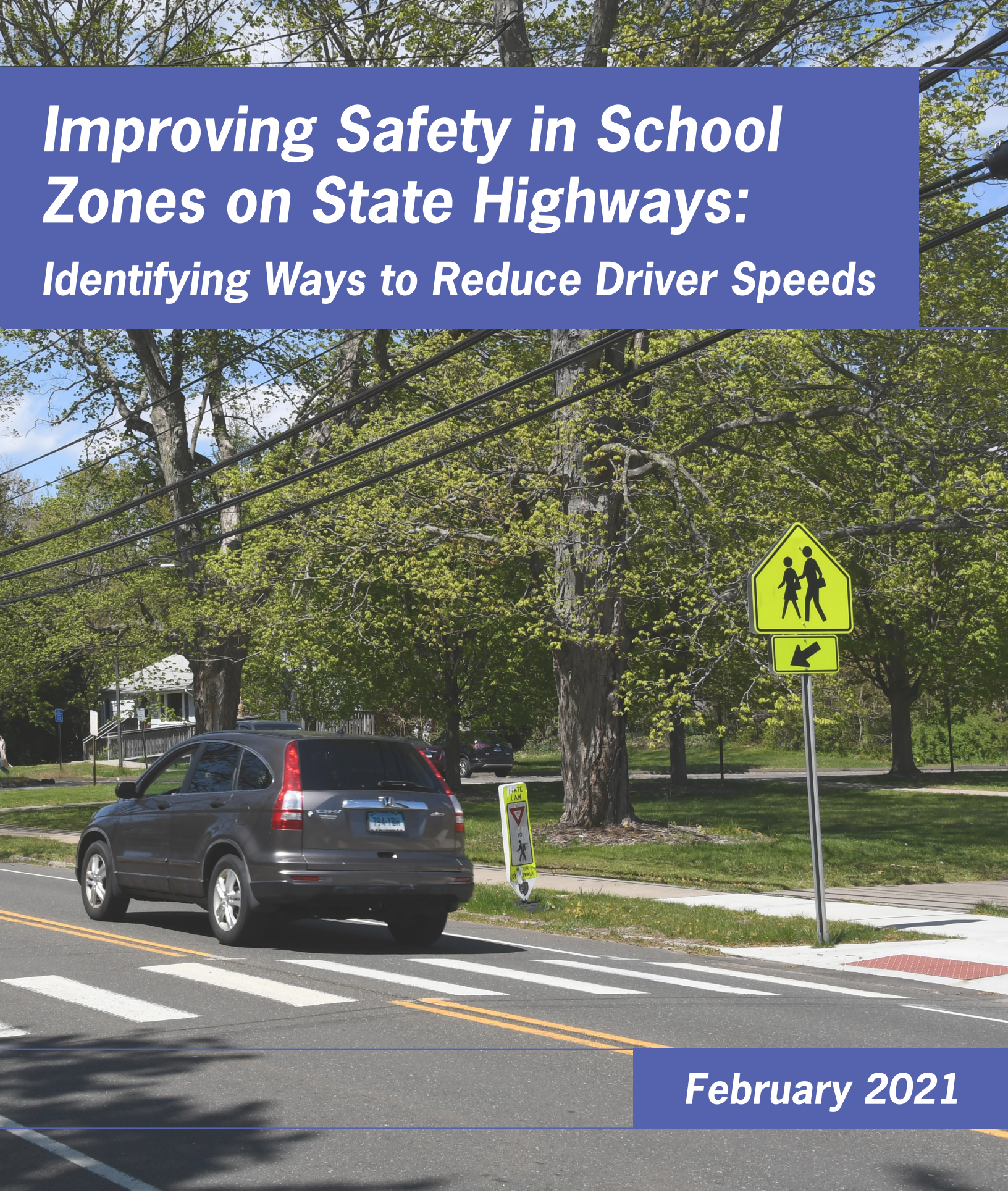
Improving Safety in School Zones on State Highways:

Identifying Ways to Reduce Driver Speeds



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The New Jersey Safe Routes Program, supported by the New Jersey Department of Transportation, is a statewide initiative with a mission to partner with schools and communities to prioritize and implement opportunities for people to walk, bike, or travel by other wheeled devices. By focusing on improvements to support active travel by youth, we believe we can create conditions that are safe, healthy, equitable, and appealing for all.

The New Jersey Safe Routes Resource Center assists public officials, transportation and health professionals, and the general public in creating safer and more accessible walking and bicycling environments for children in New Jersey through education, training, and research.

