PS COMMITTEE #2
March 5, 2018

MEMORANDUM

March 1, 2018

TO: Public Safety Committee

FROM: Susan J. Farag, Legislative Analyst

SUBJECT: **Update: Automated Traffic Enforcement Initiatives (Red light, Speed, and School Bus Cameras)**

Today the Public Safety Committee will receive an update on the Police Department's Automated Traffic Enforcement Unit (ATEU), including red light, speed, and school bus cameras.

Those expected to brief the Joint Committee include:

Assistant Chief Darryl McSwain, Montgomery County Police Department (MCPD), Field Services Bureau
Captain Tom Didone, Traffic Division, MCPD
Richard Hetherington, Manager ATEU, MCPD
Rich Harris, Office of Management and Budget

Background

MCPD has several automated traffic enforcement programs, including the Safe Speed Program, the Red Light Enforcement Program, and its newest initiative, the School Bus Camera Program.

The Red Light Enforcement Program has been in effect since 1997. The County implemented its Safe Speed Program in May 2007. In 2012, the Council passed legislation that enabled the County to implement a school bus safety camera program. The fines for each are:

Type of Citation	ATEU (Camera) Issued		Police Officer Issued	
	Fine	Points	Fine	Points
Red Light Camera	$75	0	$140	2
Speed Camera	$40	0	$90*	2*
School Bus Camera	$250	0	$570	3

*Fines and points vary by speed. Drivers may be fined $90 and receive 2 points for exceeding the speed limit by 10-19mph.

Red Light Camera Program

The County currently has red light cameras in 51 locations. In Fiscal 2016, 56,108 citations were issued, resulting in a net revenue to the County of $2,343,496. In FY17, this increased to 68,056 citations and a net revenue of $2,235,588 (data at ©3).

The County's Red Light and Speed Camera services are provided by one vendor. The contract calls for turnkey services where the vendor supplies and maintains the equipment. The vendor has no input into placement of cameras. The Police Department determines placement and all policy related to the program. It also reviews all citations before issuing them to drivers.

The current contract ends in November 2018 and the County is in the process of submitting an RFP to the Department of Procurement to do a formal solicitation. For the red light camera component, the vendor receives $29.34 for each $75.00 citation.

County revenues are used to support the program's administration as well as pedestrian safety initiatives.

Speed Camera Program

The County currently has 38 fixed pole speed cameras, 34 portable cameras, and five mobile van cameras. There are 318 approved speed camera locations throughout the County. In FY16, 415,935 citations were issued, and the County received a net revenue of $8,594,259. In FY17, the County issued 509,542 citations and received a net revenue of $8,823,170 (data at ©3).

County revenues for this program are also used to support the program's administration, as well as pedestrian safety initiatives.

School Bus Camera Program

The Council passed enabling legislation in 2012 to allow the County to implement a school bus safety camera program. These cameras are attached to buses, and can photograph and videotape vehicles that pass a stopped school bus with its red lights flashing and stop sign/arm extended. The original fine for a violation had been $125. As of July 1, 2017, the fine has been increased to $250. In FY16, 25 buses had cameras, from which 2,873 citations were issued. The County netted $104,125 from the program. During FY17, 217 buses had cameras and 17,235 citations were issued. The County netted no revenues from citations due to a contractual change as discussed below.

This contract differs from the red light and speed camera structure. The current contract began on July 2016 with a five-year term, and five additional one-year options to renew. The terms of the contract require the vendor to equip all Montgomery County Public Schools (MCPS) buses with camera, and ticket revenue will be paid to the vendor until they recover their initial investment of approximately $15-$18 million. There are 1,287 buses in the County. To date, 500 of those buses have been equipped with cameras. The contract requires all buses to be equipped by June 30, 2019.

Local Safety Data

MCPD advises that a recent evaluation of the data shows that intersections with red-light enforcement average 11% fewer crashes than before the cameras were installed. The main goal of the program is to change driver behavior, and have them comply with speed limits and red lights. MCPD indicates that it has noticed faster compliance with cameras installed at new locations. Fatalities throughout the County are also decreasing.

In 2015, the Insurance Institute for Highway Safety (IIHS) conducted a study (press release attached at ©4-6) of the County's speed camera program. It had originally reviewed the County's speed program during 2007, the first year the speed camera was operational. In that initial review, it found that the number of drivers traveling at least 10 miles over the speed limit had fallen on streets where cameras had been installed.

Following up in 2015, IIHS found that cameras have reduced the likelihood of speeding by 59%, compared with similar roads in two nearby Virginia counties that do not have speed cameras. The study also found that the camera program resulted in a 19% reduction in the likelihood that a crash would involve a fatality or significant injury.

National Safety Data and Policy

It is well-accepted that speeding is a major contributor to both the number and the severity of vehicle crashes and injuries. The National Transportation Safety Board (NTSB) conducted a safety study in 2017 that identifies ways to reduce speed-related crashes involving passenger vehicles (attached at © 7-13). Among its findings was that "automated speed enforcement is an effective countermeasure to reduce speeding-related crashes, fatalities, and injuries."

The use of red light cameras has resulted in a net positive safety effect, although most studies show that while right-angle crashes are decreased significantly, there are much more modest decreases and even some increases in rear-end crashes. Several recent studies have also looked at the cost benefit of camera enforcement. Even with increased rear-end crashes, the net cost of accidents decreases when camera enforcement systems are used. (see study abstracts attached at ©14-23).

Public Requests for Speed or Red Light Camera Installation

Residents can request traffic enforcement cameras in a variety of ways. They can either e-mail or call the Traffic Division, or contact their local district station. The station will in turn forward the request to the Traffic Division for evaluation. The ATEU evaluates the location for suitability for a camera and makes a determination. The person who requested the camera installation is then notified regarding the outcome of the request.

Discussion Issues

1) Are there a sufficient number of ATEU cameras in the County? Are there plans for more? Are there plans to remove any?
2) Is the vendor installing bus cameras in a timely manner? Is it on track to finish by 2019?
3) What is the impact of automated enforcement on pedestrian safety?
4) What is the impact of automated enforcement on law enforcement safety?
5) What is the most recent school bus camera data for the current school year to date?

This packet contains

F:\Farag\Packets\Public Safety\ATEU Update 2018.docx

1. Calendar 2016 and 2017 Speed camera data including number of cameras, camera locations, number of citations, and revenues. Broken down by year so we can compare.

2. Calendar 2016 and 2017 Red Light camera data including number of cameras, camera locations, number of citations, and revenues. Broken down by year so we can compare.

3. Calendar 2016 and 2017 School Bus camera data including number of cameras, number of citations, and revenues. Broken down by year so we can compare.

   See attached for citation, camera, location, and revenue data for the speed camera, red light camera, and school bus camera programs.

4. An overview of each vendor contract (term, ending date, options to renew, fee structure).

   Our Speed and Red-light services are combined and held in one contract. That contract is set to expire at the end of November 2018. We currently are submitting the RFP document to Procurement to be put out to bid. We are requesting a 5-year contract with 5 1-year options. The current pricing structure for the speed program is that we pay a fixed fee, per month, per camera of $7,565. For red-light enforcement, the vendor receives $29.34 for each $75.00 citation.

