

Red Light Cameras and Roundabouts: What the Research Shows

Richard Retting

**Presentation to the
Virginia Traffic Safety and Technology Advisory Committee**

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**INSURANCE INSTITUTE
FOR HIGHWAY SAFETY**

Intersections

Major source of crashes and injuries



Virginia crashes

2005

- ◆ 30,000 crashes occurred at traffic signals
- ◆ 13,000 crashes occurred at stop signs

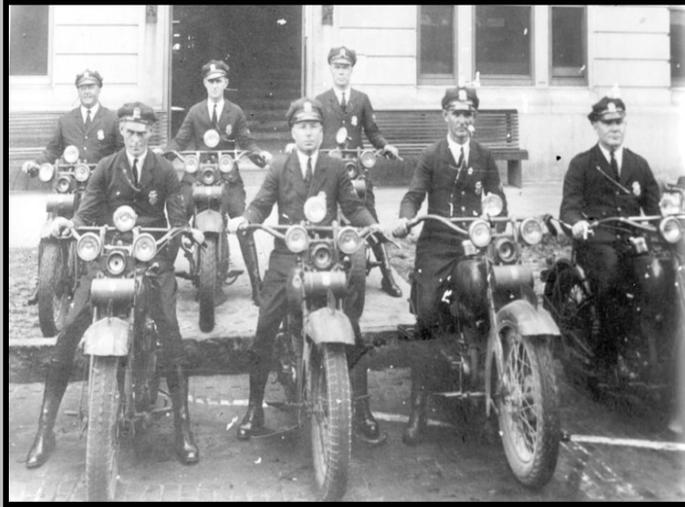
Annual red light running toll

U.S. 2004

- ◆ 196,000 crashes
- ◆ 168,000 injuries
- ◆ 928 deaths



Traditional enforcement approach

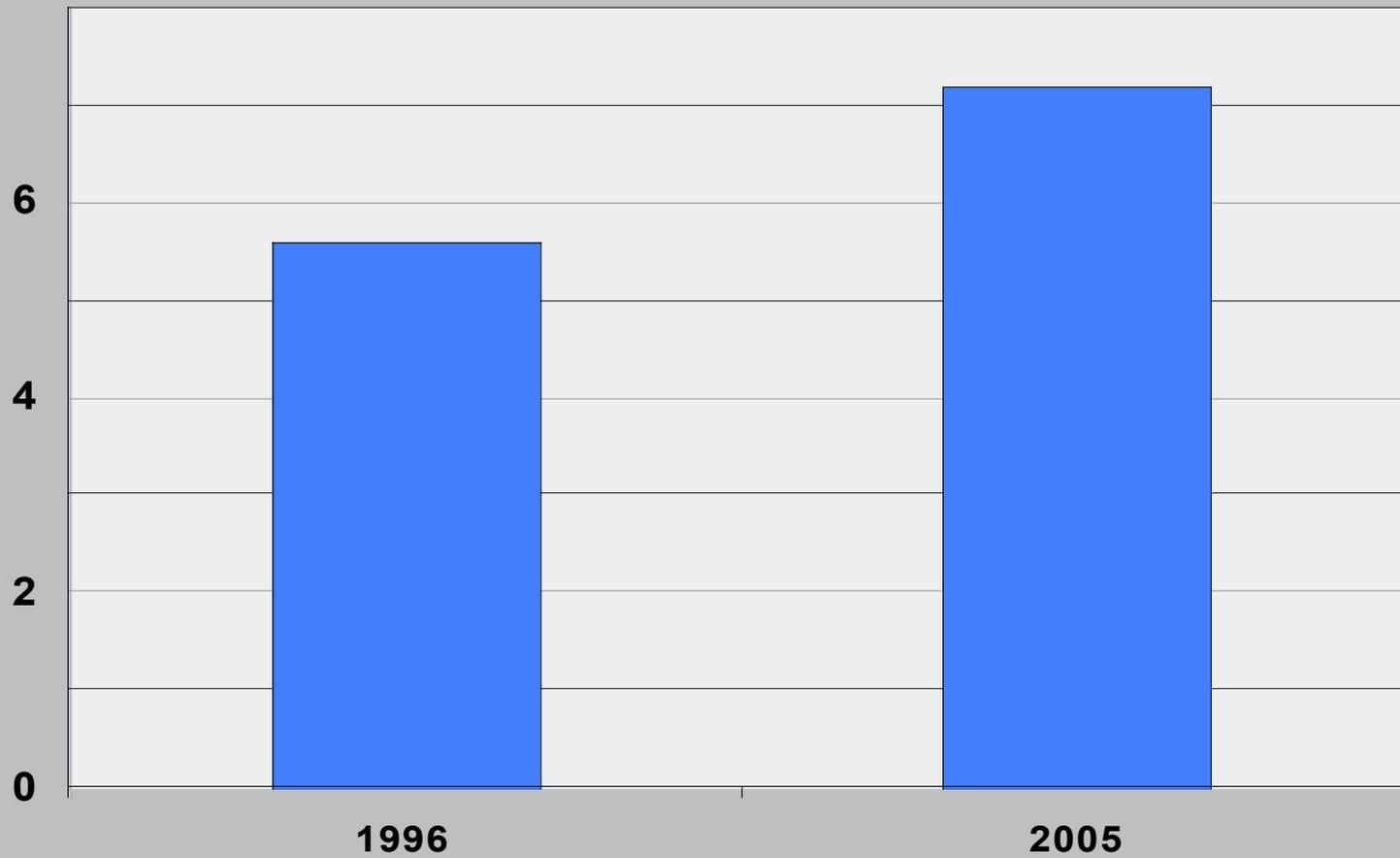


Limitations of conventional enforcement

- ◆ Time consuming
- ◆ Other priorities such as violent crime and homeland security limit resources for traffic enforcement
- ◆ Difficult to observe violations at the worst places and times
- ◆ High-speed pursuit can be dangerous for police and civilians
- ◆ Reductions in violations achieved through conventional enforcement are temporary

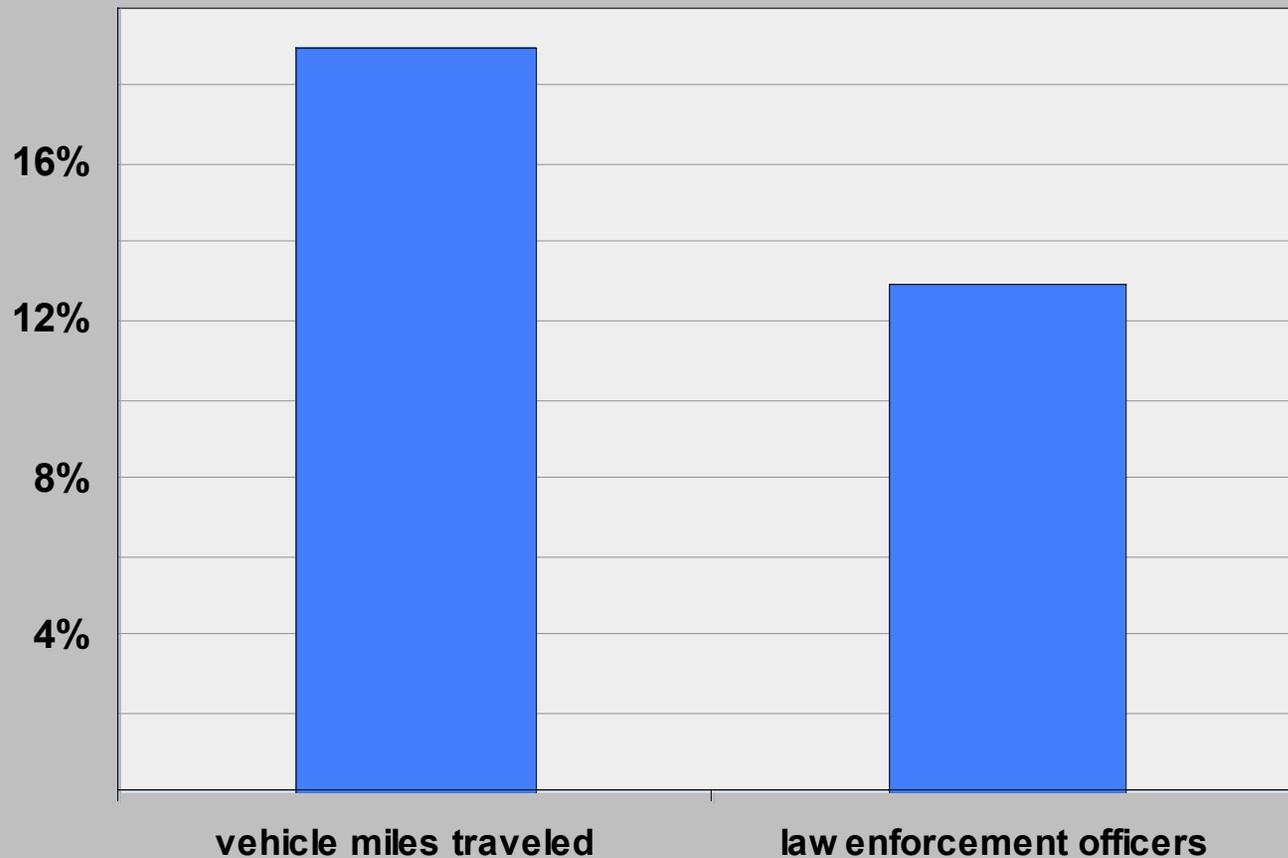
Vehicles registered (millions)

