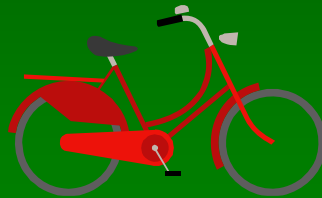


# Promoting public health through built environment and design



**June 18, 2013**

Montreal “Hands on sustainable urban mobility”

**Anne Lusk, Ph.D.**

**Harvard School of Public Health**

**Boston, Massachusetts**



# Learning outcomes:

- Issues about public health research and bicycling
- Health implications from bicycling



U.S. Department of Transportation  
**Federal Highway  
Administration**

## **U.S. Federal Highway Administration** **Mission Statement**

To improve mobility on our Nation's highways through national leadership, innovation, and program delivery.

## **System Performance**

The Nation's Highway system provides safe, reliable, effective, and sustainable mobility for all users.

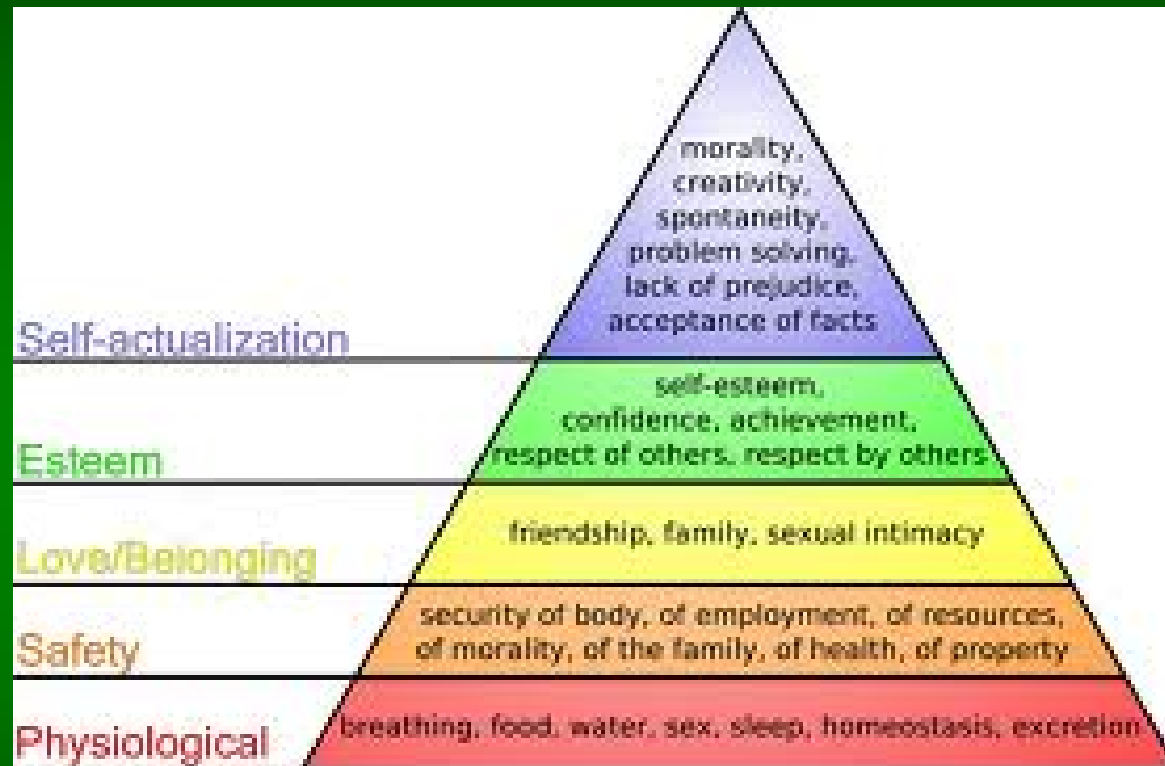


## **U.S. Department of Health and Human Services** **Mission Statement**

**The Department of Health and Human Services is the United States government's principal agency for protecting health and providing essential human services to Americans.**

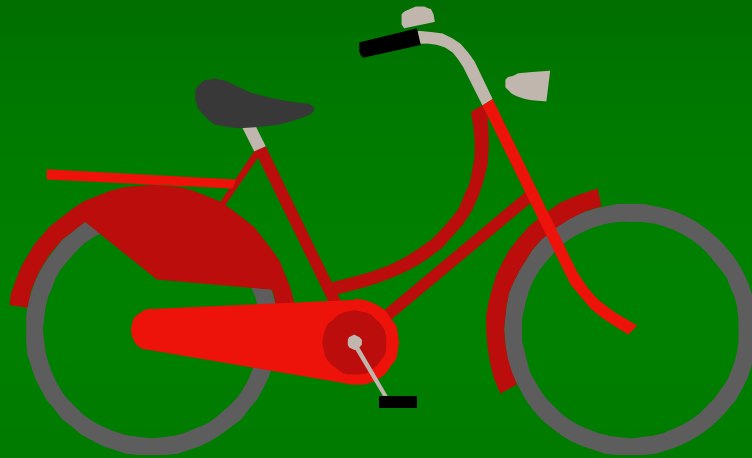
**With Emphasis on those least able to help themselves, the department provides services that protect and advance the quality of life for all Americans.**

# Maslow's Hierarchy of Needs



**Safety is a necessity but friendship, respect of others, self-esteem, and creativity = quality of life.**

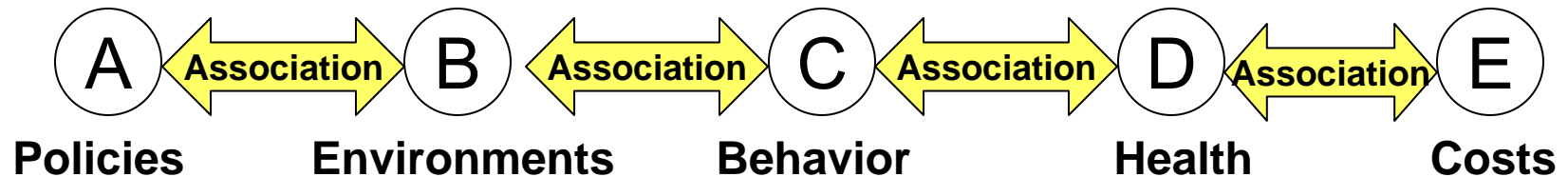
Therefore, let's suggest that there are 3 kinds of public health issues for bicycling.



1. Health from the exercise
2. Safety from crashes
3. Quality of life/joy = *New bike research domain (Maslow)*

# Epidemiology of Bicycling

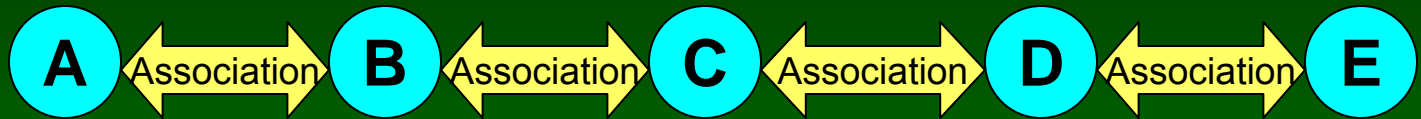
Bicycle research has multiple associations including:



**Before explaining additional health benefits from bicycling (behavior), it is important to show that bicycling has multiple associations.**

The next slide demonstrates: a) numbers of bicycle-related articles and b) the comparison between bicycle-related articles on PubMed and Transportation Research Record (TRR).

