

Pedestrian injuries and fatalities in San Francisco: frequency, distribution, causes, and responses



Presentation to the Board of Supervisors

RAJIV BHATIA, MD, MPH

ANA VALIDZIC, MPH

MEGAN WIER, MPH

SAN FRANCISCO DEPARTMENT OF PUBLIC HEALTH

April 7th, 2011

National Burden of Traffic Injuries and Fatalities

- 2009 National Traffic Safety Facts
 - ❑ 33,808 deaths
 - ❑ 2,217,000 injuries
 - ❑ 4,092 pedestrian deaths
 - ❑ 49,000 pedestrian injuries
- For youth and children
 - ❑ Leading cause of death
 - ❑ 900 pedestrians deaths
 - ❑ 51,000 children injuries
 - ❑ 5,300 hospitalizations
- Estimated \$230 billion in economic costs



SFDPH Roles in Pedestrian Safety Efforts

- Promotion of knowledge, attitudes, and behavior
 - Collection and integration of pedestrian safety data
 - Analysis of causes and consequences of injuries and fatalities
 - Environmental assessment
 - Leadership and participation in inter-agency planning
 - Care of injured and disabled pedestrians
-

San Francisco Burden of Pedestrian Injuries and Fatalities

- Estimated ~ 800 police-reported injury collisions / year
- Estimated ~100 people killed or seriously injured / year
- Annual rate five times national public health goals
- Police report estimates likely represent an undercount of injuries
 - 22% of SFGHMC hospitalized injuries not counted in police reports
 - ?? undercount of less severe injuries, injuries seen in other ERs



Streets of San Francisco are not “more dangerous” *yet walking is more dangerous than driving*

- Per trip, walking has 4 times the risk of death compared to driving
- Per trip traffic injury risk lower in San Francisco for all modes *except walking*
- Per trip fatality risk lower in San Francisco for all modes, particularly for vehicle drivers

Injury and fatality rates per 100 million trips by travel mode: San Francisco compared to the U.S.

Travel Mode	Injury Rate	Fatality Rate
United States (1999-2003)		
Walkers	216	14
Car Drivers/Passengers	803	9
Cyclists	1461	21
San Francisco (2004-2008)		
Walkers	281	8
Car Drivers/Passengers	297	2
Cyclists	1170	6

The causes of vehicle collisions with pedestrians are well-established through research

■ Environment

- ❑ Higher traffic flow
- ❑ Higher pedestrian flow
- ❑ High vehicle speed
- ❑ Vehicle type (e.g. trucks)
- ❑ Unsafe road design
- ❑ Unsafe crossing facilities
- ❑ Inadequate lighting

■ Physical ability

- ❑ Limits to visual perception / judgments in young
- ❑ Limits to agility in the aged

■ Behaviors

- ❑ Speeding
- ❑ Cell phone use
- ❑ Safety rules



Routine collision investigation does not examine all of the known causes of injuries and fatalities

- Police assign a “primary collision factor” to each collision based on their investigation
- Environmental factors (speed, road design) and physical ability are **not** recorded collision factors in police collision investigations in SF
- Driver violations represent the majority of “primary collision factors” in SF
 - Pedestrian Right of Way – 39%
 - Unsafe Speed – 6%
 - Fail to observe traffic signals and signs – 5%
 - Unsafe starting or backing (up) – 5%
 - Pedestrian violations – 31%
- Driving under the influence is the primary collision factor in ~1% of collisions



Injuries are highly concentrated in a several San Francisco neighborhoods

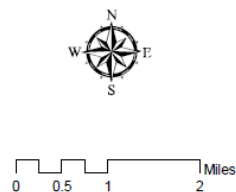
- ~50% of injuries occur in 20% of census tracts and in 8% of San Francisco surface area
- Injury rates highest in lower-income neighborhoods

Vehicle-Pedestrian Equity Analysis by Census Tract San Francisco, CA (2004-2008)

