How Can We Better Evaluate Traffic Safety of Children in School Zones?

April 2025

New Jersey Safe Routes to School

RUTGERS–NEW BRUNSWICK
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Acknowledgement

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 can create safe, healthy, and appealing conditions 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.

This study was funded by the New Jersey Department of Transportation (NJDOT) with funding from the Federal Highway Administration (FHWA). We would like to thank Dr. Mohammad Jalayer and his students from Rowan University in New Jersey for aiding in providing the speed charts for a town in Northern New Jersey from the RITIS platform. We also thank Monika Pal for her help in gathering background information on SRTS.

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Executive Summary

Safe Routes to School (SRTS) is a national initiative designed to promote walking and bicycling to school while enhancing safety for these modes of travel. The program consistently recommends using the Student Arrival and Departure Travel Tally and Parent Travel Survey to evaluate the effectiveness of SRTS programs and projects based on shifts in travel modes. Although these surveys effectively gather information on student travel modes, they do not account for safety conditions and traffic hazards children may face during their journey, such as exposure to high-speed traffic, wide intersections, or other safety risks. In many communities, high walking rates may be driven by necessity rather than safety. Even with safety improvements, walking rates may not significantly increase in such areas. Furthermore, many schools that may actually experience a mode shift due to a project do not collect data on travel modes before and after implementing a project, reducing the Tally's effectiveness in evaluating interventions. Without data that considers safety conditions and traffic hazards, assessing the true impact of SRTS infrastructure projects can be challenging.

Speed studies are more effective assessment tool. We describe the mounting evidence that excessive speeds are responsible for non-motorist-involved fatal crashes and make recommendations for speed data collection methods. We analyze 48 New Jersey SRTS infrastructure grant proposals to investigate the prevalence of implemented traffic calming measures, finding just 5 (10%) traffic calming implementations. With the Safe System Approach in mind, we analyzed school zone infrastructure projects that received New Jersey SRTS federal funding in 2012 and 2014. The most common infrastructure project was sidewalk construction, which was present in 28 of the 48 (56%) projects. Among the five projects that had implemented traffic calming measures, one town implemented a raised intersection with resurfaced sidewalks and curbs. This measure forces drivers to slow down in order to get over the hump at the intersection, improving safety for children walking and bicycling to school by reducing the likelihood of conflicts and the severity of potential collisions with motor vehicles. We used retroactive speed data to analyze speed changes following the construction of a sidewalk—in the absence of traffic calming measures—adjacent to an elementary school in New Jersey and find that motor-vehicle speeds increased following the sidewalk implementation, potentially doubling the risk of fatality if involved in a crash.

