



# How Can We Ensure Traffic Safety Funds Improve Safety? A Conversation with Transportation Engineering Professionals

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**RUTGERS-NEW BRUNSWICK**  
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**NEW JERSEY Safe Routes**



# Acknowledgements

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, equitable, 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.

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# I. Abstract

Traffic-related crashes are a leading cause of death among children in the United States. Improving children’s safety in school zones is an efficacious means of mitigating children’s injuries. Federal funding for pedestrian and bicycle infrastructure has increased, yet fatal traffic injuries are on the rise. How can we ensure that funded projects achieve safety goals? We analyzed projects that used federal transportation funds to see what sort of improvements were implemented. We found that just 10% of the 48 school zone infrastructure projects had implemented some traffic calming measure. With that, we sought to conduct focus groups with transportation engineering professionals who are in positions of implementing change. We presented case studies of infrastructure projects to elicit expert opinion on how to focus on protecting vulnerable populations most effectively during project development and implementation. While participants were knowledgeable of traffic calming measures and the Federal Highway Administration (FHWA)’s Proven Safety Countermeasures, there appeared to be a disconnect between theory and practice. Participants expressed that they often faced barriers to implementing safety countermeasures, whether political, structural, or financial. They emphasized the importance of crossing guards within school zones, noting that they would not feel comfortable allowing children to cross alone at most intersections. Participants urged the need for increased collaboration with and engagement of communities, schools, and elected officials during all aspects of school zone infrastructure improvements.

Keywords: School zones, Traffic safety, Traffic calming



## II. Introduction

Children are some of the most vulnerable road users (VRUs) due to their small stature and limited developmental capacity to perceive traffic threats (Cloutier et al., 2021). Reducing children's injuries in traffic crashes has become one of the critical safety concerns among traffic safety experts. Improving children's safety in school zones is an efficacious means of mitigating children's injuries. According to the National Highway Traffic Safety Administration (NHTSA), from 2011 to 2020, 1,009 fatal traffic crashes were categorized as school-transportation-related crashes, causing 1,125 deaths (NHTSA, 2022). Among these fatalities, 19 percent (218) were of school-age (18 and under). The location of schools has a major impact on a student's ability to walk and bike safely and affects parents' and students' perceptions of safety. National trends show more schools being built along busy roads and further away from homes. Minority and underserved children are disproportionately more likely to attend a school near a major roadway (Kingsley et al., 2014). Even in older areas without school siting issues, changes in traffic and development patterns have added additional challenges to school crossings that were once safer. Between the Safe System Approach (FHWA), the Federal Highway Administration's (FHWA) Proven Safety Countermeasures, the Manual on Uniform Traffic Control Devices (MUTCD) guidelines (MUTCD, 2009), the Safe Routes Partnership Engineering Solutions Guide (Safe Routes Partnership, 2021), and the National Association of City Transportation Officials (NACTO) design guides, there are many resources available to implement designs that protect VRUs. Additional state-specific guides, such as New Jersey's Complete Streets Design and School Zone Design Guides, are available for local practitioners ("NJ School Zone Design Guide. Chapter 7: Traffic Calming," 2014; NJDOT, 2017). It is still necessary, however, to connect these planning resources and their considerations to the engineers who design and implement road designs, especially where children need to cross the street and where crossing guards work.



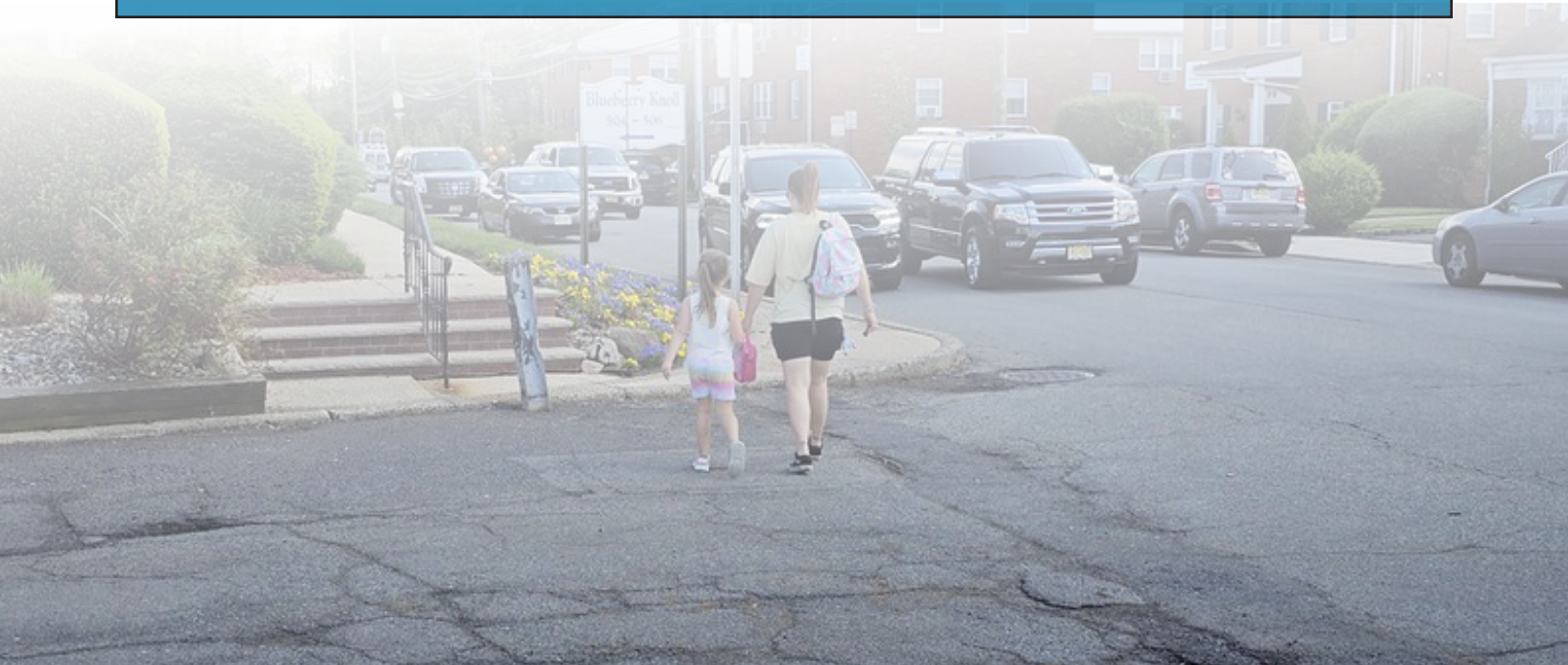
**Between 2011 and 2020, 19% of school-transportation-related crash fatalities were children under 18.**

