

Traffic Safety

Traffic Safety White Paper

April 2018



Table of Contents

Introduction	3
<i>Key themes</i>	6
Safety planning in the CMAP region	12
Emphasis Areas	14
<i>Pedestrian and bicyclist</i>	15
<i>Speeding and aggressive driving</i>	23
<i>Seat belt use</i>	28
<i>Alcohol use/impaired driver</i>	30
<i>Intersections</i>	34
<i>Roadway departure</i>	39
<i>Age of drivers</i>	40
<i>Distracted drivers</i>	46
<i>Vehicle type</i>	47
Advances in transportation technology	49
Potential CMAP roles	51
<i>Incorporate safety measures into local programming</i>	51
<i>Assist local agencies in safety planning</i>	52
<i>Developing regional safety targets</i>	56
Next steps	59
Acronyms	60



Introduction

This paper explores ways to improve the safety of the region's roadway system for motorists, bicyclists, and pedestrians. It identifies key recommendations for the Chicago Metropolitan Agency for Planning (CMAP) region that can be carried forward in ON TO 2050, the region's next comprehensive plan, as well as in other initiatives. It focuses on reducing serious injury and fatal crashes as opposed to less severe crashes involving only minor injury or property damage.

Travel has always involved some measure of risk, and since the advent of the automobile, traffic fatalities have seemed to be an unavoidable consequence of travel in the United States. National public outcry over traffic fatalities resulted in the passage of the Highway Safety Act and the National Traffic and Motor Vehicle Safety Act in 1966. This was the first legislation passed by the federal government to address automobile safety. The Highway Safety Act of 1970 established the National Highway Traffic Safety Administration (NHTSA) to regulate traffic and vehicle safety.¹ More recently, Moving Ahead for Progress in the 21st Century (MAP-21) and the Fixing America's Surface Transportation (FAST) Act have continued to address safety through an enhanced focus on measuring outcomes in the Highway Safety Improvement Program.

New technology, improved roads, public education, mandatory seat belt use, graduated driver licensing,² and lowered blood alcohol limits have already increased traffic safety. These have had tremendous success across the nation: total traffic deaths have fallen 36 percent from their peak in 1972 when nearly 55,000 individuals lost their lives in traffic crashes.³ The fatality rate per vehicle mile of travel is only a quarter of the 1972 rate. Hundreds of thousands of people are alive today thanks to these efforts, but there is still a great deal of work to do. Behavioral issues such as distracted driving, aggressive driving, and substance abuse continue to make driving dangerous. Traffic fatality rates have now begun creeping upward again, and spiked in 2016 (Figures 1 – 3).

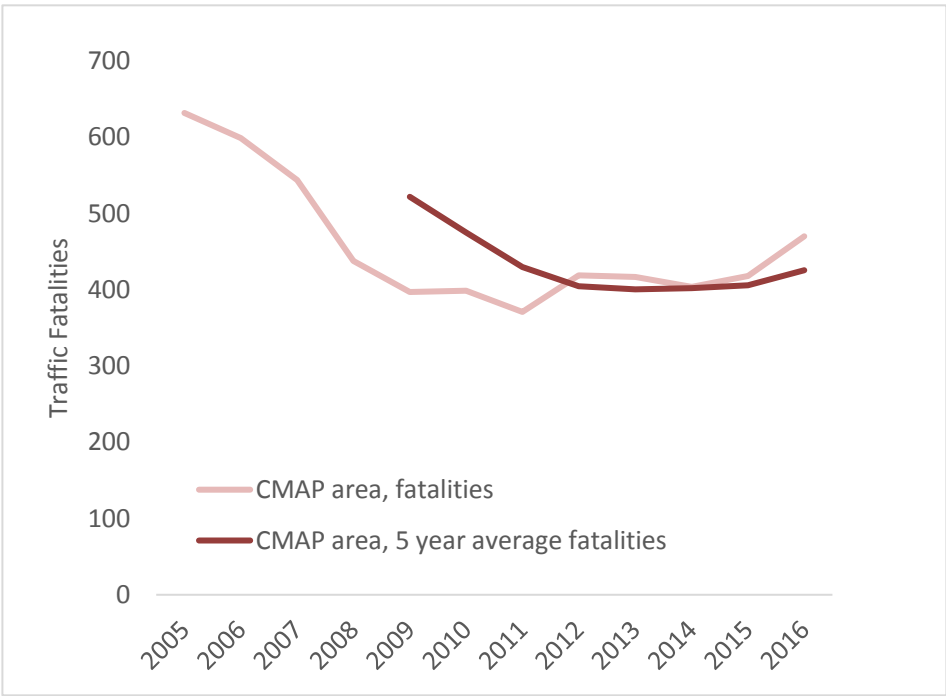
¹ AllGov, "NHTSA," <http://www.allgov.com/departments/department-of-transportation-dot/national-highway-traffic-safety-administration?agencyid=7241>.