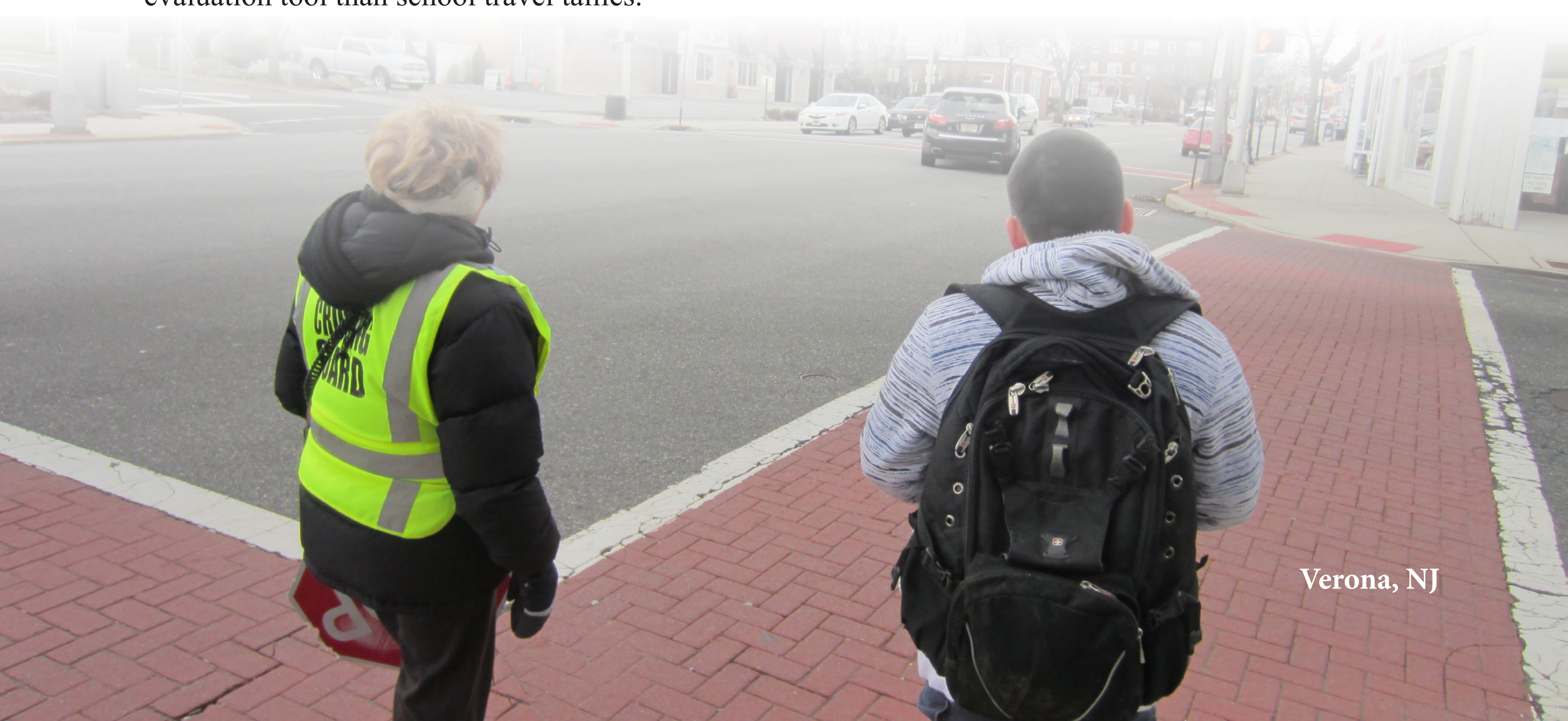
School zone safety improvements should incorporate the Safe System Approach, meaning that vehicle speeds must be addressed. Infrastructure improvements, such as sidewalk additions, should be coupled with traffic calming measures in order to improve safety. Active traffic calming, such as medians, narrow travel lanes, bike lanes, and road diets, as well as passive traffic calming, such as radar feedback signs, should be used concurrently in order to provide pedestrians and bicyclists with the greatest safety benefits. Such measures are in line with Vision Zero initiatives that aim to eliminate, not merely reduce, traffic deaths and serious injuries (Ecola et al., 2018). Because speed is of such importance to safety, SRTS projects constructed in and around school zones should include elements that slow drivers down and their effectiveness should be evaluated through speed studies in addition to, if not instead of, travel tallies and parent surveys.

1. Introduction

Efforts have been underway for nearly 20 years to make travel to schools safer and healthier for children through the national Safe Routes to School Program funded by the Federal Highway Administration. This is motivated partly by efforts to increase sustainable forms of transport (walking and bicycling) by making these modes safer for school travel. Since its inception in the 2005 Federal Transportation Authorization Bill, more than $1 billion in funding has gone to states to support infrastructure and non-infrastructure projects and initiatives. The initial programs have continued over the course of additional transportation authorization bills, though funded by money from the Transportation Alternatives program. As of 2015 all 50 states and the District of Columbia had adopted a Safe Routes to School (SRTS) program [1].

For as long as the SRTS program has been in place, the National Center for Safe Routes to School (National Center for Safe Routes to School) has recommended the use of a student arrival and departure travel tally or a parent travel survey before and after implementation of a project [2]. While such surveys can tell us about potential increases in walking and cycling and how parents perceive safety improvements, there are limitations in how student travel tallies are administered and what benefits they can offer. Problems include: 1) administering the survey places a burden on schools and on teachers, particularly in overburdened communities; 2) data collection may not be the most accurate as teachers are not trained in survey methodology; 3) there is often no evaluation of changes in travel after project completion, to the best of our knowledge travel tallies are rarely done a second time; 4) travel tallies themselves, which measure mode choice, may not be the best measure of improvements in safety; 5) mode choice is not as useful a metric in New Jersey urban areas where the majority of students walk to school, yet are not in safe conditions; and 6) infrastructure grants take upwards of 5-10 years to complete – after tally surveys can have a lot of other factors influencing walking/bicycling rates, e.g., new housing construction, closed and redistricted schools, increased number of charter schools. As for parent surveys, evidence from New Jersey has shown that low response rates severely undermine any benefits from administering the survey.

The Federal Highway Administration (FHWA) has adopted the Safe System Approach as the guiding paradigm to address roadway safety. Current evaluation methods are not sufficient to address safety in a holistic way. Our objective is to assess whether measuring motor-vehicle speeds could be a more effective evaluation tool than school travel tallies.



