Questions to ask before you research natural experiments in transit & physical activity

Illustrations from the Moving Across Places Study (MAPS)

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Overview

- Quick description of the Moving Across Places Study (MAPS) in Salt Lake City, Utah
- Then transportation-related questions you might want to ask
- Then tips from the field

Does a "Complete Street" intervention support increased physical activity?

MAPS
Moving Across Places Study
THE UNIVERSITY OF UTAH

Before

- No TRAX light rail
- No bike lane
- Narrow sidewalk
- 3 lanes, each direction
- No pedestrian lighting
- Overhead power lines

After (same place)

- TRAX light rail
- Bike lane
- Wide sidewalk
- 2 lanes, each direction
- Landscaping
- Pedestrian lights
- No overhead power lines

MAPS panel has 536 adults in the North Temple complete street corridor

- To compare
  - Near: exposed to intervention
  - Far: adjacent controls
- At 2 times
  - Time 1 = Pre-street completion
  - Time 2 = Post street completion

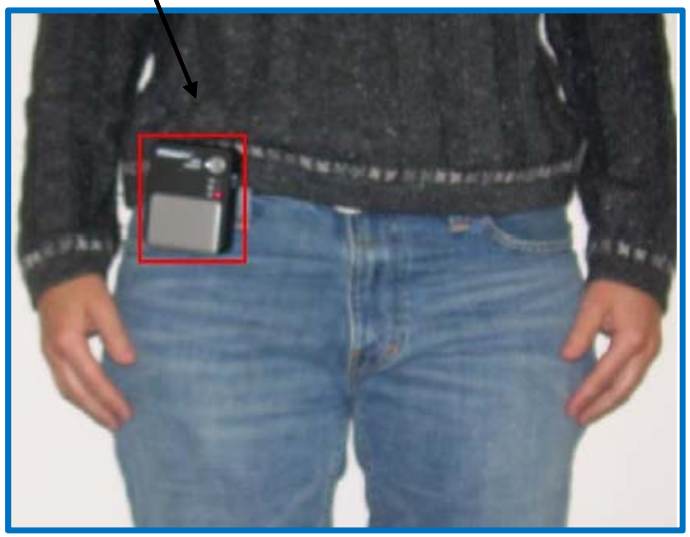
Map by GeoStats

Activity & travel measures: GPS (GlobalSat DG-100 data logger) & accelerometry (Actigraph GT3x+)

Wearable GPS

GPS tracks physical activity locations, especially for travel outdoors where GPS signals reach

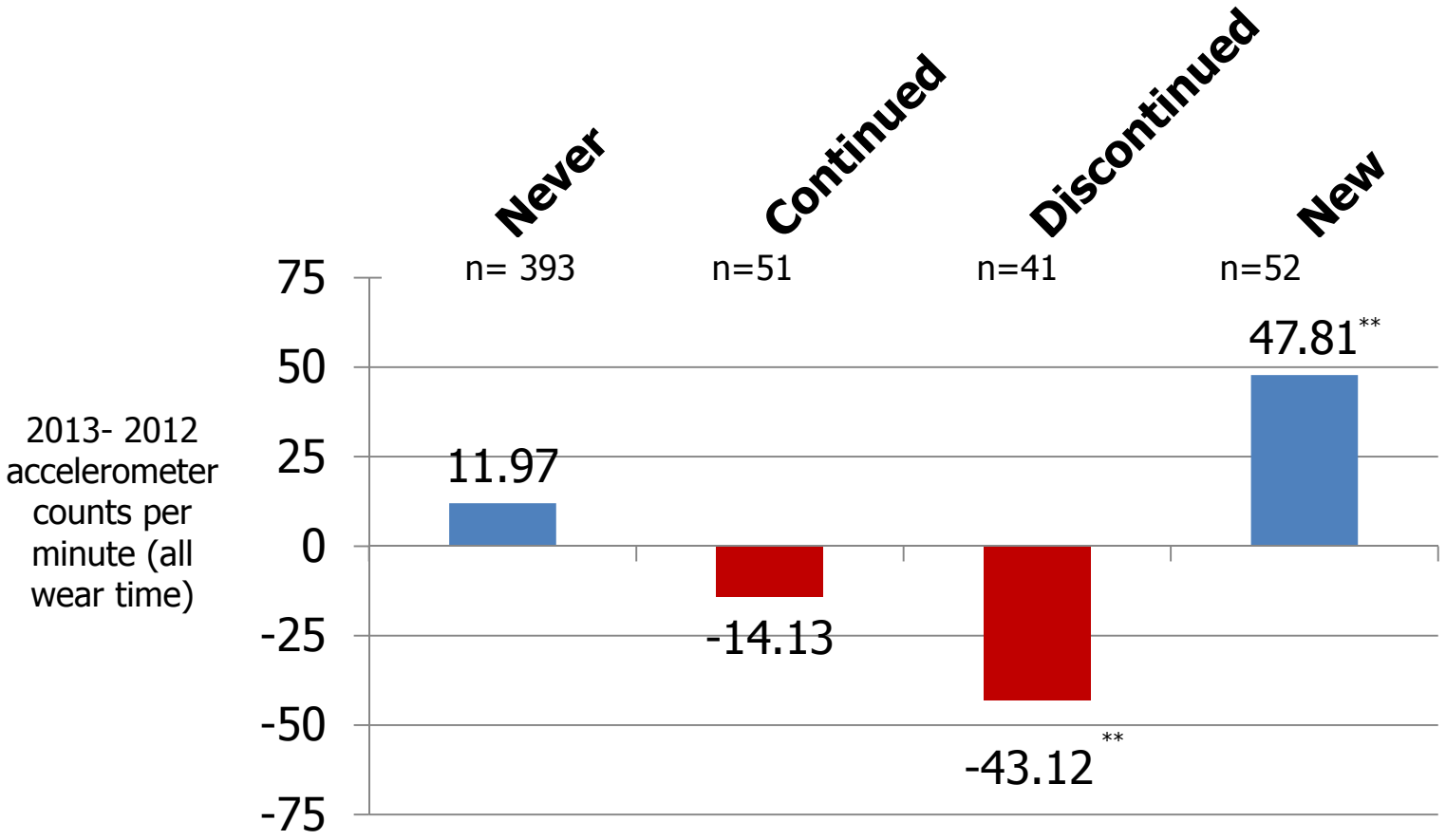
Accelerometer measures physical activity intensity



