Monetizing Morbidity in Transportation and Climate Scenario Planning

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TRB Moving Active Transportation to Higher Ground
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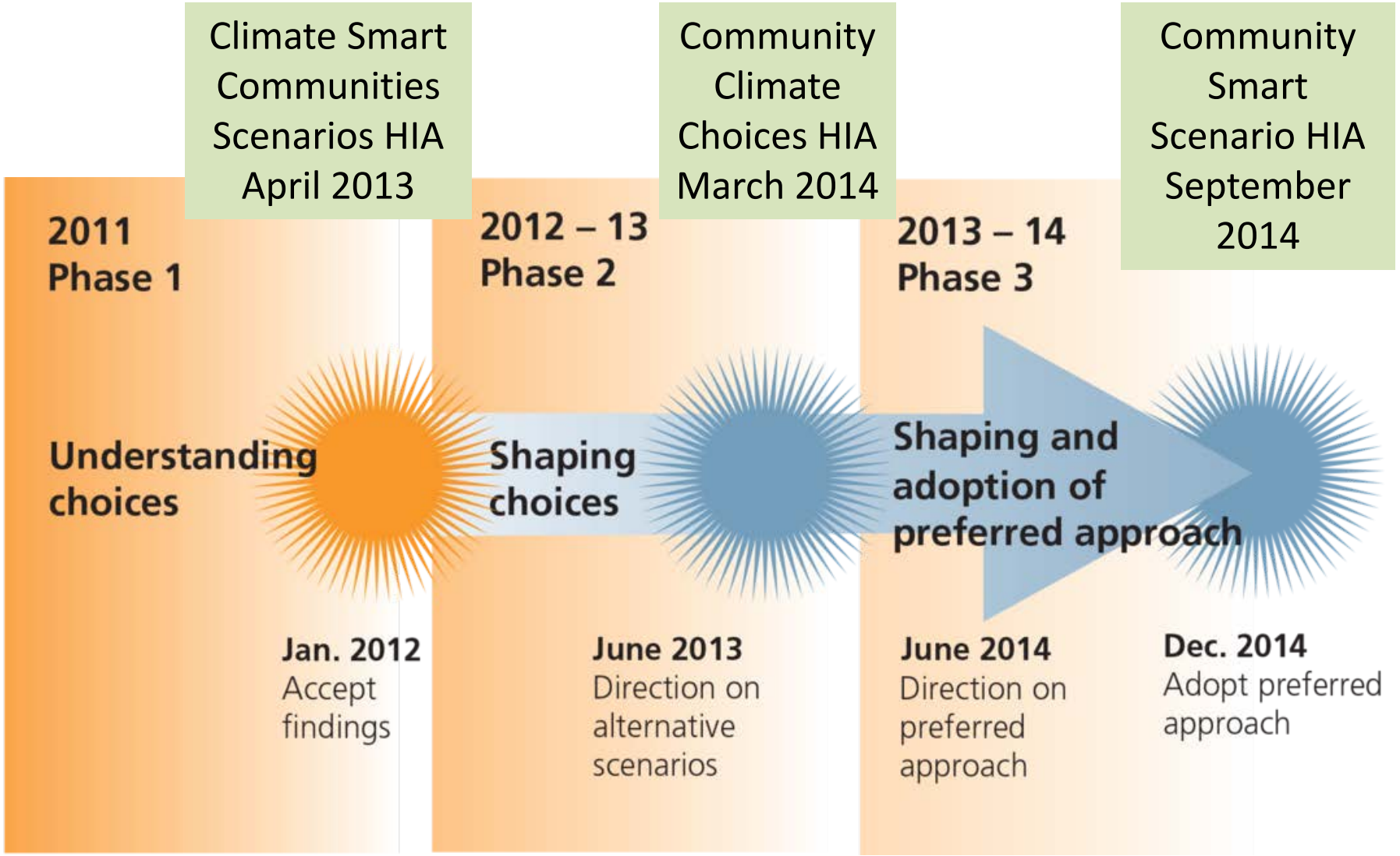
Health as an Externality