² National Institutes of Health, "Graduated drivers licensing programs reduce fatal teen crashes," 2011, <https://www.nih.gov/news-events/news-releases/graduated-drivers-licensing-programs-reduce-fatal-teen-crashes>.

³ National Highway Traffic Safety, "Motor vehicle fatalities in 2008, 2010," 2016, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812318>.

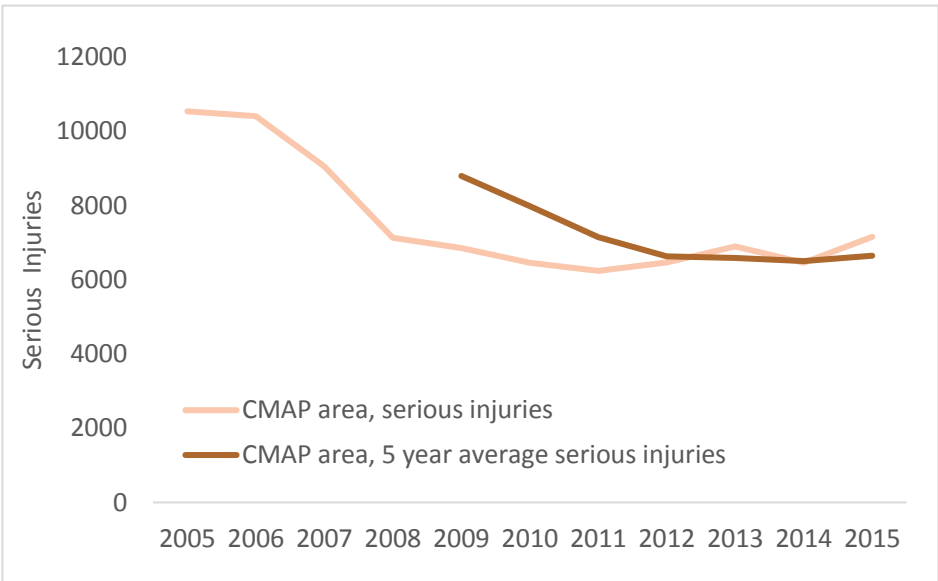


Figure 1. Traffic fatalities in the CMAP area, 2005-16



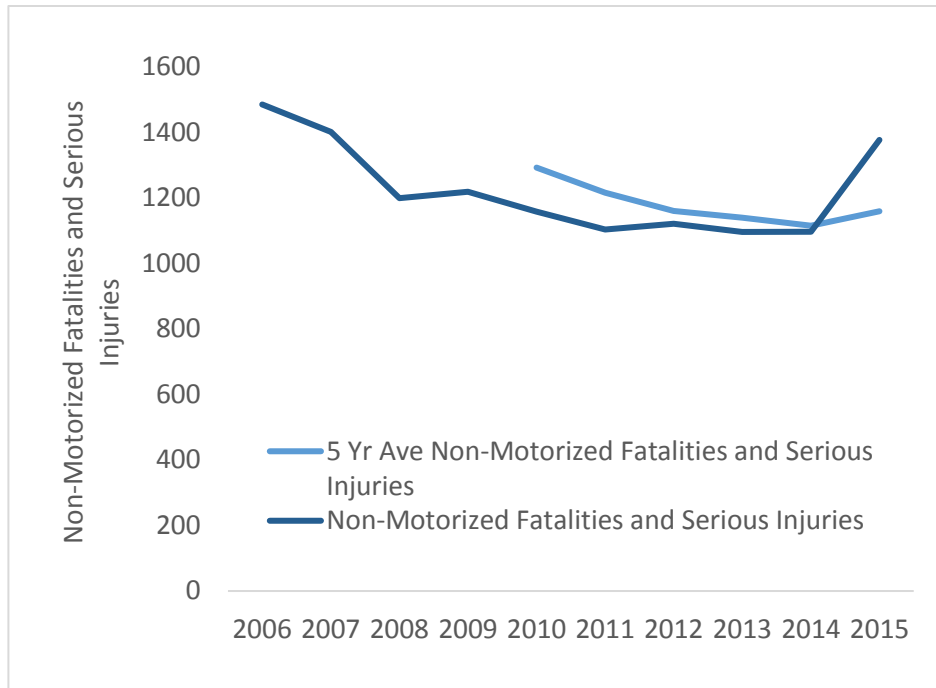
Source: CMAP analysis of NHTSA Fatality Analysis Reporting System (FARS) data