# Epidemiology of Bicycling



**A**  
Policies

**B**  
Environments

**C**  
Behavior

**D**  
Health

**E**  
Costs

No. of Articles

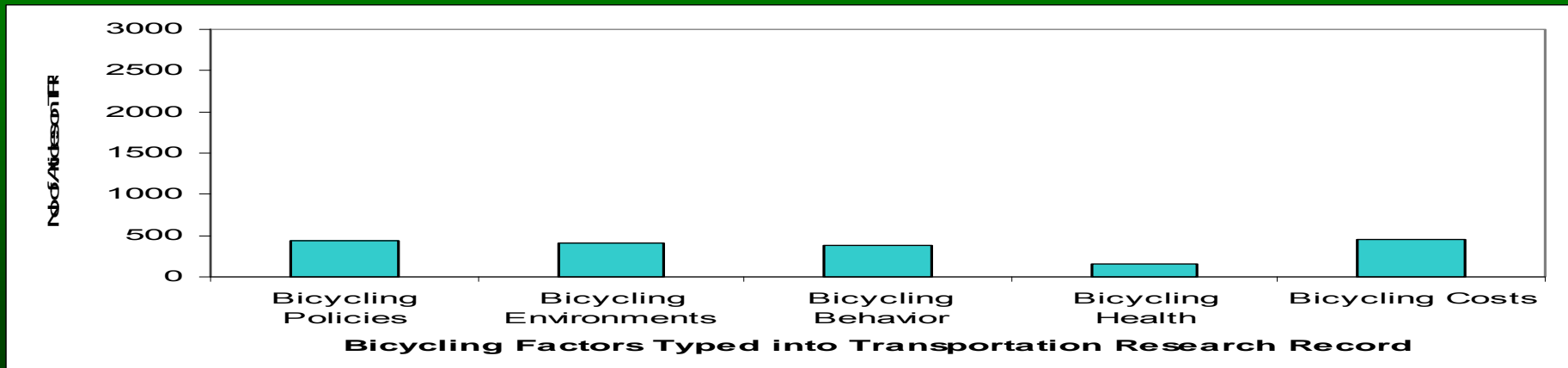
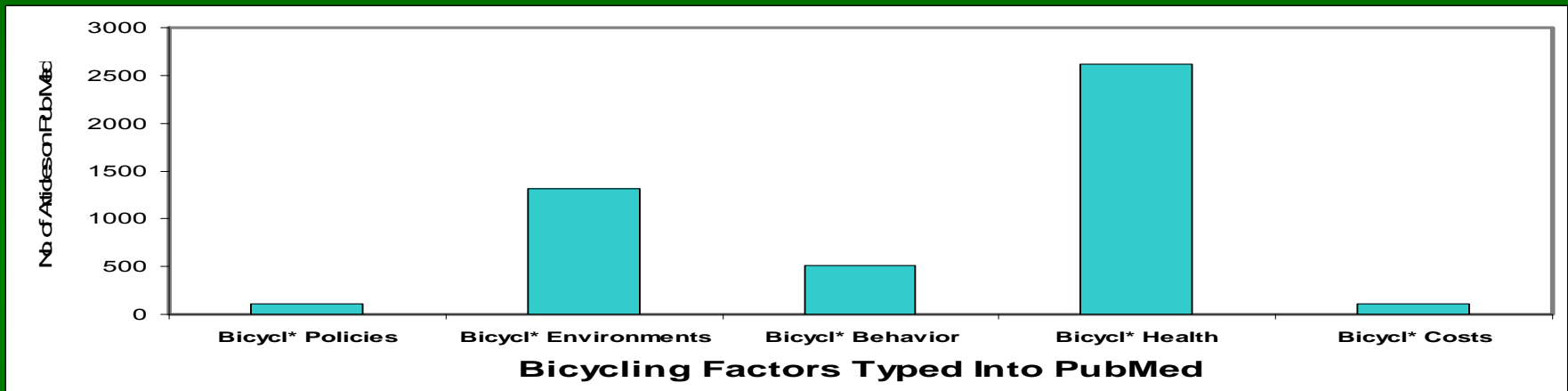
541 Total

1719 Total

897 Total

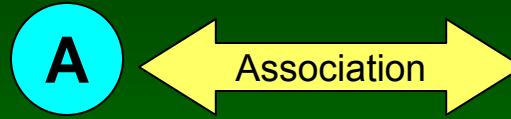
2775 Total

571 Total



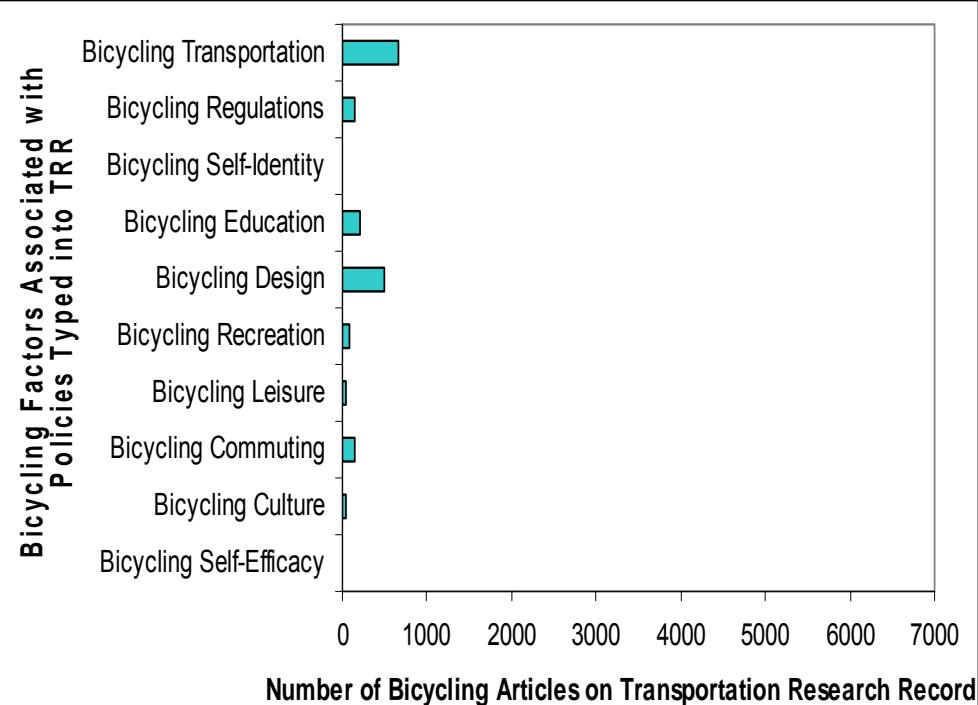
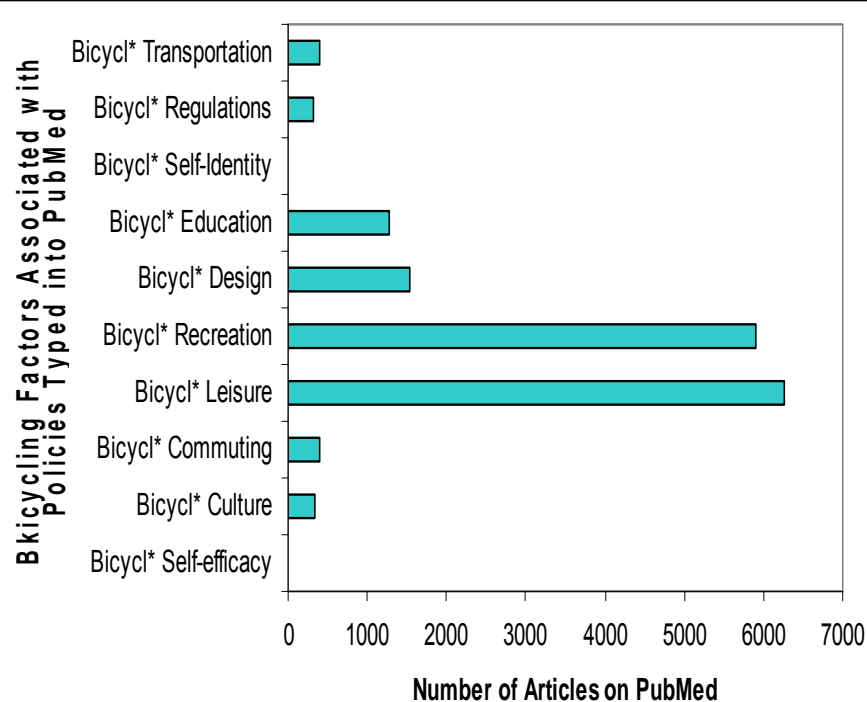


# Research on Epidemiology of Bicycling

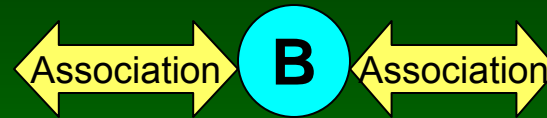


## Policies

Below are key bicycle words associated with policies.

