The VISION ZERØ Toolbox

People-Driven Strategies for Safer Philadelphia Streets

The Vision Zero Toolbox: People-Driven Strategies for Safer Philadelphia Streets provides an array of strategies to address traffic safety issues in the City. The goal of this toolbox is to move beyond the strategies and actions that are already underway or proposed through the Vision Zero Three-Year Action Plan and Philadelphia's Connect Plan.

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Cover photo: Visit Philadelphia

table of contents

Source: Bicycle Coalition of Greater Philadelphia

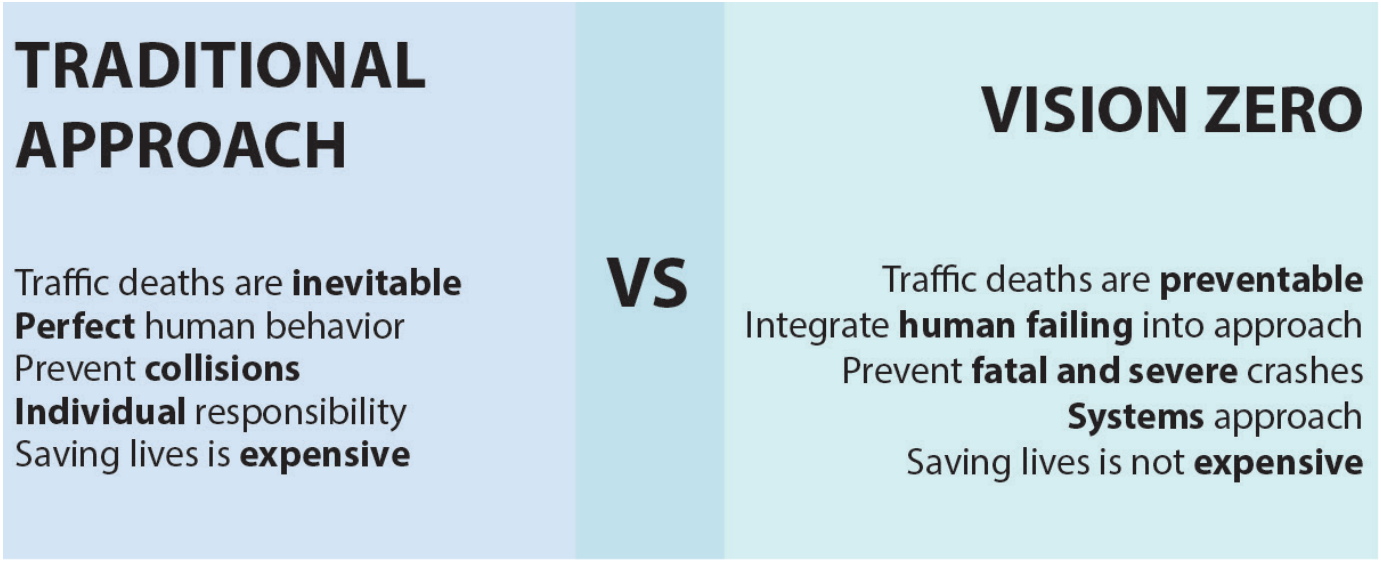
What is Vision Zero?

Vision Zero is a global movement grounded in the notion that all traffic fatalities and severe injuries are avoidable, and any loss of life is not an acceptable price to pay for improved mobility. Vision Zero changes the conversation around traffic safety, forcing road users and planners to acknowledge that crashes are not accidents; rather, they are a direct result of valuing mobility over human lives.

Using a systems approach, Vision Zero departs from the traditional approach to traffic safety in two ways. First, Vision Zero acknowledges that while drivers are bound to make mistakes, the road system should be engineered and policies should be crafted so that these mistakes do not lead to deaths. Second, Vision Zero highlights the importance of a multidisciplinary approach to traffic safety, understanding that there are many factors that bring about safe mobility, including roadway design, driving behavior, technology, speed, and policy. Vision Zero "focuses attention on the shortcomings of the transportation system itself, rather than changing individual behavior," using education, enforcement, and road design to eliminate traffic fatalities.

Founded in Sweden in 1997, Vision Zero swept across Europe in the 2000s and has recently spread to the United States. In 2014, the United States Department of Transportation established its own version of Vision Zero, Toward Zero Deaths, which serves as a national strategy for highway safety. This strategy, like Vision Zero, envisions a national highway system that is free of traffic fatalities.

Figure 1. Comparison between traditional approach to traffic safety and Vision Zero.



Source: Vision Zero Network

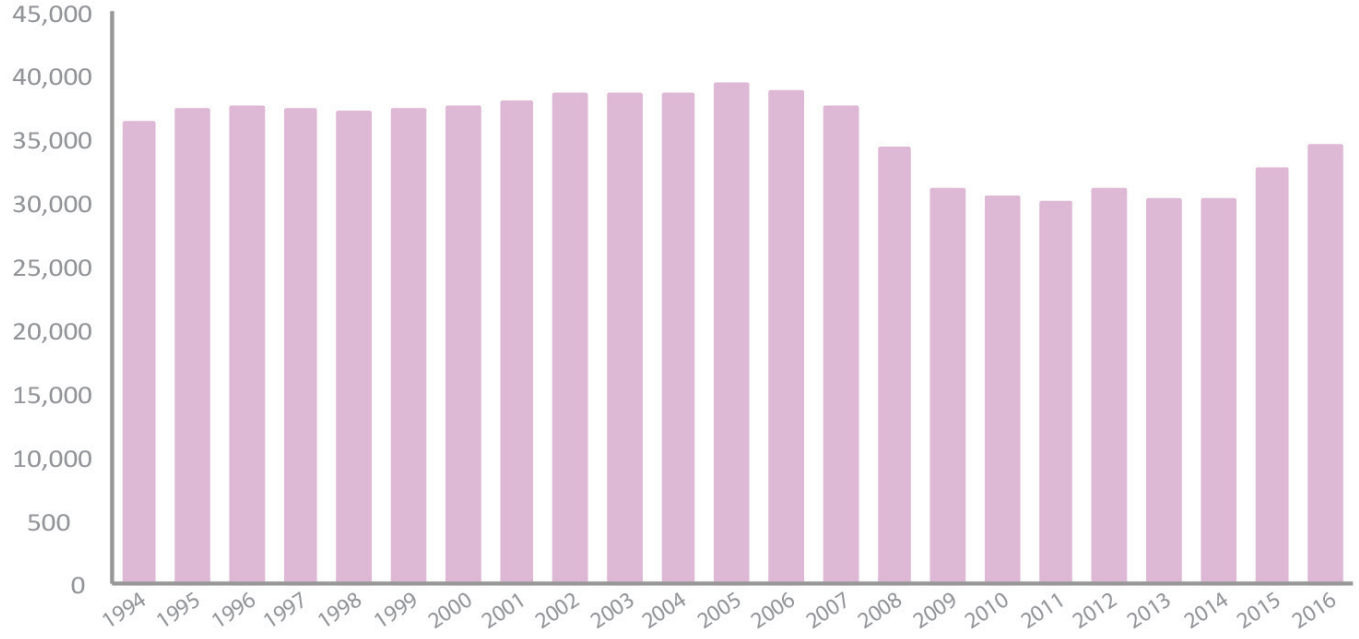
Concurrently, cities across the United States adopted their own Vision Zero policies, with New York and San Francisco leading the charge, both developing plans in 2014. Other cities have followed suit, including Boston, Washington, D.C., Los Angeles, Austin, and Seattle.

In the U.S., the interest in Vision Zero comes at a time when traffic deaths nationwide are on the rise, after decades of decline. While the year 2011 represented an all time low in traffic fatalities nationwide, since that year, the number of traffic fatalities has incrementally increased nationwide. According to data from the National Highway Transportation Safety Administration (NHTSA), in 2016, 37,461 individuals were killed in crashes, an increase of more than 5 percent from 2015.

Increases in driving activity, measured by the number of vehicle miles traveled (VMT), are often cited as the main contributor to the steady climb in traffic fatalities in recent years, but the number of vehicle miles traveled on U.S. roads increased by just 2.2 percent from 2015 to 2016. Normalized by VMT, the fatality rate on U.S. roads increased by 2.6 percent from 2015 to 2016, which suggests that other factors are driving the increase in traffic fatalities, such as an increase in the number of sports utility vehicles (SUVs) on the road and increased speed limits in some states.

The data further showed that in 2016, speeding-related deaths increased by 4 percent and pedestrian deaths increased by 9 percent. Although 2016 was a particularly bad year, the increases in traffic fatalities in 2016 compared to the previous year is emblematic of a larger trend in the United States, providing evidence for why a new approach to traffic safety, and Vision Zero in particular, has become popular among policymakers across the United States.

Figure 2. Fatal Crashes in the United States, 1994-2016.



Source: National Highway Transportation Safety Administration, Fatality Analysis Reporting System

Vision Zero in Philadelphia

Following nationwide trends, traffic fatalities in the city spiked in 2012, after several years of decline. More staggering is the comparison of Philadelphia's crash rate during the period to peer cities. Between 2012 and 2016, Philadelphia had an average crash rate of 6.2; during the same period, New York City's average crash rate was 3.1, Boston's was 4.1, and Chicago's was 4.9.

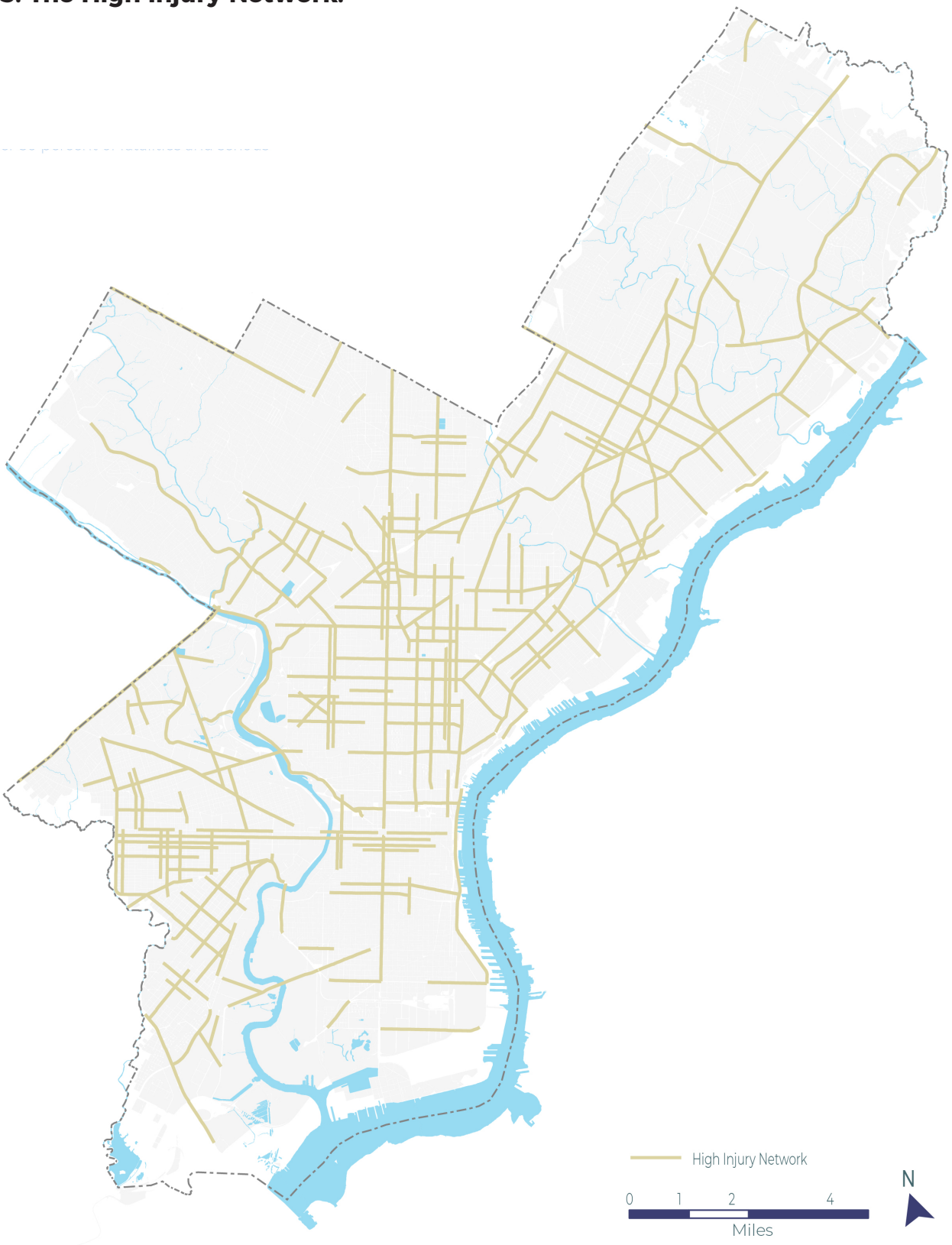
During the five year period between 2011 and 2015, there were 474 traffic fatalities in Philadelphia, 165 (35 percent) of which were pedestrians. In addition, 1,357 individuals were severely injured in traffic crashes in Philadelphia, 362 (27 percent) of whom were pedestrians. Analysis showed that children under the age of 18 were overwhelmingly impacted by traffic crashes, with approximately 4 children involved in crashes every day. Further, a spatial analysis found that crashes disproportionately impact neighborhoods where more than half of the population lives below the poverty line.

Because of the number of Philadelphians killed or severely injured in crashes each year, Vision Zero was adopted in Philadelphia through an executive order from Mayor Jim Kenney on November 7, 2016. The executive order from the mayor established a Vision Zero Task Force, whose purpose is to lead the city's effort in building and implementing Philadelphia's Vision Zero program. As achieving zero traffic deaths requires a collaborative effort, the mayor appointed task force members from numerous city and state agencies including:

- the Managing Director's Office;
- the Office of Transportation, Infrastructure, and Sustainability (oTIS);
- the Philadelphia Police Department;
- the Office of Complete Streets;
- the Department of Planning and Development;
- the Department of Streets;
- the Department of Licenses and Inspections;
- the Department of Public Health;
- the Pennsylvania Department of Transportation (PennDOT);
- the People's Emergency Center;
- the School District of Philadelphia;
- the African American Chamber of Commerce;
- the Southeastern Pennsylvania Transportation Authority (SEPTA);
- the Association Puertorriquenos en Marcha, Inc; and
- the Philadelphia Association of Community Development Corporations.

Although involvement is broad across city agencies, the charge to carry out and implement Vision Zero is largely led by the Office of Complete Streets, one of several offices housed in oTIS.

Figure 3. The High Injury Network.



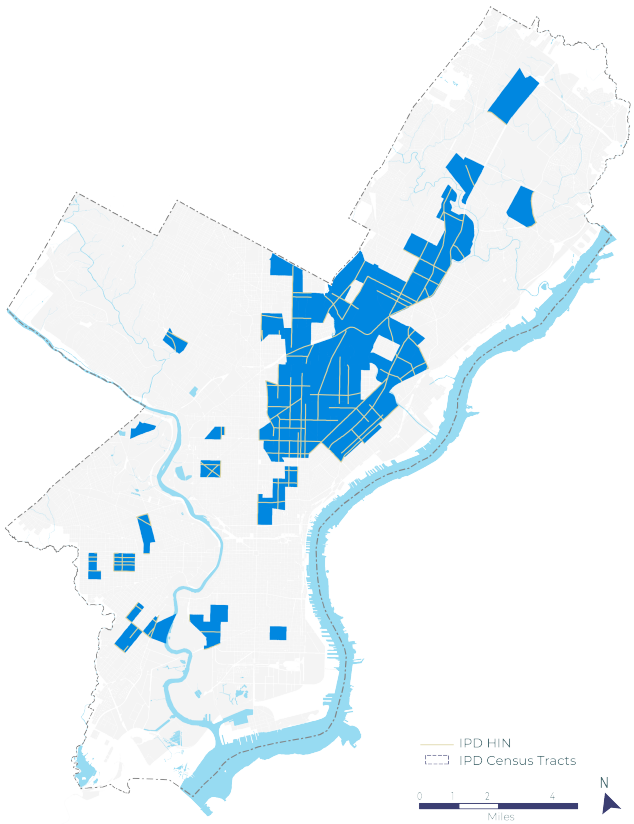
Source: Vision Zero Philadelphia

In September 2017, approximately one year after the establishment of the Task Force, the city released the Vision Zero Three-Year Action Plan. This plan laid out a framework for the realization of Vision Zero in the city, establishing goals and five key priorities: equity, evaluation, engineering, education, and enforcement, with the ultimate goal of eliminating traffic fatalities in Philadelphia by 2030. The Three-Year Action Plan also introduced the High Injury Network (HIN), a selection of roads in the city where 50 percent of traffic deaths and severe injuries occur. This network represents only 12 percent of the city's streets and helps the city prioritize where projects could have the greatest impact. The city released its first update of the Three-Year Action Plan in October 2018.

With Vision Zero only one year old, traffic crashes in Philadelphia remain a serious problem. Other cities with more established Vision Zero programs, such as New York and San Francisco, have seen significant improvements, especially in regards to pedestrian safety. In Philadelphia, 78 lives were lost due to traffic fatalities and 244 individuals were severely injured in 2017. Compared to 2016 alone, this represented a 19 percent decrease in the number of people killed in traffic crashes in the city, however, this improvement fails to tell the whole story. Philadelphia saw an abnormally high number of fatal crashes in 2016; 2017 represents about a 10 percent decrease when comparing to the 2011-2016 crash average of 87.2 fatalities. Based on the current trajectory, traffic deaths will not reach zero in Philadelphia for several decades, well beyond the goal of 2030. Importantly, pedestrians are still the road users most likely to be killed in traffic crashes. Between 2013 and 2017, pedestrians made up only 15 percent of those involved in crashes, compared to 42 percent of those killed. This indicates a great need for a continued commitment to Vision Zero in Philadelphia.

In addition, our analysis of the HIN found that KSI crashes are most prevalent in areas with greater proportions of disadvantaged

Figure 4. The High Injury Network and Indicators of Potential Disadvantage.



Source: Vision Zero Philadelphia, DVRPC

populations. Based on the Indicators of Potential Disadvantage (IPD) methodology developed by the Delaware Valley Regional Planning Commission (DVRPC), our analysis found that disadvantaged communities have 40 percent more road miles of the HIN compared to non-disadvantaged communities. There are nine IPDs in total, including low-income, racial minority, ethnic minority, and disabled populations. This finding that more HIN road miles are located in disadvantaged communities indicates that disadvantaged populations are most at risk of being killed or seriously injured in a crash.

Overview of the book

This toolbox is intended to build off the existing analyses the City conducted in the development of the Three-Year Action Plan and Year One Vision Zero Update. Using the results of in-depth analyses of the crash data, the remainder of this toolbox seeks to help the city use its limited resources wisely by answering five central questions:

1. **Who** is most impacted by crashes?
2. **Wha**t driver behaviors contribute most to crashes?
3. **Where** are crashes most likely to occur?
4. **When** are crashes most likely to occur?
5. **How** can the city create a new culture of safety?