Verona, NJ

II. Speed and Transportation Safety

When implemented before and after project implementation, student arrival and dismissal travel tallies are designed to assess changes in the number of students walking or bicycling to school. However, these tallies do not provide information on actual traffic safety conditions during the school journey. Our objective is to both evaluate whether these tallies offer useful information regarding safety improvements and determine if there are other approaches that better measure impacts of infrastructure interventions. Speed often plays a significant role in motor-vehicle-related crashes. Higher motor-vehicle speeds increase the severity and risk of fatality, especially when crashes involve people walking and bicycling. We present a different concept, or paradigm, for evaluating Safe Routes to School initiatives, especially school zone traffic safety improvements. Backed by decades of research on the relationship between speeds and motor-vehicle injuries [3], we contend that reducing travel speeds on roads which are used to access a school (either by walking or bicycling) is critical for achieving both real reductions in casualties and encouraging more active travel to school, both key objectives of programs aimed at improving student health and safety.

Currently, the National Center for SRTS recommends gathering speed data "where speeding is problematic in school zones [4]." To determine whether speed is "problematic" typically requires a formative assessment. States typically defer to the National Center for SRTS for their evaluation guidelines. We are unaware of speed studies being widespread as a technique for assessing school-zone projects, suggesting this is a little-used assessment method.

SRTS infrastructure grants aim to make conditions safer for students walking and cycling. If parents and children perceive the built environment to be safer and more appealing, they will be more likely to walk or bicycle to school. Perceptions of safety are largely associated with how comfortable people feel walking or bicycling, irrespective of actual risk [5]. This is often associated with the speed of vehicles and whether there is sufficient buffer between the road and the sidewalk or bicycle facility. The ability to safely cross a street is another compenent of perceived risks. Many school districts may have students who use active modes of travel because their families do not own a car, particularly in overburdened communities. These students may have no choice but to walk even if conditions are less than ideal. Rural and suburban communities may have few students who are able to walk or bicycle to school, even if the built environment is favorable, but distance is a factor. Thus, walking and bicycling rates are not necessarily an indicator that road conditions in school zones are safe.

We assert that there are better measures to evaluate the effectiveness of SRTS infrastructure projects and focus particularly on the safety of pedestrians and bicyclists. Motor-vehicle speed is one of the major factors in pedestrian and bicyclist fatalities and injuries, and this may be a better way to assess safety improvements [6-9].

2.1 Literature and Descriptive Statistics

High motor-vehicle speeds are a major contributor to traffic fatalities. According to the National Safety Council (NSC), speeding contributed to 29% of all U.S. traffic fatalities in 2021, the third consecutive year with an increase in speeding related deaths [10]. A large body of literature has found that speeding and other traffic violations increase the risk of a crash being fatal for pedestrians [11-13] and for bicyclists [14-17], after controlling for other factors.

Moreover, higher posted speeds in general (regardless of speeding) are associated with a higher risk of a fatality [9]. In New Jersey, between 2015 and 2019 [18], 3% of bicycle and/or pedestrian-involved crashes were fatal. The posted speed limit for the road played a large role in fatality risk. Where the posted speed limit was 25 mph, 1.4% of bicycle and/or pedestrian crashes were fatal. In contrast, 15% of crashes were fatal where the posted speed limit was 50 mph, and 41% in zones where the speed limit was 60 mph or higher (**Table 1**). The posted speed limit is also strongly associated with the functional road class (i.e., interstate, arterials, collectors, and local roads). While roads immediately adjacent to a school often have a lower posted speed limit of 25 mph or lower, surrounding areas where students walk or cycle to school may not. Even with lower posted speed limits, speeding in school zones is a common complaint of parents and crossing guards [19].

Table 1: *Posted Speed Limit and Fatal Pedestrian/Bicyclist Crashes in New Jersey [18]*

Posted Speed Limit (mph)	Fatal Crashes (2015-2019)	Total Crashes (2015-2019)	% of crashes that are fatal
25	287	21,116	1.4%
30	35	1,199	3%
35	108	3,589	3%
40	93	1,716	5%
45	123	1,118	11%
50	143	968	15%
55	58	271	21%
>60	47	114	41%
Total	894	30,091	3%

Lower speeds have been documented as a predictor of students walking to school. Gustat et al. (2015) analyzed five school safety projects in various geographical settings in Louisiana and found that, after controlling for other factors, higher speeds were negatively associated with walking and cycling to school [20]. Decreased speeds can therefore not only improve safety outcomes for children, but are associated with increased walking to school, most likely because it is now considered safer. At least 30% of public schools in New Jersey are either directly on a collector road (26%) or an arterial road (4%), with the remainder on local/municipal roads [18]. Collectors and arterials have higher posted speed limits, have more traffic lanes, and have limited sidewalks. For schools located on local roads, students may still need to walk on or cross arterial and collector roads. Many municipalities rely on the 85th percentile rule for setting speed limits; that is, they wait to see how fast cars go and then set the speed limit at the 85th percentile of measured speeds. If the road is not designed for slower speeds, the speed limit will be set such that it is less safe for children [21].