Metro's Climate Smart Communities Scenarios Project

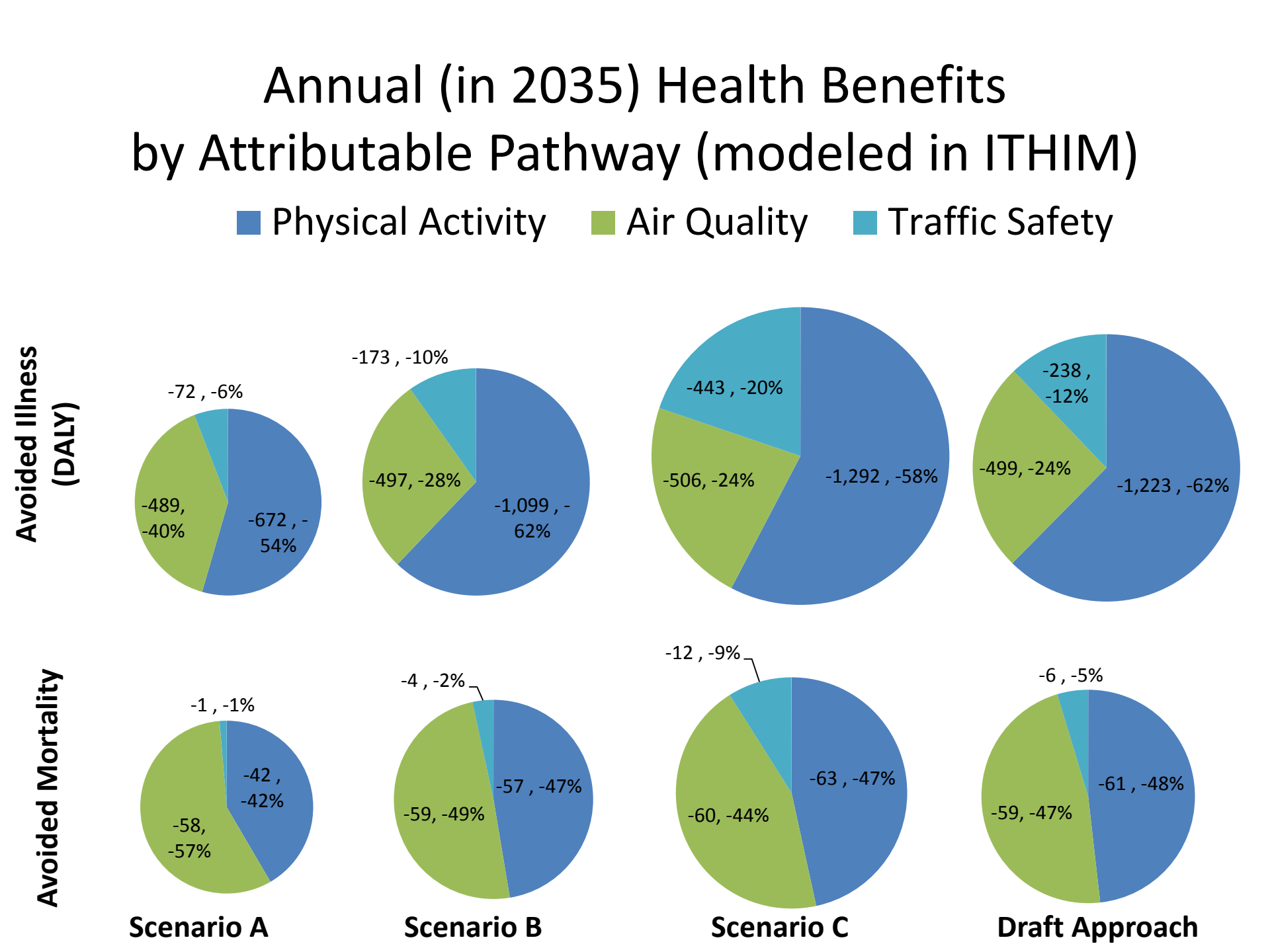
- Legislative mandate
- Portland, OR MPO
- Plan and implement
- Decrease emissions from light duty vehicles by 20% by 2035