Each individual chapter focuses on one of these five questions and includes an overview of the issues at hand, key data findings, maps of high priority areas, and strategies for solving the key issues. Rather than fitting the strategies the city has already developed to the issues addressed in this toolbox, the intention of the toolbox is to provide new strategies that support the work that is already underway. Strategies in the toolbox are divided into short-term, low-cost; medium-term, moderate-cost; and long-term, high-cost strategies, as one-size-fit-all solutions may not work for every community. Strategies are accompanied by cost estimates as well as crash reduction factors (CRF), or their estimated impact on safety.

The analyses presented in the following chapters are focused on crashes that occured on or within close proximity to the HIN, as it represents the areas of the city with the greatest need for safety improvements. With a focus on the HIN, the analyses also centered on killed and serious injury (KSI) crashes. As the intention of Vision Zero is to eliminate traffic fatalities, it is imperative that analysis and the strategies are targeted at those areas with the highest propensity for fatal crashes. The intention of the analyses presented in this toolbox is to identify key patterns in the crash data citywide over the five-year analysis period; as such, unlike an analysis of a corridor or of a single intersection, our recommendations are based on high-level takeaways and the implementation of the recommended strategies will require an in-depth study of the proposed locations to determine feasibility.

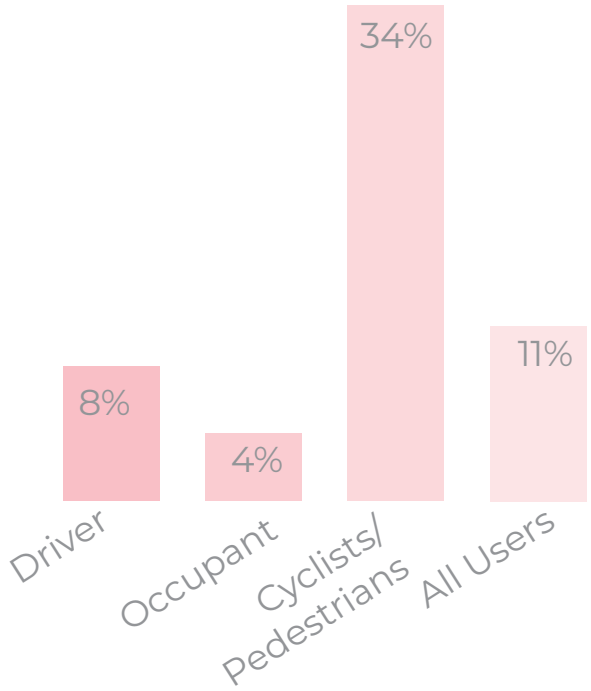
Source: streetsdept.com

Introduction

According to the Vision Zero Year One Update, drivers and passengers are mostly involved in crashes. 81 percent of Philadelphia crashes involved people in vehicles, and 54 percent of traffic fatalities were motor vehicle occupants. Although drivers and passengers are most frequently involved in crashes, pedestrians and cyclists are disproportionately affected. In 2017, only 15 percent of traffic crashes involved pedestrians and 4 percent involved cyclists. However, nearly half of those who were killed in crashes were cyclists or pedestrians, a finding consistent with analysis of previous individual years. In addition, pedestrians and cyclists are found to have the highest fatality rate of all user groups.

Among all pedestrians and cyclists, certain demographics are more vulnerable than others. The analysis found that school-aged children and older adults are especially vulnerable and need our attention. We will have analysis and strategies that specifically focus on them in the later sections of this chapter.

Figure 5. Percent of people involved and killed in crashes by mode.



Source: PennDOT, 2013-2017

Focus Area #1:
Pedestrians and cyclists

- enhance legal but unmarked crosswalks
- curb extensions and pedestrian refuge islands

Focus Area #2:
School-age pedestrians

- drop-off and pick-up lanes
- school slow zones
- speed camera enforcement in school zones
- road function transition

Focus Area #3:
Senior pedestrians

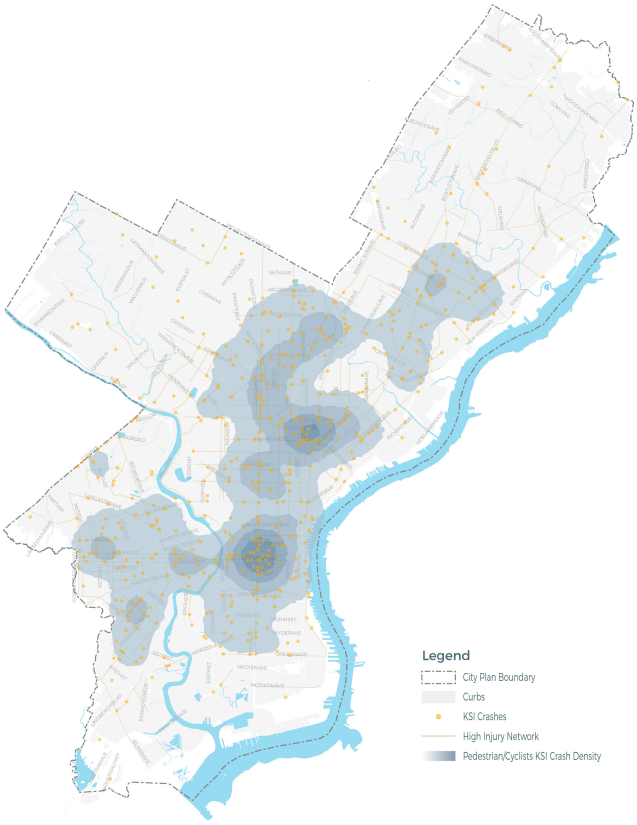
- signal improvements
- senior safety zones
- senior education campaign

focus area #1

Pedestrians and cyclists

The analysis finds that overall, 61 percent of all KSI crashes involving pedestrians and cyclists are located on the HIN. As the hotspot map shows, pedestrian and cyclist crashes are concentrated in certain areas of the city. KSI crashes involving pedestrians occurred most frequently in Center City, Kensington, West Kensington, North Philadelphia, and Broad Street.

Figure 6. Spatial distribution of KSI crashes involving pedestrians and cyclists.



Source: PennDOT, 2013-2017

strategy #1

enhance legal but unmarked crosswalks

Responsible agencies: PennDOT, oTIS

Cost: $2,500 on average

Crash reduction factor: 20-40%

Every intersection with sidewalks on the roads that intersect has a crosswalk whether marked or unmarked. According to Pennsylvania's pedestrian law, vehicles shall yield the right-of-way to pedestrians in either a marked or unmarked crosswalk at non-controlled intersections. While stop signs and traffic signals clearly delineate the roles and responsibilities at marked intersections, unmarked intersections do not provide directions and may be confusing. Enhancing these legal but unmarked crosswalks are necessary for clarifying the responsibility of drivers.

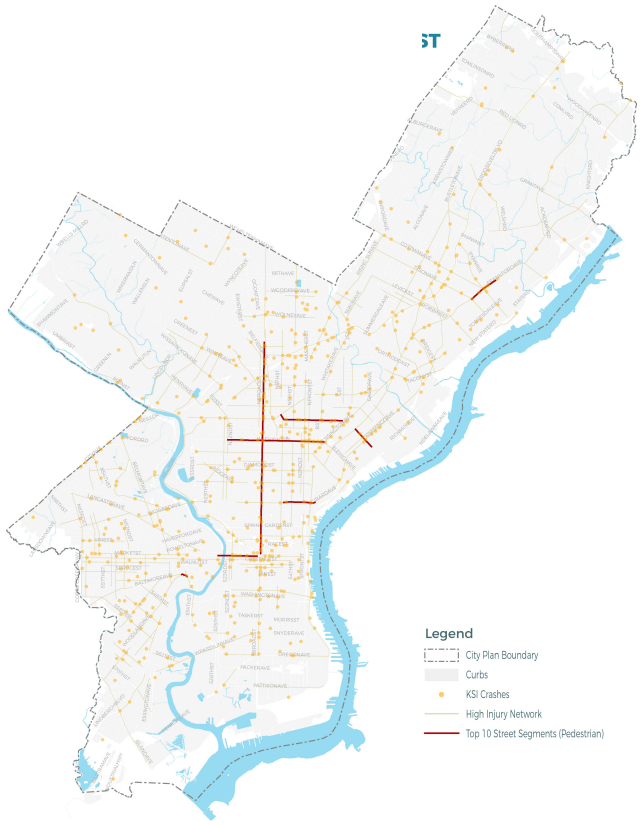
However, without any other traffic calming treatments, simply enhancing unmarked crosswalks is not expected to reduce pedestrian crashes under all conditions. A report conducted by the Federal Highway Administration (FHWA) reveals that on multi-lane roads with traffic volumes

greater than 12,000 vehicles per day, having a marked crosswalk was associated with a higher pedestrian crash rate (after controlling for other site factors) compared to an unmarked crosswalk. Therefore, locations for adding marked crosswalks should be carefully selected and enhanced with other pedestrian crossing improvements, such as traffic-calming treatments, pedestrian signals, or installing angled crosswalks with barriers to improve crossing safety for pedestrians.

In order to prioritize locations for enhancing pedestrian crosswalks, we have identified a list of the top 10 street segments on the HIN with the highest pedestrian and cyclist KSI crashes per mile. East Allegheny Avenue, the top street segment in our list, is identified as a candidate site for marked crosswalks. Currently there are some intersections without marked crosswalks, or the marked crosswalks are faded. Marked crosswalks should be added to these intersections.

Not all intersections on these street segments are appropriate for simply adding marked crosswalks, based on the travel volume, speed limit, and crosssection of the street. According to the FHWA, higher-volume streets with higher speed limits and more travel lanes may need raised medians or traffic-calming treatments in addition to marked crosswalks.

Figure 7. Top ten corridors for pedestrian and cyclist crashes.



Source: PennDOT, 2013-2017

Figure 8. Example of a unmarked crosswalk at the intersection of Allegheny Avenue and Amber Street.

Source: Google Earth

strategy #2

curb extensions and pedestrian refuge islands

Responsible agencies: PennDOT, oTIS

Cost: $13,520 per island, $3,250 per curb extension

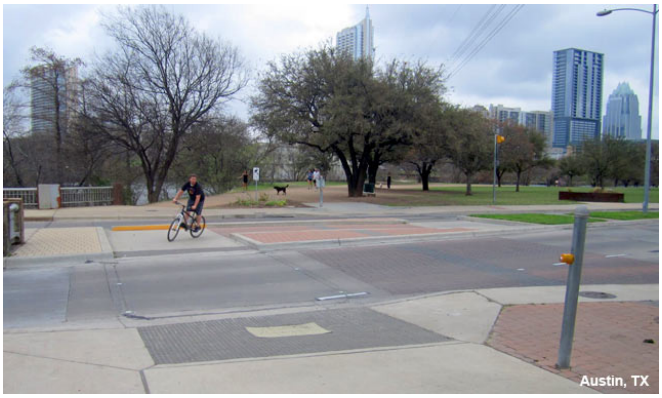
Crash reduction factor: 25-30%

Curb extensions extend the sidewalk on both sides of crosswalks to reduce the distance pedestrians have to walk in the roadway, thereby reducing their chances of getting hit by a vehicle. They also improve the visibility of pedestrians and reduce drivers' turning speed, among many other benefits. Like curb extensions, street medians serve as islands in the middle of roadways for pedestrians crossing wide streets to break if they are unable to cross in time, providing similar benefits. Raised medians are especially practical pedestrian safety solutions in Philadelphia, since the city has long been planning to construct medians on various streets and ranks each of its streets in median installation priority. On average, curb extensions cost $13,000 per extension to build. Typical concrete street medians cost $73 per linear foot to build. Medians and other types of pedestrian islands have crash reduction factors of 25 to 30 in urban areas.

The best streets for curb extension and median refuge placements are especially "wide," bidirectional, have high median installment priority by the city, and have on-street parking lanes next to curbs so that the curb extensions do not block travel and turning lanes. For this analysis, "wide" corridors were defined as being a major or minor arterial. The Philadelphia Department of Planning and Development (DPD) designates certain streets as being "high priority" for median installment as part of their complete streets planning process.

To prioritize where to install pedestrian safety islands and/or medians, the New York City Department of Transportation (NYCDOT) selected out streets that experience the highest KSI crash rates and are on roads that are considered especially wide and busy. PDPD could develop curb extension and median refuge criteria similar to New York's and require that streets be at least 60 feet wide. Several street segments with a high prevalence of pedestrian KSI crashes could have safety islands or medians installed.

Figure 9. Example of a pedestrian refuge island in Austin, Texas.



Source: National Association of City Transportation Officials

focus area #2

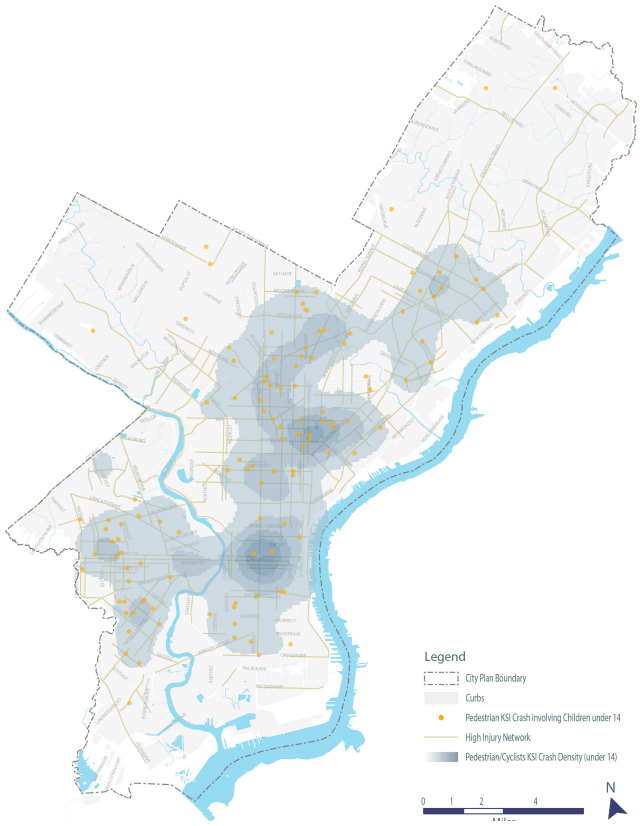
School-age pedestrians

School-aged children are disproportionately affected by traffic crashes. Every day, four children are reported to be involved in traffic crashes. In addition, 51 percent of the city's public elementary and middle schools are adjacent to HIN streets, and 58 percent of the pedestrian and cyclist KSI crashes on the HIN that involved children under 14 years old occurred within a quarter mile from a school.

The city has already invested significant resources into improving the safety of children. For example, Philadelphia already has a Safe Routes to School program (WalkSafePhilly) in response to safety concerns for children attending schools outside of their neighborhoods. In addition, in Pennsylvania, funding for Safe Routes to School Projects are incorporated in their Transportation Alternatives Set-Aside Program. With a strong background of safety concerns for school-aged children, there is opportunity for additional interventions.

The street segments on the HIN with the highest KSI crashes per mile that involve pedestrians under 14 years old, are largely minor arterials and collectors, streets that have relatively low traffic volumes compared to most streets on the HIN. The strategies suggested here will largely focus on these areas.

Figure 10. Spatial distribution of KSI crashes involving school-age pedestrians.



Source: PennDOT, 2013-2017

strategy #1

drop-off and pick-up lanes

Responsible agencies: PennDOT, oTIS, School District of Philadelphia

Cost: $0.50 per linear foot

Crash reduction factor: 20-30%

According to the Safe Routes to School Online Guide, a comprehensive online reference to support the development of the Safe Routes to School Programs, some parents are reluctant to allow their children to walk or bike to school due to the traffic danger during student arrival and dismissal. This often leads to more parents driving their children to school, resulting in increased traffic congestion. By improving the drop-off and pick-up process, traffic conditions will be better and safer in general. Safer traffic conditions around schools will ease the concerns of parents, so that they will be more willing to allow their children to walk or cycle. This is a site-specific application of strategies, since each school will have its own set of limitations and opportunities.

Drop-off and pick-up lanes are designated areas on the street adjacent to school grounds or directly on the school grounds dedicated to the loading and unloading of students by private vehicles. The rendering on the right shows a corral where children can wait to be picked up. Motor vehicles with identification tags that correspond to an individual student line up in the yellow-lined area. When the motor vehicle progresses to the white-striped loading area, the appropriate child exits or enters the vehicle. Signs, such as the one in the picture on the right, can remind drivers to follow the established process.

Identifying drop-off and pick-up lanes is a very low-cost strategy to protect school-aged children, since pavement painting and marking generally cost only $0.50 per linear foot in Pennsylvania. Some schools may have their own drop-off and pick-up loading zones directly on school grounds, while designating lanes on streets adjacent to schools for drop off and pick up can be helpful to organize traffic near schools.

One possible area in which the city can implement this strategy is along West Norris Street, a one-lane, one-way street, with two parking lanes. From 2013 to 2017, four school-aged KSI crashes occurred on this street, a comparatively high number. The traffic volume is relatively low on West Norris Street compared to other HIN streets, so designating a drop-off/pick-up zone is likely to have less effect on the existing traffic than establishing a pick-up/drop-off zone on a higher-volume corridor. In addition, 4 schools, Engineering and Science High School, Frederick Douglass Mastery Elementary, Community Partnership School, and William Dick School, are very close to West Norris Street, supporting it as a use case.

Figure 11. Rendering of a drop-off, pick-up lane at Frederick Douglass Mastery School on West Norris Street in North Philadelphia.

strategy #2

school slow zones

Responsible agencies: PennDOT, oTIS, School District of Philadelphia

Cost: $5,000 per zone

Crash reduction factor: 25-30%

NYCDOT has identified School Slow Zones adjacent to schools to reduce crashes and create a more comfortable pedestrian environment. In a School Slow Zone, the speed limit is lowered to 20 miles per hour during school days. If a speed bump is feasible at a certain location, the speed limit is reduced to 15 miles per hour. School Slow Zones are generally installed on streets with only one moving lane per direction.

In Philadelphia, a Neighborhood Slow Zone Program was recently announced, following the example of New York's Neighborhood Slow Zones. While Neighborhood Slow Zones and School Slow Zones are similar, as both aim to reduce the speed limits within specific locations and ultimately prevent severe crashes, the School Slow Zones prioritize interventions near schools, especially when schools are in session.

Schools with high enrollment as well as a high number of school-aged children KSI crashes should be targeted in this strategy. Based on New York City's list of School Slow Zones, the area of the school slow zones generally ranges from one block to a few blocks from where a school is located. We identify schools and the blocks with high priorities for implementing School Slow Zones based on the following criteria:

- schools on the HIN;
- schools with higher number of KSI crashes involving children under 14 years old than the city average; and
- schools with enrollments higher than the city average.