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Introduction

School zones are areas of reduced speed along a section of roadway in advance of, and proximate to, a school and/or school facilities. Focusing strategies for reducing child pedestrian crashes within school zones is an effective means of reducing injuries among children. This is especially true for state highways which often have higher posted speed limits, multiple travel lanes, higher traffic volumes, and fewer signalized intersections, all of which leave pedestrians vulnerable. These characteristics, coupled with the fact that school zones alone do not necessarily slow vehicle speeds, demand the implementation of proven strategies to slow traffic speeds in school zones on state highways (Strawderman, 2015). This paper explores several strategies that can be employed to improve pedestrian safety in school zones by reducing vehicle speed, increasing visibility, and reducing pedestrian exposure.

In seeking to reduce the incidence of child pedestrian crashes and injuries, school zones are an important place to focus because of the high number of crashes involving children that occur in these areas. One study showed that the 150-meter area around schools had the highest proportion of child pedestrian-vehicle crashes and the highest proportion of fatalities compared to areas 300 meters or more away from schools (Warsh et al., 2009). The study showed that half of these collisions occurred at times when children were most likely to be walking to or from school. Previous studies have shown that other factors associated with child pedestrians and car collisions include school density, population density, traffic volume, rush hour time periods, socioeconomic status, season, and the spatial relationship between schools, streets, and parking areas (Warsh et al., 2009). In addition, there is a gap between driver perception and reality related to speed. Drivers are aware that they should travel slower when children are present but tend to underestimate their driving speed in school zones (Hamric, 2013).

The argument for speed reduction to improve pedestrian safety can be further supported by the following:

- When traveling at 20mph, drivers yield to pedestrians 75 percent of the time; when traveling at 37mph, drivers yield 17 percent of the time.
- A driver's field of vision is much wider when traveling at 15mph than at 40mph, so they will take in more information about the environment, including the presence of pedestrians.
- One out of 10 pedestrians struck by a vehicle traveling at 40mph will survive, but 9 out of 10 pedestrians will survive when a vehicle is traveling at 20mph (Seattle SRTS)

Unless otherwise posted, the speed limit in New Jersey school zones is 25 mph, as established by state statute. This speed limit applies during recess, when children are clearly visible from the roadway, or while children are going to or leaving school (during opening and closing hours).[1] Municipalities and counties may establish a speed limit less than or greater than 25 mph based on traffic and engineering studies. The speed on state and county roads may be 40 mph or higher.

The strategies for improving pedestrian safety in school zones discussed in this paper fall under the headings of engineering, school zone design, and enforcement in the form of speed cameras. The paper describes Federal Highway Administration (FHWA) proven safety countermeasures employed under the Every Day Counts (EDC) Safe Transportation for Every Pedestrian (STEP) innovative initiative and notes examples of implementation of these and other safety measures on New Jersey roads.

The paper also describes observational studies related to distracted driving undertaken by schools and community organizations. Education on school zone hazards is another key strategy. Public awareness of speeding and public demand for enforcement has the most significant effect on speeding in school zones (Hamric, 2013).

1 N.J.S.A. 39:4-98 Rates of Speed.

School Zone Design

Although this paper is concentrating on addressing speeding in school zones, it is important to note other common risky behaviors in drop-off areas at schools, including drivers dropping children at the opposite side of the road from the school, making U-turns, and reversing dangerously. Traffic congestion is associated with double parking, reversing, and pedestrians crossing between parked cars (Rothman, et al., 2017).

Engineering

Several engineering solutions have been the focus of studies to assess effectiveness in increasing safety including: length of school zones, school zone design, and signage and signals.

Length of School Zones

The location of the beginning and end of a school speed limit zone should be based on engineering judgment rather than the exact location of the school property line or fence. The school speed limit zone should be centered at the location(s) where children cross the roadway. The beginning and ending points should be selected with appropriate consideration for the location of other traffic control devices and/or features that could influence the effective implementation of the school speed limit zone (Fitzpatrick et al. 2009). Drivers tend to comply with the regulatory speed limit more than with the school speed limit. Speeds tend to increase as the distance in the school zone increases. Longer school zones do not result in lower speeds over a longer distance. For shorter school zones, most minimum speeds occur closer to the school speed limit sign (Fitzpatrick et al., 2009). School Zone length should be based on youth pedestrian and bicycle needs.

School speed limit zones in urban areas, where 30 mph or less, may have school zones as short as 400 feet. School speed limit zones in rural areas, where posted speeds are typically 55 mph or more, tend to be longer. The suggested length of school zones in rural areas is 1,000 feet. However, research has shown that speeds are approximately 1 mph higher for every 500 feet driven within a school zone; therefore, longer school zones are associated with greater speed variability within the zone. (Fitzpatrick et al., 2009).

A school zone should begin at least 200 feet from the school grounds, crossing, or school-related activity and should be determined through an engineering study. The distance should increase if the reduced school speed limit is 30 mph or higher (Institute of Traffic Engineers, undated).