Metro's Climate Smart Communities Scenarios Project

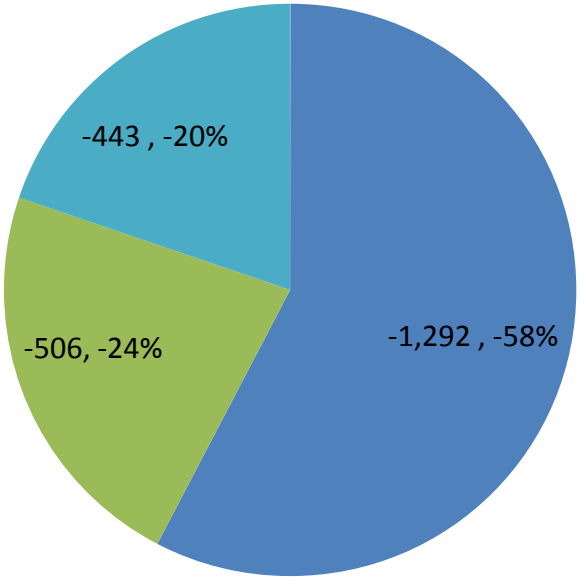


Data Input	Baseline (2010)	Scenario A Current Trajectory	Scenario B Adopted plans with increased revenue	Scenario C Scenario B plus additional policy/ infrastructure and new funding sources	Draft Approach Adopted 2014 RTP plus investment for transit and lower-cost TSMO and information
Reduction in GHG		↓12%	↓24%	↓36%	↓29%
Miles traveled per person per week	134	125	117	102	112
Average distance by mode per person per week[1]	Walk=1.3 Bike=2.1 Car=129.9	Walk=1.7 Bike=2.2 Car=120.8	Walk=1.8 Bike=3.0 Car=111.5	Walk=1.8 Bike=3.6 Car=96.3	Walk=1.8 Bike=3.4 Car=106.8
$PM_{2.5}$ (µg/m3)[2]	7.7291 (5-year average)	6.4429	6.4180	6.3925	6.4109
		↓16.6%	↓17.0%	↓17.3%	↓17.1%
UGB population	1,481,118	1,954,716 (2035 Estimate)			

Annual (in 2035) Health Benefits by Attributable Pathway (modeled in ITHIM)



How much would this save us? (And what does “save” mean?)



Concepts and Definitions - Mortality

- Willingness to Pay
- Value of Statistical Life (VSL)

Agency	VSL, 2010$
US DOT	$8,645,000 ($4,940,000 - $12,255,000)
EPA	$7,979,000

U.S. Department of Transportation. *Guidance on Treatment of the Economic Value of a Statistical Life*. Washington DC; 2013.

U.S. Environmental Protection Agency. *Guidelines for Preparing Economic Analysis.* Washington DC; December 17, 2010.

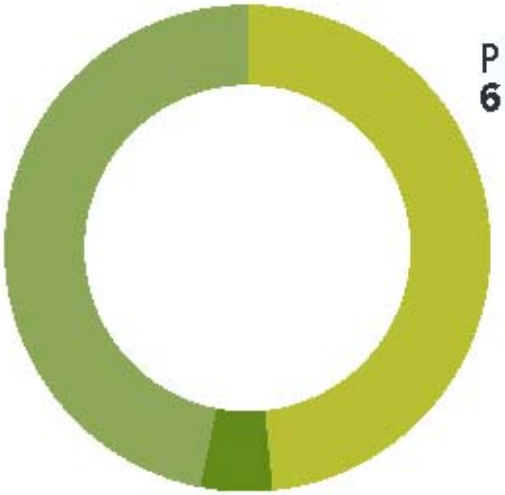
Fall 2014

KEY RESULTS

The Climate Smart Co
gas emissions from ca
leaders are shaping a
strong economy. On M
approach for testing t
communities across th

More physical activity and less air pollution provide most health benefits

LIVES SAVED EACH YEAR BY 2035



AIR POLLUTION
59 LIVES SAVED

PHYSICAL ACTIVITY
61 LIVES SAVED

TRAFFIC SAFETY
6 LIVES SAVED

By 2035 the region can save more than $1 billion per year from the lives saved each year by implementing the draft approach.

http://www.oregonmetro.gov/sites/default/files/CSC-KeyResults-Factsheet-2014_09_15.pdf

Concepts and Definitions - Morbidity

Cost of Illness (COI)	• Sum of costs, usually reported as national or per person costs
Direct Costs	• Medical and pharmacy expenditures
Indirect Costs	• Absenteeism, lost productivity • Pain & suffering not captured

National COI Example

Cardiovascular Disease

(heart disease, stroke, hypertensive disease, other)

Direct	=	$193.4
Indirect	=	$122.0
Total	=	$315.4 (billion, 2010$)

Source: Go et al (2014). Heart disease and stroke statistics-2014 updates: a report from the American Heart Association. *Circulation*. 129(3): e29-e292.