The initial selection includes 54 schools in the city. In order to further narrow down the priority areas, we selected the 20 schools with the highest enrollment. As the map shows, most of the schools are clustered in North Philadelphia.

Figure 12. Proposed School Slow Zones.

strategy #3

speed camera enforcement around schools

Responsible agencies: PennDOT, oTIS

Cost: $14,200 per camera installation, recurring cost of $9,600 per year

Crash reduction factor: 45-50%

Speeding is a leading cause of fatal traffic crashes. In New York City, an automated speed enforcement program to deter speeding in 20 pilot school speed zones was enacted by the State Legislature and Governor Cuomo in 2013. In June 2014, the pilot was expanded to a total of 140 school zones. This speed camera program has proven highly effective at deterring speeding. The presence of the speed cameras has dropped speed 63 percent during school hours and reduced injuries by 17 percent near speed cameras.

In Philadelphia, enabling state legislation, Senate Bill No. 172, gave the city the ability to pilot its first automated speed enforcement system along Roosevelt Boulevard, one of the city's Vision Zero priority streets. The pilot program is a significant policy and legislative achievement, and the support from the state's leadership will advance these efforts further. Assuming a successful pilot on Roosevelt Boulevard, there is an opportunity for the city to expand this enforcement.

Schools and blocks identified as priority locations for implementing School Slow Zones, are also targeted in this strategy for enforcing speed cameras. We expect reductions of vehicle speeds in those School Slow Zones, and would prioritize locations for installing automated speed cameras where speeds fail to decrease.

strategy #4

road function transition during school peak hour

Responsible agencies: PennDOT, oTIS, School District of Philadelphia, PPD

Cost: $25,000 per school

Crash reduction factor: 50%

The concept of "school streets," started in Bolzano, Italy in the early 1990s and has spread to many other countries since that time. School streets are marked with signs to restrict use 15 minutes before and after school begins and ends. This strategy has proven effective in reducing traffic deaths for children and increasing rates of walking to school. According to the European Local Transport Information Service, 45 percent of students in Bolzano walk to school every day, and collision rates involving school children has decreased by half after the implementation of school streets.

Domestically, the concept of school streets was implemented in Jersey City, New Jersey. Potential locations for implementing this strategy are located in areas of the city with the highest school-aged KSI crashes per mile, such as West Norris Street. West Norris Street has one of the lowest traffic volumes among HIN streets, and therefore transitioning road function during school peak hours is unlikely to affect vehicle movement and congestion substantially.

This strategy is a comprehensive intervention and requires both engineering installations as well as enforcement actions. In order to move this strategy forward, oTIS will have to coordinate with school administrations and the Philadelphia Police Department.

focus area #3

Senior pedestrians

Another vulnerable group that needs our attention is older adults. The analysis of crashes found that pedestrians and cyclists aged 65 or older have the highest fatality rate of any age group. 20 percent of Philadelphians aged 65 or older involved in HIN KSI crashes die, a rate higher than any other age group. About 60 percent of older adult HIN KSI crashes involved a senior pedestrian struck at an intersection.

strategy #1

signal improvements

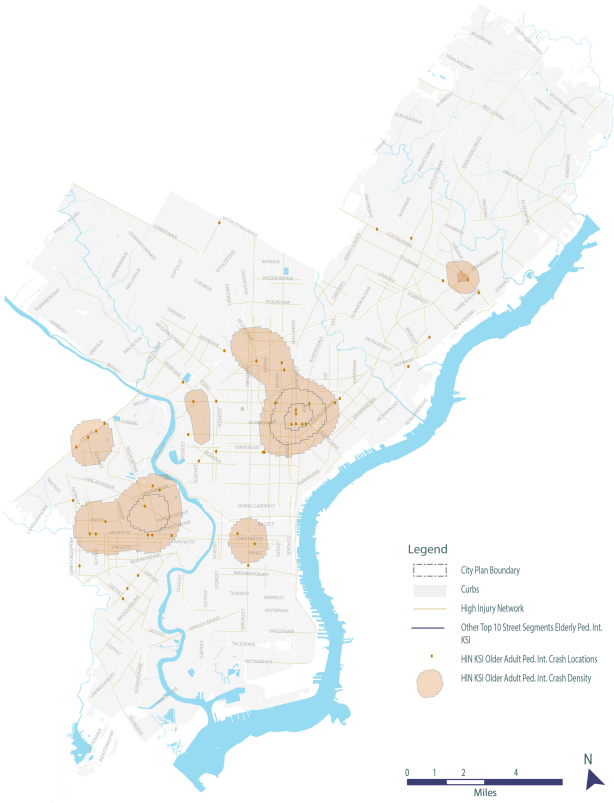
Responsible agencies: PennDOT, Streets Department, oTIS

Cost: $8,800 per intersection

Crash reduction factor: 15-20%

Intersections located on wide corridors with high concentrations of senior pedestrian intersection crashes could be altered by adding accessible pedestrian signals (APS) and extending crosswalk times. Philadelphia has already installed APS on some of its widest streets, such as on Callowhill Street from 2nd to 7th Streets. However, there are other wide and dangerous streets in the city where these could be installed as well. APS make crosswalk signals loudly audible for pedestrians who are hearing and/or vision impaired, making this a good solution for

Figure 13. Spatial distribution of KSI crashes involving senior pedestrians.



Source: PennDOT, 2013-2017

older Philadelphians who may not know when it is safe to cross the street.

In addition, extending crossing signals to give older Philadelphians who struggle to make it across the street is a simple strategy to address older pedestrian intersection crashes. Extending crosswalk times at wide and high-volume intersections and streets makes it easier for slow-walking

Figure 14. Example of an accessible pedestrian signal.

Source: Lancaster Online

seniors to cross streets, presenting a logical complement to installing APS to help these seniors. Extending crossings on wide corridors could be targeted because the increased length may be more difficult to cross compared to narrower corridors. Irregular multi-legged intersections on those widest corridors should also be targeted, as their increased complexity adds more danger by confusing both pedestrians and motorists alike. Installing crosswalk timers alone have crash reduction factors of 5 to 10 and upgrading signals by adding pedestrian features to them have crash reduction rates of 5 in urban areas.

NYCDOT installed 25 APS per year before the city adopted Vision Zero, but started implementing them at a rate of 100 per year after the city adopted Vision Zero. To prioritize which intersections to install APS, New York ranked the city's intersections based on density of senior residents surrounding them, traffic volume, traffic congestion, traffic signal patterns, intersection density, and crossing distance.

The best streets for installations of crossing signals with longer than usual crossing times and APS are especially "wide", "complex," "congested," and/or "busy," following New York's criteria. Based on these criteria, 13 intersections on Market Street from 38th to 48th Streets qualify for installations of APS and longer crossing times. The intersection of Market Street, South 44th Street, and Powelton Avenue, should especially be considered due to its irregularity.

strategy #2

senior safety zones

Responsible agencies: oTIS, PCPC, Streets Department

Cost: unknown

Crash reduction factor: unknown

One strategy is to designate new special senior safety zones to concentrate street improvements and engagement efforts for senior pedestrians. The Philadelphia City Planning Commission (PCPC) has already created small senior pedestrian zones focused around senior centers in their South District, and other cities such as Toronto and New York have established these zones in their cities as part of their Vision Zero plans.

PCPC's criteria for deciding where to establish these zones was simply being near a senior center in the South District, which has the biggest older adult population concentration in the city. However, as shown earlier, KSI crashes involving senior pedestrians concentrate elsewhere.

Other cities like New York used more criteria than Philadelphia. NYCDOT first circled clusters of KSI older adult pedestrian crashes on a heat map of senior pedestrian crashes, and assigning the neighborhoods those clusters were located in as their first round of focus areas. For their remaining two rounds of zone creation, they filtered the first round neighborhoods by selecting out districts with:

- high concentrations of older adult populations;
- high densities of nursing homes, senior centers and public housing complexes with high older adult populations; and
- close proximity to major transit network nodes.

Toronto took an approach closer to Philadelphia's when creating its senior safety zones, defining their senior safety zones more narrowly as individual intersections where many crashes with seniors occurred. However, like New York City, Toronto used similar criteria to filter out which intersections would ultimately be designated as senior safety zones.

Figure 15. Proposed senior safety zones.

Source: PennDOT, 2013-2017

Several census tracts are located in the highest senior pedestrian intersection crash hotspots that could be good candidates for this program, as seen on the map on the previous page. These tracts have senior populations of over 11 percent, at least one senior center, and are located within one block of a subway, regional rail, or trolley stop. These census tracts are primarily located in Center City west of Broad Street, West Philadelphia north of Market Street, and North-Central Philadelphia.

strategy #3

senior education campaign

Responsible agencies: oTIS, PCPC, PCA

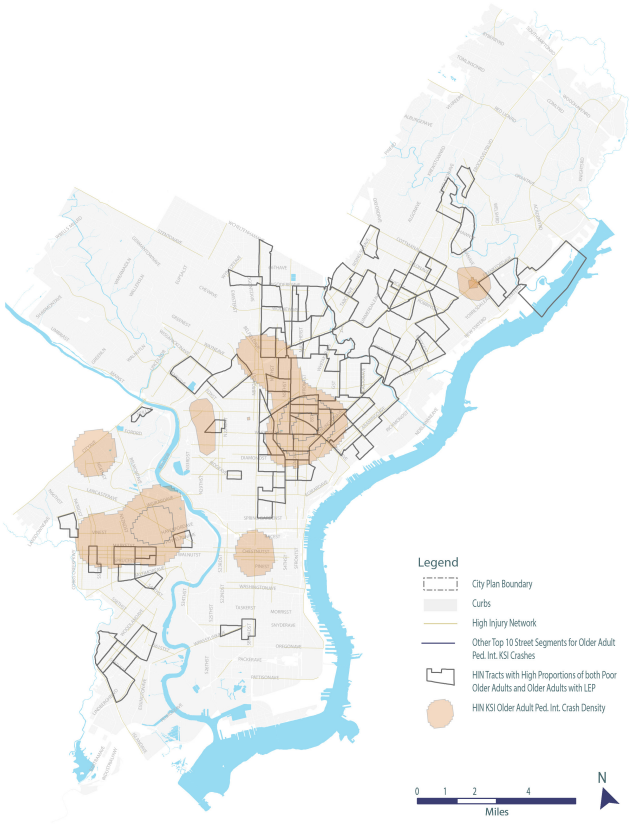
Cost: unknown

Crash reduction factor: unknown

San Francisco took a novel approach to educating seniors about traffic safety by awarding $250,000 to various community organizations along their HIN so that they could conduct outreach specifically to seniors. They reached out in particular to groups in areas with high concentrations of poor senior residents with limited English proficiency to reach the most vulnerable senior pedestrians.

Philadelphia could establish a program similar to this by awarding funds to community organizations that are situated in neighborhoods along the HIN with high rates of poor older adults with limited English proficiency. These community organizations could then hold engagement events targeting these poorer older adults in multiple languages, just like in San Francisco. The Department of Planning and Development and other similar agencies in the city that specialize in transportation and community-outreach could be responsible for distributing the funding to these community organizations and working with them. In addition to existing organizations and city agencies, like the PCDC, Registered Community Organizations (RCOs), and the Asociación Puertorriqueños en Marcha (APM), the city could partner with existing senior non-profits who work on wider regional scales, such as the city and state chapters of AARP.

Figure 16. Comparison between density of KSI crashes involving senior pedestrians and low-income, limited English proficiency areas.



Source: PennDOT, 2013-2017, American Community Survey, 2012-2016

Source: Khatibi Law

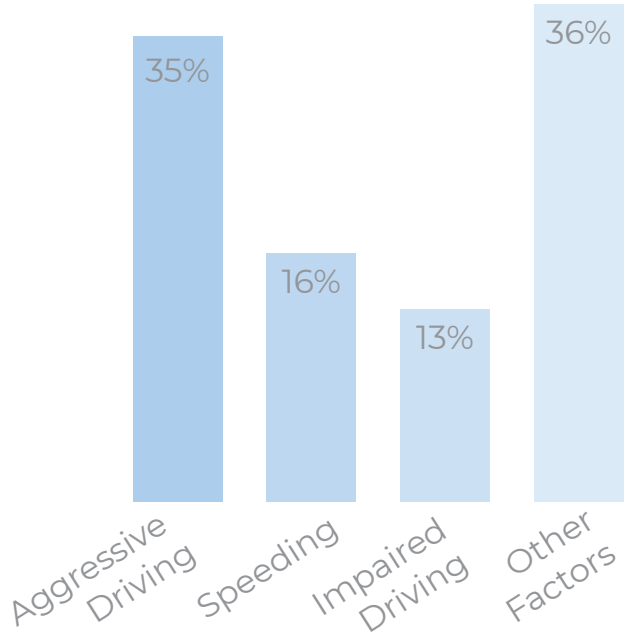
Introduction

The following chapter is centered on the most common contributing factors resulting in KSI crashes in Philadelphia, i.e. aggressive driving, impaired driving, and speeding, providing short-, medium-, and long-term strategies to address each factor.

Aggressive driving is the top contributing factor to KSI crashes across the HIN. In total, approximately 35 percent of KSI crashes are attributed to aggressive driving, almost twice the percentage of the other contributing factors. For comparison, speeding and impaired driving contribute to between 8 and 20 percent of KSI crashes.

Consistent with the findings from the "Who" chapter, pedestrians are the most likely to be killed or serious injured in KSI crashes caused by aggressive driving, impaired driving, or speeding. Pedestrians made up between 8 and 15 percent of KSI crashes to which these three factors contributed, but made up between 33 and 37 percent of those killed in these crashes.

Figure 17. Percentage of KSI crashes to which aggressive driving, speeding, and impaired driving contributed, 2013-2017.



Source: PennDOT, 2013-2017

Focus Area #1:
Aggressive driving

- neighborhood & in-school education campaigns
- high-visibility enforcement
- referral of habitual aggressive drivers to state licensing agencies

Focus Area #2:
Impaired driving

- sobriety checkpoints
- all-offender ignition interlock law
- lowering of the legal BAC limit to 0.05

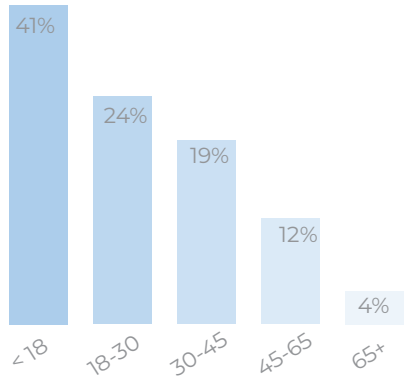
Focus Area #3:
Speeding

- conventional speed humps
- dynamic speed humps
- raised intersections
- road diets

The analysis also looks at the distribution of these driving behaviors by age group, and finds that overall, young and middle-aged adult drivers account for the majority of all three driving behaviors. This is particularly apparent when looking at aggressive driving, where drivers under 18 account for 41 percent of KSI crashes.

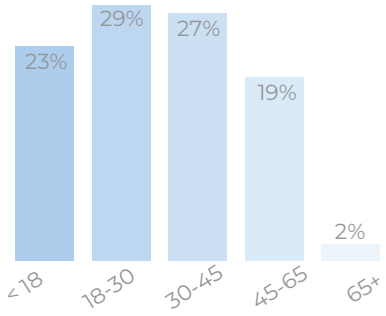
Moreover, consistent with the findings from the "When" chapter, these driving behaviors are most common between 7 p.m. and 4 a.m., with aggressive driving, impaired driving, and speeding-related crashes peaking after midnight.

Figure 18. Distribution of aggressive driving KSI crashes by age of driver.



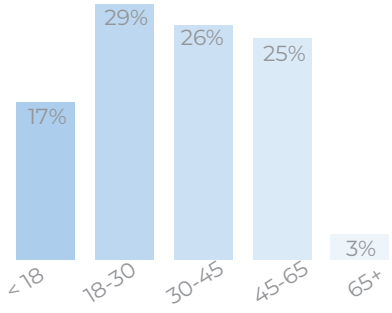
Source: PennDOT, 2013-2017

Figure 19. Distribution of impaired driving KSI crashes by age of driver.



Source: PennDOT, 2013-2017

Figure 20. Distribution of speeding-related KSI crashes by age of driver.



Source: PennDOT, 2013-2017

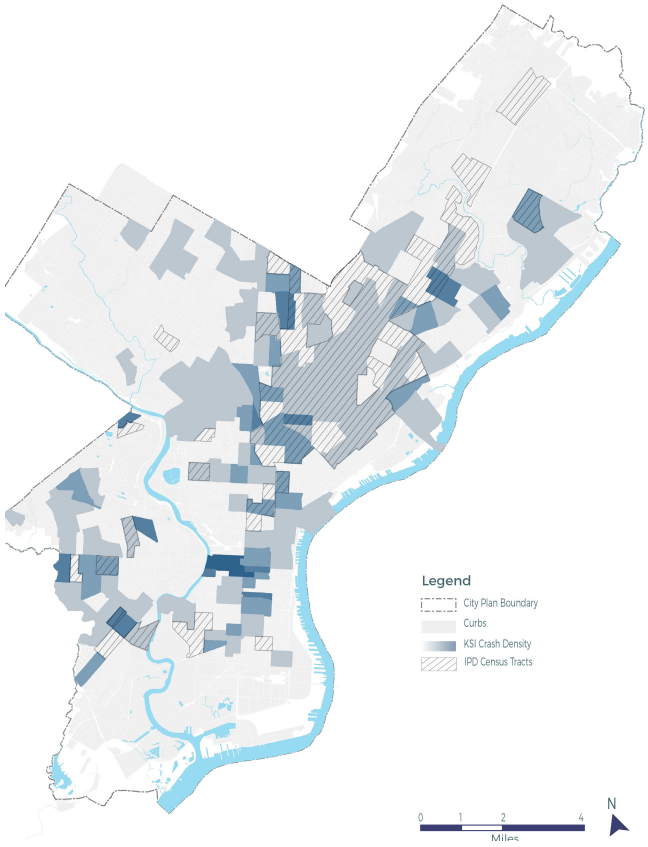
focus area #1

Aggressive driving

NHTSA defines aggressive driving as "at least two of a number of dangerous and often illegal actions, such as running a stop sign or red light, passing in a no-passing zone, and speeding." Aggressive driving is common throughout the city, with particular hotspots in North Philadelphia, Northeast Philadelphia, West Philadelphia, and Center City. Those areas with the greatest concentrations of aggressive driving crashes in the city are also higher-volume roads.

As shown in the map on the right, those areas with the highest density of aggressive driving related KSI crashes tend to overlap with census tracts with a high percentage of disadvantaged populations, as defined by DVRPC's IPD methodology. This indicates that disadvantaged populations, like low-income and minority communities, are most at risk of being impacted by an aggressive driving crash.

