



Venue-Based Sampling Methodology in an Intercept Survey of Cyclists

Presenters:
Ronaldo Iachan, PhD
Olivia Saucier, MS

May 3, 2016,
FedCASIC
Statistical Advances II



Overview

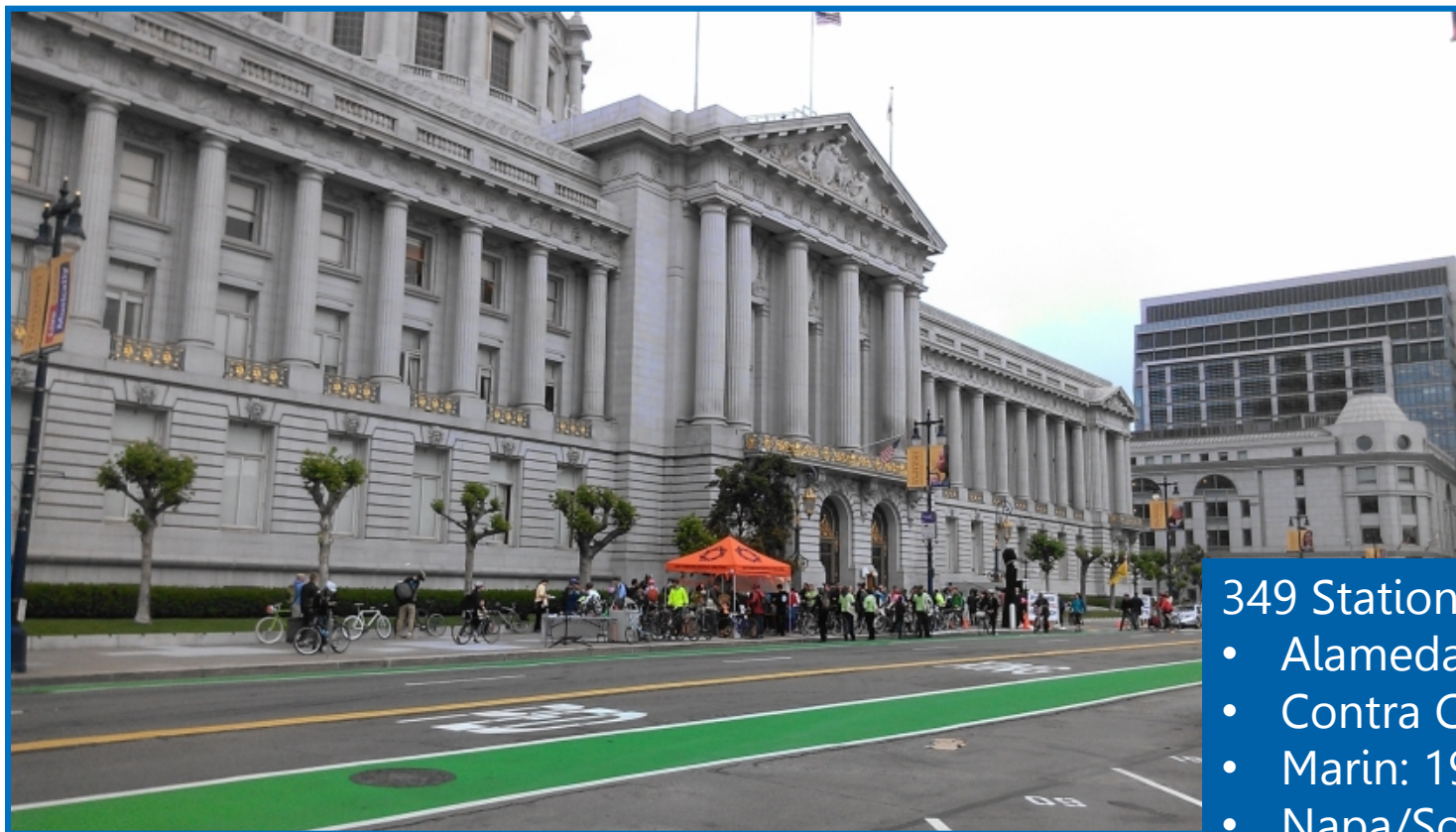
- Introduction
- Previous research
- Study design
- Outcomes
- Lessons from the field



Introduction

What is Bike to Work Day?





