for America” Report

- Status quo (2001):
  - fuel savings from short bicycling and walking trips alone are worth **\$4 billion annually**
- Modest scenario:
  - **\$10 billion annually**
    - Incl. \$2 billion from induced transit and smart growth
- Substantial scenario:
  - **\$66 billion annually**
    - Incl. \$28 billion from health care savings
    - Incl. \$10 billion from induced transit and smart growth

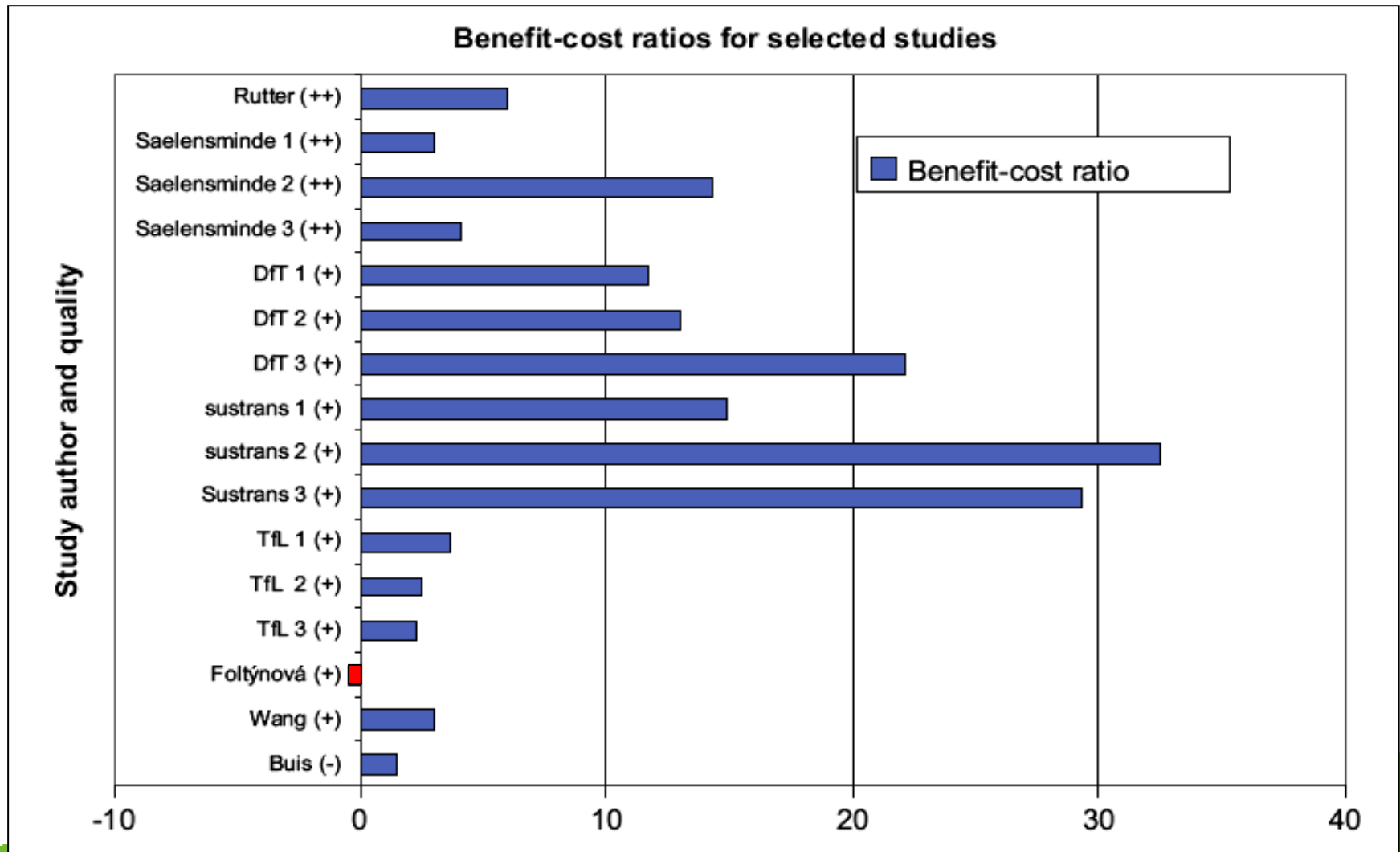
Compare to ~\$500 million in annual federal spending for bike/ped currently

How much would it cost to achieve these benefits?

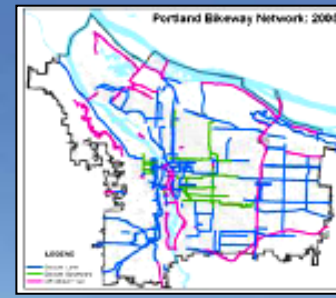
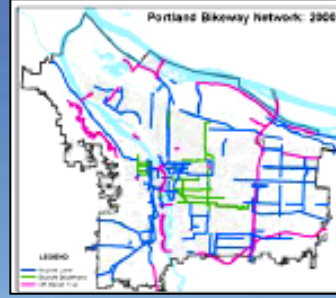
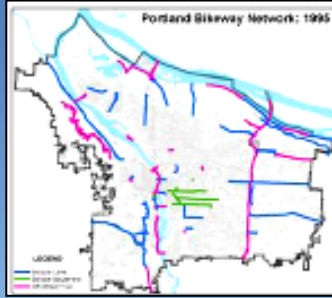
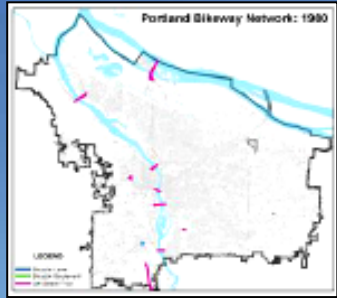


# Economic analyses of transport infrastructure and policies including health effects related to cycling and walking: A systematic review ☆