Figure 21. Comparison of aggressive driving hotspots to disadvantaged populations.



Source: PennDOT, 2013-2017, DVRPC

strategy #1

neighborhood and in-school education campaigns

Responsible agencies: oTIS, PHMC, PCPC, PDPH, School District of Philadelphia

Cost: unknown

Crash reduction factor: 25%

For short-term strategies, this analysis proposes launching a comprehensive neighborhood education campaign targeted at raising public awareness of the dangers of aggressive driving in order to cultivate a culture of safe driving throughout the city. Similar communication campaigns are already part of Philadelphia's Vision Zero program, such as the "We Meet in the Street" campaign.

Comprehensive neighborhood education campaigns could be targeted and applied in schools, given that drivers under 18 were the most frequently involved in aggressive driving KSI crashes. New Jersey's *Share the Keys* program is an example of how this could be implemented. Share the Keys is a 60- to 90-minute interactive orientation program for parents and their teen drivers that is designed to reduce teen driver crash risk through increased parental involvement.

A similar education program could be developed for Philadelphia that goes beyond what is learned in driver education programs to help ensure that young drivers understand and are prepared for the responsibility of being behind the wheel.

strategy #2

high-visbility enforcement

Responsible agencies: PPD, PennDOT, oTIS

Cost: $250,000 per year

Crash reduction factor: 70%

One strategy to curb aggressive driving behaviors is to conduct high-visibility enforcement. High-visibility enforcement aims to deter drivers from driving aggressively by targeting enforcement efforts to address certain traffic safety issues, such as speeding, impaired driving, and failure to yield, while also conducting a public awareness campaign to educate drivers of their responsibilities on the road. Passaic, Bergen, and Morris counties in New Jersey used high-visibility enforcement in 2013 to great success. This program helped the state decrease traffic fatalities by 12 percent.

High-visibility enforcement should be prioritized in those places across the city where aggressive driving behaviors are most prevalent, as shown in the maps earlier in this chapter. The implementation of this strategy must be carefully considered, however. Given that many of the top corridors for aggressive driving overlap with majority-minority and low-income communities, using high-visibility enforcement runs the risk of over-policing certain areas that have, throughout Philadelphia's history, had tenuous relationships with the police and others in power.

strategy #3

referral of habitual aggressive drivers to state licensing agencies

Responsible agencies: oTIS, PHMC, PCPC, PDPH, School District of Philadelphia

Cost: unknown

Crash reduction factor: 25%

In the long term, more forceful action can be taken to address consistent aggressive driving behaviors. For habitual aggressive drivers, police could refer these drivers to state licensing agencies for license suspension or revocation. Note that this strategy is only applicable when an officer has pulled a driver over and is able to view a motorist's driving history. Further, this strategy should only be used for drivers who have a history of aggressive driving. However, given that these habitual aggressive drivers have already demonstrated that they are willing to flout the law, they may disregard licensing restrictions.

Figure 22. *Share the Keys* program in New Jersey.

Source: Share the Keys

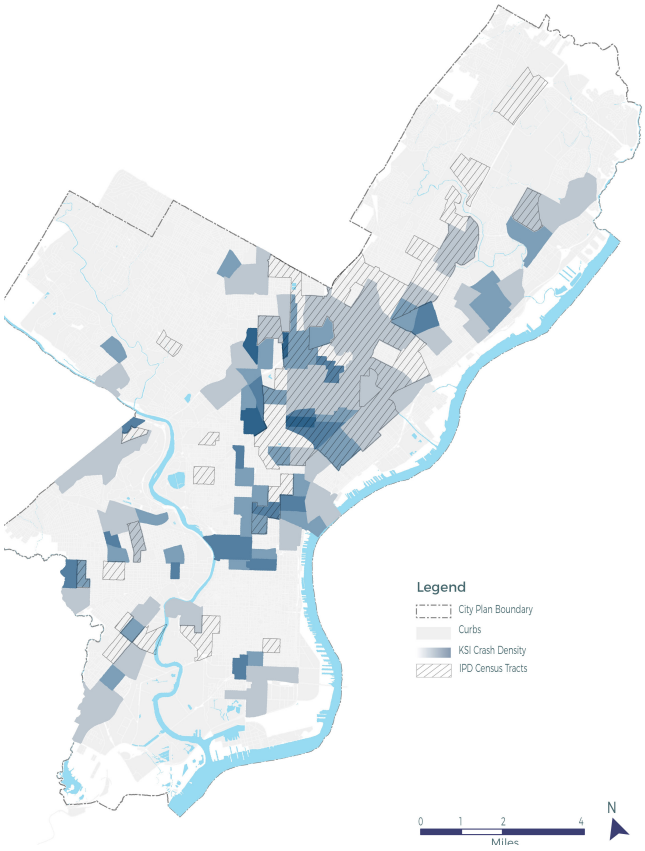
focus area #2

Impaired driving

Impaired driving refers to "driving under the influence of alcohol or drugs, whether they are illegal, prescription, or over-the-counter drugs." Unfortunately, due to data limitations, this analysis did not investigate the impact of the opioid epidemic, in which Philadelphia is particularly hard-hit, on the prevalence of drugged driving. However, drugged driving is definitely of concern. Between 2005 and 2015, the percentage of drivers involved in fatal crashes who were tested for drugs and tested positive increased by 54 percent nationwide. In response, NHTSA launched a Drug-Impaired Driving Initiative in 2018.

Impaired driving KSI crashes are less evenly distributed than aggressive driving or speeding-related KSI crashes. As the map shows, impaired driving crashes most frequently occur in Center City and North Philadelphia. Like aggressive driving, instances of impaired driving tend to be highest in places with a high disadvantaged population, as shown in the map on the right. Again, this does not indicate that these populations are driving under the influence more than other populations; rather, they are more at risk of being negatively impacted by impaired driving than other communities.

Figure 23. Comparison of impaired driving hotspots to disadvantaged populations.



Source: PennDOT, 2013-2017, DVRPC

strategy #1

sobriety checkpoints

Responsible agencies: PPD

Cost: $1-$10 per test

Crash reduction factor: unknown

One strategy to address impaired driving is screening drivers for alcohol in their systems at police checkpoints. In Pennsylvania, the state prohibits the operation of a motor vehicle by a driver with a blood alcohol concentration (BAC) of .08 percent or above. If a driver is arrested and convicted for driving under the influence (DUI) without any prior DUI arrests, they can receive up to six months probation and a $300 fine.

This document has identified the corridors where impaired driving takes place most frequently. These corridors include Whitaker Avenue, B St, Academy Road, North Broad Street, West Girard Avenue, Roosevelt Boulevard, Rising Sun Avenue, and North 2nd Street. This document recommends that more police checkpoints can be set up along these corridors.

strategy #2

all-offender ignition interlock law

Responsible agencies: PennDOT, Division of Driver Licenses, DUI treatment programs

Cost: $60-$90 per month, $70-$100 for initial installation

Crash reduction factor: 50%

An ignition interlock is a device installed in a vehicle designed to prevent a driver who has consumed alcohol from driving while impaired. The ignition interlock measures the alcohol in a person's system like a breathalyzer. If that amount exceeds a pre-programmed level, then the interlock temporarily locks the vehicle's ignition. The first waiting period is just a few minutes, then the driver can test again. To prevent drivers from drinking alcohol after the initial test, a random rolling retest while driving is required. When a driver fails to pass the retest while driving, the device will remind the driver to stop through blowing the horn and flashing lights.

Figure 24. Example of an ignition interlock device.

Source: Smart Start

Drivers who have interlocks installed are 35 to 75 percent less likely to acquire a repeat drunk-driving offense than convicted drunk drivers who do not have a device installed. Philadelphia's recidivism rate is expected to reach 25 percent by 2020.

Currently, Pennsylvania requires ignition interlock for those who are being convicted of a DUI for the first time with a BAC over 0.1, repeat DUI offenders, and individuals who refuse chemical testing. This strategy recommends requiring the installation of ignition interlocks in the vehicles of all those convicted of a DUI, regardless of BAC or previous conviction or arrest record. More than thirty states require ignition interlocks for all DUI offenders, including New York, Delaware, Maryland, and the District of Columbia.

strategy #3

lowering of legal BAC limit to 0.05

Responsible agencies: PPD

Cost: $1-$10 per test

Crash reduction factor: unknown

In the long term, the incidence of impaired driving KSI crashes could be reduced with stricter state laws regarding driving under the influence. For example, the state could lower the legal blood alcohol level from 0.08 to 0.05. Currently in all fifty states, drivers aged 21 or older are prohibited from driving with a blood alcohol level at or above 0.08 percent (drivers aged 20 or younger are subject to "zero-tolerance" laws, which criminalize alcohol-impaired driving for a BAC greater than 0). However, an individual's ability to operate a motor vehicle begins to deteriorate at blood alcohol levels below 0.08, increasing a driver's risk of being in a crash. According to recent research, all drivers are impaired regarding at least some driving performance measures at a 0.05 blood alcohol level, at which the risk of a single-vehicle crash increases by up to 21 times compared to a driver with no alcohol in their system.

Countries that have lowered their legal limit to 0.05 percent or lower, such as Austria, Denmark, and Japan, demonstrate that this is an effective policy. For instance, in Japan, alcohol-impaired traffic fatalities decreased 27 percent after the introduction of the new traffic law in 2002. In the United States, Utah's Governor Herbert signed a bill into law that will lower the legal drinking limit to 0.05 percent. The law is set to go into effect on December 30, 2018.

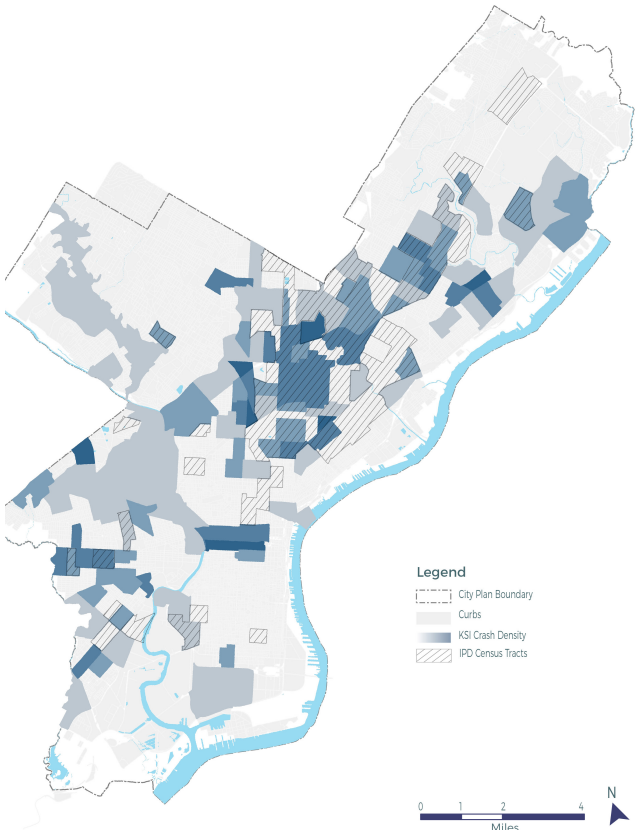
Reducing the legal limit for blood alcohol levels requires legislative action from the state, and is likely to experience pushback from a variety of stakeholders, including the beverage industry, the tourism industry, and the restaurant industry. This process could be accelerated by federal action to change the legal limit to 0.05 nationwide. Implementing this strategy is likely to be an uphill battle and will require effective media campaigns and visible enforcement efforts.

focus area #3

Speeding

In this analysis, speeding-related KSI crashes are analyzed in two separate categories: mid-block speeding crashes and intersection speeding crashes. Because of the separation, targeted strategies can be identified for different parts of the street. Both intersection and mid-block speeding-related crashes are concentrated in North and Northeast Philadelphia. In addition, like the other behavioral factors, speeding-related KSI crashes are concentrated in areas with higher concentrations of disadvantaged populations, especially around Roosevelt Boulevard. Residents of these areas are most at risk of being impacted by speeding-related crashes.

Figure 25. Comparison of speeding hotspots to disadvantaged populations.



Source: PennDOT, 2013-2017, DVRPC

strategy #1

conventional speed humps

Responsible agencies: PennDOT, oTIS, Streets Department

Cost: $1,500-$3,500 per hump

Crash reduction factor: 45-50%

A short term strategy to reduce speeding is the installation of speed humps. Installed in a series along a corridor with road signs, speed humps force vehicles to slow down. Speed humps can slow vehicles down to approximately 20 miles per hour at the hump and 25 to 30 miles per hour at the points between the humps. Speed humps are already common practice in Philadelphia, providing support for their implementation. Variations on the speed hump include dynamic speed humps and raised intersections; please see strategies #2 and #3.

strategy #2

dynamic speed humps

Responsible agencies: PennDOT, oTIS, Streets Department

Cost: $14,000 per hump for initial installation, $9,700 per year

Crash reduction factor: 45-50%

One of the challenges with speed humps is their impact on emergency vehicles, which are also forced to slow down over the hump. Response times can be slowed by 3 to 5 seconds per hump for fire trucks and fire engines and up to 10 seconds for ambulances with patients on board.

Dynamic speed humps differ from conventional speed humps in that they only activate if a vehicle is traveling above a certain speed. In addition to reducing the impact on emergency vehicles, dynamic speed humps also produce less noise pollution compared to conventional speed humps, since they are not activated for every vehicle on the road.

This document recommends that the conventional speed humps installed on Rising Sun Avenue be replaced with dynamic speed humps in the future, especially if conventional speed humps are found to not reduce speeding substantially. These speed humps could be more widely installed following a successful pilot on Rising Sun Avenue, especially in residential corridors.

strategy #3

raised intersections

Responsible agencies: PennDOT, oTIS, Streets Department

Cost: $25,000-$100,000 per intersection

Crash reduction factor: 60%

Slightly more extreme than a speed hump is a raised intersection, also known as a modified urban intersection. Raised intersections are created by raising the roadway to the same level as the sidewalk. These treatments provide an array of benefits especially for people with mobility and visual impairments because there are no vertical transitions to navigate.

Raised intersections can provide a number of benefits, including:

- making it physically more difficult for drivers to go through intersections at unsafe speeds;

Figure 26. Example of dynamic speed humps.

Source: Nordic Road and Transport Research

- improving drivers' awareness by prioritizing pedestrian crossings and helping define locations where pedestrians are expected;
- eliminating water ponding and debris collection at the base of ramps;
- increasing visibility between drivers and pedestrians by raising pedestrians in the motorists' field of view and giving pedestrians an elevated vantage point from which to look for oncoming traffic; and
- creating pedestrian intersections that are more comfortable, convenient and accessible since transitioning between the sidewalk and roadway does not require negotiating a curb ramp.

Regarding appropriate locations, this plan proposes that a raised intersection can be applied at the intersection of Whitaker Avenue and Jericho Road. The traffic volume is relatively low for a HIN street, so fewer vehicles will be impacted when crossing this intersection. In addition, this district is a highly residential area where the pedestrian demand is sufficient for the installation of a raised intersection.

A recent example of a raised intersection would be the those installed on Broad Street. Completed in July 2018, the project reconstructed intersections on Broad Street at Chestnut and Walnut Streets by modifying the elevation of the roadway surface and crosswalks to the same elevation as the adjacent sidewalk.

strategy #4

road diets

Responsible agencies: PennDOT, oTIS, Streets Department

Cost: variable

Crash reduction factor: 25-30%

In the long term, a road diet could be applied on certain corridors to further reduce speeding. A road diet is a traffic calming technique that improves safety and expands space for alternative travel modes by reducing the number of lanes or effective road width. The added road space can be used for pedestrian or cyclist infrastructure.

Road diets lower vehicle speeds and reduce crash rates by reducing vulnerable users exposure to motor vehicle traffic and crossing distances. In addition to benefiting vulnerable users, road diets also reduce rear-end collisions. Depending on the treatments included, a road diet can be implemented quickly and inexpensively or at a higher cost. Restriping can be implemented quickly and is less expensive, while installing new bicycle lanes takes more time and can be more costly.

There is some precedent for road diets in Philadelphia. In February 2018, the city proposed a pilot project that will last up to nine months. Through the project, both Market Street and JFK Boulevard could be transformed with fewer vehicle travel lanes and parking-protected bike lanes.

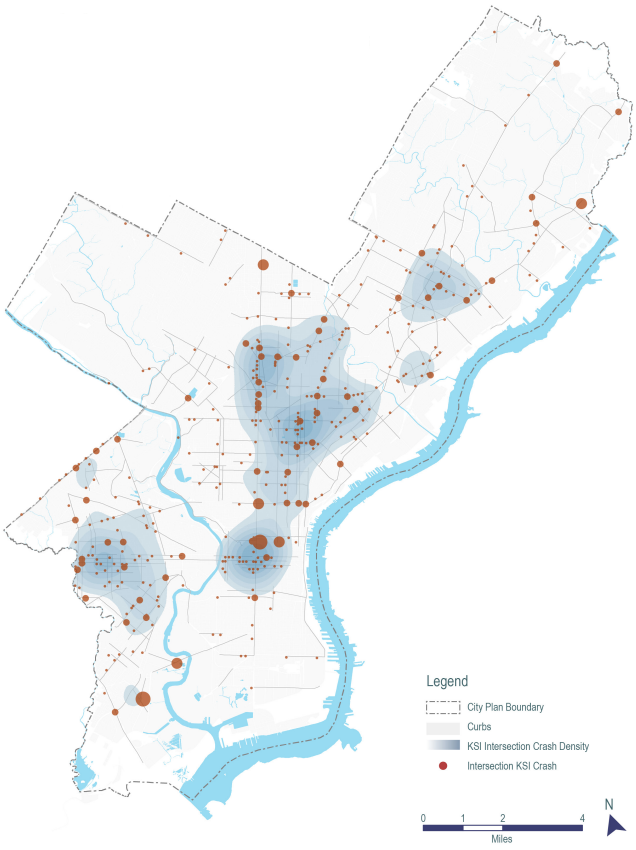
Source: streetsdept.com

Introduction

Intersections are planned conflict points in the road network, therefore they are where vehicles are most likely to come into contact with each other, as well as with pedestrians and cyclists. Despite making up a very small percentage of the road network, 25 percent of traffic fatalities in the United States occur at intersections, according to the FHWA. As such, intersection safety is one of the priority safety focus areas in Pennsylvania's 2017 Strategic Highway Safety Plan.

Intersection safety is of particular concern in urban areas, where intersection density is higher compared to rural or suburban areas. In Philadelphia, 59 percent of KSI crashes on the HIN occur at intersections. As seen in the map on the right, intersection KSI crashes are concentrated in North Philadelphia and West Philadelphia, as well as in Center City West. In these locations, this document recommends a variety of strategies to improve intersection safety.

