Money Well Spent:

Benefit-Cost Analysis of Treating Pedestrian Injuries and Implementing an Effective Engineering Countermeasure

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Dahianna Lopez & Oliver Gajda

Agenda

Gajda,O- SFMTA

- Introduction
- Walking in San Francisco
- Prioritization
- Better Streets Plan
- Pedestrian Countdown Signals

Lopez, D- UCSF, SF Injury Center

- Pedestrian Injury and Its Associated Medical Costs
- Aims and Hypotheses
- Data
- Results & Findings

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Introduction

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Picture courtesy **of www.aviewoncities.com**

Picture courtesy of www.spaceimaging.com

Walking in San Francisco

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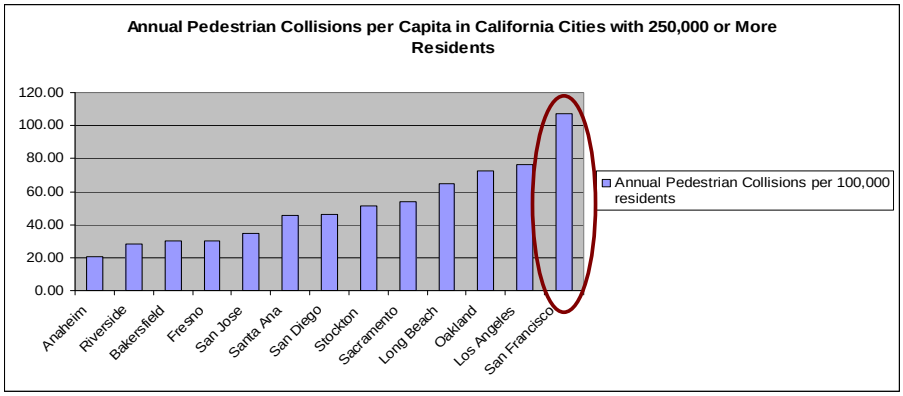
~800,000 residents

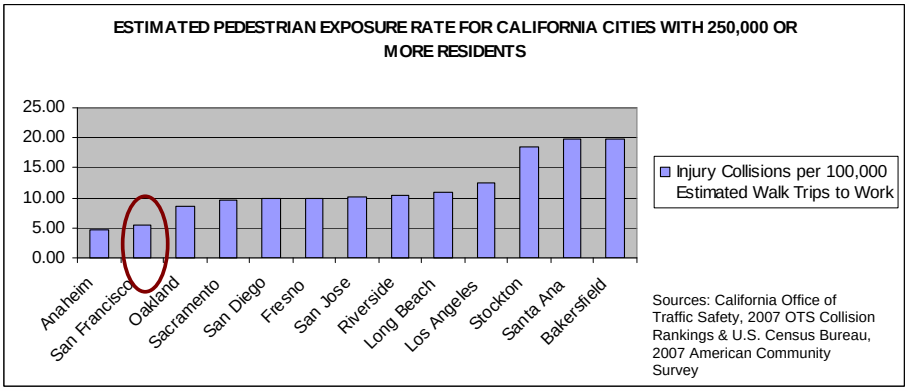
~121 square km (Amsterdam 165 sq. km.)

~6,600 people/square km (~Amsterdam 4,500 people/ square km)

10% of the trips to work are walking trips vs. USA (3%)

Walking in San Francisco





Sources: California Office of Traffic Safety, 2007 OTS Collision Rankings & U.S. Census Bureau, 2007 American Community Survey

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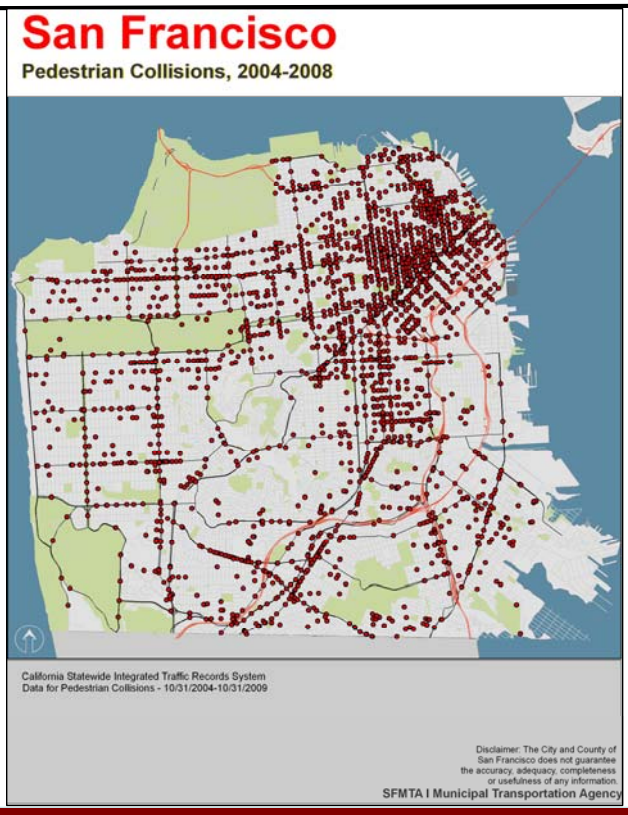
Walking in San Francisco