Collision speeds are strongly correlated with the probability of a fatality. While 25 mph (40 kph) is a typical limit for school zones and local roads, lower speeds are safer (less than 20 mph or 32 kph) in order to avoid fatal and serious injuries [22, 23]. If struck by a motor vehicle traveling at a speed of 36 mph (58 kph) or higher, a pedestrian is usually fatally injured [24]. With that said, posted speed limits are not enough to ensure safe speeds in the case of a conflict. Traffic calming measures are of paramount importance because such measures are designed to slow speeds [24, 25].

2.2 Traffic Calming Measures

Evidence shows that traffic calming measures can be a viable tool to reduce traffic speeds and crashes [24]. The Institute of Transportation Engineers (ITE) and the FHWA have issued a comprehensive list of traffic calming measures [25]. Traffic calming measures are intended to slow vehicle speeds and consist of physical design and other measures to reduce vehicle speeds and improve safety for all road users. The ITE and FHWA describe four types of measures: vertical deflections, horizontal shifts, street width reduction, and routing restrictions. Vertical deflections include speed humps and similar physical changes to the road to slow traffic. Horizontal deflections include chicanes or any physical alteration that leads to a lateral shift in the road; this may include traffic circles or roundabouts. Street width reductions can both slow traffic and provide more physical space for pedestrians, including corner/bulb extensions and median islands. Routing restrictions may not reduce speeds but limits vehicle movements on local streets. Effective traffic calming strategies often include more than one measure, such as signage and active traffic calming [26].

Traffic calming measures improve safety by reducing speeds. Speed reduction through traffic calming may lead to important population health gains, as the burden of injuries from crashes is lessened for all users [27]. Evidence shows that traffic calming can also lead to increases in active travel and physical activity [28]. Brown et al. [27] conducted a scoping review of the literature on traffic calming and physical activity in children. Most of the studies used perceived safety improvements from self-reported surveys (either completed by parents or students) to detect changes in active travel. Much of the findings show that perceived road safety was positively associated with active travel [29-34]. Just two studies used self-reported longitudinal data, finding mixed associations between road environment and changes in active travel depending on age and gender of children [32, 35].

2.3 Suggested Speed Data Collection Methods

There are several methods for speed data collection. A report from the FHWA outlines some of the advantages and disadvantages of five speed collection devices: radar recorders, laser guns, radar guns, pneumatic road tubes, and stop watches [36, 37]. More recently, Stinson ITS, a traffic sensors and Intelligent Transportation Systems (ITS) manufacturer outlined speed collection devices, including radar and road tubes, as well as LiDAR and video-analytics [38].

We discuss two methods that make the most sense for systemic use to conduct speed studies for projects in and around school zones: radar (or LiDAR) guns or feedback signs and pneumatic road tubes. Radar is one of the most accurate methods for data collection, with around 95-99% accuracy [38]. Radar can be handheld guns or stationary signs, with the capability of showing drivers their speed. LiDAR functions similar to radar, with the caveat that it may not function as well in adverse weather conditions [38]. Radar and LiDAR equipment have long been used to gather operating speed data for various applications, such as assessing speed reductions after the implementation of a traffic calming measure [39], or to evaluate the posted speed limit for a road segment [21]. One potential disadvantage for an accurate assessment using radar and LiDAR is that drivers may see the equipment and reduce their speeds in response, though visibility of devices is a strategy for speed reduction. Radar feedback signs (**Figure 1**) are useful for controlling speeds as there is evidence that people slow down when seeing their own speed [39]. However, for a speed study, feedback should be turned off and signs should be set only to collect speed data. Additionally, some radar/LiDAR equipment may not reliably collect speed data on multi-lane roads [37].

Figure 1 *- Radar feedback sign in New Jersey school zone. Source: VTC.*

Pneumatic road tubes can be effective and have a high level of accuracy with the caveat that they should not be used in snowy conditions [38]. Road tubes can be quickly installed for permanent or temporary recording of data with low power usage, and require simple maintenance [40]. They can also collect bicycle count data for cyclists riding on top of the tube, offering potential insights for mode split [41]. A disadvantage, in addition to weather limitations, is the inaccurate axle counting when truck and bus volumes are high [36].