Proportion of SF Residents Living in, Proportion of Injuries Happening In

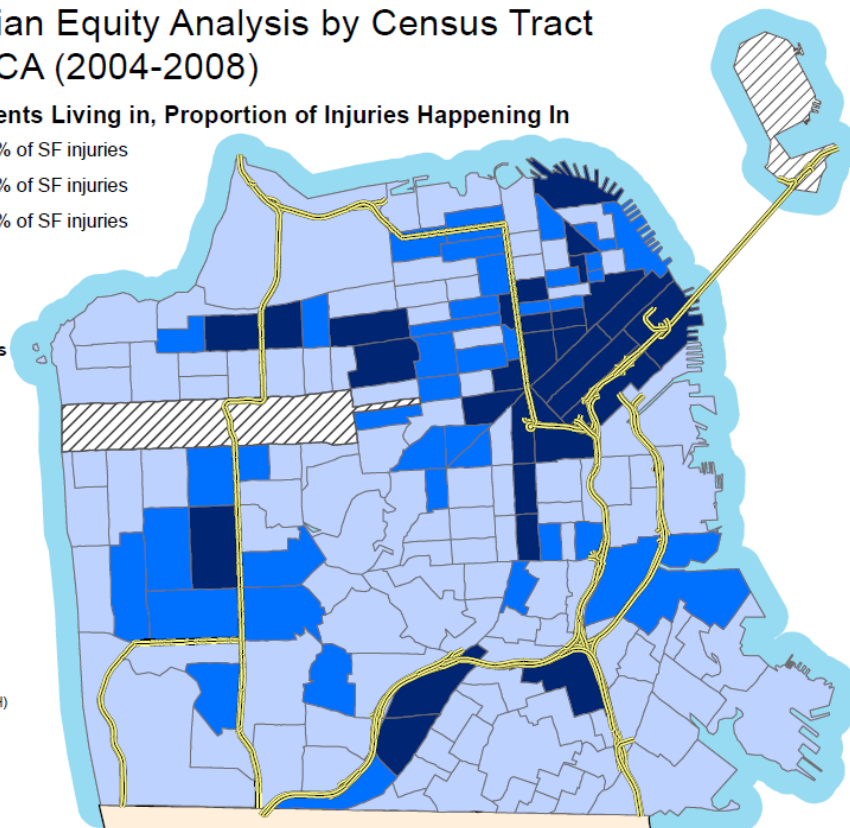
- 20% of SF residents, 50% of SF injuries
- 20% of SF residents, 25% of SF injuries
- 60% of SF residents, 25% of SF injuries

- ▨ Excluded because of small population
- Major Highways/Freeways



Source: California Highway Patrol, Statewide Integrated Traffic Records System (SWITRS)
Data geocoded by Jeff Burton (SFDPH)

City and County of San Francisco
Department of Public Health
Environmental Health Section



Pedestrian Injury Prediction Models Help To Evaluate the Roles of Multiple Related Risk Factors



Dan Nabors, BMI-SG

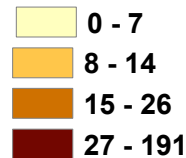
- AASHTO/FHWA best practice
- Integrates risk factor data from many sources
- Analysis of independent contribution of causes
 - Traffic conditions
 - Population factors
 - Street design
 - Countermeasures
- Used to prioritize risk factors and evaluate the impact of solutions

SF modeling shows traffic volumes, high capacity streets, land use, and population explain local injury concentration

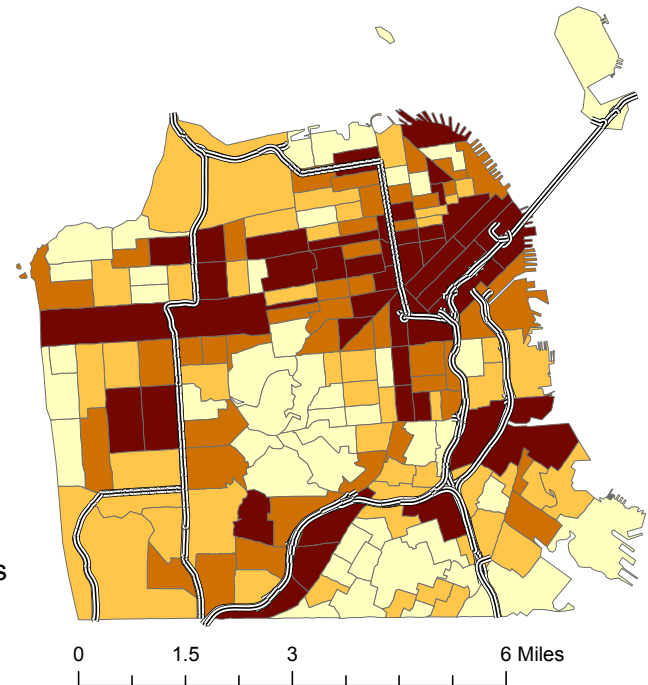
Proportion of small-area differences in injuries explained by variation in the risk factor:

- 21% - Traffic volume
- 13% - Employee Population
- 10% - Neighborhood Commercial (NC) Zoning
- 10% - Arterial streets
- 9% - Resident Population
- 7% - Residential-NC zoning
- 7% - Land area (-)
- 5% - Below poverty level
- 5% - Age 65 and over (-)

Number of Collisions

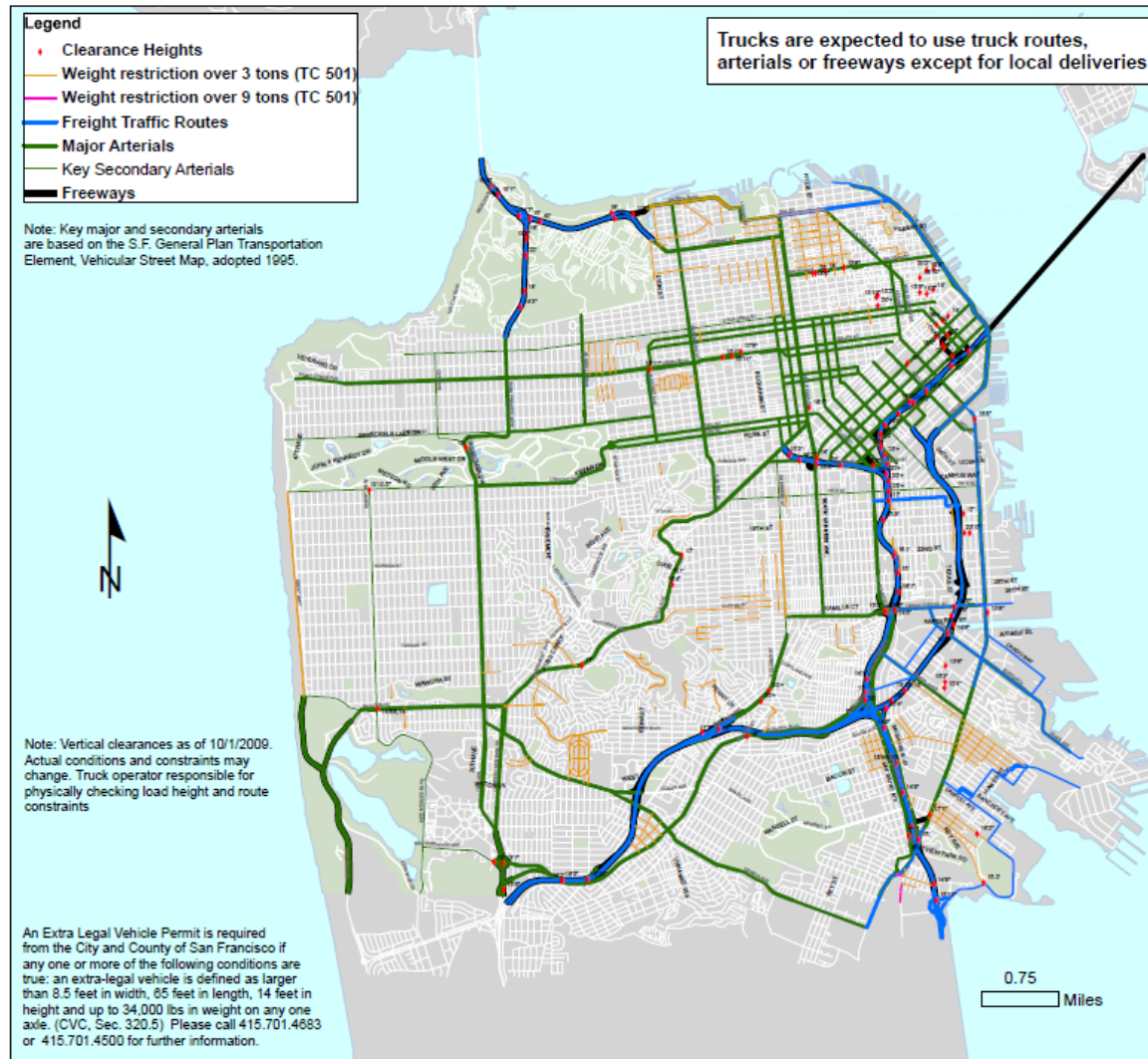


 Highways/Freeways



Source: California Highway Patrol, Statewide Integrated Traffic Records System