   Both the speed and red-light programs are essentially turnkey. The vendor supplies and maintains the equipment and we essentially lease the equipment from them either in the form of a flat rate (speed cameras) or as part of the assessed fine (red light cameras).

   The school bus program is similar in terms of providing and maintaining the equipment, though it differs in the pricing structure. Our school bus program was initiated with our current vendor on July 1, 2016 with the term of the contract being 5 years with 5 additional 1-year options. The pricing structure under the current terms provides that all revenue goes to the vendor until they recuperate their initial investment of approximately $15-18 million.

5. An overview of what revenues are used for. The speed camera revenues go to pedestrian safety initiatives, and I see that broken down in the budget. But where do red light and school bus camera revenues go?

   Like the speed camera revenues, red light camera revenues support the program's administration as well as pedestrian safety initiatives. For the school bus camera program, as noted in the answer to #4 these revenues are used to pay back the vendor for the cost of outfitting the County's buses with its camera system. There are currently 30 FTEs supporting speed and red-light camera programs.

6. Have we done any studies looking at whether crashes, speed, fatalities, injuries, etc. are increasing, decreasing, staying steady, because of ATEU?

In terms of crashes, a recent evaluation of the data shows that intersections where we are conducting red-light enforcement average 11% fewer crashes than before the cameras were installed. The citation issuance rate for both programs fluctuates over the course of the year and the course of the program. They can be attributed to weather, construction, a change in traffic patterns, etc. We have noticed that the amount of time to gain driver compliance when we put a portable speed camera at a new location has shortened. Driver awareness and the corresponding behavior seem to currently be on the rise. Fatalities throughout the County are also on a downward trend.

7. **Please describe the process that the public can follow to request the installation of speed or red-light cameras.**

   The public can request a camera in a variety of ways, all of which are equally effective. Residents can email or call the Traffic Division, or contact their local district station who will forward the request to ATEU for evaluation. We also receive requests though Local Designees.

   When we receive a request, we document it, evaluate the location for suitability for a camera, and make a determination. The requester is notified throughout the process regarding the status of his or her request.

8. **What is the status of school bus cameras as far as installing them on most (all?) buses in the fleet?**

   There are currently approximately 1,287 buses in the County school bus fleet. We have 500 of those buses equipped with cameras on both the inside and outside of the bus for enforcement purposes. The current contract requires all buses be outfitted with the camera system by June 30, 2019.

I. Revenue & Expenditure Summary - Speed Camera Program
FY16 & FY17

	FY16	FY17
Total Gross Revenue	$ 19,714,005	$ 17,748,658
Total Expenditure	$ 11,119,746	$ 8,925,488
Net Revenue	**$ 8,594,259**	**$ 8,823,170**
No. of Citations Issued	**415,935**	**509,542**

For FY16 & FY17: 5 mobile van cameras, 34 portable cameras, and 38 fixed pole cameras
For FY16 & FY17: There are 318 approved speed camera locations

II. Revenue & Expenditure Summary - Red Light Program
FY16 & FY17

	FY16	FY17
Total Gross Revenue	$ 4,831,355	$ 4,359,449
Total Expenditure	$ 2,487,859	$ 2,123,862
Net Revenue	**$ 2,343,496**	**$ 2,235,588**
No. of Citations Issued	**56,108**	**68,056**
# of Cameras & Locations	**50 Cameras**	**51 Cameras**

II. Revenue & Expenditure Summary - School Bus Program
FY16 & FY17

	FY16	FY17
Total Gross Revenue	$ 359,125	$ 2,185,700
Total Expenditure	$ 255,000	$ 2,185,700
Net Revenue	**$ 104,125**	**$ -**
	(Xerox)	**(FXS)**
No. of Citations Issued	**2,873**	**17,235**
# of Buses	**25 buses**	**217 buses**

(3)

Insurance Institute for Highway Safety
Highway Loss Data Institute

IIHS News | September 1, 2015

Speed cameras yield long-term safety benefits, IIHS study shows

NASHVILLE, Tenn. — A speed-camera program in a large community near Washington, D.C., has led to long-term changes in driver behavior and substantial reductions in deaths and injuries, a study by the Insurance Institute for Highway Safety shows.

"We hope this research will help energize the discussion around speed," says IIHS President Adrian Lund, who will present the findings Tuesday at the annual meeting of the Governors Highway Safety Association in Nashville. "We're all accustomed to seeing posted limits ignored, but it's a mistake to think nothing can be done about it. Automated enforcement is one of the tools we have at our disposal."

Automated speed enforcement is gradually becoming more common around the country but remains relatively rare, with only 138 jurisdictions operating such programs as of last month. If all U.S. communities had speed-camera programs like the one IIHS studied in Maryland's Montgomery County, more than 21,000 fatal or incapacitating injuries would have been prevented in 2013.

Speed cameras were introduced in Montgomery County in 2007. As of 2014, the county had 56 fixed cameras, 30 portable cameras and 6 mobile speed vans. The cameras are used on residential streets with speed limits of 35 mph or less and in school zones.

IIHS originally looked at the Montgomery County program during its first year. Six months into the program, the proportion of drivers traveling at least 10 miles over the speed limit had fallen on streets with cameras.

Seven years later, the program is still working. Cameras have reduced by 59 percent the likelihood of a driver exceeding the speed limit by more than 10 mph, compared with similar roads in two nearby Virginia counties that don't have speed cameras, the latest study found.

The researchers also looked at crashes on camera-eligible roads in Montgomery County, relative to comparison roads in Virginia. They found that the camera program resulted in a 19 percent reduction in the likelihood that a crash would involve a fatality or an incapacitating injury, as reported by a police officer on the scene.

"Speed cameras get drivers to ease off the accelerator, and crashes are less likely to be deadly at lower speeds," Lund says. "This study connects the dots to show that speed cameras save lives."

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Speed-camera corridors

Although cameras alone are effective, Montgomery County recently found a way to deploy them so that they have a bigger impact.

In 2012, the county introduced speed-camera corridors. With corridors, enforcement is focused on long segments of roads instead of specific locations. The cameras are regularly moved to different locations on those roads so drivers don't become familiar with their exact locations.

With speed camera corridors, cameras are moved to different locations on a road segment. Deploying cameras this way leads to even bigger safety gains, the study found.

The corridor approach led to further safety gains, reducing the likelihood of a crash involving fatal or incapacitating injury an additional 30 percent beyond the use of cameras alone, the researchers found.

"Speed-camera corridors force drivers to watch their speed for the length of the road, instead of slamming on the brakes at a specific location and then speeding up again," says Anne McCartt, the Institute's senior vice president for research and a co-author of the study.

Overall, the county's camera program in its current form — including the use of corridors and a minor enforcement change that took effect in 2009 — reduces fatal or incapacitating injuries by 39 percent on residential roads with speed limits of 25-35 mph, the researchers found. The estimate of 21,000 fatal or incapacitating injuries that cameras could prevent nationwide is based on that reduction.

The total benefit would likely be even greater because that number doesn't include any spillover effect. Drivers in Montgomery County seem to have slowed down even on roads that aren't eligible for automated enforcement. The researchers found that fatal or incapacitating injuries fell 27 percent on 40 mph roads as a result of the camera program on roads with limits of 35 mph or less.