Costs with each of these measures will vary widely depending on whether equipment is available. Municipalities commonly use radar and pneumatic road tubes both to control speed and do traffic counts. Many municipalities, counties, and state agencies have access to this equipment, as well as radar feedback signs. Schools can potentially obtain this equipment to assess speeds both before and after a safety project. Pneumatic road tubes cost a few hundred dollars [42] while radar feedback signs cost around $2,500.

2.4 Framework for Evaluating Projects Using Speed Studies

When municipalities or other local public agencies apply for infrastructure grants, proposals often include the installation of a sidewalk, curb extensions, sidewalk improvements, traffic signal implementations, and improved lighting, among other safety changes. Champions, or those dedicated to leading infrastructure projects, should think critically about how their proposed projects will protect children and other vulnerable road users from excessive motor-vehicle speeds [43]. We propose the following as a framework (adapted from the National Center for Safe Routes to School's Safe Routes Info guide [2, 43] and the Seattle Department of Transportation Safe Routes to School Action Plan [44]):

BEFORE

- Identify opportunities for improvement that support safe and healthy travel for children..
- Review the guiding principles of FHWA Safe System Approach.
- Incorporate proper Traffic Calming measures and Proven Safety Countermeasures.
- Select a proper data collection method for speed, ensuring sustainable and unbiased data collection throughout the project.

DURING

- Conduct the program.
- Monitor progress by conducting a speed collection study during the program, if feasible.

AFTER

- Collect speed data using the same method as before the program was implemented.
- Interpret findings and use result for future research.
- Consider which aspectes of Safe System Approach have been met
- Continue to Moniter speeds and use data-driven processes to select and implement traffic calming tools.

Figure 2 *- Proposed framework for including speed studies in evaluating school zone improvements. Adapted from National Center for Safe Routes to School's Safe Routes info guide.*

Cherry Hill, NJ

III. Review of Completed Projects

We reviewed all 48 New Jersey SRTS projects that were awarded in 2012 and 2014. We selected these years because projects can take 8 to 10 years to be completed. In discussions with New Jersey Department of Transportation (NJDOT) and local municipality staff, and online assessment via google street view imagery, we found that 25 of the 48 projects had implemented school safety improvements, either partially or fully based on their application description. Among completed projects, infrastructure implementation took between three and ten years to complete, with an average of 6 years. The remaining 23 are still in the process of approvals for installation or rescinded as of this writing. We classified which ones sought to implement traffic calming measures in their initial plan.

The most commonly proposed infrastructure was sidewalk installation, present in 28 of the 48 (58%) projects. Sidewalk installation is not a traffic calming measure because it does not slow down the speeds of motor vehicles. Eight of the 48 proposed projects sought funding for traffic calming measures. Of the eight proposed projects, five completed their proposed installation of traffic calming measures (**Table 2**). Therefore, of all New Jersey municipalities that received SRTS funding in 2012 and 2014, 10.4% have so far led to improvements that might calm traffic or encouraged vehicle drivers to slow down. Towns A-E are projects that have completed their proposed plans. Towns F and G completed their projects but did not implement the proposed traffic calming measures. The funding for Town H was rescinded, meaning that they never completed any of the proposed measures using SRTS funds. **Figures 3 through 6** display the street view of two towns who implemented traffic calming measures. **Figures 3 and 5** show the streets before implementation while **Figures 4 and 6** show street view post implementation. In **Figure 4**, a raised intersection was implemented, forcing drivers to slow down when approaching the intersection. In **Figure 6**, there is a curb extension, which narrows the lane and provides a shorter path for crossing pedestrians. Lane narrowing in and of itself also slows down speeds, as recent research has shown [45].

Table 2 - *NJ SRTS projects that proposed traffic calming measures between 2012 and 2014*

	Year	**Full Description of Proposed Changes**	**Proposed Traffic Calming Measures**	**Implemented Traffic Calming Measures**
Traffic Calming Measures Implemented				
Town A	2012	Installation of raised crosswalks/intersection, reconstruction of curb ramps, sidewalk construction,	Raised crosswalk/ intersection	Raised intersection
Town B	2014	Curb extensions, curb ramps, sidewalk/crosswalk construction	Curb extension	Curb extension

