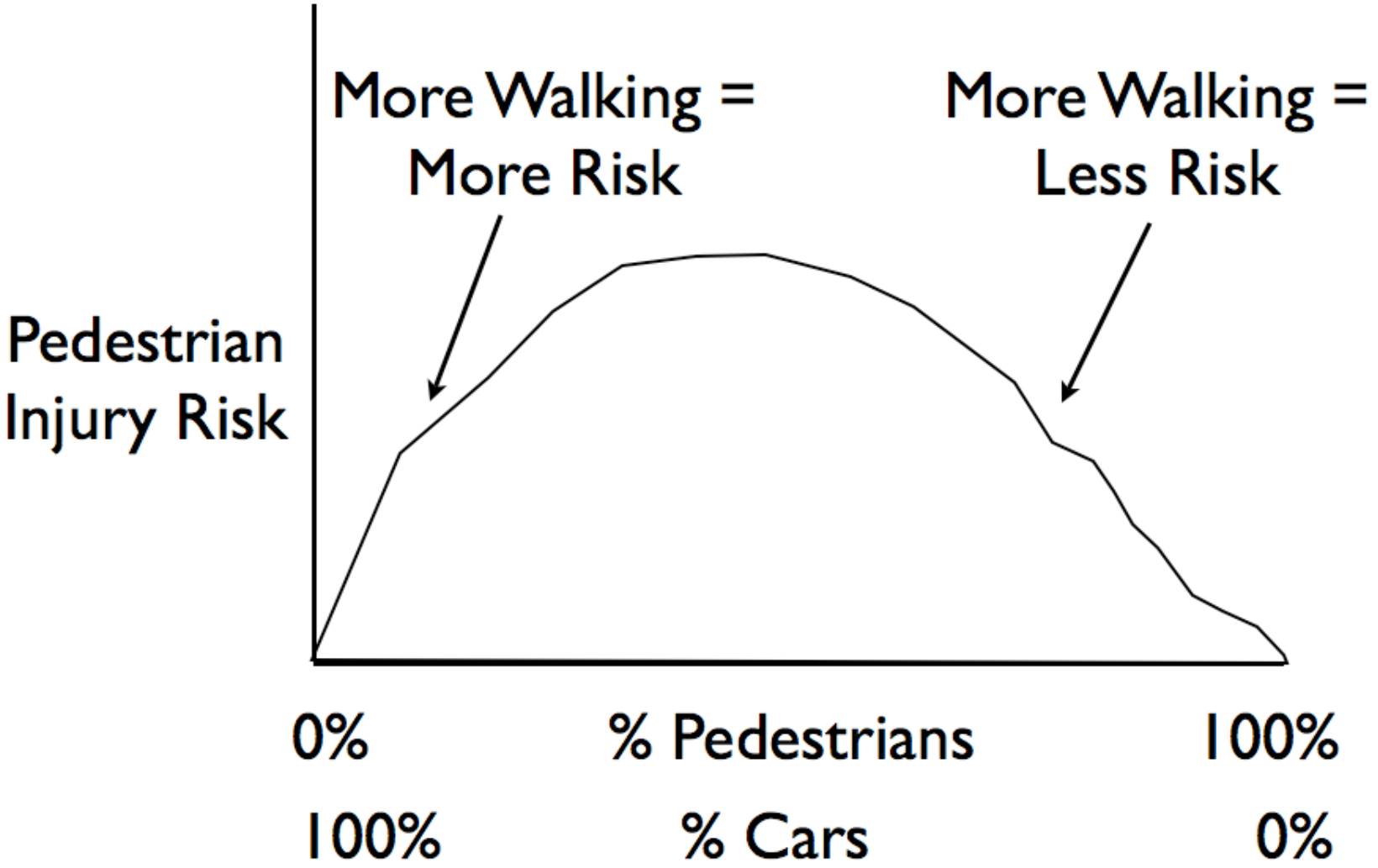
Technology and Pedestrian Injury: Traffic Signals

Andrew Howard MD MSc FRCS(C)
Professor, Surgery and Public Health
Sickkids and University of Toronto

Overview

- Pedestrian Injuries don’t have to happen
- Our analysis in Toronto showed more pedestrian injuries with countdown signals
- Still, I believe traffic signals play a role in reducing pedestrian injury risk



Risk of Pedestrian Injury Varies by Transport Mix

Haddon's Matrix - Pedestrian Injury

	Person	Equipment	Environment
Pre Event	Driver Training, Distraction, pedestrian visibility	pedestrian warning systems	Road design, raised crosswalks, speed camera, crossing guards, signals, lighting, etc…….
Event		bumper, hood, windshield design	
Post Event	Access to health care	Collision Notification	ATLS system

Pedestrian Countdown Signals

- Detailed spatial pre-post study of pedestrian countdown timers at 1965 traffic light controlled intersections
- 26% overall increase in car-pedestrian collisions after installation of signals
- Why?