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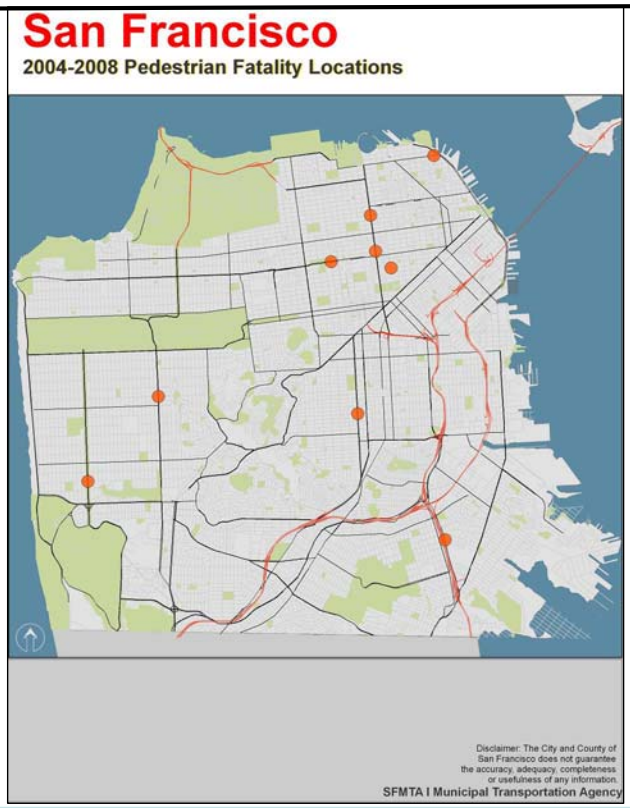
Walking in San Francisco



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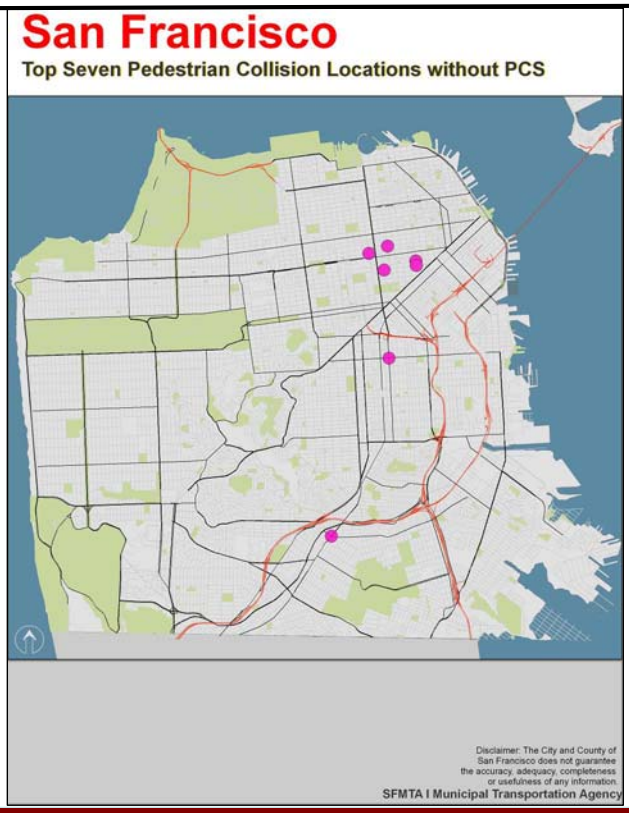
Walking in San Francisco



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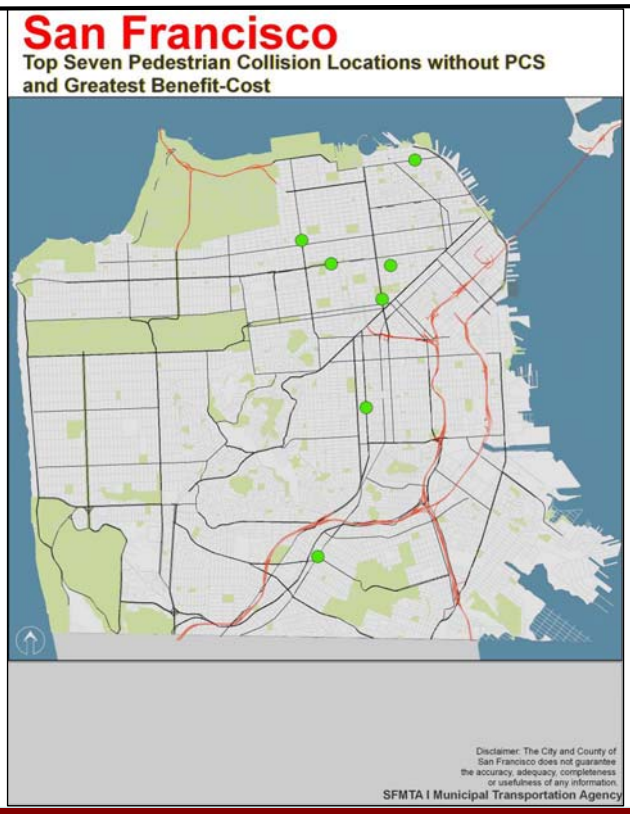
Walking in San Francisco