Concepts and Definitions - Morbidity

Attributable Fraction (AF)

- The change in the environment attributable to a particular policy or intervention

Attributable Costs

- The change in costs attributable to a particular policy or intervention

AF: How big is the Plan's fork?

National Cost of Illness (COI)

% of U.S. Population

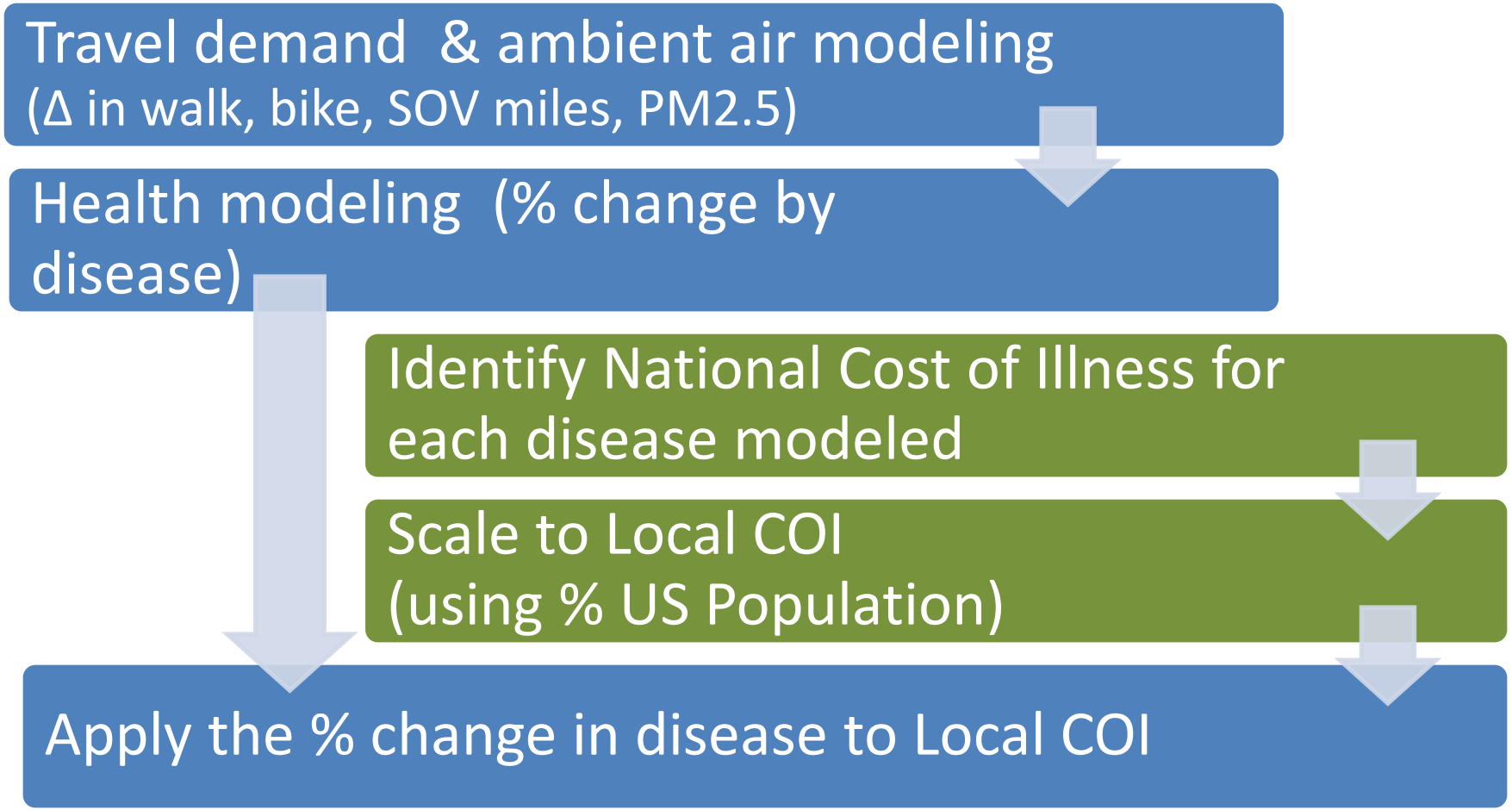
Local COI

Modeled % Reduction in Disease (DALYs)