Original article

OPEN ACCESS

The impact of pedestrian countdown signals on pedestrian-motor vehicle collisions: a reanalysis of data from a quasi-experimental study

Sarah A Richmond,[1] Andrew R Willan,[1,2] Linda Rothman,[1] Andi Camden,[1] Ron Buliung,[3] Colin Macarthur,[1,4] Andrew Howard[1,5,6,7]

Richmond SA, Willan AR, Rothman L, et al. Inj Prev 2014;20:155–158.

International Journal of Injury Control and Safety Promotion

ISSN: 1745-7300 (Print) 1745-7319 (Online) Journal homepage: http://www.tandfonline.com/loi/nics20

The impact of pedestrian countdown signals on single and two vehicle motor vehicle collisions: a quasi-experimental study

Benjamin G. Escott, Sarah A. Richmond, Andrew R. Willan, Bheeshma Ravi & Andrew W. Howard

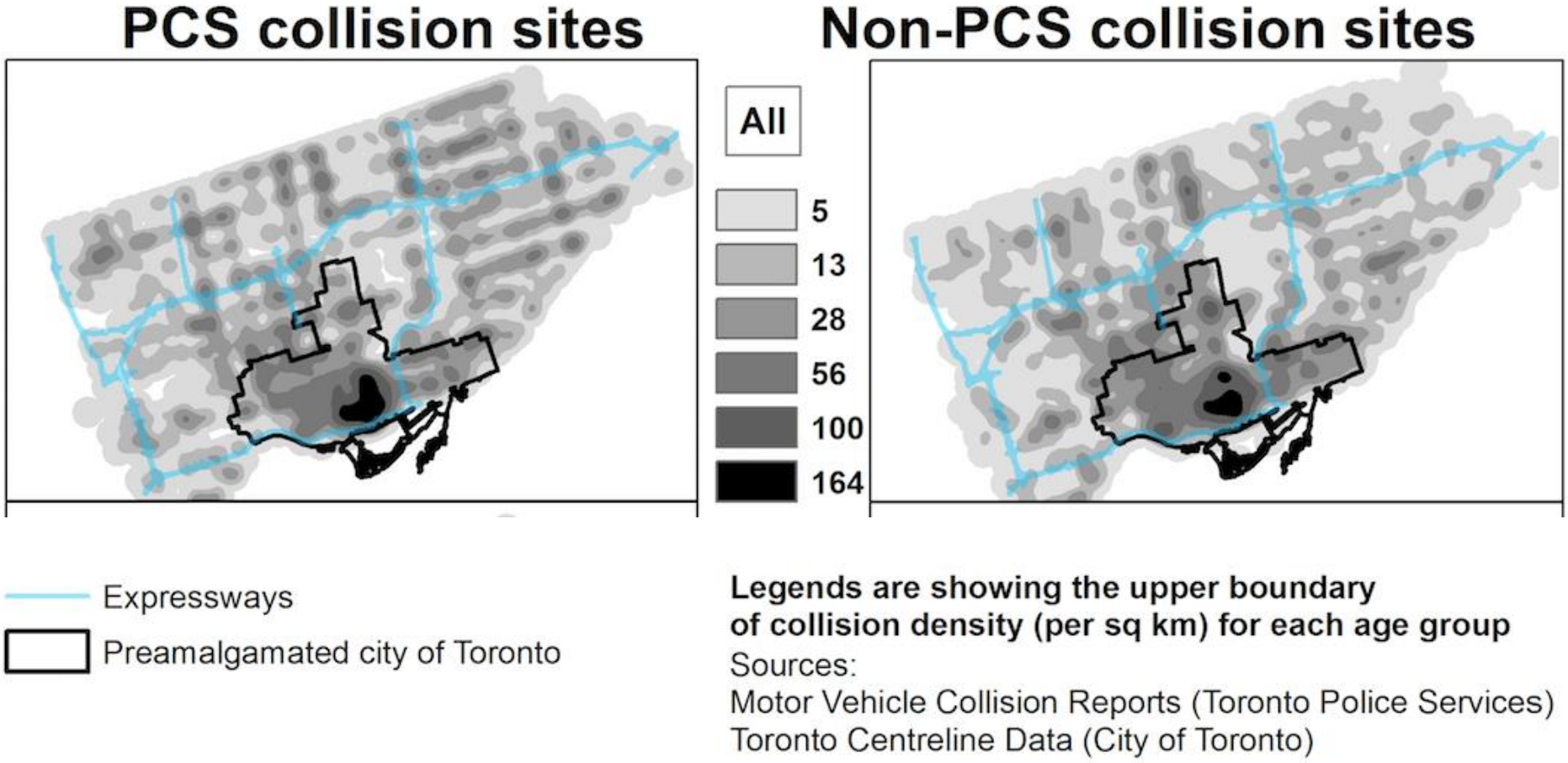
Table 3. Incidence rate ratios of motor vehicle collisions after pedestrian countdown signal installation, stratified by collision type.