"The IIHS evaluation of our Safe Speed program validates the fact that a well-managed program that properly deploys its speed cameras can effectively change behavior and reduce the likelihood of collisions," says Capt. Tom Didone, director of the Montgomery County Police Department's traffic division. "Law enforcement programs across the nation will greatly benefit from this report."

Public awareness of cameras

Cameras succeed in changing behavior only if drivers know about them. In Montgomery County, 95 percent of drivers surveyed were aware of them. More than three-quarters said they had reduced their speed because of the program, and 59 percent had received a speed-camera ticket personally.

Automated enforcement can be controversial, and some communities have rolled back programs because of a backlash. However, 62 percent of drivers surveyed in Montgomery County said they favored speed cameras on residential streets. That means there are supporters even among those who have been ticketed.

More information

Effects of automated speed enforcement in Montgomery County, Maryland, on vehicle speeds, public opinion, and crashes

Research paper

High-risk drivers

Presentation by IIHS President Adrian Lund at GHSA annual meeting, Sept. 1, 2015

More on speed

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For more information, visit our **press room**.

The **Insurance Institute for Highway Safety** is an independent, nonprofit scientific and educational organization dedicated to reducing the losses — deaths, injuries and property damage — from crashes on the nation's roads.

The **Highway Loss Data Institute** shares and supports this mission through scientific studies of insurance data representing the human and economic losses resulting from the ownership and operation of different types of vehicles and by publishing insurance loss results by vehicle make and model.

Both organizations are wholly supported by auto insurers.

NATIONAL TRANSPORTATION SAFETY BOARD
Public Meeting of July 25, 2017
(Information subject to editing)

Safety Study
Reducing Speeding-Related Crashes Involving Passenger Vehicles
NTSB/SS-17/01

This is a synopsis from the NTSB's Safety Study and does not include the Board's rationale for the conclusions and safety recommendations. NTSB staff is currently making final revisions to the report from which the attached conclusions and safety recommendations have been extracted. The final report and pertinent safety recommendation letters will be distributed to recommendation recipients as soon as possible. The attached information is subject to further review and editing.

EXECUTIVE SUMMARY

Speeding – exceeding a speed limit or driving too fast for conditions – is one of the most common factors in motor vehicle crashes in the United States. In this safety study, the National Transportation Safety Board (NTSB) examines causes of and trends in speeding-related passenger vehicle crashes and countermeasures to prevent these crashes.

Why the NTSB Did This Study

From 2005 through 2014, crashes in which a law enforcement officer indicated a vehicle's speed was a factor resulted in 112,580 fatalities, representing 31% of all traffic fatalities. Speeding or speed has been cited as a safety issue, or a causal or contributing factor in 49 major NTSB highway accident investigations since 1967. Although recent speeding-related NTSB investigations have primarily involved large trucks and buses, most speeding-related crashes involve speeding passenger vehicles. In 2014, passenger vehicles constituted 77% of speeding vehicles involved in fatal crashes, and 78% of all speeding-related fatalities involved a speeding passenger vehicle. This study leverages prior NTSB investigations, together with other research, to address the national safety issue of speeding among passenger vehicle drivers.

In this study, the NTSB used a combination of quantitative and qualitative methods to summarize the risks of speeding, describe the scope of the problem, and promote the use of proven and emerging speeding countermeasures. This included a literature survey; analyses of speeding-related crash data; and interviews with national, state, and local traffic safety stakeholders. The stakeholders were representatives from transportation and highway safety agencies, law enforcement agencies, automobile manufacturers, research institutions, advocacy groups, equipment vendors, personal auto insurance providers, and professional associations.

This study assessed speeding among passenger vehicle drivers in a broad sense, as a factor that contributes to crashes and injury severity. Several, of many, potential solutions to the issue of speeding-related crashes are discussed. The solutions do not address every cause of

speeding or type of speeding-related crash, but they are intended to be widely applicable to a significant portion of these crashes.

What the NTSB Found

Speed – and therefore speeding – increases crash risk in two ways: (1) it increases the likelihood of being involved in a crash, and (2) it increases the severity of injuries sustained by all road users in a crash.

The relationship between speed and crash involvement is complex, and it is affected by factors such as road type, driver age, alcohol impairment, and roadway characteristics like curvature, grade, width, and adjacent land use. In contrast, the relationship between speed and injury severity is consistent and direct. Higher vehicle speeds lead to larger changes in velocity in a crash, and these velocity changes are closely linked to injury severity. This relationship is especially critical for pedestrians involved in a motor vehicle crash, due to their lack of protection.

Typically, speed limits are set by statute, but adjustments to statutory speed limits are generally based on the observed operating speeds for each road segment—specifically, the 85th percentile speed of free-flowing traffic. Raising speed limits to match the 85th percentile speed can result in unintended consequences. It may lead to higher operating speeds, and thus a higher 85th percentile speed. In general, there is not strong evidence that the 85th percentile speed within a given traffic flow equates to the speed with the lowest crash involvement rate for all road types. Alternative approaches and expert systems for setting speed limits are available, which incorporate factors such as crash history and the presence of vulnerable road users such as pedestrians.

Speed limits must be enforced to be effective, and data-driven, high-visibility enforcement is an efficient way to use law enforcement resources. The success of data-driven speed enforcement programs depends on the ability to measure and communicate their effectiveness. However, law enforcement reporting of speeding-related crashes is inconsistent, which leads to underreporting of speeding-related crashes. This underreporting leads stakeholders and the public to underestimate the overall scope of speeding as a traffic safety issue nationally and hinders the effective implementation of data-driven speed enforcement programs locally.

Automated speed enforcement (ASE) is also widely acknowledged as an effective countermeasure to reduce speeding-related crashes, fatalities, and injuries. However, only 14 states and the District of Columbia use it. Many states have laws that prohibit or place operational restrictions on ASE, and federal guidelines for ASE are outdated and not well known among ASE program administrators. Point-to-point enforcement, which is based on the average speed of a vehicle between two points, can be used on roadway segments many miles long. This type of ASE has had recent success in other countries, but it is not currently used in the United States.

Vehicle technologies can also be effective at reducing speeding. Intelligent speed adaptation (ISA) uses an onboard global positioning system or road sign-detecting camera to determine the speed limit; it then warns drivers when they exceed the speed limit, or prevents drivers from exceeding the speed limit by electronically limiting the speed of the vehicle. Although passenger vehicle manufacturers are increasingly equipping their vehicles with technologies relevant to speeding, these technologies often are not standard features and require the purchase of certain option packages. New car safety rating systems are one effective way to incentivize the manufacture and purchase of passenger vehicles with advanced safety systems such as ISA.

Finally, the current level of emphasis on speeding as a national traffic safety issue is lower than warranted. Current federal-aid programs do not ensure that states fund speed management activities at a level commensurate with the national impact of speeding on fatalities and injuries. Also, unlike other traffic safety issues with a similar impact (such as alcohol-impaired driving) there are no nationwide programs to increase public awareness of the risks of speeding. Although the US Department of Transportation (DOT) has established a multi-agency team to coordinate speeding-related work throughout the DOT, this team's work plan does not include means to ensure that the planned actions are completed in a timely manner.

FINDINGS

1. Speed increases the likelihood of serious and fatal crash involvement, although the exact relationship is complex due to many factors.

2. Speed increases the injury severity of a crash.

3. Drivers report understanding that speeding is a threat to safety but acknowledge it is a common driving behavior in the United States.