Activity Monitor

More PA over time for those who begin transit use; less PA for stopping transit

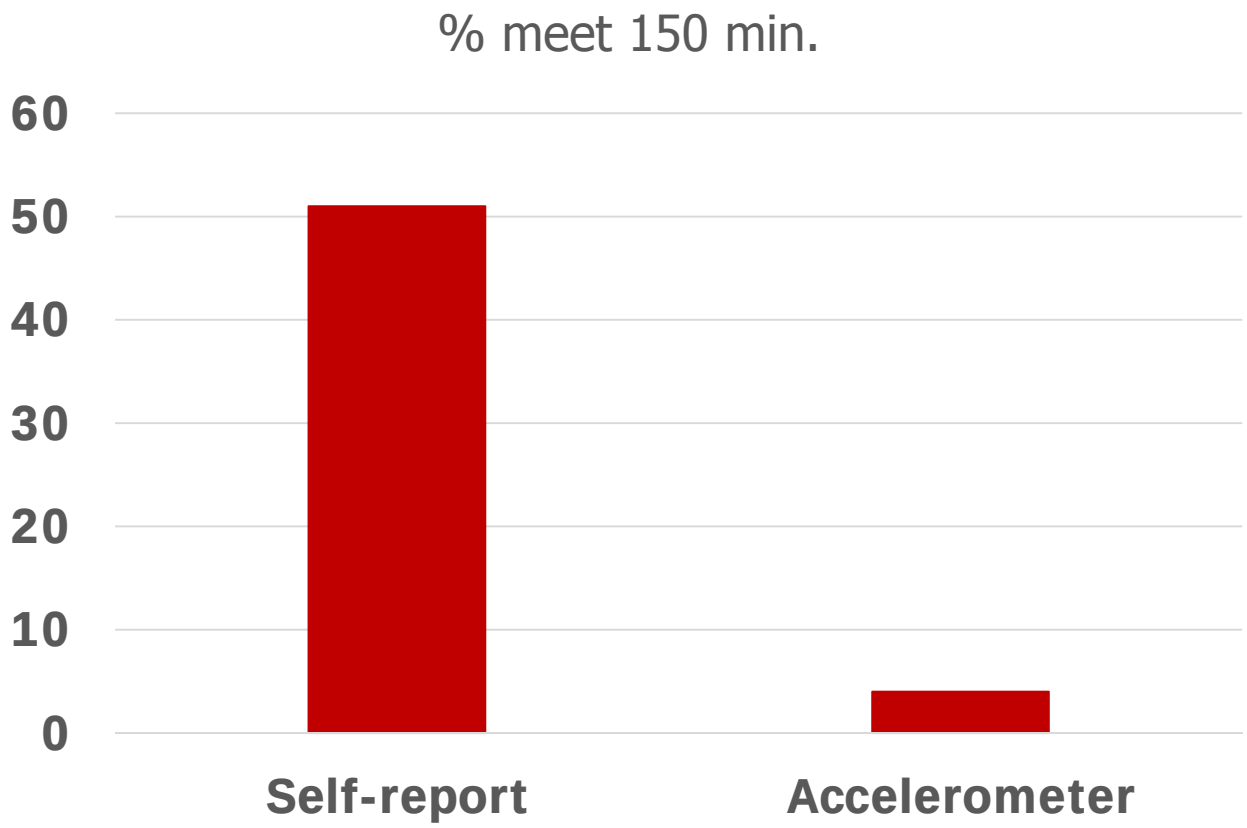
(Brown, et al., *AJPH,* 2015)



**p<.01 Never = control group; contrasts significant, controlling for Age, female, Hispanic, college grad, married, self-reported health, days between measures, temperature differences

Do you need accelerometer measures?

