Executive Summary: Health Impact Review of HB 1256

Increasing monetary penalties for the unlawful use of a personal electronic device while driving a motor vehicle in a school, playground, or crosswalk speed zone (2019 Legislative Session)

Evidence indicates that HB 1256 has the potential to decrease distracted driving and increase revenue for the School Zone Safety Account, which in turn have the potential to reduce injuries and fatalities among pedestrians and bicyclists within school, playground, and crosswalk speed zones. There is no evidence to indicate how provisions may affect populations that experience inequities in pedestrian and bicyclist injuries and fatalities.

BILL INFORMATION

Sponsors: Lovick, Irwin, Valdez, Orwall, Kloba, Sells, Slatter, Riccelli, Gregerson, Ortiz-Self, Kilduff, Mead, Doglio, Goodman, Dolan, Peterson, Stonier, Reeves, Appleton

Summary of Bill:

- Increases the financial penalty of operating a motor vehicle while using a wireless communications device to two times the penalty amount under RCW 46.63.110 when it occurs within a school, playground, or crosswalk speed zone created under RCW 46.61.400.
- Requires 50% of the moneys collected under this subsection to be deposited into the school zone safety account RCW 46.61.440.

HEALTH IMPACT REVIEW

Summary of Findings:
This Health Impact Review found the following evidence regarding the provisions in HB 1256:

Pathway 1: Double financial penalties

- There is a fair amount of evidence that increasing the financial penalty for operating a motor vehicle while using a wireless communications device within a school zone would likely decrease distracted driving.
- Strong evidence that decreasing distracted driving would likely reduce injuries and fatalities among people who walk and bike in school zones.

Pathway 2: School Zone Safety Account

This review makes the informed assumption that requiring that 50% of the moneys collected be deposited into the School Zone Safety Account would result in increased safety and enforcement equipment, traffic safety design treatments (e.g., flashing beacons), and bicycle/pedestrian education programs in Washington State school zones. This informed assumption is based on discussions with staff at the Washington Traffic Safety Commission (WTSC).

- There is a fair amount of evidence that increasing safety and enforcement equipment, traffic safety treatments, and programs in school zones would likely reduce injuries and fatalities among people who walk and bike in school zones.
- There is no available evidence that provisions would disproportionately affect, positively or negatively, the populations that experience inequities in pedestrian and bicyclist injuries and fatalities.

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Health Impact Review of HB 1256

Increasing monetary penalties for the unlawful use of a personal electronic device while driving a motor vehicle in a school, playground, or crosswalk speed zone (2019 Legislative Session)

January 28, 2019

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Introduction and Methods

A Health Impact Review is an analysis of how a proposed legislative or budgetary change will likely impact health and health disparities in Washington State (RCW 43.20.285). For the purpose of this review 'health disparities' have been defined as the differences in disease, death, and other adverse health conditions that exist between populations (RCW 43.20.270). This document provides summaries of the evidence analyzed by State Board of Health staff during the Health Impact Review of House Bill 1256 (HB 1256).

Staff analyzed the content of HB 1256 and created a logic model depicting possible pathways leading from the provisions of the bill to health outcomes. We consulted with experts and contacted key informants about the provisions and potential impacts of the bill. We conducted an objective review of published literature for each pathway using databases including PubMed, Google Scholar, and University of Washington Libraries. More information about key informants and detailed methods are available upon request.

The following pages provide a detailed analysis of the bill including the logic model, summaries of evidence, and annotated references. The logic model is presented both in text and through a flowchart (Figure 1). The logic model includes information on the strength-of-evidence for each relationship. The strength-of-evidence has been defined using the following criteria:

- **Not well researched:** the review of literature yielded few if any studies or only yielded studies that were poorly designed or executed or had high risk of bias.
- **A fair amount of evidence:** the review of literature yielded several studies supporting the association, but a large body of evidence was not established; or the review yielded a large body of evidence but findings were inconsistent with only a slightly larger percentage of the studies supporting the association; or the research did not incorporate the most robust study designs or execution or had a higher than average risk of bias.
- **Strong evidence:** the review of literature yielded a large body of evidence on the relationship (a vast majority of which supported the association) but the body of evidence did contain some contradictory findings or studies that did not incorporate the most robust study designs or execution or had a higher than average risk of bias; or there were too few studies to reach the rigor of "very strong evidence;" or some combination of these.
- **Very strong evidence:** the review of literature yielded a very large body of robust evidence supporting the association with few if any contradictory findings. The evidence indicates that the scientific community largely accepts the existence of the association.

This review was subject to time constraints, which influenced the scope of work for this review. The annotated references are only a representation of the evidence and provide examples of current research. In some cases only a few review articles or meta-analyses are referenced. One article may cite or provide analysis of dozens of other articles. Therefore the number of references included in the bibliography does not necessarily reflect the strength-of-evidence. In addition, some articles provide evidence for more than one research question, so are referenced multiple times.

Analysis of HB 1256 and the Scientific Evidence

Summary of relevant background information

- In 2017, the Washington State Legislature modified the infraction of and penalties for distracted driving (Chapter 224, Laws of 2017).
    - Effective July 23, 2017, "a person who uses a personal electronic device while driving a motor vehicle on a public highway is guilty of a traffic infraction. The first violation of the infraction carries a base penalty of $48 and a total penalty of $136. Second and subsequent violations of this infraction double the base penalty to $96, resulting in a total penalty of approximately $235."[1]
    - Uses is defined as "holding a personal electronic device in either hand; using your hand or finger to compose, send, read, view, access, browse, transmit, save, or retrieve email, text messages, instant messages, photographs, or other electronic data; and watching video on a personal electronic device."[1] The minimal use of a finger to activate, deactivate, or initiate a function of a device is not precluded.[1]
    - The state law supersedes local laws regulating the use of wireless devices in motor vehicles.[1]
- Funds deposited into the School Zone Safety (SZS) Account may be used only by the Washington Traffic Safety Commission (WTSC) "solely to fund projects in local communities to improve school zone safety, pupil transportation safety, and student safety in school bus loading and unloading areas."[2]
    - The SZS Account finances the WTSC small law enforcement grants, school zone crossing guard grants, and School Walk Improvement Program.
    - During the 2017-2019 biennium, WTSC allocated $80,000 to law enforcement grants, $45,000 to school zone crossing guard grants, and $500,000 to fund ten projects through the School Walk Improvement Program.[3]

Summary of HB 1256

- Increases the financial penalty of operating a motor vehicle while using a wireless communications device to two times the penalty amount under RCW 46.63.110 when it occurs within a school, playground, or crosswalk speed zone created under RCW 46.61.400.
- Requires 50% of the moneys collected under this subsection to be deposited into the school zone safety account created under RCW 46.61.440.

Health impact of HB 1256

Evidence indicates that HB 1256 has the potential to decrease distracted driving and increase revenue for the School Zone Safety Account, which in turn have the potential to reduce injuries and fatalities among pedestrians and bicyclists within school, playground, and crosswalk speed zones. There is no evidence to indicate how provisions may affect populations that experience inequities in pedestrian and bicyclist injuries and fatalities.

Pathway to health impacts
The potential pathways leading from the provisions of HB 1256 to decreased health disparities are depicted in Figure 1.

Pathway 1: Double financial penalties
There is a fair amount of evidence that increasing the financial penalty for operating a motor vehicle while using a wireless communications device within a school zone would likely decrease distracted driving.[4-7] Strong evidence that decreasing distracted driving would likely reduce injuries and fatalities among people who walk and bike in school zones.[8-18]

Pathway 2: School Zone Safety Account
This review makes the informed assumption that requiring that 50% of the moneys collected be deposited into the School Zone Safety Account would result in increased safety and enforcement equipment, traffic safety design treatments (e.g., flashing beacons), and bicycle/pedestrian education programs in Washington State school zones.[3,17,19,20] This informed assumption is based on discussions with staff at the Washington Traffic Safety Commission (WTSC). There is a fair amount of evidence that increasing safety and enforcement equipment, traffic safety treatments, and programs in school zones would likely reduce injuries and fatalities among people who walk and bike in school zones.[17,19,21-24]

Finally, there is no available evidence that the provisions in HB 1256 would disproportionately affect, positively or negatively, the populations that experience inequities in pedestrian and bicyclist injuries and fatalities.

Due to time limitations, we only researched the most direct connections between the provisions of the bill and decreased health inequities and did not explore the evidence for all possible pathways.

Magnitude of impact
Analysts could not identify data on injuries and fatalities in school zones due to distracted driving. However, this section provides data on: distracted driving citations overall; collisions, including those with injuries and fatalities due to distracted driving; information on pedestrian/bicycle fatalities in Washington; and data on how children in Washington travel to school.

The Washington State Administrative Office of the Courts' (AOC) data warehouse does not have a useful category for violation location (AOC, personal communication, January 2019). Therefore, analysts were unable to determine how many citations have been issued to drivers for using a personal electronic device while driving in a school zone. Table 1, presents the number of citations law enforcement officers have issued to drivers for using a personal electronic device while driving (RCWs 46.20.075.4, 46.61.672.1, and 46.61.672.4) since modifications to the infraction of and penalties for distracted driving took effect (AOC, personal communication, January 2019). From July 23, 2017 (effective date) through early January 2019 (data requested), law enforcement officers have cited 28 people with intermediate licenses using a wireless device and 40,517 people for using a personal electronic device while driving (AOC, personal communication, January 2019). It is likely that these numbers underestimate the number of

people stopped by law enforcement officers for driving while using a device as the first few months of implementation likely included officers educating drivers about the new law.