4. The *Manual on Uniform Traffic Control Devices* guidance for setting speed limits in speed zones is based on the 85th percentile speed, but there is not strong evidence that, within a given traffic flow, the 85th percentile speed equates to the speed with the lowest crash involvement rate on all road types.

5. Unintended consequences of the reliance on using the 85th percentile speed for changing speed limits in speed zones include higher operating speeds and new, higher 85th percentile speeds in the speed zones, and an increase in operating speeds outside the speed zones.

6. Expert systems such as USLIMITS2 can improve the setting of speed limits by allowing traffic engineers to systematically incorporate crash statistics and other factors in addition to the 85th percentile speed, and to validate their engineering studies.

7. The safe system approach to setting speed limits in urban areas is an improvement over conventional approaches because it considers the vulnerability of all road users.

8. Speeding-related performance measures are needed to determine the effectiveness of data-driven, high-visibility enforcement programs and to communicate the value of these programs to law enforcement officers and the public.

9. The involvement of speeding passenger vehicles in fatal crashes is underestimated.

10. The lack of consistent law enforcement reporting of speeding-related crashes hinders the effective implementation of data-driven speed enforcement programs.

11. Automated speed enforcement is an effective countermeasure to reduce speeding-related crashes, fatalities, and injuries.

12. The lack of state-level automated speed enforcement (ASE) enabling legislation, and restrictions on the use of ASE in states where legislation exists, have led to underuse of this effective speeding countermeasure.

13. Federal guidelines for automated speed enforcement (ASE) programs do not reflect the latest technologies and operating practices and are not very effective because their existence is not well known among the ASE program administrators.

14. Point-to-point speed enforcement has been shown to be an effective speeding countermeasure internationally, but it is not currently used in the United States.

15. Intelligent speed adaptation is an effective vehicle technology to reduce speeding.

16. New car safety ratings are effective in incentivizing consumers to purchase passenger vehicles with advanced safety systems.

17. Traffic safety campaigns that include highly publicized, increased enforcement can be an effective speeding countermeasure, but their inconsistent and infrequent use by states hinders their effectiveness.

18. The current level of emphasis on speeding as a national traffic safety issue is lower than warranted and insufficient to achieve the goal of zero traffic fatalities in the United States.

19. Current federal-aid programs do not require or incentivize states to fund speed management activities at a level commensurate with the national impact of speeding on fatalities and injuries.

20. The US Department of Transportation (DOT) Speed Management Program Plan identifies important actions to reduce speeding-related fatalities, but the DOT has not tracked or ensured the timely implementation of these actions.

RECOMMENDATIONS

New Recommendations

As a result of this safety study, the National Transportation Safety Board makes the following safety recommendations:

To the US Department of Transportation:

1. Complete the actions called for in your 2014 Speed Management Program Plan, and periodically publish status reports on the progress you have made.

To the National Highway Traffic Safety Administration:

2. Identify speeding-related performance measures to be used by local law enforcement agencies, including—but not limited to—the numbers and locations of speeding-related crashes of different injury severity levels, speeding citations, and warnings, and establish a consistent method for evaluating data-driven, high-visibility enforcement programs to reduce speeding. Disseminate the performance measures and evaluation method to local law enforcement agencies.

3. Identify best practices for communicating with law enforcement officers and the public about the effectiveness of data-driven, high-visibility enforcement programs to reduce speeding, and disseminate the best practices to local law enforcement agencies.

4. Work with the Governors Highway Safety Association, the International Association of Chiefs of Police, and the National Sheriffs' Association to develop and implement a program to increase the adoption of speeding-related *Model Minimum Uniform Crash Criteria Guideline* data elements and improve consistency in law enforcement reporting of speeding-related crashes.

5. Work with the Federal Highway Administration to update the *Speed Enforcement Camera Systems Operational Guidelines* to reflect the latest automated speed enforcement (ASE) technologies and operating practices, and promote the updated guidelines among ASE program administrators.

6. Work with the Federal Highway Administration to assess the effectiveness of point-to-point speed enforcement in the United States and, based on the results of that assessment, update the *Speed Enforcement Camera Systems Operational Guidelines*, as appropriate.

7. Incentivize passenger vehicle manufacturers and consumers to adopt intelligent speed adaptation (ISA) systems by, for example, including ISA in the New Car Assessment Program.

8. Collaborate with other traffic safety stakeholders to develop and implement an ongoing program to increase public awareness of speeding as a national traffic safety issue. The program should include, but not be limited to, initiating an annual enforcement mobilization directed at speeding drivers.

9. Establish a program to incentivize state and local speed management activities.

To the Federal Highway Administration:

10. Revise Section 2B.13 of the *Manual on Uniform Traffic Control Devices* so that the factors currently listed as optional for all engineering studies are required, require that an expert system such as USLIMITS2 be used as a validation tool, and remove the guidance that speed limits in speed zones should be within 5 mph of the 85th percentile speed.

11. Revise Section 2B.13 of the *Manual on Uniform Traffic Control Devices* to, at a minimum, incorporate the safe system approach for urban roads to strengthen protection for vulnerable road users.

12. Work with the National Highway Traffic Safety Administration to update the *Speed Enforcement Camera Systems Operational Guidelines* to reflect the latest automated speed enforcement (ASE) technologies and operating practices, and promote the updated guidelines among ASE program administrators.

13. Work with the National Highway Traffic Safety Administration to assess the effectiveness of point-to-point speed enforcement in the United States and, based on the results of that assessment, update the *Speed Enforcement Camera Systems Operational Guidelines*, as appropriate.

To the seven states prohibiting automated speed enforcement:

14. Amend current laws to authorize state and local agencies to use automated speed enforcement.

To the 28 states without automated speed enforcement laws:

15. Authorize state and local agencies to use automated speed enforcement.

To the 15 states with automated speed enforcement restrictions:

16. Amend current laws to remove operational and location restrictions on the use of automated speed enforcement, except where such restrictions are necessary to align with best practices.

To the Governors Highway Safety Association:

17. Work with the National Highway Traffic Safety Administration, the International Association of Chiefs of Police, and the National Sheriffs' Association to develop and implement a program to increase the adoption of speeding-related *Model Minimum Uniform Crash Criteria Guideline* data elements and improve consistency in law enforcement reporting of speeding-related crashes.

To the International Association of Chiefs of Police:

18. Work with the National Highway Traffic Safety Administration, the Governors Highway Safety Association, and the National Sheriffs' Association to develop and implement a program to increase the adoption of speeding-related *Model Minimum Uniform Crash Criteria Guideline* data elements and improve consistency in law enforcement reporting of speeding-related crashes.

To the National Sheriffs' Association:

19. Work with the National Highway Traffic Safety Administration, the Governors Highway Safety Association, and the International Association of Chiefs of Police to develop and implement a program to increase the adoption of speeding-related *Model Minimum Uniform Crash Criteria Guideline* data elements and improve consistency in law enforcement reporting of speeding-related crashes.