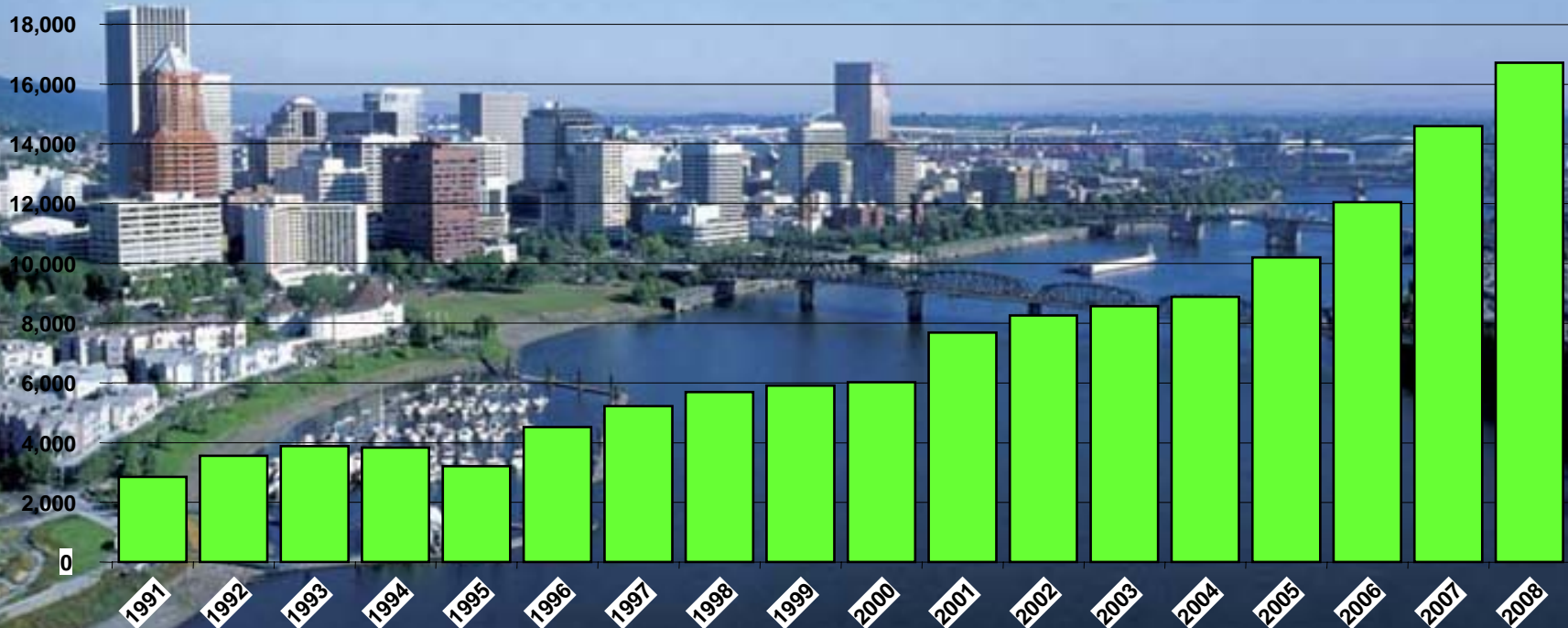
Nick Cavill<sup>b,\*</sup>, Sonja Kahlmeier<sup>a</sup>, Harry Rutter<sup>b</sup>, Francesca Racioppi<sup>a</sup>, Pekka Oja<sup>b</sup>



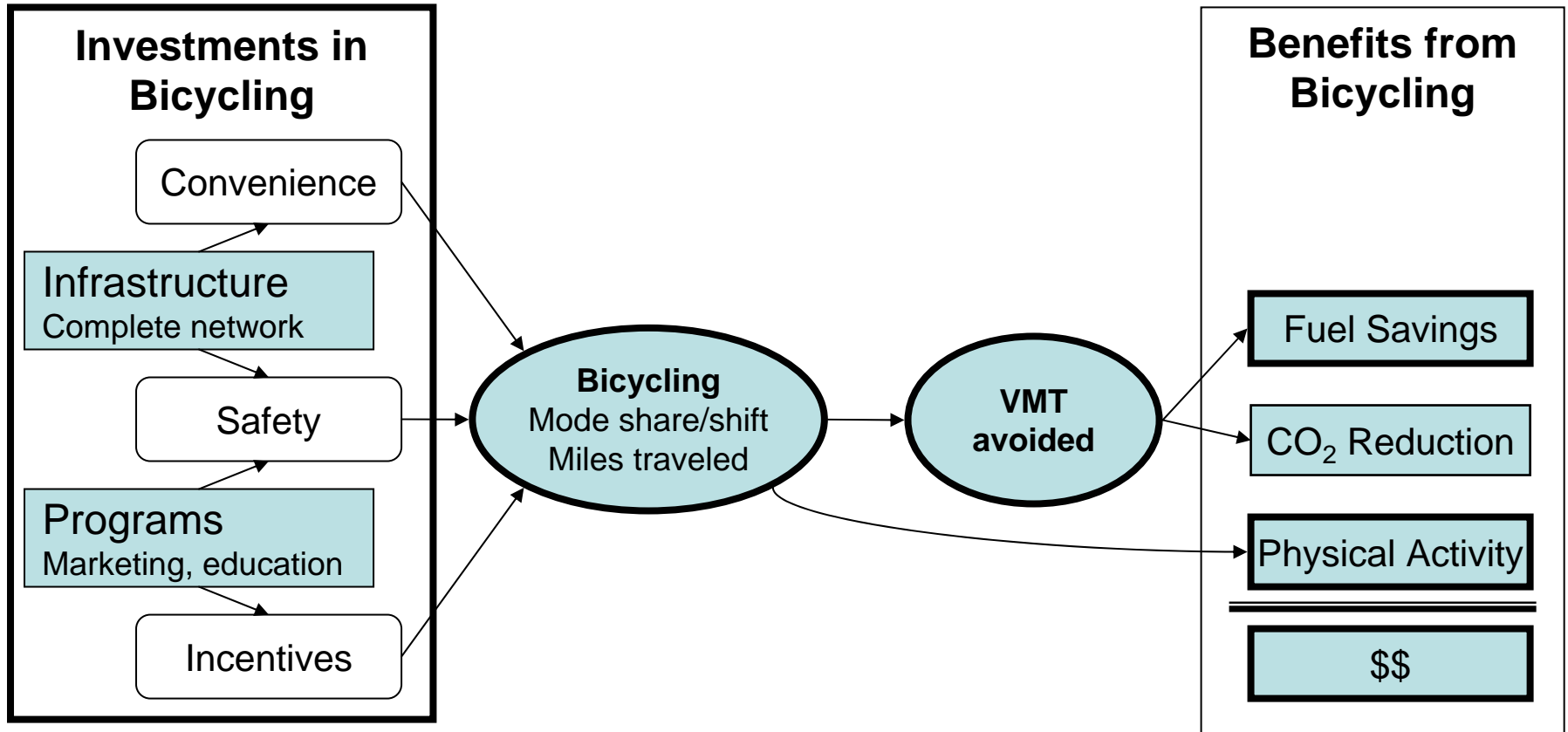
# Impacts of Bicycle Investments in Portland, Ore.