Table 1. Counts of citations related to driving while using a personal electronic device, 2017-2019 (Administrative Office of the Courts)

Statute	RCW 46.20.075.4	RCW 46.61.672.1	RCW 46.61.672.4	
Infraction	Intermediate license use wireless device (number of citations)	Personal electronic device while driving (number of citations)	2nd/subsequent offense (number of citations)	TOTAL
2017*	11	5,278	7	5,296
2018	15	33,790	98	33,903
2019**	2	1,449	6	1,457
TOTAL	28	40,517	111	40,656

* The number of citations reflects those written from July 23, 2017 (when Chapter 224, Laws of 2017 took effect) through December 31, 2017.
** The number of citations reflects those written and processed before the data request was filled January 24, 2019.

Data from the Washington Traffic Safety Commission (WTSC) show that in 2017 there were 12,142 collisions that were due to distracted drivers and of these, 835 were from a driver operating some form of electronic device (WTSC, personal communication, January 2019). Together, these collisions where a personal electronic device was a distraction account for 8 fatal collisions, 13 serious injury collisions, 299 minor injury collisions, 503 collisions with no injury, and 12 collisions with an unknown injury (WTSC, personal communication, January 2019). It is likely that these numbers are an underestimate of the actual impact that distracted driving has on injuries and fatalities because there is not always a standard way to report distraction on police collision reports and many drivers are reluctant to disclose that information.[25] However, it can be estimated that some proportion of these distracted driving accidents and the resulting injuries and fatalities may be prevented by this legislation, although the actual numbers are unknown.

Due to the limited time to complete this review, analysts were unable to identify school zone specific injury and fatality data for Washington State. Therefore, we have presented publicly available state level data generally. According to data from the Washington Fatal Accident Reporting System (FARS), a pedestrian died in a traffic-related crash every three days in Washington State in 2017.[17] The Cooper Jones Bicyclist Safety Advisory Council reported that 51 people died while riding bicycles on Washington State roads during the past four years, averaging more than one fatality each month.[18]

The Washington State Student Travel survey is a study of how children, kindergarten through 8th grade, get to and from school and possible barriers to walking, biking, or riding the bus. The Washington State Departments of Transportation (WSDOT) and Health (DOH) developed the survey with support from the Office of Superintendent of Public Instruction (OSPI). The most

recent survey, conducted in 2016, included phone interviews with over 11,000 parents and guardians of students from more than 200 schools across Washington State.[17] Results show that, "[b]etween 2014 and 2016, there was a significant increase in the percentage of children walking (16.4%) and biking (56%) to school."[17] Additionally, "[a] greater percentage of students from lower-income schools (17.4%) than from higher-income schools (14.9%) reportedly walked from home to school."[17] Furthermore, "[a] greater percentage of students living in urban areas (18.2%), compared to rural areas (11.2%), walked from home to school."[17]

While these data provide some indication of the extent to which distracted driving is being cited and the number of collisions due to distracted driving, they likely underestimate the prevalence and effects of using personal electronic devices while driving. We were not able to identify specific data about how many injuries and fatalities occur to drivers, pedestrians, and bicyclists due to distracted driving in school zones.

Logic Model

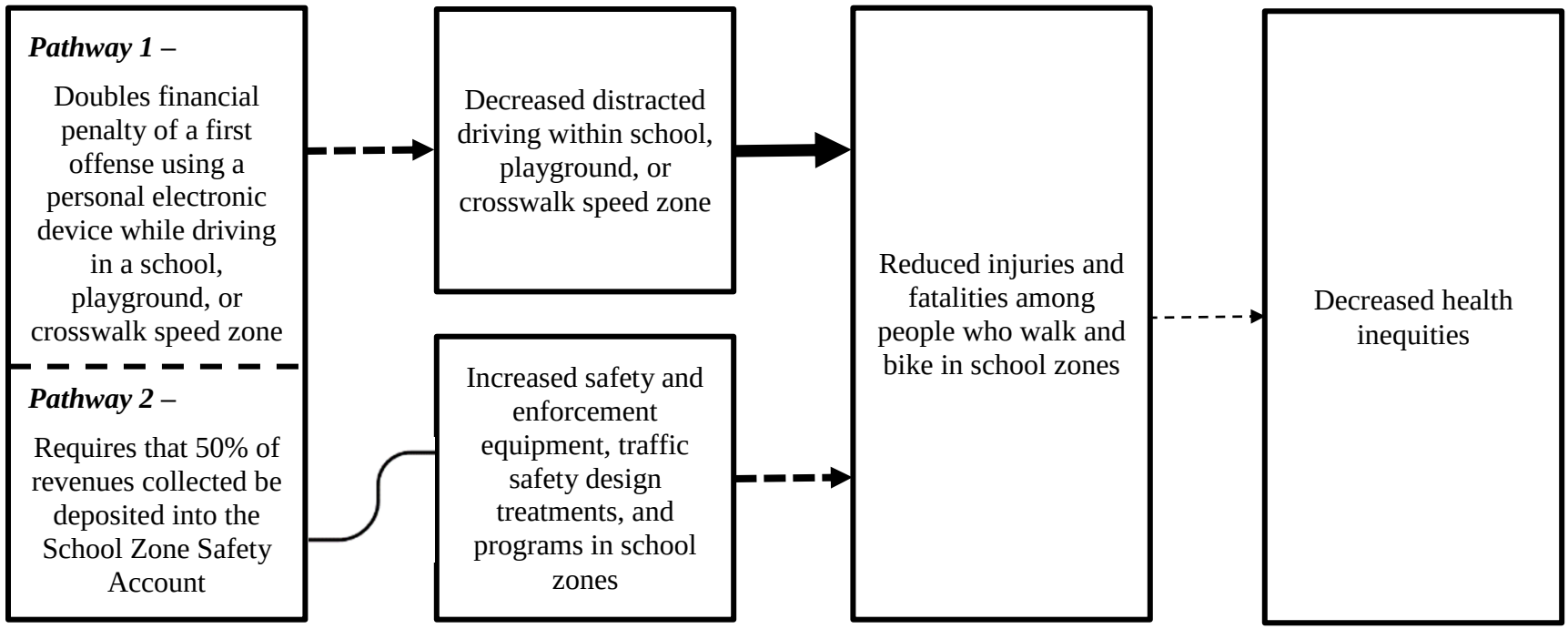
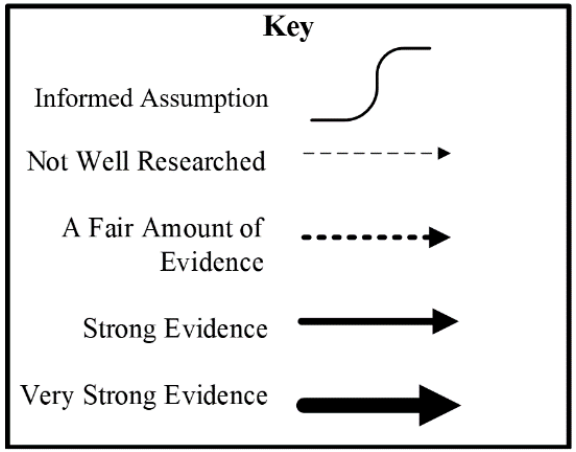


Figure 1

Increasing monetary penalties for the unlawful use of a personal electronic device while driving a motor vehicle in a school, playground, or crosswalk speed zone.

HB 1256



Summaries of Findings

Pathway 1: Increasing financial penalties

Will increasing the financial penalty of using a personal electronic device while operating a motor vehicle in a school, playground, or crosswalk speed zone decrease distracted driving?

This review did not identify specific evidence related to whether increasing the financial penalty for using an electronic device while operating a motor vehicle in a school, playground, or crosswalk speed zone would decrease distracted driving. Therefore, we broadened our search to consider how increasing financial penalties associated with other traffic violations (e.g., seat belt and speed limits) influence drivers' compliance with the law. We also considered how awareness of double fines influences drivers' decisions whether to speed in school and work zones. Analysts found that research to be reasonably generalizable to school zones, therefore, this review finds a fair amount of evidence that increasing the financial penalty for operating a motor vehicle while using a wireless communications device within a school, playground, or crosswalk speed zone would result in decreased distracted driving.

A 2016 meta-analysis evaluated the association between increases in traffic fine amounts (fixed penalties) and changes in compliance with road traffic law or the number of accidents. Authors included nine international studies that evaluated changes in compliance; seven studies examined rate of speeding, two used the rate of seat belt wearing, and 1 considered the number of tickets issued.[5] Analyses showed that increasing traffic fines was associated with small changes in the rate of violations, varying between studies from less than 1-12%.[5] This relationship was non-linear, and resulted in a turning point for very large increases in fixed penalties. Specifically, for increases up to about 100%, violations were reduced, but larger increases yielded no reduction in violations.[5]

Another study examining the impact of enforcement and statutory fines on seat belt use rates from 1991-2001, found the level of the fine imposed by statute had an effect on safety belt use apart from that attributable to the enforcement provision.[6] Specifically, authors reported, "the fine variable is statistically significant and indicates that for every dollar a fine increases, average state seat belt use increases by 0.15 percentage points."[6] Which means, the average fine for a seat belt infraction of $25 was attributed with increasing seat belt use by 3.8 percentage points compared to no fine.[6] Authors hypothesize that increasing the fine to at least $50 would result in a further increase in the rate of seat belt use.