SoMa provides the principal thoroughfares moving traffic and trucks from freeways into the city

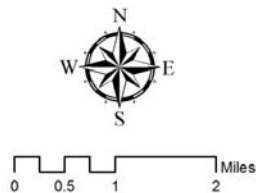


Causes of fatalities are different from causes of injuries— most SF pedestrian fatalities occur near high volume arterial streets

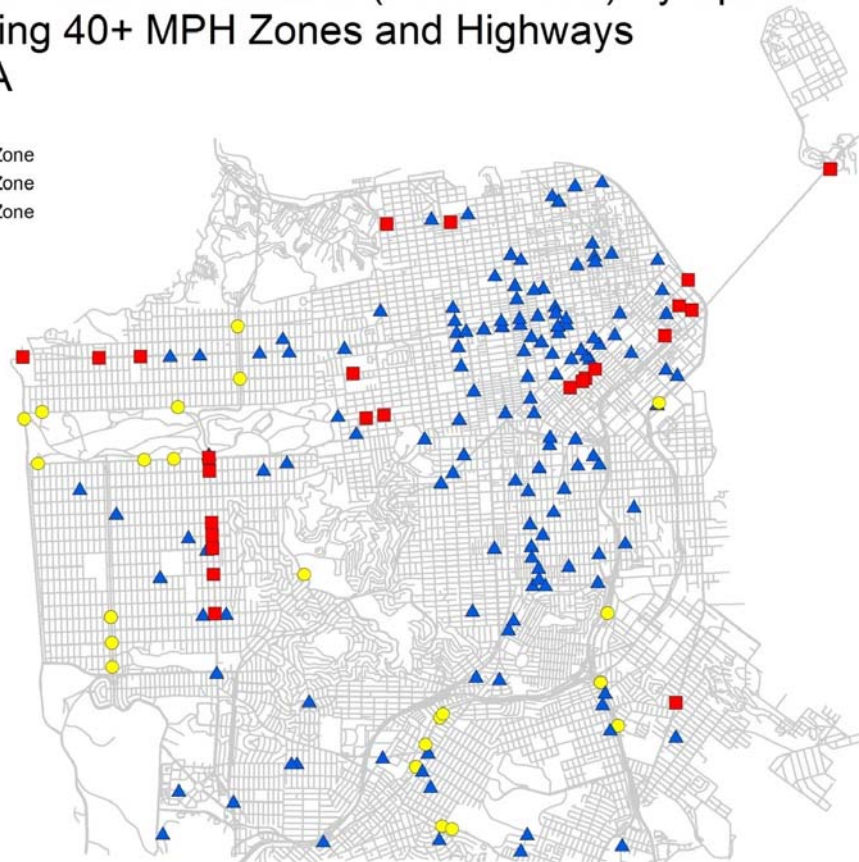
Vehicle-Pedestrian Collision Fatalities (1999 - 2008) By Speed Limit Zone Excluding 40+ MPH Zones and Highways San Francisco, CA