- NHANES self-reported vs. accelerometer-measured PA attainment (Troiano, '08 MSSE)



Do you need GPS measures?

- If knowing outdoor locations is important
- Example (Miller, 2015, H&P):
  - Is more PA in transit neighborhoods due to transit use?
  - Or walking to shops near transit?
- GPS data can tie activities to places or routes
  - Ideal for new infrastructure evaluation

Can you do this in-house?

- GPS & accelerometry data flood in!
  - 3-second readings for GPS; 10-second epochs accelerometers
- We chose GeoStats (Westat) to take advantage of their experience
- Data integration and mode designation takes time
  - No mid-course corrections possible between Time 1 & 2

Will your target intervention increase PA?

- Get to know your possible sites
- We vetoed some prospective rail stops
  - With big park & ride lots
  - Or fenced off transit stations
- You will spend lots of time on your project
  - Find a site that you believe translates your research goals well

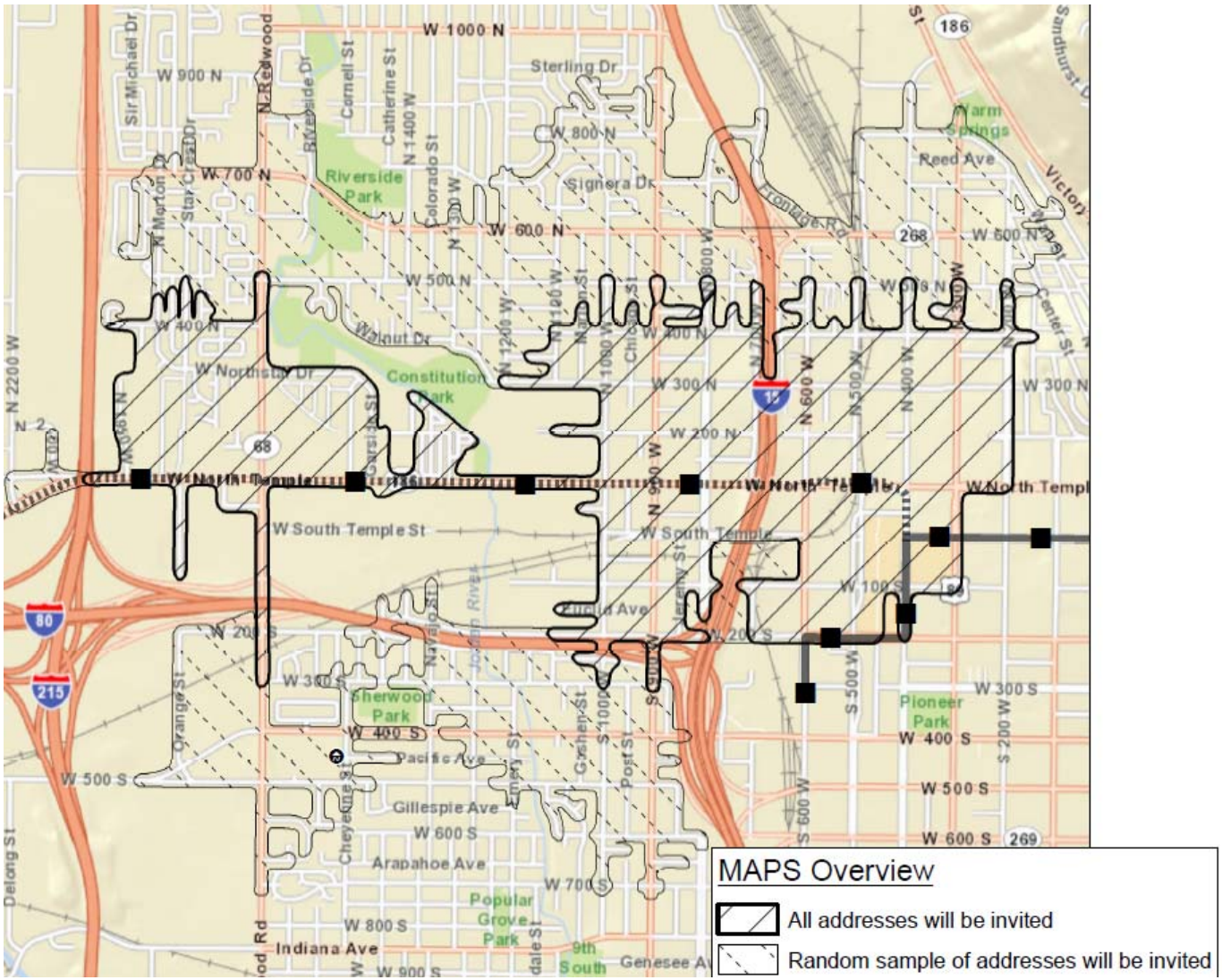
How do you select Near vs. Far areas?
(AKA exposed/not exposed; "experimental/control")