In 2002, the Oregon Department of Transportation conducted a telephone survey to assess driving behaviors, speed citation history, perceptions of speed enforcement, and awareness of laws and practices regarding double fines.[4,7] The survey also included questions about "the risk factors that the respondent considers in deciding whether or not to speed."[7] Survey results from 651 adult Oregon drivers show that 65% report following the speed signs because of the cost of a traffic fine.[4,7] Furthermore, a higher percent of respondents reported obeying speed signs because of the risk of receiving a traffic citation from the police (83.1%) rather than because of the risk of causing an accident (81.1%).[4] Authors suggest this "may illustrate the psychological tradeoff

between considerations of severity and certainty alluded to […] the extent that they perceive a citation as less severe but considerably more probable than a crash."[4]

Oregon researchers note, "[i]n order for drivers to be motivated by the threat of double fines, they must at least be aware that double fines might apply."[7] The majority of survey respondents reported being aware that traffic fines double in work zones (93.5%) and school zones (75.7%). Further analysis found respondents' awareness of the "applicability of double fines does seem to alter perception of risk associated with traffic citations [and] traffic fines." While weak, the associations are statistically significant for school zones, which indicates that people who are aware of double fines are significantly more cognizant of risks associated with citations and fines.[4,7]

However, another study (Ullman 2000) investigated the effects of Texas' double-fine law in work zones and found mixed results. "The researchers conducted speed studies at ten work zones two months prior to, and five months after, the effective date of the law."[4] Results of speed data analyses showed that "traffic speeds in the work zones after the law was in place did not appreciably change from before the law was enacted."[4] Specifically, despite visible warning signs posted in each of the work zone sites, "two-thirds of the drivers were still exceeding the posted speed limit at seven of the ten work zone sites."[4] Meanwhile, a review of traffic citation data for the same work zones for a six-month period before, and after the law's implementation found the number of citations issued decreased slightly (6%) after the law was in place.[4]

Evidence indicates that deterrence has three components: severity, certainty, and swiftness.[4] For example, evidence from drinking-and-driving laws suggest that increased severity (or increased financial penalties) may have little or no influence on behavior if drivers perceive the risk of being stopped and/or cited to be acceptably low.[4] Overall, evidence suggests that increased financial penalties for traffic infractions are just one component of a comprehensive countermeasure strategy. Efforts to increase public awareness of traffic fines and enforcement of the traffic violation also influence driver behaviors.

While we did not identify specific evidence related to increased financial penalties for distracted driving, applicable evidence indicates that increased traffic fines, in general, contribute to driver compliance to traffic safety laws. Therefore, there is a fair amount of evidence that increasing fines for operating a motor vehicle while using a personal electronic device within a school, playground, or crosswalk speed zones, would result in decreased distracted driving within these zones.

Will decreasing distracted driving in school, playground, or crosswalk speed zones reduce injuries and fatalities among people who walk and bike in school zones?

This review did not identify specific evidence related to distracted driving in school, playground, or crosswalk speed zones. However, there is a large body of evidence that distracted driving, in general, contributes to collisions, injuries, and fatalities, particularly to pedestrians and cyclists. Analysts find that research to be reasonably generalizable to school zones, therefore, this review finds strong evidence that reducing distracted driving within those zones, would result in decreased injuries and fatalities.

A number of studies have examined the association between performing secondary tasks (e.g., talking on the phone, texting, checking emails) and driving performance. For example, one study found that typing text messages while driving adversely affected nearly all aspects of safe driving performance including visual attention and eye movements, reaction time, collisions, lane positioning, speed, stimulus detection, and headway.[8] More broadly, evidence indicates that distracted driving is a major contributor to car accidents that result in injuries and fatalities[8-14] and that cell phone use while driving causes significant driver distraction.[12,15,16] For example, data from the National Highway Traffic Safety Commission's Fatality Analysis Reporting System show that there were 29,989 fatal crashes in the United States in 2014 and of those, 2,955 included some kind of distraction (10%).[11] Further, 18% of injury crashes and 16% of all police-reported motor vehicle traffic crashes were reported as distraction-affected crashes. As a result of these 2,955 distracted driving crashes, 3,179 fatalities occurred. It is estimated that another 431,000 people were injured in a crash that involved a distracted driver and 502 people killed in a fatal crash that involved a distracted driver were non-occupants (pedestrians, bicyclists, etc.).[11]

In 2017, deaths involving people who were walking comprised roughly 20% of Washington State traffic fatalities (109 out of 565 total fatalities).[17] This is the highest number of pedestrian deaths in more than 30 years in Washington. As seen in Figure 2, the "National Highway Traffic Safety Administration tracks Washington State's five-year rolling average for fatalities and that measure indicates an increase of nearly [19%] over a 10-year period from 69 in 2007 to 82 in 2017."[17] Moreover, "[t]he rate of pedestrian fatalities (frequency of fatalities per 100,000 people) has increased from less than one in 2013, to nearly 1.5 in 2017."[17]

Figure 2. Pedestrian Fatalities in Washington State 2003-2017 (FARS, 2018)[17]

Similarly, bicycle fatalities in Washington increased by 55% from the 2014-2015 period to the 2016-2017 period (from 20 to 31 fatalities).[18] In context, "the number of deaths and serious injuries involving bicycle riders increased 8.7 percent from 229 to 249, faster than both state population growth (3.2 percent increase) and motor vehicle miles traveled (5.1 percent increase) during the same period."[18]

Results from one study indicate that pedestrians and bicyclists account for about one out of ten fatalities caused by distracted driving and that drivers who were distracted at the time of a fatal accident were 1.6 times as likely as drivers who were not distracted to fatally hit a pedestrian at a marked crosswalk and close to 3 times as likely to hit a pedestrian on a road shoulder.[14] In one study of motor vehicle collisions related to distracted driving, the greatest risk for getting in an accident was found to be for those individuals who made a phone call within 5 minutes of the time of the collision.[13] Even the use of hands-free devices while driving has found to be a risk factor for car accidents as it still causes impairment in safe driving performance due to the brain's inability to multitask. Studies indicate that talking on cell phones, either handheld or hands-free, can increase the risk of crashing by 4 times.[10]

While we did not identify specific evidence related to distracted driving in school, playground, or crosswalk speed zones, there is a large body of evidence that distracted driving, in general, contributes to collisions, injuries, and fatalities, particularly to pedestrians and cyclists. Therefore, there is strong evidence that reducing distracted driving within those zones, would result in decreased injuries and fatalities.

Pathway 2: School Zone Safety Account

Will requiring that 50% of revenues collected be deposited into the School Zone Safety Account result in increased safety and enforcement equipment, traffic safety design treatments, and programs in Washington State school zones?

Based on conversations with staff at the Washington Traffic Safety Commission (WTSC), we have made the informed assumption that requiring that 50% of the moneys collected be deposited into the School Zone Safety (SZS) Account would result in increased safety and enforcement equipment, traffic safety design treatments (e.g., flashing beacons), and bicycle/pedestrian education programs in Washington State school zones. A new revenue source for the SZS Account would likely increase funds available for the WTSC to award as grants to elementary and middle schools and law enforcement agencies. State law (RCW 46.61.440) requires SZS Account funds be used to "finance projects in local communities to improve school zone safety, pupil transportation safety, and student safety in school bus loading and unloading areas." The director of the WTSC or the director's designee may authorize expenditures from the SZS Account. During the 2017-2019 biennium, the WTSC had a biennial appropriation for the SZS account of $850,000, down from $3 million in previous biennium (WTSC, personal communication, January 2019).

The SZS Account finances the WTSC small law enforcement grants, school zone crossing guard grants, and School Walk Improvement Program. The law enforcement grants can be used to purchase radar, LIDARs (Light Detection and Ranging), heavy weather gear for motorcycle enforcement officers, and other equipment that is used to enforce school zone speed limits and keep kids safe on their way to school.[3,19] Eligible applicants must be law enforcement officers who are actively enforcing traffic safety in school zones (RCW 46.61.440). During the 2017-2019 biennium, $80,000 were allocated for this purpose and roughly three-quarters of that had been allocated through January 22, 2019.[3] The WTSC also offers mini reimbursement grants to assist schools in purchasing crossing guard training materials and equipment (e.g., flags, cones, signs, whistles, vests, raincoats, gloves, and hats).[3] These grants are available to public, private,

and tribal elementary and middle schools within the state of Washington.[19] During the 2017-2019 biennium, $45,000 were allocated for these grants, and about half had been awarded through January 22, 2019. However, due to declining revenue (less than $50,000 per month), the WTSC has reduced these school grants from $500 to $300 in recent years (WTSC, personal communication, January 2019). Both of these grant programs are available once per funding round to all eligible applicants, as funds allow. On April 1st, any unallocated funds are pooled and become available to applicants who reapply.

According to a 2015 WTSC report to the legislature, "[r]evenue in the SZS Account has been on the decline for the previous three biennia. Account receipts for the first several months of the 2015-2017 biennium indicate this trend will continue."[19] In the face of declining revenue, the WTSC discontinued awarding grants to schools and school districts specifically for the acquisition and installation of school zone flashing beacons. "Under this program, schools were awarded $7,500 per school zone to cover the acquisition for two flashing beacons to demarcate each zone." The last round of grants offered for the implementation of school zone flashing beacons occurred in 2013. Over the course of the program, the WTSC provided grants to 443 schools establishing 542 school zones with flashing beacons.[19] According to the Office of Superintendent of Public Instruction (OSPI), there are approximately 2,370 school facilities and approximately 530 private schools in Washington.