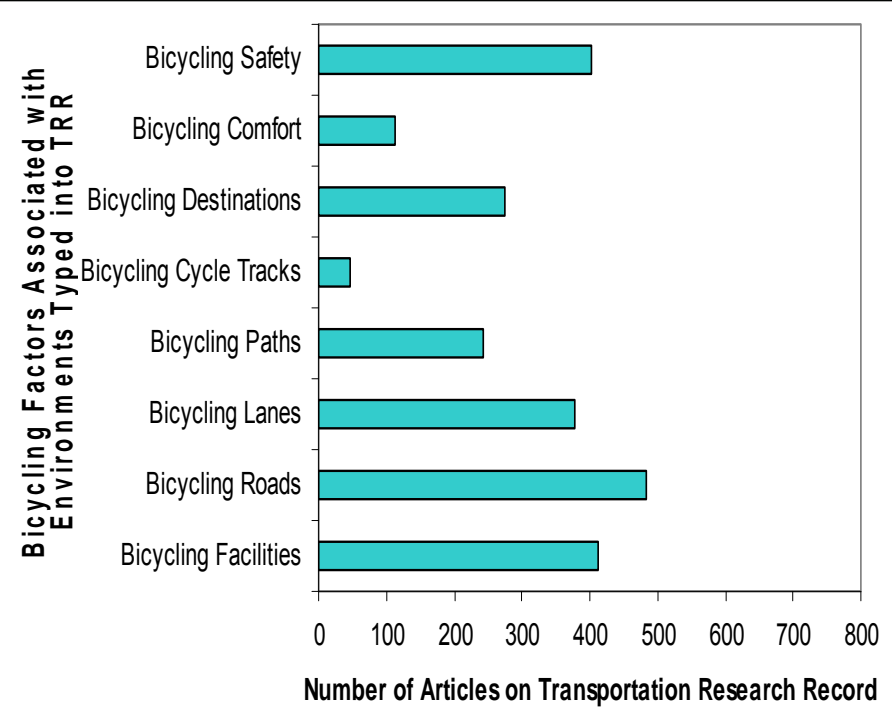
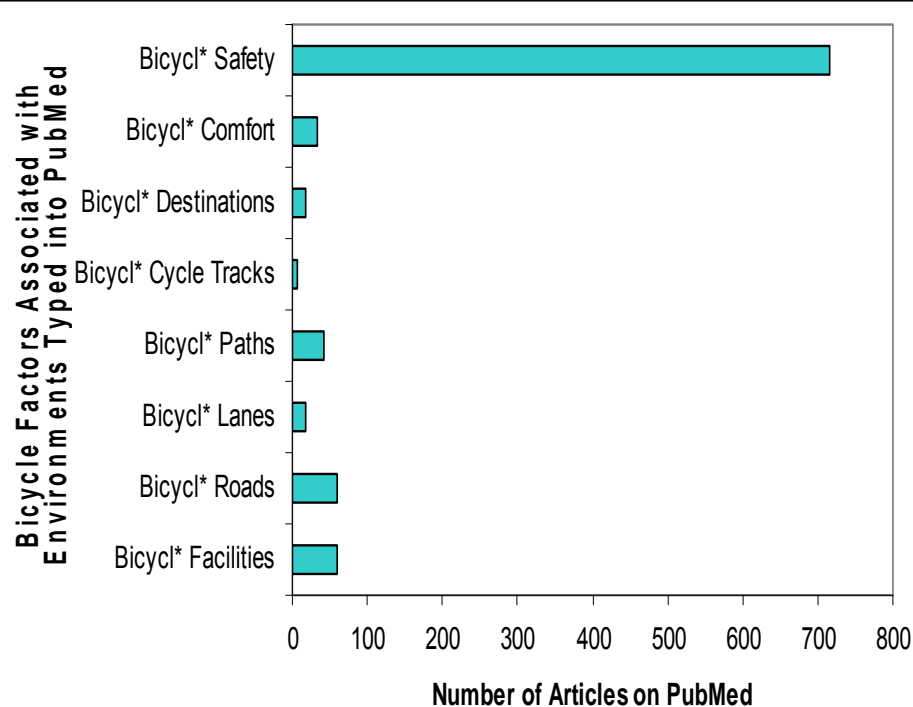


# Research on Epidemiology of Bicycling

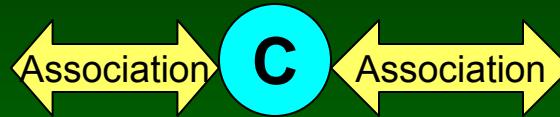


## Environments

Below are key bicycle words associated with environments.

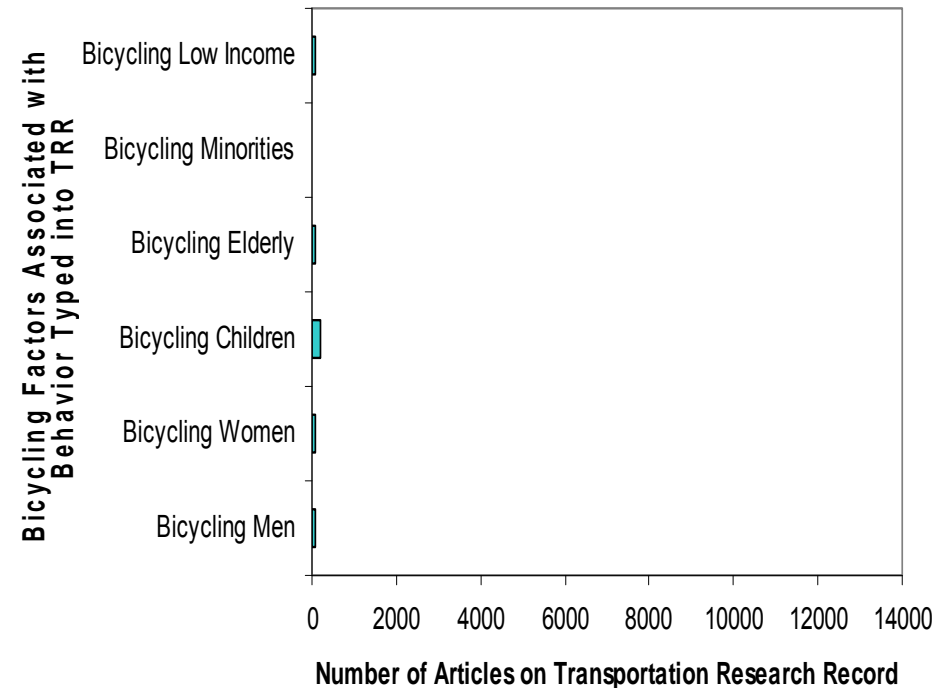
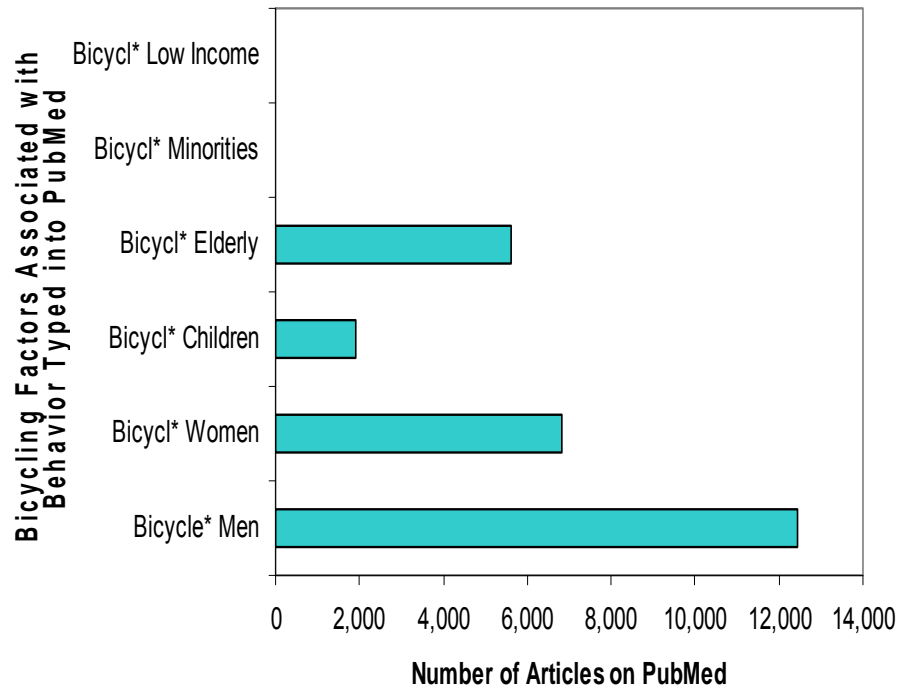