Figure 2. Serious injuries in the CMAP area, 2005-15



Source: CMAP analysis of IDOT crash data

Figure 3. Non-motorized fatalities and serious injuries in the CMAP area, 2005-15



Source: CMAP analysis of NHTSA Fatality Analysis Reporting System (FARS) and IDOT crash data

In recent years, a renewed focus on traffic safety has led to heightened expectations. In this new era for traffic safety, there is a strong demand for eliminating all traffic fatalities. The question that is driving this movement is “How many preventable traffic deaths are acceptable?” Many advocates countered that no preventable death is acceptable and have embraced the concept of a safe transportation system as a right for all citizens. Dozens of cities have joined the “Vision Zero” network and have stated a goal to eliminate traffic fatalities. The City of Chicago joined the Vision Zero initiative with a goal of eliminating fatal traffic crashes by 2026. In addition, the Illinois Department of Transportation (IDOT) has embraced a long-term goal of zero traffic fatalities.⁴ Recently, the Federal Highway Administration (FHWA) has committed to eliminating traffic fatalities through the Toward Zero Deaths program. There is a great deal of focus on eliminating traffic fatalities.

The region should continue to strive to make the transportation system a safer place for all users. ON TO 2050 should include a long-term goal to eliminate traffic fatalities in the region, and the region should set short-term targets that are as aggressive as possible. Vehicle technology improvements, driven by federal standards and fed by consumer demand, are expected to play a significant role in safety improvement by 2050. At the regional level, a

⁴ IDOT, “The 2009 Illinois Strategic Highway Plan,” 2009, <http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Reports/Safety/SHSP/SHSP%202009.pdf>.

serious commitment to eliminating traffic fatalities means embracing a full array of strategies, including both roadway design as well as behavior modification through education and enforcement.

The remainder of the introduction summarizes the main themes of the paper. Following that, the paper reports on safety planning efforts in the region and explores the safety emphasis areas the CMAP region should focus on to reduce fatal and serious injury crashes. The paper discusses the future of automotive technology and automated vehicles and the role CMAP can play in safety planning and programming. The paper ends with a discussion of setting regional safety targets for the federally required safety measures and the ON TO 2050 safety goal.

Key themes

By analyzing regional crash data and holding discussions with stakeholders throughout the region, CMAP identified a number of key safety themes that the region needs to acknowledge and develop strategies to address. The key themes identified in the paper are not new to the safety planning community; however this paper is designed as a starting point on what the region should focus on and the role that CMAP can play in planning for a safer transportation system for all users.

Traffic deaths and injuries are preventable

Collisions and the injuries that result from them are not “accidents,” but instead are the outcome of many individual factors that each can be influenced by technology, public policy, or engineering practice. A multi-disciplinary, system-based approach is needed to improve the safety of the built environment along with policies that influence behavior to increase safety.