Striping

High visibility markings improve crosswalk visibility compared to transverse lines at uncontrolled intersections and mid-block crossings, thereby improving pedestrian safety and positively affecting driver behavior. High visibility markings include textured pavement and longitudinal, zebra, and ladder markings. These markings are wider and/or perpendicular to the driver's path and thereby increase the amount of marking visible to the driver (McGrane and Mitman, 2013; Sarwar, et al. 2017).

High visibility crosswalk markings are likely to decrease the speed and acceleration at the benchmark and crosswalk points. The benchmark point is the approximate location at which a driver would be able to see and react to the crosswalk markings. High visibility markings increase the likelihood that speed reduction will be above a statistically significant amount and increase the likelihood that a driver will apply the brake pedal (Sarwar, et al. 2017).

High visibility markings improve crosswalk visibility compared to transverse lines.

School Zone Design – Fewer Conflict Points

In a study of the effect of some countermeasures on traffic safety in school zones, two-step speed reduction and a decrease in the number of driveways reduced the number of vehicle crashes. Replacing a two-way left-turn lane with a raised median did not have the same positive outcome. The combination of two-step speed reduction and reduction in the number of driveways outperformed all other sub-scenarios (Rahman, 2019).

Traffic Signals

When school drop-off and pick-up areas are located at or near high-volume intersections, traffic control at those intersections is a critical factor in pedestrian safety in the school zone. Recommended treatments at these locations include no right turn on red, pedestrian lead interval phases, and all-red pedestrian phase. Disallowing a right turn on red during school commuting hours reduces the potential conflicts between pedestrians crossing and drivers turning into the crosswalk (Cambridge Systematics, 2009).

The addition of a lead phase for pedestrians at signalized intersections provides a three-second head start when crossing the street. During the lead phase, pedestrians walk into the intersection before the green phase for the parallel vehicles begins, which gives pedestrians more time to cross and increases their visibility to drivers (Cambridge Systematics, 2009). Federal Highway Administration also lists it as a proven safety countermeasure (Federal Highway Administration, 2020). For intersections with high crossing volumes, an all-red pedestrian phase allows all pedestrian movements to occur at once. This strategy may be particularly useful at locations lacking crossing guards. However, implementing the treatment at only one of three adjacent signals leads to a confusing environment for drivers and pedestrians (Cambridge Systematics, 2009).

Signals at school crossings on state highways should be programmed to automatically activate pedestrian phases for both intersecting streets during morning and afternoon school times. Police officers should ensure that adequate crossing time for pedestrian volumes is provided at all signalized school crossings so that pedestrians can clear the crosswalk before the signal changes. If signal cycles timed to favor the movement of vehicles cause students to wait for long stretches, these students may become impatient and cross the street against the light. Limiting signal cycle lengths during school commute times responds to this concern (Cambridge Systematics, 2009).

Signage

The FHWA Manual of Uniform Traffic Control Devices provides guidance on appropriate signage in school zones, although the Manual does not prescribe placement of these signs. A study of sign saturation in school zones found that greater numbers of signs positively affect vehicle speed, driver compliance, and crash frequency. This study also found that speeding is more prevalent in the mornings and on weekends (Strawderman, et al, 2015).

Speed monitoring displays in school zones, especially those with text and flashing lights, are effective in both the short- and long-term.

Radar Feedback Speed Sign

Speed monitoring displays in school zones are effective in the short-term and long-term (Lee, Lee, Choi 2006; Ash & Saito, 2006; Jue and Jarzab, 2020). When drivers have had to stop at signalized intersections in a school zone, they resume driving at a faster speed than drivers who have not had to stop. A flashing speed check sign counteracts the effect of the interrupted travel. The most effective sign will include text and flashing lights (Bree et al., 2015).

School Zone Beacons

In school zones where drivers approach at slower speeds, the type of signage does not affect speed. However, where drivers approach at higher-rates of speed, flashing beacons show the only measurable decrease in speed. Sites with flashing beacons on speed limit signs have better compliance rates than those sites without flashing beacons. Rear-facing speed limit beacons effectively reduce speeding in long school zones or zones with intersections where motorists might forget they are in a restricted speed zone (Hamric, 2013). Flashing lights in combination with signs that have written text result in decreased speeding. Drivers sped when only flashing lights were visible, when only text was present, and when no sign was present (Gregory, et al., 2015; Kattan, Tay, Acharjee, 2011).

Rectangular Rapid Flash Beacons (RRFBs) are one of FHWA's Innovative Intersection Safety Treatments. FHWA notes that these treatments "show promise for improving safety, but comprehensive effectiveness evaluations have not been completed. RRFBs are amber LEDs that supplement warning signs at unsignalized intersections or mid-block crosswalks on either two-lane or multi-lane roadways. They can be activated by pedestrians manually by a push button or passively by a pedestrian detection system. RRFBs use an irregular flash pattern similar to emergency flashers on police vehicles (FHWA, 2014).