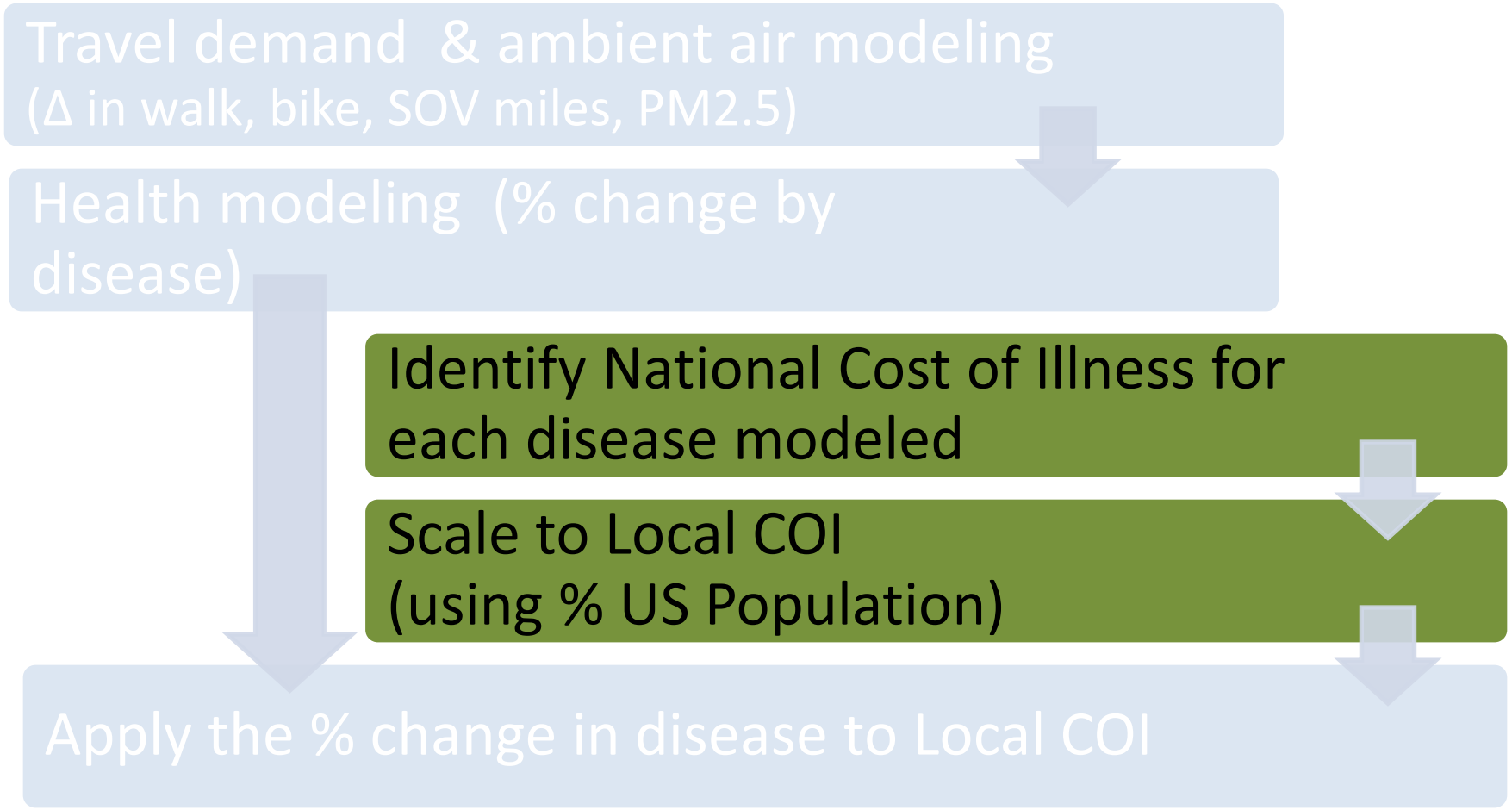
Saved Healthcare Costs

Attributable to Plan

Protocol for Attributable Costs



Protocol for Attributable Costs
Example of Defining Local COI



Condition	National COI (Base Year) in millions	CPI Adj	National COI - mil of 2010$	Regional Share - mil of 2010$	Source
Cancer (1) direct costs only					
Breast[1]	$27,378 (2010)	1.000	$27,378	$131	National Cancer Institute - Mariotto et al (2011)
Colon and rectum cancer[1]	$26,942 (2010)	1.000	$26,942	$129	
Lung[1]	$51,073 (2010)	1.000	$51,073	$245	
Cardiovascular					
Stroke	$36,500 (2010)	1.000	$36,500	$175	American Heart Association - Go et al (2013)
Stroke	$105,200 (2010)	1.000	$105,200	$505	American Heart Association & American Stroke Association - Ovbiagele et al (2013)