# Research on Epidemiology of Bicycling

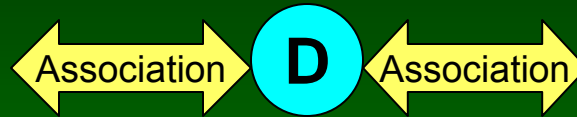


## Behavior

Below are key bicycle words associated with behavior.

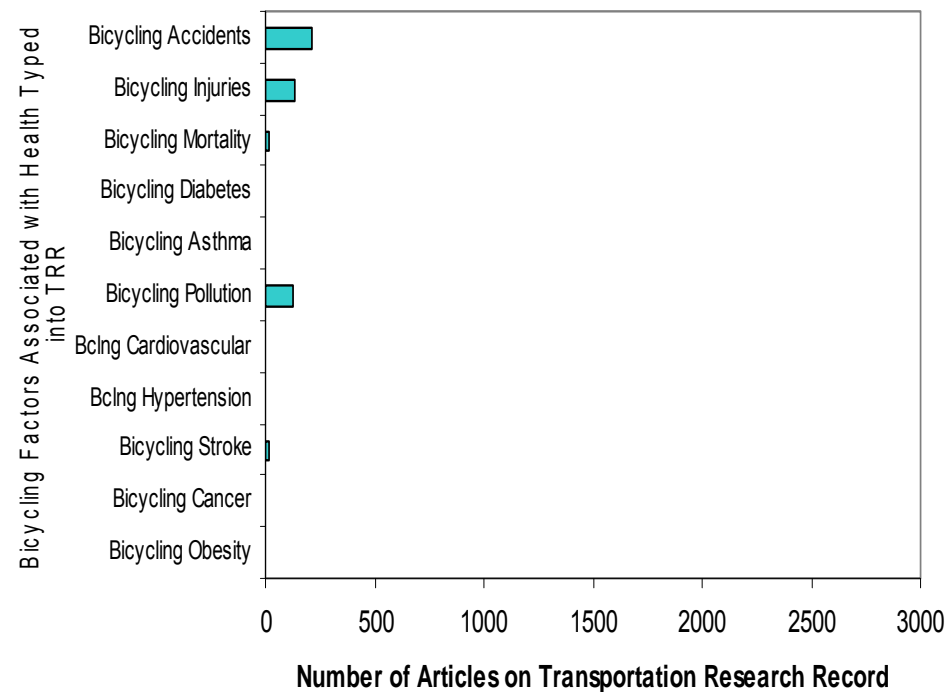
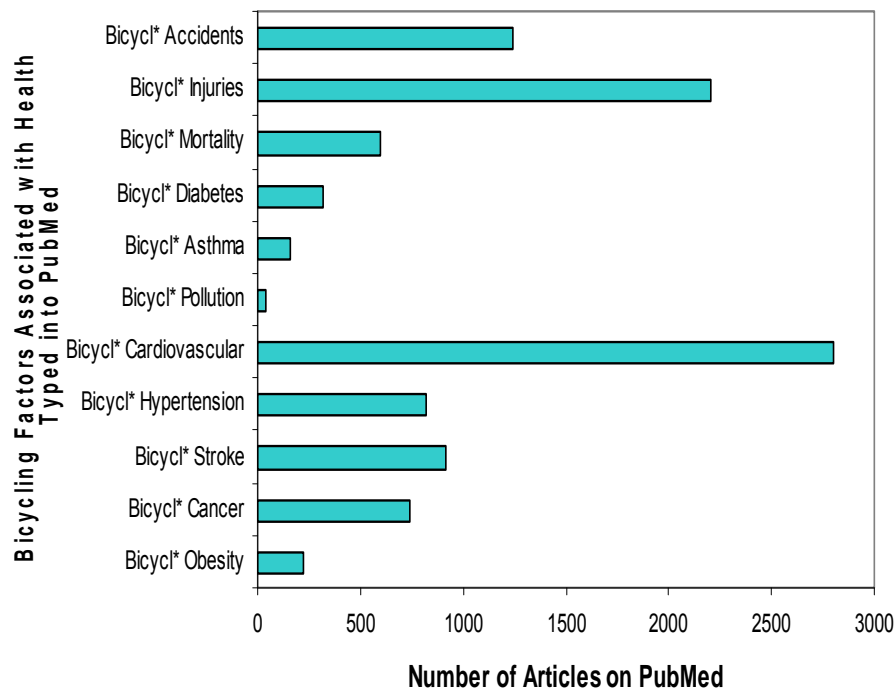


# Research on Epidemiology of Bicycling



Health

Below are key bicycle words associated with health.