Beginning in fiscal year 2018, the WTSC implemented its School Walk Route Improvement Program, which awarded funds totaling $500,000 (two years' worth of funding) to 10 applicants to support a variety of initiatives (e.g., installation of flashing yellow lights in school zones).[3] Private not-for-profit organizations as well as governmental institutions can apply for these funds. According to staff, a total of 28 applications were submitted in response to the program's initial Request for Applications. In 2018, funded projects included six flashing yellow light projects (three in Western Washington, three in Eastern Washington); two preliminary engineering design efforts (one in Western Washington, one in Eastern Washington); and two bicycle/pedestrian safety education programs based in schools.[3]

On January 25, 2019, WTSC announced a new Request for Applications for the School Walk Route Improvement Program. For the 2019-20 state fiscal year there will be $250,000 available to fund the following types of projects: automated (photo) speed enforcement; crossing guard program improvement; flashing yellow lights and signage improvement (including pedestrian actuated beacon, rectangular rapid flashing beacons, and other similar devices); pedestrian and/or bicycle safety audit; preliminary engineering studies and designs; reducing illegal passing of school buses; and walk/bike to school encouragement activities. WTSC will begin providing funds starting in July 2019.

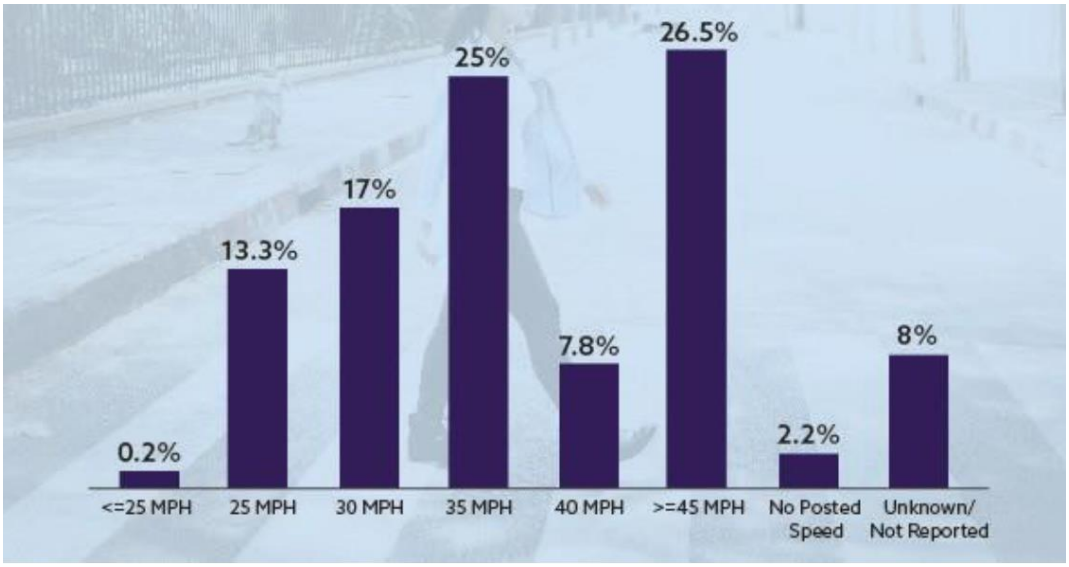
The fact that the first funding cycle for the School Walk Improvement Program had more applications than WTSC had funds available to award indicates that local communities have unmet needs to improve school zone safety. Therefore, if more funds were available, we would expect that the WTSC would provide additional opportunities for schools and law enforcement agencies to improve school zone safety (WTSC, personal communication, January 2019).

Will increasing safety and enforcement equipment, traffic safety treatments, and programs in school zones result in reduced injuries and fatalities among people who walk and bike in school zones?

There is a fair amount of evidence that increasing safety and enforcement equipment, traffic safety treatments, and programs in school zones would likely result in reduced injuries and fatalities among people who walk and bike in school zones.[17,21,22] This section focuses on traffic safety treatments and speed enforcement technologies which may otherwise be cost-prohibitive for resource-limited settings.

The speed at which a motor vehicle strikes someone who is walking or biking greatly affects the pedestrian's or bicyclist's likelihood of being seriously injured or killed. Figure 3 shows the relationship between motor vehicle operating speed and the percentage of crashes resulting in a pedestrian fatality at each posted speed limit when crashes occur.[17] Posted speed is often used as a proxy for the speed at which drivers were traveling because the actual speed at impact is often not determined.[17] The Washington State Pedestrian Safety Advisory Council report notes, "[t]he potential for a pedestrian fatality increases rapidly for crashes involving vehicles going 30 mph or faster. Most crashes in which a driver hits a pedestrian occur in areas where the posted speeds are 35 mph or lower," as a significantly higher number of people walk on streets in cities and towns. According to the Washington State Strategic Highway Safety Plan 2016: Target Zero, 57% of fatalities and 67% of serious injuries between 2012 and 2014 occurred while the pedestrian was crossing the roadway.[17] Therefore, by reducing vehicle operating speeds in contexts where people walk and bike (e.g., school zones), serious injuries and fatalities can likely be reduced.

Figure 3. Posted Speed Limit of the Striking Vehicle in Pedestrian Traffic Fatalities, 2012-2017 (FARS, 2018)[17]



Traffic safety treatments

Evidence indicates that flashing beacons demarcating school zones have contributed to slower vehicle speeds. For example, a 1999 study in Washington evaluated the effects of the type of sign (i.e., time of day signs-7:30 a.m. to 4:30 p.m.; flashing beacons; when children are present;

when orange flags are present) on drivers' speed. The study found no statistically significant difference for the various signs posted on roads with a 25 mph posted speed limit. On roads with posted speed limits of 30 mph or greater, "vehicles were measured at significant higher average speeds with the [When Children Are Present or When Flagged] signs."[21] However, "flashing beacons signs were associated with significantly slower average speeds of 22.5 mph—a 5- to 7-mph slower speed when compared to the speeds at the other signs."[21] Similarly, a field study of 24 school sites in Texas found that "the mean speed in a buffer zone is significantly lower when the beacon is on than when the beacon is off."[21] Furthermore, an analysis of 42 Washington school zones that received WTSC grants in 2013 to install flashing beacons found that for school zones in which speeds were recorded before and after beacon installations the average speed reduction was approximately 7 mph.[19]

In 2005, the U.S. Congress allocated $612 million for a national Safe Routes to School (SRTS) program to encourage walking and bicycling to school. While numerous studies have demonstrated community acceptance of SRTS interventions and their success in addressing perceptions about safety, fewer have examined these programs effectiveness in reducing pedestrian injury risk in school-aged children.[23] In 2013, one study used geocoded motor vehicle crash data from 168,806 pedestrian injuries in New York City between 2001 and 2010 to assess the effectiveness of SRTS interventions in reducing school-aged pedestrian injuries in New York City.[23] Intervention Census tracts (n=30) were defined as those in which the SRTS program had implemented a mix of short-term measures (e.g., new crosswalk markings, replaced or improved signage) and had either completed or started capital construction projects.[23] The comparison non-intervention census tracts were defined as those containing schools that were not included as 1 of the 124 SRTS schools.

Researchers then calculated annual pedestrian injury rates per 100,000 population for different age groups in census tracts with and without SRTS interventions during school-travel hours (defined as 7 a.m. to 9 a.m. and 2 p.m. to 4 p.m., Monday through Friday during September through June). Authors report, during the study period, the annual rate of pedestrian injury decreased 33% (95% confidence interval [CI]: 30 to 36) among school-aged children (5- to 19-years) and 14% (95% CI: 12 to 16) in other age groups.[23] Moreover, "the rate of school-aged pedestrian injuries during school-travel hours decreased 44% (95% CI: 17 to 65) from 8.0 injuries per 10,000 population in the pre-intervention period (2001-2008) to 4.4 injuries per 10,000 population in the post-intervention period (2009-2010) in census tracts with SRTS interventions."[23] In census tracts without SRTS interventions the rate remained virtually unchanged (0% [95% CI: -8 to 9]).[23] Authors concluded that SRTS interventions contributed to the reduction in pedestrian injury in New York City school-aged children.

Other school zone traffic control devices including driver feedback signs (i.e., radar speed signs) and fiber-optic illuminated signs (i.e., School Speed Limit 20) have also been shown to effectively reduce driver speeds.[21]

Speed enforcement

More recent evidence suggests that automated speed enforcement cameras are an effective technology to reduce driving speeds which can in turn reduce the risk of serious injury or fatality for those walking and biking.[17] Washington law (RCW 46.63.170) allows placement of

automated speed enforcement cameras in school speed zones. Note, "fines from infractions issued by automated traffic safety cameras are not assessed at twice the regular penalty, nor is any portion of the fine deposited into the SZS account."[19] Washington's Pedestrian Safety Advisory Council and Cooper Jones Bicycle Safety Council have recommended that the State Legislature amend the statute to allow placement on any roadway identified in a school's walk area (RCW 28A.160.160) because speed enforcement makes for a safer environment for people who walk and bike.[17,18] WTSC's School Walk Route Improvement Program funds can be used to purchase these cameras.