In the United States, we are at a crossroads where fatal pedestrian and bicycle crashes continue to increase, and while the federal Infrastructure Investment and Jobs Act (IIJA) passed in 2021 still stands, future federal funding is uncertain, including for grant programs via the Transportation Alternatives Program (TAP aka TASA) ("H.R.3684 - Infrastructure Investment and Jobs Act," 2021). TAP has historically been spent on on- and off-road bicycle facilities, streetscape improvements for pedestrians, and Safe Routes to School (SRTS) infrastructure. In addition, several newly created federal funding sources, including the Safe Streets and Roads for All Program (SS4A) (USDOT), specifically aim to eliminate roadway deaths and serious injuries.

State Department of Transportations (DOTs) should spend traffic safety grant money wisely on projects that lead to real reductions in traffic deaths. However, if traffic safety construction does not address speeds, visibility, and other elements that make it challenging for people to walk and bike safely, zero death goals will not be met (Younes et al., 2023). Is there a disconnect between these best practices and the infrastructure that gets implemented in school zones? Infrastructure projects designed to prioritize pedestrian safety have not always reduced speeding, even in school zones. To fully embrace vision zero goals, infrastructure that serves VRU needs to be prioritized over motor vehicle speeds. This requires adequate and complete data, increased training for engineering and transportation professionals, and proper evaluation methods (e.g., before and after speed studies).

We conducted focus groups, i.e., in-depth small group interview-style sessions, to elicit the opinions of transportation engineering professionals on how to focus on protecting vulnerable populations most effectively during project development and implementation. With the goal of eliminating fatalities and serious injuries from traffic crashes, we want to understand the perceptions of transportation engineers who are in positions of implementing change. The value of this work lies in the insights and takeaways uncovered during our conversations, in which we identify barriers to and gaps in implementation and transportation policies. The following topics were addressed:

1. What is their knowledge of the FHWA Safe System Approach?
2. What factors increase the likelihood of pedestrian and bicycle fatalities and injuries?
3. What type of infrastructure should be implemented to slow down motor vehicle speeds?
4. What is their experience implementing infrastructure in school zones that address safety for vulnerable road users?
5. What is needed in school zones to decrease and eliminate traffic fatalities and serious injuries?