Figure 27. Spatial distribution of intersection KSI crashes.



Source: PennDOT, 2013-2017

Focus Area #1:
Major-minor intersections

- left-turn bays
- protected left-turn signal phasing
- left-turn prohibition

Focus Area #2:
Irregular intersections

- more frequent restriping between resurfacing
- installation of roundabouts
- intersection realignment

focus area #1

Major-minor intersections

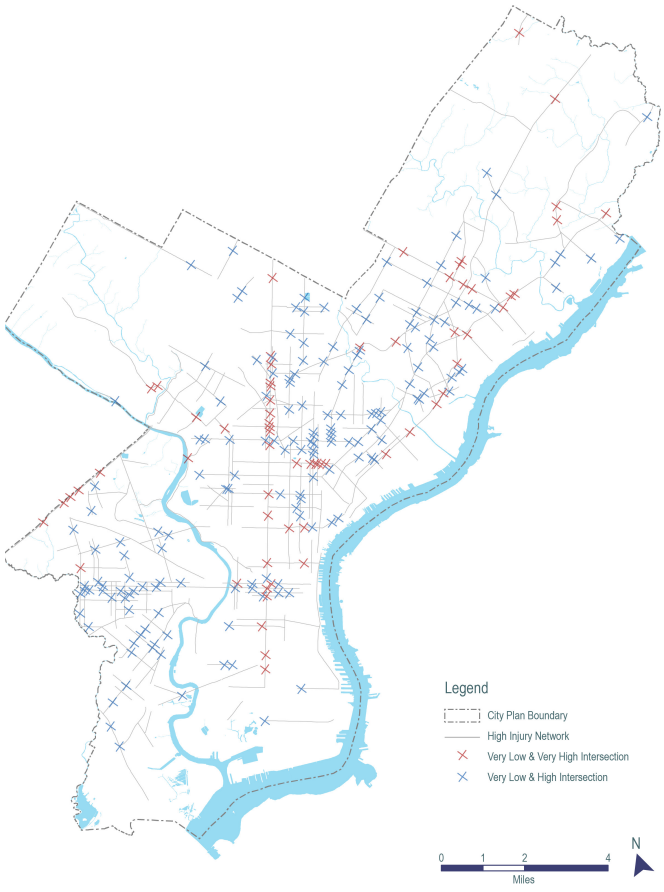
There are two types of intersections that are particularly crash-prone; one of these are what we refer to as "major-minor intersections." Major-minor intersections occur where high volume and low volume roads intersect, and are particularly crash-prone because of the large traffic volume differential between the intersecting streets. The major street is the intersecting street with higher traffic volume, while the minor street is the intersecting street with lower traffic volume.

People turning from the major to the minor street have to adjust to a lower-speed (often more residential) environment and vice versa. Without appropriate design elements to mark this transition, such as gateway signage, people might not be aware that they are entering a lower- or higher-speed environment.

These intersections occur more frequently in the HIN than in Philadelphia's street network as a whole; major-minor intersections make up a combined 59 percent of intersections in the HIN, compared to 27 percent of intersections in Philadelphia's street network as a whole. As can be seen in the map on the right, these major-minor intersections are distributed widely and unevenly across the HIN. The prevalence of these intersections along certain streets, such as North Broad Street, suggests that the problems associated with major-minor intersections are systemic issues that are best addressed through corridor-wide improvements, instead of site-specific treatments.

Major-minor intersections are also more crash-prone because they have a higher prevalence of left-turn crashes than do other intersections. 33 percent of major-minor intersections across the HIN experienced at least one left-turn crash, compared to 25 percent of the other intersection typologies. In general, left-turn crashes occur more frequently and are more severe than right-turn crashes, mostly due to the larger turn radius of left turns compared to right turns, which encourages a higher turning speed. Nearly a third of intersection KSI crashes involved a left-turning vehicle, while only 8 percent involved a right-turning vehicle.

Figure 28. Spatial distribution of major-minor intersections across the HIN.



strategy #1

left-turn bays

Responsible agencies: Streets Department

Cost: $500-$1,000 per linear foot

Crash reduction factor: 20%

Left-turn bays reduce "back pressure" by providing a space for turning vehicles to queue and decelerate safely. "Back pressure" occurs when a number of vehicles queue behind a left-turning vehicle, which can cause the driver to turn when it is unsafe to do so, resulting in angle crashes. By removing left-turning vehicles from the through-lane(s), left-turn bays also reduce rear-end crashes. A before-and-after analysis of crash data in New York City found that left-turn motorist injuries decreased by 45 percent after the installation of left-turn bays on select streets. This analysis also demonstrated a safety benefit for pedestrians and cyclists as well; left-turn pedestrian and cyclist injuries decreased by 15 percent after installation.

Left-turn bays are warranted wherever left-turning volumes exceed 100 vehicles per hour or 20 percent of the total approach volumes during peak periods. Left-turn bays are a relatively low-cost improvement; usually, the only cost involved in installing left-turn bays is the cost of the paint needed to restripe the lanes. However, depending on the width of the cartway, left-turn bays can require either widening the road or taking away a through-lane, which may make it more difficult to implement other safety improvements such as buffered or protected bicycle lanes.

strategy #2

protected left-turn signal phasing

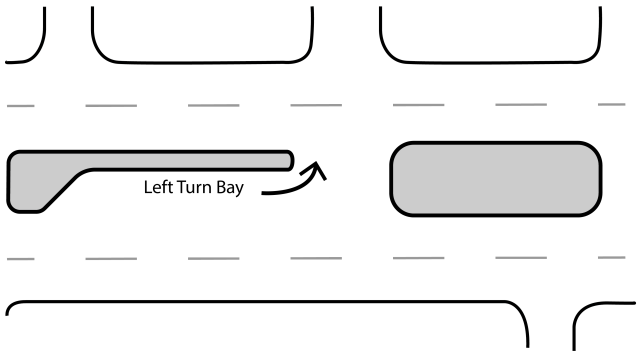
Responsible agencies: Streets Department

Cost: $800 per new signal head

Crash reduction factor: 50%

A more expensive solution, one which can be installed at intersections which already have a left-turn bay, involves changing the signal phasing to include a protected left-turn phase. Research by the FHWA as well as NYCDOT shows that the addition of a protected left-turn phase can reduce left-turn and head-on crashes by approximately 84 percent and left-turn pedestrian and cyclist injuries by approximately 33 percent. Protected left-turn phases eliminate the need for drivers to "find the gaps" in oncoming traffic, but are only recommended at intersections with high left-turn volumes, given the potential for the protected left-turn phase to increase overall intersection delay.

Figure 29. Example of a left-turn bay.



strategy #3

left-turn prohibition

Responsible agencies: Streets Department

Cost: $300 per sign

Crash reduction factor: 70%

The last strategy is more extreme than the preceding strategies, as it requires restricting left turns at some intersections during certain times of day (such as during the peak hour), or banning them altogether. Prohibiting left-turns should only be considered if left-turn bays and protected left-turn signal phasing has proven unsuccessful at reducing the frequency and severity of left-turn, rear-end, and head-on crashes at an intersection, or if left-turn bays or protected left-turn signal phasing are not feasible. It should also only be considered if there are nearby intersections at which the redirected left-turn vehicles can turn, so as not to significantly lengthen that vehicle's trip, which could worsen congestion during peak periods. A before-and-after analysis of crash data in New York City found that restricting left-turns reduced left-turn pedestrian and cyclist injuries by 41 percent.

focus area #2

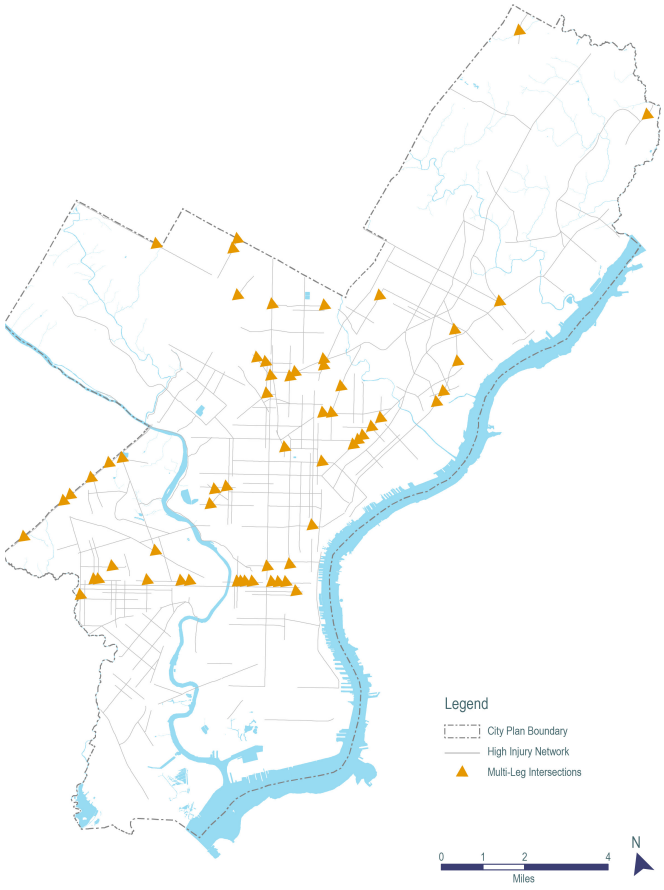
Irregular intersections

Irregular intersections occur where more than two roads intersect, resulting in multi-leg intersections. Given that Philadelphia has a fairly regular street grid, most intersections have four approaches meeting at right angles; therefore, irregular intersections make up a very small proportion of intersections across the street network as a whole. While skewed intersections are not easily identifiable with the data available, multi-leg intersections were easily identified. Multi-leg intersections are more common across the HIN; 15 percent of intersections across the HIN are multi-leg intersections, compared to 5 percent of intersections across the street network as a whole.

As shown in the map on the right, multi-leg intersections are widely and unevenly distributed across the HIN. They tend to be clustered in Center City on Market Street and in North Philadelphia.

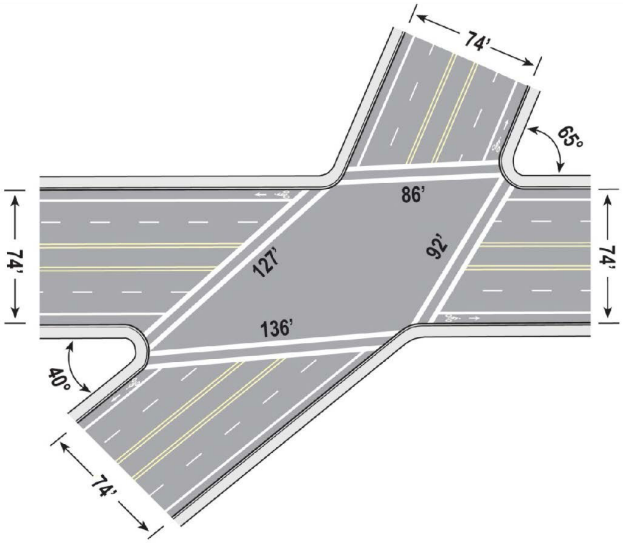
Multi-leg intersections are more crash-prone than conventional four-way or three-way ("T") intersections because they have more conflict points than a conventional four-way or three-way ("T") intersection and are more confusing for drivers to navigate, especially for those unfamiliar with the area. Multi-leg intersections also have the same problems as skewed intersections as at least one leg of the intersection must be skewed.

Figure 30. Spatial distribution of irregular intersections across the HIN.



Skewed intersections are more crash-prone than other four-way or three-way ("T") intersections because both vehicles and pedestrians may have a longer crossing distance, which means that they are more at risk of being involved in an intersection crash. Older adults, in particular, need more time than other pedestrians to cross streets, and as such, skewed intersections can be particularly challenging for them. It is also harder for drivers, and older drivers in particular, to have an adequate line of sight down an acute-angle approach and to judge when it is safe to turn. Moreover, vehicles turning left across an obtuse angle have a larger turning radius and therefore are able to turn at a higher speed. Speed, of course, is one of the main determinants of crash severity.

Figure 31. Example of a skewed intersection.



Source: Pedestrian and Bicycle Information Center

strategy #1

more frequent restriping between resurfacing

Responsible agencies: Streets Department

Cost: < $1 per foot

Crash reduction factor: unknown

In Mayor Kenney's 2018 budget proposal, $178 million was allocated to road resurfacing, to be spent over six years with the hope of reaching the city's goal of repaving 130 miles each year by 2023. However, even at this ambitious pace, roads will be resurfaced only once every 15 years. By this time, lane markings and crosswalk paint will have long faded away, especially in high-traffic areas. This document recommends restriping irregular intersections between resurfacing and taking steps to reduce the need for maintenance, such as spacing crosswalk bars to avoid the tire path of vehicles. While ideally all roads would be restriped more frequently (every three to five years), irregular intersections require even clearer delineation of space than regular intersections. As part of Washington, D.C.'s 311 program, residents can report roads with faded or missing lane markings, which is another way in which those intersections most in need of restriping could be prioritized.

strategy #2

installation of roundabouts

Responsible agencies: Streets Department

Cost: $250,000 each

Crash reduction factor: 80%

The conversion of conventional intersections to roundabouts is an FHWA proven safety countermeasure and has been shown to reduce injury crashes by approximately 80 percent. Compared to a conventional intersection, roundabouts have fewer places where vehicles could crash into each other, especially for intersections with multiple approaches. Roundabout designs usually include pedestrian refuge islands as well, which allow pedestrians to cross one lane of traffic at a time and reduces their risk of being involved in a crash. The curvature of the circular intersection also slows vehicles to between 15 and 25 miles per hour, which greatly reduces the chance of severe injury or death in the event of a pedestrian-vehicle or a vehicle-vehicle crash.

Roundabouts do have to be carefully considered along major bus, truck, or emergency response routes, as, even with a truck apron, which compensates for the off-tracking effect of larger vehicles, roundabouts may impact transit and emergency response times. If an intersection has high traffic volumes or a high left-turn percentage, a single-lane roundabout may not be sufficient and a double-lane roundabout may be warranted instead. Roundabouts can also be very expensive to install, depending on whether additional right-of-way needs to be acquired.

While roundabouts are not yet common in Philadelphia, several have been proposed. For example, in 2012, Urban Engineers partnered with the Philadelphia City Planning Commission to reimagine a multi-leg intersection near a Regional Rail stop in Mt. Airy as a roundabout.

Another intersection that is a prime candidate for conversion to a roundabout is the intersection of Frankford Avenue, Cottman Avenue, and Ryan Avenue in Mayfair, which has six distinct approaches. All three of these streets are part of the HIN, and there were three KSI crashes at this intersection between 2013 and 2017. One of these KSI crashes was an angle crash and the other two were “hit pedestrian” crashes.

Figure 32. Conceptual design of a roundabout at the intersection of Frankford Avenue, Cottman Avenue, and Ryan Avenue.

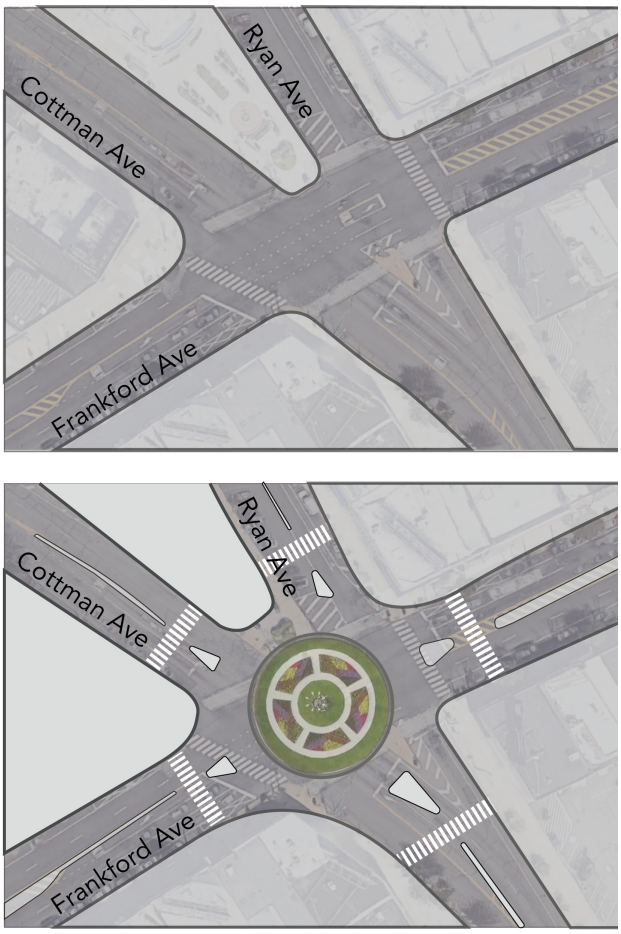


Figure 33. Rendering of a roundabout at the intersection of Whitaker Avenue, Wingohocking Street, and D Street.

strategy #3

intersection realignment

Responsible agencies: Streets Department

Cost: $2,000-20,000 per curb extension

Crash reduction factor: unknown

If intersection crashes persist at some skewed intersections, it is worth considering realigning these intersections so they intersect at 90 degree angles. Doing so will completely eliminate the issues associated with skewed intersections, such as short line-of-sight, long crossing distances, and large turning radii, but may require acquiring right-of-way, which in a dense urban area like Philadelphia can prove prohibitively expensive. Similarly, relocating one or more of the legs of a multi-leg intersection should be considered if a roundabout is not appropriate or feasible.

Inman Square, a notoriously complex intersection located in Cambridge, Massachusetts, is currently being considered for realignment following a cyclist fatality in June 2016.

One such skewed intersection in need of realignment is the intersection of Hurley Street and Whitaker Avenue, which is also a major-minor intersection. There was one KSI crash at this location in 2017, and it was an angle crash.

Figure 34. Conceptual design of the realignment of the intersection of Hurley Street and Whitaker Avenue.

Source: The Philadelphia Inquirer/Tom Gralish

Introduction

People's travel behavior is highly dependent on the time of day. As a result, traffic patterns also vary greatly at different periods of the day, as do road conditions. In addition, poor visibility could also be a potential issue affecting drivers after sunset. According to data published by the NHTSA, the six-hour block of 3 to 9 p.m. experiences the most traffic crashes. In addition, from 12 to 6 a.m., impaired driving was a factor in 71 percent of deadly crashes in the United States. These statistics and the analysis presented in this chapter show that crash characteristics and the causes behind them are also highly dependent on the time of the day.

This chapter focuses on two distinct time periods: the morning and evening peaks (from 7 to 8 a.m. and 4 to 6 p.m.) and nighttime crashes. The proposed strategies target these two time periods separately and are aimed at addressing the factors contributing to the crash experience during these times.