Seattle launched fixed cameras to enforce the 20 mph school zone speed limit in December 2012 (Cohort 1: 4 elementary schools).[17] The city expanded the program in September 2014 (Cohort 2: 5 schools) and in September 2015 (Cohort 3: 5 schools). The speed cameras are synchronized with the school zone flashing beacons which are scheduled by the Seattle Department of Transportation based on when students will be arriving and leaving school grounds.[17] For each Cohort, the city implemented a period where warnings were issued for speeding violations and conducted community outreach to inform people living near the schools about the automated enforcement program.[17]

A study of Seattle's program "showed that automated speed enforcement camera citations in school zones decreased both the rate of speed violations and driver operating speeds during school travel times compared to the warning phase."[17] Furthermore, "[i]n the absence of speed enforcement citations, it was common for drivers to travel in excess of 30 mph, increasing the likelihood of pedestrian fatalities. In the warning phase, maximum violation speeds reached 50 mph, a speed at which most crashes would result in a child being killed if struck."[17] Additionally, American Traffic Solutions, Inc., the camera provider for the City of Seattle, reported, 90% of all drivers who have received a school zone speeding infraction since the installation of the cameras have not reoffended.[19]

Since the automated enforcement cameras have been operating, there have been no crashes involving motorists and children on bicycles or walking.[17] Operating speeds have also been reduced around Cohort schools by 4%.[17] Additionally, the number of automated speed enforcement citations at the Cohort 1 schools has decreased from 46,000 in the first year to just over 16,000 in 2017.[17] Table 2 illustrates the decrease in automated speed enforcement camera citations for all three cohorts from 2016 to 2017.

Table 2. City of Seattle automated speed enforcement camera citations, 2016-2017 (City of Seattle Police, 2018)[17]

	2016 Citations	2017 Citations	% Change
Cohort 1	18,053	16,238	-10.0%
Cohort 2	26,786	19,934	-25.6%
Cohort 3	36,270	26,800	-26.1%

City of Seattle Police crash data show that there has been a significant decrease in crashes in the five years that the cameras have been operating at Cohort 1 schools. However, "there was a slight increase in crashes from the 2014-2016 period to the 2015-2017 period. There was also a

slight increase in crashes for Cohort 2 during that period although Cohort 3 had a decrease in reported crashes."[17]

Chronic shortage of comprehensive and accurate data (i.e., counts of people who walk and bike, existing infrastructure) is one of the primary challenges to effectively planning for and strategically investing in a sustainable safety environment.[17] Experts in the field recommend improving data collection to allow for analyses to quantify the association between specific traffic safety treatments and speed enforcement and outcome measures (i.e., pedestrian and bicycle injuries and fatalities). Therefore, based on the available research, there is a fair amount of evidence that increasing safety and enforcement equipment, traffic safety treatments, and programs in school zones would likely result in reduced injuries and fatalities among people who walk and bike in school zones.

Will reducing injuries and fatalities among people who walk and bike in school zones decrease health inequities?

There is no available evidence to indicate that decreasing distracted driving behaviors and implementing traffic safety equipment, treatments, and programs (detailed in the previous section) would disproportionately affect, positively or negatively, the populations that experience inequities in pedestrian and bicyclist injuries and fatalities. Evidence indicates that children,[17,18,24,26] older adults,[17,18,27] males,[24,26,27] people with disabilities,[17,18] and people living in communities with low-incomes[17,18,24] and communities of color[17,18,28] are more likely to be seriously injured or killed if involved in a crash. As there is no evidence to show disproportionate impact of the proposals, this pathway is not well-researched.

Inequities by age

Children and older adults are more likely to die or be seriously injured when a driver hits them. This in part due to physical factors that increase these populations' vulnerability. For example, lower-riding vehicles like passenger cars tend to impact a walking person's legs, causing the pedestrian to snap forward onto the hood of the vehicle.[17] However "crashes with people walking involving larger vehicles like SUVs more often result in death of the person walking because their body has no place to displace the force of the impact."[17] This same principle applies to children; "their position to the vehicle bumper is much lower and provides no opportunity to displace the force of the impact."[17] Children and older adults are also more likely to walk for transportation due to physical, economic, or legal reasons.[17]

According to the National Highway Traffic Safety Administration (NHTSA), motor vehicle crashes are the leading cause of death for children age 14 years and younger.[26] In 2015, an average of 3 children were killed and an estimated 487 children were injured every day in the U.S. in traffic crashes.[26] Of the 1,132 child traffic fatalities (3% of total traffic fatalities) in the U.S., 73% were occupants (824) and 27% were non-occupants (308). Twenty-one percent of children killed in traffic crashes in the U.S. are pedestrians and 4% are pedalcyclists (riders of bicycles, tricycles, and unicycles).[26] In Washington, 20 children [14 school-age] were killed in motor vehicle traffic crashes in 2015, a rate of 1.49 child motor vehicle traffic fatalities per 100,000 child population.[26]

NHTSA data show that, in 2015, 19% of all pedestrian fatalities (1,002 of 5,376) and an estimated 13% of all pedestrians injured (9,000 of 70,000 after rounding) were people 65 and older.[27] In the same year, the highest total pedestrian fatality rates by age group were those ages 50 to 54 years and 80 years and older (2.56 and 2.50 per 100,000 population, respectively).[27]

Inequities by sex
According to 2015 NHTSA data, 70% of pedestrians killed in U.S. traffic crashes were males.[27] Specifically, of the 233 child pedestrian fatalities in traffic crashes, 145 (62%) were boys.[26] Of the 44 child pedalcyclists killed in traffic crashes, 37 (84%) were boys.[26]

Inequities by disability status
People with disabilities are also more likely to die or be seriously injured when hit by a vehicle. Similar to the physical factors that put children at risk, people who use wheelchairs are in a relatively lower position that does not allow their body to displace the force of the impact of a lower-riding passenger car.[17]

Inequities by income
Evidence indicates that pedestrians and bicyclists living in census tracts with high poverty rates have higher fatality rates per capita than the population as a whole.[17,24] The Pedestrian Safety Advisory Council reports, "[s]erious and fatal crashes are more likely for people living in poverty, which includes an overrepresentation of people of color, the elderly, and people with disabilities."[17] Furthermore, evidence suggests Washington has a "history of [failures] to invest in infrastructure that reduces crash exposure for people who walk or bicycle in lower income communities and communities with a high percentage of people of color."[17]

Inequities by race/ethnicity
Although analysts did not identify Washington-specific literature or data that examined whether racial/ethnic inequities exist for pedestrian/bicycle injuries/fatalities caused by motor vehicle crashes, evidence exists that in the U.S., communities where people of color are more likely to reside have historically experienced limited transportation infrastructure investment. One study in Chicago, Illinois, used trauma registry E-codes for pedestrian motor vehicle crashes to examine pediatric (children younger than age 16 years) pedestrian injury data for children who received acute care and were hospitalized at the University of Chicago Medical Center after being struck by a motor vehicle from 2002 to 2009.[28] Of the 3,521 children who were admitted for traumatic injuries, 27.7% (974) sustained injuries in pedestrian motor vehicle injuries. From 2002 to 2009, there were a total of 106 traumatic deaths, of which 29 (27.4%) were due to pedestrian motor vehicle crashes."[28] The analysis found that "pediatric pedestrian motor vehicle crash sites occurred predominantly within low-income, predominantly African-American neighborhoods. A lower prevalence of crash sites was observed in the predominantly higher income, non–African-American neighborhoods."[28] Authors discussed the benefits of using demographic data gleaned from GIS-identified associations to develop risk profiles but noted this methodology cannot infer causality.

Analysts found no published literature to indicate the provisions in HB 1256 would decrease inequities in injuries and fatalities by age, sex, disability status, income, or race/ethnicity. Therefore, analysts contacted the WTSC to learn how SZS Account funds are distributed.

According to staff, the WTSC law enforcement and school zone crossing guard grants are both available to all eligible applicants once per funding cycle until funds run out (WTSC, personal communication, January 2019). If, as of April 1 of a funding cycle, available funds remain, WTSC can announce that previous applicants may reapply for unallocated funds (WTSC, personal communication, January 2019).

For its School Walk Route Improvement Program, the WTSC uses a competitive application process to award grants.[20] Each application is reviewed and scored by a multidisciplinary review panel, and the highest scoring projects are recommended to the WTSC director for funding. Table 3 outlines the criteria used to review and score applications.

Table 3. WTSC School Walk Route Improvement Program Application Scoring Criteria

Narrative Proposal – Question Topic		Maximum Points
A.	Project Summary (project, participants, implementation timeline)	30
B.	Problems the Project will Address (detail problem and provide data or anecdotal evidence as available)	30
C.	Geographic Area for the Project (school locations served by project)	15
D.	Goals (specific, measurable, time-bound goals)	20
E.	Free and Reduced Lunch Rates (rates for each of the schools in the proposed service area)	25*
F.	Majority of Impact from Project (benefit students and families associated with the schools with free and reduced lunch rates greater than 50%)	25*
G.	Addressing Diversity of Population (e.g., language diversity, literacy levels)	40**
H.	Start Ready (preparation for July 1, 2019 start date)	20
I.	Timeline and Process (for evaluating the project)	15
J.	Target Zero Strategies	10
K.	Match (cash match available)	15
* Denotes available bonus points for projects that serve low-income students and families (as designated by a proxy-measure, school level free and reduced lunch rates). ** Denotes available points for applicants to discuss how the project, communication, and implementation will serve and meet the needs of the diverse population.		

The criteria were developed to intentionally screen in schools serving communities with lower incomes. Criterion E (Free and Reduced Lunch Rates) asks applicants to identify the proportion of students receiving free and reduced priced lunches at each school served by the proposed project. This question serves as a proxy for socioeconomic status. Applications that serve schools with more than 50% of students on free and reduced priced lunch qualify as serving a majority of low-income students and families (maximum 25 points). Criterion F (Majority of Impact from Project) asks how the applicant plans to ensure that the majority of the benefits from the project

activities benefit the students and families associated with the schools with free and reduced lunch rates greater than 50% (maximum 25 points). Finally, Criterion G asks applicants to describe the diversity of the population the grant will serve and to explain how the project activities can address such diversity. The application goes on to ask specific questions regarding how the project will meet the needs of community members with differing literacy levels (print and verbal) and languages. Together, these three criteria account for 90 points of 245 total points (36.7% of points). These points are meant to help prioritize funding for projects in communities with lower incomes.