One study showed that installing a two-beacon system mounted on the warning sign on the right side of the crossing increased yielding from 18 to 81 percent; this increased to 88 percent with a four-beacon system on both sides of the crossing. Another study showed little to no decrease in driver compliance over one year (FHWA, 2014).

Pedestrian Hybrid Beacon

Pedestrian hybrid beacons (PHBs) are one of the FHWA's proven safety countermeasures because they have been shown to significantly reduce pedestrian crashes by assigning right of way and providing positive stop control. Appropriate for use at mid-block crossings or at uncontrolled intersections, PHBs reduce pedestrian crashes by 55 percent and total crashes by 29 percent. PHBs signal motorists to stop to enable pedestrians to cross the street. Motorist yielding to pedestrians at PHBs exceeds 90 percent (FHWA, 2019).

Pedestrian Hybrid Beacons can reduce pedestrian crashes by assigning right of way and providing positive stop control.

Enforcement

Speed Cameras

Local efforts to address school zone pedestrian and bicycle safety issues tend to focus on speeding and, at least in larger cities, are often motivated by broader Zero Death Initiatives that treat all traffic fatalities and severe injuries as preventable. Several cities have recently prioritized engineering and enforcement in school zones to improve pedestrian and bicycle safety. Many are using speed cameras, generally with operation limited to school travel times.

- New York City is using 300 speed cameras in 215 school zones and will add between 40 and 60 cameras each month through 2021. The number of crashes dropped by 15 percent from 2012 to 2016. Fatalities fell from an average of 18 in the three years before installation to an average of 8 for each year after installation, and severe injuries dropped by 17 percent. The cameras resulted in reduced speeding from an average of 104 violations each day in the first month of the installation to 51 violations each day at the end of the first year. Over 75 percent of vehicle owners fined did not receive a second violation. (Hu, 2019). New York City has set a 20 mph speed limit in school zones.
- Seattle has seen a 64 percent decrease in the average number of traffic violations for each speed camera each day. Ninety percent of the people who receive a citation do not receive a second citation. Average speeds in the school zone have decreased by four percent (Seattle Department of Transportation 2015).
- Savannah, Georgia, issues tickets during the first two weeks of school for speeding in school zones and has upgraded school zone flashing beacon signage to a connected Internet of Things (IOT)-based system for improved maintenance (Pyzyk 2018).
- Columbus, Ohio, is using emerging technology as part of its Connected Vehicle Environment project. In response to observations of over 80 percent of vehicles traveling over the school zone speed limit during active school zone hours, the city proposes installing roadside devices that would detect speeding vehicles and alert the driver to the reduced speed. The city also uses IOT-based beacons (Pyzyk 2018).
- Chicago, Illinois, uses enhanced signage and automated safety cameras to identify speeding drivers and issue tickets in Children's Safety Zones, designated as the area within a 1/8-mile radius of any school or park. A recent analysis comparing crashes before and after camera installation (2012-13 compared to 2014-16) reported that fatal or serious injury crashes decreased 9 percent near speed cameras compared to a 6 percent increase citywide. Crashes citywide increased by 21 percent but increased only 1 percent at automated speed enforcement locations (City of Chicago, 2018).

New Jersey is one of 13 states that prohibit the use of speed cameras, although some of these states allow for narrow exceptions. For example, New York allows the use of speed cameras in school zones only. The NJ 2020 Strategic Highway Safety Plan Pedestrians and Bicyclists Emphasis Area Strategy calls for assessing current practices nationally for automated speed enforcement in school and work zones and providing recommendations for automated speed enforcement in school and work zones, as well as for vulnerable road user laws.

Chicago's Children's Safety Zone Toolbox

In addition to automated safety cameras, Chicago uses the following strategies to improve safety in Children's Safety Zones:

- Pedestrian refuge islands
- Safety zone signage and street stencils
- High-visibility crosswalk markings
- Speed feedback signs
- Speed humps
- Traffic signal improvements
- Curb and ramp improvements
- Pedestrian countdown timers
- Lead pedestrian intervals
- In-street "Stop for Pedestrians" signs

Source: City of Chicago, 2018

FHWA Proven Safety Countermeasures

The FHWA Every Day Counts Safe Transportation for Every Pedestrian (STEP) initiative promotes safety countermeasures to reduce pedestrian crashes. FHWA has chosen these countermeasures based on their proven effectiveness and benefits. Table 1 lists the countermeasures and their benefits.

Road Diets, Pedestrian Refuge Islands, Pedestrian Hybrid Beacons (PHB), and Leading Pedestrian Intervals (LPI) are all considered Proven Safety Countermeasures by the Federal Highway Administration (FHWA). Crosswalk Visibility Enhancements (lighting and pavement markings) and Raised Crosswalks are promoted through FHWA's PEDSAFE (Pedestrian Safety Guide and Countermeasure Selection System).