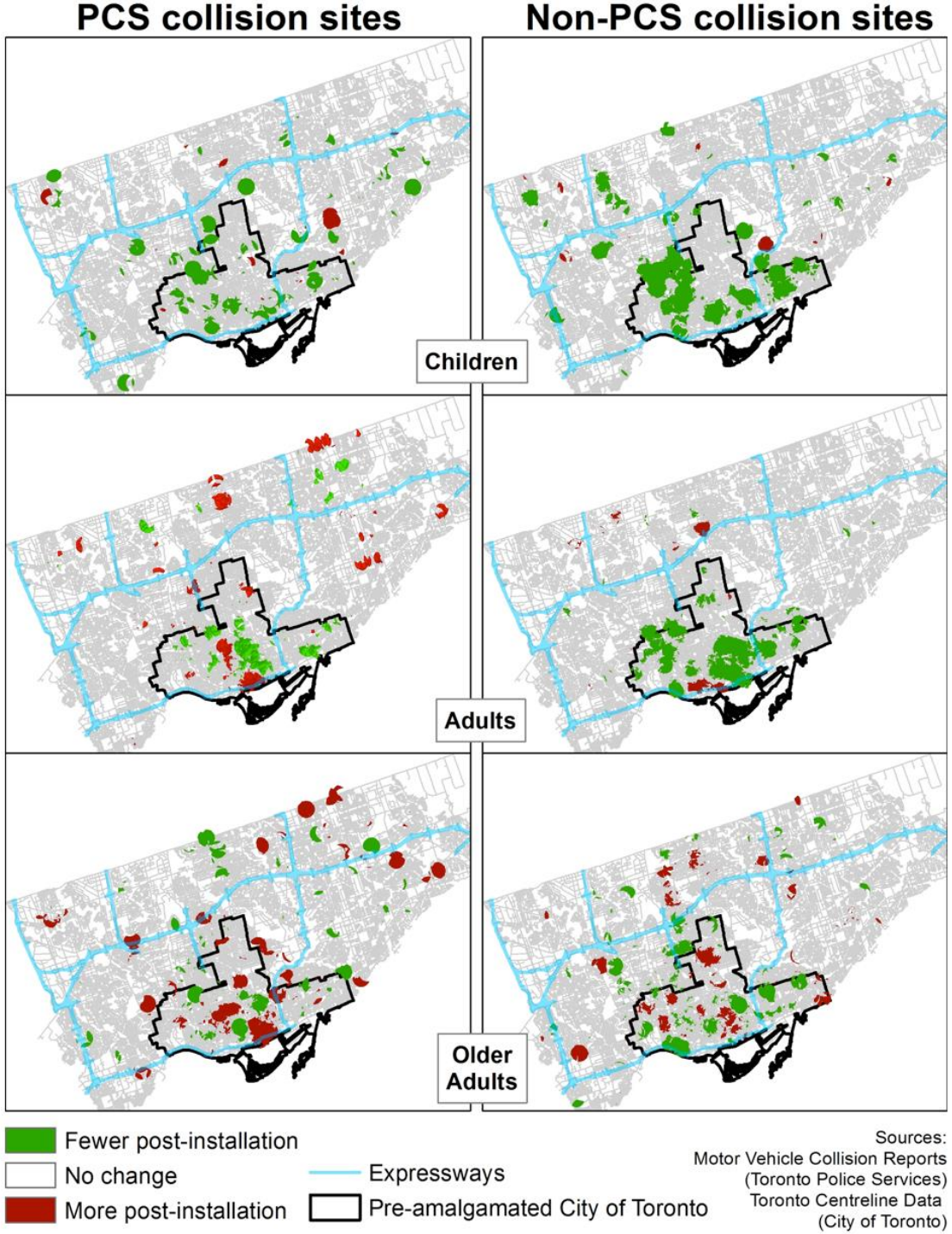
Predictor	IRR*	95% CI**	*p*-value
Approaching	1.290	1.120, 1.486	0.0004
Angle	1.101	1.026, 1.181	0.0073
Rear end	1.076	1.028, 1.125	0.0013
Sideswipe	1.210	1.121, 1.306	<0.0001
Turning	0.970	0.910, 1.035	0.3558
SMV*** unattended	1.136	1.006, 1.283	0.0370
SMV other****	1.000	0.857, 1.167	0.9991
Other	1.537	1.054, 2.242	0.0321