Changing driver behavior is of primary importance

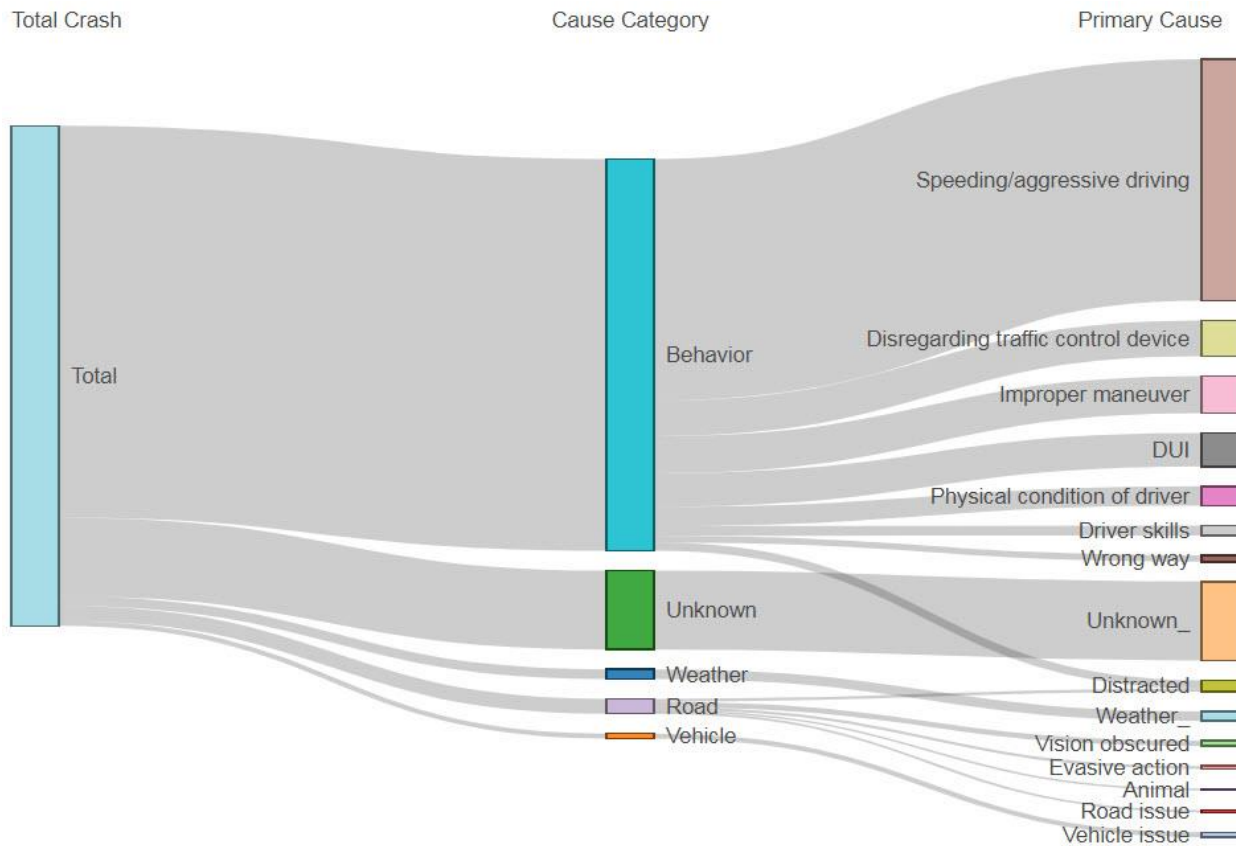
When examining the causes of crashes, what stands out most clearly is the significance of driver behavior. Driver behavior – such as speeding or impaired driving, as opposed to skill and ability of the driver -- is the primary cause of most crashes. NHTSA has identified it as a factor in 94 percent of crashes nationally.⁵ In the Chicago region, as Figure 4 shows, it is the most often cited primary cause of fatal and serious injury crashes.⁶ Programs that seek to modify driver behavior through engineering, enforcement, education – and some would also say evaluation -- are critical to achieving significant reductions in fatalities and serious injuries. Effective enforcement and educational programs that modify behavior are critical to achieve a significant reduction in fatalities and serious injuries.

⁵ NHTSA, “Crash Statistics,” 2015, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812115>.

⁶ IDOT, “Illinois Traffic Crash Report SR 1050,” 2013, <http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Manuals-Guides-&-Handbooks/Safety/Illinois%20Traffic%20Crash%20Report%20SR%201050%202013.pdf>.



Figure 4. Primary cause of fatal and serious injury crashes in CMAP region, 2010-14



Source: CMAP analysis of IDOT crash reports. Cause categories were identified by CMAP.

Engineering must prioritize transportation system safety

Given the prominence of driver behavior in causing crashes, engineering should aim to improve roadway design in order to reduce the impacts of that behavior. Some engineering solutions can eliminate conflicts (that is, crash opportunities) between drivers and between drivers and other road users, such as separating pedestrians from vehicular traffic, or make the roadway more forgiving, such as improved guardrail systems or anti-skid treatments. Drivers should receive cues to drive at safe speeds, and bicyclists and pedestrians should be given priority safety treatments so they can share limited roadway space. Speed management, effective lighting, improved sight lines, safer intersections, conspicuous signs, lane markings and warning devices, less dangerous roadside equipment and barriers, appropriate use of left turn lanes, and improved signal timing all can be implemented where appropriate to make traveling less dangerous.

Tools such as the Highway Safety Manual exist now to allow engineers to forecast safety outcomes of alternative designs.⁷ Forecasting crash reduction benefits must become an integral part of highway project studies. Similarly, it is critical to include effective safety countermeasures where a safety problem has been identified and not rely only on designing to a nominally safe standard in a design manual. Many resources such as the FHWA's Proven Countermeasures⁸ and the Crash Modification Factors Clearinghouse⁹ are available. Moving forward, the transportation community should collect and evaluate data on the safety performance of different roadway designs.

Enforcement and proper adjudication is critical

Traffic law enforcement by local authorities targeting aggressive and impaired driving is one key to reducing traffic fatalities. Major reductions in deaths cannot be accomplished without more effective traffic enforcement. An important component of any safety plan is drivers knowing there are consequences for dangerous driving. There is also room to improve the targeting of enforcement activities, particularly through coordination with local planning and traffic engineering functions. One element of this is allocating more enforcement efforts, including traffic stops by local police, to the most dangerous period, which is overnight.