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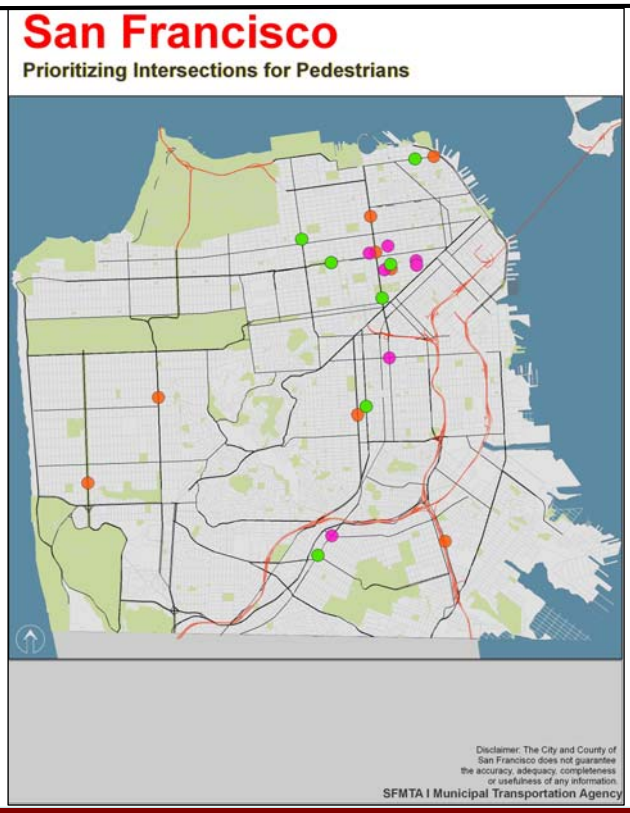
Walking in San Francisco



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Better Streets Plan

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Better Streets Plan

Memorable
Support Diverse Public Life
Vibrant Places for Commerce
Promote Human Use & Comfort
Promote Human Health
Safe

Establish Convenient Connections
Ecologically Sustainable
Accessible
Attractive, Inviting, Well-Cared For

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Better Streets Plan

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Plan Elements
Engineering Countermeasures

Engineering Countermeasures

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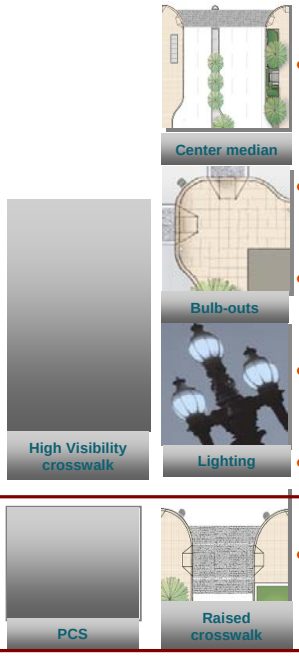

- Advance limit lines with high visibility crosswalks
- Center Median improvements
- Sidewalk “bulb-outs”
- Improved Lighting
- Raised Crosswalks
- Pedestrian Countdown Signals (PCS)

Engineering Countermeasures

Pedestrian Countdown Signal

22% Reduction of Collisions after installation*

*SafeTREC, 2003

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Pedestrian Countdown Signal Cost

- Cost per location: $34,400
- Currently: 342 locations without PCS

*SFMTA, 2010

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Countermeasure Cost vs. Injury Cost

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Aims & Hypotheses

Test feasibility of conducting BCA

Identify street intersections where PCS would be beneficial

Hypothesis: At least 50% of intersections → beneficial

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Pedestrian Injury & Medical Costs*

Admitted Patient :
$74,750/patient average

Emergency Dept Visit Only:
$6,400/patient average

*Dicker et al, 2009

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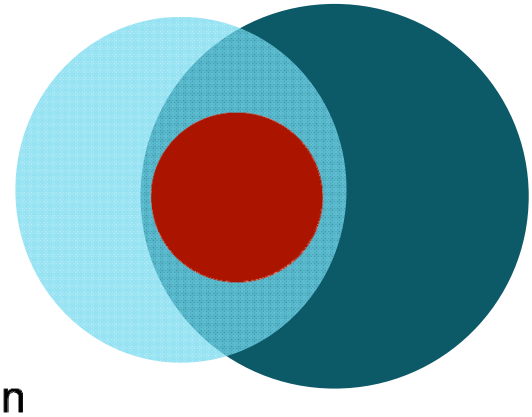
Data Sources – 2004 to 2008