349 Stations in 9 counties:

- Alameda: 80
- Contra Costa: 49
- Marin: 19
- Napa/Solano: 28
- SF: 22
- San Mateo: 39
- Santa Clara: 80
- Sonoma: 32

Previous Research

Bike to Work Day:

- Rose and Manfurt 2007: Victoria, Australia
- League of American Bicyclists, 2008: San Francisco
- Piatkowski, Bronson, Marshall and Krizek, 2014: Denver, Colo.
- Bicycle counts

Recreational users:

- Iachan, R., and S. S. Kemp. 1995. Visitor sample surveys. *Survey Methodology*, 21(1), 89–96.
- Iachan, R. 1989. Issues in environmental survey design. *Journal of Official Statistics*, 5, 323–335.

Design Options

	Listed Sample (Registered users, Facebook Group)	RDD Phone/ABS Sample in Bay Area	Venue-based sampling (VBS) at Energizer Stations with follow-up
Pros	<ul style="list-style-type: none"> • Easy sample draw • Members are engaged and likely to participate 	<ul style="list-style-type: none"> • Represents all riders (experienced and new) 	<ul style="list-style-type: none"> • Represents registered and non-registered riders • Day-of recall accuracy • Sampling design assigns nearly equal probabilities of selection to all riders
Cons	<ul style="list-style-type: none"> • Biased sample (undercoverage): may exclude more casual riders • Only web or mail contact possible 	<ul style="list-style-type: none"> • Low incidence (eligibility rate) • Potentially high refusal rate • Cost-prohibitive 	<ul style="list-style-type: none"> • Difficult to gauge representativeness

Study Overview

Research questions:

- 1) What travel changes and emission reductions occur on BTWD, as compared to a typical workday?
- 2) What are the effects of BTWD on travel and emissions throughout the year?

Design:

- Intercept Survey on BTWD (venue-based sampling)
- Follow-up Survey in 3 months (web or phone)



Sampling Design

- Venue Based Sampling (VBS)
- Probability sampling variation of “intercept survey”
- Three-stage stratified sampling design
- Sampling units are station-period pairs (units)



Venue-based sampling (VBS)

- Recruitment at venues where population of interest gathers
- First-stage sampling: venues
- Second-stage sampling: venue and day-time combinations (VDTs)
- Third-stage sampling: individuals within sample (conducted) VDTs
- Stages 1-2 can be combined



Strengths and Weaknesses - VBS

- Strengths
 - Probability sampling (though eroded by practical concerns)
 - Responsive: Ability to monitor, control and adjust process
 - Account for refusals → population-based estimates

- Potential weaknesses
 - Weightable probability sample if and only if implemented with random sampling
 - Not all eligible people attend venues (non-coverage bias)
 - Potential multiplicity
 - People may attend venues at different frequencies