Driver behavior varies throughout the day. The summary chart on the next page shows how traffic deaths and injuries are distributed by time of day throughout the year. The lighter red indicates a lower rate of traffic deaths and injuries, while the darker red indicates a higher rate. As the chart shows, the greatest number of traffic deaths and injuries occurred during the evening peak period and during the night, with fewer traffic deaths and injuries in the midday period, with some variation based on the month.

The difference before and after 4 p.m. is particularly stark. After 4 p.m., there are more "red" areas, indicating that more people are killed or injured in a crash, especially from April to October. It is generally believed that increased congestion contributes to increased crash frequency because of the number of vehicles on the road, but slow speeds generally *reduce* the frequency of injury crashes. However, when Philadelphia becomes more congested during the evening peak (from 5 to 6 p.m.), the rate of traffic deaths and injuries increases.

In addition, the nighttime period also has a high injury rate. As the chart shows, the injury rate decreases after sunrise, when visibility is better, and increases at sunset.

Focus Area #1:
Peak-hour crashes

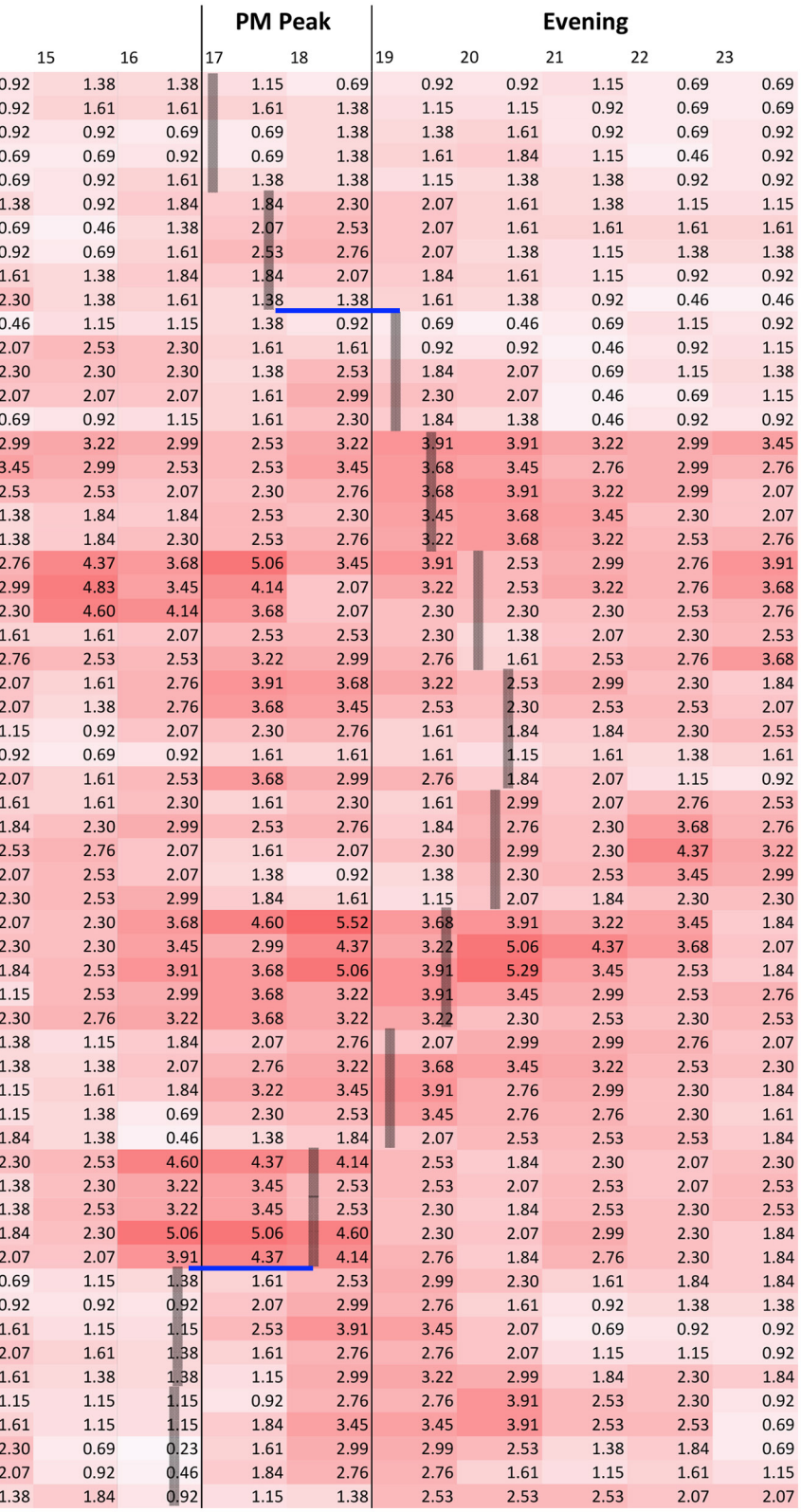
- school bus enforcement
- enhanced road materials

Focus Area #2:
Nighttime crashes

- raised pavement markers
- intersection lighting redesign

Figure 35. People killed or injured in crashes by month, weekday, and hour, 2013-2017.

		Overnight							AM Peak		Midday					
Month	Weekda	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Jan	MON	0.69	1.61	1.61	1.38	0.69	0.46	1.61	1.38	1.61	1.61	1.61	1.61	0.46	0.69	
	TUE	0.46	0.92	0.92	0.92	0.69	0.46	1.84	1.61	2.53	2.07	2.07	1.61	0.69	1.15	
	WED	0.69	1.84	1.84	1.84	1.15	0.69	2.53	1.84	2.99	2.30	2.30	1.84	0.92	1.61	
	THU	0.92	2.07	1.61	1.38	0.46	0.23	1.38	1.15	2.30	1.84	1.84	1.15	0.69	0.92	
	FRI	0.69	1.84	1.61	1.38	0.46	0.23	0.92	0.92	1.61	1.84	1.84	1.38	0.69	0.46	
Feb	MON	0.46	1.15	1.15	2.30	1.38	1.38	0.46	0.46	1.15	2.53	2.30	1.84	1.15	1.15	
	TUE	0.69	1.38	1.15	2.30	1.38	1.38	0.23	0.23	0.46	1.84	2.07	2.07	1.38	0.92	
	WED	0.69	1.38	1.15	2.30	1.61	1.61	0.46	0.00	0.00	0.92	1.38	1.61	1.61	1.15	
	THU	0.23	0.23	0.00	0.00	0.23	0.23	0.46	0.23	0.69	0.69	1.15	1.15	2.07	1.61	
	FRI	0.00	0.00	0.00	0.00	0.23	0.23	0.46	0.46	1.15	1.61	1.38	0.92	2.07	2.07	
Mar	MON	0.92	1.15	1.84	2.99	2.53	2.30	0.92	1.15	1.15	0.92	0.46	0.00	0.00	0.23	
	TUE	1.61	1.84	2.30	2.99	2.53	2.30	1.15	0.92	1.38	1.15	1.15	0.46	0.69	1.61	
	WED	1.61	1.84	2.53	3.22	2.76	2.07	1.15	0.92	1.84	1.84	2.30	1.38	1.61	1.84	
	THU	0.92	1.15	1.15	1.15	0.69	0.92	1.15	1.61	2.30	2.30	2.30	1.38	1.61	1.84	
	FRI	0.46	0.23	0.46	0.69	0.46	0.69	1.15	1.61	1.61	1.38	1.38	0.92	0.92	0.69	
Apr	MON	2.99	2.30	2.76	2.53	2.07	0.46	0.46	0.92	1.38	1.61	1.38	1.15	1.38	2.07	
	TUE	2.53	1.61	2.76	2.53	2.07	0.46	0.46	0.46	0.92	0.92	1.15	1.38	2.07	3.22	
	WED	2.30	1.61	2.76	2.30	2.07	0.92	0.92	0.46	0.46	0.46	0.46	1.38	1.84	2.99	
	THU	1.61	1.15	0.23	0.23	0.92	1.15	0.92	0.69	0.46	0.92	0.46	1.38	1.61	2.07	
	FRI	2.30	1.61	0.46	0.69	1.15	1.15	0.69	0.92	0.92	1.61	1.38	1.61	1.38	1.38	
May	MON	2.53	2.53	2.07	1.84	1.38	0.92	1.38	1.15	0.69	0.46	0.46	0.46	1.38	2.53	
	TUE	2.76	2.99	2.76	2.30	1.38	0.69	0.92	0.92	0.69	0.69	0.46	0.46	1.15	2.76	
	WED	2.53	3.22	3.45	2.76	1.38	0.69	1.15	1.15	1.15	1.61	1.38	1.38	0.69	1.61	
	THU	2.07	2.30	1.84	1.38	0.46	0.69	1.15	0.92	0.92	1.61	1.84	1.84	0.92	1.15	
	FRI	2.53	2.07	0.92	0.69	0.23	0.46	0.92	0.69	0.69	1.15	1.38	1.38	1.38	2.30	
Jun	MON	1.38	1.61	1.38	0.92	1.38	1.15	1.15	0.69	1.38	1.84	1.38	2.30	2.99	3.22	
	TUE	1.61	1.61	1.38	1.15	1.61	1.15	1.15	0.23	0.92	2.30	2.30	2.76	2.76	2.76	
	WED	2.53	2.53	2.07	1.61	2.53	1.84	1.61	0.23	0.23	1.15	1.38	2.53	2.07	1.84	
	THU	1.61	1.84	1.61	1.61	1.61	1.15	0.46	0.46	0.46	1.38	1.15	2.76	2.30	2.30	
	FRI	1.15	1.38	1.15	0.92	1.15	0.92	0.46	0.46	1.15	1.61	1.38	3.45	4.37	4.37	
Jul	MON	2.76	2.99	2.99	2.76	1.61	0.69	0.92	0.69	0.69	0.46	1.15	1.61	1.84	1.61	
	TUE	2.07	1.61	2.30	2.76	1.61	0.92	0.46	0.46	1.38	1.61	2.30	1.38	1.61	1.38	
	WED	3.22	1.84	3.22	3.45	2.30	1.38	0.92	0.92	1.61	2.07	2.30	1.61	1.38	2.07	
	THU	3.45	2.99	4.14	3.68	2.99	1.15	0.92	0.69	1.84	2.07	2.53	1.84	1.61	1.61	
	FRI	2.99	2.99	3.22	2.53	1.84	0.69	0.92	0.69	0.69	0.69	1.38	1.84	1.84	1.61	
Aug	MON	2.53	2.30	2.30	1.84	1.84	2.07	1.15	0.92	0.46	0.92	1.38	1.61	1.38	1.61	
	TUE	2.30	2.53	2.53	2.53	2.76	2.30	0.92	0.23	0.00	0.46	1.15	1.38	1.38	1.61	
	WED	2.99	2.99	2.53	2.53	2.99	2.53	0.92	0.23	0.00	0.46	1.15	1.38	1.15	1.38	
	THU	3.22	2.76	2.53	1.84	1.61	1.38	1.15	1.15	0.46	0.69	0.92	0.92	0.69	0.46	
	FRI	2.76	2.53	1.84	0.92	0.46	0.69	0.69	0.92	0.46	0.92	0.92	0.92	0.92	1.15	
Sep	MON	2.07	2.30	2.53	2.07	2.07	1.15	1.61	0.92	1.61	0.92	1.15	1.15	1.38	1.84	
	TUE	2.76	2.53	3.22	2.53	3.22	2.30	2.30	1.15	1.84	1.61	2.53	2.07	2.30	1.61	
	WED	2.30	2.30	3.45	2.53	3.22	2.30	1.84	0.69	1.84	2.07	2.99	1.84	1.61	1.15	
	THU	2.30	1.61	1.61	0.69	1.38	1.38	1.61	1.15	2.30	2.07	3.22	2.07	1.84	1.38	
	FRI	2.30	1.61	0.92	0.46	0.46	0.46	0.92	0.92	2.07	1.61	1.84	1.15	1.15	2.30	
Oct	MON	1.84	1.61	1.61	1.15	0.69	0.69	0.92	0.92	1.38	2.07	2.30	2.53	2.07	2.30	
	TUE	2.30	2.07	1.61	1.15	1.15	0.92	1.38	0.92	1.38	2.07	2.53	2.30	1.38	1.15	
	WED	2.07	2.30	1.61	1.15	0.92	0.69	1.15	0.92	1.61	1.84	2.30	2.07	1.38	0.92	
	THU	0.69	1.61	1.15	1.15	0.92	1.15	1.61	1.38	2.30	2.07	2.30	1.84	1.84	1.38	
	FRI	0.69	0.69	0.92	0.92	0.46	0.69	1.15	1.38	2.30	2.30	2.30	1.61	1.61	1.84	
Nov	MON	1.84	1.61	2.53	3.45	2.99	2.07	0.46	0.69	0.46	1.61	2.07	2.07	0.92	0.00	
	TUE	1.38	1.15	2.30	3.22	2.76	2.07	0.69	1.38	0.92	1.61	1.84	2.30	1.84	1.38	
	WED	0.92	0.92	2.07	1.84	1.38	0.69	0.92	1.84	1.38	1.61	1.15	2.53	2.76	2.99	
	THU	0.69	0.46	0.69	0.69	0.69	0.92	0.92	1.15	0.92	1.61	1.15	2.53	2.30	2.99	
	FRI	1.38	0.69	0.69	1.84	1.84	1.84	0.46	0.46	0.46	1.15	1.38	2.30	1.84	1.61	
Dec	MON	1.38	1.38	2.53	1.61	1.38	0.23	0.69	1.15	1.61	2.30	2.53	2.07	0.92	0.69	
	TUE	0.92	0.69	1.84	2.07	1.84	1.15	0.69	0.69	0.69	1.84	2.07	1.61	0.69	0.92	
	WED	0.46	0.23	1.38	2.07	1.84	1.15	0.92	1.38	0.92	1.84	1.84	1.84	2.07	2.07	
	THU	1.15	0.69	0.69	0.46	0.46	0.92	1.15	2.07	1.61	2.99	2.76	2.76	2.07	1.84	
	FRI	1.61	1.15	3.91	1.15	0.00	0.00	0.00	0.69	1.61	2.07	2.76	2.53	2.07	1.84	



3 Hour - 3 Day Monthly Injury Rate Rolling Average

Low — High

Sunrise/Sunset

Daylight Savings

focus area #1

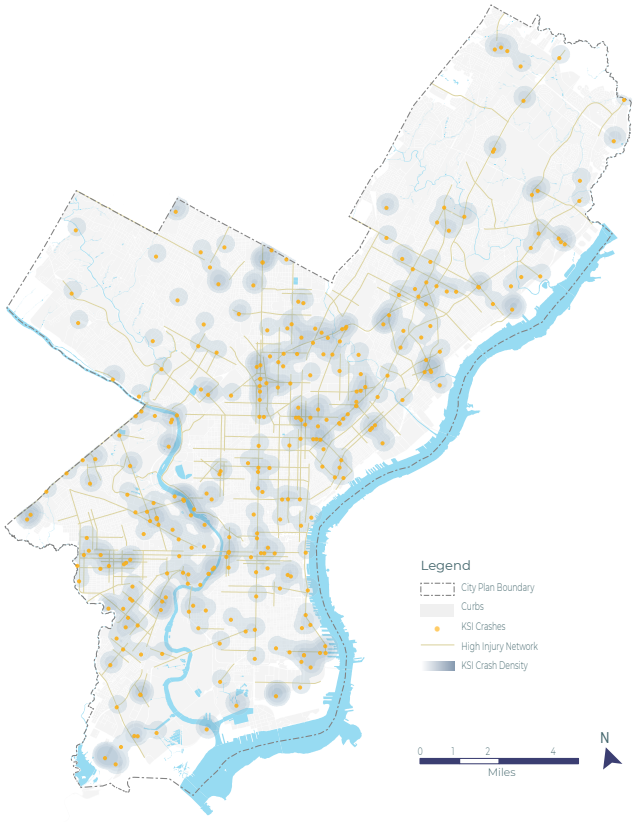
Peak-hour crashes

To better understand peak hour travel, this analysis used the Travel Time Index (TTI) developed by DVRPC, which is a measure that compares peak-period travel time to free-flow travel time. The TTI was used to determine congestion levels in the city during the morning and evening peaks. The citywide average TTI shows that, unsurprisingly, the city is most congested during peak hours. It takes about 10 percent more time to travel on the road during the morning peak and 16 percent longer during the evening peak in Philadelphia compared to uncongested travel.

This analysis found that, during the morning peak, roads on which KSI crashes occurred were not more congested than roads on which midday KSI crashes occurred. However, this was not the case during the evening peak. This is a somewhat surprising finding, given that the reduced speeds caused by congestion are expected to result in fewer serious crashes. The relationship between evening peak-hour crashes and congestion indicates that there must be other factors contributing to crashes during this period. One explanation is that the effect of congestion on safety also depends on the extent to which drivers are surprised by the congestion, which may depend on the type of congestion, the location of the queue, and the use of variable message signs.

Examining the crash data, which includes information on road conditions as well as contributing factors to crashes, could shed light on why the evening peak, in particular, experiences so many crashes. The comparison between peak-hour crashes and midday crashes shows that four types of factors may lead to the disparity between midday and peak-hour crashes, including road conditions, schools and young drivers, vulnerable users, and behavioral factors. As many of these factors have been mentioned in other chapters, this focus area concentrates more on the temporal analysis of these crash factors.

Figure 36. Spatial distribution of peak-hour crashes.



Source: PennDOT, 2013-2017

strategy #1

school bus enforcement

Responsible agencies: School District of Philadelphia, PPD

Cost: $300 per bus for LED signs, $1,000 per bus for additional cameras

Crash reduction factor: unknown

Increase penalties for failure to yield to school buses

School bus safety is a high priority in Pennsylvania. Although the state has clear and strict laws for stopping for school buses to keep children safe on and around the school bus, injuries resulting from violating these laws are still high. In Philadelphia, the morning peak experienced twice as many school zone injuries than during other parts of the day, when school buses are not actively picking up and dropping off children.

Prioritizing the right of school buses on the road during peak hours, especially the morning peak, and enforcing lack of compliance with existing laws, will improve the awareness of the issue of school-age pedestrian safety among drivers.

There are several strategies to promote the school buses' right to the road, including raising the violation for failure to yield during peak hours, installing cameras on school buses to better monitor their blind spots, and enforcing stopping signals. Taken with the school-based strategies in the "Who" chapter, these strategies could serve to improve safety for school-age children substantially.

Currently, a driver can receive all of the following penalties for failing to yield to a school bus: 60-day driver's license suspension, five points on their driving record, and a $250 fine. These penalties could be increased to encourage compliance, as well as requiring volunteer work for the School District of Philadelphia for repeat offenders. This would result in the following penalties for failure to yield:

- 60-day driver's license suspension;
- five points on driving record;
- $375 fine; and
- a second violation will require volunteer work for the School District of Philadelphia.