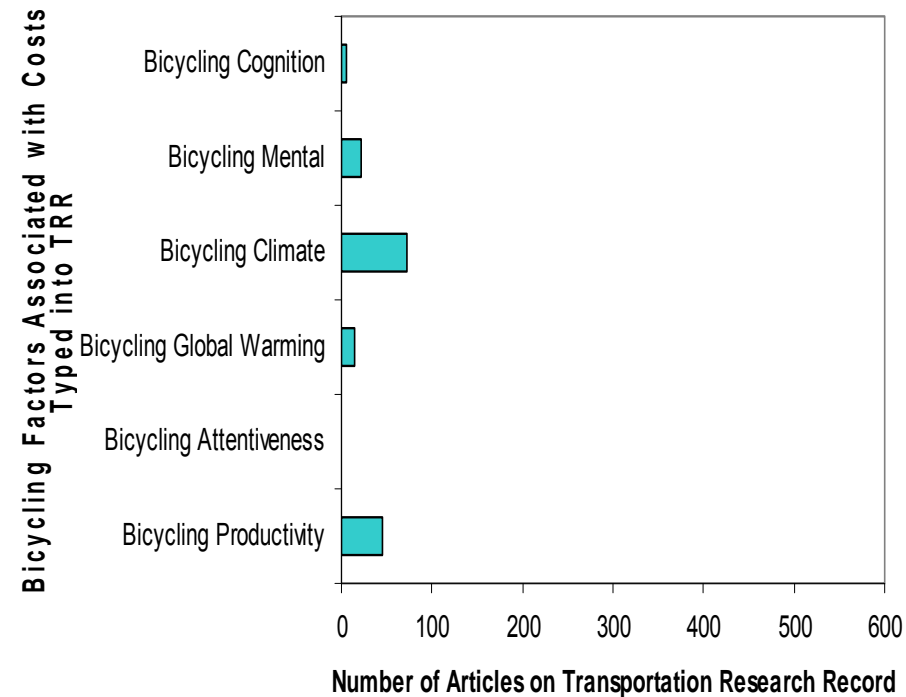
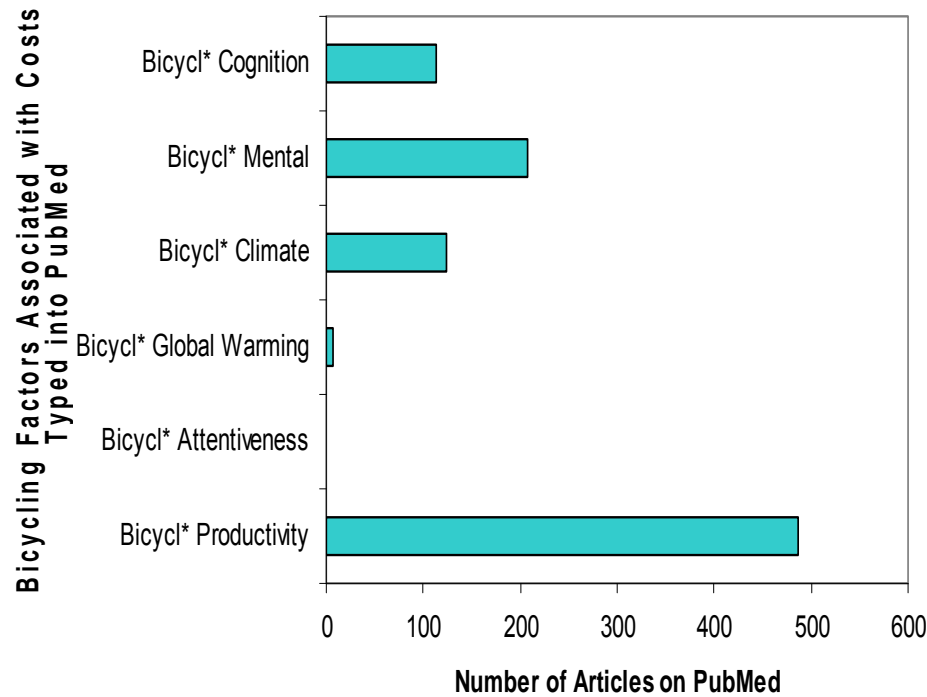


# Research on Epidemiology of Bicycling



Costs

Below are key bicycle words associated with costs.



**Health Benefits – When studying research, be watchful for a walking emphasis or measures on 30 minutes of Moderate to Vigorous Physical Activity (MVPA) most days of the week.**

**Main health points about bicycling:**

1. Bicycling and walking are **daily routine physical activities.**
2. Because **METs** (metabolic equivalency rating) are **higher for bicycling (4.0-16.0 METs)** compared to walking (2.0-6.3 METs) (Ainsworth, 2000 Med Sci Sport Exerc; 32(9Suppl)S498-504), **bicycling is better for controlling weight.**

# Built environment and public health research

Moderate physical activity was associated with residential density, intersection density, and land use mix.

Frank LD, Schmid TL, Sallis JF, Chapman J, Saelens BE. Linking objectively measured physical activity with objectively measured urban form: findings from SMARTRAQ. Am J Prev Med 2005;28(2 Suppl 2):117-25.

Residential and housing density within a 1-k zone around work was associated with moderate to vigorous physical activity (MVPA).

Troped PJ, Wilson JS, Matthews CE, Cromley EK, Melly SJ. The built environment and location-based physical activity. Am J Prev Med 2010;38(4):429-38.

Physical activity facilities and intersection density in a 3km and 1km buffer were associated with MVPA.

Boone-Heinonen J, Popkin BM, Song Y, Gordon-Larsen P. What neighborhood area captures built environment features related to adolescent physical activity? Health Place 2010;16(6):1280-6.

Density, destination distance, and land use mix were associated with walking while connectivity, parks/open space, and safety were less strongly associated.

Saelens BE, Handy SL. Built environment correlates of walking: a review. Med Sci Sports Exerc 2008;40(7 Suppl):S550-66.

# Built Environment and public health research

Though associations between the built environment and obesity were drawn around 2007, a review conducted in 2010 was able to draw no conclusions.

Papas MA, Alberg AJ, Ewing R, Helzlouer KJ, Gary TL, Klassen AC. The built environment and obesity. Epidemiol Rev 2007;29:129-43.

Feng J, Glass TA, Curriero FC, Stewart WF, Schwartz BS. The built environment and obesity: a systematic review of the epidemiologic evidence. Health Place 2010;16(2):175-90.

A study in 2009 in Portland found no association between walkability as measured by connectivity, development, transit, and open space, and a change in waist circumference or weight change after a year.

Li F, Harmer P, Cardinal BJ, Bosworth M, Johnson-Shelton D, Moore JM, et al. Built environment and 1-year change in weight and waist circumference in middle-aged and older adults: Portland Neighborhood Environment and Health Study. Am J Epidemiol 2009;169(4):401-8.

A more recent study in the Twin Cities found no association on the walkability factors of density and block size to BMI.

McDonald KN, Oakes JM, Forsyth A. Effect of street connectivity and density on adult BMI: results from the Twin Cities Walking Study. J Epidemiol Community Health 2011.



# Built Environment and public health research

Though 53% of dog walkers achieved the moderate to vigorous physical activity (MVPA) recommendations compared to 46% for non dog owners and 33% for dog owners/non-walkers, 43% of dog walkers were overweight compared to 34% and 34% respectively.

Coleman KJ, Rosenberg DE, Conway TL, Sallis JF, Saelens BE, Frank LD, et al. Physical activity, weight status, and neighborhood characteristics of dog walkers. *Prev Med* 2008;47(3):309-12.

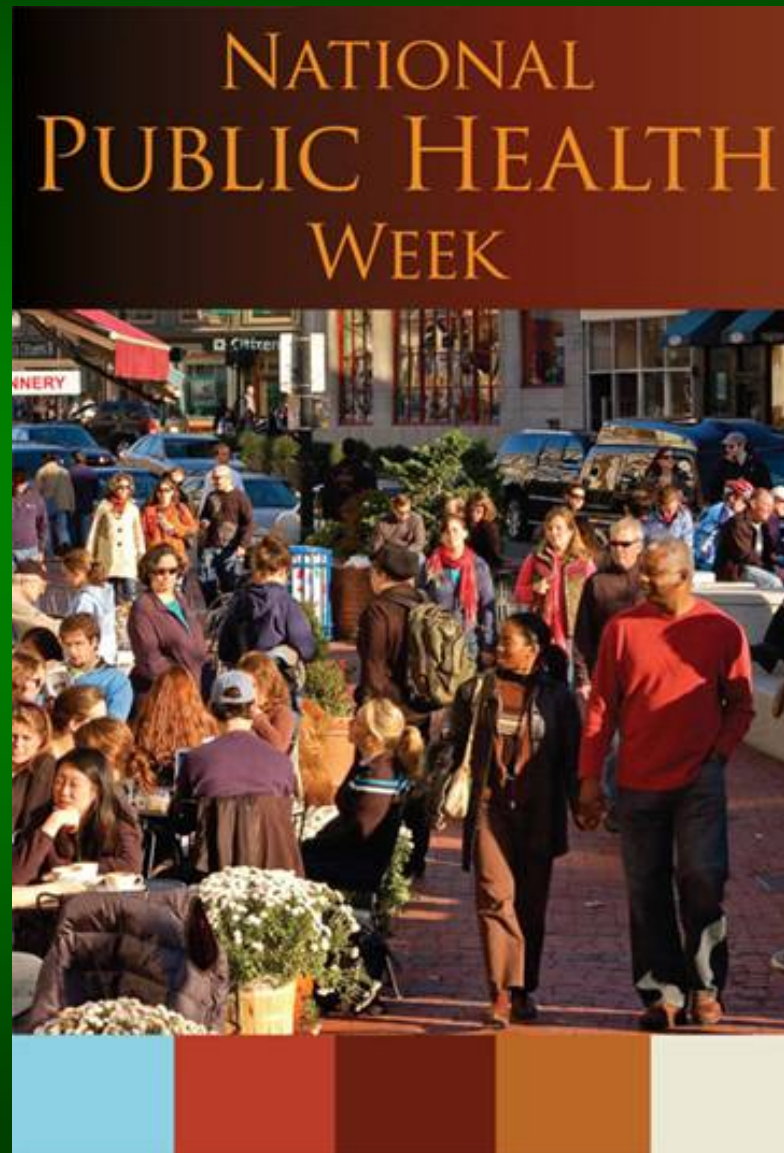
In another study, 68% of dog walkers met MVPA recommendations compared to 55% of non-dog walkers but weight was not reported.