Portland Average Daily Bridge Bicycle Traffic 1991-2008



# Portland Cost-Benefit Framework



# Basics of the Analysis

- Timeframe: 1991-2040
  - Monetary values in 2008 \$\$  
(2.6% average annual inflation rate)
  - Annual discount rate for future values 3%  
(caveat: not included in calculation in abstract!)
  - 1991 levels used as baseline
  - Not considered: Faster rate of cost increases in health care
- 

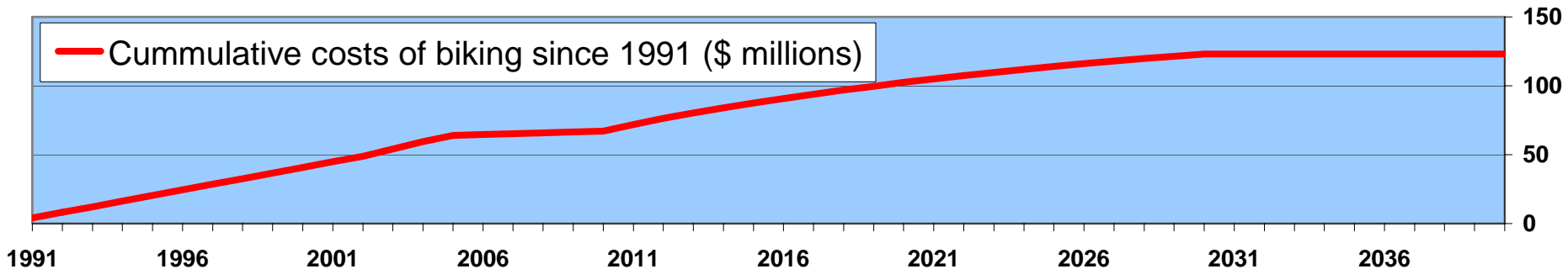


# Costs of Infrastructure and Promotion

- In 2008, city estimated cost of 300 miles bikeway network at **\$57 million**
- Since 2003, SmartTrips promotion program **\$7.2 million** total over ten years (\$600k per year )
- Assumption: to achieve future mode shift goals Portland will invest another **\$100 million** by 2030

---

Total investment: \$164 million (1991-2040)



- (currently not included: investments in regional trails of \$79 million, and plans for full build-out of regional trails of approx. \$1 billion)
- Opportunity costs: not straight forward (Assume zero)

# Portland's Plan for the Future



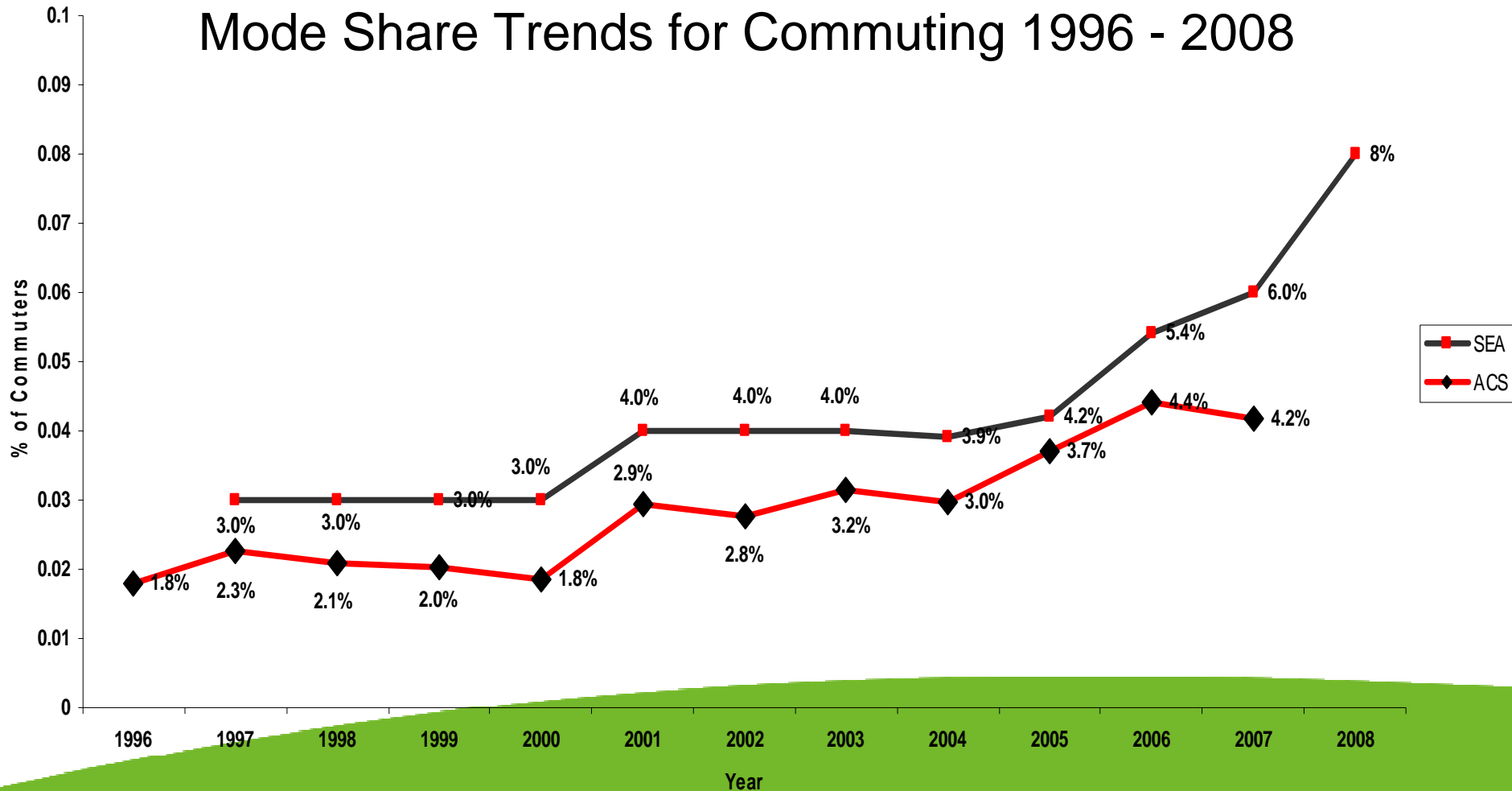
# Portland Metropolitan Regional Transportation Plan