- We had 3 active modes to consider
  - Walk to TRAX light rail
  - Walk for non-transit
  - Bicycling
- We defined Near/Far for walks to light rail, likely to be most popular
  - Several suggested ½ mile distance (≈800M; O'Sullivan, 1996)
  - Some suggested 1km (1000M; Canepa,2007)

We chose <1km = Near, which provided similar Near/Far samples

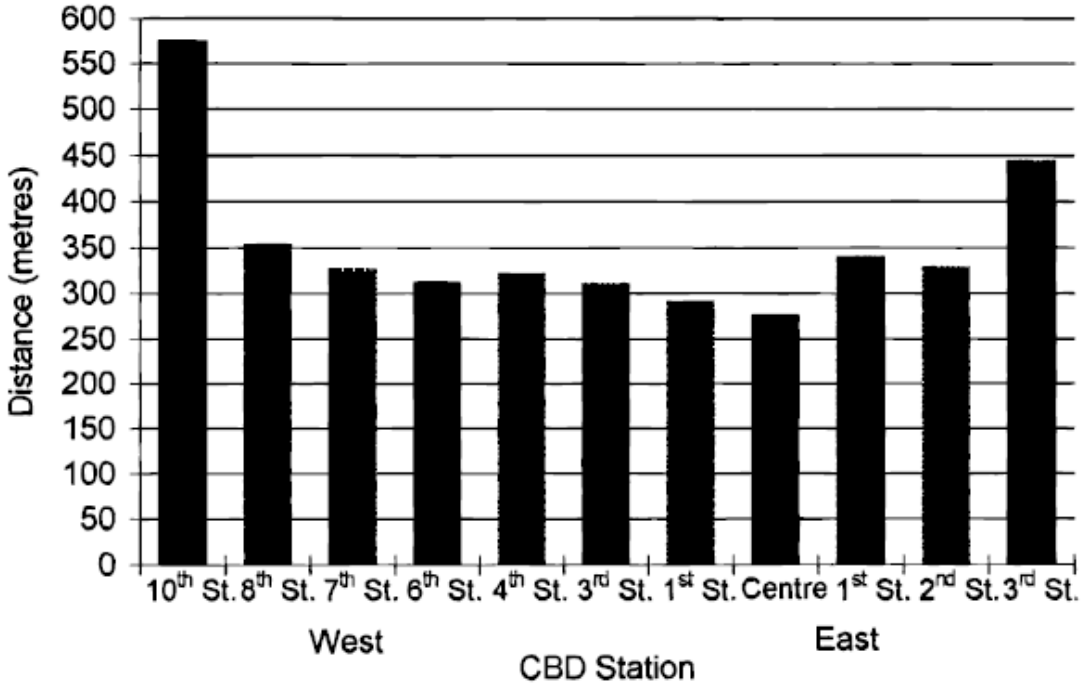
Near & Far not different on:	Nears were:
Gender	Lower income
Age	Less likely to be married
Hispanic ethnicity	Less likely to be white
Education (coll. grad)	Less likely employed
Education (h.s. grad)	
Renter/owner	
Years residence	
Children in home	
Household size	
Student status	

But even Nears show lots of variability in transit stop access due to layout of area