Virginia 1996-2005



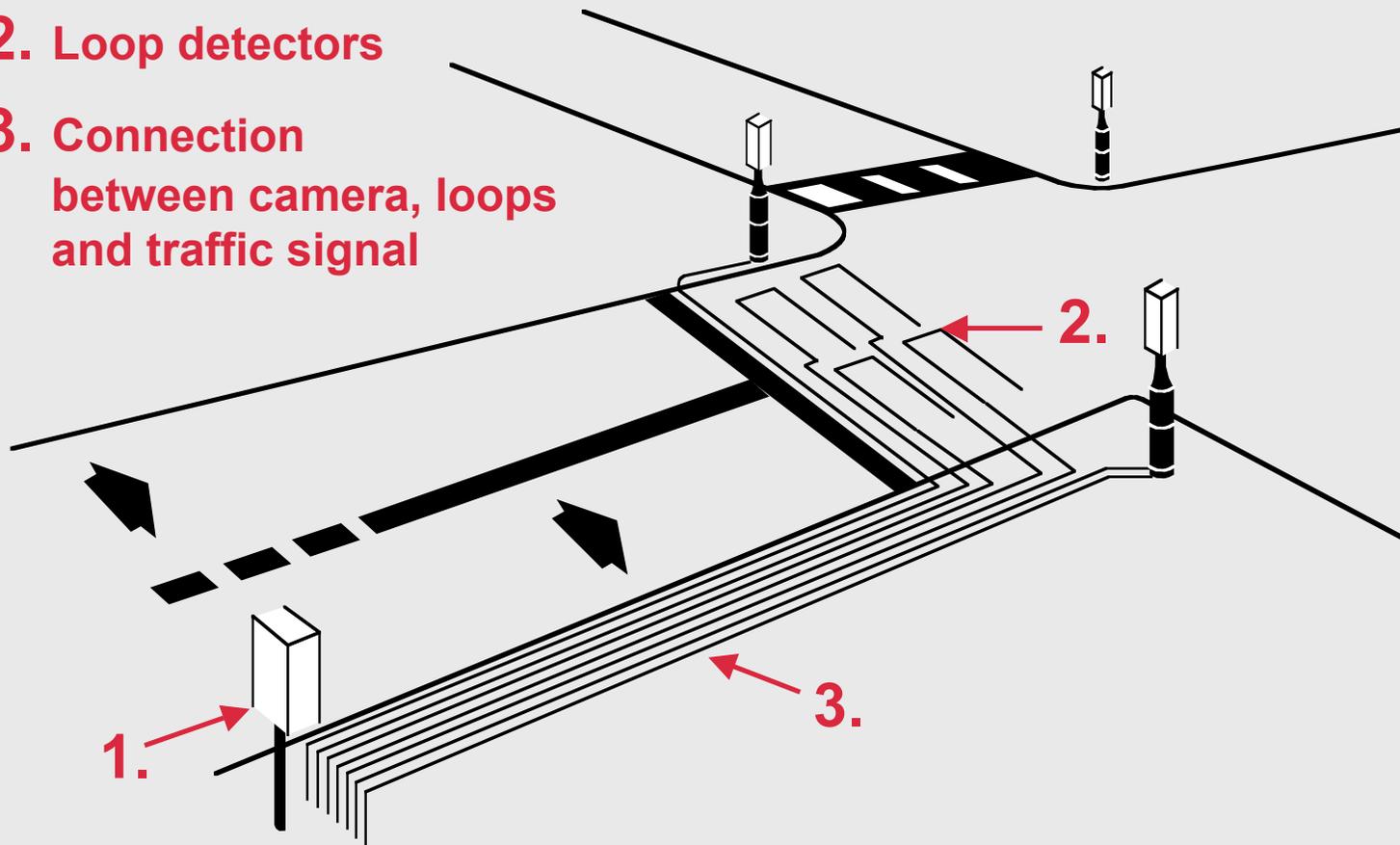
Police resources have not kept pace with vehicle travel