\$100 million to achieve bike mode share of 25% by 2030

- Build missing portions of the regional **trails** identified for having maximum potential to increase mode share. **\$50 million**
- Build 100 miles of **bicycle boulevards** to a total of 130 miles throughout the entire city, putting 80% of Portland's citizens within one-half mile of these popular, family-friendly bikeways. **\$21 million**
- Improve **on-street connections** that link to the trails and trailheads in the region through improved crossing, bike boulevards, signage, signals, crosswalks, etc. **\$5 million**
- Improve **existing bikeways** in the City of Portland — improving crossings, slowing traffic, widening bicycle lanes, and fixing the 50 worst **intersections** in Portland **\$6 million**
- Repair and upgrade existing regional trails. **\$2 million**
- Build two **bicycle-pedestrian bridges** to eliminate barriers that currently prevent two Portland neighborhoods from having access to primary bikeway network. **\$7 million**
- Expand nationally-recognized **Portland Smart Trips** and Regional Transportation Options encouragement programs. **\$9 million**

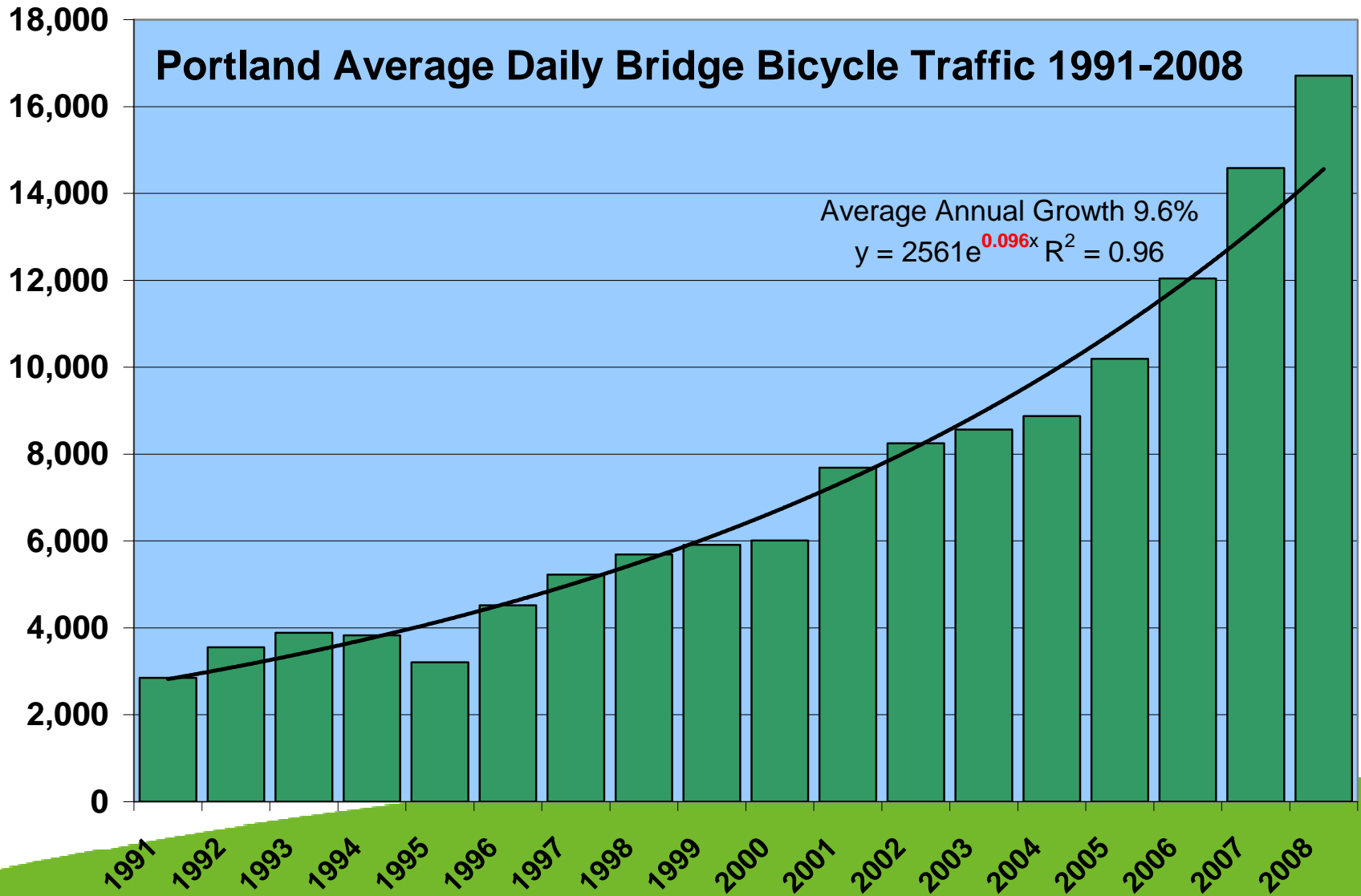
# Assessing Levels of Bicycling

## Mode Share Trends for Commuting 1996 - 2008





# Bicycle Count Trends



# Metro Travel Demand Model

**Metro Travel Forecasting  
2008 Trip-Based Demand Model  
Methodology Report**

**March 2008**



**METRO**

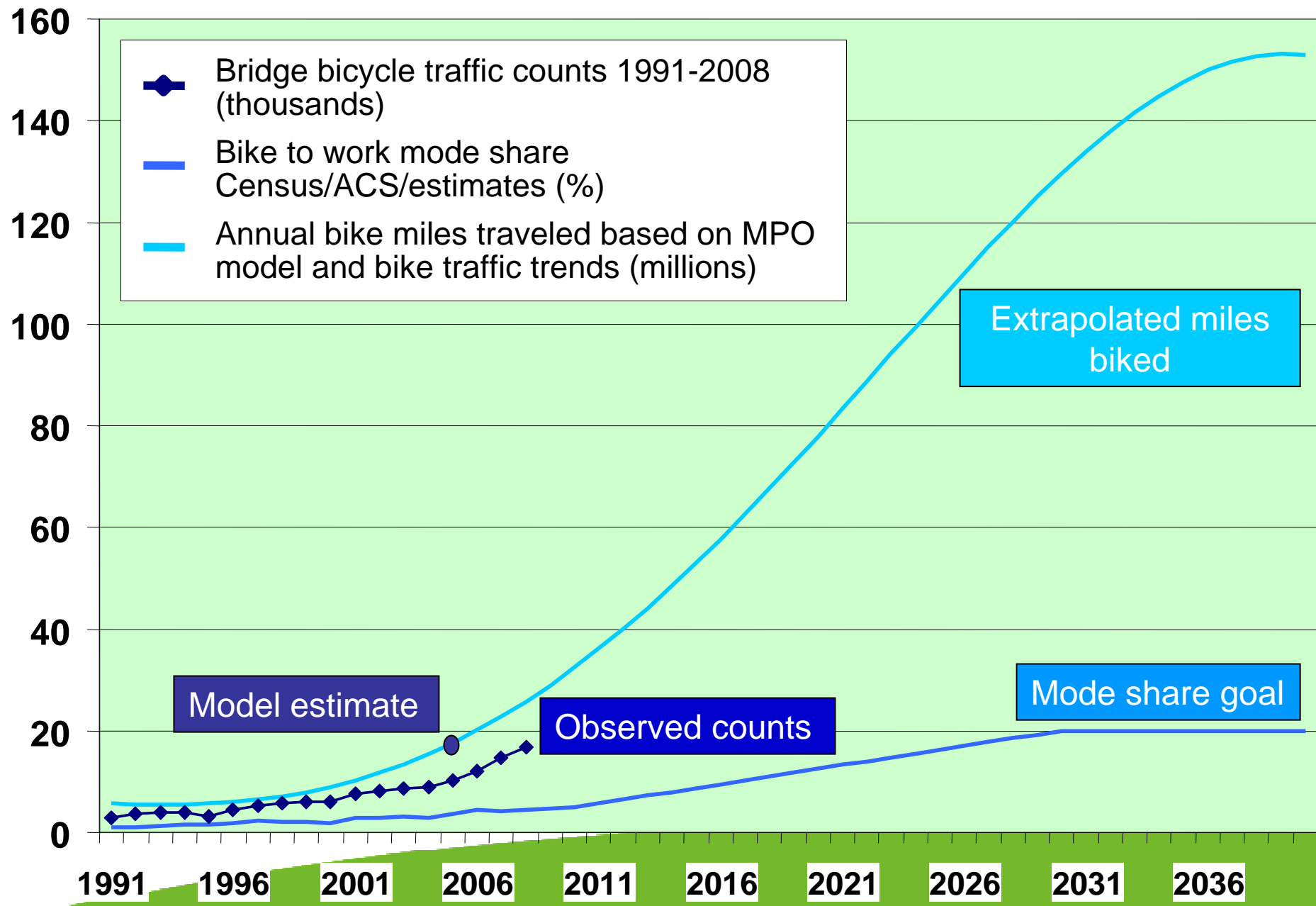
**Planning Department  
Transportation Research and Modeling Services**

**Andrew Cotugno, Director**

**Principal Author : Kyung-Hwa Kim**

# Converting Counts and % to Miles Biked

- 17 years count data: 10% annual increase
  - Correlated mode share data (2008: 4-8%)
- 2030 mode share goal of 25% (20%)
  - Used to fit a polynomial extrapolation
- 2005 MPO traffic model
  - Provides miles biked by trip length. Capped at trips of 3 miles or less. Predominantly utilitarian, urban.





# Reality Check

By 2030, 1 out of 5 Portlanders will ride  
2.4 miles a day, on average.

(or about 6.5 miles on every sunny day)