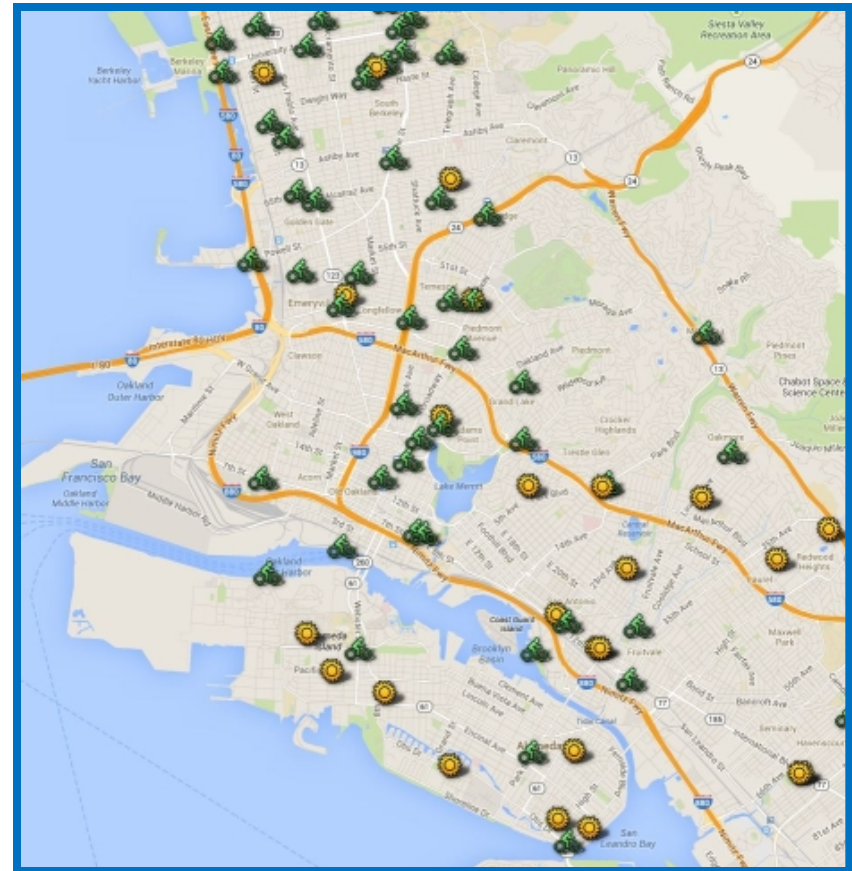
- Non-coverage biases and multiplicity are minimized in this study

Sample Allocation

Distribution of bicycle users

County	Estimated daily bicycle commuters (2005)
San Francisco	9,686
Santa Clara	7,983
Alameda	7,859
Contra Costa	4,543
Sonoma	3,413
San Mateo	3,231
Solano	2,766
Marin	1,637
Napa	1,182

Below: Energizer stations in Oakland



Sampling Allocation (continued)

- Allocation to counties for day and evening sampling using bicycle count data
- Allocated 60 sampling station-period units (40 + 20 for am/pm) to counties
- Allocation to substrata defined by busy/non-busy stations



Respondent Selection

- Interviewer positioning
- Systematic selection approach: “Look up and select”
- No control over stream of riders coming through Energizer Station
- Short invitation mentioning incentive



Outcomes

- Number of riders invited: 1,690
- % of riders who completed intercept => 82% (1,386)
- % of respondents who agreed to be contacted for the follow-up three months later => 81% (1,123).
- Follow-up RR => 60% (669).
- Follow-up mode => Web and phone



Lessons from the Field

High levels of cooperation/participation:

- Ultra short instrument
- Fun spirit of the day
- High value prize
- “Part of team”
- Collected both email and phone contacts



Survey results

- 21% of participants would not have biked if it were not BTWD, resulting in 68 tons of GHG emissions reduced from avoided car trips.
- About 1/3 of new bicyclists continued biking after BTWD and planned to continue biking.
- Approximately 8% of respondents had increased the number of days they biked per week since BTWD.
- Assuming that behavior change following BTWD will endure in the long term, the BTWD event will reduce regional VMT by 4.6 million annually, resulting in more than 1,700 tons of GHG emissions reduced annually.
- BTWD has measurable impacts on bicycling activity and GHG emissions in both the short term and the long term.