*Incidence rate ratio; **confidence interval; ***single motor vehicle; ****involves a single vehicle striking a fixed object, pedestrian, or animal.

Car – car collisions (of some sorts) increased with PCS installation – driver behaviour changes!

Pedestrian collisions are different in different locations across the city





The effect of PCS on collisions differs by location and by age of pedestrian.

Other studies on countdown timers

- A dozen reports specific to countdown signals
- Most report improvements
- Inconsistency in both design and results
  - Outcomes ‘behaviour’ or ’conflicts’
- Small numbers
- Regression to mean effects usually ignored
- Area wide effects usually ignored

Effects of Red Light Cameras on Violations and Crashes: A Review of the International Literature

RICHARD A. RETTING and SUSAN A. FERGUSON
Insurance Institute for Highway Safety, Arlington, Virginia, USA

A. SHALOM HAKKERT
Transportation Research Institute, Technion City, Haifa, Israel

Red light running is a frequent cause of motor vehicle crashes and injuries. A primary countermeasure for red light running crashes is police traffic enforcement. In recent years, many police agencies have begun using automated red light cameras as a supplement to conventional enforcement methods. The present study reviewed and evaluated available evidence in the international literature regarding the effectiveness of cameras to reduce both red light violations and crashes. Camera enforcement generally reduces violations by an estimated 40–50%. In terms of crash effects, most studies contain methodological flaws that, to varying degrees, either overestimate (failure to adjust for regression to the mean) or underestimate (comparison with nearby signalized intersections affected by cameras) crash effects. Mindful of these limitations, the research generally indicates that camera enforcement can significantly reduce injury crashes at signalized intersections, in particular right-angle injury crashes. Most studies reported increases in rear-end crashes following camera installation. Taken together the studies indicate that, overall, injury crashes, including rear-end collisions, were reduced by 25–30% as a result of camera enforcement.

Keywords Automated Enforcement; Red Light Cameras; Red Light Running Crashes; Right-Angle Crashes; Signalized Intersections

Tap for MORE crossing time, Cross with Greater EASE!

Green Man +

- More locations!
- More crossing time for both senior citizens and pedestrians with disabilities!