Hoerster KD, Mayer JA, Sallis JF, Pizzi N, Talley S, Pichon LC, et al. Dog walking: its association with physical activity guideline adherence and its correlates. *Prev Med*;52(1):33-8.

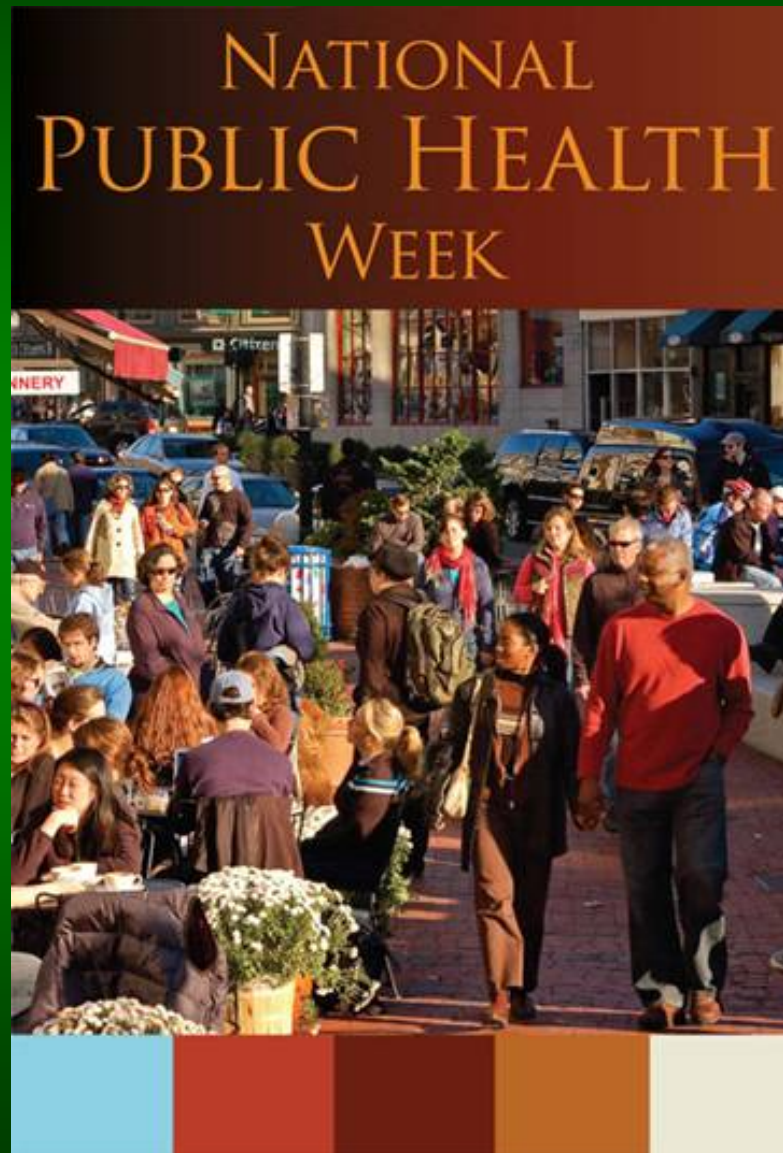
Applying urban design principles in Smart Growth does not result in lowered BMI.

Durand CP, Andalib M, Dunton GF, Wolch J, Pentz MA. A systematic review of built environment factors related to physical activity and obesity risk: implications for smart growth urban planning. *Obes Rev* 2011;12(5):e173-82.

This would be considered a model “Fit City”...

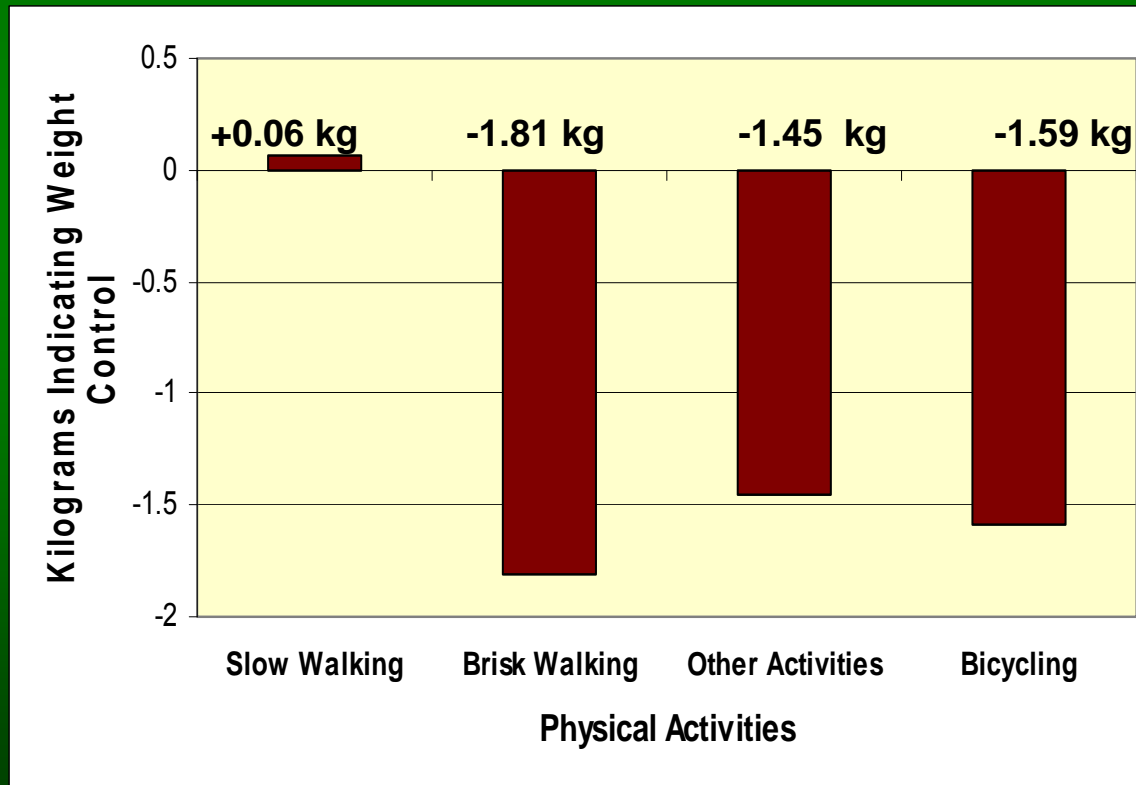


...but everyone is gaining weight.



**They are gaining weight because they are sitting or walking slowly and slow walking doesn't control weight.**

**In research conducted on 18,414 nurses in the Nurses' Health Study II, 50 % of the women walked slowly.**



# But if you bicycle, you can control weight...

In research conducted on 18,414 nurses in the Nurses' Health Study II, if women did not bicycle in 1989 but bicycled in 2005 for a set time, they were more likely to have controlled weight. A dose response also exists, i.e., more bicycling = more weight control and less bicycling = more weight gain.