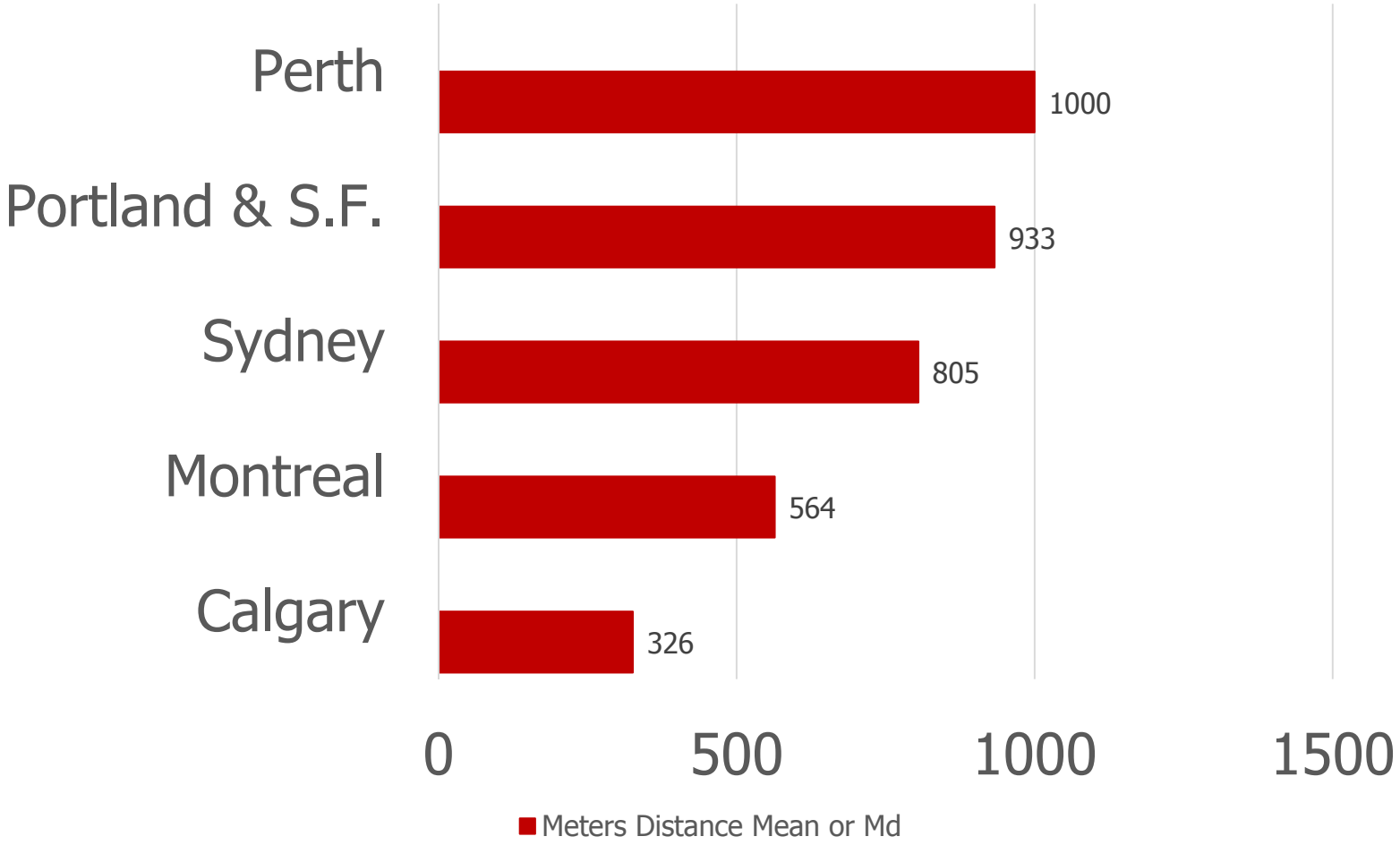


How much variation is there in walk distances to transit across one line?

- A lot! Calgary walk distances vary 2-fold across stops (O'Sullivan & Morrall, 1996)
  - Reflects sparser transit stop spacing on periphery