Table 1: FHWA Proven Safety Countermeasures

FHWA Proven Safety Countermeasure	Description	Safety Benefits
Walkways	A walkway is any defined space or pathway for use by a person traveling by foot or using a wheelchair (pedestrian walkways, shared-use paths, sidewalks, or roadway shoulders). Well-designed pedestrian walkways improve the safety and mobility of pedestrians. In some rural or suburban areas, where these types of walkways are not feasible, roadway shoulders provide an area for pedestrians to walk next to the roadway. Transportation agencies should work towards incorporating pedestrian facilities into all roadway projects unless exceptional circumstances exist. It is important to provide and maintain accessible walkways along both sides of the road in urban areas, particularly near school zones and transit locations and where there is pedestrian activity. Walkable shoulders should also be considered along both sides of rural highways routinely used by pedestrians.	***Sidewalks:*** 65–89% reduction in crashes involving pedestrians walking along roadways ***Paved shoulders:*** 71% reduction in crashes involving pedestrians walking along roadways
Crosswalk Visibility Enhancements	This group of countermeasures includes improved lighting, advance or in-street warning signage, pavement markings, and geometric design elements. Such features may be used in combination to indicate optimal or preferred locations for people to cross and to help reinforce the driver requirement to yield the right-of-way to pedestrians at crossing locations. • High-visibility markings improve the visibility of the crosswalk compared to the standard parallel lines. • Parking restriction on the crosswalk approach improves sightlines for motorists and pedestrians. • Advance STOP or YIELD markings and signs reduce the threat of a multiple-threat crash. • Curb extension improves sight distance between drivers and pedestrians and narrows crossing distance. • Improved nighttime lighting to illuminate pedestrians. • In-street STOP or YIELD signs may increase driver yielding rates.	Can reduce crashes by 23–48%

Table 1: FHWA Proven Safety Countermeasures

FHWA Proven Safety Countermeasure	Description	Safety Benefits
Raised Crosswalk	Elevated crossings make the pedestrian more prominent in the driver's field of vision and allow pedestrians to cross at grade with the sidewalk. Approach ramps may reduce vehicle speed and improve motorist yielding.	Can reduce pedestrian crashes by 45%
Pedestrian Hybrid Beacon (PHB)	Addresses pedestrian-vehicle conflicts at mid-block crossings and unsignalized intersections where vehicle speed is often a factor. An intermediate option between an RRFB and a full pedestrian signal, PHBs assign right of way and provides positive stop control. Vehicles must stop but can then proceed after pedestrians are out of the roadway.	69% reduction in pedestrian crashes 29% reduction in total crashes 15% reduction in serious injury and fatal crashes
Pedestrian Crossing Island/Medians	A ***median*** is the area between opposing lanes of traffic, excluding turn lanes. They can be defined by pavement markings, raised medians, or islands to separate motorized and non-motorized road users. A ***pedestrian crossing island*** (or refuge area) is a raised island located between opposing traffic lanes at an intersection or midblock locations, which separate crossing pedestrians from motor vehicles. For pedestrians to safely cross a roadway, they must estimate vehicle speeds, adjust their walking speed, determine gaps in traffic, and predict vehicle paths. Installing raised medians or pedestrian crossing islands can help improve safety by simplifying these tasks and allowing pedestrians to cross one direction of traffic at a time. Transportation agencies should consider medians or pedestrian crossing islands in curbed sections of urban and suburban multi-lane roadways, particularly in areas with a significant mix of pedestrian and vehicle traffic and intermediate or high travel speeds.	***Raised median*** – 46% reduction in pedestrian crashes ***Pedestrian crossing island*** – 56% reduction in pedestrian crashes
Leading Pedestrian Interval	Allows pedestrians to enter an intersection 3-7 seconds before vehicles are given a green indication. With this head start, pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn left. LPIs provide the following benefits: • Increased visibility of crossing pedestrians. • Reduced conflicts between pedestrians and vehicles. • Increased likelihood of motorists yielding to pedestrians. • Enhanced safety for pedestrians who may be slower to start into the intersection.	60% reduction in pedestrian-vehicle crashes at intersections