However, police traffic enforcement has declined in recent years due to resource constraints and policy changes. Enforcement has waned most significantly at the state level and in the City of Chicago (Figure 5), where traffic stops have both been reduced by one-third. Stops by other local agencies have dropped 10 percent. Citations have dropped more, but this may be a result of changes in policies. It is important to note that automated traffic enforcement is not captured in these totals. Starting in 2015, police officer performance could not be based on ticket quotas or citation records.¹⁰ Also, the operations division of the Illinois State Police has seen a 21 percent reduction in headcount from 2010 to 2015.¹¹ These trends have consequences: for example, in one analysis, the risk of a fatal crash was 35 percent less in the month following a traffic ticket conviction.¹²

⁷AASHTO, "Highway Safety Manual," <http://www.highwaysafetymanual.org/Pages/default.aspx>.

⁸FHWA, "Proven Safety Countermeasures," <https://safety.fhwa.dot.gov/provencountermeasures/>

⁹FHWA, "Crash Modification Factors Clearinghouse," <http://www.cmfclearinghouse.org/>

¹⁰ Illinois General Assembly, "Public Act 98-0650," 2014, <http://www.ilga.gov/legislation/publicacts/fulltext.asp?Name=098-0930>.

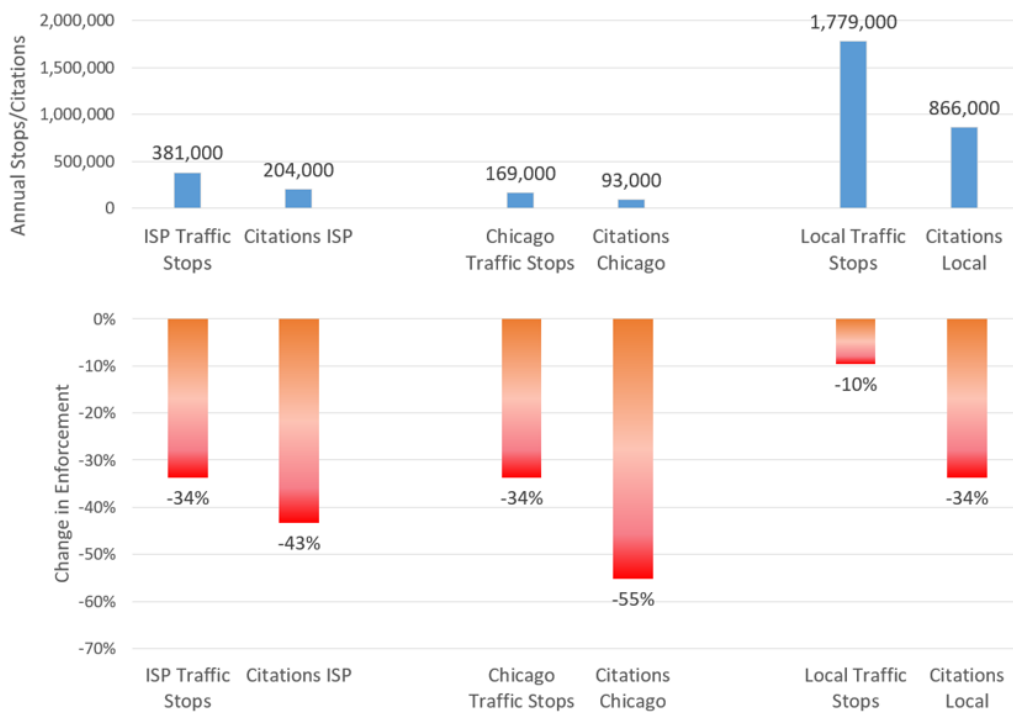
¹¹ Reynolds, John, "Speeding ticket numbers down, fatalities up on Illinois roads," The State Journal-Register, December, 17, 2016, <http://www.sj-r.com/news/20161217/speeding-ticket-numbers-down-fatalities-up-on-illinois-roads>.

¹² Donald Redelmeier and colleagues, "Traffic report: Increasing the frequency of traffic enforcement might further reduce total deaths," Lancet Volume 361, Number 9376, June 28, 2003.



Automated enforcement should also be used more broadly. Automated enforcement shows great promise and is shown to be effective – it is a central part of the strategies in countries with excellent safety records such as the Netherlands, Australia, and Germany.¹³ While speed and red light camera programs have had problems in their implementation in Illinois, they are effective. A significant campaign for wider implementation is needed that demonstrates the safety benefits of the strategy, provides a path for transparent operation with a documented rationale for the locations of cameras, and clarifies that raising revenue is incidental to the program.

Figure 5. Total annual enforcement level in 2016 (top) and change in traffic enforcement measures, 2006-2008 average vs. 2014-2016 average (bottom)



Source: IDOT, Illinois Traffic Stop Study. Note: Does not include automated enforcement. ISP = Illinois State Police.