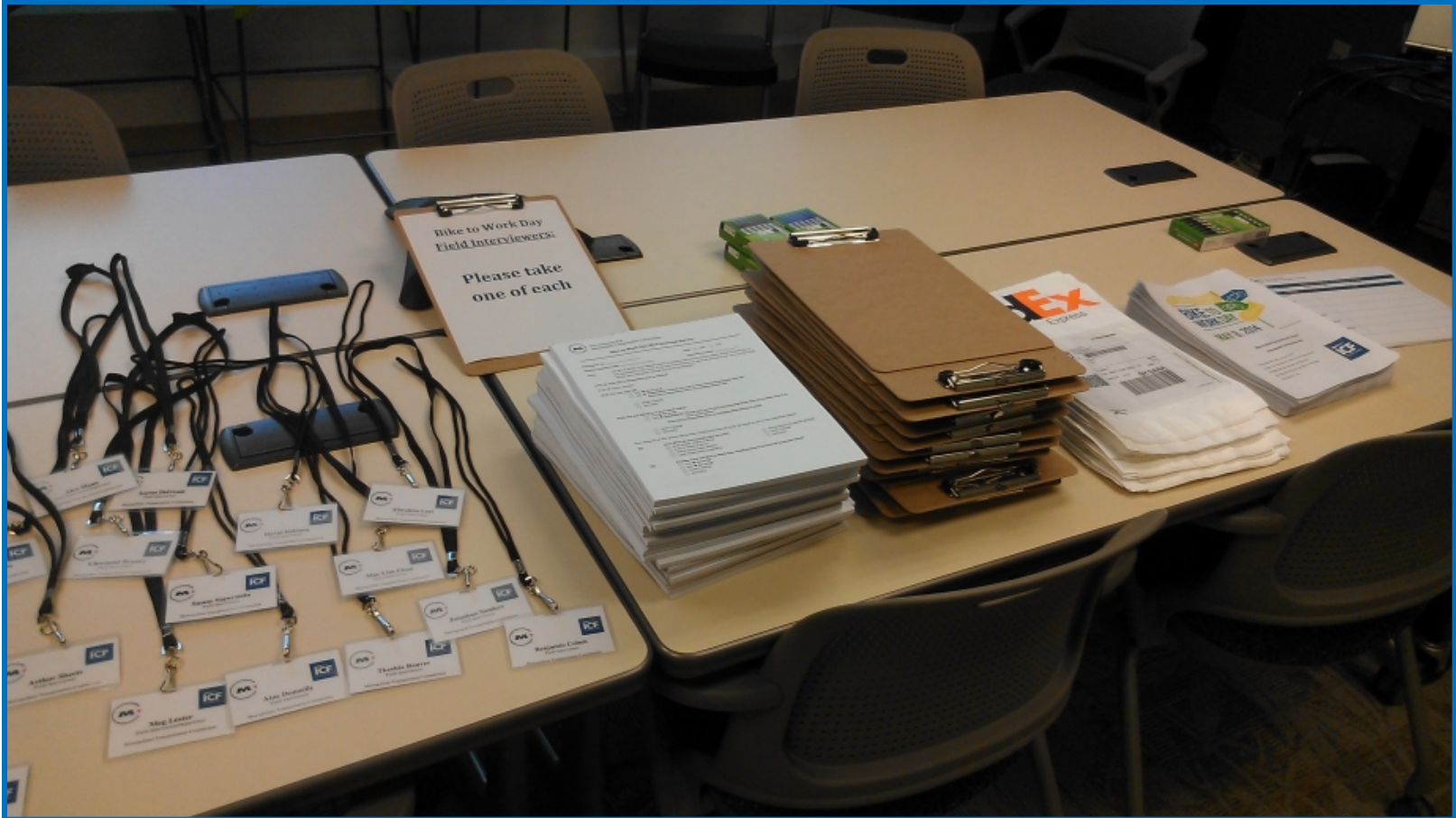






Photo: Jimmy Wang

THANK YOU!

Results – Day of Impacts

How often do you typically bike to work?	Number of Respondents	% of Respondents
3 or more times a week	899	63.3%
1 to 2 times a week	261	18.4%
Once every two weeks	70	4.9%
Less than once a month	126	8.8%
Never biked to work before	61	4.3%
Don't know/Refuse	4	0.3%
Total	1,421	100%

- On the day of the event, 4% of participants were new bicycle commuters.
- 21% of participants would not have biked if it were not BTWD, resulting in 68 tons of GHG emissions reduced from avoided car trips.

Results – Long-term Impacts

- In the long term, about 1/3 of new bicyclists continued biking after BTWD and planned to continue biking.
- Approximately 8% of respondents had increased the number of days they biked per week since BTWD.
- Assuming that behavior change following BTWD will endure in the long term, the BTWD event on May 8, 2014 will reduce regional VMT by 4.6 million annually, resulting in more than 1,700 tons of GHG emissions reduced annually.
- BTWD has measurable impacts on bicycling activity and GHG emissions in both the short term and the long term.