Reduce blind spots on school buses

Most school buses have 7-mirror systems installed for drivers to monitor their blind spots. However, the vision provided by these mirrors does not cover all areas, resulting in blind spots. This analysis recommends installing extra cameras on school buses to help drivers better monitor the surrounding area. Two cameras could be added to the current 7-mirror system and effectively create a 9-mirror system. Pennsylvania has approved a bill to install cameras on school buses, however, the purpose of these cameras is to photograph and ticket drivers who illegally pass a school bus. This strategy is not enforcement-based, but aimed at preventing crashes instead.

Improve school bus signage

To further improve the safety of children, new, digital on-bus signage could be installed to indicate when it is unsafe for drivers to overtake a stopped bus. Michigan has recently tested a new lighting system of LED signals on the eye level of drivers to make school buses safer. In addition to the usual flashing lights and stop signs drivers have grown accustomed to, the new lighting system will also display text reading "Stop" and "Do not pass" on the rear door of the bus.

Figure 37. Rendering of a school bus with enhanced LED signage.

strategy #2

enhanced road materials

Responsible agencies: Streets Department, PennDOT, oTIS

Cost: $50 per square foot

Crash reduction factor: unknown

Icy, snowy, and wet roads are frequent contributing factors to serious crashes during peak hours. In the long term, we propose applying new technologies to city roads to address these dangerous road conditions. Solar Roadways provide one potential solution. Solar Roadways are created by installing solar road panels made of photovoltaic cells, heating elements, and wireless LED lights, which are covered in durable glass. These road panels provide traction similar to traditional road materials, such as asphalt. This new technology is currently being tested by the FHWA and has been installed in bicycle lanes in the Netherlands to much success. Not only do these roadways reduce the cost of resurfacing roads as each panel can be replaced individually and as needed, they can also generate electricity, which can be used for melting snow or can be channeled into Philadelphia's electric grid. However, this technology is still new and can be expensive. As a result, this strategy should not be prioritized over regular street resurfacing, which, as discussed in the "Where" chapter, has safety benefits as well.

focus area #2

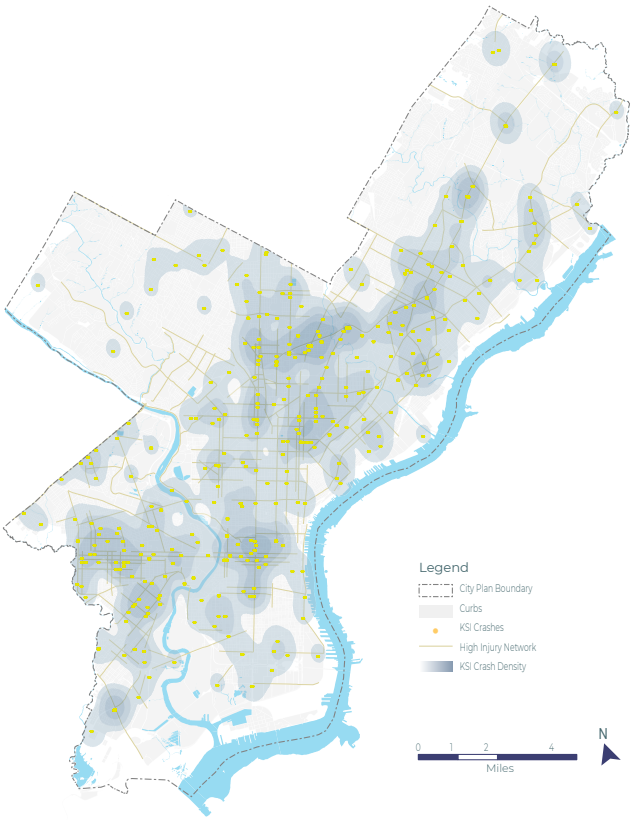
Nighttime crashes

From the analysis of crash times throughout the year, it is clear that there are about as many KSI crashes happening during daylight hours as there are KSI crashes during dawn, dusk or nighttime. More specifically, between 2013 and 2017, 50 percent of KSI crashes occurred during the daylight hours, 47 percent occurred at night, and about 3 percent occurred during dawn or dusk. Given the fact that there is generally less traffic at night, it can thus be determined that the risk of being involved in a KSI crash increases while driving at night or in the dark, compared to driving during the daytime.

However, analysis has indicated that lack of lighting is not the primary factor causing crashes at night. Just 2 percent of nighttime KSI crashes occurred on roads without street lights. Driver behaviors, like speeding and impaired driving, increase substantially at night; speeding increases by 150 percent at night whereas impaired driving increases by 300 percent. Strategies, like those listed in the "What" chapters, that serve to reduce vehicle speed and limit impaired driving, are especially important in addressing nighttime crashes.

The strategies presented here focus not on improving lighting in general, but instead on improving lighting at intersections, both to warn drivers that they are approaching an intersection, which as discussed in the "Where' chapter, are where the majority of KSI crashes occur, and to improve the visibility of pedestrians and cyclists, who are particularly vulnerable, as discussed in the "Who" chapter.

Figure 38. Spatial distribution of nighttime crashes.



Source: PennDOT, 2013-2017

strategy #1

raised pavement markers

Responsible agencies: Streets Department, PennDOT, oTIS

Cost: $2 each for non-LED RPMs, $50 each for LED-equipped RPMs

Crash reduction factor: 20%

Installation of RPMs is recommended by the FHWA as a low-cost, innovative intersection safety treatment in low-visibility areas. While the basic version does not emit light, they can reflect the vehicles' headlights and thus increase visibility. More advanced versions could also include LED lights powered by photovoltaic cells.

RPMs can improve the safety of intersections by clearly marking crossings, making them more visible to drivers. In addition, the illumination of lane markings could help drivers stay in their lane and be aware of any upcoming turns in the road. This strategy could be first implemented at irregular intersections, where the "Where" chapter encouraged more frequent restriping, as well as at the intersections where no street lights currently exist.

strategy #2

intersection lighting redesign

Responsible agencies: Streets Department, PennDOT, oTIS

Cost: $5,000 per pole

Crash reduction factor: 35%

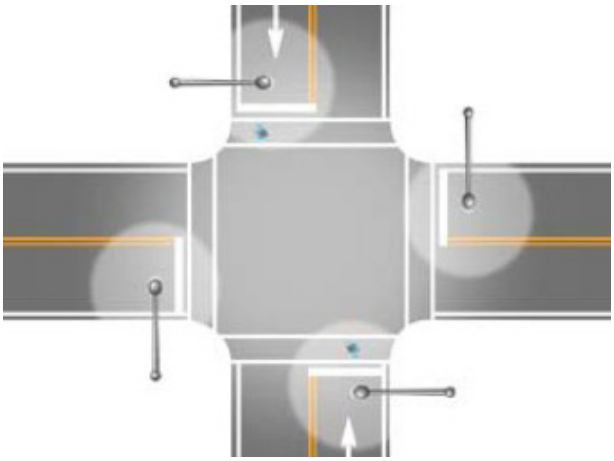
Nighttime intersection KSI crashes are concentrated in a few areas of the city, as shown by the map on the previous page. A few corridors in particular experience far more nighttime intersection KSI crashes than others. One of these is Whitaker Avenue, on which at least one nighttime KSI crash has happened at almost every major intersection. The irregular intersection of Whitaker Avenue, Wingohocking Street, and D Street is a good example of the need to focus lighting on intersections, especially those intersections that are particularly difficult for pedestrians and drivers to navigate.

Per FHWA recommendations, street lighting should be focused on the intersection crossing in the pattern as seen in Figure 40.

Figure 39. Rendering of LED-equipped raised pavement markers.

Such improvements would allow drivers to better recognize that they are approaching an intersection, better navigate turns, and recognize other vehicles and pedestrians at the intersection. In addition, double-headed streetlights could be installed, with one light being lower in height than the other to provide pedestrian-scale lighting. Street lights could also stay lit longer during late-night or early morning times. Such measures can reduce late-night and early morning crashes by about a third, according to studies.

Figure 40. FHWA recommendations for intersection lighting.



Source: Federal Highway Administration

Figure 41. Rendering of intersection lighting redesign at the intersection of Whitaker Avenue, Wingohocking Street, and D Street.

Source: Philadelphia City Planning Commission

Introduction

This chapter focuses on how Philadelphia can achieve its Vision Zero goals. This section does not provide specifics on engineering treatments or policies to reduce the likelihood of fatal crashes on city streets; rather, it focuses on how Philadelphia's Vision Zero leaders can shift the culture of safety in the city. In doing so, the task force can ensure continued internal and external support for Vision Zero as well as institutionalization of Vision Zero priorities beyond the current mayoral administration. The following sections of this chapter provide a brief overview of the existing conditions of the Vision Zero task force and the program's current public acceptance and then provides details on several strategies.

Since Vision Zero's start in Philadelphia significant work has been conducted by task force member agencies, spearheaded by the Office of Complete Streets within oTIS to develop a plan and priorities, and ultimately, bring Vision Zero into fruition in the city. The success of Vision Zero, however, is dependent on numerous factors. Key among them is strong leadership and collaboration between leading agencies in the city as well as clear and consistent messaging to the public. A successful Vision Zero program is, at its core, a program that is able to develop a new culture of safety that prioritizes people. According to an analysis of best practice in Vision Zero, several different elements are required to make Vision Zero programs successful, including:

- an urgent, clear, and sustained public commitment to Vision Zero from high ranking officials;
- a permanent, high-level home for a city's Vision Zero efforts;
- institutionalization of Vision Zero to help ensure accountability for all agencies;
- cross-sectoral collaboration;
- commitment to all goals, long- and short-term, by all stakeholders;
- regular internal stakeholder meetings and public reportings; and
- pilot and demonstration projects.

Philadelphia's program has many of these elements, however, increased institutionalization of Vision Zero would go a long way in ensuring that the primary tenet of Vision Zero, that all lives lost on Philadelphia roads are avoidable, becomes a part of the city's culture, both within the municipal government and with the general public. By shifting culture and institutionalizing Vision Zero, the program will be able to live on regardless of mayoral priorities or administration.

Currently, many agencies throughout the city are tasked with institutionalizing Vision Zero priorities in city government. For example, the Department of Planning and Development is responsible for integrating Vision Zero into the City of Philadelphia's Development Services Program Checklist to ensure that streets are being designed for the most vulnerable roadway users, and oTIS is responsible for conducting a study to identify best practices in peer cities for sidewalk repair and enforcement programs in construction zones, as well as recommendations for Philadelphia. These strategies, along with many others listed in the Three-Year Action Plan, are a strong start in promoting institutionalization of Vision Zero and a shift to a new culture of safety in Philadelphia. However, additional strategies can help support these goals.

State of the Task Force

Since Mayor Kenney signed Executive Order 11-16 on November 7, 2016 and established Philadelphia's Vision Zero Task Force, the group has made remarkable strides bringing new technologies, collaborative practices, and public attention to the issue of traffic safety. Now, more than two years in, the Task Force still faces immense challenges, both to identify and address traffic safety needs and to align city agency values with Vision Zero.

Who's on the Task Force?

Mayor Kenney's executive order authorizes his office to appoint fifteen members, including the mayor's Deputy Managing Director, who serves as chair. Currently, government agencies make up ten of the task force members, leaving only four seats for advocates from communities of color, business associations, and other nonprofits.

The task force meets quarterly, and each member is also part of sub-committees that meet regularly to implement strategies in six areas: evaluation and data, engineering, education and engagement, enforcement, fleet management, and policy. Other organizations, such as the Center City District and the Clean Air Council participate in sub-committees but are not part of the task force.

Cultures of Safety at Odds

Since the Action Plan's release in September of last year, oTIS and PPD have dramatically improved data collection and analysis practices in Philadelphia, however Vision Zero's safety philosophies have not permeated through all involved agencies. Across city agencies, safety concerns are still balanced with other motivating factors, like minimizing obstructions—truly elevating safety considerations to the top of the decision making pyramid remains easier said than done for departments that are still charged with (and evaluated on the basis of) many missions.

A Fleeting Vision

Furthermore, the Three-Year Vision Zero Action Plan is slated to end with Mayor Kenney's mayoral term; however, our goal of zero deaths continues to 2030. According to the Year One Update, if current trends continue, Philadelphians will continue to die on our streets far beyond that.

Mayoral executive orders have been neglected or even reversed; it's very common for the priorities of previous mayors to fall through the cracks. On the first day of his term, Mayor Kenney himself reversed the policy of his predecessor Michael Nutter by forbidding city agencies from cooperating with federal Immigration and Customs Enforcement. While we hope that the next mayor also prioritizes traffic safety or that Mayor Kenney continues to champion his policy at re-election, Vision Zero needs deeper and broader roots.

Vision Zero by the people

Vision Zero in Philadelphia remains largely confined to city administration. Despite the start of an advertising campaign titled "We Meet in the Street" and other educational programs, most efforts to date have not invited audiences to make a personal connection with Vision Zero.

While a start, advertising campaigns alone cannot fully instill Vision Zero's philosophies within the public. Ultimately, direct engagement is needed. Engagement is a process that builds collaborative partnerships with stakeholders and creates customized solutions for a cultural change. It requires transparency not just through feedback at public meetings (which many may be unable to attend), but also through intentional knowledge-sharing and thorough outreach. Because we consider Philadelphians to be experts, we include them in the development of Vision Zero projects and policies to save lives; we share our knowledge and data surrounding traffic safety in their communities and where they work, play, and live. This engagement lends itself to creating community buy-in, which ultimately serves to institutionalize Vision Zero with the general public.

Engagement is especially important in communities that have traditionally been underserved, such as the low-income and minority communities in North Philadelphia and West Philadelphia. Philadelphia is a majority-minority city and the poorest big city in America; residents have historically had strained relationships with law enforcement and special care will need to be taken to ensure that these communities feel that their interests are being served.

Figure 42. "We Meet in the Street" campaign to address failure to yield to pedestrians.

Source: Vision Zero Philadelphia

This chapter presents strategies that aim to address the challenge of public acceptance and institutionalization of Vision Zero that Philadelphia faces. Unlike the previous chapters, the strategies presented here fit less neatly into short-, medium-, and long-term bins. Strategies presented in this chapter are ongoing and stepped in terms of implementation. These strategies are separated into four focus areas: Legislative Authority, Institutional Practice, Community Leadership, and Individual Proficiency, categories that loosely align with the Spectrum of Prevention, a systematic tool that has been used to develop a multifaceted range of activities for initiatives in traffic safety, violence prevention, nutrition, and fitness. It recognizes that outcomes are not just caused by design or environmental factors, but also cultural and behavioral change.

The strategies discussed in the following sections all serve to enable public engagement to support a culture change in Philadelphia. However, these strategies will be difficult to achieve without additional resources (including personnel) available to the city, who can support existing staff members in public engagement activities. oTIS, for example, has a vacant community engagement position. Filling this position could enable existing staff to focus their efforts on other aspects of the Vision Zero program. Funding for this position could come from a variety of sources, such as private philanthropic organizations including the William Penn Foundation and Bloomberg Philanthropies, which has pledged over $200 million in grants to cities across the county, including Philadelphia. It is important to note, however, that communications and outreach, especially the appointment of staff members dedicated to these activities, sometimes have a lower priority within city government. More visible, and necessary, engineering changes, like street resurfacing, are often, rightfully so, given higher priority than staffing needs.

Figure 43. Prevention Institute's *Spectrum of Prevention*.

Focus Area #1: Legislative and legal

- cultivate (extra-)mayoral leadership
- strengthen authority to implement projects

Focus Area #2: Operations and praxis

- expand knowledge of Vision Zero
- improve publicly available data

Focus Area #3: Community leadership

- formalize advisory roles
- foster traffic safety advocacy

Focus Area #4: Individual proficiency

- measure public support for Vision Zero

focus area #1

Legislative and legal

Legislative strategies refer to those strategies that seek to institutionalize Vision Zero within the municipal government and garner support for Vision Zero initiatives. While these strategies may not directly amend regulations or legislation, they do serve to support systematic political change, which is imperative for the long-term success of Vision Zero.

strategy #1

cultivate (extra-) mayoral leadership

Research has shown that strong leadership at high levels of government is important for successful Vision Zero programs. Critical to the success of Vision Zero is a public commitment from high-level leaders in a city, generally the mayor. Public commitment in the form of an executive order is not enough to truly demonstrate mayoral leadership in Vision Zero programs, however. The establishment of a program must be followed with prioritization of Vision Zero within the administration as well as an allocation of resources to enable action.

Philadelphia's Vision Zero program was borne out of an executive order from Mayor Kenney, however, other policy priorities have competed for attention and resources. For example, Mayor Kenney's first budget focused largely on anti-poverty initiatives, including the creation of community schools, the expansion of preschool programs, and investment in parks, recreation centers, and libraries (e.g. Rebuild). However, some strategies can be undertaken to institutionalize Vision Zero at the staff level, thus making the policy less political and less subject to mayoral preference.

In Philadelphia, the mayor is empowered to restructure the city government when they take office, meaning that entire departments can shift and change when a new mayor begins his post. Despite this, there are still opportunities to institutionalize Vision Zero at a leadership level. The city government is comprised of both civil service and non-civil service employees. In general, civil service posts require an extensive hiring process which includes sitting for exams, but these employees tend to remain in their posts during administrative transitions. Thus, housing Vision Zero with a high-ranking civil servant may serve to instill the program within the city government, regardless of structural changes.

Currently the Streets Department is almost entirely staffed by civil servants, while oTIS is largely non-civil service. Shifting oTIS to the civil service model could be one way to decouple Vision Zero from a more transient structure. Although disruptive, one possibility is to transition oTIS into civil service positions. To do so, the Streets Department could expand and create a new division for planning and policy, thereby creating a new transportation department that includes both Streets and oTIS, where all positions are civil service. This would allow Vision Zero to remain housed in the Office of Complete Streets while simultaneously making that office more permanent.

strategy #2

strengthen authority to implement projects

City government in Philadelphia is structured to endow the mayor with broad power to legislate and manage the city. However, the members of the city council hold power over land use decisions due to councilmanic prerogative, a power granted to members of city council through state law that gives councilmembers veto power on land use and public property decisions in their districts. While councilmanic prerogative is largely intended for land use decisions, councilmembers have used it in street design projects. In 2012, the City Council enacted an ordinance that requires the council's approval of any bike lanes that would eliminate parking spots or vehicle lanes, essentially giving district councilmembers direct authority over small street design decisions.

While used less frequently for street design projects, councilmanic prerogative allows, and in some ways encourages, very local interests to outweigh citywide interests and policies. To combat this, the Vision Zero Task Force can reclaim street design decisions, thus strengthening the authority of implementing agencies to execute Vision Zero projects. Given that this is a power that the City Council currently holds, it is unlikely that council members will warm to the idea of losing authority; however, there are other shorter-term strategies that can help lay the groundwork for this shift in power. For example, councilmembers can be encouraged or incentivized to champion, instead of oppose, Vision Zero interventions that are good and benefit the people of Philadelphia. This will help ensure that when Vision Zero projects require council action, district councilmembers will be supportive.