Journal

Traffic Injury Prevention ›

Volume 18, 2017 - Issue 1

Original Articles

Safety effectiveness and crash cost benefit of red light cameras in Missouri

Boris Claros, **Carlos Sun** & Praveen Edara

Pages 70-76 | Received 11 Nov 2015, Accepted 05 May 2016, Accepted author version posted online: 27 Jun 2016, Published online: 14 Sep 2016

ABSTRACT

Objective: Red light cameras (RLCs) have generated heated discussions over issues of safety effectiveness, revenue generation, and procedural due process. This study focuses on the safety evaluation of RLCs in Missouri, including the economic valuation of safety benefits. The publication of the national *Highway Safety Manual* (HSM; American Association of State Highway and Transportation Officials) in 2010 produced statistical safety models for intersections and spurred the calibration of these models to local conditions.

Methods: This study adds to existing knowledge by applying the latest statistical methodology presented in the HSM and more current data. Driver behavior constantly

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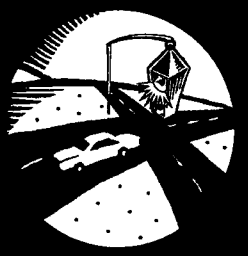
changes due in part to driving conditions and the use of technology. The safety and economic benefit evaluation was performed using the empirical Bayes method, which accounts for regression to the mean bias. For the economic benefit evaluation, the KABCO crash severity scale and crash cost estimates were used. A total of 24 4-leg urban intersections were randomly selected from a master list of RLCs in Missouri from 2006 to 2011. Additionally, 35 comparable nontreated intersections were selected for the analysis.

Results and Conclusions: The implementation of RLCs reduced overall angle crashes by 11.6%, whereas rear-end crashes increased by 16.5%. The net economic crash cost benefit of the implementation of RLCs was $35,269 per site per year in 2001 dollars (approximately $47,000 in 2015 dollars). Thus, RLCs produced a sizable net positive safety benefit that is consistent with previous statistical studies.

KEYWORDS: Automated enforcement, intersection safety, crash frequency modeling, right angle crashes

EXECUTIVE SUMMARY



Safety Evaluation of Red-Light Cameras—Executive Summary

FHWA Contact: Michael Griffith, HRDS-02, 202–493–3316

This document is an Executive Summary of the report *Safety Evaluation of Red-Light Cameras,* FHWA-HRT-05-048, published by the Federal Highway Administration in April 2005.

Abstract

The fundamental objective of this research was to determine the effectiveness of red-light-camera (RLC) systems in reducing crashes. The study involved an empirical Bayes (EB) before-after research using data from seven jurisdictions across the United States to estimate the crash and associated economic effects of RLC systems. The study included 132 treatment sites, and specially derived rear end and right-angle unit crash costs for various severity levels. Crash effects detected were consistent in direction with those found in many previous studies: decreased right-angle crashes and increased rear end ones. The economic analysis examined the extent to which the increase in rear end crashes negates the benefits for decreased right-angle crashes. There was indeed a modest aggregate crash cost benefit of RLC systems. A disaggregate analysis found that greatest economic benefits are associated with factors of the highest total entering average annual daily traffic (AADT), the largest ratios of right-angle to rear end crashes, and with the presence of protected left-turn phases. There were weak indications of a spillover effect that point to a need for a more definitive, perhaps prospective, study of this issue.

Introduction and Background

RLC systems are aimed at helping reduce a major safety problem at urban and rural intersections, a problem that is estimated to produce more than 100,000 crashes and approximately 1,000 deaths per year in the United States.[1] The size of the problem, the promise shown from the use of RLC systems in

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other countries, and the paucity of definitive studies in the United States established the need for this national study to determine the effectiveness of the RLC systems jurisdiction-wide in reducing crashes at monitored intersections. This study included collecting background information from literature and other sources, establishing study goals, interviewing and choosing potential study jurisdictions, and designing and carrying out the study of both crash and economic effects. A description of all project efforts is in the complete report summarized by this document and, to a lesser extent, in two Transportation Research Board (TRB) papers that were also prepared.[2,3]


TRIMARC/Northrop Grumman Mission Systems

Figure 1: A photo taken from a camera of a crash involving red-light running.

A literature review found that estimates of the safety effect of red-light-running programs vary considerably. The bulk of the results appear to support a conclusion that red light cameras reduce right-angle crashes and could increase rear end crashes; however, most of the studies are tainted by methodological difficulties that would render useless any conclusions from them. One difficulty, failure to account for regression to the mean[1] (RTM), can exaggerate the positive effects, while another difficulty, ignoring possible spillover effects[2] to intersections without RLCs, will lead to an underestimation of RLC benefits, more so if sites with these effects are used as a comparison group.

While it is difficult to make definitive conclusions from studies with failed methodology validity, the results of the review did provide some level of comfort for a decision to conduct a definitive, large-scale study of installations in the United States. It was important for the new study to capitalize on lessons learned from the strengths and weaknesses of previous evaluations, many of which were conducted in an era with less knowledge of potential pitfalls in evaluation studies and methods to avoid or correct them.

The lessons learned required that the number of treatment sites be sufficient to assure statistical significance of results, and that the possibility of spillover effects be considered in designating comparison sites, perhaps requiring a study design without a strong reliance on the use of comparison sites. Previous research experience also pointed to a need for the definition of the term, "red-light-running crashes," to be consistent, clear, and logical and for provision of a mechanism to aggregate the differential effects on crashes of various impact types and severities.

Methodological Basics

The general crash effects analysis methodology used is

[1] "Regression to the mean" is the statistical tendency for locations chosen because of high crash histories to have lower crash frequencies in subsequent years even without treatment.

[2] Spillover effect is the expected effect of RLCs on intersections other than the ones actually treated because of jurisdiction-wide publicity and the general public's lack of knowledge of where RLCs are installed.

different from those used in past RLC studies. This study benefits from significant advances made in the methodology for observational before-after studies, described in a landmark book by Hauer.[4] The book documented the EB procedure used in this study. The EB approach sought to overcome the limitations of previous evaluations of red-light cameras, especially by properly accounting for regression to the mean, and by overcoming the difficulties of using crash rates in normalizing for volume differences between the before and after periods.

The analysis of economic effects fundamentally involved the development of per-crash cost estimates for different crash types and police-reported crash severities. In essence, the application of these unit costs to the EB crash frequency effect estimates. The EB analysis was first conducted for each crash type and severity and site before applying the unit costs and aggregating the economic effect estimates across crash types and severity and then across jurisdictions. The estimates of economic effects for each site allowed for exploratory analysis and regression modeling of cross-jurisdiction aggregate economic costs to identify the intersection and RLC program characteristics associated with the greatest economic benefits of RLC systems.

Details of the development of the unit crash-cost estimates can be found in a recent paper and in an internal report available from FHWA.[5,6] Unit costs were developed for angle, rear end, and "other" crashes at urban and rural signalized intersections. The crash cost to be used had to be keyed to police crash severity based on the KABCO[3] scale. By merging previously developed costs per victim keyed on the AIS injury severity scale into U.S. traffic crash data files that scored injuries in both the Abbreviated Injury Scale (AIS) and KABCO scales, estimates for both economic (human capital) costs and comprehensive costs per crash were produced. In addition, the analysis produced an estimate of the standard deviation for each average cost. All estimates were stated in Year 2001 dollar costs.