轻触阅卡器，越过马路的时间更长，更轻松！

延时绿人

- 扩展到更多的地点！
- 让乐龄人士和行动不便的行人有更多时间越过马路！

Land Transport Authority

We Keep Your World Moving

Planning and evaluation

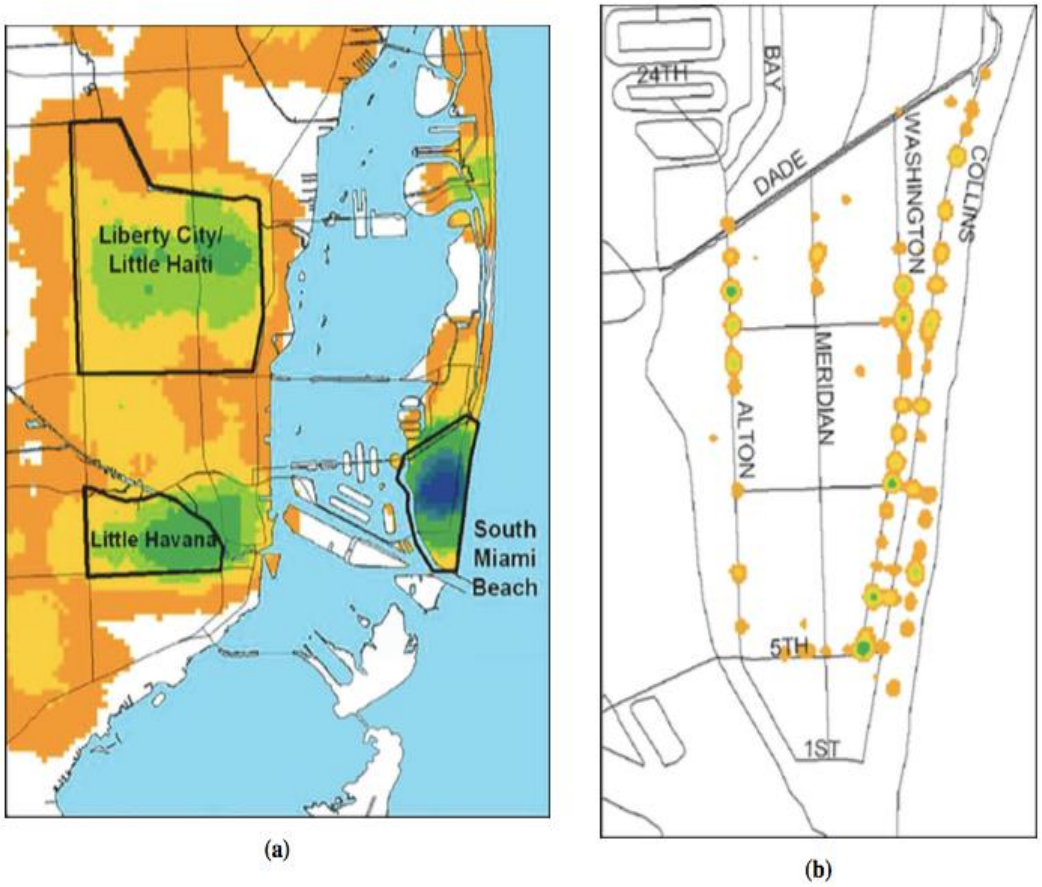


FIGURE 1 Miami–Dade high pedestrian-crash zones: (*a*) crash density map and (*b*) South Miami Beach high pedestrian-crash corridors.

Planning Phase I	$125,000
Implementation Phase II	$1,010,540
Design of countermeasures	$133,933
Installation and deployment labor	$108,833
Materials and equipment	$302,913
Data collection and evaluation	$282,172
Other program management (including planning and design of countermeasures not installed)	$182,690

Interventions: traffic controls

General Countermeasures:

1. Reduced minimum green time at midblock crosswalks controlled by a traffic signal,
2. Advance yield markings at crosswalks with an uncontrolled approach,
3. Recessed or offset stop lines for intersections with traffic signals,
4. Leading pedestrian intervals (LPIs),
5. Pedestrian pushbuttons that confirm having been pressed,
6. “Turning Vehicles Yield to Pedestrians” symbol signs for drivers,
7. Elimination of permissive left turns at a signalized intersection,
8. In-street pedestrians signs,
9. Pedestrian zone signs, and
10. Midblock traffic signal.

ITS countermeasures:

1. ITS video pedestrian detection,
2. Rectangular LED rapid-flash beacons for uncontrolled multilane crosswalks,
3. ITS smart lighting at crosswalks with nighttime crashes,
4. ITS“No Right Turn on Red”(NRTOR)signs,
5. Pedestrian countdown timers,
6. Speedtrailer.