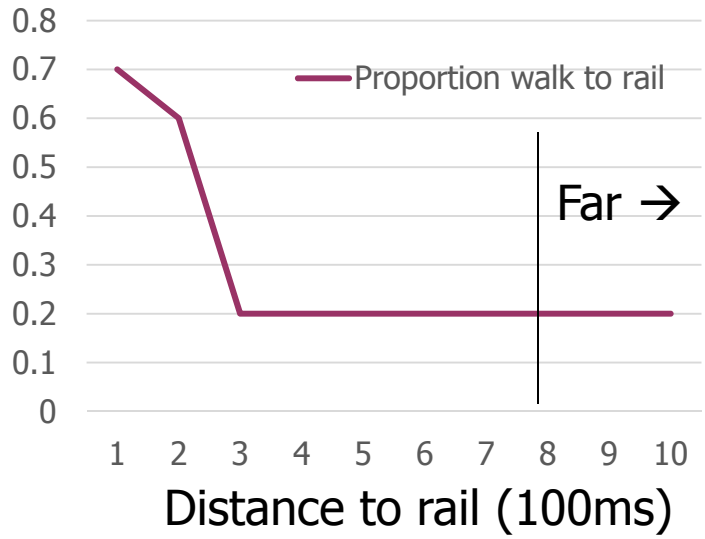


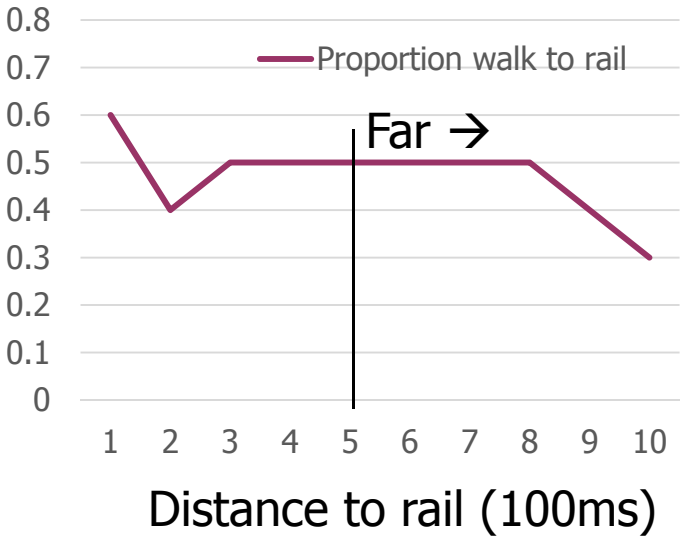
How much variation in walk to rail globally? 326m to 1000m+



So your choice of Near/Far boundary matters

- If Far set too distant,
  - Near effect could dissipates
- If Far set too close,
  - Near effect may seep into control area
- You define Far to plan your sampling
  - but expect to test multiple distances



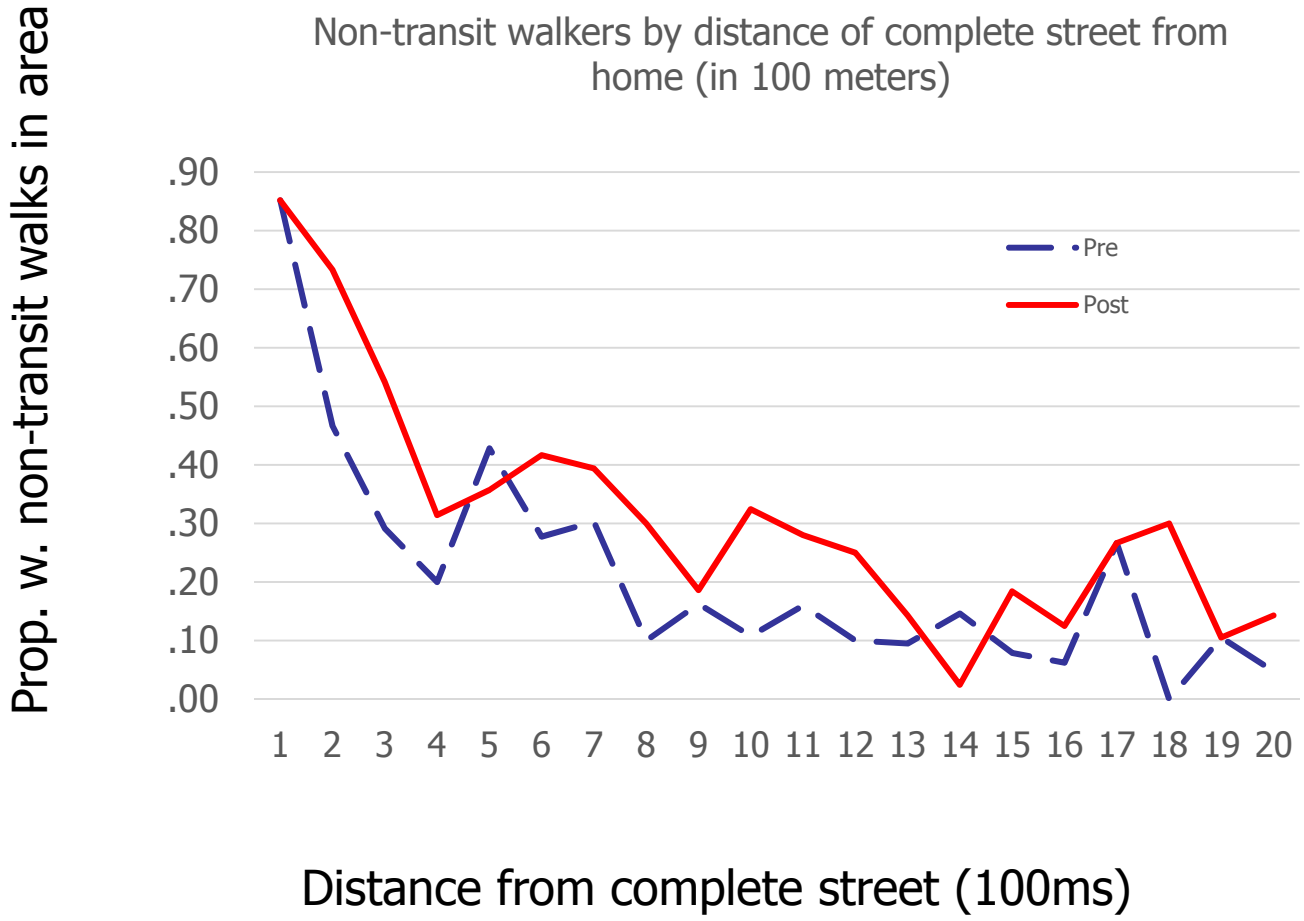


Distance effects vary across types of active transport

- What were distance effects for *walks to transit*?
  - Peak within about 300m

What were distance effects for *non-transit walks*?