Data Collection

The choice of jurisdictions to include in the study was based on an analysis of sample size needs and the data available in potential jurisdictions. It was vital to ensure that enough data were included to detect that the expected change in safety has appropriate statistical significance. To this end, extensive interviews were conducted for several potential jurisdictions known to have significant RLC programs and a sample size analysis was done. The final selection of seven jurisdictions was made after an assessment of each jurisdiction's ability to provide the required data. The jurisdictions chosen were El Cajon, San Diego, and San Francisco, CA; Howard County, Montgomery County, and Baltimore, MD; and Charlotte, NC.

Data were required not only for RLC-equipped intersections but also for a reference group of signalized intersections not equipped with RLCs but similar to the RLC locations. These sites were to be used in the calibration of safety performance functions (SPFs) used in the EB analysis and to investigate possible spillover effects. To account for time trends between the period before the first RLC installation and the period after that, crash and traffic volume data were collected to calibrate SPFs from a comparison group of approximately 50 unsignalized intersections in each jurisdiction.

Following the site/jurisdiction selection, the project team collected and coded the required data. Before the actual data

[3] The KABCO severity scale is used by the investigating police officer on the scene to classify injury severity for occupants with five categories: K, killed; A, disabling injury; B, evident injury; C, possible injury; O, no apparent injury.[7] These definitions may vary slightly for different police agencies.

Table 1. Combined results for seven jurisdictions

	Right-angle crashes		Rear end crashes	
	Total crashes	Definite injury	Total crashes	Definite injury
EB estimate of crashes expected in the after period without RLC	1,542	351	2,521	131
Count of crashes observed in the after period	1,163	296	2,896	163
Estimate of percentage change (standard error)	- 24.6 (2.9)	- 15.7 (5.9)	14.9 (3.0)	24.0 (11.6)
Estimate of the change in crash frequency	- 379	- 55	375	32

Note: A negative sign indicates a decrease in crashes.

analyses, preliminary efforts involving file merging and data quality checks were conducted. This effort included the crash data linkage to intersections and the defining of crashes expected to be affected by RLC implementation. Basic red-light-running crashes at the intersection proper were defined as "right-angle," "broadside," or "right- or left-turning-crashes" involving two vehicles, with the vehicles entering the intersection from perpendicular approaches. Also included were crashes involving a left-turning vehicle and a through vehicle from opposite approaches. "Rear end crashes" were defined as a rear end crash type occurring on any approach within 45.72 m (150 ft) of the intersection. In addition, "injury crashes" were defined as including fatal and definite injuries, excluding those classified as "possible injury."

Results

Because the intent of the research was to conduct a multi-jurisdictional study representing different locations across the United States, the aggregate effects over all RLC sites in all jurisdictions was of primary interest. Table 1 shows the combined results for the seven jurisdictions. There is a significant decrease in right-angle crashes, but there is also a significant increase in rear end crashes. Note that "injury" crashes are defined by severity as K, A, or B crashes; but the frequencies shown do not contain a category for "possible injury" crashes captured by KABCO-level C; thus, these crashes could better be labeled "definite injury" crashes.

As seen in table 2, the direction of these effects (and the magni-

Table 2. Results for individual jurisdictions for total accidents

Jurisdiction number* (in random order)	Percent change in right-angle crashes (standard error)	Percent change in rear end crashes (standard error)
1	- 40.0 (5.4)	21.3 (17.1)
2	0.8 (9.0)	8.5 (9.8)
3	- 14.3 (12.5)	15.1 (14.1)
4	- 24.7 (8.7)	19.7 (11.7)
5	- 34.3 (7.6)	38.1 (14.5)
6	- 26.1 (4.7)	12.7 (3.4)
7	- 24.4 (11.2)	7.0 (18.5)

*The identification of jurisdictions is not provided because of an agreement with the jurisdictions; such information is irrelevant to the findings.

Note: A negative sign indicates a decrease in crashes.

Table 3. Unit crash cost estimates by severity level used in the economic effects analysis

Crash severity level	Right-angle crash cost	Rear end crash cost
O (standard deviation)	$8,673 (1,285)	$11,463 (3,338)
K+A+B+C (standard deviation)	$64,468 (11,919)	$53,659 (9,276)

tude to a lesser degree) was remarkably consistent across jurisdictions. The analysis indicated a modest spillover effect on right-angle crashes; however, that this was not mirrored by the increase in rear end crashes seen in the treatment group, which detracts somewhat from the credibility of this result as evidence of a general deterrence effect.

For the analysis of economic effects, it was recognized that there were low sample sizes of fatal and serious (A-level) crashes in the after period for some intersections. In addition, the initially developed cost estimates for B- and C-level rear end crashes indicated some anomalies in the order (e.g., C-level costs were higher, very likely because on-scene police estimates of "minor injury" often ultimately include expensive whiplash injuries), the B- and C-level costs were combined by Pacific Institute for Research and Evaluation (PIRE) into one cost. Considering these issues and the need to use the same cost categories across all intersections in all seven jurisdictions, two crash cost levels were ultimately used in all analyses: Injury (K+A+B+C) and Non-injury (O). These unit costs are shown in table 3 along with the standard deviation of these costs.

Table 4 shows the results for the economic effects including and excluding property-damage only (PDO) crashes. The latter estimates are included in recognition of the fact that several jurisdictions considerably under-report PDO collisions. Those estimates (with PDOs excluded) show a positive aggregate economic benefit of more than $18.5 million over approximately 370 site years, which translates into a crash reduction benefit of approximately $50,000 per site year. With PDOs included, the benefit is approximately $39,000 per site year. The implication from this result is that the lesser severities and generally lower unit costs for rear end injury crashes together ensure that the increase in rear end crash frequency does not negate the decrease in the right-angle crashes targeted by red-light-camera systems.

Further analysis indicated that right-angle crashes appear slightly more severe in the after period in two jurisdictions, but not in the other five. Because such an effect would mean that the benefits in table 4 are slightly overestimated, an attempt was made to estimate the possible size of the benefit reduction. If such a shift were real, and if its effects could be assumed to be correctly estimated from individual KABCO unit costs already deemed to be inappropriate for such purposes, the overall cost savings reported in the last row of table 4 could be decreased by approximately $4 million; however, there would still be positive economic benefits, even if it is assumed that the unit cost shifts were real and correctly estimated.

Table 4. Economic effects including and excluding PDOs (Using a combined unit cost for K+A+B+C)

	All severities combined			PDOs excluded		
	Right-Angle crash	Rear end crash	All crashes	Right-Angle crash	Rear end crash	All crashes
EB estimate of crash costs before RLC installation	$66,814,067	$69,347,624	$161,843,021	$61,687,367	$52,681,148	$134,407,104
Recorded cost of crashes after RLC installation (370 site years)	$48,319,090	$75,222,780	$147,470,550	$43,868,392	$53,944,539	$115,901,685
Percentage of change in crash cost (s.e.)*	- 27.7 (0.6)	8.5 (0.7)	- 8.9 (0.4)	- 28.9 (0.6)	2.4 (0.8)	- 13.8 (0.5)
Crash cost decrease (per site year)			$14,372,471 ($38,845)			$18,505,419 ($50,015)

* A negative number indicates a decrease.

Examination of the aggregate economic effect per after-period year for each site indicated substantial variation, much of which could be attributable to randomness. It was reasonable to suspect that some of the differences may be due to factors that impact RLC effectiveness; therefore, a disaggregate analysis, which involved exploratory univariate analysis and multivariate modeling was undertaken to try to identify factors associated with the greatest and least economic benefits. The outcome measure in these models was the aggregate economic effect per after period site year.