Vehicle-Pedestrian Fatalities

- ▲ Pedestrian Fatality in 25 MPH Zone
- Pedestrian Fatality in 30 MPH Zone
- Pedestrian Fatality in 35 MPH Zone



Sources-
Speed Data: San Francisco Municipal
Transportation Agency
Pedestrian Collision Data: Statewide
Integrated Traffic Records System (SWITRS)
City and County of San Francisco
Department of Public Health
Environmental Health Section



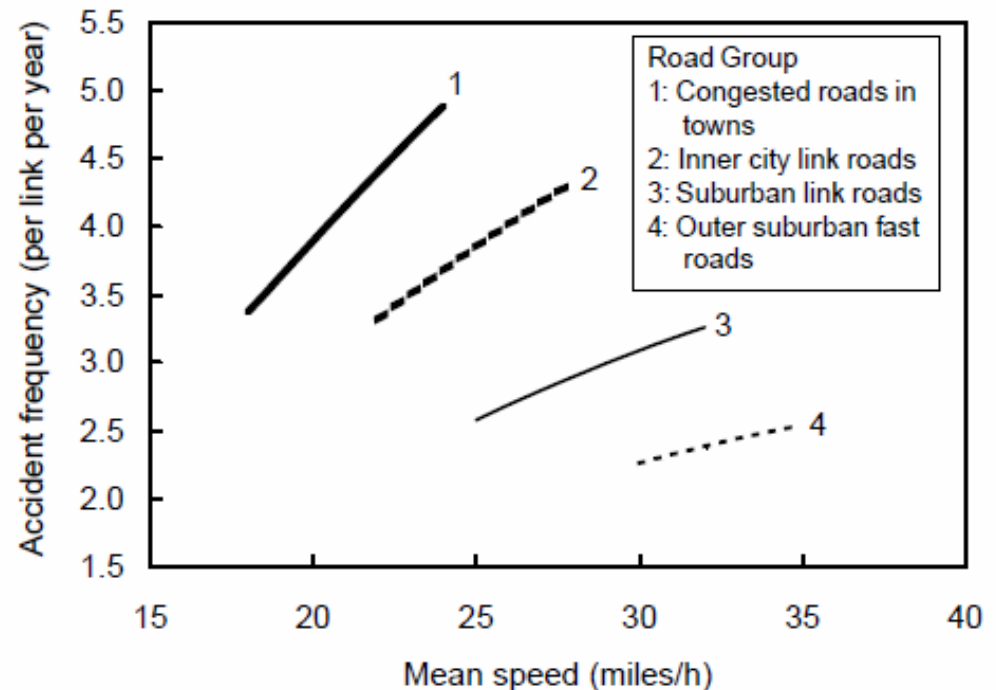
Travel speeds are known to be an important avoidable cause of collision frequency

■ Speeds affects

- Awareness of pedestrians
- Control of vehicle
- Stopping distance

- On urban arterials, a 1 mph change in speed, increases injury collisions by ~5%

Collision frequency against mean speed for urban road groups (UK data)

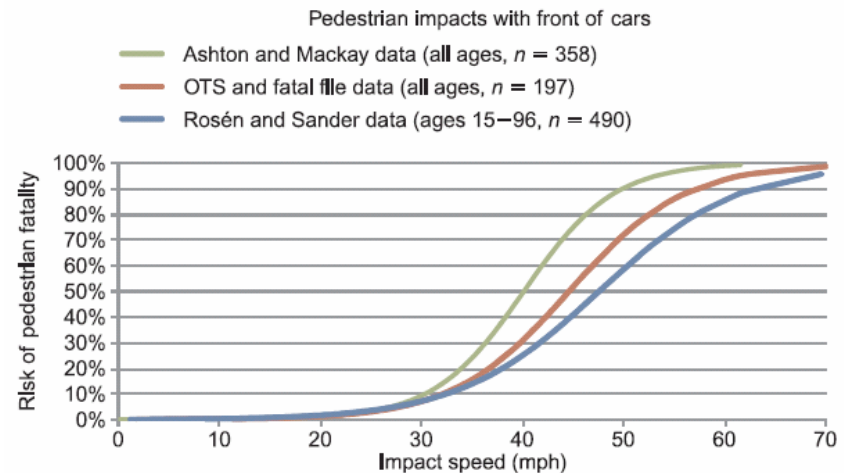


Many San Francisco drivers are driving much faster than the speed limit

Posted speed limit	Observations	Estimated mean speed	Percent exceeding speed limit	Estimated mean speed of those exceeding limit	Percent 5 mph or more over speed limit
25 mph	152,640	25 mph	56%	30 mph	23%
30 mph	61,388	26 mph	31%	34 mph	10%
35 mph	29,626	31 mph	26%	39 mph	8%