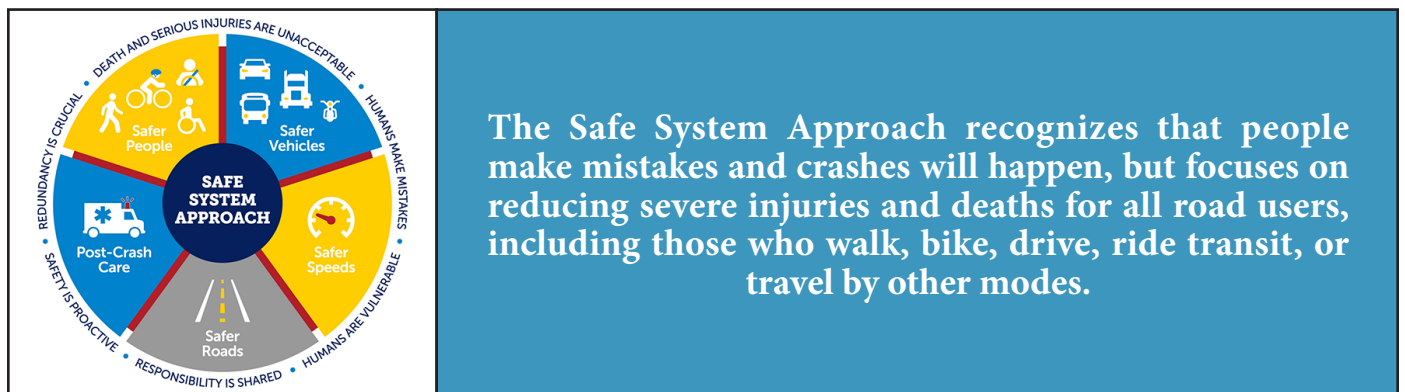
# III. Literature review

## Engineering training

An emerging body of literature seeks to examine the nature of course content and training that students receive while completing an undergraduate degree in transportation engineering. Transportation engineering constitutes a required portion of the civil engineering curriculum at over 75% of undergraduate civil engineering programs in the United States (Agrawal & Dill, 2008; Russell & Stouffer, 2005; Turochy, 2006). A survey of transportation engineering professors was administered in 2004 and 2011, with the aim of finding the most important topics for inclusion in an introductory transportation engineering course, which is typically taken in the third year of a civil engineering undergraduate curriculum. In 2004, the topics that topped the list were geometric design of highways and highway capacity (Turochy, 2006). Traffic safety was also gaining interest compared to a 1984 survey. In 2011, the top of the list consisted of: geometric design of highways, description of transportation systems, highway capacity studies, traffic control devices, and transportation planning. Traffic safety and pedestrian/bicycle issues ranked 8th and 15th, respectively, in the list of 34 topics to be covered in an introductory course (Turochy, 2013). Bicycle and pedestrian modes of travel, as a topic, increased in priority for inclusion from 27th in 2004 to 15th in 2011 (Turochy, 2013). The substantial increase in the ranks of non-motor-vehicle transportation may be evidence of an increasing recognition of the importance of alternatives to private vehicle transportation. Nonetheless, this implies that only early career transportation professionals (i.e., who graduated in the last 10 years) may have a more multi-modal transportation engineering education. The bulk of transportation engineering professionals currently in the field had an education that more heavily focused on highway design and capacity.

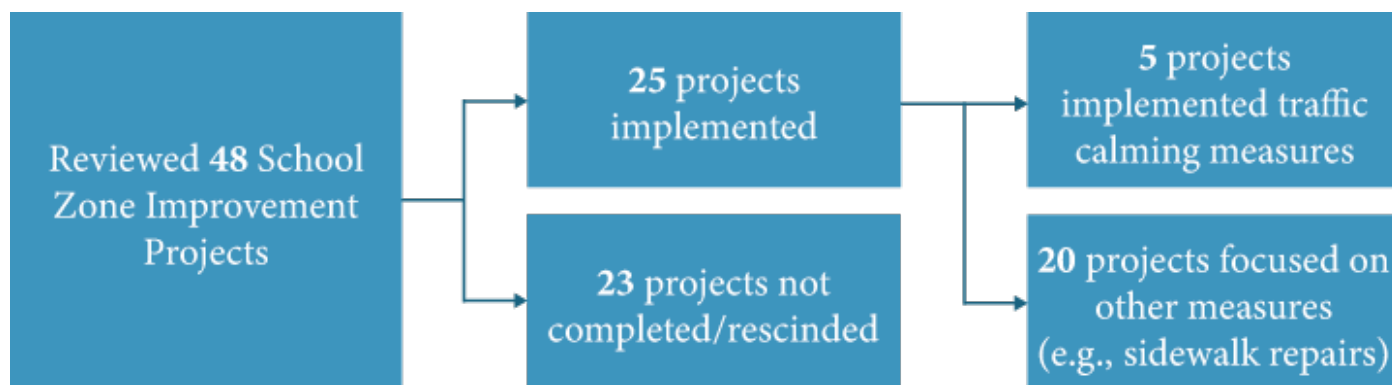
## Safe System Approach

The U.S. DOT has adopted a Safe System Approach as the guiding paradigm to address roadway safety (USDOT, 2022). In 2022, the federal government released the National Roadway Safety Strategy, a comprehensive approach to significantly reducing traffic-related serious injuries and fatalities. The Safe System Approach recognizes that people make mistakes and embraces resiliency and redundancy in the transportation system to keep the risks of mistakes less severe. Through this human-centered approach with a focus on redundancy, when a mistake does lead to a crash, safe systems lessen the severe impacts on the human body. So, crashes will happen, but they are less likely to result in severe injuries or deaths. A crucial element of the Safe System Approach is that the safety of all road users must be equitably addressed, including those who walk, bike, drive, ride transit, or travel by other modes. Addressing roadway safety through the Safe System Approach helps to ensure greater attention is placed on the needs of these vulnerable road users who are outside of motor vehicles and are more likely to be severely injured or killed in a crash.



## Methods

We reviewed all 48 school zone improvement projects that received Safe Routes to School funding in New Jersey in 2012 and 2014. These years were selected because projects can take upwards of 10 years to complete. Based on our conversations with NJDOT personnel, reading news articles and town hall meeting notes, and street view imagery, we found evidence that around half (25) of the projects had been implemented. The remaining half had either not been completed yet or had rescinded their funds. We analyzed the 25 projects that had been implemented to see the nature of the improvement described and implemented. Five of the 25 projects implemented traffic calming measures. The remaining ones focused mainly on sidewalk repair and implementation. While sidewalk infrastructure is necessary, sidewalks are not sufficient to protect a pedestrian in the case of a crash. Unless adding the sidewalk narrows travel lanes, sidewalks do not slow down the speed of motor vehicles; evidence shows the opposite (Ishaque & Noland, 2006). Infrastructure improvements work best when a Safe System Approach is followed, and multiple improvements are implemented together to eliminate road fatalities.