The disaggregate analysis found that greatest economic benefits are associated with the highest total entering AADTs, the largest ratios of right-angle to rear end crashes, higher proportions of entering AADT on the major road, shorter cycle lengths and intergreen periods, and with the presence of protected left-turn phases. The presence of warning signs and high publicity levels also appear to be associated with greater benefits. These results do not provide numerical guidance for trading off the effects of various factors. The intent of identifying these factors is that in practice RLC implementers would identify program factors such as warning signs that increase program effectiveness and give the highest priority for RLC implementation to the sites with most or all of the positive binary factors present (e.g., left-turn protection) and with the highest levels of the favorable continuous variables (e.g. higher ratios of right-angle to rear end crashes).

Conclusions

This statistically defendable study found crash effects that were consistent in direction with those found in many previous studies, although the positive effects were somewhat lower that those reported in many sources. The conflicting direction effects for rear end and right-angle crashes justified the conduct of the economic effects analysis to assess the extent to which the increase in rear end crashes

negates the benefits for right-angle crashes. This analysis, which was based on an aggregation of rear end and right-angle crash costs for various severity levels, showed that RLC systems do indeed provide a modest aggregate crash-cost benefit.

The opposing effects for the two crash types also implied that RLC systems would be most beneficial at intersections where there are relatively few rear end crashes and many right-angle ones. This was verified in a disaggregate analysis of the economic effect to try to isolate the factors that would favor (or discourage) the installation of RLC systems. That analysis revealed that RLC systems should be considered for intersections with a high ratio of right-angle crashes to rear end crashes, higher proportion of entering AADT on the major road, shorter cycle lengths and intergreen periods, one or more left turn protected phases, and higher entering AADTs. It also revealed the presence of warning signs at both RLC intersections and city limits and the application of high publicity levels will enhance the benefits of RLC systems.

The indications of a spillover effect point to a need for a more definitive study of this issue. That more confidence could not be placed in this aspect of the analysis reflects that this is an observational retrospective study in which RLC installations took place over many years and where other programs and treatments may have affected crash frequencies at the spillover study sites. A prospective study with an explicit purpose of addressing this issue seems to be required.

In closing, this economic analysis represents the first attempt in the known literature to combine the positive effects of right-angle crash reductions with the negative effects of rear end crash increases and identify factors that might further enhance the effects of RLC systems. Larger crash sample sizes would have added even more information. The following primary conclusions are based on these current analyses:

Even though the positive effects on angle crashes of RLC systems is partially offset by negative effects related to increases in rear end crashes, there is still a modest to moderate economic benefit of between $39,000 and $50,000 per treated site year, depending on consideration of only injury crashes or including PDO crashes, and whether the statistically non-significant shift to slightly more severe angle crashes remaining after treatment is, in fact, real.

Even if modest, this economic benefit is important. In many instances today, the RLC systems pay for themselves through red-light-running fines generated. However, in many jurisdictions, this differs from most safety treatments where there are installation, maintenance, and other costs that must be weighed against the treatment benefits.

The modest benefit per site is an average over all sites. As the analysis of factors showed, this benefit can be increased through careful selection of the sites to be treated (e.g., sites with a high ratio of right-angle to rear end crashes as compared to other potential treatment sites) and program design (e.g., high publicity, signing at both intersections and jurisdiction limits).

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Availability—The report will be available in spring 2005 and may be obtained from the FHWA Report Center by e-mail to report.center@fhwa.dot.gov, by fax to 301–577–1421, or by phone to 301–577–0818.

Key Words—Red light camera, empirical Bayes, Crash evaluation, Economic analysis, Signalized intersection

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Pedestrian Safety

MISSION STATEMENT

Montgomery County is committed to improving pedestrian safety and accessibility for everyone. The County's goals are to reduce collisions and make our community more walkable. The County Executive has created a comprehensive pedestrian safety strategic plan, the Pedestrian Safety Initiative, with specific performance measures, timelines, and budgets for achieving recommended actions. Ongoing evaluations will ensure the proposed engineering, enforcement, and education solutions are really working. Multiple agencies throughout the County work together to install infrastructure improvements, educate residents on safe driving and walking behavior, enforce traffic laws, encourage safety innovations, and evaluate results to guide future actions.

LINKAGE TO COUNTY RESULT AREAS

- **An Effective and Efficient Transportation Network**
- **Healthy and Sustainable Communities**
- **Safe Streets and Secure Neighborhoods**

PROGRAM CONTACTS

Contact Venu Nemani of the Department of Transportation at 240.777.8790 or Brady Goldsmith of the Office of Management and Budget at 240.777.2793 for more information regarding this initiative's operating budget.

PROGRAM DESCRIPTION

County Executive Leggett has pledged to make improving pedestrian safety and making our communities more walkable a priority of his administration. The Pedestrian Safety Initiative, established in December 2007, outlines a comprehensive approach to meet that commitment. This is a collaborative effort of the County Executive and the County Council, as well as the Maryland-National Capital Park and Planning Commission's (M-NCPPC) Planning Board and the Maryland State Highway Administration. This plan provides Montgomery County with a blueprint for pedestrian safety activities based on measureable strategies.

The strategic approaches to achieve the goals and objectives of this initiative are as follows:

- **Strategy 1:** Target pedestrian safety improvements in High Incidence Areas;
- **Strategy 2:** Assess and improve pedestrian network and connectivity needs;
- **Strategy 3:** Increase emphasis on pedestrians and bicyclists in the planning process;
- **Strategy 4:** Identify and implement corridor and intersection modifications and traffic calming treatments;
- **Strategy 5:** Upgrade pedestrian signals;
- **Strategy 6:** Assess and enhance street lighting; and
- **Strategy 7:** Modify pedestrian and driver behavior through enhanced enforcement and educational efforts.

RESULTS

Since the start of this initiative, these strategies have seen several successes. Seventeen High Incidence Areas (HIA) have been identified and studied, with short-term improvements completed and many long-term improvements in progress. The Montgomery County Department of Transportation (MCDOT) has constructed 30 miles of new sidewalk segments,

completed over 3,083 bus stop improvements, and undertaken 245 new Americans with Disabilities Act (ADA) projects. Areas with traffic calming improvements have seen pedestrian collisions decrease by 44 percent. Educational efforts have been conducted in HIAs, pedestrian collision hot spots, as well as targeted to high-risk groups. These efforts were conducted in coordination with enforcement efforts, and have been used to change unsafe pedestrian and driver behaviors. Following engineering improvements, education coupled with enforcement, have modified perceptions of risk and responsibility on the roads and sidewalks. Targeting these HIAs with these three "Es", has resulted in up to 52 percent reduction of pedestrian collisions in these locations. Since funding the Pedestrian Safety Initiative in FY10, there has been a 41 percent reduction in average yearly pedestrian fatalities, and a 34 percent reduction in serious collisions where pedestrians are killed or incapacitated by their injuries.

The County Executive recommends $71.4 million in FY18 expenditures in support of pedestrian safety. The FY18 Recommended Operating Budget includes $8.5 million for pedestrian safety initiatives. In addition, the Capital Improvements Program (CIP) includes $62.9 million in expenditures for FY18.