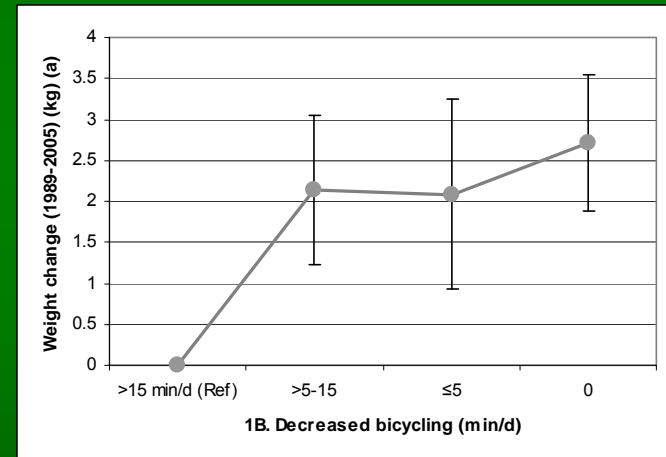
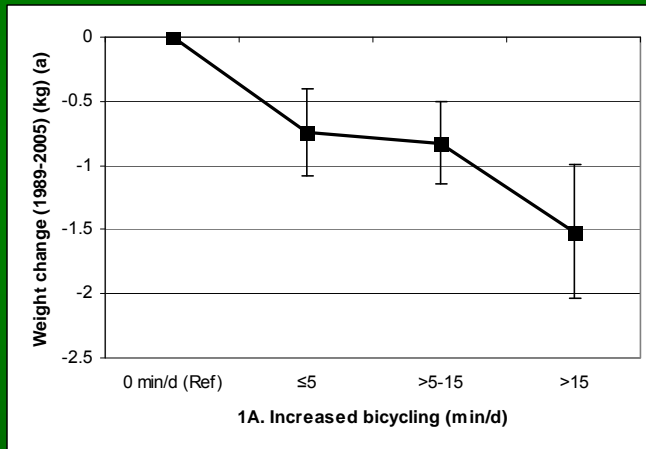


Figure 1A includes only women who did not initially bicycle (0 min/d) at baseline (1989). The figure reflects the slope of weight change if women remained in the non-bicycling category in 2005 or if they increased their bicycling in 2005. Figure 1B includes only women who initially bicycled for >15 min/d at baseline (1989). The figure reflects the slope of weight change if women remained in the high bicycling activity category in 2005 (reference), or if they decreased their bicycling in 2005.

# For bicycling, some would consider this a model “Fit City” ...

[Making Streets for Walking: Dan Burden on Reforming Design Standards by Noah Kazis on April 8, 2010](#)





**... but percentage of the population would be comfortable bicycling in the door zone? We need to create bicycle environments for everyone.**



# **We need bicycle environments for everyone because of the tremendous health benefits:**

- **Bicycling is associated with lower overall mortality.**

*Andersen LB, Schnohr P, Schroll M, Hein HO. All-cause mortality associated with physical activity during leisure time, work, sports, and cycling to work. Arch Intern Med 2000;160(11):1621-8.*

- **Children and teens who cycled to school were 4.8 times as likely as those who walked or traveled by motorized transport to be in the top 25 percent for cardiovascular fitness.**

*Cooper AR, Wedderkopp N, Wang H, Andersen LB, Froberg K, Page AS. Active travel to school and cardiovascular fitness in Danish children and adolescents. Med Sci Sports Exerc. 2006;38(10):1724-31*

- **Bicycling is associated with relaxed neck/shoulder muscles in women.**

*Andersen LL, Blangsted AK, Nielsen PK, Hansen L, Vedsted P, Sjogaard G, et al. Effect of cycling on oxygenation of relaxed neck/shoulder muscles in women with and without chronic pain. Eur J Appl Physiol. 2010;110(2):389-94.*

- **Intense bicycling, and not the duration, is associated with lowered all-cause and coronary heart disease mortality.**

*Schnohr P, Marott JL, Jensen JS, Jensen GB. Intensity versus duration of cycling, impact on all-cause and coronary heart disease mortality: the Copenhagen City Heart Study. Eur J Cardiovasc Prev Rehabil 2011*



## ....and more health benefits from bicycling:

- **Bicycling reduces waist circumference in abdominally obese women.**  
Hemmingsson E, Udden J, Neovius M, Ekelund U, Rossner S. Increased physical activity in abdominally obese women through support for changed commuting habits: a randomized clinical trial. *Int J Obes (Lond)* 2009;33(6):645-52.
- **Compared to driving to work, men who bicycled were significantly less likely to be overweight or obese (Australia).**  
Wen LM, Rissel C. Inverse associations between cycling to work, public transport, and overweight and obesity: findings from a population based study in Australia. *Preventive Medicine* 2008;46:29-32.
- **Commuting by bicycle is associated with lower cardiovascular risk.**  
Hamer M, Chida Y. Active commuting and cardiovascular risk: a meta-analytic review. *Prev Med* 2008;46(1):9-13.

# But safety is also a public health issue:



## In research on cycle tracks in Montreal:

- 2.5 times as many bicyclists rode on cycle tracks compared to bicycling in the road without bicycle provisions.
- There was a 28% lower injury rate on the cycle tracks compared to bicycling on the road.

Lusk AC, Furth PG, Morency P, Miranda-Moreno LF, Willett WC, Dennerlein JT. “Risk of injury for bicycling on cycle tracks versus in the street.” *Injury Prevention* 2011. PMC 3064866

# To corroborate the safety findings:

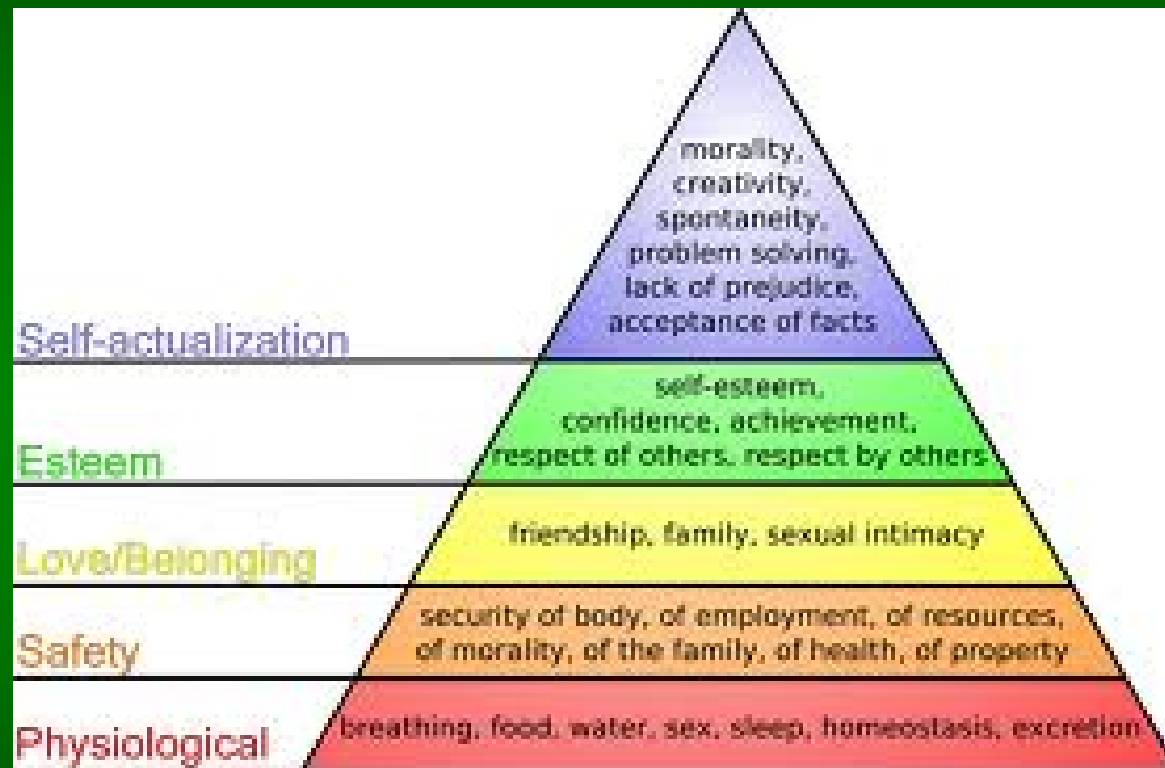


**We learned that 19 cycle tracks in the US had:**

- **A crash rate of 2.3 per million bicycle kilometers, which is lower than the crash rate for the 6 cycle tracks in Montreal (10.5 per million bicycle kilometers).**

Lusk AC, Morency P, Miranda-Moreno LF, Willett WC, Dennerlein JT. “Bicycle Guidelines and Crash Rates on Cycle Tracks in the United States” *American Journal of Public Health*, 2013.