	Year	Full Description of Proposed Changes	Proposed Traffic Calming Measures	Implemented Traffic Calming Measures
Town C	2014	Curb ramps, sidewalk/crosswalk construction, speed humps, line striping, pedestrian safety and directional signage	Speed humps	Speed humps
Town D	2012	Intersection bulb-out, raised crosswalks, speed humps, pedestrian-friendly crosswalk.	Bulb-out, raised crosswalks, speed humps	Speed hump and bulb out
Town E	2014	Textured pavement crosswalks, curb ramps with detectable warning surfaces, replacement of concrete curb and sidewalk, speed tables with required signage and bike rack	Speed table	Speed table
Project Partially Implemented (traffic calming measures not implemented)				
Town F	2012	Traffic light installation, sidewalk/crosswalk construction, reduced turn radii	Reduced turn radii	No traffic calming changes implemented
Town G	2014	Sidewalk and curb construction, line striping for bicycles	Line striping (lane narrowing)	No traffic calming changes implemented
Project Not Implemented (funding rescinded)				
Town H	2014	Bump-outs and raised textured intersection, curb ramps	Bump-outs, raised intersection	Not implemented (funding rescinded)

Figure 3 - *Before (2013) the raised intersection in Town A. (Source - Google Street View)*

Figure 4 - *After (2019) the raised intersection in Town A. (Source - Google Street View)*

Figure 5 *- Before (2017) curb extensions in Town B. (Source: Google Street View)*

Figure 6 *- After (2022) curb extensions in Town B. (Source: Google Street View)*

3.1 Speed Study Using Sensor-Based Retroactive Speed Data

Sidewalk construction was the most common school zone infrastructure proposed, based on New Jersey SRTS proposals from 2012 and 2014. We wanted to see whether a sidewalk had any measurable impact on motor-vehicle speeds. Because projects take several years to be implemented, we were limited to using available aggregated retroactive speed data. We conducted a retroactive speed study analysis for a sidewalk construction project in a small town in New Jersey for which aggregated speed data from RITIS was readily available. RITIS is a data aggregation and dessimination platform administered through the University of Maryland Center for Advanced Transportation Technology (CATT) laboratory and used widely by transportation agencies (https://ritis.org/intro). In this study, we use the Probe Data Analytics (PDA) Suite which enables us to use archived sensor-based data from HERE Technologies and INRIX [46].

In 2012, a town in northern New Jersey received funding to construct a sidewalk on the northbound side of a county road (minor arterial) connecting the elementary school to a neighborhood of single-family homes (**Figures 7 and 8**). The sidewalk was constructed in the spring of 2016 and is separated from northbound traffic by a painted shoulder. We used aggregated hourly average motor-vehicle speed data for 6 months before and after the construction of the sidewalk while school was in session (October 2015 – March 2016 and October 2016 – March 2017). We report the results for weekdays northbound versus weekdays southbound in **Figures 9 and 10**.

The sidewalk was constructed between along a county road between a US highway and a municipal road (0.6 mi/1 km). The speed limit along the county road is 40 mph (64 kph), and 25 mph (40 kph) for the school zone when school is in session (along which the sidewalk was built). The data provided by RITIS

***Figure** 7 - Before (2009) Example of a school zone before the construction of the sidewalk. (Source: Google Street View)*

Figure 8 *- After (2018) Example of a school zone after the construction of the sidewalk. (Source: Google Street View)*

provides aggregated speeds for the entire 1.8 mi (2.9 km) stretch of road, which is three times longer than the stretch of sidewalk that was built. This longer stretch provides less than ideal comparisons; nonetheless, our goal is to determine if there was a speed reduction for this stretch of road.

When examining the actual speeds, motor-vehicles traveled on average at a speed of 30-35 mph (48-56 kph) in both directions (**Figures 9 and 10**) before and after the sidewalk was built. This means that the average motor-vehicle exceeds the speed limit during school hours, when the speed limit is 25 mph (40 kph). Traffic speeds northbound, on the side on which the sidewalk was built saw an increase in speeds. Specifically, weekday 7 am - 9 am speeds were 3 to 4 mph (4.8 to 6.4 kph) higher after the sidewalk was constructed (**see Figures 9 and 10**). No sidewalk was built next to the southbound lane which had similar speeds both before and after the single sidewalk was constructed.

These 5 to 10 mph (8 to 16 kph) increases in speed above the posted speed limit (25 mph / 40 kph) double the risk of fatality in the case of a crash involving a pedestrian (**see Table 1**). While the sidewalk provides a safer path for pedestrians, there is no physical buffer from high-speed traffic and bicyclists are still at risk. Pedestrians crossing the street also have an increase in risk due to the higher vehicle speeds. In order to commit to zero traffic deaths, all aspects of safety must be addressed, meaning that sidewalks must be coupled with other proven safety countermeasures that reduce speeds of motor vehicles in areas where pedestrians and bicyclists are permitted [47].