Services dedicated to improving pedestrian safety are general program offerings as well as targeted services. These services address critical needs facing the County at this time and the desired outcome of reduced collisions and resulting injuries while increasing walkability. Below are some of the major County government programs currently supporting pedestrian safety:

Department of Transportation

- Provide a mechanism for communities through Safe Routes to School (SRTS) to increase the ability of students to walk or bike to school safely through improved facilities along student walking routes to school. Evaluate and assess traffic and operational safety issues at County schools. Completed 18 studies/observations at public schools and 25 at private schools. Preparation of school walking routes in GIS. Safety campaign in public schools including bike rodeos and crosswalk simulations.
- Participate in the regional Street Smart pedestrian safety education campaign. The twice yearly, four-week media campaigns use transit shelters and bus advertising throughout the County to promote safe pedestrian behaviors and raise awareness of drivers and pedestrians about the importance of bicycle and pedestrian safety. In FY16, this campaign was broadened to a County-wide, year-round effort to coordinate with targeted enforcement actions.
- Perform traffic calming improvements by treating roadways with pedestrian refuge islands, curb extensions, speed humps, and improved signage and markings, such as current projects under design or construction on Wickham Road, Old Baltimore Road, Arlington Road, Lockwood Drive, Brunette Avenue, East Franklin Street, Lamberton Drive at Belgrade Road, Ray Drive at Gist Avenue, Spring Street at Fairview Road, and Grubb Road at Lyttonsville Road. Where traffic calming has been employed in areas with collisions, there has been a measurable reduction in speeding and a 44 percent reduction in pedestrian collisions.
- Implement pedestrian signal timing improvements to provide pedestrians with more time to safely cross streets. This program has thus far completed retiming of 78 percent of all County pedestrian signals.
- Improve sidewalk connectivity to transportation, commercial, employment, and medical areas throughout the County. Additionally, more direct sidewalk programs exist, such as one targeting the homeless shelter on East Gude Drive and improved safety on Springfield Drive at River Road .
- Provide curb ramps for sidewalks and other accessibility barriers on County roadways through the Americans with Disabilities Act (ADA) compliance program.
- Implementation of bike lanes along Nebel Street between Randolph Road and Marinelli Road. On-street parking was removed and buffered bike lanes were installed.
- Design and construct an extension from the end of the existing trail in Takoma Park and the Silver Spring Transit Center through the Metropolitan Branch Trail project.
- Conduct both countywide and targeted pedestrian safety education campaigns in HIA's and police district hot spots, coordinating with enforcement actions by Montgomery County Police Department, the creation of a 30-member

volunteer brigade to conduct bilingual education on the streets, and bilingual education teams to reach at-risk groups within the High Incidence Areas. High school pedestrian safety education was expanded through the Walk Your Way Program and the YOLO Walk Safe Campaign with expanded use of social media and school partnering.

- Conduct evaluations of pedestrian and bicycle facilities in eight of the County's twenty-eight Bicycle and Pedestrian Priority Areas (BiPPAs) and construct improvements to pedestrian and bicycle connectivity and safety in these BiPPAs.

Department of Police

- Manage and analyze a database of collision data used to inform policy and program decisions through the Police Traffic Division, such as the identification of HIAs, locations for traffic calming improvements, and groups and areas at high risk of being involved in pedestrian collisions.
- Target enforcement of pedestrian safety and traffic safety laws in HIAs and areas around elementary, middle, and high schools in coordination with MCDOT's pedestrian safety education activities.
- Continue to implement countywide speed camera and red light camera enforcement to slow traffic to posted speed limits.
- Engage shoppers in parking lots with the "Shop with a Cop" program, where police distribute high-visibility shopping bags and safety tips brochures to address pedestrian collisions that occur in parking lots.
- Work with property managers and property owners to implement improvements that will improve pedestrian safety in parking lots, where 30 percent of the County's pedestrian collisions occur.
- Overall, enhanced enforcement of pedestrian and traffic safety laws help modify perceptions of risk and responsibility on the road, can change behavior, and contribute to building a culture of safety. Montgomery County Police have been instrumental in helping reduce the number of pedestrian collisions by:
    - Administering special pedestrian crosswalks, operating safe streets corridors, holiday and school enforcements; and
    - Dedicating regular on-duty police enforcement in HIAs to issue warnings to pedestrians and motorists.

Public Information Office

- Continue the educational program in cooperation with the Department of Transportation to educate the public about ways to improve safety in parking lots - both as drivers and as pedestrians.

County Executive's Pedestrian Safety Initiative - All Funding Sources FY18 CE Recommended Capital Improvements Program and Operating Budget		
Department	Project/Program	FY18 Recommended
Capital Improvements Program (CIP)		
Maryland-National Capital Park and Planning Commission	Trails: Hard Surface Design and Construction	$ 450,000
	Trails: Natural Surface & Resource-based Recreation	455,000
	Trails: Hard Surface Renovation	1,000,000
	Total M-NCPPC (CIP)	**$ 1,905,000**
Department of Transportation	Sidewalk and Curb Replacement	9,700,000
	Bus Stop Improvements	943,000
	Pedestrian Safety Program	1,776,000
	Streetlight Enhancements - CBD/Town Center	250,000
	Traffic Signal System Modernization	2,603,000
	White Flint Traffic Analysis and Mitigation	81,000
	Intersection and Spot Improvements	1,804,000
	Streetlighting	1,370,000
	Traffic Signals	5,835,000
	Frederick Road Bike Path	2,542,000
	MD 355 Crossing (BRAC)	20,465,000
	Guardrail Projects	315,000
	Advanced Transportation Management System	1,508,000
	Neighborhood Traffic Calming	310,000
	Transportation Improvements for Schools	209,000
	Sidewalk Program - Minor Projects	2,414,000
	Bikeway Program - Minor Projects	530,000
	Bicycle-Pedestrian Priority Area Improvements	2,000,000
	ADA Compliance: Transportation	1,525,000
	Metropolitan Branch Trail	4,840,000
	Total Department of Transportation (CIP)	**$ 61,020,000**
	Total FY18 CIP	**$ 62,925,000**
Operating Budget (PSP)		
Department of Transportation	Pedestrian Safety/General Fund	32,596
	Pedestrian Safety Outreach Education	200,000
	Street Smart Campaign	10,564
	Pedestrian Safety Coordinator	169,921
	Sidewalks/General Fund	793,946
	Contract Crosswalk Treatments	326,990
	Street Lighting/General Fund	528,769
	School Zone Pedestrian Treatments	156,240
Department of Police	Police Enforcement for HIAs - Overtime	180,000
	Police Enforcement for HIAs - Data Analyst	96,981
	School Safety Program/General Fund	5,978,136
Public Information Office	Pedestrian Safety Outreach Education	50,000
	Total FY18 PSP	**$ 8,524,143**
	TOTAL FY18 RECOMMENDED EXPENDITURES (CIP & PSP)	**$ 71,449,143**

Source: CE Recommended FY18 Operating and Capital Budgets

Note: *This table is not a comprehensive list of pedestrian safety activities undertaken by Montgomery County. It displays the capital projects and operating programs that are specifically targeted to improve pedestrian safety. There are additional costs in individual capital projects not displayed above, including sidewalk construction, street lighting, and other elements in support of pedestrian safety. In addition, there are other operating budget programs that support pedestrian safety including traffic enforcement and school crossing guards in the Police Department.*