Growth in law enforcement personnel vs. vehicle miles traveled:
U.S. 1995-2003



Red light camera system components

1. Red light camera
2. Loop detectors
3. Connection between camera, loops and traffic signal



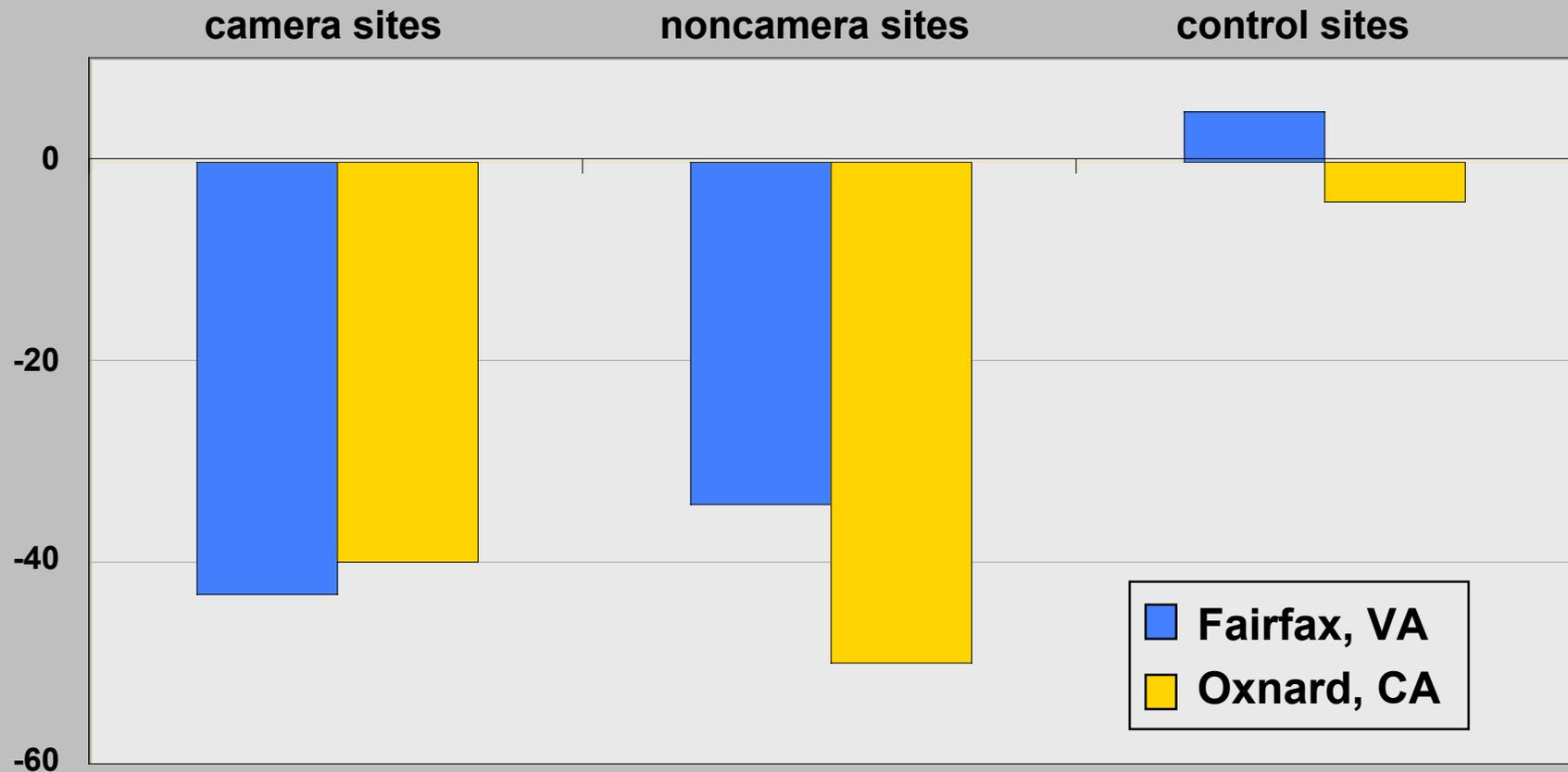


Fairfax City, VA

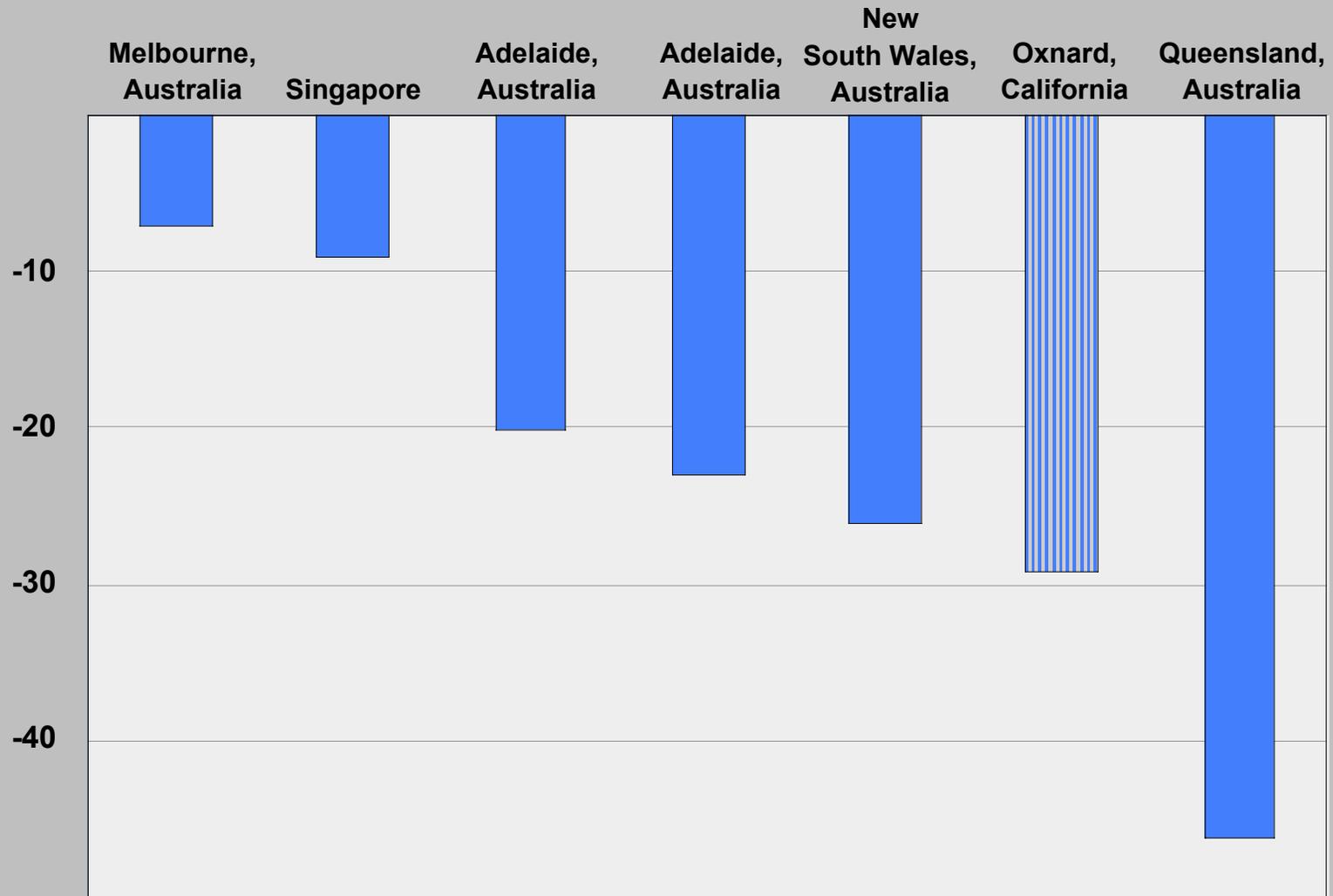


Fairfax City, VA

Percent reduction in red light violations per 10,000 vehicles

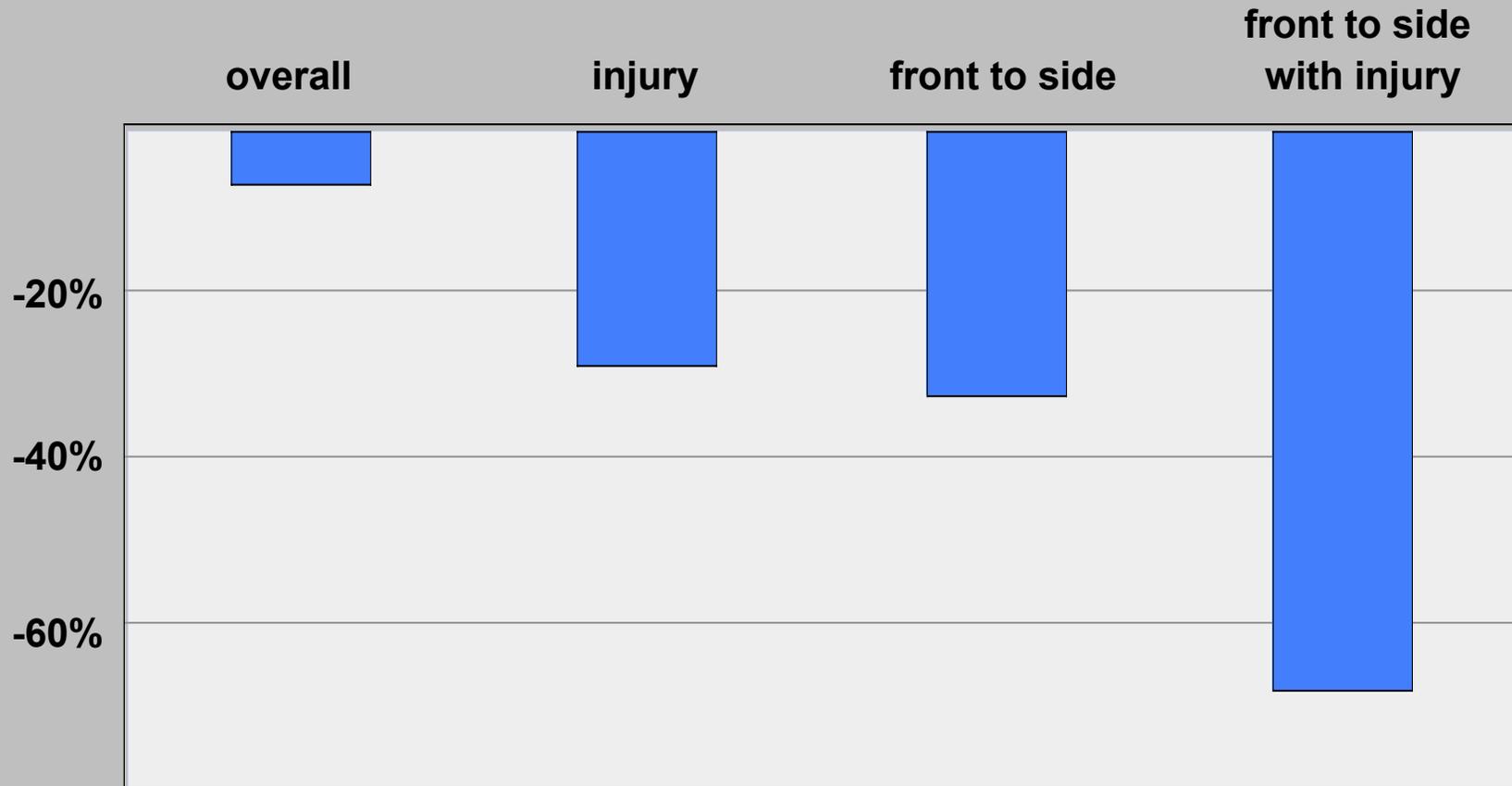


Percent reductions in red light running crashes with injuries



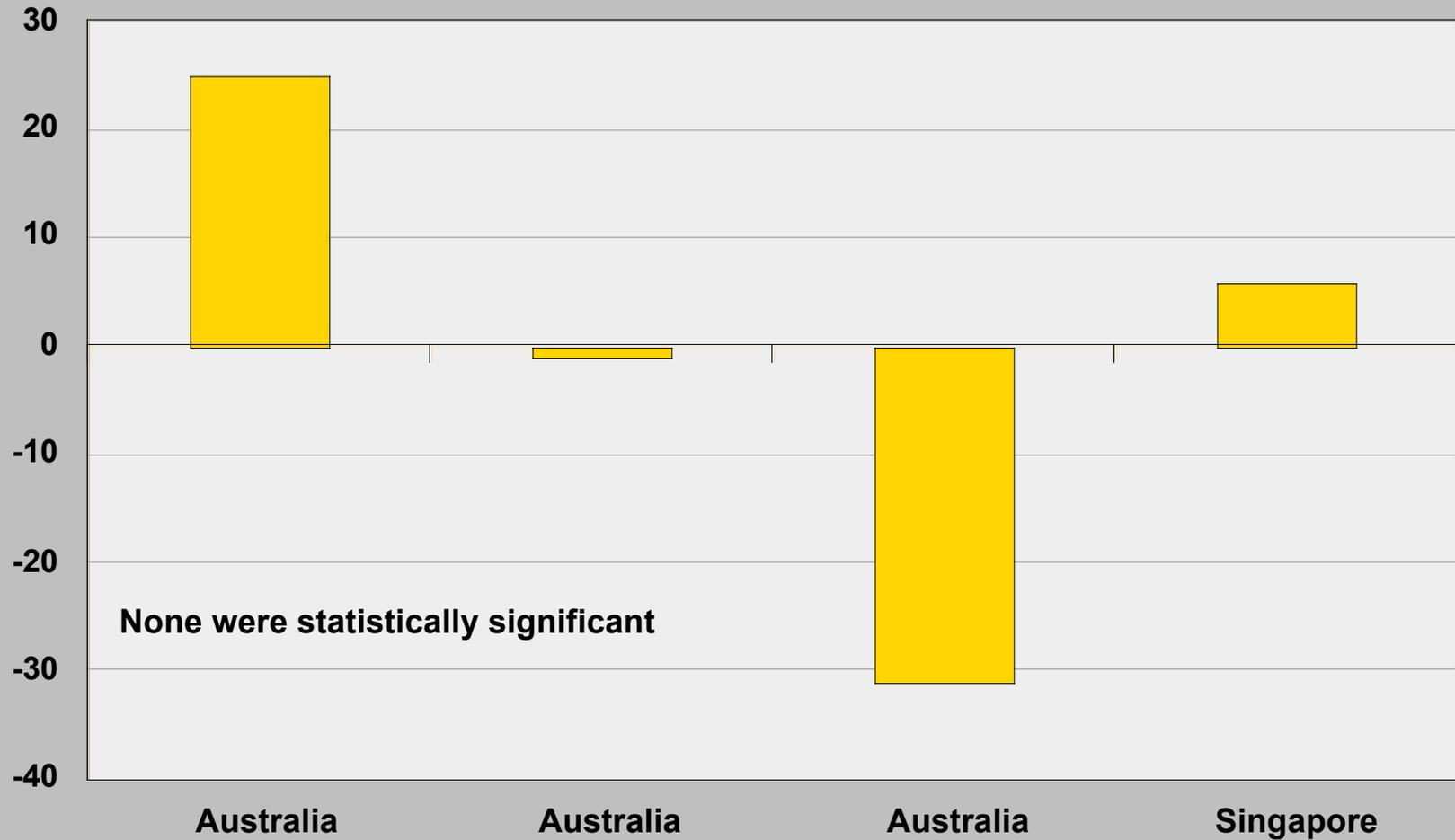
Citywide crash reductions with red light cameras