- Hospital
- Police
- Transportation



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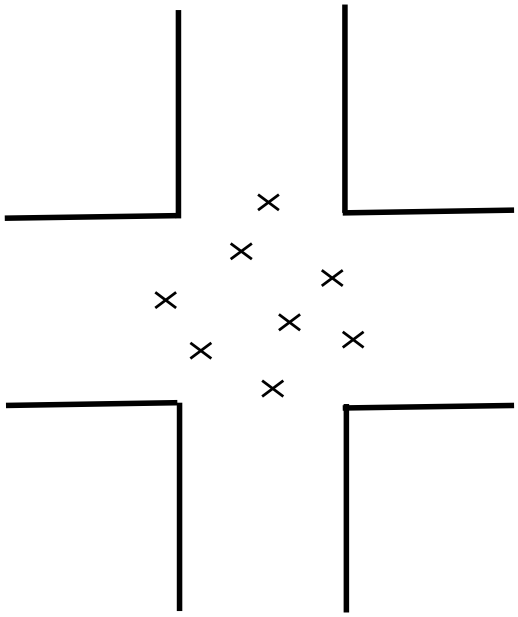
Inclusion Criteria

- **Hospital cost & intersection**



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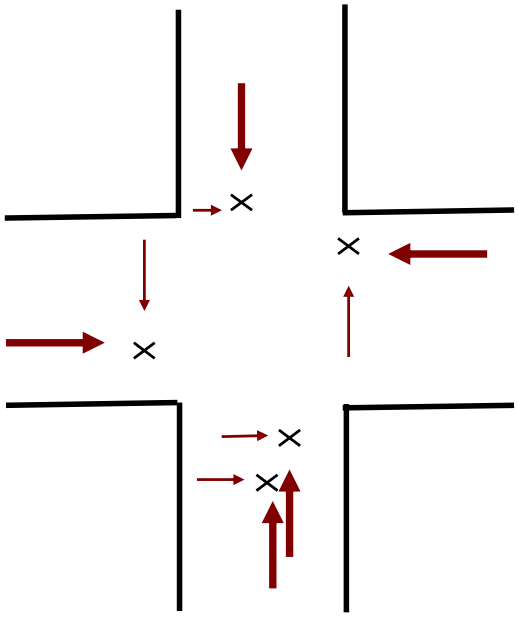
Inclusion Criteria

- Hospital cost & intersection
- **Filed police report**



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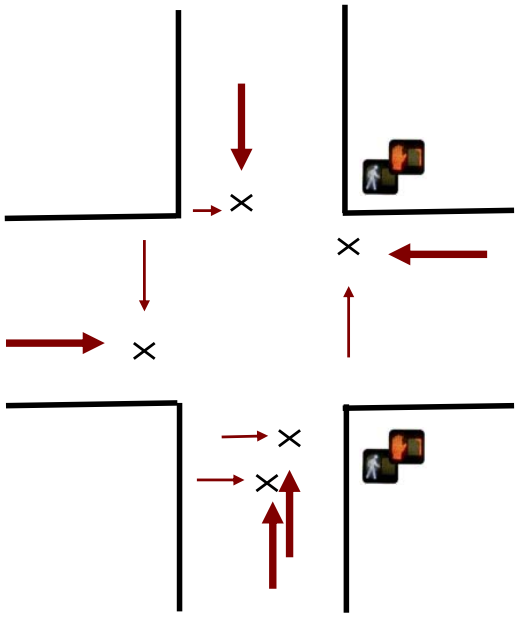
Inclusion Criteria

- Hospital cost & intersection
- Filed police report
- **Engineering data**



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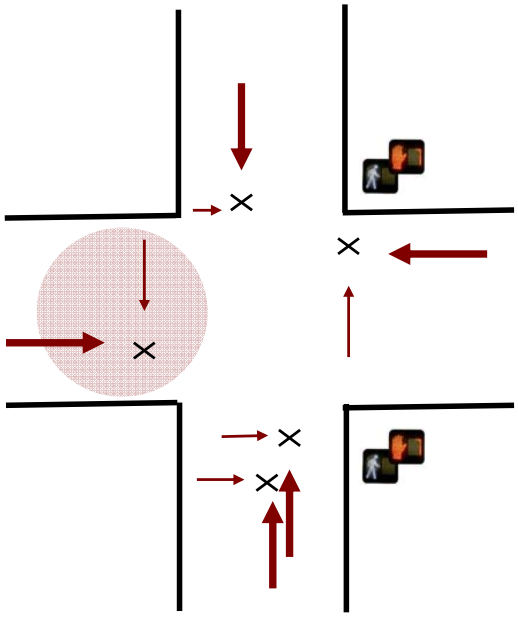
Inclusion Criteria