Reduction of Pedestrian Fatalities, Injuries, Conflicts, and Other Surrogate Measures in Miami–Dade, Florida

Results of Large-Scale FHWA Project

Ralph Ellis and Ron Van Houten

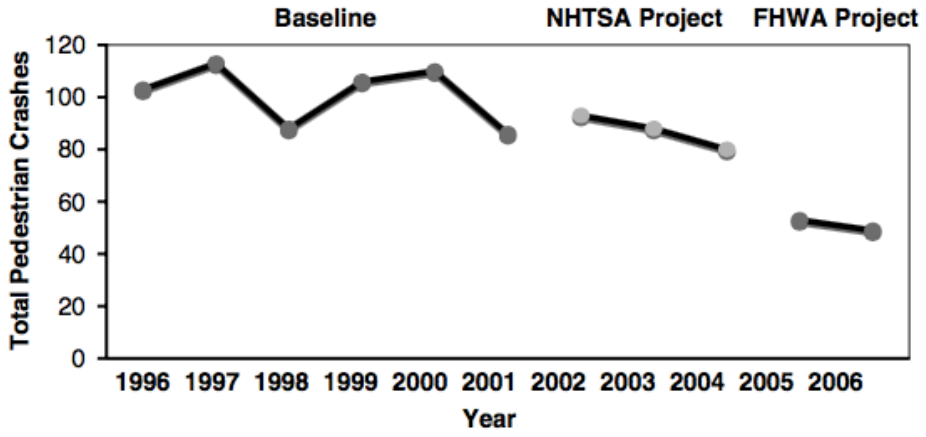


FIGURE 2 Number of crashes per year for all eight high-crash corridors during each condition of experiment.

Overview

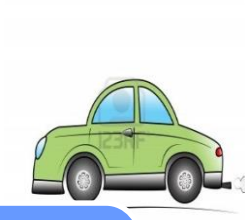
- Pedestrian Injuries don’t have to happen
- Our analysis in Toronto showed more pedestrian injuries with countdown signals
- Still, I believe traffic signals play a role in reducing pedestrian injury risk

Walking to School

Built Environment Design

(BE)

Potential Health Benefits



Potential Risk of Pedestrian- Motor Vehicle Collisions

(PMVCs)

BALANCE

Technology and Pedestrian Injury

- Personal
- Car Based
- Road Infrastructure
- System

Protecting pedestrians

Pedestrian detection detects people walking ahead of your vehicle to help you avoid accidents, and even brakes for you should the situation require it.

Protecting cyclists

If a cyclist swerves in front of your car, our cyclist detection will warn you with a light on your windshield and brake for you if quick action is necessary.

Pedestrian airbag

A safe car should protect those inside and out. That's why the Pedestrian Airbag — a Volvo-first technology — automatically releases to cover the windshield and lessen the impact. (Not available in Canada)

Safety Campaigns >

The Ratings Explained >

Adult Occupant Protection >

Child Occupant Protection >

Pedestrian Protection

Head Impact

Upper Leg Impact

Lower Leg Impact

AEB Pedestrian

Safety Assist >

Quadricycle Ratings Explained

The Rewards Explained >

Glossary

HOW SAFE IS YOUR CAR ?

Select one or more vehicles among the following possibilities.

Make

Model

OR

Class

OR

ALL RESULTS & REWARDS →

Pedestrian Protection

The Pedestrian Protection score is determined from tests to the most important vehicle front-end structures such as the bonnet and windshield, the bonnet leading edge and the bumper.

In these tests, the potential risk at injuries to pedestrian head, pelvis, upper and lower leg are assessed. Cars which perform well can gain additional points if they have an autonomous emergency braking (AEB) system which recognises pedestrians.

Click below to learn more about the tests.

Google Patents

SEARCH TERMS

pedestrian × + Synonym

collision × + Synonym

+ Search term or CPC

SEARCH FIELDS

Before priority YYYY-MM-DD

+ Assignee

MORE

About 67,292 results ordered by relevance grouped by classification 10 results / page

Download (CSV)

B60R21/36?

Protecting non-occupants of a vehicle, e.g. pedestrians using airbags

Pedestrian-vehicle collision detecting apparatus

Grant US7036621B2 • Tetsuya Takafuji • Denso Corporation

Priority 2002-12-03 • Filing 2003-12-02 • Grant 2006-05-02 • Publication 2006-05-02

A **pedestrian collision** detecting apparatus for motor vehicles is provided which works to distinguish between impacts with **pedestrians** and other sorts of impacts using a combination of a **collision** duration for which a sensor continues to ...

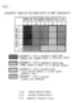
Collision discriminating apparatus for vehicles

Grant US6561301B1 • Katsuhiko Hattori • Kabushiki Kaisha Toyota Chuo Kenkyusho

Priority 1998-02-24 • Filing 1999-02-24 • Grant 2003-05-13 • Publication 2003-05-13

A **collision** discriminating apparatus for vehicles having a **collision** detection device mounted on a part of the vehicle to detect the deformed amount of a **collided** portion deformed by **collision** of a **collision** object against the vehicle, and ...