Oxnard, California



Effects of red light cameras on crashes

Rear-end injury crashes



Cochrane review of red light camera effectiveness

Aeron-Thomas and Hess, 2006

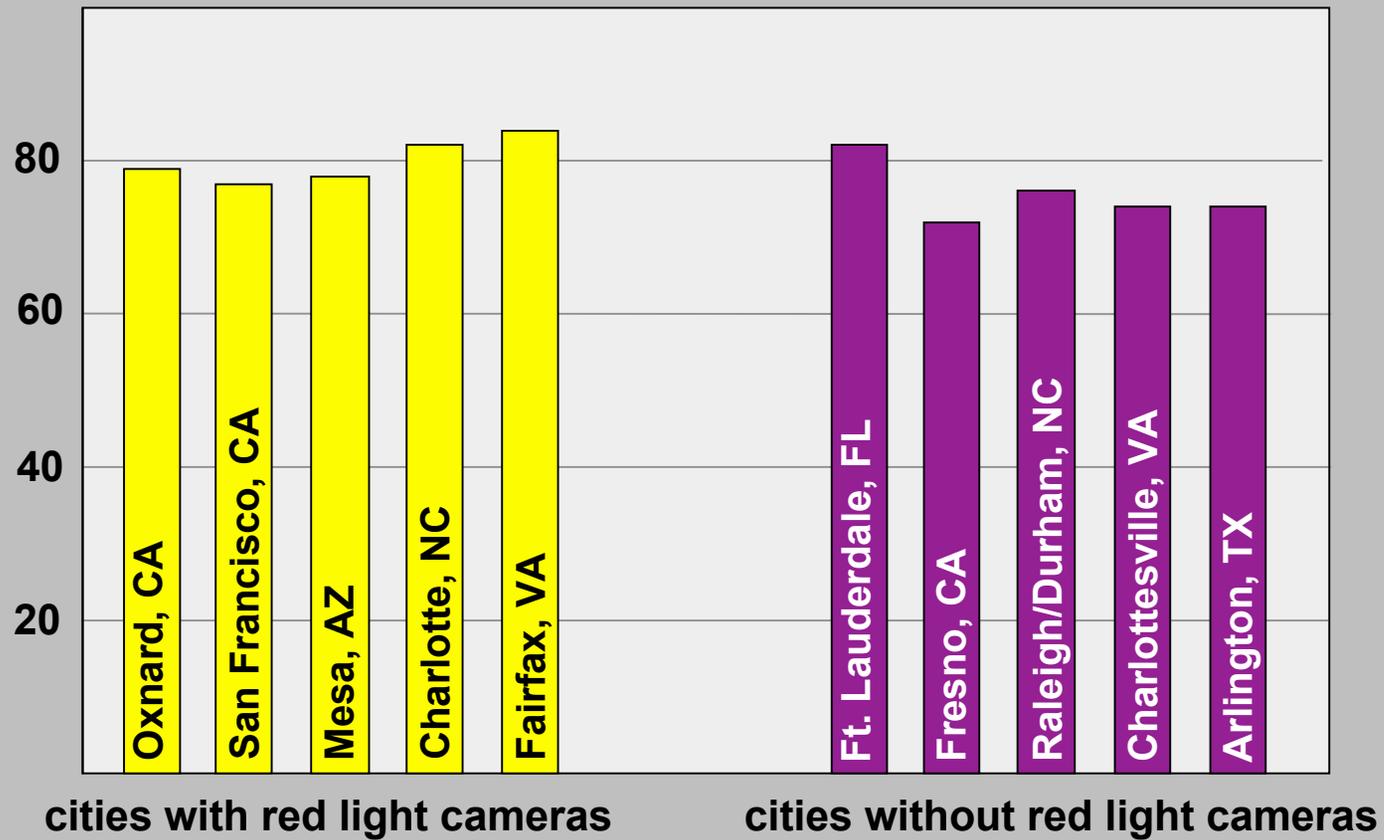
- ◆ Systematic review of studies examining the effectiveness of red light cameras in reducing crashes
- ◆ Five studies in Australia, Singapore, and the US all found the use of red-light cameras cut the number of injury crashes
- ◆ In the best conducted of these studies, the reduction was nearly 30%

Benefits of photo enforcement

- ◆ Enhanced safety through deterrence
- ◆ Reductions in violations and collisions
- ◆ Consistent enforcement without excessive penalty
- ◆ Safer for police officers and bystanders
- ◆ Unbiased enforcement
- ◆ Funded by violators

Percent of drivers who support red light cameras

May 1999



Percent of drivers who favored red light cameras Before and after implementation in Fairfax, Virginia



Many newspapers support automated enforcement

More red-light cameras

RED-LIGHT cameras designed to catch offending motorists obviously are working. About 900 citations have been issued since the first of the 10 cameras were installed in Toledo. More need to be installed. Toledoans' long-documented penchant for running red lights notwithstanding, the prospect of being slammed with a citation is a deterrent.

Insurance Institute for Highway Safety that injury accidents have dropped 10 percent at intersections with red-light cameras in other cities.

Nationwide

David Mazarella
Editor
Karen Jurgensen
Editor of the
Editorial Page
Thomas Curley
President and Publisher

Legislature should allow red-light cameras

The issue: Red light rage
Our view: It can kill you

Legislature should allow red-light cameras

arms, about 800 people are dying each year. To hope there will be no more roadblocks, municipalities in-charge should let municipalities in-charge.

OUR-VIEW

Give red-light cameras a try

The issue: Springfield city leaders are dipping into a discussion some would rather not have: Should the city use cameras to photograph and ticket drivers who blast through red lights? Advocates say that...

...for Va., after they had used cameras for one year. In Oxford, a city about the size of Springfield, red-light violators...

LOS ANGELES TIMES, San Fernando Valley Ed, October 15, 2000

Traffic Cameras Welcomed

After this month, an automatic camera will be installed at the intersection of Sherman Way and Anetka Avenue in the San Fernando Valley when entering a yellow light or turning right red. The photos must clearly show the driver's face and front license plate for a citation to be issued.

HARTFORD COURANT, July 23, 2000, editorial

Put Cameras At Intersections

Running a red light is one of the dumbest things a driver can do. It's also against the law, and it's dangerous. How many Americans still think that?

New York and the other five New England states with 1.6 deaths per 100,000 residents. Eight states have responded to red-light with laws allowing the installation of cameras.

SAN ANTONIO EXPRESS-NEWS, July 17, 2000, editorial

Red light toll unacceptable

Stopping at red lights is such an elementary rule that it should not require mentioning after driver's education class. But Americans are dying at an alarming rate at red-light intersections.

■ Hundreds of Americans are killed each year in accidents involving running red lights.

Use high tech to nab traffic violators, make roads safer

Today's debate: PHOTO RADAR

A TODAY hopes to use as a forum for better understanding and unity to help make the USA truly one nation.

—Allen H. Neuharth
Founder, Sept. 15, 1982

USA TODAY

Published by Gannett

Portland OREGONIAN, July 20, 1998

Put stop to red-light runners

Portland and other cities should press for change in state law to permit the use of red-light cameras at some intersections

For Maureen Kennedy, every busy intersection, every car rocketing through a red light, is a painful reminder of her son, Aaron. Oregon lawmakers rejected a bill in 1997 that would have allowed the mental use of red-light cameras before either city can experiment with the cameras. State law now requires that officers be present to witness a violation, unless an accident is involved.

Portland OREGONIAN, July 20, 1998

Jurisdictions with red light cameras, Sept. 2006

Arizona

Avondale
Chandler
Mesa
Paradise Valley
Phoenix
Scottsdale
Tempe

California

Bakersfield
Baldwin Park
Beverly Hills
Capitola
Cerritos
Compton
Costa Mesa
Culver City
Davis
Del Mar
El Cajon
Encinitas
Escondido
Fremont
Fresno
Fullerton
Garden Grove
Gardena
Hawthorne
Indian Wells
Inglewood
Lancaster
Loma Linda
Long Beach
Los Angeles City
Los Angeles County
Millbrae
Modesto
Montclair
Montebello
Murrieta
Oceanside
Oxnard

Pasadena
Poway
Rancho Cucamonga
Redwood City
Riverside
Sacramento City
Sacramento County
San Bernardino
San Diego
San Francisco
San Juan Capistrano
San Mateo
Santa Ana
Santa Clarita
Santa Fe Springs
Solana Beach
South Gate
Stockton
Union City
Upland
Ventura
Vista
West Hollywood
Whittier
Yuba City
Colorado
Aurora
Boulder
Denver
Fort Collins
Greenwood Village
Northglenn
Delaware
Dover
Elsmere
Newark
Seaford
Wilmington
District of Columbia
Georgia
Alpharetta
Atlanta

Brunswick
Decatur
Duluth
Fulton County
Georgetown
Griffin
Gwinnet County
Lilburn
Marietta
Rome
Roseville
Savannah
Snellville
Suwanee
Thomasville
Illinois
Chicago
Iowa
Clive
Council Bluffs
Davenport
Maryland
Anne Arundel County
Annapolis
Baltimore City
Baltimore County
Bel Air
Bladensburg
Bowie
Charles County
Cheverly
College Park
Cottage City
Forest Heights
Frederick
Greenbelt
Howard County
Hyattsville
Laurel
Landover Hills
Montgomery County
Morningside

Prince Georges County
Riverdale Park
Rockville
Minnesota
Minneapolis
Missouri
Arnold
Florissant
New Mexico
Albuquerque
New York
New York City
North Carolina
Cary
Charlotte
Fayetteville
Greenville
Indian Trail
Marshville
Monroe
Raleigh
Rocky Mount
Wilmington
Ohio
Cleveland
Dayton
Middletown
Northwood
Springfield
Toledo
Trotwood
Oregon
Beaverton
Medford
Portland
Pennsylvania
Philadelphia
Rhode Island
Providence
South Dakota
Sioux Falls

Tennessee
Gallatin
Germantown
Jackson
Knoxville
Red bank
Texas
Denton
Duncanville
Frisco
Garland
Grand Prairie
Houston
Plano
Richardson
Rowlett
Washington
Auburn
Bonnie Lake
Lakewood
Seattle

Negative stories have recently appeared

USA TODAY, June 20, 2001, editorial

Camera tricks

No wonder communities are rushing to install cameras that catch people running red lights. Not only do the cameras provide a low-cost, common-sense way to reduce some of the nation's 1,000 deaths from red-light violations, their men- ence slashes red-light running in half. The cameras are widely

Red-Light Camera Causes Confusion
When similar-
Police have stopped issuing fines for the city's most active red-light camera. The camera, which monitors a non-conventional traffic light, has generated about 20,000 tickets in the last six months. At intersections with red lights (preferably with "inill approaches").
is no mystery. Not only does in every

Lawmakers Predict Demise of Red-Light Traffic Cameras

by BRIAN TROMPETER
Staff Writer

Photo-red light cameras were supposed to be the scourge of bad drivers. But since their implementation five years ago, the remote-controlled video or film cameras have not produced profits and have drawn fire from privacy advocates.



system and Falls Church may adopt such cameras soon. All the systems give drivers a grace period, snapping photos only after the light

Ottens disputed some critics' views that the cameras primarily raise money for cash-strapped jurisdictions.