We employ a qualitative research approach—focus groups—to further understand the perceptions of transportation engineering professionals in positions to implement change. The benefits of such an approach are that we can identify issues, challenges, and solutions not captured through quantitative methods and expose more nuances in people’s responses (Roberts et al., 2021). It can also effectively highlight the unique experiences of transportation engineering professionals and expose “unknown unknowns,” or topics that the authors would not expect to discuss (Ralph & White, 2024). A drawback with such an approach is that it requires a longer time commitment than a survey, and only professionals with the time and/or desire to participate will be captured (Roberts et al., 2021).

A focus group protocol and a semi-structured discussion guide were developed in accordance with established methodology (Krueger, 1997; Simons et al., 2014). Our focus group questions focus on general traffic calming measures and the safe system approach, and then delve into case studies. We aimed to include case studies that were broadly representative of anywhere in the nation, and included urban, suburban, and rural school zone examples. We use a sample of the 10 projects that implemented school zone safety improvements throughout New Jersey. We asked transportation engineering professionals to critically assess relevant projects to obtain their opinion about what was done and what they might have done differently, whether the projects address safety issues, and whether they will bring us closer to eliminating traffic fatalities. This study was approved by the Rutgers University Institutional Review Board (IRB), and participation in these focus groups was fully voluntary. Results are anonymized such that no one can be identified.

We recruited transportation engineering professionals at two main events:



The New Jersey Society of Municipal Engineers quarterly meetings



The New Jersey TransAction 2024 Conference

Our participants consisted of professional consultant engineers, in-house municipal engineers, and/or other professionals who have a direct role in implementing traffic safety improvements. Participation was voluntary, and participants were not given any financial incentive to participate. We held three focus groups (one in-person and two virtual) with between 3 and 7 participants in each (16 people total) during the months of May, June, and July 2024. All focus groups were conducted in English and lasted approximately 60 to 90 minutes.

Focus group interviews were transcribed and reviewed using inductive coding, a well-established qualitative method in which researchers start by meticulously reviewing one observation (or focus group interview in this case) and come to recognize themes and patterns as they systematically incorporate additional observations (Ralph & White, 2024). Focus groups were held until saturation was reached, i.e., all questions had been thoroughly explored in detail, and no new concepts or themes emerged in subsequent interviews (Simons et al., 2014).



## IV. Results and Focus Group Discussion

### ***Background: Vulnerable road users and safe routes***

The first part of the focus group consisted of a discussion on how to prevent bicycle and pedestrian fatalities. These questions were intended to set the stage for the case studies. In principle, the expectation is that school zone safety improvements will have elements that decrease the likelihood of pedestrian and bicycle fatalities.

Transportation engineering professionals were asked the following:

#### **Q1) What are the factors that decrease the likelihood of pedestrian fatalities and injuries?**

Participants could easily list the factors decreasing the likelihood of pedestrian fatalities and injuries, including FHWA Proven Safety Countermeasures. Vehicle speed was highlighted as a leading factor, which is in line with the US DOT Safe System Approach.

*“[Addressing] vehicle speeds. Crashes are caused by the transfer of kinetic energy. If you reduce the speed, you reduce the likelihood of crashes and severity.”*

(Focus Group [FG] 1, Professional Engineer [PE] 1)

Participants also discussed traffic calming measures, sidewalk availability, roadway geometry, speed enforcement, increasing visibility and lighting, landscaping, as well as decreasing crossing distance (i.e., using curb extensions). In all, there was an impression that our participants were aware of the factors influencing traffic fatalities. There was, nonetheless, a focus on low-cost measures, such as high-visibility paint/markings and flashing signage. Traffic calming measures, such as raised intersections, were also listed, although not as prominently.

Participants also felt like they perhaps lacked control over the factors leading to pedestrian injuries and fatalities. There was an implication that travelers put themselves in unsafe situations regardless of roadway design, i.e., that drivers have traffic violations, and that sidewalks are not always utilized by pedestrians.

*“Well, the biggest one, us engineers have no control over. That’s driver’s behavior.”*

(FG3, PE1)

*“It’s pedestrian behavior as well as motorist behavior. Since the pandemic, I think we’ve all experienced a lot more pedestrians choosing the road over sidewalks. We spend a lot of money on having a walkable community, but if the pedestrians choose to walk in the road, it’s difficult for the motorists to see them.”*

(FG3, PE2)

*“These e-scooters and e-bikes, and what not, they're zipping in and out around schools. These kids just don't have care in the world. And it's causing issues. It doesn't seem like there's a lot of enforcement for those.”*

(FG1, PE2)

**Q2) What are the factors that decrease the likelihood of bicycle fatalities and injuries?**

For the most part, participants were quick to point to protected bicycling infrastructure, such as protected bike lanes.