Table 1: FHWA Proven Safety Countermeasures

FHWA Proven Safety Countermeasure	Description	Safety Benefits
Road Diet	Converts an existing four-lane undivided roadway to a three-lane roadway consisting of two through lanes and a center two-way left-turn lane. Benefits of Road Diet installations may include: • An overall crash reduction of 19 to 47 percent. • Reduction of rear-end and left-turn crashes due to the dedicated left-turn lane. • Reduced right-angle crashes as side street motorists cross three versus four travel lanes. • Fewer lanes for pedestrians to cross. • Opportunity to install pedestrian refuge islands, bicycle lanes, on-street parking, or transit stops. • Traffic calming and more consistent speeds. • A more community-focused, "Complete Streets" environment that better accommodates the needs of all road users.	4 to 3 lane conversion 19–47% reduction in total crashes
Road Safety Audit	RSAs are performed by a multidisciplinary team independent of the project. RSAs consider all road users, account for human factors and road user capabilities, are documented in a formal report, and require a formal response from the road owner. RSAs can be performed in any phase of project development, from planning through construction, and on any size project, from minor intersection and roadway retrofits to large-scale construction projects. Agencies are encouraged to conduct an RSA at the earliest stage possible, as all roadway design options and alternatives are being explored. RSAs provide the following benefits: • Reduced number and severity of crashes due to safer designs. • Reduced costs resulting from early identification and mitigation of safety issues before projects are built. • Improved awareness of safe design practices. • Increased opportunities to integrate multimodal safety strategies and proven safety countermeasures. • Expanded ability to consider human factors in all facets of design.	10–60% reduction in total crashes

New Jersey Implementation of Safety Improvements

Several pedestrian safety countermeasures have been implemented on New Jersey's roadways under the jurisdiction of the New Jersey Department of Transportation, and some examples can be found on roads under the jurisdiction of county or local agencies. Examples of the implementation of pedestrian safety countermeasures can be found in Table 2.

Table 2: Safety Countermeasures Installed on NJ State Roadways

Safety Countermeasure	Location Installed	Notes
NJ State Highway Examples		
Crosswalk Visibility Improvements	Willingboro - Route 130 and Levitt	
Pedestrian Crossing/ Refuge Islands	Atlantic City, Route 30 (Absecon Boulevard) and North Carolina Avenue	
Pedestrian Hybrid Beacons	Woodbridge - Route 27 and Magnolia	At Metropark https://www.state.nj.us/transportation/about/press/2012/053012.shtm
	Cinnaminson - Route 130	https://njbwc.org/empathy-and-equity-solving-the-route-130-pedestrian-crisis/
	Cherry Hill - Route 38	https://www.courierpostonline.com/story/news/2019/10/25/cherry-hill-fatal-hit-and-run-route-38-chestnut-street/2454240001/
	Morristown - Route 202 (Speedwell at Flager)	https://www.tapinto.net/towns/morristown/sections/community-life/articles/pedestrian-beacon-is-now-active-on-speedwell-avenue-at-flager-street-in-morristown On hold
	Ocean City - Ninth Street and Haven Avenue	https://patch.com/new-jersey/oceancity/hawk-traffic-signal-now-live-in-ocean-city

Table 2: Safety Countermeasures Installed on NJ State Roadways

Safety Countermeasure	Location Installed	Notes
Road Diets	Woodbury - Route 45	https://www.state.nj.us/transportation/works/njfit/route45.shtm
	Burlington City - Route 130	https://www.njdottechtransfer.net/2018/04/27/road-diets-making-roads-safer-new-jersey/
	Asbury Park - Route 71	https://www.state.nj.us/transportation/uploads/comm/news/details/comm_np_20200514_151345_Route_71_Main_Ave_nb_to_reopen_for_summer.pdf
Rectangular Rapid Flash Beacons	Elmwood Park and Fairlawn - Route 4 (Broadway Avenue)	http://www.pedbikesafe.org/pedsafe/casestudies_detail.cfm?CM_NUM=15&CS_NUM=100
Systematic at Stop-Controlled Intersections	None	
Road Safety Audits	Numerous	
County Road Examples		
Leading Pedestrian Intervals	Jersey City - CR 501 (Kennedy Blvd)	47 intersections https://www.nj.com/hudson/2016/11/new_traffic_timing_implemented_on_kennedy_boulevar.html
Road Safety Audit/ Pedestrian Hybrid Beacons	Washington Ave, Carlstadt, Bergen	

Table 2: Safety Countermeasures Installed on NJ State Roadways

Safety Countermeasure	Location Installed	Notes
Local Road – School Zone Examples		
Rectangular Rapid Flash Beacons	Hightstown - Rt. 33 and Grape Run Road, Mercer	
Pedestrian Hybrid Beacons	Seaside Heights - Rt. 35 MP 3.04 , Ocean	
	Middlesex - Rt. 28 and Lorraine, Middlesex	Designed, not installed
Local Road – Non-School-Related Examples		
Pedestrian Hybrid Beacons	Red Bank - Rt. 35NB and Pearl St, Monmouth	Designed, not installed
Other Examples		
Exclusive Pedestrian Phase	Princeton - Nassau Street/Washington Road/ Vandeventer Avenue	

Solar Powered Safety Signs

Several NJ communities have installed solar-powered signs, in some cases specifically to address issues in school zones.