"We're
"We've y
The C
August

department and extends the opposing traffic's red light if sensors detect an imminent violation.

Vienna officials made several other light running. The

WASHINGTON POST, May 19, 2000

Seeing Red Over 'Gotcha' Camera

Motorists Now Spared Fines For Running Light on H St.

By ARTHUR SANTANA
Washington Post Staff Writer

At one point, it generated \$10,000 a day in fines, snapping pictures of dozens of drivers who were caught in the act. But now it turns out that the most active camera in the District's war against red-light runners—billing \$1.5 million in just over six months—is a high-tech trap for motorists.

Perched on the H Street bridge in Northeast Washington, just off the busy North Capitol Street corridor, the camera set up by Lockheed Martin IMS patrols an

cided to inst... about 100 feet east of the... to address...
WASHINGTON TIMES, August 22, 2001, editorial

Automated ticket factories
Lockheed Martin's for-profit enforcement of traffic regulations was dealt a small but hopeful setback last week when a San Francisco camera doesn't lie.orney Arthur Tait clients have gone to at least in California.
drawing attention to

Photos called privacy threat

Alvord
TODAY

to traffic school, but I didn't because I believe the camera is wrong. There's something in the mechanism that triggers something that's incorrect."

Tait became the guru of red-light camera law after he helped represent a San Diego man who had the money to mount a legal defense against a ticket last year. Publicity from winning that case brought in hundreds of referrals, he says. He and Cusack then ran an ad in a local free newspaper offering classes on how to defend citations. Some students became clients.

All of the clients are fighting the tickets with similar legal arguments, in-

WASHINGTON POST, May 18, 1999

AAA Questions Traffic Camera Contract in D.C.

By MICHAEL H. COTTMAN
Washington Post Staff Writer

The Automobile Association of Ameri-

for AAA, said the District's arrangement with Lockheed is the only ticket-for-commission contract in the area, although other jurisdictions have contracts with Lockheed for detection cameras.

He said that AAA strongly supports using red-light camera technology to deter motorists from running red lights but that the District's current contract with Lockheed Martin "taints the system."

USA TODAY, July 6, 2001

Motorists race to court to challenge red-light cameras

Photos called privacy threat

Alvord
TODAY

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Common arguments against red light cameras

- ◆ Invades privacy
- ◆ Violates constitutional rights
- ◆ Revenue
- ◆ Crashes increase
- ◆ Yellow timing

Constitutional challenges have failed in court

Due process

- ◆ Not all drivers photographed receive tickets; owner is presumed to be driver; statutes do not state where warning signs should be placed; delay in receiving ticket too long

Equal protection

- ◆ Some violators of the same offense pay a higher fine and receive points while others do not

Fourth amendment (search/seizure)

- ◆ Photographing a vehicle amounts to seizure

Privacy issues

- ◆ Driving is a regulated activity on public roads
- ◆ No expectation of privacy in motor vehicle
- ◆ No right to keep license plate private – required to be in plain view for a reason
- ◆ Courts have ruled that privacy concerns are outweighed by legitimate concerns of public safety

Privacy issues

- ◆ Surveillance cameras are widely used in public places such as airports, transit terminals, freeways, schools, and government buildings, for safety purposes
- ◆ These applications observe each person simply passing by, whereas traffic enforcement cameras are limited to violators

- ◆ Privacy and constitutional arguments against photo enforcement generally have been ineffective
- ◆ Opponents are now focusing on claims that
 - red light cameras increase (rather than decrease) crashes
 - city traffic engineers are reducing yellow signal timing
 - red light cameras raise too much revenue



Crash effects: Council, Persaud, et al., 2005

FHWA-funded research project

- ◆ Analyzed crash-effects of red light cameras in 7 cities
- ◆ Estimated a 25% decrease in right-angle crashes and a 15% increase in rear-end crashes
- ◆ Applied economic values to crash effects:
“The results show a positive aggregate economic benefit of more than \$14 million over approx 370 site years, which translates into a crash reduction benefit of approx \$38,000 per site year”

Crash effects: San Diego Photo Enforcement System Review, 2000

- ◆ Photo enforcement resulted in significant reductions in red light violations and significant reductions in red light running crashes
- ◆ While some initial increases in rear-end crashes were found, the rate of rear-end crashes dropped over time
- ◆ For intersections where cameras were in place for three years, the rate of rear-end collisions returned to pre-enforcement levels

Yellow timing: San Diego Photo Enforcement System Review, 2002

- ◆ The actual yellow change intervals at 17 of the photo-enforced intersections were equal to or higher than yellow times calculated using the City's guidelines
- ◆ Yellow timings were lower than the guidelines at two locations:
 - 4.5 actual versus 4.7 seconds per guidelines
 - 3.7 actual versus 4.2 seconds per guidelines

Revenue

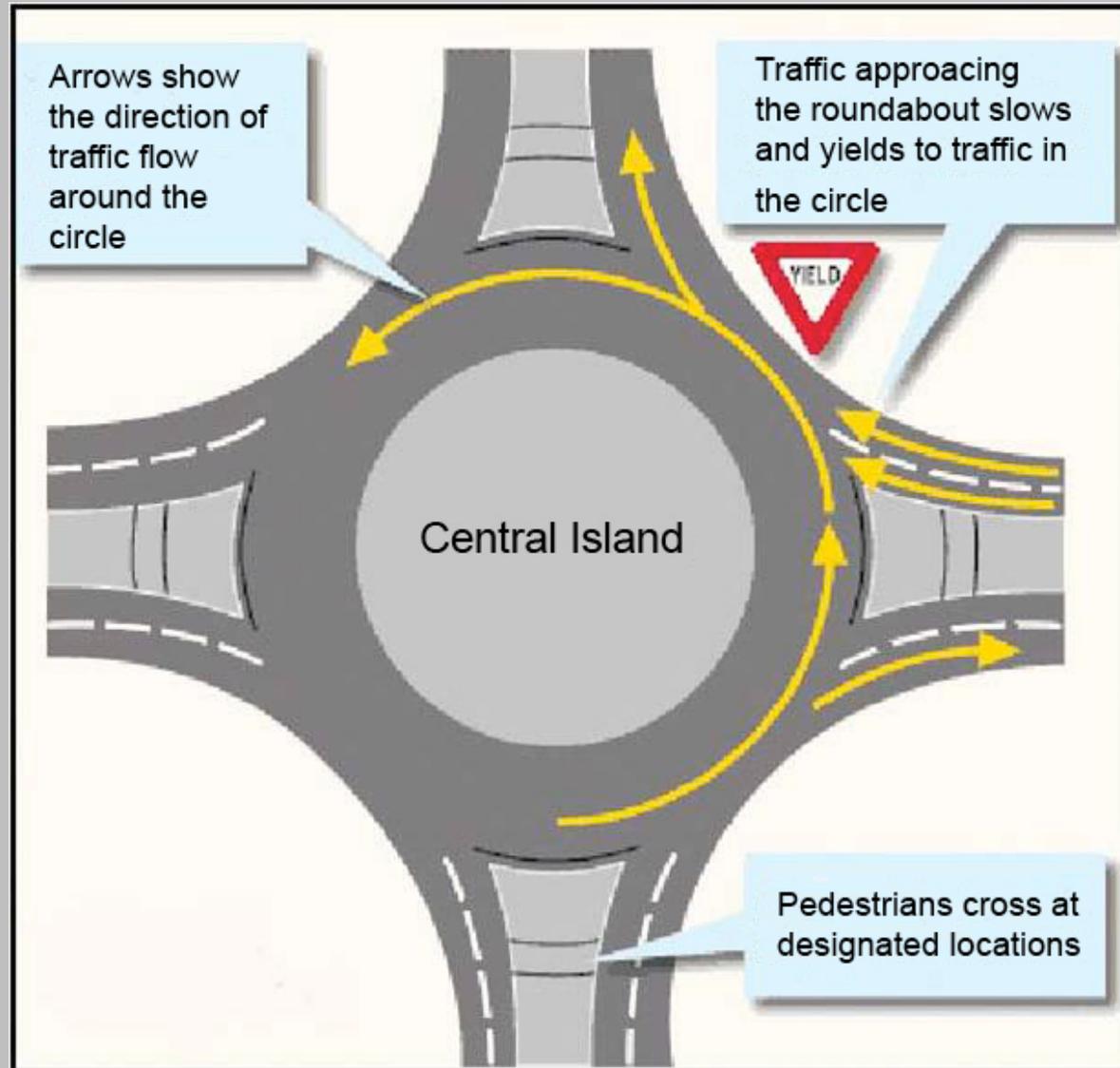
- ◆ California State Auditor, 2002
 - Local governments generally make little or no profit from red light camera programs

- ◆ US Government Accounting Office, 2003
 - Of 5 jurisdictions examined, 2 reported that revenues from photo enforcement programs were greater than program costs; 3 reported revenues less than program costs



Roundabouts

Roundabouts are circular intersections with design features that eliminate the need for stop signs or traffic signals



