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<td>Angela &amp; Eric</td>
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<td>TERM PAPER DUE</td>
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Today’s agenda

- Some quick i>clicker questions about the readings
- More in depth on the reading
- Hands on
Office Hours

• As usual this week

• Wednesday 11-noon and 2-3pm
Story arc of the course

• Randomized controlled trials
  - When we apply a treatment $x$ to one *randomly selected* group and see how it changes an outcome $y$

• Observational studies
  - When we see groups with different $y$’s and $x$’s, what do we do?

• In-between studies: Exogenous variables like weather, the macroeconomy, season of birth, end of wars

• **Choices and perceptions**
An aside: Nearest-neighbor

• Sometimes when you have observational data, it’s useful to think about identifying “control groups”
  - When there’s some “treatment” $x$ but there are other characteristics $z$, maybe we look for similar units in $z$
  - Comparing “treated” with $x$ to not-treated without $x$ but with similar $z$, or a control group, might work

• The hitch: selection into treatment probably isn’t random

• If selection is on unobservables, this might be a real problem

• All this is called “propensity score matching”
i>clicker question 14.1

Other things equal (and they never are), what’s worst?

A. Turning 21

B. Being born in January

C. Riding a bicycle

D. Being born male before 1928
i>clicker question 14.2

When you’re 20, what should you do?

A. Drink and drive your car
B. Drive your car, but don’t drink
C. Drink and ride your bike
D. Ride your bike, but don’t drink
Why should accident mortality matter a lot for choices of transportation?

A. It can happen at any age
B. It afflicts the young more
C. It afflicts the old more
D. It actually doesn’t matter
Spinning the Wheels and Rolling the Dice:
Life-Cycle Risks and Benefits of Bicycle Commuting in the U.S.

Ryan D. Edwards and Carl N. Mason
Queens College, CUNY; UC Berkeley

Annual Meeting of the Population Association of America
Session 35

May 1, 2014
Rapid growth in U.S. bike share programs, up to around 50 cities now

Source: Earth Policy Institute
The sales pitch has often highlighted the health benefits of bicycling.

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY and MAJOR FINDINGS

2. THE CASE FOR BIKE-SHARE IN NEW YORK CITY
   - What is a Bike-Share?
   - Potential Benefits of Bike-Share Programs
     - Transportation Benefits
     - Economic Benefits and Job Creation
     - Health Benefits
     - City Image Benefits and Connections to PlaNYC
Paraphrasing of specific claims in the NYC pitch

• Bike-shares tend to introduce new people to bicycling and make bicycling part of their lives.

• In NYC, most adults don’t exercise 30 minutes a day at least 5 days/week.

• CA Health Dept says 5% improvement in rates of physical inactivity could **save $6 billion** *(but that’s only $150 per person in CA)*.

• A Danish study showed a **39% higher mortality rate** among those who did not bicycle to work compared to those who did.

• Another source: 15 minutes of biking to and from work 5 days per week can **burn 11 lbs of fat** in a year.

• **Obesity is expensive** for public medical insurance plans and for lost productivity, and Americans’ obesity rates are rising.
But accidents, injuries, and fatalities are a very real risk for bicyclists, especially in the U.S.

True story: DUI & texting 23 year-old killed a 41 year-old triathlete in Newport Beach, CA
And nobody ever actually does this:

I couldn’t find a single sporting goods store in Washington, DC, and you can’t rent helmets
How do the costs and benefits of U.S. bicycle commuting balance out?