Furthermore, WTSC wrote Criterion B (Problems the Project will Address) in such a way that recognizes that crash data or injury/fatality data may not be available to justify a project. It states, "[i]f there is not much hard data available, please provide some anecdotes/stories that illustrate that there is a problem. For example, can the school principal or school nurse tell you stories about students who have experienced 'near misses' or 'close calls' for crashes?"[20] This type of informal collection of lived experiences as evidence can help under-resourced settings make a case for funding without first needing to invest resources to formally collect data.

In 2017, of the 28 applications received, 13 applications (46%) were submitted by school districts with lower incomes (50% or higher free or reduced lunch rates). Of the 10 projects WTSC funded, five were from lower income schools (50%). WTSC staff note, "those applications also received bonus points for recognizing the compositions of their communities and identifying plans to reach out to the entire community" (WTSC, personal communication, January 2019). Staff determined that the scoring criteria and preferences impacted who received funding. This suggests that the criteria developed helped lower income schools compete with wealthier schools to secure funding. However, the 50/50 split of funding between higher income schools and lower income schools suggests the criteria did not specifically prioritize school districts in lower income areas.

In conclusion, the question as to whether reducing injuries and fatalities among people who walk and bike in school zones would decrease health inequities has not been well researched. While there is evidence that children, older adults, males, people with disabilities, and people living in communities with low-incomes and communities of color currently experience inequities in injuries and fatalities due to being hit by a car as a pedestrian or cyclist, this review found no evidence that those populations would be disproportionately impacted, either positively or negatively, by HB 1256.

Annotated References

Uncategorized References

1. **Final Bill Report SSB 5289. Olympia, Washington: Washington State Senate 2017.**
This Senate Bill Report outlines Substitute Senate Bill 5289 as passed by the Washington State Senate and House of Representatives and signed by the Governor.

2. **Maximum speed limit when passing school or playground crosswalks—Penalty, disposition of proceeds., RCW 46.61.440 Revised Code of Washington, §5.**
Washington State law RCW 46.61.440(5) establishes the School Zone Safety Account and outlines how funds may be used by the Washington Traffic Safety Commission.

3. **School Safety Zone Project Funding. Olympia, Washington: Washington Traffic Safety Commission; 2019.**
This document from the Washington Traffic Safety Commissions outlines the three grant programs financed by the School Zone Safety Account. It details who is eligible to apply for grants and how awarded funds may be used.

4. **Jones Barnie, Griffith Andrew, Haas Kevin. Effectiveness of Double Fines as Speed Control Measures in Safety Corridors Final Report.Salem, Oregon: Oregon Department of Transportation Research Group; December 2002 2002. SPR 304-191.**
Sponsored by the Oregon Department of Transportation and the Federal Highway Administration, this research effort examined the use of elevated traffic fines, and specifically doubling of applicable traffic fines under certain conditions. Authors cited evidence that deterrence has three components: severity, certainty, and celerity (swiftness). Evidence from drinking-and-driving laws suggest that increased severity (or stiffer fines) may have little or no influence on behavior if drivers perceive the risk of being stopped and/or cited to be acceptably low. The report also references applicable research on effectiveness of speed counter measures. For example, a 2001 survey of state and toll road authority traffic engineers found that although 28 of 34 agencies used regulatory signs as an enforcement strategy, "only two of the respondents indicated posting regulatory signs was effective in reducing work zone speeds." The most effective speed reduction strategy reported was actual police enforcement in the work zone (17 of 25 respondents). A study in Texas found that "when motorists were issued a citation after the double-fine law was in place, a lower proportion of drivers pled guilty, and more drivers opted to take defensive driver training in order to have their ticket subsequently dismissed." Authors were not able to "determine whether this was due to a potentially higher fine or some other reason unrelated to the double fine law." Researchers used a telephone survey of 651 adult Oregon drivers to assess whether respondents judgements differed from one situation to another. Results were used to infer indirectly whether double fine signing was influencing their judgments. Based on the analysis, authors conclude that if double fine signing is retained, that other countermeasure enhancements should also be considered to achieve more effective speed control, specifically in safety corridors.

5. **Elvik R. Association between increase in fixed penalties and road safety outcomes: A meta-analysis. *Accident; analysis and prevention.* 2016;92:202-210.**
Elvik conducted a meta-analysis to to synthesize the evidence evaluating the association between increases in traffic fine amounts (fixed penalties) and changes in compliance with road traffic

law or the number of accidents. Nine studies were included in the meta-analysis of changes in compliance, and four studies were included in the meta-analysis of changes in accidents. Overall, increasing traffic fines was associated with small changes in the rate of violations (i.e., speeding rate and wearing seat belt). The analysis found "a dose-response relationship between the size of the increase in fixed penalties and the size of the reduction in violations." However, the relationship was non-linear, and resulted in a turning point for very large increases in fixed penalties. Specifically, for increases up to about 100%, violations were reduced. However, larger increases yielded no reduction in violations. "A small reduction in fatal accidents was associated with increased fixed penalties, varying between studies from less than 1-12%. The main pattern of changes in violations was similar in the fixed-effects and random-effects models of meta-analysis, meta-regression and when simple (non-weighted) mean values were computed." Elvik concludes the main findings of the meta-analyses are robust, despite most of the primary studies not controlling very well for potentially confounding factors. "Summary estimates of changes in violations or accidents should be treated as provisional and do not necessarily reflect causal relationships."

6. **Houston D. J., Richardson L. E., Jr. Getting Americans to buckle up: the efficacy of state seat belt laws. *Accident; analysis and prevention.* 2005;37(6):1114-1120.**

In this study by Houston and Richardson, the authors aimed to examine the impact of enforcement and statutory fines on seat belt use rates from 1991-2001. The discussion begins with an overview of the current literature regarding the effectiveness of seatbelt laws including findings that indicate primary enforcement statues are more effective at increasing seat belt use than secondary enforcement laws. For this study, the authors use time-series cross-sectional data about observed annual state seat belt use rate from 47 states in the United States (reported by the National Highway Traffic Safety Administration). The average state seat belt use in 2001 was 71.9%, which was an increase from the 54.0% average reported in 1991. The main finding from this data was that states that have a primarily enforced seat belt law have a seat belt use rate that is, on average, 9.1% higher than states with a secondary law. Further, the average fine for a seat belt infraction was $25 and in states with this level of fine, the seat belt use rate was 3.8% higher than states with no fine. The authors hypothesize that increasing the fine to at least $50 would result in a further increase in the rate of seat belt use.

7. **Jones Barnie, Haas Kevin, Kirk Alan, et al. Self-Reported Effectiveness of Double-Fine Zones as a Speed Control Measure. *Appl Health Econ Health Policy.* 2004;3(2004):17-28.**

Jones et al. evaluated the effectiveness of signs alerting drivers to double traffic fines in highway work zones, school zones, and safety corridors. The evaluation was based on a driver survey that investigated the decision to exceed speed limits across a range of driving contexts and risk categories. "The findings indicated that personal assessments of risk change from one hypothetical situation to another, suggesting that people make a more or less calculated decision to violate the speed limit, based on those risks." Additionally, findings suggested that people perceive a higher relative risk associated with traffic fines if the situation is one in which a doubling of traffic fines may apply. Moreover, the results showed that "interview subjects who reported being aware of double-fine zones tended to have somewhat higher assessments of the risk associated with traffic citations, traffic fines and higher insurance rates."

8. **Caird J. K., Johnston K. A., Willness C. R., et al. A meta-analysis of the effects of texting on driving. *Accident; analysis and prevention.* 2014;71:311-318.**
Caird, Johnston, Willness et al. conducted a meta-analysis of all peer-reviewed articles that measured the effects of texting while driving. After searching relevant databases, researchers found 1,476 publications with variants of the words "driving" and "text messaging". Through exclusion criteria, 28 publications were coded into the meta-analysis. Most studies used driving simulators (n=25); however, three used closed test tracks. A total sample size of 977 participants were compiled from these publications. In all studies, typing text messages while driving adversely affected nearly all aspects of safe driving performance. These performance indicators include visual attention and eye movements, reaction time, collisions, lane positioning, speed, stimulus detection, and headway. Large effect sizes were measured for eye movements during typing and reading text messages (rc=0.74) and typing alone (rc=0.88). Visual, physical, and cognitive distractions were all recorded when participants texted while driving. Researchers recommend targeted legislation and increased enforcement to reduce this public health threat.

9. **2015 Annual Collision Summary. 2015.**
This annual summary of collisions in Washington is put together through a collaboration between the Washington State Department of Transportation, Washington Traffic Safety Commission, Department of Licensing, Office of Financial Management, Administrative Office of the Courts, and the Department of Health. The most relevant data for this review is related to collisions due to inattentive or distracted drivers. In 2015, there were 12,399 collisions that were due to distracted drivers and of these, 895 were from a driver operating some kind of electronic device. Together, these collisions where a personal electronic device was a distraction account for 5 fatal collisions, 13 serious injury collisions, 309 minor injury collisions, 562 property damage collisions, and 6 collisions with an unknown injury. It is important to note that about 56% of the total distracted driving collisions reported above are due to unknown driver distraction and therefore it is unclear if the fatalities and injuries due to personal electronic device use may actually be higher.