Rural



Suburban



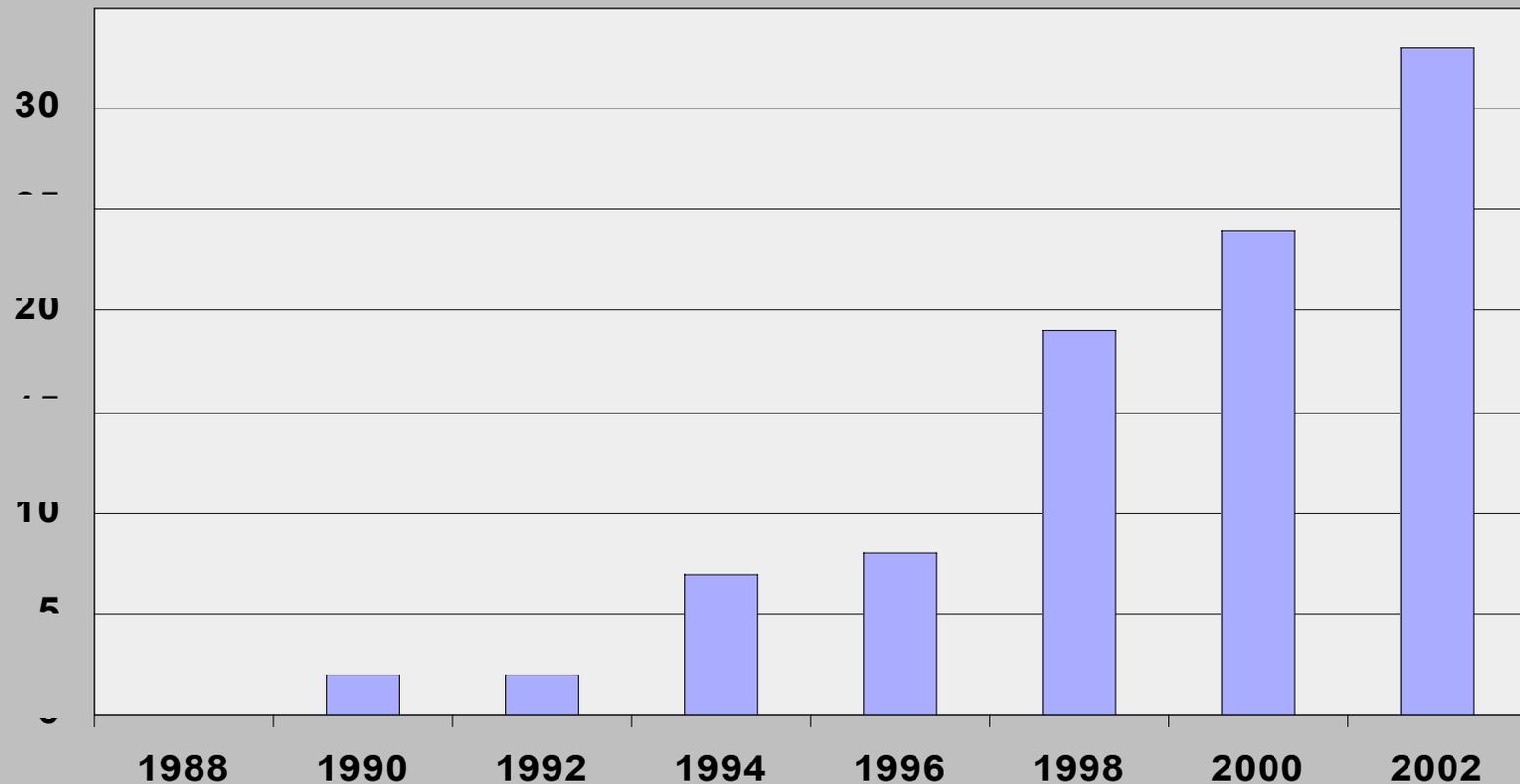
Urban



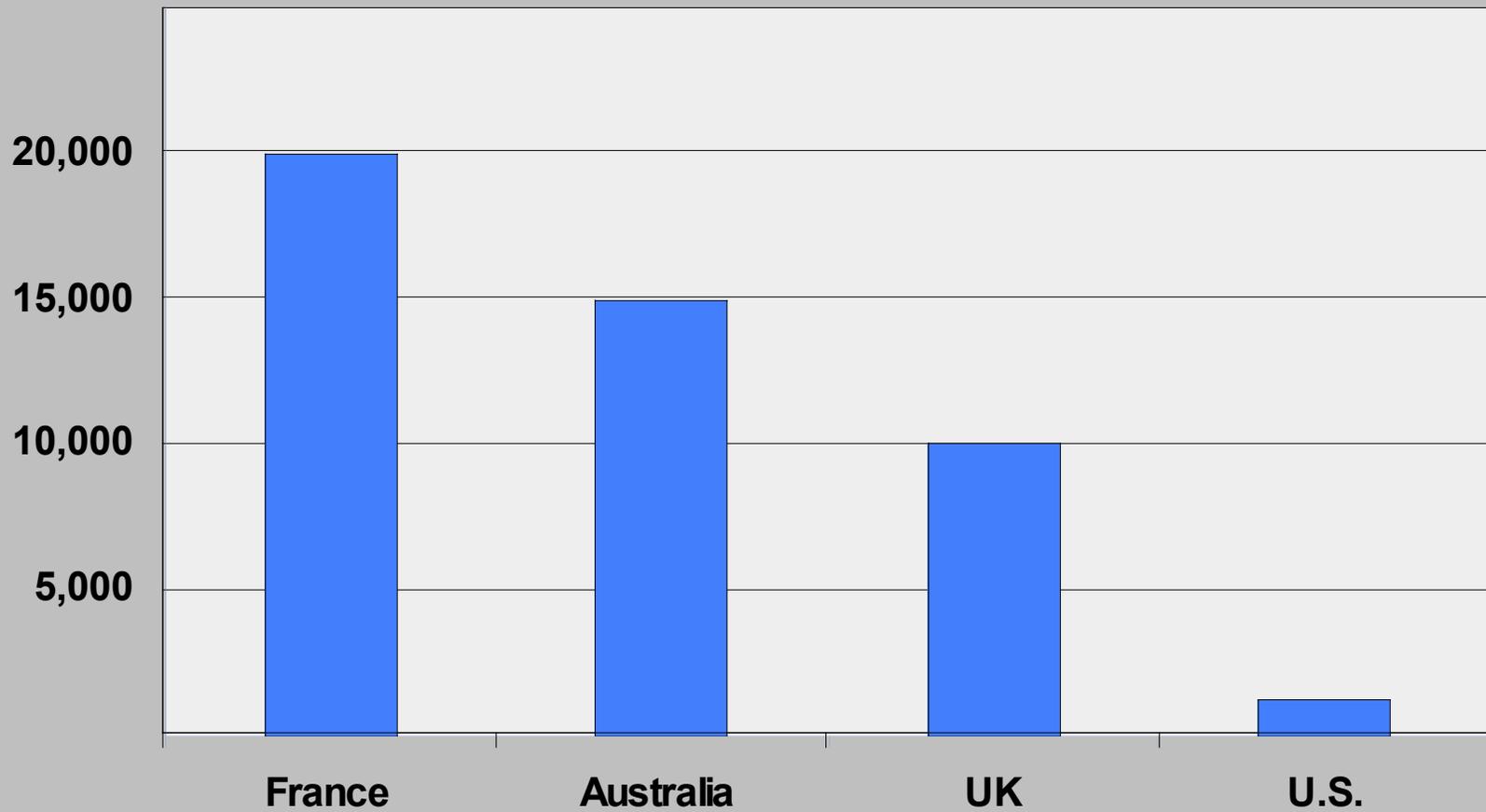
Roundabouts require fewer traffic lanes than traditional intersections to accommodate the same amount of traffic



Number of roundabouts constructed by transportation departments in 9 states CA, CO, FL, KS, MD, NV, NY, OR, WA



Estimated number of roundabouts



Impediments to construction of roundabouts

- ◆ Relatively new in the United States, so there has been some reluctance to apply them
- ◆ Questions about relevance of international research and design practices to U.S. experience
- ◆ Opposition among some local residents and public officials

Purposes of IHS roundabout research

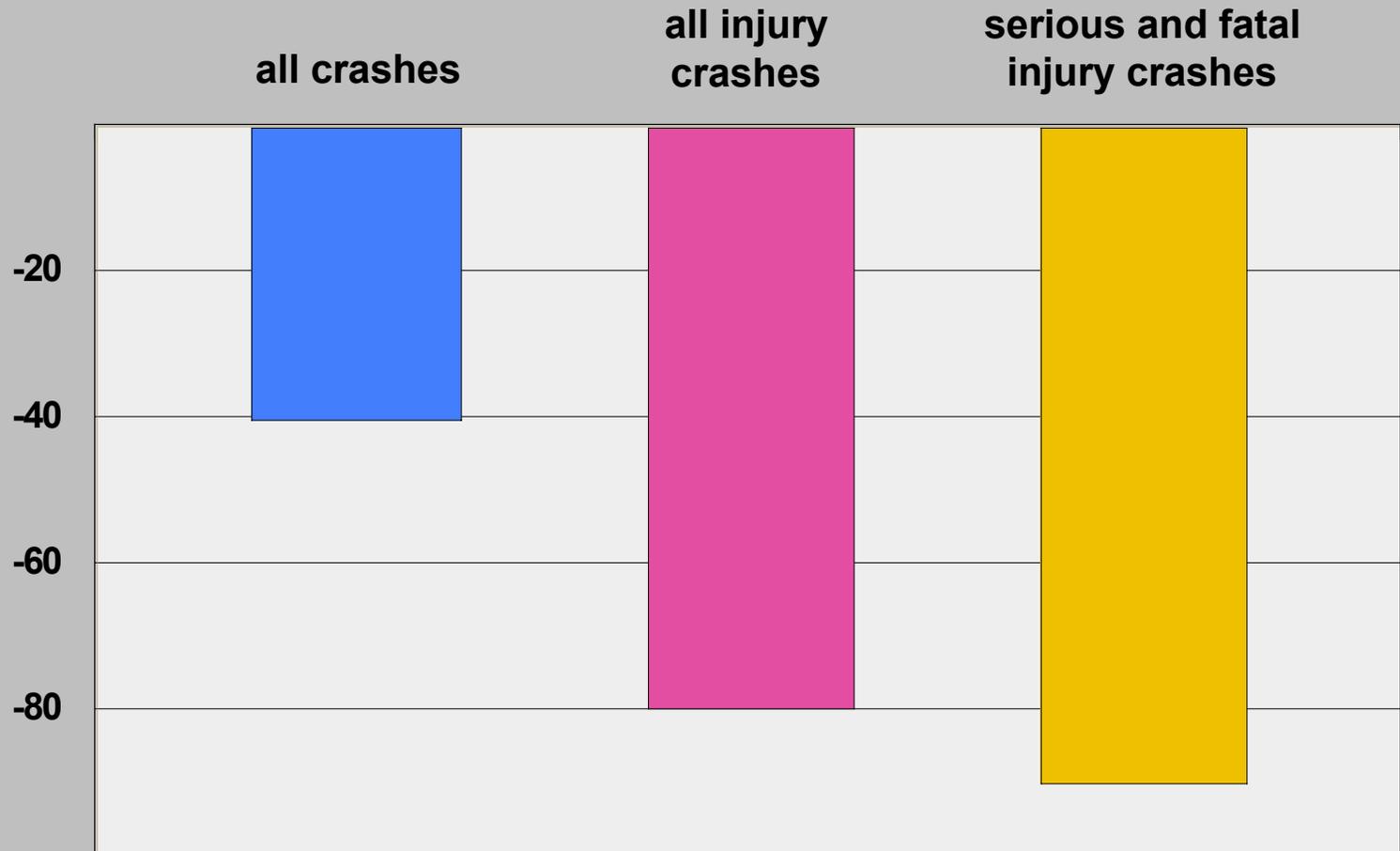
- ◆ Estimate crash reductions associated with roundabouts compared to stop signs and traffic signals
- ◆ Evaluate impact of roundabout conversions on traffic flow and public opinion