*“I think, and we all know this, that we get increased protection when the bicycle lane is protected.”*

(FG2, Municipal Engineer [ME] 1)

They also discussed lane design, including having narrower lanes, fewer lanes, and one-way streets. Reducing speed limits was also cited as a way to reduce the likelihood of bicycle fatalities. Public education campaigns on how to use e-bikes and e-scooters were also listed as factors decreasing injury risk.

Other participants appeared not to have thought about bicycle safety in their town. It was not an apparent concern, and the use of a bicycle was downplayed, with two participants stating that children simply did not use bicycles in their towns, particularly because they were more rural and suburban. The towns range between 20,000 and 50,000 in population, and thus, it is likely that a proportion of children do bicycle, whether to school or in their neighborhood. Research has shown that rural towns are less likely to have bicycle and walking infrastructure and that children are more likely to have higher obesity levels (Safe Routes Partnership, 2015).



*“I know no school that has any bicycle parking, so we have no children using bikes to get to school that I’m aware of. We don’t have any dedicated bike lanes at this point [in our town]. We encourage them to be off the street, you know, but you don’t want them on the sidewalk either. That’s something to be addressed going forward.”*

(FG2, ME2)

*“I’m in a rural town, so I don’t see students riding their bike to school.”*

(FG2, ME3)

**Q3) What is needed in school zones in order to decrease and eliminate traffic fatalities and serious injuries?**

We then narrowed the conversation topic to focus on school zone safety. In addition to the measures mentioned in the first two questions, the participants discussed the importance of crossing guards, improving signage, adding crosswalks, and prohibiting parking near crosswalks. The need to decrease speed was also reinforced.

In particular, one participant discussed the benefits of introducing plastic delineators near crosswalks to increase the visibility of pedestrians crossing and prevent cars from parking and obstructing the view. They mentioned that the bollards are low-cost and that they are easily replaceable when damaged. They emphasized that the cost needed to maintain these bollards is minimal in comparison to the costs of a life lost.

*“New Jersey’s Title 39 law prohibits cars from parking within 25 ft of a crosswalk. How do you keep that clear beyond police enforcement? In our town, we installed flexible plastic delineators near crosswalks, so people don’t park near the crosswalk.”*

(FG2, ME1)



## Presentation of Case Studies

We covered ten case studies that underwent recent school zone improvements across the state of New Jersey. We aimed to include a wide variety of improvement measures, including traffic calming, sidewalk construction, and signal implementation. The participants were shown a Google Street View image of the area before the implementation of the school zone project, and asked a series of questions regarding their perception of children's safety and what recommendations they had for the area. They were not given any information on what was to be done, and instead were asked to brainstorm ideas for what they would consider the biggest improvements for youth safety. They were also given no restrictions on funding, allowing them to hypothesize with no constraint. They were then shown a Google Street View image of the area after the implementation of the project, and asked to reflect on the safety improvements that had occurred. In this paper, we discuss the first three case studies that we presented, which covered the bulk of our focus group discussions.

We asked participants about the average speed of vehicles based on the geometric design of the roads, and about whether they would feel comfortable allowing an 8-year-old child to walk, cross, or bicycle in each presented case study. While children of all ages walk to school alone, particularly in lower-income and urban areas, we chose 8-year-olds in the wording of our question in light of the "8 80 Cities" non-profit organization. 8 80 Cities' guiding principle is that "if everything we do in our cities is great for an 8-year-old and an 80-year-old, then it will be better for all people" (About Us). With that, there is subjectivity to the answer, which we aimed to capture with our qualitative focus group approach.

### Case Study I

The first case study was of one of the few examples of a town that had implemented traffic calming measures. The intersection, situated one block (600 feet) from a public elementary school, is a three-way intersection with one traffic stop (Figure 1). It accommodates a New Jersey Public Transit bus stop. The improvement included a raised intersection, reconstruction of American Disability Act (ADA) ramps, and the installation of vibro-tactile buttons at crossings.

#### **Q1) Would you let an 8-year-old child cross the road here?**

Walking and bicycling to school make up a modest but consequential proportion of school travel modes, especially in lower-income and urban areas. Research shows that elementary school-aged children who receive free lunch are more likely to walk to school (Su et al., 2013). Resoundingly, participants responded that they would not let an 8-year-old child cross, walk, or bicycle on this road.

***"Not without a crossing guard."***

(FG2, ME2)

#### **Q2) Do you think that cars drive 25 miles per hour (mph) here?**

The school zone speed limit in New Jersey is typically 25 mph during school arrival and dismissal times. Motor vehicles are expected to drive 25 mph during school hours and while children are present, regardless of the posted speed limit. Participants agreed, nonetheless, that drivers are probably not going 25 mph in Case Study 1. They cited the width of the road, as well as the (lack of) street curvature, saying that the road is made for high speeds.

### Q3) What concerns do you have and how would you improve this intersection?

Participants were given an opportunity to describe the changes they would make to the intersection in Case Study 1, devoid of any financial or right-of-way restrictions. Generally, they mentioned increasing the visibility of the road, using high-visibility crosswalk markings and rectangular rapid flashing beacons (RRFBs), narrowing the road lanes, widening the sidewalks, adding painted curb extensions, and adding a pedestrian refuge island for the longer crossing. It was also mentioned that the position of the bus stop may obstruct the crosswalk when people are crossing, and to move it to the further end of the crosswalk. Participants expressed concerns about costlier traffic measures and the challenges they would face with stormwater management, snow plowing, and emergency services. They also stated that adding a stop sign would not be effective, people would just ignore it, and it would create a false sense of safety for pedestrians.