- Hospital cost & intersection
- Filed police report
- Engineering data
  - **No PCS**



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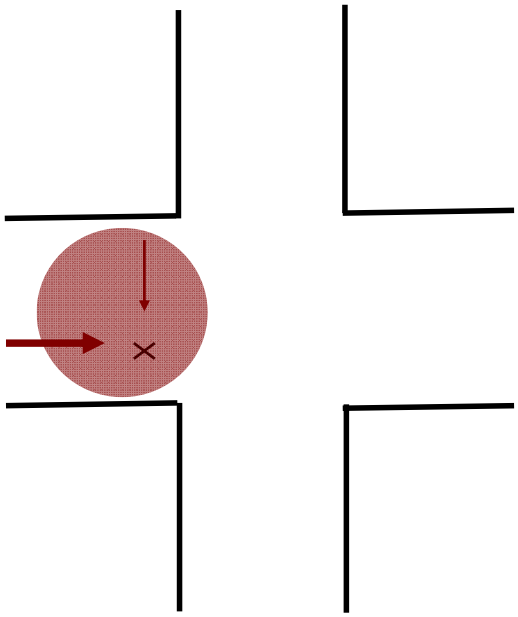
Sample

Data of three sources yielded:

- 73 AVP incidents
- 62 Intersections

No PCS Present



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Measure: Safety Improvement Index (SII)

$$S = \frac{F(C_f + C_{nf})}{Y} - M$$

$$Q = \frac{(A_a - A_b)}{A_b} \times \frac{1}{L}) \times S$$

$$B = \frac{S + \frac{1}{2}Q}{1.06} + \sum_{i=2}^{L}[\frac{(S + \frac{1}{2}Q) + (i-1)Q}{(1.06)^i}]$$

$$SII = \frac{B}{C}$$

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Result: Cost-Beneficial or Not

	SII > 1	SII < 1
Number of Intersections	33	29
Median SII	2.40	0.60
Total Cost of Injury	$4.65 Million	$583,590
Total Cost of PCS	$1.14 Million	$997,000

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Results by Intersection

SII	Intersection
22.94	FILLMORE & GEARY
16.43	HAYES & VAN NESS
14.54	ELLIS & LARKIN
12.74	BRAZIL & MISSION
10.52	DIVISADERO & SACRAMENTO
6.22	BAY & POWELL
6.04	22ND ST & GUERRERO

SII	Intersection
0.2	GEARY & VAN NESS
0.26	GEARY & LAGUNA
0.3	IRVING & SUNSET
0.33	MISSION & SILVER
0.38	22ND ST & DOLORES
0.4	ELLIS & TAYLOR
0.4	DOLORES & MARKET

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Fillmore St. & Geary Blvd.