Safety evaluation

- ◆ 23 intersections converted to roundabouts between 1992 and 1997
- ◆ 14 were single lane; 9 were multi-lane
- ◆ Study sites located in 8 states: CA, CO, FL, KS, ME, MD, SC, and VT
- ◆ The empirical Bayes approach was employed to account for regression to the mean while normalizing the differences in traffic volume between the before and after periods

Percent reductions in crashes associated with roundabouts at 23 U.S. intersections

2001



Evaluation of public opinion and traffic flow

2004

- ◆ 3 intersections converted to roundabouts from traffic signals and stop signs
- ◆ Study sites in New Hampshire, New York, and Washington
- ◆ Roundabouts completed in 2004

Public opinion surveys

- ◆ Surveys conducted in each community approximately 6 weeks before, 6 weeks after, and 1 year after construction
- ◆ Random digit dialing methods used to survey 300 drivers per city and time period



***Intersection with
stop sign converted to
roundabout
Nashua, NH***





*Intersection with
traffic signal converted
to roundabout
Greenwich, NY*

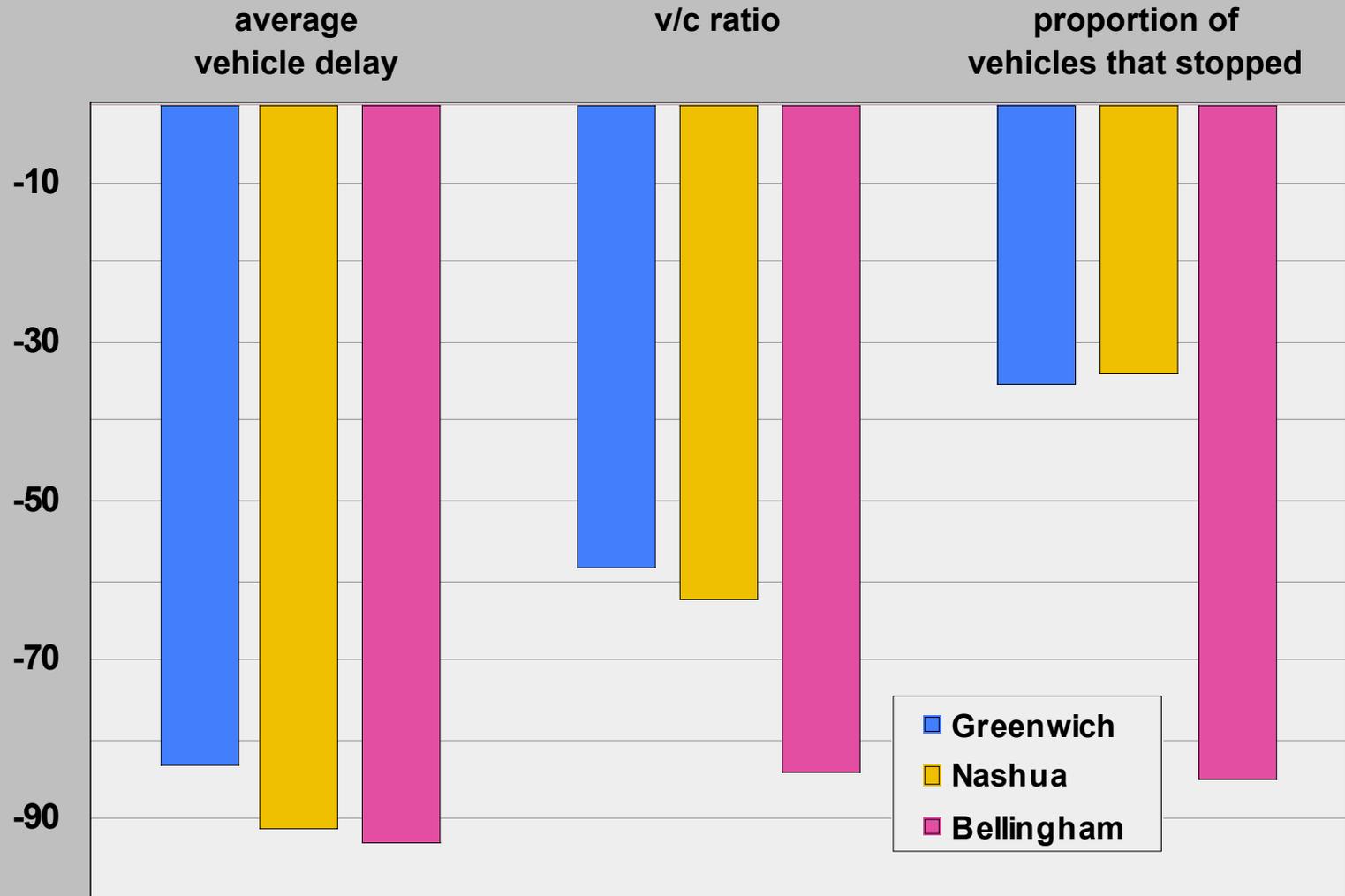




*Intersection with
4-way stop sign
converted to roundabout
Bellingham, WA*

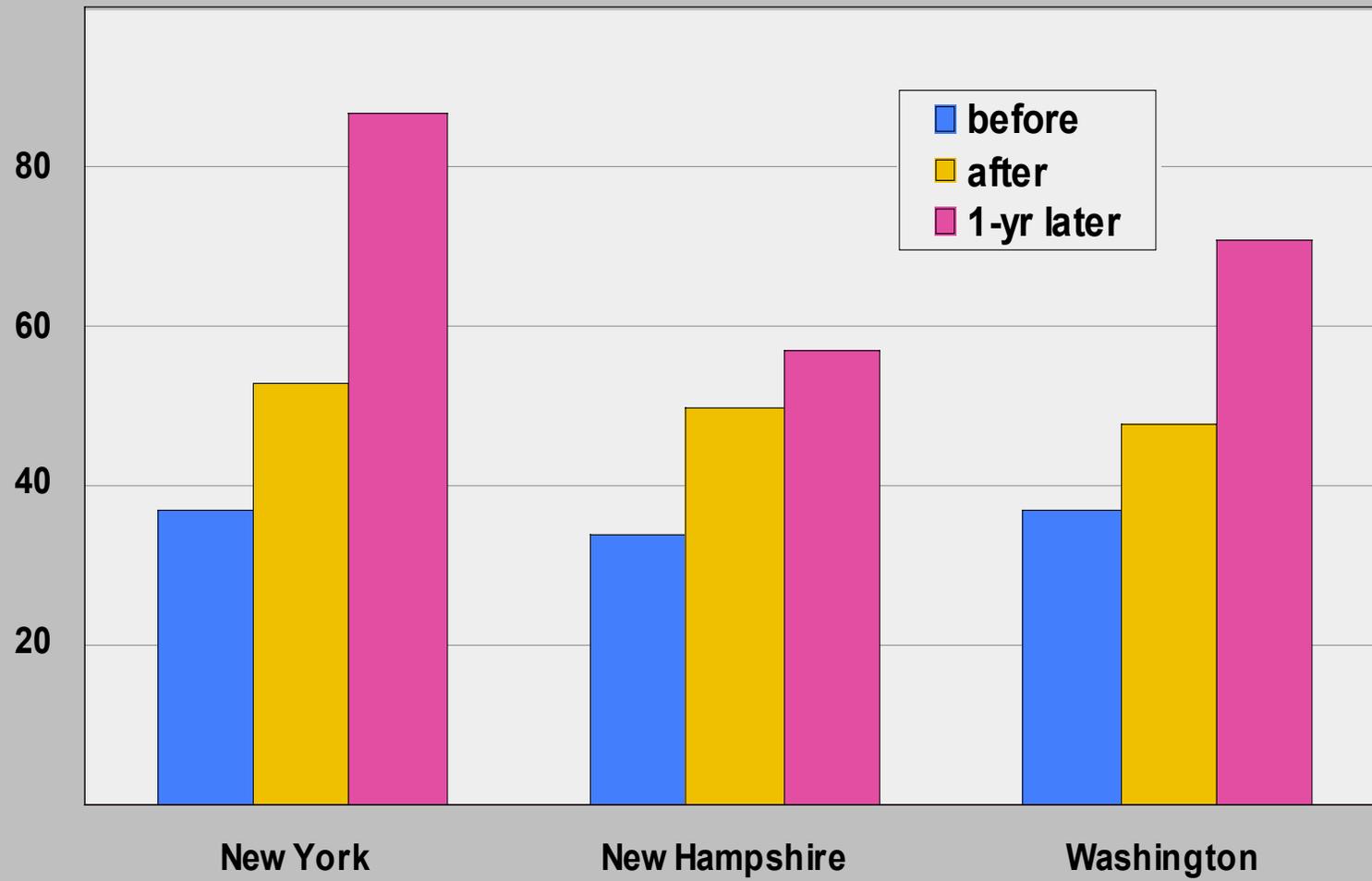


Percent reductions in delay

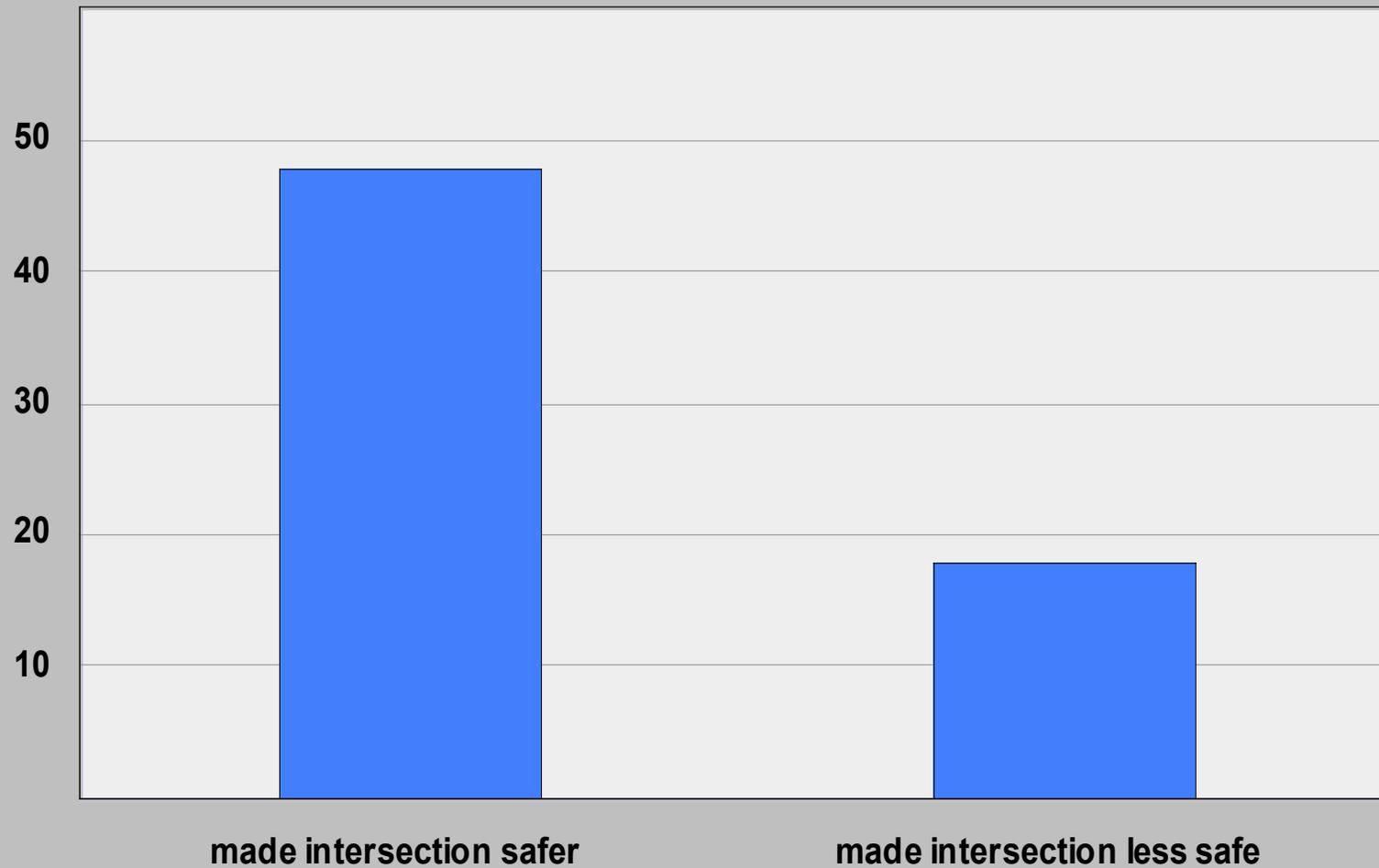


Percent of residents who favor roundabouts

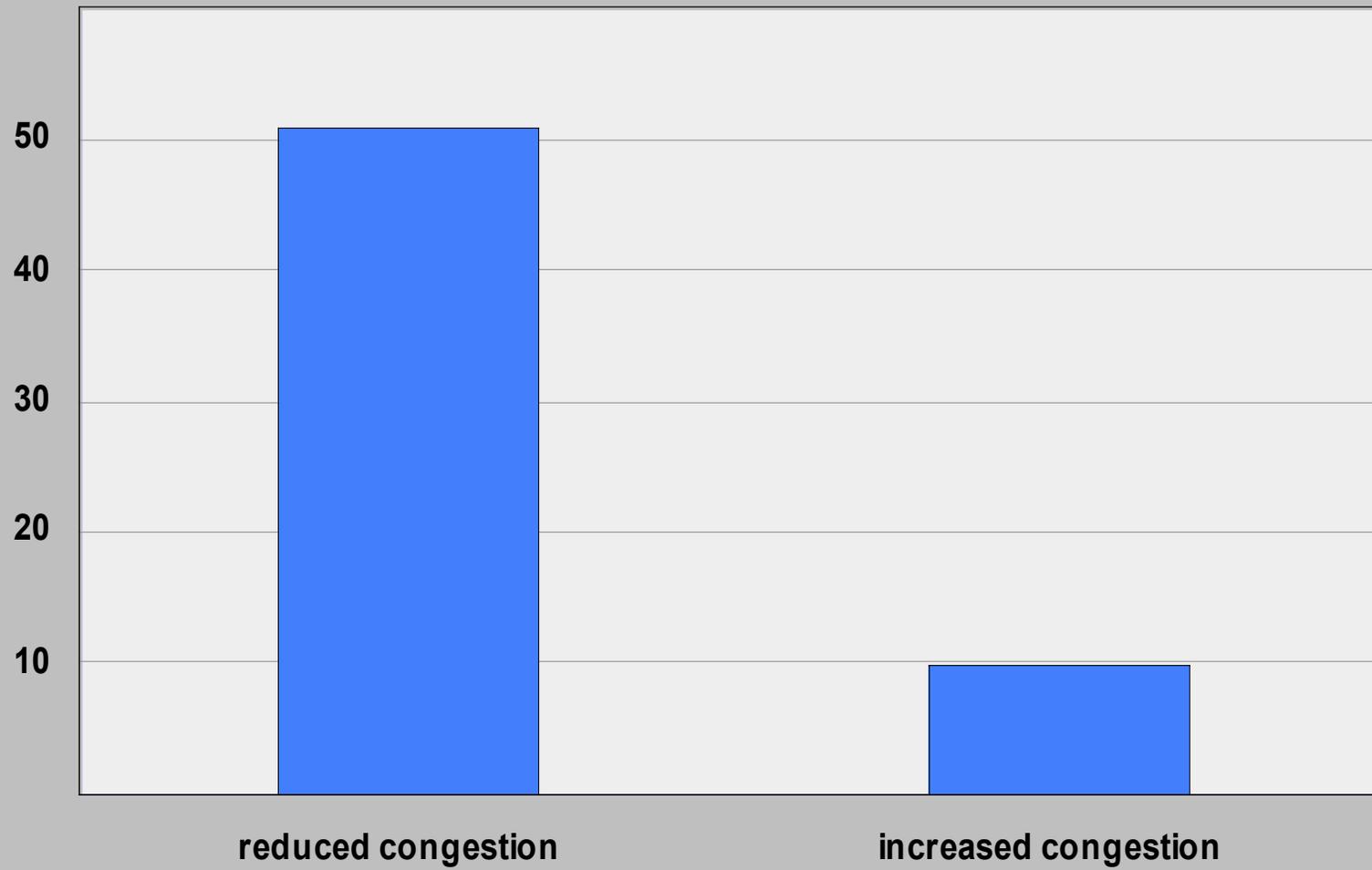
Before and after installation



What impact do you think the roundabout has had on safety?



What impact do you think the roundabout has had on traffic congestion?



IIHS study of missed opportunities to improve traffic flow and safety

- ◆ Identified 10 intersections in Northern Virginia where
 - new traffic signals were installed within past 5 years or
 - intersections with traffic signals were substantially modified by widening or other changes
- ◆ Designed hypothetical roundabouts for these locations
- ◆ Used standard traffic engineering models to conduct comparative analyses of intersection performance

Recently modified intersection

Route 123 at Lee Chapel Road in Fairfax Station, Virginia