Zurich, Switzerland

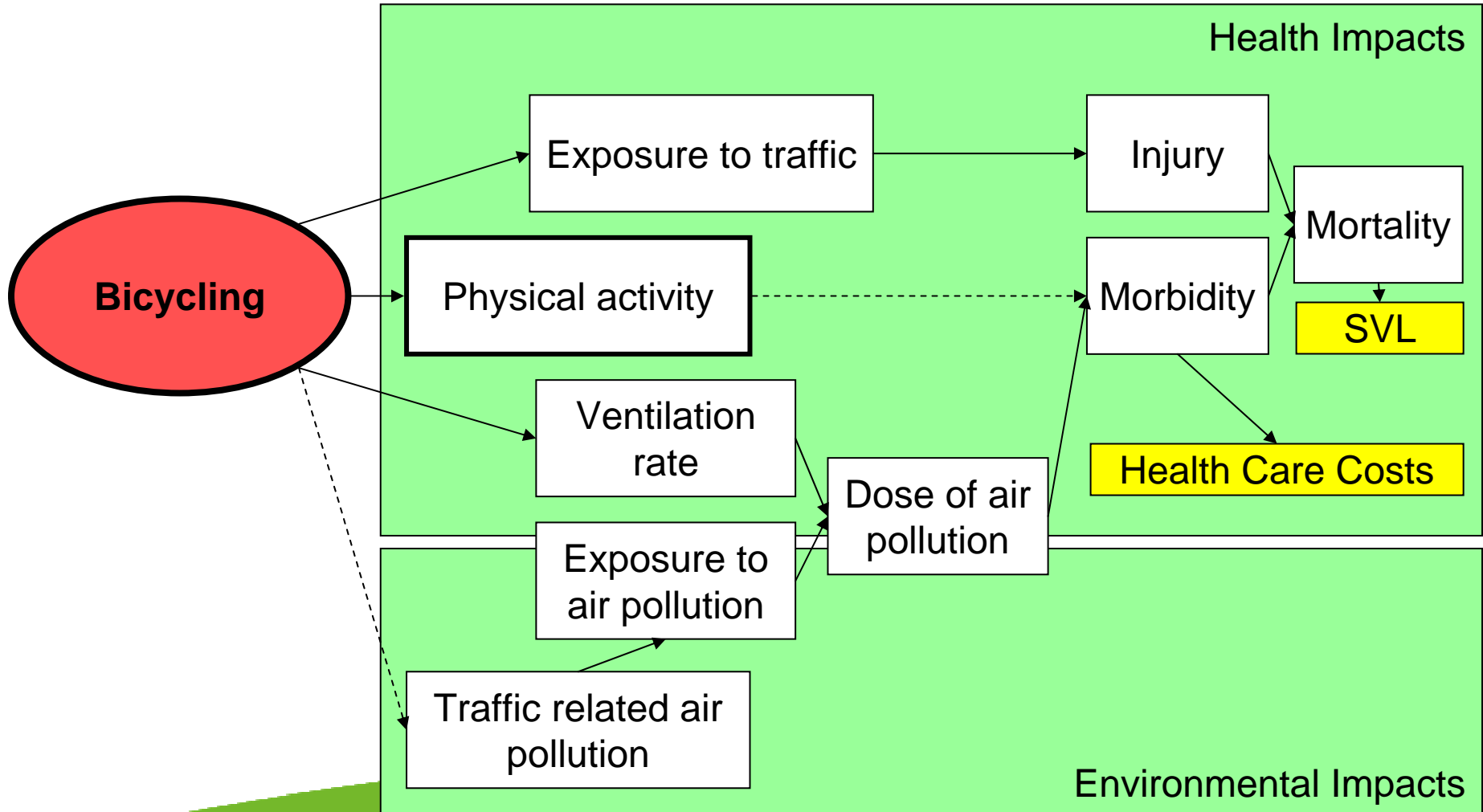


*“A Mid-range Bicycle City  
in the European Context”*

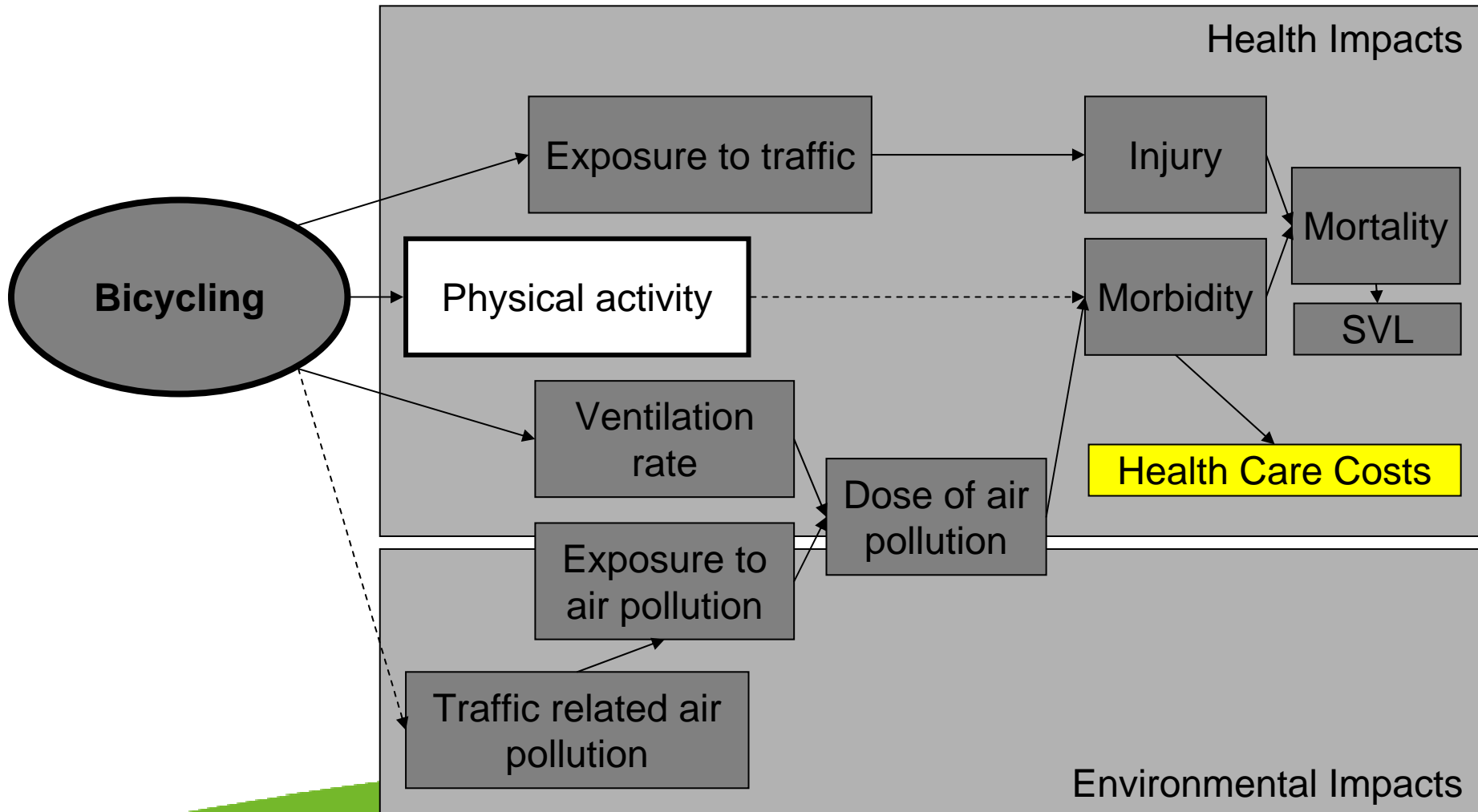
2005

- *Population 440,000*
- *Approx. 25% ride their bike on an average day*
- *Cyclists make 1 trip/day on average*
- *Average trip distance 2 miles*
- *Household bike ownership 70%*