Google

SII = 22.94

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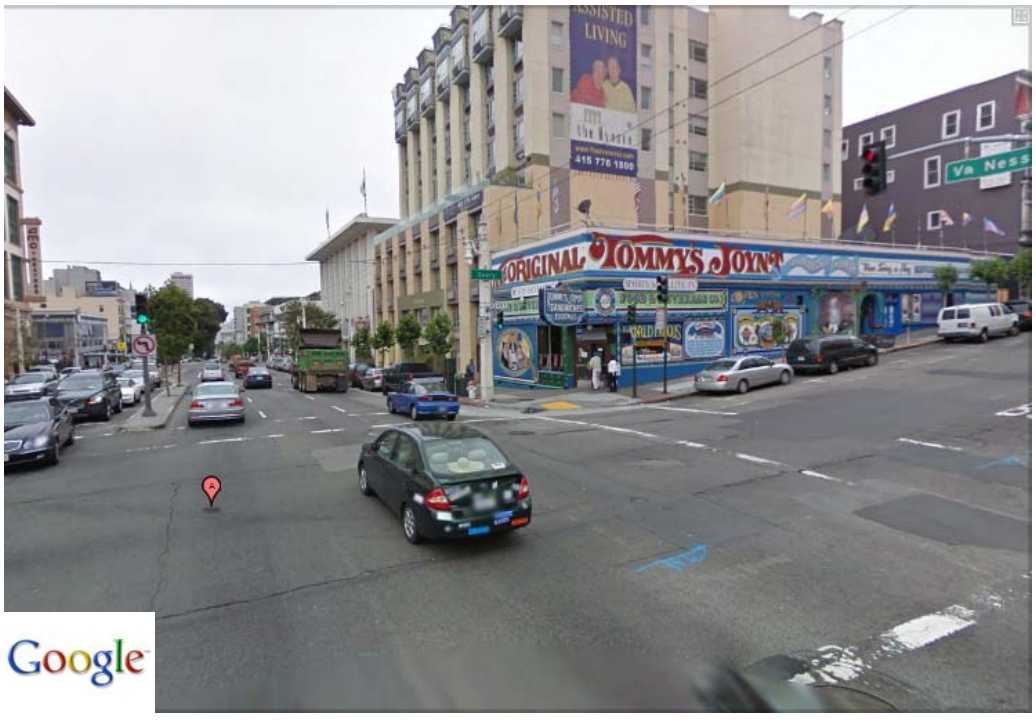
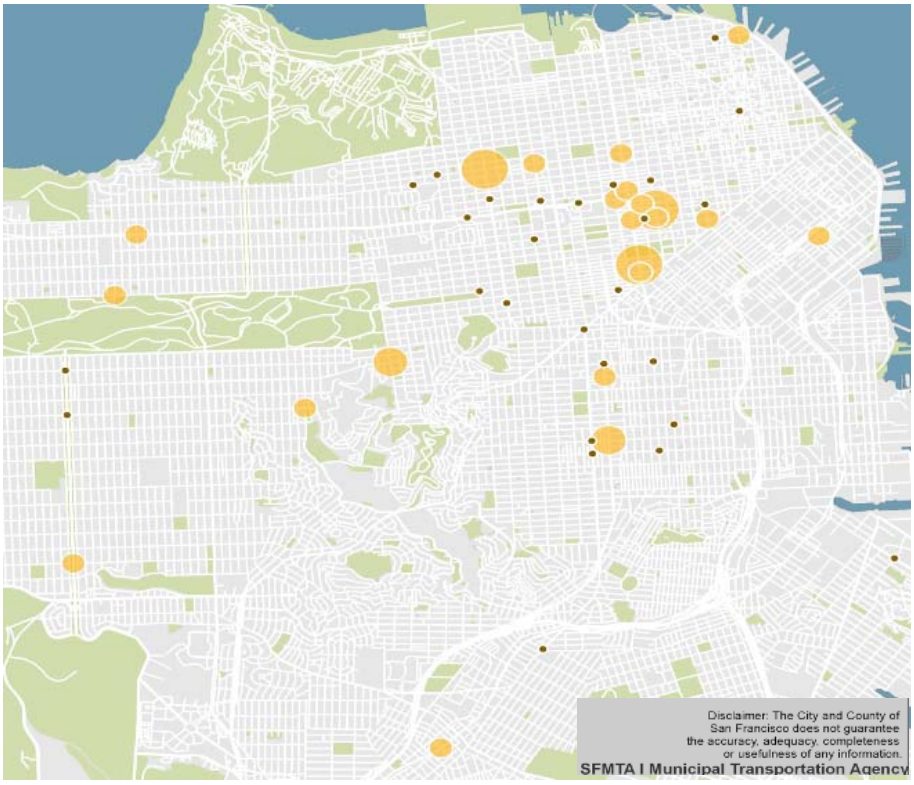
Geary Blvd. & Van Ness Ave.



Google

SII = 0.20

Cost Benefit Collision Areas with SII



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Findings & Implications for Policy

Overall, San Francisco could save **$2.40 for every $1** using PCS at "cost-beneficial" locations

Recommendations:

Use findings to advocate for funding

Consider BCA in prioritizing projects

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Source: National Geographic Jan. 2010

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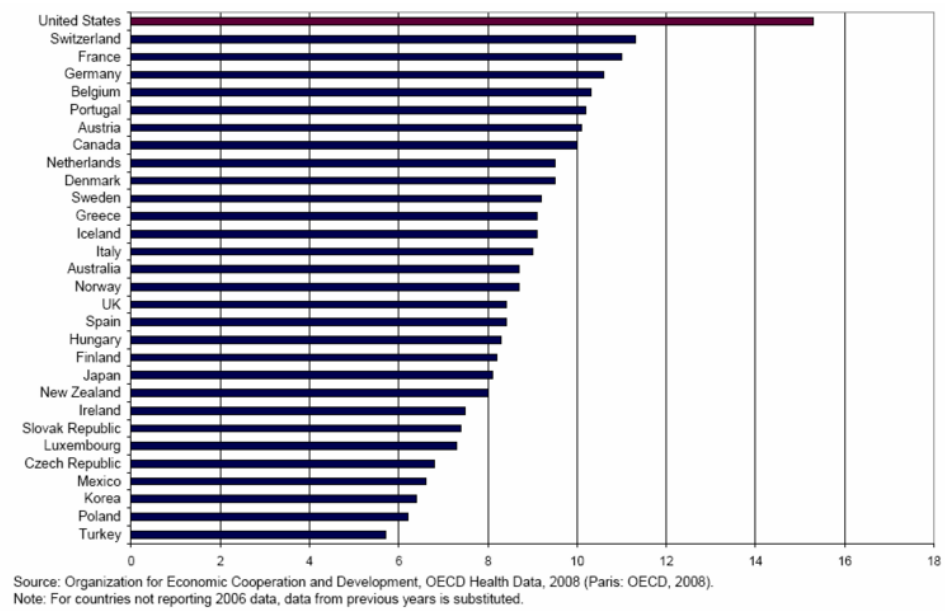
How much does the U.S. spend on healthcare?