Table 3: Solar-Powered Sign Installation by Municipalities

Safety Countermeasure	Location Installed	Notes
Local Road – School Zone Examples		
Speed Feedback Sign	Cinnaminson – New Albany Road	At Elementary School
	Atlantic City, Route 30 (Absecon Boulevard) and North Carolina Avenue	At Middle School
School Zone Speed Radar Sign	Hillsdale – Ruchman Road & Watson Place	https://www.hillsdalepolice.com/content/solar-trafficpedestrian-safety-initiative
Caution Lights	Newton – White Lake Road	Sussex County Technical School
Local Road – Non-School-Related Examples		
Speed Feedback Sign	Cinnaminson – Wynwood Dr	As deterrent, not for ticketing – looking for problem areas
	Cherry Hill	Multiple locations
Caution Lights	Newton – Mill Street	
	Newton – Main Street	Municipal Bldg, Park & Ride Lot
Pedestrian Crossing Signs	Hillsdale – Hillsdale Avenue & Yester Avenue	

Responses to Hazards in the School Zone

School Crossing Guards

Crossing guards assist students in crossing streets on their way to and from school. Until children are 9 or 10 years old, they lack the motor and cognitive skills needed to safely navigate traffic and cross streets. In situations where students need to cross traffic to access their school, they should cross at a designated crosswalk at which a crossing guard is posted. Crossing guards are not only recognized as beneficial to the safety of children at school crossings, but a lack of crossing guards can be a barrier to walking and biking to school (Cambridge Systematics, 2009: Eyler et al., 2008; Rothman et al., 2017; Stewart et al., 2012). In one study, the presence of crossing guards was associated with lower numbers of observed texting incidents among drivers (Rothman et al., 2017).

In general, New Jersey's municipal police departments hire, train, and supervise crossing guards to assist students on their way to and from school. With support from NJDOT, NJ Division of Highway Traffic Safety, NJMEL, and other partner organizations, the NJ Safe Routes Resource Center developed the NJ Crossing Guard Training and Resources Program to provide uniform statewide training for crossing guard supervisors and crossing guards. The Program approaches crossing guard safety and the safety of the students they cross, through an emphasis on equipment, training, supervision, and crossing guard post maintenance. Crossing guard training emphasizes the concepts of visibility, noticeability, and consistency.

Maintenance of crossing guard posts and other crossings in school zones supports safety for all pedestrians. The crossing guard's "office" is the roadway. Not only do they have to deal with traffic, but they cope with ice, snow, potholes, missing curb cuts, and other hazards that can contribute to injuries. In 2018, there were 20

Crossing guards are not only recognized as beneficial to the safety of children at school crossings, but a lack of crossing guards can be a barrier to walking and biking to school.

reported injuries, all due to slips, trips, and falls. In that year, median days away from work for crossing guards totaled 15, compared to 7 for all municipal occupations (NJ OSHA). For decades, median days away from work, which is a key measure of the severity of an injury or illness, has almost always been higher for crossing guards than for all local government occupations combined. Attention to conditions at crossing guard locations and regular maintenance can reduce workplace injuries. NJ Safe Routes staff promote the use of a post observation report form to help supervisors assess conditions at crossing guard posts and address hazards.

Distracted Driving and Observational Studies

The 2015 NSDDAB National Survey on Distracted Driving Attitudes and Behaviors compiled responses on attitudes and self-reported behaviors related to distracted driving, cell phone use, and texting. Survey participants were given a list of driving situations and asked if there were any situations in which they would never talk, text or e-mail, or use an app while driving. When asked about driving in marked school zones, only 1.3 percent of respondents said they would never talk on a cell phone, only 2.2 percent said they would never text or e-mail, and only 1.2 percent said they would never use apps (Schroeder, et al., 2015). A study conducted using cell phone data determined that afternoon dismissal time (2:00pm to 5:00pm) is 40 percent more dangerous than the morning arrival time (7:00am to 10:00am) (Zendrive, 2017).

Several school districts have conducted observational studies of driver, pedestrian, and bicyclist behavior in school zones, mostly related to distracted driving. Through a Safe Routes to School program at a middle school in Greenville, North Carolina, adult volunteers observed distracted driving behavior during student arrival and dismissal times. To reduce poor driving behaviors, the community took several measures to improve the walking and biking environment, including installing speed feedback signs at the school, creating a neighborhood speed watch program, and increased law enforcement before and after school. Speeding is quantifiable, but distracted driving is difficult to observe and enforce without photographic evidence of the behavior. However, following implementation of these measures, there was a reduction in the percentage of distracted drivers in the school zone from 20 percent to 17 percent (National Center for Safe Routes to School, n.d.).