- Non-transit walking falls off less sharply



Are Near effects a "slam-dunk" in pre-post- walking path studies? No

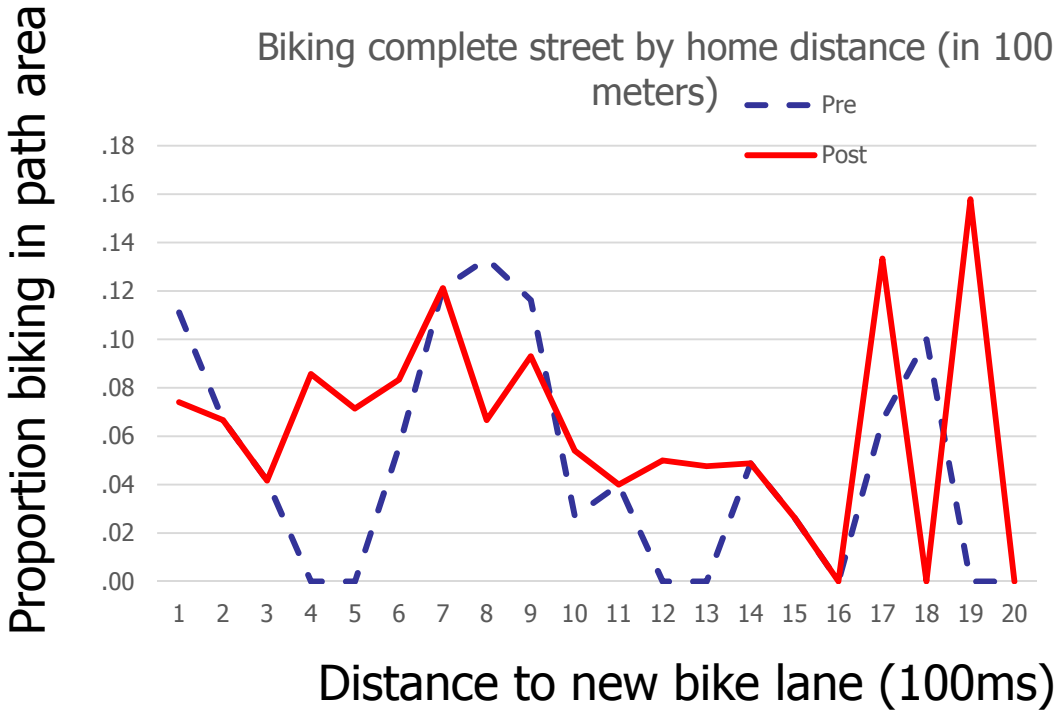
- Only 3 of 52 path studies reviewed had pre- and post-data (Starnes, 2011)
- And no increase for Near pedestrians in intervention studies (Evenson et al., 2005; Brownson et al., 2004; Merom et al., 2001)
- But proximity to trails was correlated with more use (4 studies)
- We need to tease out correlational vs. longitudinal findings

What special challenges exist for research on new bike lanes?

- U.S. biking is rare & sporadic
  - Only 0.6% of commuters bike to work (2008-2012 American Community Survey, McKenzie, 2014)
  - Biking is often not stable over time
    - Only 13% of cyclists biked in past week (Schroeder & Wilbur, 2013)
- Few studies find hoped for Near effects (Burbidge & Goulias, 2009; Evenson et al., 2005)
  - Although riders Near a new Sydney path were more likely to use it, they did not increase their biking (Rissel et al., 2015)

What were distance effects for cycling?

- We did not even state a biking Aim
- Good thing!
- This is what we found in our exploratory tests



No strong pattern of proximity to new bike lane and biking

Solution? What other ways can you study biking?

- Sample only cyclists (Sydney; Merom, et al., 2003)
  - Near cyclists (<1.5km) reported .24 hr/wk more biking
  - Far (>1.5km) cyclists reported .24 hr less
- Screen for bike owners (Portland, Dill et al., 2014)
  - Yielded 40% biking in a week
    - (but no increase among Near cyclists)

What other ways to study biking?