Source: Organization for Economic Cooperation and Development, OECD Health Data, 2008 (Paris: OECD, 2008).
Note: For countries not reporting 2006 data, data from previous years is substituted.

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World Health Organization

International Health
System Ranking

Rank	Country > View list in alph
1	France
2	Italy
3	San Marino
4	Andorra
5	Malta
6	Singapore
7	Spain
8	Oman
9	Austria
10	Japan
11	Norway
12	Portugal
13	Monaco
14	Greece
15	Iceland
16	Luxembourg
17	Netherlands
18	United Kingdom
19	Ireland
20	Switzerland
21	Belgium
22	Colombia
23	Sweden
24	Cyprus
25	Germany
26	Saudi Arabia
27	United Arab Emirates
28	Israel
29	Morocco
30	Canada
31	Finland
32	Australia
33	Chile
34	Denmark
35	Dominica
36	Costa Rica
37	United States of America
38	Slovenia
39	Cuba

35

Thank You

Dharma Sunjaya
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Pedestrian Countdown Signals

Countdown Signals Program

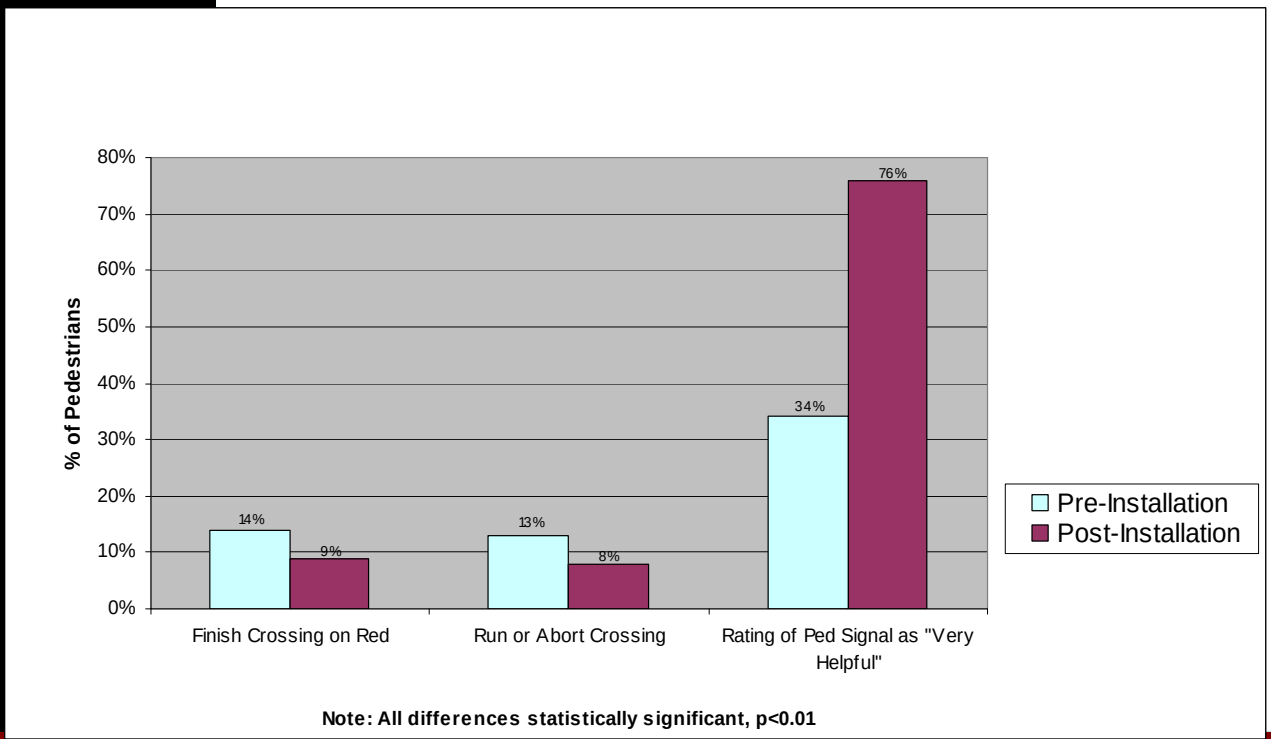
- Pilot - Countdown signals initially installed at 14 test locations
- Full-scale Replacement - City eventually replaced most pedestrian signals with Countdown Signals (over 800 intersections)
- More energy-efficient: electricity savings paying for LED device installation (over several years)

Countdown Signals

Summary of Impacts :

- Pedestrians like additional information on how much time is left to cross the street
- Citywide installation – about 22% drop in injuries at countdown locations vs. 2% rise at signalized intersections without pedestrian signals
- Significant reduction in pedestrians finishing crossing on red
- No significant reduction Pedestrians starting to cross at the beginning of the clearance interval
- No increase in red light running