Vehicle impact speed, vehicle mass, and physical vulnerability are the determinants of injury severity

- Risk of pedestrian fatality ~6x at 30 mph relative to 20 mph
- Enforcement of the speed limit or small reductions in the average speed could reduce collisions by >15% and fatalities by ~50%
- Legislative obstacles to safe urban traffic speeds
 - ❑ 85% rule
 - ❑ Automated speed enforcement



Current SFDPH Focus Areas

- Coordinate and improve injury data collection and analysis
 - Full accounting of injuries
 - Assess of environmental factors
 - Used data to target enforcement & investments
- Integrate best practices in safety countermeasures in development planning and transportation improvements
- Safe Routes to Schools
- Support resources and investments for pedestrian environmental quality and safety
- Support of newly created Inter-agency Pedestrian Safety Task Force



Walk First Project: A inter-agency partnership for walking



■ Objectives:

- ❑ citywide map of key pedestrian streets and zones;
- ❑ method and criteria for prioritizing pedestrian improvements;
- ❑ five case study and concept designs;
- ❑ capital project list of recommended pedestrian improvements for those case studies;
- ❑ draft General Plan policies relating to walking and the pedestrian environment; and
- ❑ strategies for safe and active walking to be included into the San Francisco Transportation Plan.

■ Partners:

- ❑ San Francisco Municipal Transportation Agency
- ❑ San Francisco County Transportation Authority
- ❑ San Francisco Planning Department

■ Funding Source:

- ❑ California Office of Traffic Safety

■ DPH Staff Lead:

- ❑ Ana Validzic

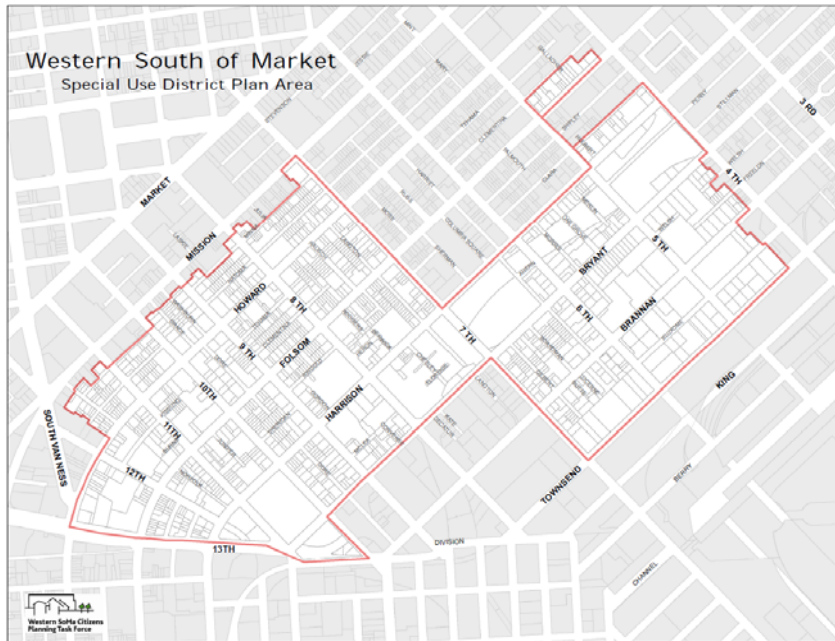
Safe Routes to School

- Goal: increase **safe** and **active** walking and bicycling to and from school
- Interdisciplinary movement – transportation, health and environmental
- Use the “Five Es” model:
 - ❑ Education
 - ❑ Encouragement
 - ❑ Enforcement
 - ❑ Engineering
 - ❑ Evaluation
- Marshall ES is District 6 school