Heart Disease	$250,800 (2010)	1.000	$250,800	$1,203	American Heart Association - Go et al (2013)
Heart Disease	$336,800 (2008)	1.010	$340,168	$1,632	Heidenrieich et al (2011) adj for heart failure Voigt et al (2014)
Respiratory					
Asthma	$56,000 (2007)	1.052	$58,895	$283	Barnett et al (2011)
Mental Illness					
Dementia	$157,000-$215,000 (2010)	1.000	$157,000-$215,000	$753-$1,031	Hurd, (2013)
Depression	$83,100 (2000)	1.270	$105,230	$505	Greenberg et al (2003)
Other					
Diabetes	$245,000 (2012)	0.950	$232,750	$1,117	American Diabetes Assoc (2013)
Traffic Injuries	$41,789 (2005)	1.117	$46,657	$224	CDC's Injury Prevention – Naumann et al (2010)

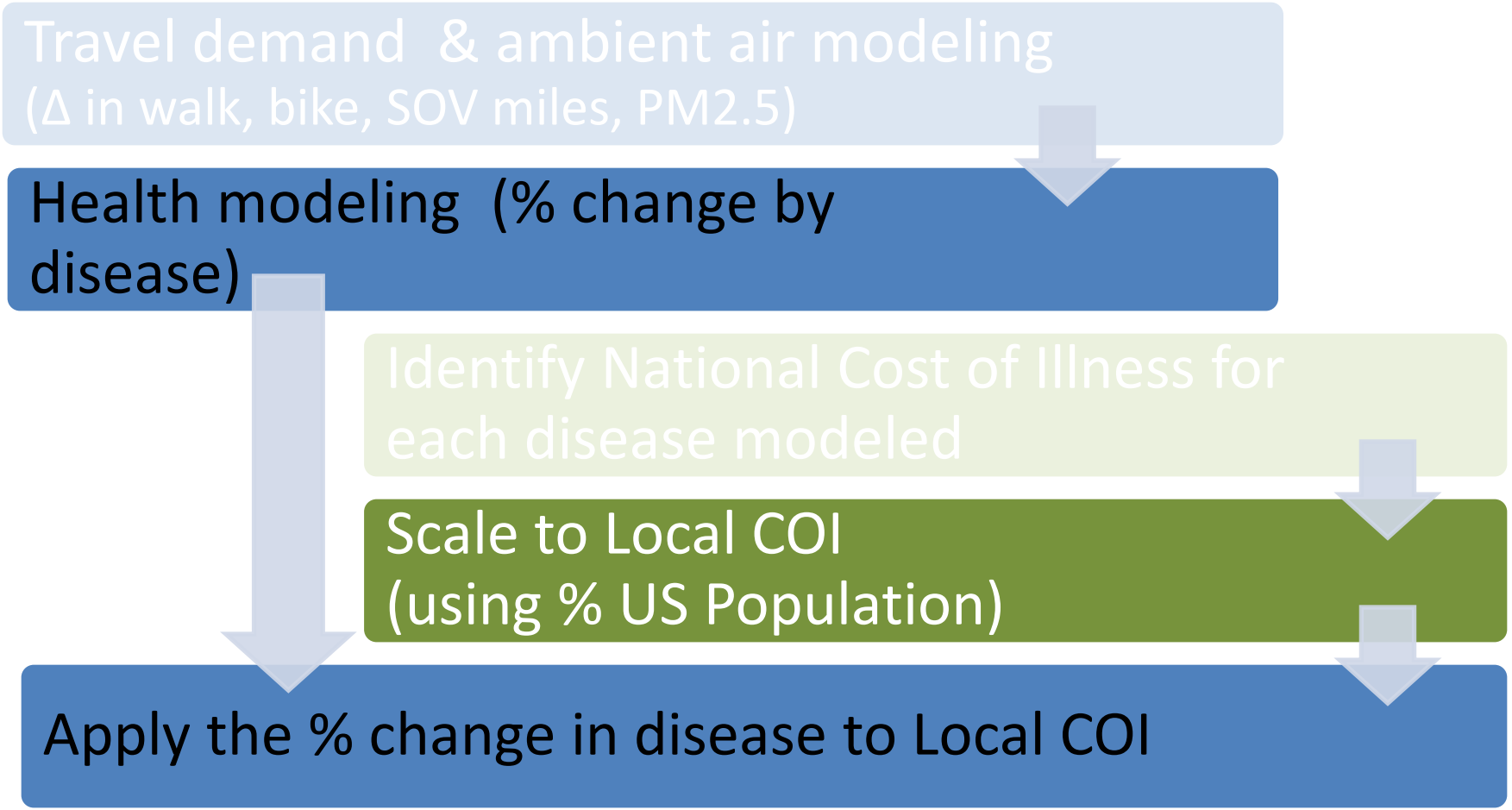
Protocol for Attributable Costs
Example of Defining Local COI