Figure 1: Case Study 1 before the treatment was implemented (2013)

A similar set of questions were asked once we showed the “after” picture (Figure 2). Participants were pleased to see the raised intersection as a traffic improvement. Not seen in this image is the bus stop, which was moved a few feet behind the camera's view. Participants were more likely to allow a child to cross the road, but many were still hesitant to do so. They were not completely convinced that speeds are reduced to 25 mph, and instead that drivers “slow down at the intersection and speed up right after.” There was a discussion about whether the markings were correct to delineate the raised intersection.

*“I [still] don't necessarily think I'd let [children] bike in the street. I'd encourage them to bike on the sidewalk.”*

(FG3, ME1)

*“I think visual cues and the raised intersection will encourage drivers to slow down, but, you know, with the way people drive nowadays, I wouldn't trust them anyway.”*

(FG2, ME2)

Others were impressed by the changes. The raised intersection forces vehicles to slow down at the intersection, while the change in center line to accommodate the bus stop pad narrows the road lanes. One participant argued that, even without the vertical deflection, the simple change in surface color for the crossing and bus stop will slow down vehicle speeds because these are visuals that drivers don't usually see.

*“That's a pretty radical change, too, to move the center line.”*

(FG3, ME2)

They would have liked to see an additional crosswalk on the further side of the intersection. They also expressed concern about the bushes obstructing the driveway to the right, the bus stopping prior to the crosswalk, and the potential for children to be hit. These last two points, however, involve other stakeholders (i.e., transit agency, property owners).



Figure 2: Case Study 1 after the treatment was implemented (2019)

## Case Study II

The second case study consisted of a traffic light installation adjacent to an elementary school and a church (Figure 3). The road is in a suburban setting and has one lane in each direction with a speed limit of 25 mph. Out of the 48 case studies we reviewed, this was the only one that included a signalized traffic light implementation. Traffic lights are not traffic calming measures. According to the FHWA, installing a signal at a school crossing can eliminate the barrier created by a busy and wide intersection that pedestrians find difficult to cross safely (Chandler et al., 2013).

When presented with the picture of the intersection prior to safety improvements, participants generally felt that drivers likely drive fast, and they would not feel comfortable letting a child walk or cross along the main street alone. They pointed out that the crosswalk was not ADA-compliant and “looked like an afterthought.” Some of the recommendations included: a roundabout, bump-outs, pinched lanes, four-way stops, and increasing visibility.



Figure 3: Case Study 2 before the treatment was implemented (2012)

When presented with the post-implementation image, participants had mixed feelings about whether signalization was the best safety improvement (Figure 4). They appreciated the no-turn-on-red signs, the pedestrian push buttons, and the added crosswalk to improve safety. They were also surprised that warrants for a signal were met. When asked if they thought drivers were going 25 mph after the implementation of the signal, one participant stated that “people may be trying to beat the signal,” thereby exceeding the speed limit.

*“I question if the signal was really needed there. A four-way stop would’ve been much safer.”*

(FG1, PE1)

*“It met the warrants for a signal? Or wait, [maybe] the mayor really wanted a traffic signal there.”*

(FG3, PE1)

*“I would’ve still liked to see encroachment and daylighting here. [more] Traffic calming.”*

(FG2, ME1)

There were more participants willing to allow a child to cross the street alone, although a few participants would require a crossing guard. They also suggested that the traffic light makes the intersection more complex for children.

*“I’m not sure if I would let an 8-year-old bike here. With the traffic light, I mean, it depends how responsible kids are.”*

(FG2, ME2)

*“I would let a child cross here, as long as they understood the signal.”*

(FG3, ME1)

The worries expressed by the participants are generally backed by research. Signalized traffic intersections are not always warranted, and do not necessarily lead to safer conditions. For instance, a study showed that roundabouts may be more effective at improving safety (Gross et al., 2013). The study analyzed 28 signalized intersections that were converted to roundabouts and found that both injury and fatal crashes were reduced in the presence of roundabouts (Gross et al., 2013).



Figure 4: Case Study 2 after the treatment was implemented (2019)

## Case Study III

The last case study displays a more common example of school zone safety improvements that we observed when reviewing school zone infrastructure projects. Over half of the New Jersey SRTS projects from 2012 and 2014 included sidewalk implementation and repair. In this case study, there is one lane in each direction, and the speed limit is set at 25 mph. This case study includes sidewalk repair and curbing near an elementary school (Figure 5).

### Q1) Do you think that cars drive 25 mph here?

Participants immediately noticed the conditions of the road pavement (Figure 5). They commented poor condition of the pavement may slow drivers. Others commented that the lack of a centerline encourages speeding because it looks as if there are no lane markings.