In minority and low-income communities, the presence and tactics of police have led to major concerns over profiling, harassment, and use of deadly force. This is a complex issue that goes well beyond traffic safety, but a limited, partial solution may be automation, which allows for

¹³ European Commission, “Mobility and Transport: Road Safety: Speed Enforcement,” https://ec.europa.eu/transport/road_safety/specialist/knowledge/speed/speed_limits/speed_enforcement_en.

traffic law enforcement while minimizing additional police interaction. However, it is critical to have a credible analysis of the equity impacts of the locations and numbers of potential violations from automated enforcement. It is equally important to understand that there are racial and economic disparities in traffic fatalities.^{14,15} As discussed below, this is particularly true for non-motorized users. Thus, there is an opportunity to address multiple equity impacts by piloting community-centered enforcement approaches.

A last key factor in enforcement is making sure that traffic citations proceed through the judicial system properly. Cases should be adjudicated properly and violators should receive the legally prescribed punishment. Traffic violations should be tracked in court data systems. The process must be fully integrated from the traffic stop on the street to the courtroom. As noted in the Illinois Traffic Records Coordinating Committee's 2017 Traffic Safety Information Systems Strategic Plan, the state does not have a statewide citation database, and a number of data management issues require additional attention.¹⁶ While many of these elements require state-level coordination, given the Chicago region represents over half of the serious injuries and about two-fifths of the traffic fatalities in Illinois, our region will need to coordinate on making improvements.

Vulnerable users deserve priority treatment

Pedestrians and bicyclists are the most vulnerable users of the transportation network. Furthermore, non-motorized crashes disproportionately affect minority and low-income individuals. Crash data suggests that serious crash rates for bicyclists and pedestrians are increasing faster than those for vehicle occupants. Non-motorized users should be accommodated in as many locations as possible without the danger of being hit by a vehicle. Strong consideration should be given to local and state policies to reduce speed where pedestrians and bicyclists share the road with motorists. Establishment and implementation of Complete Streets policies providing non-motorized separation or protection from vehicles is encouraged. As noted in the influential *Dangerous by Design* report, special attention to vulnerable users is a necessity as part of design and construction of transportation facilities:

Everyone involved in the street design process - from federal policymakers to local elected leaders to transportation engineers - must take action to end pedestrian deaths.

¹⁴ City of Chicago, "Vision Zero Action Plan," June 2017, p. 17. http://visionzerochicago.org/wp-content/uploads/2016/05/17_0612-VZ-Action-Plan_FOR-WEB.pdf.

¹⁵ Huda Hamdan, *Racial/Ethnic Differences in Fatality Rates from Motor Vehicle Crashes: An Analysis from a Behavioral and Cultural Perspective*. Thesis, Virginia Commonwealth University, 2013.

¹⁶ Illinois Department of Transportation Bureau of Safety Programs and Engineering, "Illinois Traffic Records Coordinating Committee 2017 Traffic Safety Information Systems Strategic Plan," 2017, [http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Reports/Safety/ITRCC/2018%20TRCC%20Strategic%20Plan%20including%20Responses%20to%20NHTSA%20Questions%20\(Final\).pdf](http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Reports/Safety/ITRCC/2018%20TRCC%20Strategic%20Plan%20including%20Responses%20to%20NHTSA%20Questions%20(Final).pdf).



So long as streets are built to prioritize high speeds at the cost of pedestrian safety, this will remain a problem.¹⁷

Data quality and availability need improvement

In order to have a data-driven approach to improving traffic safety, crash data needs to be available in a timely manner. As noted in the Illinois 2017 Traffic Safety Information Systems Strategic Plan, multiple facets of data management and integration require improvement. Annual state crash data have typically been released about nine months after the end of the year, but recently it has taken longer for IDOT to provide this data to the various agencies who rely upon crash records for their analysis. It can be especially difficult to quickly observe whether safety improvements are working; three years of data are typically required for analyses, which may take five years to obtain after an improvement. State and regional partners, including CMAP, need to work together to hasten data availability through electronic reporting and improved data definitions and standards. Additional resources may be necessary for this effort. Other areas in which improvements and integration are needed include: emergency response, roadway, driver, and vehicle data.

Vehicle technology will ultimately have a major effect

Vehicle technology, such as airbags and seatbelts, has had a major impact on traffic safety over the past decades. In the coming years some of the biggest opportunities to improve safety may lie in technological solutions. Vehicles increasingly include features to improve survivability as well as crash avoidance. There are opportunities to use technology to influence behaviors that are resistant to change, such as failing to wear a seat belt or impaired driving. Increasing automation may eliminate at least some of the human factors responsible for crashes. However, given that vehicle technology is not under the control of local planners or highway engineers, this report will have limited focus on in-vehicle technology.