10. **Understanding the Distracted Brain: Why Driving While Using Hangs-Free Cell Phones is Risky Behavior. National Safety Council;2012.**
The National Safety Council authored a white paper on the topic of hands-free cell phone risk. The authors state that there is an informed consensus among researchers and policy makers that using a handheld phone while driving or that texting while driving can lead to increased fatal and non-fatal crashes. However, a summary of state policies indicate that all states and many employers allow hands-free cell phone use. The authors warns that hands-free cell phone use, while it allows for drivers to keep their eyes on the road, still causes impairment in safe driving performance due to the brain's inability to multitask. Studies indicate that talking on cell phones—either handheld or hands-free—can increase the risk of crashing by four times. Advances in technology, such as those that will block all calls and messages while driving, offer the best method for minimizing the use of cell phones of any kind on the road.

11. **Traffic Safety Facts: Research Note.Washington, D.C.: National Highway Traffic Safety Commission's National Center for Statistics and Analysis;2016.**
This research note from the National Highway Traffic Safety Administration (NHTSA) presents an overview of distracted driving statistics from 2014. The authors used data from NHTSA's

Fatality Analysis Reporting System (FARS) and the National Automotive Sampling System general Estimates System. Data from these sources shows that there were 29,989 fatal crashes in the United States in 2014 and of those, 2,955 included some kind of distraction (10%). Further, 18% of injury crashes and 16% of all police-reported motor vehicle traffic crashes were reported as distraction-affected crashes. As a result of these crashes, 3,179 fatalities occurred and it is estimated that another 431,000 people were injured in a crash that involved a distracted driver. 502 people killed in a fatal crash that involved distracted driving were nonoccupants (pedestrians, pedalcyclists, etc.). The largest proportion of drivers who were distracted at the time of a crash, among those where were involved in a fatal crash in 2014, were in the 15-19 year old age category.

12. **Klauer S. G., Guo F., Simons-Morton B. G., et al. Distracted driving and risk of road crashes among novice and experienced drivers.** ***New England Journal of Medicine.*** **2014;370(1):54-59.**

Klauer, Guo, Simons-Morton et al. collected data from both the 100-Car Naturalistic Driving Study (experienced drivers) and the Naturalistic Teenage Driving Study (novice drivers) to determine the risk of distracted driving on road crashes. Researchers equipped vehicles of 42 novice drivers and 109 experienced drivers with accelerometers, cameras, global positioning systems, and other sensors. Novice drivers (mean age 16.4 years)—those who had had their driver's license for three weeks or less—were measured for an 18-month period. Experienced drivers (mean age 36.2 years) were measured for a 12-month period in the Washington D.C. area. Several secondary tasks while driving were reported in this study, including: handheld cell phone use, hands-free cell phone use, reaching for an object, using the internet or email, adjusting the radio or other internal vehicle system controls, looking at a roadside object, eating with or without utensils, and drinking a beverage. Among novice drivers, all of the above listed secondary tasks except talking on the phone, adjusting internal vehicle control systems, and drinking a beverage were significantly associated with increased risk of crash or near-crash. For experienced drivers, only cell-phone dialing was significantly associated with increased risk of crash or near-crash. The authors recommend that more states pass graduated licensing requirements or other policy initiatives to prevent novice drivers from performing these secondary tasks while driving.

13. **Redelmeier Donald A., Tibshirani Robert J. Association between cellular-telephone calls and motor vehicle collisions.** ***The New England journal of medicine.*** **1997;336(7):453-458.**

Redelmeier and Tibshirani examined data from a sample of drivers who reported being involved in a motor vehicle collision and owned a cell phone in order to examine whether using a cell phone increases the risk of a motor vehicle collision. Data was collected from individuals who reported to the North York Collision Reporting Centre in Toronto between July 1, 1994 and August 31, 1995 (n=699). These individuals were involved in a collision that resulted in substantial property damage but no personal injury. In addition to police records, subject statements, and a questionnaire, researchers obtained information from telephone records in order to determine if phone calls were made within a hazard interval (defined as within 10 minutes before the time of the collision). The greatest risk was found to be for those individuals who made a phone call near the time of the collision. There was not a statistically significant risk for calls made more than 15 minutes before a collision however there was a relative risk of 4.8

for calls made within 5 minutes before the collision. Further, the authors found that there was no protective advantage of using a hands free device.

14. **Stimpson Jim P., Wilson Fernando A., Muelleman Robert L. Fatalities of pedestrians, bicycle riders, and motorists due to distracted driving motor vehicle crashes in the U.S., 2005-2010. *Public Health Reports.* 2013;128:436-442.**
In this study by Stimpson et al. the authors used data on traffic fatalities from the Fatality Analysis Reporting System (FARS) from 2005 through 2010 to describe trends in pedestrian, bicycle rider, and other victim's deaths that were caused by distracted drivers in the United States. The authors used the National Highway Traffic Safety Commission definition of distracted driving meaning that the police investigation determined that a driver was been using a device or had been engaged in inattentive or careless activities. Results indicate that while fatalities from distracted driving crashes are declining for motorists, the fatality rates from distracted driving crashes are increasing for pedestrians and bicyclists. Pedestrians and bicyclists account for about one out of ten fatalities caused by distracted driving and victims of these crashes are disproportionately male, middle-aged, and non-Hispanic white. Further, the data indicates that drivers who were distracted were 1.6 times as likely as drivers who were not distracted to fatally hit a pedestrian at a marked crosswalk and close to 3 times as likely to hit a pedestrian on a road shoulder.

15. **Llerena L. E., Aronow K. V., Macleod J., et al. An evidence-based review: distracted driver. *The journal of trauma and acute care surgery.* 2015;78(1):147-152.**
Llerena, Aronow, Macleod et al. conducted a systematic review of international data during the years 2000 to 2013 to determine the effects of cell-phone use on driving performance. Variations on the key words “texting” and/or “distracted driving” were used to find citations in the PubMed database. The authors initially found 39 such articles; however, after exclusion criteria, 19 were coded into the systematic review. Three main trends were summarized: 1. Driver distractions significantly contribute to motor vehicle crashes in all age groups, 2. All cell phone use while driving causes significant driver distraction, and 3. Novice and teen drivers are at increased risk of crashes due to distracted driving.

16. **Strayer David L., Cooper Joel M., Turrill Jonna, et al. Measuring Cognitive Distraction in the Automobile.Washington, D.C.: AAA Foundation for Traffic Safety;2013.**
Together with the AAA Foundation for Traffic Safety, researchers from the University of Utah—Cooper, Turrill, Coleman et al.—conducted three experiments to systematically measure cognitive distraction. Each experiment measured eight tasks: 1. No secondary task, 2. Listening to a radio, 3. Listening to a book on tape, 4. Conversation with a passenger, 5. Conversation on hand-held cell phone, 6. Conservation on hands-free cell phone, 7. Interaction with speech-to-text email system, and 8. Concurrent performance with an auditory Operation Span (OSPAN) task, which are tasks that use math and memorization. For each experiment, researchers had participants rate the difficultly of each task. Researchers used NeuroScan 4.5 software to measure cognitive distraction by having participants wear a continuous EEG during the experiments. Experiment 1 measured baseline data for the above-listed eight tasks, without driving, for thirty-eight participants. Experiment 2 measured cognitive distraction for thirty-two participants by requiring that they complete the above-listed eight tasks while using a fixed-base high fidelity driving simulator. Experiment 3 measured cognitive distraction for thirty-two

participants on the above-listed eight tasks while the participant drove an instrumented car on a defined route. After analysis, researchers determined that the eight tasks gradually increased in workload rating throughout all experiments, with speech-to-text being the most cognitively distracting out of all of the common in-vehicle activities. Through these experiments, researchers were able to establish a systematic instrument for measuring and understanding cognitive distraction in the vehicle.

17. **Pedestrian Safety Advisory Council 2018 Annual Report & Recommendations.Olympia, Washington: Washington Traffic Safety Commission;2018.**
This Pedestrian Safety Advisory Council (PSAC) report details the factors that have led to pedestrian fatalities and serious injuries on Washington State roadways and provides recommendations to improve safety for people who walk.

18. **Cooper Jones Bicyclist Safety Advisory Council 2018 Annual Report.Olympia, Washington: Washington Traffic Safety Commission;2018.**
This Cooper Jones Bicyclist Safety Advisory Council (BSAC) report details the factors that have led to bicyclist fatalities and serious injuries on Washington State roadways and provides recommendations to improve safety for people who ride bicycles.

19. **Washington State's School Zone Safety Account: A Report to the Legislature.Olympia, Washington: Washington Traffic Safety Commission; 31 December 2015 2015.**
This Washington Traffic Safety Commission (WTSC) report examined "declining revenue going to the school zone safety account with the goal of identifying factors contributing to the decline" and provides recommendations to "ensure that that the account is receiving all amounts that should be deposited into the account." The report specifically examines changes in traffic enforcement, driver behavior, automated traffic safety camera revenue, and amended charges.

20. **School Walk Route Improvement Program Scoring Criteria. Olympia, Washington: Washington Traffic Safety Commission; 2017.**
This document outlines the Washington Traffic Safety Commission's scoring criteria for the School Walk Route Improvement Program grant. Applications are reviewed and scored by a multidisciplinary panel. The highest scoring projects are recommended to the WTSC director for funding. Staff note that the criteria were developed to screen in lower income schools that may not otherwise have access to funds to implement school zone traffic safety projects.