# Valuing Health Impacts of Bicycling



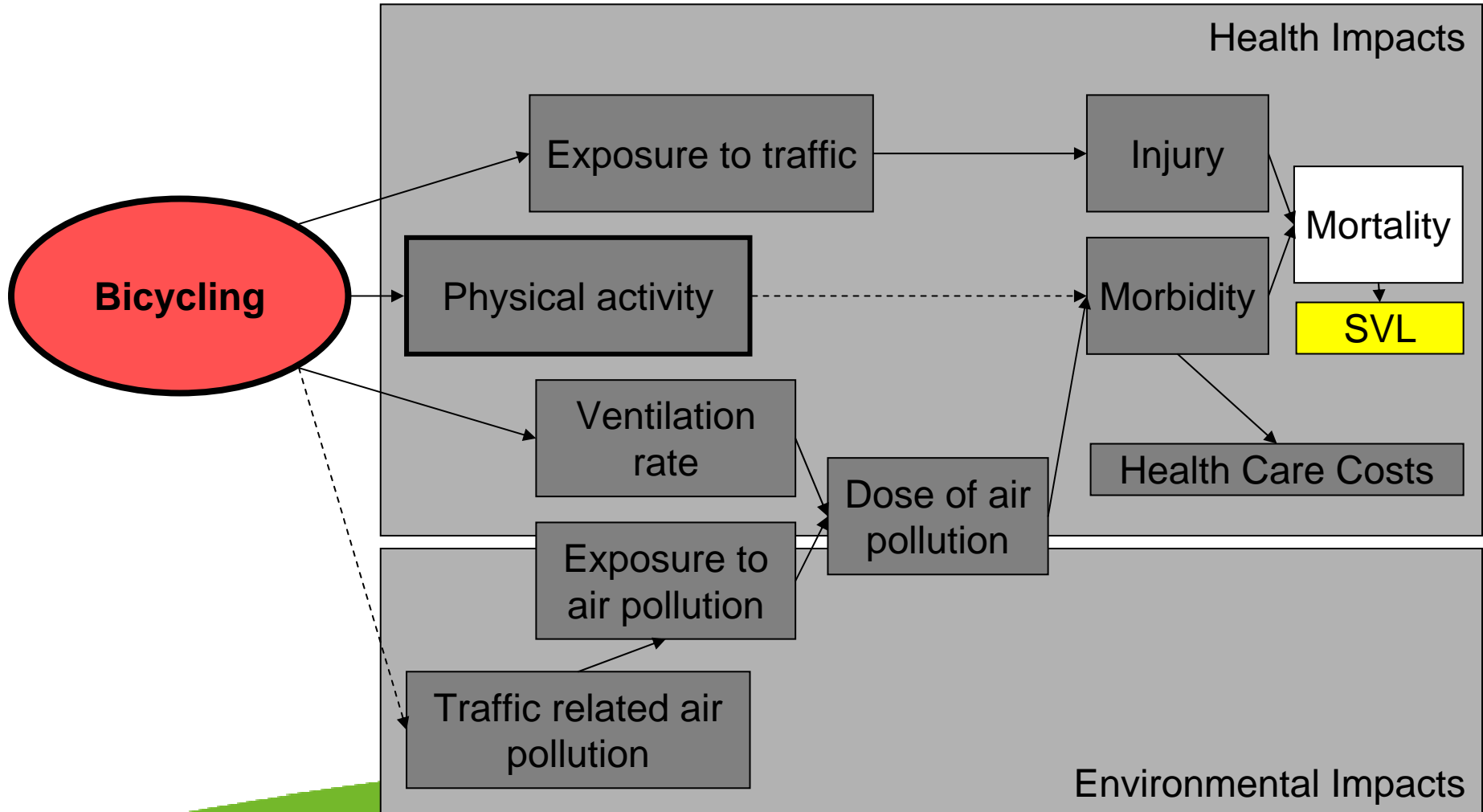
# Approach 1: Health Care Savings



# Converting Miles Biked to Health Care Savings

- Convert bike miles to minutes of PA (10mph)
- Studies estimate health care savings from sufficient physical activity (30min/day) at \$544 per year.  
(in 2008 \$\$ compared to insufficient PA)
  - Colditz et al. 1999, Pratt et al. 2000, Wang et al. 2004
- Assumption: to achieve 30 min/day, an insufficiently active person needs add. 15 minutes of PA, on average.
- Alternative: HEAT for Cycling (WHO), based on:
  - reduction of all-cause mortality among bicyclists in Copenhagen (RR=0.72, Andersen et al. 2000)
  - statistical value of life (\$5.8 million)

# Approach 2: Statistical Value of Life





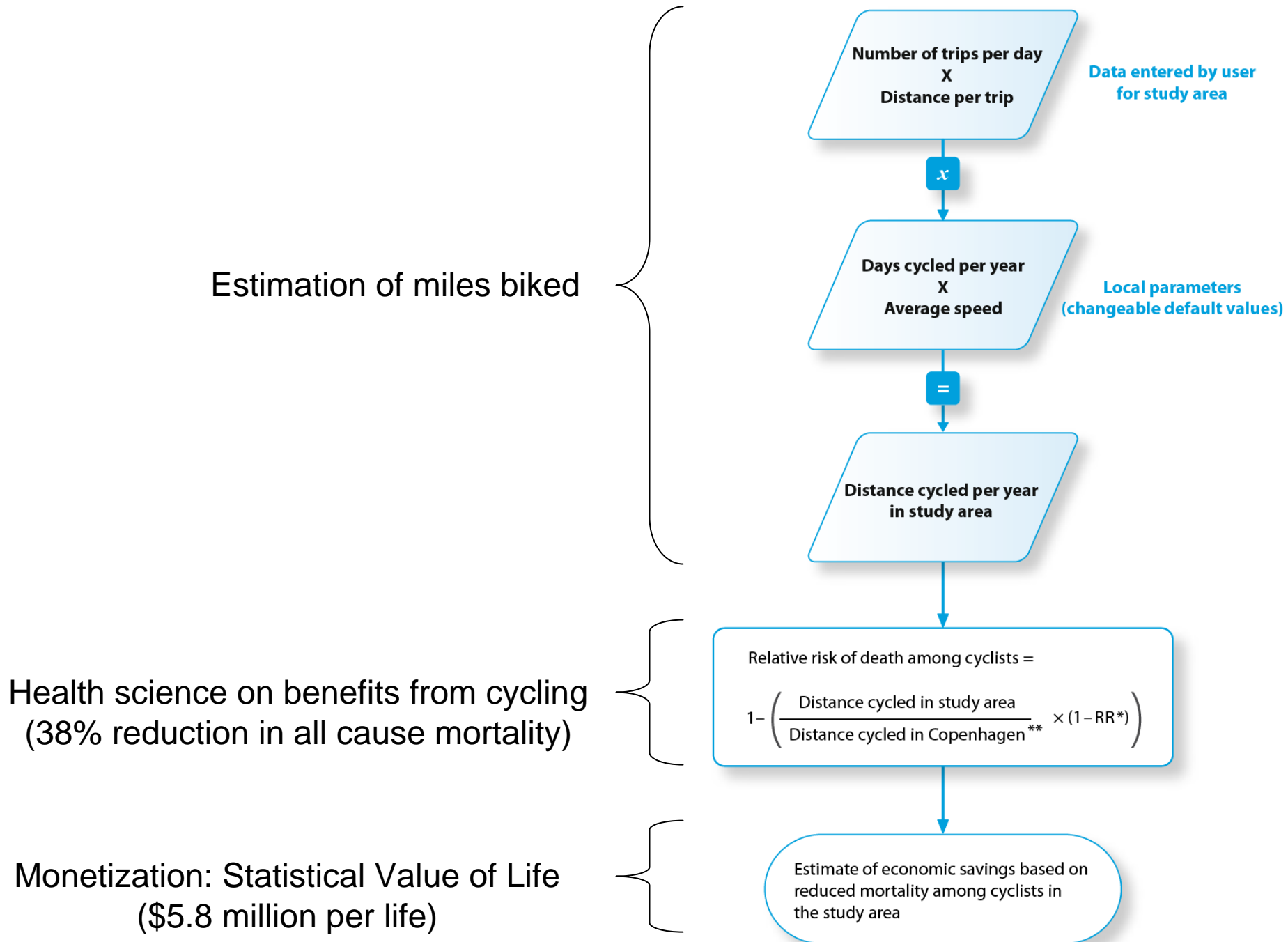


**If  $x$  people cycle a distance of  $y$  kilometres on most days, what is the economic value of the health benefits that occur as a result of the reduction in mortality due to their physical activity?**