A collision discriminating apparatus for vehicles using detecting means in the ...



Application EP0937612A2 • Katsuhiko c/o K.K. Toyota Chuo Kenkyusho Hattori • Kabushiki Kaisha Toyota Chuo Kenkyusho

Priority 1998-02-24 • Filing 1999-02-24 • Publication 1999-08-25

A **collision** discriminating apparatus for vehicles having: a **collision** detection device (1) monted on a part of the vehicle to detect the deformed amount of a **collided** portion deformed by **collision** of a **collision** object against the vehicle;

Search within classification B60R21/36 (42,618 results)

G08G1/166?

Anti-collision systems for active traffic, e.g. moving vehicles, pedestrians, bikes

System and method for providing pedestrian alerts

Grant US7095336B2 • Charles E. Rodgers • Optimus Corporation

Priority 2003-09-23 • Filing 2003-09-23 • Grant 2006-08-22 • Publication 2006-08-22

A system and method for generating **pedestrian** alerts are provided. Vehicle operators are provided with alerts regarding potential vehicle-**pedestrian collisions** and other dangers involving **pedestrians**. Additionally, **pedestrians** may be ...

Collision with pedestrian prevention system

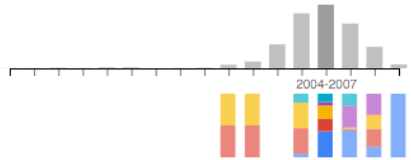
Grant US6337637B1 • Koji Kubota • Public Works Research Institute, Ministry Of Construction

Priority 1999-10-27 • Filing 2000-10-20 • Grant 2002-01-08 • Publication 2002-01-08

The **collision** with **pedestrian** prevention system according to the present invention comprises **pedestrian** detection means, road surface conditions detection means, road information accumulation means, vehicle position detection means, ...

Search within classification G08G1/166 (15,701 results)

Top 1000 results by filing date



Relative count of top 5 values

Assignees Inventors CPCs

- Denso Corporation 6.7%
  B60R21/0136 B60R21/013 B60R21/01 B60R19/483
- トヨタ自動車株式会社 5.7%
  B60R21/36 B60R2019/186 B60R2019/188 B60R19/48
- Toyota Motor Corp 5.6%
  B60R21/36 B60R2019/186 B60R2019/1873 B60R19/48
- Gm Global Technology Operations, Inc. 3.5%
  G01S13/87 G01S13/66 G01S13/723 G01S13/72
- 株式会社デンソー 2.9%
  B60R19/483 B60R19/48 B60R21/0136 B60R19/02

Expand

Reduction of Pedestrian Fatalities, Injuries, Conflicts, and Other Surrogate Measures in Miami–Dade, Florida

Results of Large-Scale FHWA Project

Ralph Ellis and Ron Van Houten

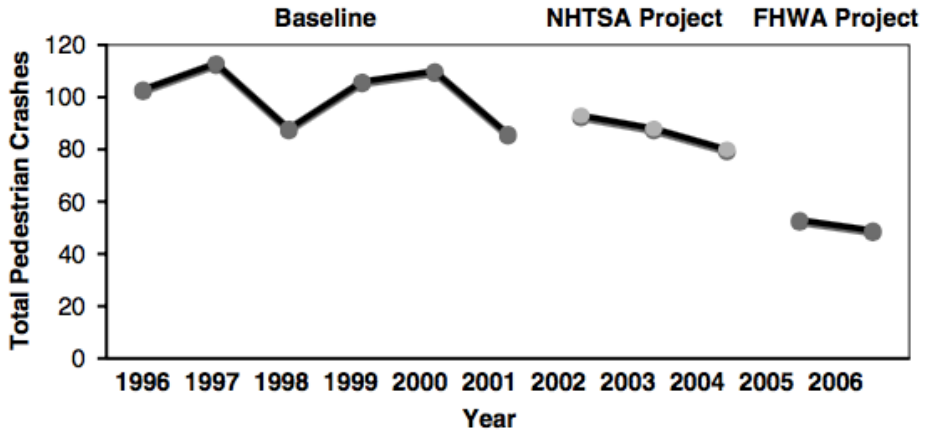


FIGURE 2 Number of crashes per year for all eight high-crash corridors during each condition of experiment.