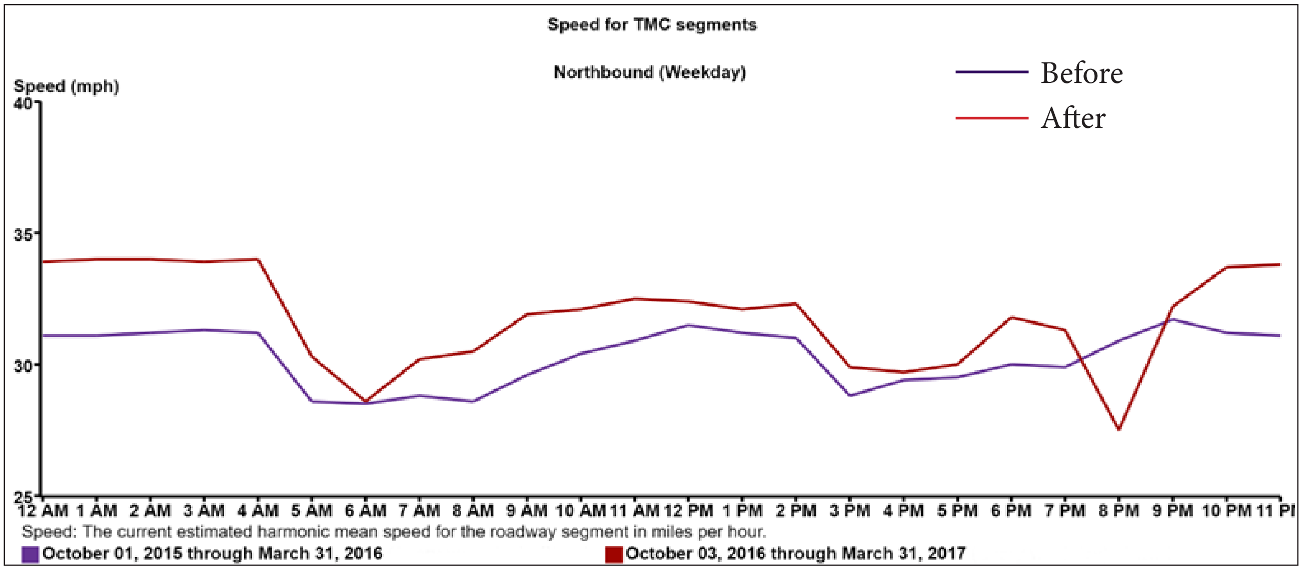


Figure 9 - *Example from the roadway in* ***Figures 7 and 8*** *showing the average speed of motor vehicles along the northbound lanes in the school zone. Purple is before sidewalk construction (**Figure** 7), Red is after sidewalk construction (**Figure 8**).[49]*

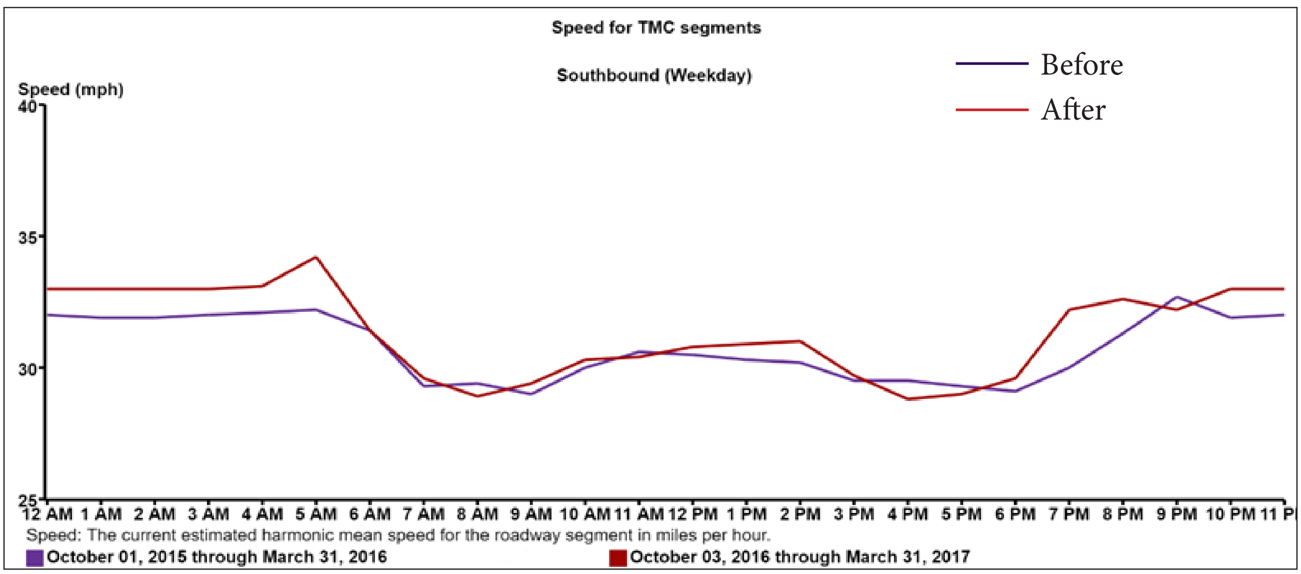


Figure 10 *-Example from the roadway in* ***Figures*** *7* ***and 8*** *showing the average speed of motor vehicles along the southbound lanes in the school zone. Purple is before sidewalk construction (**Figure** 7), Red is after sidewalk construction (**Figure 8**). [49]*