*“This one, you got a fighting chance of going under the speed limit. The road is in such bad condition right there.”*

(FG3, PE1)

*“Cars will probably go slower because of how bad the pavement looks and feels.”*

(FG2, ME1)

Participants were not generally comfortable letting a child cross this road due to the lack of pedestrian facilities. They recommended striping and signage to increase visibility, adding a crosswalk, improving pavement conditions and curbing, and implementing sidewalks on both sides of the streets. Just one participant from the three focus groups voiced that bike lanes should be included in the design. We noticed at that point that the tone of the conversation had changed. Participants did not focus as much on traffic calming and reducing speeds (i.e., adopting a Safe System Approach), as they had in the previous two case studies, but rather focused at providing basic road design features.

*“Anything is an improvement over what’s here.”*

(FG2, ME2)



Figure 5: Case Study 3 before the treatment was implemented (2007)

When presented with the image post-implementation (Figure 6), participants were generally not pleased with the improvements. They did not feel the infrastructure improvements provided any safer conditions for a child to walk, bicycle, or cross the road. They thought that travel speeds would have increased due to the improvement of the pavement conditions, which does not improve pedestrian safety. They pointed to the missing crosswalk on one side of the road and the lack of sidewalk for children living in homes on the right-hand side. They had mixed feelings about the tree removal; on one hand it improved visibility, but on the other, trees can calm traffic (Kennedy et al., 2005; Wolf & Bratton, 2006).

*“So, this means that an 8-year-old coming from the neighborhood on the right is always in the roadway.”*

(FG3, PE2)

*“It’s odd, there’s no bike lane.”*

(FG3, PE1)

*“Not even a center line marking down this road.”*

(FG3, ME1)

*“Yeah, so [drivers] can wander all over the road like it’s a 25-foot-wide one-way street.”*

(FG3, PE2)

This last case study is a more appropriate representation of what we observed when analyzing implemented school zone projects, compared to the first two case studies presented, which were exceptions. Infrastructure improvements in the school zones studied did not typically result in reducing motor vehicle speeds or conditions that led to safer walking or bicycling environments for children.



Figure 6: Case Study 3 after the treatment was implemented (2018)

*“This isn’t a great improvement here. It’s better as far as the road’s concerned, not as far as the pedestrian’s concerned.”*

(FG2, ME2)

## **Reflection and Final Thoughts**

We presented several other case studies to our participants, as time permitted, but these first three took up most of the time that we had allotted. We received helpful feedback regarding some other traffic improvements. Participants thought that roundabouts, curb extensions with planters, and delineated bicycle lanes were effective measures to enhance the safety of pedestrians and bicyclists. However, they voiced concerns that such bigger measures can trigger backlash from political leaders and communities reliant on personal vehicles, which appeared to be an ongoing challenge that transportation engineers face. They felt that sometimes the smaller projects that did not involve reducing motor vehicle speeds were a good first step.

*“It doesn’t have to be perfect. It can just be good and start moving the needle and getting it, say, a little bit safer.”*

(FG3, PE1)

*“Yeah, for sure. Better is still better.”*

(FG3, ME2)

We asked our participants what recommendations they had for working with engineers and municipal officials to ensure slower motor vehicle speeds are addressed in school zones. Participants suggested:

- Working with public works departments from the beginning, especially in projects involving vertical deflection, where plow operators would need to know proper procedures for snow removal.
- Reaching out to elected officials to generate support for school zone safety improvements that focus on Vulnerable Road Users.
- Communicating with school administrators and parents to understand their needs and concerns.
- Finding safety designs that better achieve slower speeds.
- Conducting post-project evaluations, such as speed studies and vehicle volume measurements, and potentially evaluating near misses.

They also pointed to several guides and resources that they rely on for traffic safety improvements, including NACTO guides, New Jersey’s School Zone Design Guide, and FHWA’s Rural Design Guide and Proven Safety Countermeasures, and workshops/conferences through the New Jersey Society of Municipal Engineers, the New Jersey League of Municipalities, and the New Jersey TransAction conference.

## V. Results and Focus Group Discussion

In this study, we sought to elicit the expert opinion of transportation engineering professionals in positions of implementing infrastructure changes. We presented case study examples of implemented school zone safety improvements that utilized federal funding. The focus groups were an effective qualitative approach to explore this topic, exposing the nuance, the unknowns, and the intricacies of the design and implementation process. Moreover, the before-and-after case study format proved to be an effective method for discussing school zone safety, with participants eager to explore infrastructure designs that address vulnerable road users. These case study examples generated the most interaction among participants, who were keen to brainstorm potential infrastructure improvements during the "before" examples and excited to see the results in the "after" photos. This approach emerged as a successful method for education about safety and infrastructure improvements. Much like the popularity of home renovation shows, this method can be used to generate enthusiasm and surprise at the predicted versus final project outcomes, which can be engaging for engineers and other decision-makers like elected officials. This approach can be part of routine training and education for stakeholders in school zone safety projects, including elected officials. We discuss and conclude with some takeaways for policy, planning, and practice.

### **1) Road design does not match the posted speed limit in school zones.**

School zones are vulnerable corridors for children, especially during arrival and dismissal times. School zone speed limits differ from state to state, but are usually between 15 and 25 mph in most of the United States (FHWA, 2017). With that said, the speed limit for school hours does not always match the road design—especially when the regulatory posted speed is set much higher. Transportation engineers agreed that roads were generally too wide and proposed low-cost measures such as paint and striping to visually narrow the lanes in school zones.