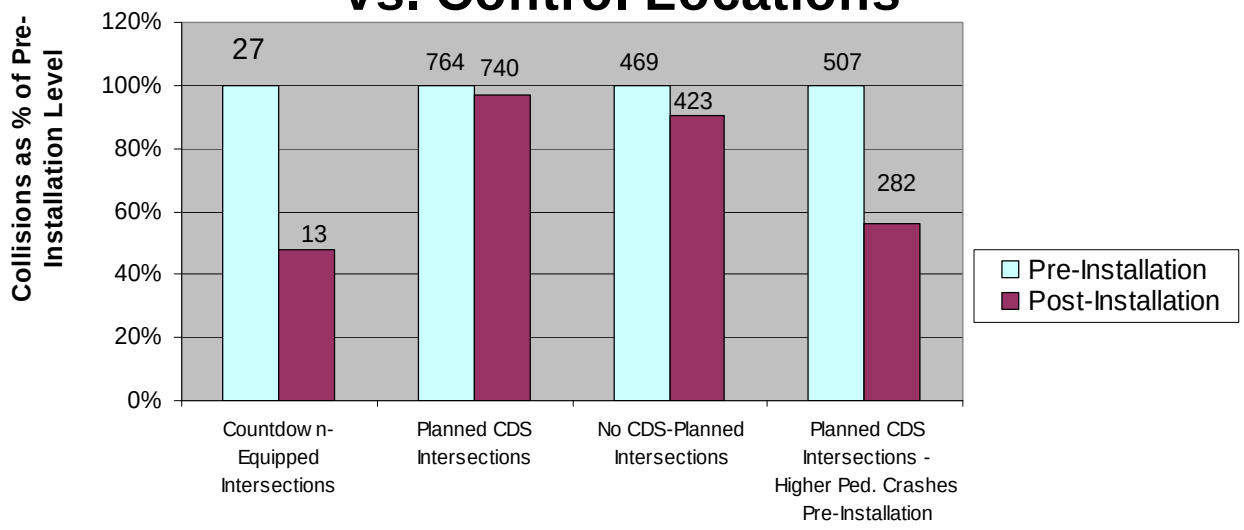
Countdown Behavioral Impacts



Note: All differences statistically significant, p<0.01

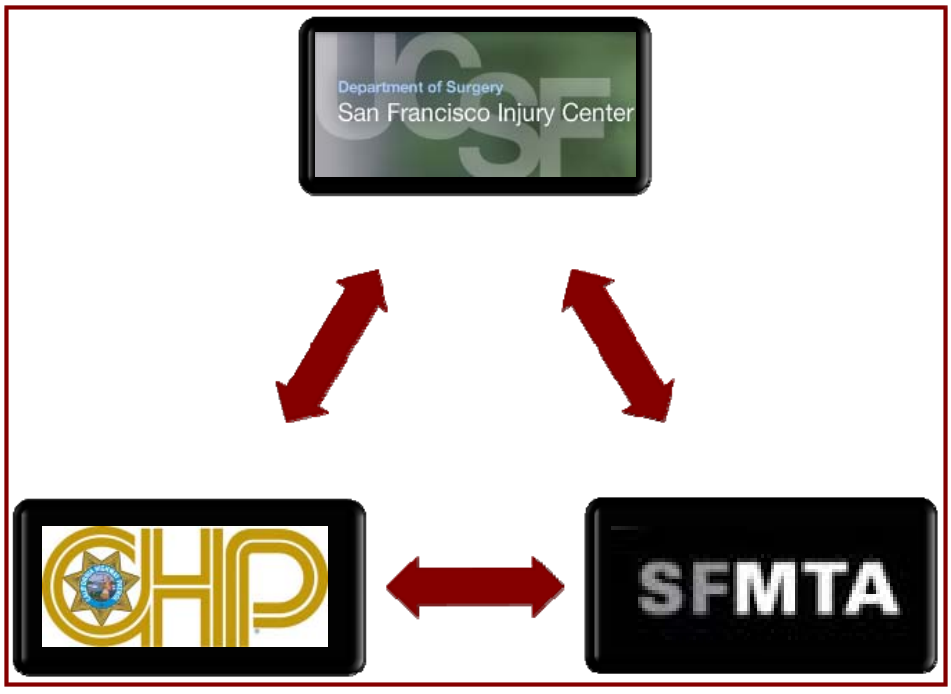
Collision Impacts

Pilot Countdown Locations vs. Control Locations



Note: Countdown reduction statistically significant, p<0.05

Recommend Collaboration



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Limitations

- Data availability
- Data linking
- Broader context

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Walking in San Francisco

San Francisco:
92/100,000

USA:
62/100,000

HP2010 :
19/100,000

HEALTHY PEOPLE 2010

PHOTO: Armand Emamdjomeh

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