IV. Discussion

Infrastructure projects in school zones are intended to improve safety and/or increase active travel, especially by children. Collecting travel data via student tallies or parental surveys does not provide an adequate assessment of safety improvements, and often fails to provide useful counts of changes in active travel. We reviewed speed data collection methods, and focused specifically on pneumatic tubes and radar feedback signs. In the case of radar feedback signs, we emphasize that the digital speed display to the driver should be turned off during the study, as this may affect driver behavior. These can actually be used as a potential speed reduction measure [48].

We analyzed school zone infrastructure projects that received New Jersey SRTS federal funding in 2012 and 2014. Among the 48 projects, five had implemented traffic calming measures. The most common infrastructure project was sidewalk construction/implementation. While sidewalks are critical infrastructure for pedestrians, we wanted to see whether they helped to reduce vehicle speeds in the absence of traffic calming measures. We used a town in northern New Jersey as a case study, and found that sidewalk implementation was not associated with reductions in speed, and that the average speed was still 5-10 mph (8-16 kph) higher than the posted speed limit of 25 mph (40 kph) during school hours. Parents who have the choice to drive their children to school will likely continue to do so despite now having a sidewalk, simply because of the high speed of cars on this county road. The presence of sidewalks has been documented to decrease crash fatalities [9], but potential higher traffic speeds may offset such benefits. Evidence from Great Britain, for instance, shows that sidewalks are built to get pedestrians out of the street and enable faster vehicle flows [49]. Therefore, if these projects do not address the speeds of motor-vehicles, they do not adequately address safety issues. These issues are particularly important for communities where students have no alternative but to walk or bicycle to school, such as in lower income and minority areas. Low-income and minority individuals are more likely to die if involved in a crash [50], partly because they are more likely to walk and bicycle along higher speed roads with fewer pedestrian facilities, and thus, ensuring that projects reduce motor vehicle speeds is of paramount importance.

The FHWA has adopted the Safe System Approach as the guiding paradigm to address roadway safety. This approach recognizes that humans are vulnerable, that humans make mistakes, that safety should be proactive, and that death and serious injuries are unacceptable. Projects should therefore address safety from more than one angle and prioritize reductions in motor-vehicle speeds, which is one of the five principles of the Safe System Approach. Infrastructure improvements, such as sidewalk additions, should be coupled with traffic calming measures. Active traffic calming, such as medians and road diets, as well as passive traffic calming, such as radar feedback signs should be used concurrently in order to provide pedestrians with the largest safety benefits [26]. Such measures are in line with Vision Zero initiatives that aim to eliminate, not merely reduce, traffic deaths [51].

V. Conclusions

In 2022, the The U.S. Department of Transportation announced its vision for Roadway Safety, with a commitment to strive for zero roadway fatalities [52]. Projects seeking to improve the safety of road users must carefully consider how they impact those who may be most vulnerable, i.e., pedestrians, bicyclists, and children [4]. Infrastructure projects installed in school zones should aim to reduce speeds as one of their goals. We focused on the New Jersey SRTS program and called for a better evaluation method to assess the success of infrastructure projects. Historically, school arrival and departure travel mode split was often used to assess whether a project was successful. However, potential increases in active travel are not necessarily an indication of safer traffic conditions. We propose that speed studies are a better evaluation method, with the objective that speeds should decrease after the construction of projects installed in and around school zones. Radar feedback signs and pneumatic road tubes are likely the best and most cost-effective approaches for systemic data collection, in line with the Safe System Approach. Reduction in speeds are not only a proven safety countermeasure, but have been shown to increase pedestrian activity. Yet, only 5 of the 48 New Jersey SRTS projects that we analyzed had implemented traffic calming measures, aimed at reducing speeds. In our speed study example, we found that motor vehicle speeds increased after the completion of a project that involved the construction of a sidewalk on one side of a high-speed road. Sidewalk construction should be complemented with traffic calming measures in order to reduce traffic speeds. We conclude that speed studies should be a guiding paradigm to evaluate infrastructure safety projects.

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