Although a challenging task, garnering support for Vision Zero from both council members and the general public can be achieved in the short-term. In its first year with Vision Zero, the city has already made significant strides in expanding public knowledge and understanding of Vision Zero and its priorities. This includes the launch of the "We Meet in the Street" public educational campaign, the "Behind the Big Wheel" interactive campaign, and the Vision Zero Citizens Planning Institute elective course. In addition, the task force is in the process of developing an engagement plan. The formalization of an engagement plan in conjunction with existing engagement strategies will serve to enhance public understanding of and support for Vision Zero. Several additional engagement strategies including establishing a yearly Vision Zero survey and a marketing plan, discussed in detail in proceeding subsections of this chapter, could become part of the Vision Zero Engagement Plan.

Shoring up public acceptance of Vision Zero and its priorities is a good first step in gathering support from City Council members. As more constituents understand and support Vision Zero, council members will put safety at the top of their agenda. It is likely that this will happen naturally as Vision Zero matures in Philadelphia and citizens start to see positive impacts from the program. However, this also requires constituents and local community organizations to be vocal about their support for safety projects. Beyond this, however, it is important that there are strategies that directly address council member engagement. As is noted in the Vision Zero One-Year Update, oTIS has an ongoing practice of engaging City Council members through meetings and site visits. This is a useful practice, and one that should continue throughout the length of Vision Zero.

focus area #2

Operations and praxis

Operational strategies refer to those strategies focused on amending operational activities and practices within city agencies. Like the legislative strategies, these strategies intend to help institutionalize a new culture of safety in the city, serving to push knowledge of Vision Zero out to all employees of city agencies and to streamline data sharing among agencies and to the public.

strategy #1

expand knowledge of Vision Zero

Vision Zero is built around the understanding that traffic safety is about more than just transportation. Programs are centered on finding innovative ways for different sectors to collaborate with one another in order to create safer streets. Successful Vision Zero programs tend to be the programs that find ways for everyone involved to collaborate effectively. A part of this is ensuring that everyone at an agency or organization that has any involvement with Vision Zero has a keen knowledge and understanding of the program's priorities. While buy-in and promotion of Vision Zero at a leadership level is needed, equally important is buy-in and promotion of Vision Zero by those further down the command chain. While leadership sets an agenda, it is those lower down the chain that develop and implement projects.

The Task Force included several strategies in the Three-Year Action Plan focused specifically on developing departmental-specific trainings and outreach materials, most of which were already completed or underway by the end of year one of the program. These strategies include:

- developing a "Safety Six" Traffic Code cheat sheet for PPD officers;
- continueing Complete Streets training for planners and engineers designing a multimodal transportation system;
- engaging City Council and state level elected officials through meetings and site visits;
- continuing existing work of information sharing with city agencies; and
- developing a series of traffic safety trainings for PPD roll call.

These strategies serve as a strong starting point in the short-term, but additional short- and medium-term strategies may be added to help instill the values of Vision Zero throughout city agencies. One strategy here is to expand the traffic safety trainings developed for PPD to all agencies involved in Vision Zero. Trainings could be administered at agency- or department-wide meetings for existing employees and as part of onboarding and orientation for new employees. This would help establish Vision Zero as a priority at the staff level within agencies as well as provide employees with data and resources about Vision Zero.

strategy #2

improve publicly available data

A key tenet of Vision Zero programs is that they are data-driven. In Vision Zero programs across the United States, cities use data to understand where crashes are happening, why they are happening, when they are happening, and who they are happening to. Data is used to ensure limited resources are going where they are most in need and to help provide transparency for the public.

Philadelphia's Vision Zero program has put data at the forefront. Prior to publishing the Three-Year Action Plan, the City worked with counterparts at the Pennsylvania Department of Transportation (PennDOT) to collect and collate crash data on Philadelphia's roads and developed the High Injury Network. The current focus of data and evaluation is to analyze crash data to prioritize Vision Zero, coordinate data collection, and report data publicly. The city has put forth significant effort to standardize the collection of data and share it with the public. On the Vision Zero webpage are two interactive maps, one that displays the HIN and KSI crashes and one that shows Vision Zero projects.

These maps are excellent for sharing information with the public in an interactive way. However, the information provided on the maps could be enhanced. Adding additional data from crash reports to the crash map, for example could allow for more nuanced analyses. Currently, the only crash information that is included are injury type (e.g. fatality or severe injury), age and gender of victim, travel mode of victim, and year of incident. Crash reports include information on time of day, existing weather and road conditions, as well as factors contributing to the crash, all of which could be useful to include in a public-facing web application. In support of this strategy, the Philadelphia Police Department (PPD), is currently rolling out a new electronic crash report system, which could ultimately be integrated into a citywide crash database as well as public facing webmaps.

In addition, collecting data on race and socioeconomic factors could galvanize support from the public. For example, the Task Force could work with the Delaware Valley Regional Planning Commission (DVRPC) to integrate analyses related to the nine Indicators of Potential Disadvantage, which considers low-income status, race, and ethnic minority, among other factors.

In the long term, a combined and integrated tool that allows users to run queries and reports on the crash data, similar to the Transportation Injury Mapping System (TIMS) developed by SafeTREC at the University of California, Berkeley should be developed. Having all Vision Zero related data in one place for the public to interact with would provide increased transparency and ease of use.

focus area #3

Community leadership

The third category of engagement strategies involves facilitation with city community leaders, both as representatives of the public at large and as gateways to policy and resources surrounding Vision Zero.

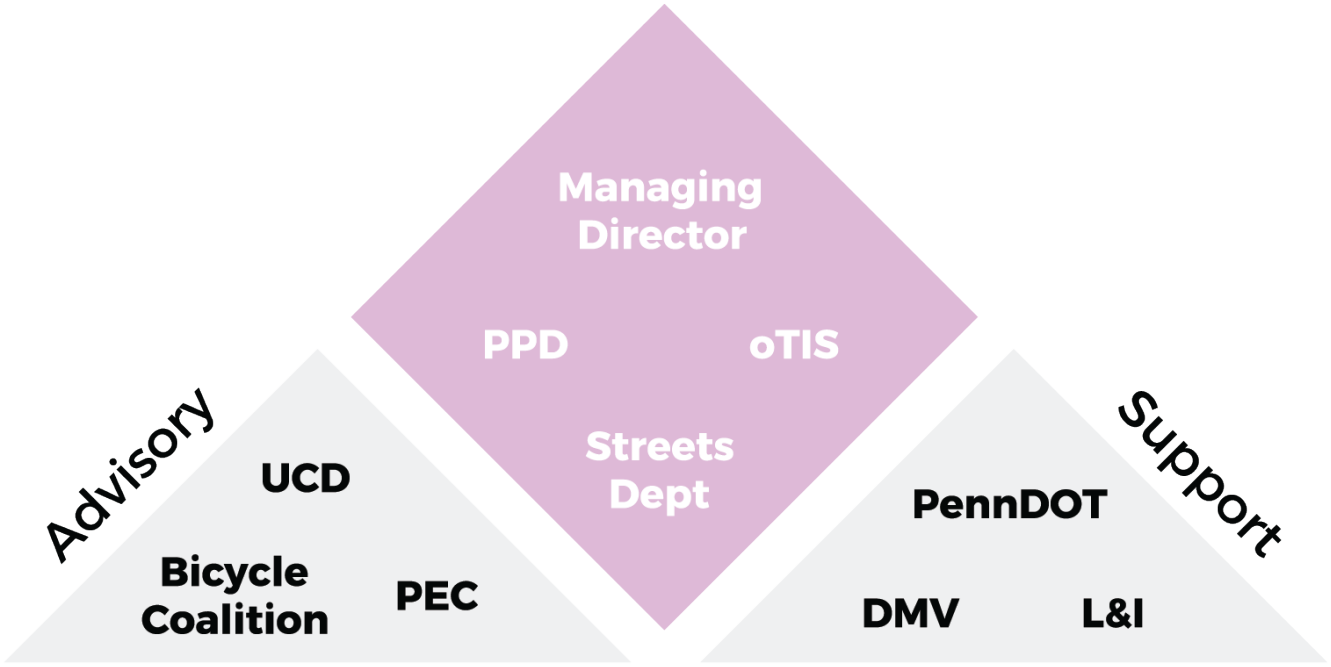
strategy #1

formalize advisory roles

Currently, the Vision Zero Task Force mostly includes administrative agencies responsible for the research, design, and implementation of traffic safety practices. While these members perform key responsibilities for improving traffic safety, the focus on data has neglected the experiences of road users. As much as we love boggling over HIN statistics, the expertise of our residents is the very information (data) that can save the most lives because they can tell us their needs.

Creating formal advisory roles for non-governmental organizations will create avenues for the most vulnerable road users to have a voice in Vision Zero. Inversely, these organizations can serve to spread Vision Zero's message to those same vulnerable populations. Currently, five members of the mayor-appointed Task Force represent vulnerable populations. Advocates for vulnerable modes (distinct from vulnerable populations) like the

Figure 44. Proposed structure for Vision Zero Task Force.



Bicycle Coalition of Greater Philadelphia or Feet First Philly do not officially participate in any subcommittee. That said, as one of Philadelphia's most powerful transportation advocacy groups, the Bicycle Coalition, in particular, does have say in Vision Zero in the City.

Our proposal suggests a formalization of the Task Force's core, supporting, and advisory roles in order to strengthen the advocacy roles of agencies and organizations not directly involved in traffic safety initiatives.

First, core decision-making agencies can represent key members of the Task Force. These are governmental agencies like oTIS, PPD, and Streets, who have major roles in all sub-committees.

Next, supporting governmental members can support the task force with expertise on Philadelphia's operations involving stakeholders or on various sub-committees: Licenses & Inspections, the Department of Motor Vehicles, SEPTA, DVRPC, and others. Also, appointing liaisons to facilitate relationships with non-participating agencies, including councilmembers, the District Attorney, or the state legislature can preemptively resolve conflicts, such as the city council's opposition to bicycle lanes or the removal of parking.

Finally, advocacy roles should be filled by representatives for different stakeholder groups: transit riders, pedestrians, cyclists, and even drivers; community development corporations (CDCs); business improvement districts (BIDs); and non-profit groups.

D.C.'s Crash Review Task Force includes Bicycle and Pedestrian Advisory Councils, LA's Vision Zero Alliance includes LA Walks and LA County Bicycle Coalition. Vision Zero Task Forces in NYC, SF, LA, and DC include youth organizations, Institutes on Aging, advocacy groups for communities of color and the poor, among others.

strategy #2

foster traffic safety advocacy

One particular challenge to bringing Philadelphia stakeholder representatives to the table is that the city lacks established transportation advocacy groups beyond the Bicycle Coalition of Greater Philadelphia. Feet First Philly is a project started in 2016 by the Clean Air Council, Philadelphia's "oldest environmental non-profit." 5th Square, a political action committee started in 2014, has introduced a Transit Committee to bring to light transit issues for urban Philadelphia, and Pennsylvania for Transit was launched in 2017 by Alex Doty, a former executive of the Bicycle Coalition.

Philadelphia does have a strong network of nonprofits advocating for other issues, and some of them, such as the Center City District and the People's Emergency Center, are active members of the Task Force or its subcommittees. These relationships should, over the life of Vision Zero safety policies, be leveraged to elevate traffic safety in the public eye. Organizations like community development corporations are created to support and revitalize communities, and a loss of life from crashes is not revitalizing.

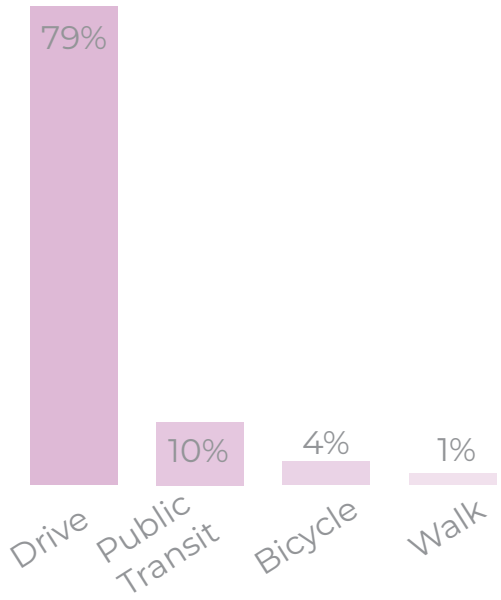
At the same time, Philadelphia's general public and, accordingly, many of its advocacy groups, are strongly tied to and dependent upon their motor vehicles as their primary mode of transportation. This means that popular safety treatments protecting pedestrians and cyclists at the expense of vehicle comfort may not be received well. Traffic calming may be seen as a nuisance, especially in transit-poor regions to the north, where Roosevelt Boulevard sees 700 crashes and 10 deaths every year. Bicycle lanes may be seen as symbols of gentrification in poor

neighborhoods where less than 1 percent of residents cycle to work. Business owners may protest that streetscape improvements taking away parking limits customer access.

This means that engagement is all the more necessary. The role of the communications officer proposed earlier in this chapter goes beyond managing relationships within city government; it includes the difficult process of bringing about cultural change at the community level. The city must use its relationships with organizations like CDCs to not only familiarize community leaders with Vision Zero principles, but also be able to share them with their constituents.

Currently, the African American Chamber of Commerce (AACC) and the Philadelphia Association of CDCs (PACDC) are on the Vision Zero Task Force, but their websites provide little reference to the citywide policy. As members of the task force, PACDC could take more steps to establish traffic safety as a priority in our communities, not just housing or commercial development. The development of Vision Zero-related programming and services for business owners and community leaders can help to demonstrate that traffic safety is good for Philadelphia. In fact, safe, walkable streets are good for business: it's not just about taking away parking.

Figure 45. Philadelphia urban area (PA-NJ-DE-MD) mode share.



Source: American Community Survey 1-Year Estimate, 2017

focus area #4

Individual proficiency

The fourth category of engagement strategies involves expanding individual knowledge of Vision Zero throughout the broader Philadelphia community. The strategy presented here is intended to both measure public support and understanding of Vision Zero.

strategy #1

measure public support for Vision Zero

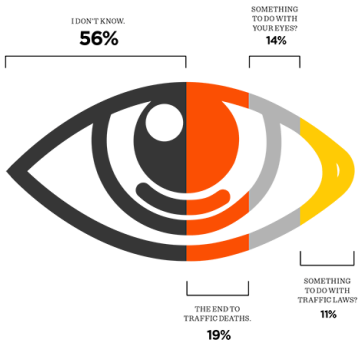
Data is a necessary part of developing and evaluating engineering and enforcement strategies and it should be equally as important in engagement strategies. While it can be challenging to measure public support or knowledge of a program, it is imperative for gauging the saturation of Vision Zero priorities into the culture of the city.

One way of measuring public support and knowledge is through yearly surveys of the public. Several different survey models exist. For example, Transportation Alternatives, a transportation advocacy organization in New York City, developed a "100 Person Poll," where they "stopped 100 random New Yorkers on the street to talk about whether or not their streets look and feel safe." The poll asked basic questions including those which focused on how individuals feel on the road, if they have been involved in a crash, their opinions on more controversial strategies, their knowledge of Vision Zero, and their perception of who is in charge of keeping streets safe. While the sample size of the survey is no doubt small, it provides an example for how Philadelphia could start measuring knowledge of and acceptance of Vision Zero. To expand the sample size, several 100 person surveys could be conducted throughout the city—perhaps having 100 person surveys for each planning or council district.

While surveying is time- and labor-intensive, it is important for assessing and understanding the public's engagement with Vision Zero, and even for directly improving awareness. Survey execution provides an opportunity to engage with the Task Force and community leaders to pool resources and work together.

With this kind of data, even obstinate City Council members could see that the city needs safety projects. With this kind of data—if we could show how much Philadelphians care about not dying on our streets—Vision Zero could change hearts and minds and make traffic safety a priority.

Figure 46. Results of Transportation Alternatives' "100 Person Poll."



Source: Transportation Alternatives

CONCLUSION

Source: Kenneth Wajda

Crashes today are seen as the cost of doing business, an inevitability of an auto-oriented transportation system. However, Vision Zero can change that. Strategies aimed at addressing the primary crash contributors as well as strategies that create a new safety culture, in particular, serve to shift society away from the idea that driving a private vehicle is a right rather than a privilege that comes with huge responsibility. While this type of culture change seems like a daunting task, it is one that has happened throughout modern American history both within and outside of the transportation field.

For example, the campaign to reduce drunk driving, led by Mothers Against Drunk Driving (MADD) in the 1980s, fundamentally changed how Americans viewed driving under the influence. Among other things, MADD played an instrumental role in raising the minimum drinking age from 18 to 21 and institutionalizing the idea that impaired driving crashes are 100 percent preventable. While our analysis has shown that alcohol-impaired driving is still an issue, between 2007 and 2016, traffic fatalities resulting from alcohol-impaired driving have decreased by 20 percent nationwide, which can be attributed in part to the success of MADD's advocacy.

The strategies presented in this document provide targeted solutions to address specific traffic safety challenges identified through the analysis, with the goal of helping Philadelphia achieve zero traffic fatalities by 2030. Although presented in separate chapters, the strategies included here should be taken in tandem. Crashes are not caused by any one factor, and examining the who, what, where, when, and how of crashes in silos does not fully address the issues at play. For example, a strategy, such as installing a roundabout at a multi-leg intersection, to improve intersection safety can also force vehicles to slow down (during the day or at night) and provide protection for the most vulnerable road users (pedestrians and cyclists).

Many of the suggested strategies are both cost- and time-intensive, but an analysis of the economic cost of crashes supports the case that these are worthwhile investments. Not only does it mean that lives are being saved, but there are also significant economic benefits. The FHWA estimates that the economic cost of a traffic fatality is $1.7 million and the economic cost of a serious injury resulting from a crash is $130,000. Between 2013 and 2017, 475 Philadelphians lost their lives in a traffic crash, and a further 1,384 Philadelphians were seriously injured, resulting in over $998 million of economic costs.

This highlights the importance of achieving Vision Zero. Yet, given the political and financial constraints facing Philadelphia, which is the poorest large city in the United States, it is imperative that strategies be prioritized so that resources are spent wisely and the greatest benefit is realized. Ultimately, those strategies that force drivers to slow down either through engineering treatments or increased enforcement will have the greatest impact on traffic safety, especially for the system's most vulnerable users. A pedestrian hit by a vehicle traveling at 20 miles per hour has a 90 percent chance of surviving, compared to a 10 percent chance of surviving if hit at 40 miles per hour. Equally important as prioritizing reducing the speed of vehicles is effectively engaging and communicating with the public and governmental officials, who must believe in and accept Vision Zero in order to ensure its success.

Source: CBS Philly

Note that any images or graphics that are not cited are the product of this studio.

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