Longfellow Elementary

Western SoMa Citizens Planning Task Force



- ❑ SFDPH appointed to the Task Force, participating since 2006
- ❑ Supporting the Community Plan with evidence-based pedestrian safety recommendations, including:
 - Traffic calming
 - Safe mid-block crossings
 - Lane reductions
 - Safe goods movement
 - Alleyway improvements
 - Pedestrian-oriented design

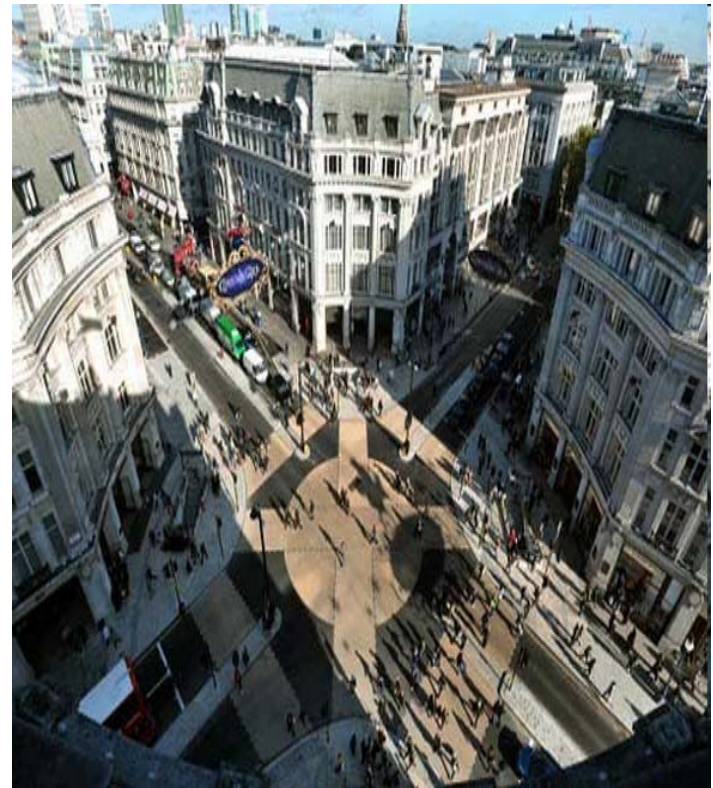
December 20th 2010 Executive Directive on Pedestrian Safety

- Establishes new medium (25% by 2016) and long range (50% by 2021) reduction targets for serious and fatal injuries
- SFMTA and SFDPH co-chair Inter-agency workgroup
- Short term actions
 - 15 mph school zone speed limits
 - Pilot 20 mph home zones
 - High risk corridor engineering program
 - Pedestrian Injury Prediction Model (SFDPH)
 - Applications of Pedestrian Environmental Quality Index (SFDPH)
 - Best practices research (All)
- Long term: Pedestrian Safety Plan



Many proven & effective strategies for reducing injury frequency and severity

- Speed reductions:
 - 20 mph Home Zones
 - Traffic Calming
 - Automated Speed Enforcement
 - Signal Timing
- Engineering counter-measures
 - Median Refuge Islands
 - Signalized cross-walks
 - Pedestrian crossing phase
 - Lighting



Keys obstacles to pedestrian safety

- Safety viewed as an individual responsibility not environmental problem
 - Pedestrians and drivers compete for blame
 - No accounting for the vulnerability of walkers and abilities of children and elderly
 - Allows “mistakes” to have fatal consequences
- Several existing laws and policies create barriers to available and effective engineering and enforcement strategies



An international best practice in cultural change: Principles of the *Vision Zero* movement

VISION **ZERO**
INTERNATIONAL



- ❑ System designers are ultimately responsible for the safety of the transportation system.
- ❑ The system should be designed to prevent levels of violence intolerable to the human body (excessive forces) for all users
- ❑ Systems designers should account for the expected behaviors of road users