It is important to note the most vulnerable roadway users, bicyclists and pedestrians, are not completely protected by improvements to crashworthiness,¹⁸ although crash avoidance technology may improve to protect them more. Highway engineering remains the most important way to address non-motorized serious injuries and fatalities. Furthermore, lower-income groups tend to drive older cars with fewer safety features, so they benefit to a lesser degree from technological improvements.

¹⁷ Smart Growth America, "Dangerous by Design 2016," <https://smartgrowthamerica.org/resources/dangerous-by-design-2016/>.

¹⁸ Some vehicle improvements are being developed to eliminate or reduce the severity of non-motorized crashes, including technologies to help connected vehicles avoid crashes with pedestrians, redesigns of the front portions of vehicles to reduce the injury severity in case of an impact (Insurance Institute for Highway Safety, <http://www.iihs.org/iihs/sr/statusreport/article/48/10/3>), and truck side guards to prevent bicyclists and pedestrians from being swept under the rear wheels of a turning truck (Volpe Center, <https://www.volpe.dot.gov/our-work/truck-side-guards-resource-page>).



Safety planning in the CMAP region

Transportation agencies across the region are very active in planning and building a safe transportation system for all users. To help understand how transportation agencies in the region currently plan for safety, identify safety strategies that have been successful in the region, and help define CMAP's role in safety planning for the region, CMAP staff interviewed safety engineers and planners from highway agencies in the region.

Illinois Department of Transportation

IDOT plays a leading role in improving the safety of the state and regional transportation system. IDOT uses a data-driven approach to identify and address safety deficiencies. The [Strategic Highway Safety Plan](#) (SHSP) produced by IDOT creates a roadmap for the state and local transportation agencies to reduce the number of fatal and serious-injury crashes on all public roads in the state. The SHSP designates emphasis areas that agencies should focus safety efforts towards, so as to reduce crashes. Efforts entail using one of the 4Es (engineering, enforcement, education, and emergency response) of transportation safety. In 2016, IDOT released county-level SHSPs that focused on counties in Illinois that had a significant number of serious and fatal crashes between 2010 and 2014. Emphasis areas for local agencies, crash heat maps, and other disaggregate crash statistics were included in the county SHSPs to help local agencies locate and address locations with a high rate of severe crashes.

In addition to the SHSP, IDOT annually releases the [Highway Safety Plan](#) (HSP) and [Annual Evaluation Report](#). The HSP documents the safety programs and agencies that receive federal highway safety funds to reduce fatal and serious-injury crashes through non-engineering solutions such as enforcement and public education or outreach. The Annual Evaluation Report provides an evaluation of the safety programs identified in the HSP.

IDOT also releases a "five percent report", or more recently the "critical locations report," that identifies the top five percent of all road segments or intersections that are in need of a safety improvement on state and local roads. High-risk behaviors like speeding, drinking and driving, and not wearing a seat belt are often the cause of severe crashes at five percent locations.¹⁹ The five percent reports are designed to help IDOT and local agencies target projects to improve safety at dangerous locations on the road network.

Recently, IDOT developed a set of performance measures to evaluate and prioritize road projects that includes two safety measures, the [Safer Roads Index](#) (SRI) and the "benefit of safety improvement." Based on historical severe crash data and exposure rates, the SRI ranks the safety risk of a roadway. The "benefit of safety improvement" uses crash modification

¹⁹ IDOT, "Illinois Local Roads Five Percent Report," 2014, <http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Bulletins-&-Circulars/Bureau-of-Local-Roads-and-Streets/Circular-Letters/Informational/CL2014-01%20HSIP%20Revised.pdf>.



factors to predict the reduction of different types of crashes based on selected safety counter-measures to calculate the benefit-cost ratio of a certain project type. The SRI is one of the tools available to local agencies that can help them identify potential locations that are good candidates to receive HSIP funding.

City of Chicago

Along with IDOT, the City of Chicago is very active in safety planning. Like many cities across the United States, the City of Chicago committed to the “Vision Zero” initiative. Chicago first committed to Vision Zero in 2012, and in 2017 the Chicago Department of Transportation (CDOT) released a 2017 – 2019 action plan. [Chicago’s Vision Zero](#) action plan seeks to reduce fatalities and serious injuries from traffic crashes by 20 percent and 35 percent, respectively, by 2020 and eliminate both by 2026. Chicago seeks to achieve the goals presented in the plan by the following actions:

- Invest equitably in areas that are most affected by severe traffic crashes
- Develop a culture of safety by changing behaviors and perceptions
- Make streets safer for all users through redesigning streets to be safer for all users
- Make drivers and vehicles safer through implementing policies, offering training, and supporting technologies that improve safety for all road users