21. **Fitzpatrick Kay, Brewer Marcus, Obeng-Boampong Kwaku, et al. Speeds in School Zones.Austin, Texas: Texas Transportation Institute; February 2009 2009.**
This research project was sponsored by the Texas Department of Transportation Research and Technology Implementation Office. Researchers at the Texas Transportation Institute were tasked with reviewing existing practices and developing guidelines regarding the establishment of school zones. "Researchers documented existing knowledge on traffic control devices in school zones using a review of previous research that examined effectiveness of devices, a survey of practitioners on signing and marking, a review of state and city school zone guidelines and warrants, and a telephone survey of law enforcement officers." They also collected field data

at 24 school zones across Texas and "analyzed the data for findings on speed-distance relationships, speed-time relationships, influences of various site characteristics on speeds, and special characteristics of school zones with buffer zones." Findings were used to develop suggested guidelines for traffic control devices, including school speed zones, near schools in Texas.

22. **DiMaggio Charles, Brady Joanne, Li Guohua. Association of the Safe Routes to School Program with school-age pedestrian and bicyclist injury risk in Texas. *Injury Epidemiology.* 2015;2015(15).**
This study analyzed quarterly traffic crash data between January 2008 and June 2013 in Texas to assess the effect of the Safe Routes to School (SRTS) program implemented after 2009 on school-age pedestrian and bicyclist injuries. The analysis includes SRTS programs that implemented various interventions (e.g., capital improvements, education programs). Results show the number of pedestrian and bicyclists injuries decreased 42.5% in children from 5 to 19-years of age and 33% in adults 30 to 64 years of age. The annualized school-age pedestrian fatality rates decreased 37.1% with the implementation of the SRTS. Study limitations included restricting comparisons to locations with SRTS interventions versus those location without interventions rather than restricted to injuries occurring during school travel times. Authors concluded results indicate that the implementation of the SRTS program in Texas may have contributed to declines in school-aged pedestrian and bicyclist injuries.

23. **DiMaggio Charles, Li Guohua. Effectiveness of a Safe Routes to School Program Preventing School-Aged Pedestrian Injury. *Pediatrics.* 2013;131(February 2013).**
This study from Columbia University examined the prevention of school-aged pedestrian injury in New York City. Authors geocoded motor vehicle crash data obtained from the New York City Department of Transportation, Office of Research, Implementation, and Safety. During the study period, the annual rate of pedestrian injury decreased 33% among school-aged children (5-19 years) and 14% in adults. Authors analyzed data from both Safe Routes to School (intervention) census tracts and non-intervention census tracts. Authors report, the rate of injury among school-aged children remained virtually unchanged in census tracts without SRTS interventions. Limitations of the study include an inability to account for other factors that may have influenced or reduced the number of school aged pedestrian injury. This research was funded by the National Center for Injury Prevention and Control of the Centers for Disease Control and Prevention, the National Institute on Drug Abuse, and the National Institutes of Health (NIH).

24. **Wheeler-Martin Katherine, Mooney Stephen J., Lee David C., et al. Pediatric emergency department visits for pedestrian and bicyclist injuries in the US. 2017.**
Wheeler-Martin et al. used a multi-year national sample of emergency department (ED) records (2006-2012) to estimate annual motorized-vehicle related pediatric pedestrian and bicyclist (i.e. pedalcyclist) injury rates by age and region. Authors modeled in-hospital fatality risk controlling for age, gender, injury severity, traumatic brain injury (TBI), and trauma center status. "A total of 467,093 (95% CI 464,110–470,076) of these discharges (0.21%, 95% CI 0.20, 0.21) were for pedestrian or bicyclist injuries related to motor vehicles, of which 72.7% (95% CI 72.6, 73.5) were pedestrians." Results showed that "ED visits for pediatric pedestrian injuries declined 19.3% (95% CI 16.8, 21.8) from 2006 to 2012, with the largest decreases in 5-to-9 year olds and

10-to-14 year olds." Case fatality rates also declined 14.0%. However, bicyclist injury rates did not significantly change. Overall, "TBI was implicated in 6.7% (95% CI 6.3, 7.1) of all pedestrian and bicyclist injuries and 55.5% (95% CI 27.9, 83.1) of fatalities. Pedestrian ED visits were more likely to be fatal than bicyclist injuries (aOR = 2.4, 95% CI 2.3, 2.6), with significant additive interaction between pedestrian status and TBI." Authors concluded, "TBI in young pedestrian ED patients was associated with a higher risk of mortality compared to cyclists." Authors also noted, ED data captures a substantially larger number of pediatric pedestrian injuries compared to crash reports and can play a role in those analyses.

25. **Nevin P. E., Blanar L., Kirk A. P., et al. "I wasn't texting; I was just reading an email ...": a qualitative study of distracted driving enforcement in Washington State.** ***Injury prevention : journal of the International Society for Child and Adolescent Injury Prevention.*** **2016.**

Nevin et al. conducted semistructured focus groups with Washington State active duty law enforcement officers with the goal of understanding the factors that influence distracted driving enforcement. The study was done in 2013 with 26 active duty officers from three counties in Washington that represent both rural and urban locations. Participants filled out anonymous surveys about demographic data and personal driving habits and participated in a focus group that included a set of 28 general and probing questions. Among the participants, 58% reported that they talked either weekly or daily on their cell phone while driving and 27% reported regularly reading text messages while driving. A number of themes emerged from the qualitative interviews regarding challenges to enforcing distracted driving laws. A number of officers discussed resistance to citations during traffic stops, particularly when they were stopped for texting as opposed to talking on a cell phone. There was also a consistent discussion about enforcement for distracted driving being a lower priority compared to other duties. For example, one officer discussed that if he is on a call responding to a burglary and he sees a phone related violation on the way there, it's not enough of a priority to stop and respond to the phone violation so he will just continue on. In response to this theme, there was a general consensus that dedicated traffic enforcement officers is an effective strategy for distracted driving and many noted that this strategy has worked for seat belt and impaired driving enforcement. Other enforcement strategies discussed include the use of patrol on motorcycles and bicycles, unmarked patrol cars, and increased communication with prosecutors in an effort to improve coordination and education for officers. Many officers discussed that distracted driving is under-reported on collision reports because it is often not a habit to ask about it when taking a report and many drivers are reluctant to disclose that information. Specifically related to Washington laws, officers reported that the texting and driving law is narrowly defined and challenging to enforce, particularly because other activities people engage in on their phones besides texting is not expressly prohibited so it's difficult to differentiate. These frustrations were also true for the use of a handheld mobile phone given that the law prohibits holding the phone to your ear but not necessarily holding it up to your face on speaker mode, for example.

26. **Administration National Highway Traffic and Safety. Traffic safety facts, 2015 data: Children. US Department of Transportation; March 2017 2017.**

This fact sheet contains information on fatal motor vehicle crashes and fatalities in the United States based on data from the Fatality Analysis Reporting System (FARS). Motor vehicle crashes are the leading cause of death for children age 14 years and younger. In 2015, children accounted

for 3% of traffic fatalities (1,132). Of those 73% were occupants (824) and 27% were nonoccupants (308) (pedestrians [21%], pedalcyclists [4%], and other [2%]). Of the 233 children pedestrian fatalities in traffic crashes, 145 (62%) were boys. An estimated 178,000 children were injured in traffic crashes, a 6% increase from 167,000 in 2014. On average 3 children were killed and an estimated 487 children were injured every day in the U.S. in traffic crashes. In Washington, 20 children were killed in motor vehicle traffic crashes (rate of 1.49 child motor vehicle traffic fatalities per 100,000 child population).

27. **Administration National Highway Traffic and Safety. Traffic safety facts, 2015 data: Pedestrians. US Department of Transportation; February 2017 2017.**
This fact sheet presents 2015 data on fatal motor vehicle crashes and fatalities in the U.S. based on data from the Fatality Analysis Reporting System (FARS). In 2015, a total of 5,295 traffic crashes had one or more pedestrian fatalities. On average, a pedestrian was killed every 1.6 hours and injured every 7.5 minutes in traffic crashes. Seventy percent of pedestrians killed in traffic crashes were males. Overall, the male pedestrian fatality rate per 100,000 population was 2.37, more than double that for females (0.99 per 100,000 population). The highest total pedestrian fatality rates by age group were those ages 50 to 54 years and 80 years and older (2.56 and 2.50 per 100,000 population, respectively).

28. **Statter Mindy, Schuble Todd, Harris-Rosado Michele, et al. Targeting Pediatric Pedestrian Injury Prevention Efforts: Teasing the Information Through Spatial Analysis. *The Journal of TRAUMA Injury, Infection, and Critical Care.* 2011;71(5):S511-S516.**
Slatter et al. analyzed pediatric pedestrian injury data in Chicago, Illinois, to identify geographic areas at greater risk of crashes involving child pedestrians. Researchers used trauma registry E-codes for pedestrian motor vehicle crashes to identify children younger than 16 years of age who received acute care and were hospitalized at the University of Chicago Medical Center, a Level I pediatric trauma center, after being struck by a motor vehicle from 2002 to 2009. Findings show that 3,521 children were admitted to the University of Chicago Medical Center for traumatic injuries from 2002 to 2009. Of those, "27.7% (974) of these children sustained injuries in pedestrian motor vehicle injuries. From 2002 to 2009, there were a total of 106 traumatic deaths, of which 29 (27.4%) were due to pedestrian motor vehicle crashes." Analysis found that "pediatric pedestrian motor vehicle crash sites occurred predominantly within low-income, predominantly African-American neighborhoods. A lower prevalence of crash sites was observed in the predominantly higher income, non–African-American neighborhoods." Authors note that "[t]the disparity in prevalence of crash sites is somewhat attributable to the lower density of children living in the predominantly higher income, non-African-American neighborhoods, including the community immediately around [University of Chicago Medical Center]." Demographic data gleaned from GIS-identified associations are useful to develop risk profiles. However, this methodology cannot infer causality.