New traffic signal

Roberts Road at New Guinea Road in Burke, Virginia



Expected effects of roundabouts on traffic flow compared with signal lights

Northern Virginia

- ◆ Average 62% to 74% reduction in vehicle delays
- ◆ Vehicle delays reduced by about 325,000 hours annually
- ◆ Fuel consumption and emissions reduced by about 235,000 gallons annually

Expected effects of roundabouts on crashes and injuries compared with signal lights

Northern Virginia

- ◆ Could have prevented an estimated 62 crashes, including 41 injury crashes, between 1999 and 2003 at 5 intersections
- ◆ Estimates based on N.Y. Department of Transportation study (2004) that found 37% fewer crashes and 75% fewer injury crashes from conversion to roundabouts

Benefits of modern roundabouts

- ◆ Traffic flow: reduce delay, decrease fuel consumption and air pollution
- ◆ Safety: significantly reduce injury crashes
- ◆ Maintenance: eliminate maintenance and electricity costs associated with traffic signals (approximately \$3,000 per year)
- ◆ Aesthetics: central island provides opportunity for landscaping

Advantages for pedestrians

- ◆ Traffic speeds within roundabouts are very low – typically 15-20 MPH
- ◆ Refuge islands provide for short crossing distances
- ◆ Roundabouts are simple intersections, which eliminate left-turns, right-turns, and associated conflicts common at conventional intersections



**How can we accelerate construction
of roundabouts?**

Land development

Critical opportunity to construct roundabouts



Advantages of constructing roundabouts as part of land development



- ◆ Developer pays construction cost
- ◆ Cost of roundabout is less than traffic signal
- ◆ Landscaping opportunities
- ◆ Avoids expense and controversy of conversion to roundabouts later, after conventional intersections have been built

Roundabout constructed as part of land development

Nokesville, Virginia



Roundabout constructed as part of land development

Reno, Nevada



For more information:

www.iihs.org

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