Bike to Work Day 2014 Intercept Survey Disposition Sheet		
Interviewer ID:	Station Location code:	AM or PM:
Disposition	Tally	
Complete		
Partial		
Refusal		
Language Barrier		
Ineligible - Under 18		
Ineligible - Not biking to work		

Questionnaire Review



San Francisco Bay
Metropolitan Transportation Commission

Bike to Work Day 2014 Intercept Survey

Interviewer ID: _____

Shift: AM PM

Station Location Code: _____

Interview number: _____

Intro: *Hi! We're doing a two-minute survey to measure the environmental impact of Bike to Work Day. If you participate in this quick survey and a brief follow-up, you'll be entered to win up to \$1,500 worth of bike gear and prizes. Would you like to participate?*

If No → Note this in Disposition form as Refusal

If Yes → Great, thanks!

Pre1: Are you over 18?

- YES → Go to Pre2
- NO → TERMINATE: "Thank you, we're only interviewing people over 18."
Note this in Disposition form as Ineligible (Under 18)
- DON'T KNOW
- REFUSED

Questionnaire Review

Pre2: Are you biking to or from work today?

- YES → Go to Q1
- NO → TERMINATE: “Thank you, we’re only interviewing those who are on their way to or from work today.”

Note this in Disposition form as Ineligible (Not biking to work)

- DON'T KNOW
- REFUSED

Your answers to this survey will be kept confidential and will never be linked to you in any published reports.

Q1 How often do you typically bike to work?

- 3 OR MORE TIMES A WEEK
- 1 TO 2 TIMES A WEEK
- ONCE EVERY TWO WEEKS
- LESS THAN ONCE A MONTH
- NEVER BIKED TO WORK BEFORE
- DON'T KNOW
- REFUSED

Q2 If today were not Bike to Work Day, would you have commuted by bicycle today?

- YES → Go to Q4
- NO → Go to Q3
- DON'T KNOW
- REFUSED

Questionnaire Review



San Francisco Bay
Metropolitan Transportation Commission

- Q3** *IF NO to Q2: How would you have gotten to work today?*
- | | |
|---|--------------------------------------|
| <input type="radio"/> DRIVE ALONE | <input type="radio"/> WALKING |
| <input type="radio"/> CARPOOL/VANPOOL | <input type="radio"/> OTHER: SPECIFY |
| <input type="radio"/> TRANSIT (INCLUDES BART, MUNI, CALTRAIN) | <input type="radio"/> DON'T KNOW |
| <input type="radio"/> TAXI (INCLUDES UBER, LYFT, SIDECAR) | <input type="radio"/> REFUSED |
-
- Q4** **What is your one-way travel distance from home to work, in miles?**
- _____ DON'T KNOW
- REFUSED
-
- Q5** **What ZIP code did you start your commute in today?**
- _____ DON'T KNOW
- REFUSED
-
- Q6** **What is the ZIP code of your destination?**
- _____ DON'T KNOW
- REFUSED

Questionnaire Review

Q7 We're doing a short follow-up survey in three months to measure the environmental impact of Bike to Work Day. If you complete the follow-up survey, you'll be entered to win up to \$1,500-worth of bike gear and prizes. Can we contact you about the follow-up survey?

- YES → Go to Q8
- NO → TERMINATE: "Thank you for your input, and have a great ride!"

- DON'T KNOW
- REFUSED

Q8 Can you please tell me what email address we can contact you at?

- _____
- DON'T KNOW
 - REFUSED

Q9 Can you please tell me a phone number we could reach you at?

- _____
- DON'T KNOW
 - REFUSED

Can I please get your name? (IF NO → "Thank you for your input, and have a great ride!")

Q10 What is your last name?

Q11 What is your first name?

Great! Thank you so much for your input and your willingness to participate in our follow-up. We will contact you in three months' time. Have a great ride!