• Thought experiment: bicycling rather than driving to work

• Benefits
  
  – Improved cardiovascular health, improved mental health(?), reduced obesity, reduced mortality
  
  – Reduced pollution, but more exposure to extant pollution (omitted because we didn’t have good data; in Europe, these effects are small)

• Costs
  
  – Increased exposure to traffic fatalities

• We think that the ages at which these costs and benefits accrue are important
Summary

• Calibrate the net longevity benefits of switching from car to bicycle commuting in the U.S. starting from age 20

• Measure benefits in terms of undiscounted life years (life expectancy) and discounted life years

  — Economists think that people discount future cash flows and probably also future years of life, but that’s more controversial

• Model choice parameters for the average American

  — There are also interesting differences in risks by geography (and by sex, which aren’t in the paper or these slides)
Summary

• Findings:

  — Bicycling is *really dangerous* in the U.S. on average

  — Fatality rates per km are an order of magnitude higher than in the Netherlands

  — Still, bicycling instead of driving probably raises life expectancy, *if we believe the massive protective effects of exercise are real*

  — But if we sufficiently *discount* the future, biking in youth is not a good deal, because:

  — Bicycling raises death rates now while lowering death rates in the future
Full disclosure

- Both authors bicycle to work in Berkeley, CA

- We rationalize this with one observation: We’re not young

- The first author *does not bicycle in New York City*

- There are too many ghost bikes
Health improvements through bicycling

• We agree that evidence and theory supports this general idea, but there are few if any randomized controlled trials

• Literature dominated by observational studies that don’t agree, and we’re suspicious of observational studies: omitted variable bias

• Most cited study: Andersen et al (2000) follow 30,000 Copenhagen residents in several studies for about 15 years

  — All-cause mortality was 28 percent lower among bike commuters

  — But this relationship was not significant for women under 45, and it was not robust among men under 45

  — This is enormous but not crazy: Elo and Preston (1996) found a college degree is independently associated with reduced death probabilities of 10–25%
But patterns in causes of death suggest health benefits of physical activity are only felt later in life.

People die at younger ages because of accidents, homicides, suicides.

We find it implausible that exercise could reduce mortality much under age 45, so in our model the protective effects start at age 45.
Bicycling is much more dangerous than driving in the U.S., and it’s much more dangerous than biking in Europe.

**Our paper: U.S. data**

Table 2: Rates of traffic deaths per billion person kilometer in the U.S., 2009

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<th>Age</th>
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<th>Auto</th>
<th>Ratio</th>
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<td>18.4</td>
<td>1.3</td>
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<td>ages 20–64</td>
<td>41.5</td>
<td>4.2</td>
<td>9.9</td>
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**de Hartog et al. (2010): Netherlands data**

Table 4: Traffic deaths per age category per billion passenger kilometers by bicycle and by car in the Netherlands.

<table>
<thead>
<tr>
<th>Age category (years)</th>
<th>Bicycle</th>
<th>Car</th>
<th>Ratio</th>
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<td>&lt;15</td>
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<td>&gt;80</td>
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<td>Total average (all ages)</td>
<td>12.2</td>
<td>2.2</td>
<td>5.5</td>
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<td>Total average (20–70 years of age)</td>
<td>8.2</td>
<td>1.9</td>
<td>4.3</td>
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Data from CBS (2008).
A digression: Why is biking so dangerous?

Fatality rates are declining in amount bicycled, but is this cause or effect?

“Safety in Numbers”
Biking is also more hazardous where driving is more hazardous.

Are there common risk elements?

THINGS THAT CAN KILL

Log of auto fatalities per billion km

Log of bicycle fatalities per billion km
Life years lived: Always downhill, and biking doesn’t really change that!

Nearly imperceptible effect of biking
The gains in life years due to improved health through exercise dominates the losses due to bicycle fatalities.
If annual discounting is 3%, large benefits still outweigh costs.

Increases in life years due to improved health

Reductions in life years due to bicycling fatalities
But when annual discounting reaches 10%, the costs start to visibly approach the benefits.
Bottom lines

• Biking is dangerous in the U.S.

• Rational people who sufficiently discount the future might decide to avoid it

• We’re not comfortable with policies that encourage biking without also making it safer

• Kids, stay in school, don’t do drugs, and drive

• Why are some states such death traps for everyone?
### Data

- **bCourses: Pages: Data exercise: Class 14**
- **or** [http://demog.berkeley.edu/~redwards/ls39g.html](http://demog.berkeley.edu/~redwards/ls39g.html)
- **Exercises:** Let's look at y-vs-x scatterplots of

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