# **The health economic assessment tool for cycling (HEAT for cycling)**



Fig. 1. Basic functioning of the HEAT for cycling

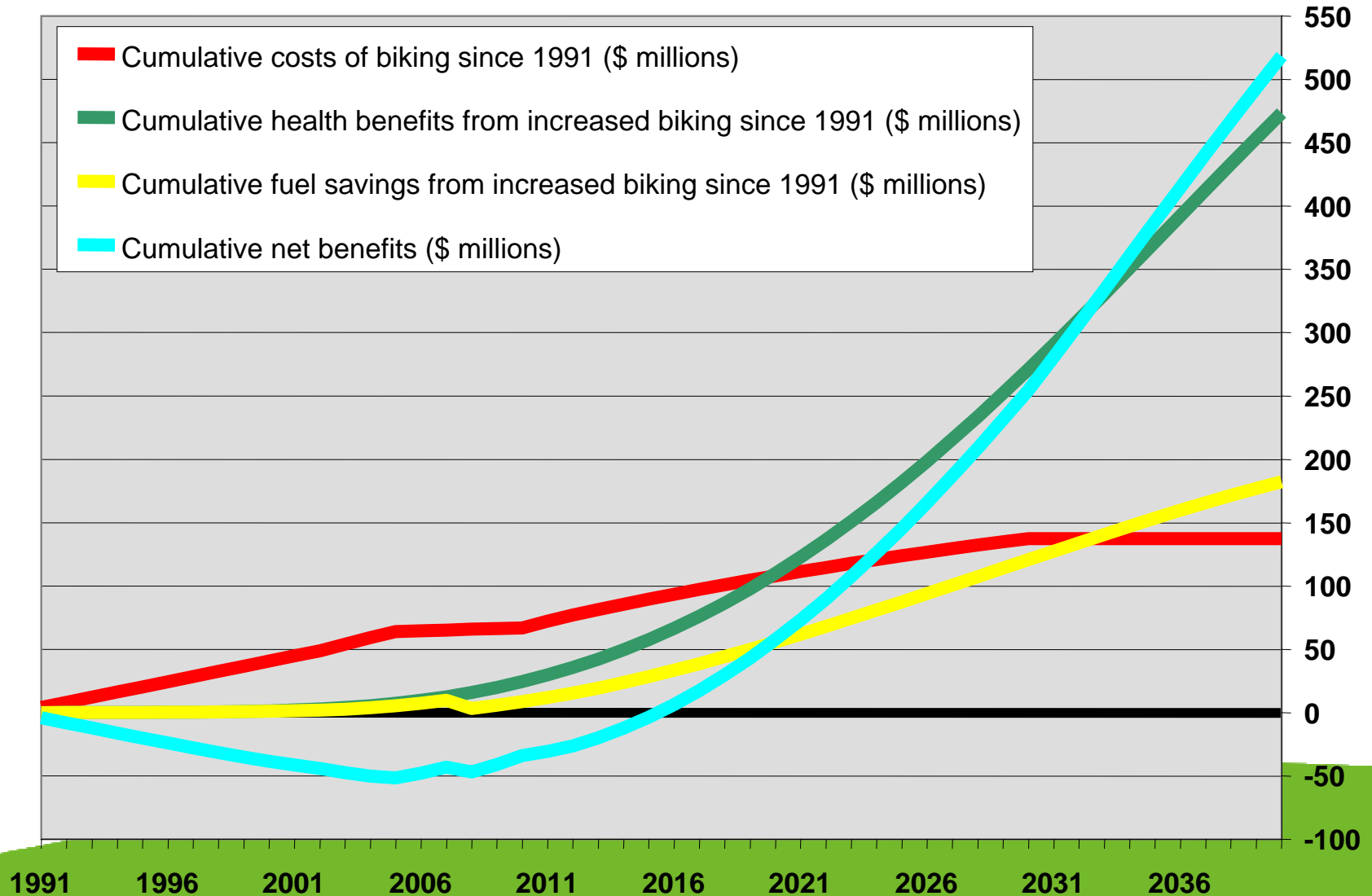


# Discounting for “Health Irrelevant”<sup>\*</sup> PA

- Some cyclists may already be sufficiently active
- Some bicycling may substitute for other forms of physical activity
- Assumption:  
In 2000, only 20% of cyclists would be insufficiently active without bicycling.  
By 2030, this proportion increases to 50%.

<sup>\*</sup> Please do not adopt this terminology

# Costs and Health Care and Fuel Savings of Bicycling in Portland 1990-2040



# Cost-Benefit Ratio

By 2040:

- Total investments: \$138 million  
(\$167M before discount)
- Health care savings: \$473M
- Fuel savings: \$182M


Return on investment:

**\$4.8 in benefits per \$1 invested**

Using HEAT:

- Savings in SVL by 2040: \$13B (2310 lives saved)

# Benefits not Considered

- Bicycling trips > 3 miles
  - Health benefits among the sufficiently active
  - Safety improvements/increased exposure
  - Time savings/opportunity costs
  - CO<sub>2</sub>, air pollution reduction
  - Transportation benefits (congestion relief, infrastructure savings, transit synergies)
  - Economic benefits (local businesses, real estate values, total costs of driving)
  - etc.
- 

# Concluding Remarks

- This analysis provides **ballpark estimates** – substantial potential for **improvements in methodology and data** remains
- Replication of this analysis in other US cities is difficult for **lack of data**
- Arguably, the limited consideration of benefits, and several conservative assumptions outweigh uncertainties in cost estimates, resulting in a **conservative assessment of cost-effectiveness** of bicycling
  
- Increases in active transportation, and bicycling in particular are **worth pursuing**
- Investments in bicycling in Portland are **highly cost-effective**
  
- Key research needs:
  - Assessment of levels of bicycling (counts and models)
  - Relationship between bicycling and physical activity
  - Quantification of health care savings from bicycling/physical activity




# Thank You!



Contact: Thomas Gotschi [gotom22@gmail.com](mailto:gotom22@gmail.com)

# Converting Miles Biked to Fuel Savings

- Assumption: Fuel efficiency increases to 35mpg by 2030
    - Convert miles to gallons
  - Assumption: gasoline costs \$3.80 by 2030  
(average of EIA high and low predictions)
  - For CO<sub>2</sub> reductions, assume reduced C content of 15% by 2030
    - CO<sub>2</sub> reduction currently not considered in cost-benefit calculation, but used for cost-per-ton calculations
- 

# Safety in Numbers