In California, through the Friday Night Live program, high school students conducted a 2018 observational study at 88 intersections near high schools and middle schools in 30 counties throughout the state. The Friday Night Live program focuses on developing healthy lifestyles among youth. The observers reported an average of over 116 instances of distracted driving per intersection studied in one hour's time, a 7.5 percent increase over a similar survey in 2016. Distractions observed included phones, passengers, pets, grooming, eating, and drinking. Phone use was the predominant cause of distraction (Hansen, 2018). This program increases awareness among teenagers of the prevalence, and potential dangers, of distracted driving.

Observational tools used to record behavior can serve as examples for the development of a form for NJ communities. The Friday Night Live Roadwatch form is designed to record distractions on the part of drivers. The Minnesota Safe Routes to School Program has created a School Zone Hazard Observation Tool. The document includes forms to record hazardous behavior on the part of drivers, pedestrians, and bicyclists. The observational tools used in these programs are included in Appendix.

These efforts involve various community partners to raise awareness of school zone safety issues and respond to these challenges. If communities are planning to evaluate and address school zone issues, the National Center for Safe Routes to School recommends:

1. Measuring the current behavior – Observation of driver behavior
    - Observation should be conducted at arrival and dismissal because different behaviors may be observed at each time. More students are driven to school in the morning than are picked up in the afternoon.
2. Conducting activities to address the behavior
3. Repeating the observation and count of driver behavior as conducted after improvements are installed in Step 1.

Advocate for Lower Speed Limits Where Advisable

Municipalities throughout New Jersey are taking steps to limit speeds to improve pedestrian safety. Metuchen, NJ, has reduced the speed limit on all local roads to 25mph and has worked with the county to reduce the speed limit to 25 on county roads as well. NJDOT has agreed to reduce the speed limit on a section of Route 27, a state highway, to 25mph (Chang, 2020).

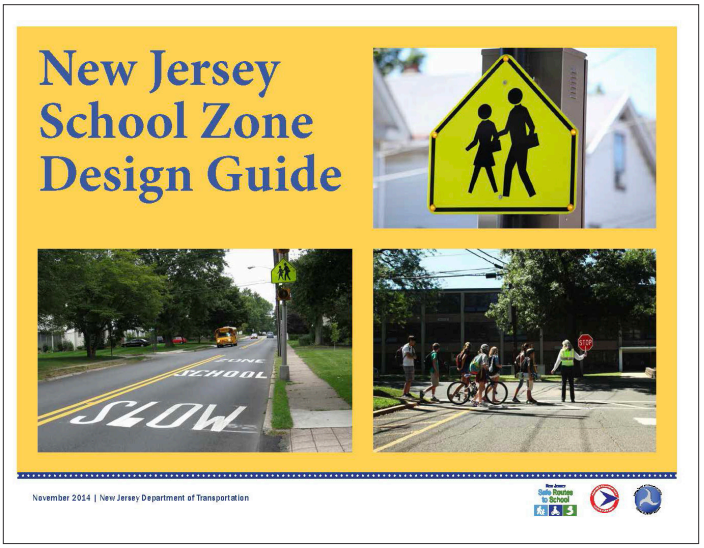
Hoboken's school zone speed limit is 15mph when flashing school zone speed limit signs are operating at the primary and elementary schools. The mayor is seeking to reduce speeds throughout the city to 20mph (Kuntzman, 2020).

These examples demonstrate the possibilities for communities throughout the State to improve pedestrian safety through reduced speed limits.

Next Steps

Moving forward with information gathered in this research effort, Rutgers proposes the following steps:

- Amend the NJ School Zone Design Guide to provide information on additional resources:
  - FHWA Proven Safety Countermeasures:
    - Crosswalk Visibility Enhancements – these are in the SZDG but are scattered. These strategies might be introduced under one heading and then referred to in other parts of the Guide
      - High visibility markings
      - Parking restrictions on the crosswalk approach
      - Advance STOP or YIELD markings and signs
      - Curb extensions
      - In-street STOP or YIELD signs
      - Improved nighttime lighting
    - Leading Pedestrian Intervals
    - Road Safety Audits
    - Road Diets
  - Driver behavior related to length of school zone
  - Lowering speed limits
  - NJ examples of pedestrian safety improvements
    - Conduct additional research on solar-powered safety signs and their efficacy, including case studies of NJ communities that currently utilize this technology



- Develop instructions and forms for conducting observational studies for distracted driving. As mentioned above, these studies raise awareness of the prevalence of distracted driving and provide a basis for educational efforts.
- Report on assessments related to implementation of STEP countermeasures on state, county, and municipal roadways. Follow up on examples provided by NJDOT to explore whether safety is improved.
- Analysis of pedestrian, bicycle, and/or other wheeled device crashes reported in school zones, as available. (Safe Routes Strategic Plan, 2020 Goal 5.3)

In addition to an updated School Zone Design Guide, provide resources that can be easily disseminated, such as pamphlets or videos, that demonstrate best practices and case studies in pedestrian safety improvements in school zones in New Jersey communities.

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