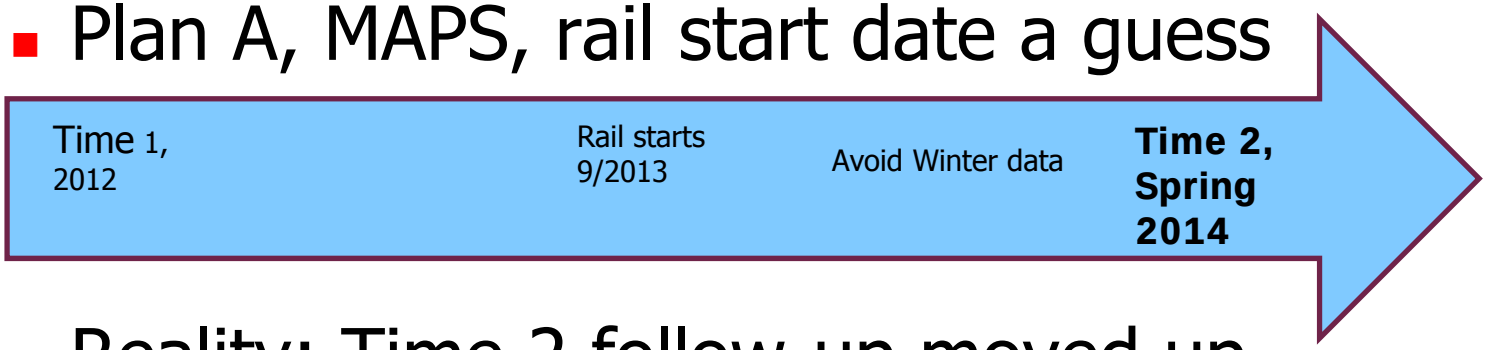
- Study biking abroad where it is common
  - 8/10 studies showing effects for adult cycling & health/weight were from Europe or China (Oja et al., 2011)
- Observe cyclists on new bike paths
  - Increased cyclists counted on improved/better connected bike paths, compared to other sites (CA: Cohen, 2008)
  - Limitation: Is this new biking? Or relocated biking?

Tips from the field: Intervention timing/control problems are rampant!

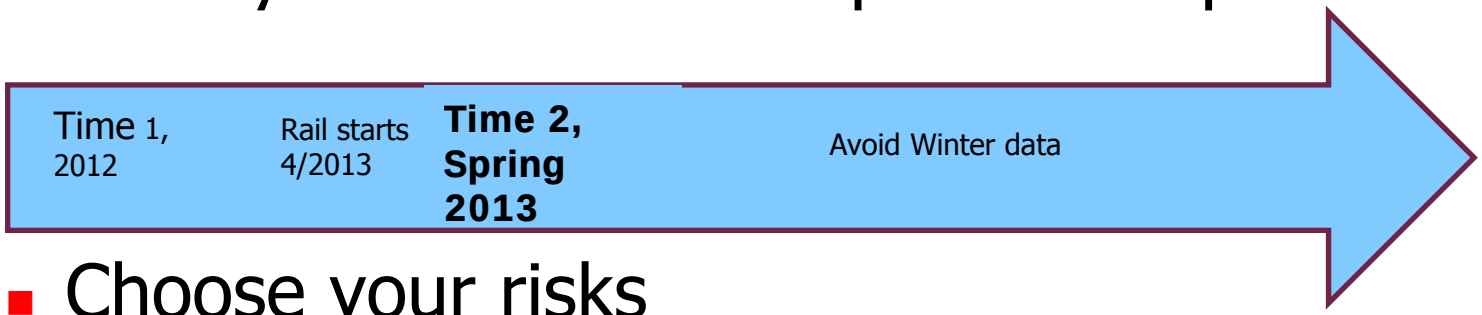
- *Surprise interventions*—you don't hear about them 'til too late
  - We were lucky to hear of a new stop over lunch (Brown & Werner, 2007, 2008, 2009)
  - Alert your network of your interests
- *Stalled interventions*
  - Ex: Busway construction 2-yr delay (Ogilvie, BMCPH, 2010)
  - Can you test in staged phases?

Earlier than expected interventions

- Plan A, MAPS, rail start date a guess



- Reality: Time 2 follow-up moved up



- Choose your risks
  - Little exposure time to intervention (Goodman, et al. AJPH, 2014)
  - Or risk participants moving away

Incomplete interventions

- You hire the staff & train the students, then…
- Interventions are cut back
  - e.g., fewer street improvements than promised to encourage older person's PA (Ward-Thompson, 2014)

Other tips

- Door-to-door recruitment issues
  - A letter from the police chief helped
  - Locked condos/apartments require extra recruitment time
    - Snack table outreach in some
    - Denied access in another

Good resources

- Moudon, Saelens et al. A report on participant sampling and recruitment for travel and physical activity data collection. ntl.bts.gov/lib/31000/31700/31738/VernezMoudon_EffectofLight_Rail.pdf
- Oakes JM, et al. Recruiting participants for neighborhood effects research: strategies and outcomes of the Twin Cities walking study. *Environment & Behavior* 2009;41(6):787-805

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