### **2) Crossing guards are indispensable.**

Participants consistently emphasized the importance of crossing guards. They repeatedly said that they would not feel comfortable letting a child walk without a crossing guard. The issue with this narrative is that crossing guards are only present during school arrival and dismissal times, limited to specific intersections, and generally to K-8 schools. Children who have extracurricular activities, attend before and after care programs, or go to the school playground or ballfields after school hours will not have a crossing guard available to help ensure their safety.

### **3) Transportation engineers face barriers from other stakeholders, including political leaders, public works, emergency medical services, and communities.**

Engineers face numerous barriers throughout school zone safety improvement processes. Throughout our conversations, challenges with other stakeholders surfaced. Namely, the departments of public works, in charge of stormwater management, maintenance, and snow plowing, were one of the most common considerations for implementing a traffic improvement. Emergency Medical Services were also considered, particularly in the conversation of speed humps. Political and communal support is necessary in order for a project to receive approvals. Participants pointed to increasing education about traffic engineering for elected officials. Lastly, statutes prevent engineers from implementing proven safety traffic countermeasures, as traffic calming is typically restricted by roadway volume and speed.

**4) There are policies that can be confusing and internal pressures to avoid vertical deflection measures.**

Vertical deflection measures, such as speed humps and raised crosswalks or intersections, create changes in roadway height that compel drivers to slow down. Although participants agreed these measures should be implemented more often, especially in school zones, they identified challenges in collaborating with municipal elected officials, staff, and agencies, citing concerns about increased response times for emergency services and complications for snow removal. Additionally, for higher traffic volume roads, they felt that current design guides and statutes effectively discourage implementation.

*“Things like vertical deflection in the roadway, those are extremely limited by statutes based on roadway volume. That’s a policy that doesn’t make sense today.”*

(FG1, PE1)

**5) Daycare centers and preschools are still absent from the conversation about safety for children and parents walking or bicycling to these facilities.**

While not the focus of these focus groups, participants expressed that school zone safety for children under age 5 was generally absent from the conversation. There are child education establishments that are excluded from the conversation. This topic was beyond the scope of this study, and we include this as a takeaway for consideration in further research.

*“I’ve certainly seen preschools without anything, parents running across the street with their kids and, there’s no drop off zone or anything like that.”*

(FG1, PE6)

*“A parent got hit in the crosswalk right outside of [my child’s] preschool. It happens, and they’re not really captured, right? They don’t have crossing guards; they don’t have some of the low hanging fruit options for safety. They don’t [even] have school zone signs.”*

(FG1, PE1)

**6) Transportation engineering professionals had a hard time not considering costs in their solutions, despite our telling them that they had unlimited funds and that the scenarios were hypothetical.**

While participants were able to articulate interventions to improve school zone safety for pedestrians and bicyclists during discussions on best practice infrastructure improvements, some participants defaulted to more common, less bold designs when applying that knowledge to case study examples. These participants primarily focused on signage and striping, frequently citing barriers to implementation such as limitations posed by annual average daily traffic (AADT) and support from elected officials. Similarly, participants concentrated on low-cost interventions despite being told they had unlimited funds and that the case study scenarios were hypothetical. This focus on low-cost improvements could hinder engineers from proposing more involved safety infrastructure, like vertical deflectors and curb extensions.

*“We really do try to do low-cost improvements. And we try to keep our plow operators happy at the same time.”*

(FG2, ME3)

## **7) There is a mismatch with the FHWA's Safe System Approach.**

When discussing which interventions should be implemented in the case study locations, some participants seemed unconvinced that slowing speeds should always be a priority, reflecting a disconnect with the Safe System Approach tenet that the safety of all road users must be equitably addressed. Some participants questioned whether children even walk in these areas, overlooking that some students have no choice but to walk or bicycle to access their school, or that safer conditions could encourage more walking or bicycling. Each case study site was located in a school zone, adjacent to school property. Even in districts where walking and bicycling are not the main modes of transportation, some students still walk or bike to and from school daily. This is especially true for families with limited vehicle access and parental availability during arrival and dismissal. Additionally, schools often serve as community hubs, meaning children and other community members regularly walk or bike to and around these schools. Children who do not walk or bike to school daily might still do so for activities such as sports practice, social events, or recreational play. To improve bicycle and pedestrian safety in school zones, emphasis should be placed on the needs of children walking to school for any reason, implementing interventions that not only make them safer but also make walking or biking more appealing for other children and community members.

## **8) Lastly, is federal money being well-spent?**

There is room for improvement. It is undeniable that vehicle speed is a critical component of pedestrian safety, yet infrastructure installed in school zones to protect children does not always result in safer speeds. This raises concerns about whether federal grant money is being effectively spent on infrastructure that addresses the safety of children and all vulnerable roadway users.

Moving forward, implementing a process with better checks and balances can ensure that proposed projects include speed reduction measures and that installed infrastructure effectively reduces motor vehicle speeds. Post-project evaluations can further refine which projects have the greatest safety impacts. This will be essential to achieving the FHWA's Safe System Approach vision and national roadway safety goals.

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