Maybe you stop there

- Helps tell something about the magnitude of the problem
- Works well for talking points

Protocol for Attributable Costs

Example of Applying Expected Change in Disease to Local COI



Disease	Regional COI	Draft Approach	
		Attributable Fraction	Regional Attributable Costs
Cancer			
Breast[1]	$131	0.40%	$0.53
Colon and rectum[1]	$129	0.70%	$0.90
Lung[1]	$245	1.65%	$4.04
Cardiovascular (CVD)			
Stroke	$175- $505	2.70%	$4.73-$13.63
Heart Disease	$1,203- $1,632	3.14%	$37.78-$51.24
Respiratory			
Asthma	$283	0.45%	$1.27
Mental Illness			
Dementia	$753-$1,031	0.91%	$6.85-$9.39
Depression	$505	0.65%	$3.28
Other			
Diabetes	$1,117	2.33%	$26.02
Traffic Injuries	$224	6.69%	$14.97
Total Annual Health Savings From Reduced Illness	**$4,765 -$5,801**		**$100.4-$125.3**

CLIMATE SMART COMMUNITIES SCENARIOS PROJECT

Metro

KEY RESULTS

The Climate Smart Communities Scenarios Project responds to a state mandate to reduce greenhouse gas emissions from cars and small trucks by 2035. Working together, community, business and elected leaders ar
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approach
communit

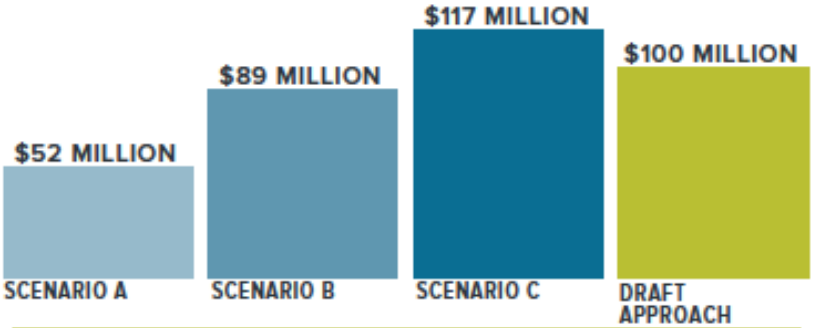
WHAT ARE THE PUBLIC HEALTH AND ECONOMIC BENEFITS?

By 2035, the draft approach can help people live healthier lives and save businesses and households money through benefits like:

- Reduced air pollution and increased physical activity can help **reduce illness and save lives.**
- Reducing the number of miles driven results in **fewer traffic fatalities and severe injuries.**

Our economy benefits from improved public health

ANNUAL HEALTHCARE COST SAVINGS FROM REDUCED ILLNESS (MILLIONS, 2010$)



In 2010, our region spent $5-6 billion on healthcare costs related to illness alone. By 2035, the region can save $100 million per year from implementing the draft approach.

http://www.oregonmetro.gov/sites/default/files/CSC-KeyResults-Factsheet-2014_09_15.pdf

Challenges with COI

- Sourcing National COI
- Understanding/reporting direct vs indirect

- Ethical & policy implications of valuing life/disease
  - Maximize quantity and quality of life
  - Benefits don't "transfer" well

Next Steps for Monetizing Active Transportation

- More comfort within public health with putting a $ amount on health
- More examples of the pivot approach
- Direct measurement
  - Difficult due to fractured health care system
  - Better interdisciplinary understanding
    - Econometrics for modeling
    - Health care economists for utilization
  - Ongoing research at University of British Columbia

Questions?

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