## Finally, a return to Maslow's Hierarchy of Needs and public health



**Safety is a necessity but friendship, respect of others, self-esteem, and creativity = quality of life.**

# Public health research based on Maslow:



## Maslow – “Confidence”

For population health, women prefer separation from vehicular traffic.

Garrard J, Rose G, Lo SK. Promoting transportation cycling for women: the role of bicycle infrastructure. *Prev Med* 2008;46(1):55-9.

## Maslow – “Friendship”

Bicycling is beneficial for psychophysical well-being.

Whitaker ED. The bicycle makes the eyes smile: exercise, aging, and psychophysical well-being in older Italian cyclists. *Med Anthropol* 2005;24(1):1-43.

# Public health research based on Maslow:

Maslow – “Self-esteem ” - Bicycle messenger’s self-identity should be allowed.

“... if  
messengers are  
speaking through  
their style, the  
question is not  
simply what are  
they saying, but  
why are they  
saying it?”

## STYLE AND ACTION

A Decoding of Bike  
Messenger Symbols

JEFFREY L. KIDDER

University of California, San Diego



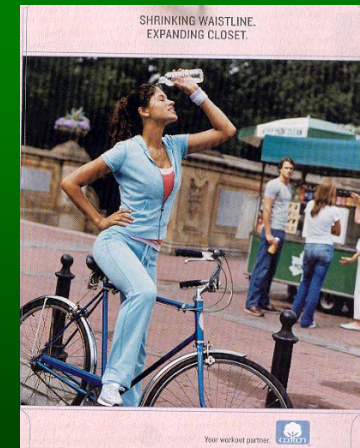
*Journal of Contemporary Ethnography*, Vol. 34 No. 2, June 2005 344-367  
DOI: 10.1177/0891241605274734  
© 2005 Sage Publications

[thegogreenblog.com](http://thegogreenblog.com)



# Public health research based on Maslow:

Maslow – “Self-esteem” – But also every bicyclist’s self-identity should be allowed for their self-esteem and health.



# Public health research based on Maslow:

Maslow – “Friendship ” – Instead of only fostering friendships while sitting at a table (and gaining weight), cycle tracks should be wide enough for bicycling side-by-side and having a conversation on **“Social Cycle Tracks.”**





# Public health research based on Maslow:

Maslow – “Friendship ” – Instead of having bicyclists be lone road warriors on roads or bike lanes, “**Social Cycle Tracks**” should allow bicyclists to be side-by-side just as bus passengers, car passengers, and pedestrians can travel side-by-side.

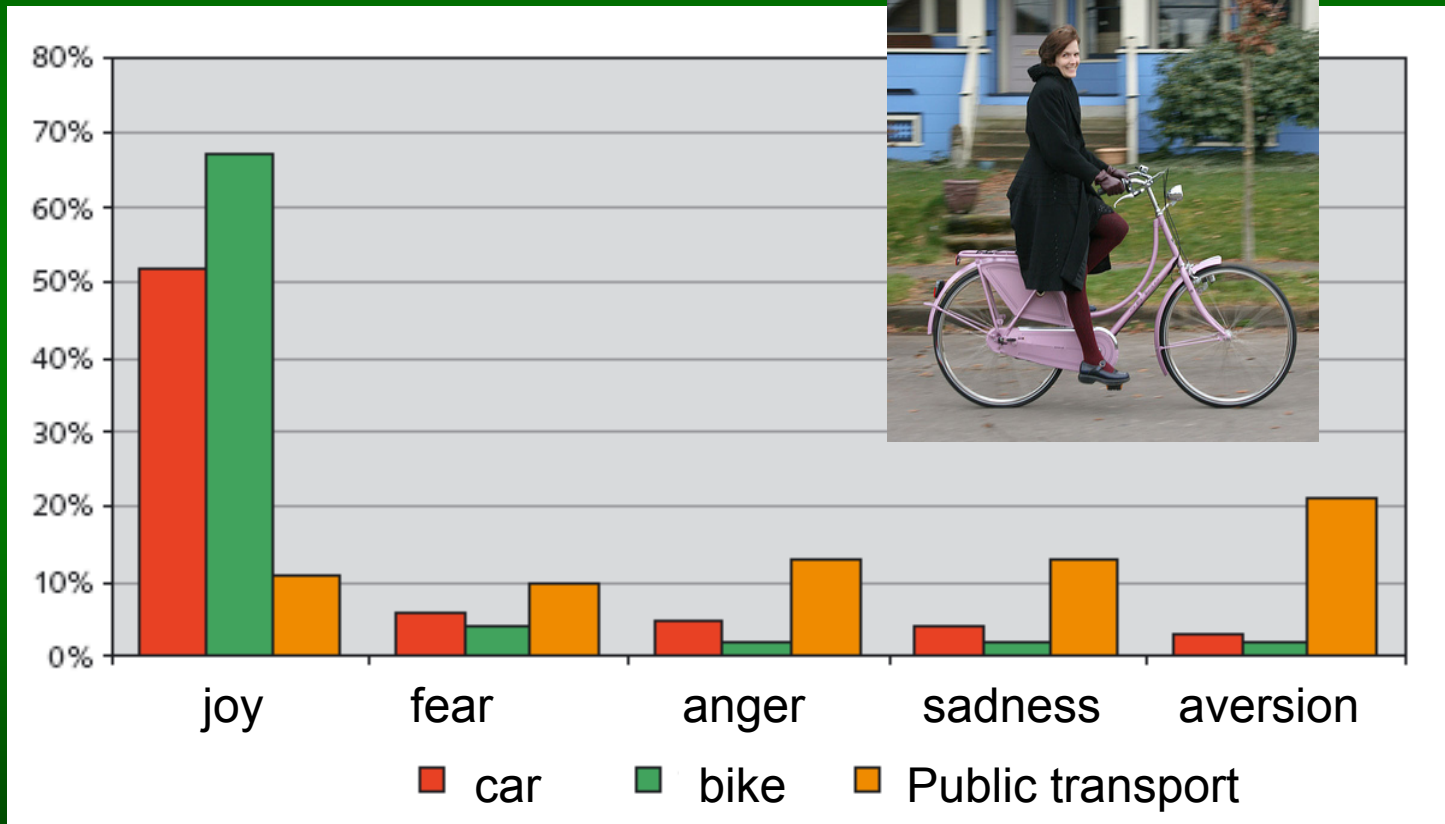


# Public health research based on Maslow:

Maslow – “Friendship” – These “**Social Cycle Tracks**” could even be “**Date Night**” **cycle tracks** or the healthy way to get around the city while talking.



# “Social Cycle Tracks” could bring health and joy to a city.



From Knowledge Institute Mobility, 2007 The Netherlands

# Learned outcomes:

- Issues about public health research and bicycling
- Health implications from bicycling
  - 1) Health from exercise
  - 2) Safety from crashes
  - 3) *Quality of Life - Maslow's Hierarchy of Needs*

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