The City has completed a number of other plans in which safety played a prominent role, including a complete streets plan, bike plan, and pedestrian plan. The complete streets plan developed a pedestrian-first modal hierarchy in which roads are designed for pedestrians first instead of the automobile, except in special circumstances.²⁰

County Departments of Transportation

The county transportation departments in the CMAP region also plan and design for roads to be safer for all users. Many of the counties in the region have successfully applied for federal Highway Safety Improvement Program (HSIP) funds to implement safety counter-measures on roads they operate and maintain. DuPage Department of Transportation (DOT) routinely conducts intra-departmental safety project meetings to identify projects at high crash locations in the county. Additionally, IDOT has met with each county to introduce the county-level SHSP and discuss how they can use the reports to help identify locations with safety issues on the county system as well as work with municipalities in the county that have high-priority locations on the local system. An excellent example of a multi-disciplinary approach to safety planning is the Lake County DOT, which holds quarterly meetings with local police and the sheriff’s office to discuss how they can work together to develop strategies to address current safety issues in the county.

²⁰ Chicago Department of Transportation, “Complete Streets Chicago, 2013,” <https://www.cityofchicago.org/content/dam/city/depts/cdot/Complete%20Streets/CompleteStreetsGuidelines.pdf>.



Emphasis Areas

In order to target recommendations and strategies that will reduce serious-injury and fatal crashes in the CMAP region, an analysis of regional crash information, along with input from safety engineers and planners from highway agencies in the region, reveals a number of emphasis areas that the region should focus on. These include pedestrians/bicyclists, speeding/aggressive driving, seat belt use, alcohol use/impaired drivers, intersections, roadway departure, age of drivers, distracted driving, and vehicle type.

Figure 6 displays the annual number of fatalities and serious injuries (2010-15) associated with each emphasis area, as well as a cross tabulation with percentage of fatalities and serious injuries associated with each emphasis area where appropriate. Emphasis areas are not completely separate issues and often many are present in the same crash. Because of this, the sum of the percentages of fatalities and serious injuries in the cross tabulation will exceed 100 percent.

Figure 6. Interconnection of emphasis areas for six years of fatalities and serious injuries CMAP region, 2010-15

Average Annual Serious Injury or Fatal Crashes	Emphasis area	Younger Drivers 16-30	Intersection Related	Speeding/Aggressive Driving	Roadway Departure	Pedestrian and Bicyclist	Older Driver 65+	Impaired Drivers	Motorcycle	All Trucks and Bus	Unrestrained Occupants	Distracted Driving	Work Zone	Railroad Crossing
2948	Younger Drivers 16-30	na	48%	23%	19%	9%	9%	16%	6%	6%	7%	4%	1%	0%
2721	Intersection Related	52%	na	15%	na	17%	19%	8%	6%	6%	4%	4%	1%	0%
1195	Speeding/Aggressive Driving	58%	34%	na	23%	7%	12%	12%	8%	8%	7%	na	2%	0%
1109	Roadway Departure	51%	na	25%	na	na	9%	31%	10%	5%	15%	4%	1%	0%
965	Pedestrian and Bicyclist	26%	49%	9%	na	na	9%	4%	1%	4%	na	2%	1%	0%
872	Older Driver 65+	32%	58%	17%	12%	10%	na	6%	5%	8%	4%	4%	1%	0%
773	Impaired Drivers	60%	30%	19%	44%	5%	6%	na	9%	6%	20%	2%	1%	0%
434	Motorcycle	44%	41%	22%	25%	1%	10%	16%	na	2%	na	2%	2%	0%
430	All Trucks and Bus	44%	39%	23%	12%	9%	15%	10%	3%	na	6%	3%	3%	0%
343	Unrestrained Occupants	60%	29%	25%	48%	na	10%	44%	na	8%	na	3%	1%	0%
231	Distracted Driving	57%	43%	na	18%	10%	16%	6%	4%	6%	5%	na	1%	0%
82	Work Zone	48%	36%	26%	16%	13%	14%	10%	11%	14%	5%	4%	na	0%
6	Railroad Crossing	24%	6%	9%	na	3%	24%	35%	3%	3%	18%	0%	0%	na

Note: In the table above, some cells in the cross tabulations are not applicable and are shown in black because the crashes are classified in exclusive ways. A crash could be coded as a roadway departure or a pedestrian crash, but not both, although both events may have occurred.

Source: CMAP analysis of IDOT Safety Portal data

Some elements of crashes are consistently associated with other elements such as impaired drivers and roadway departure crashes. The cross tabulation values highlight the frequency that different emphasis areas occur in the same crash. The coincidence of the emphasis areas are shown by percentages and also with the cells shaded red (high) to blue (low). For example, of the 1109 annual fatalities and serious injuries in the region that involved a roadway departure crash, 31 percent included an impaired driver. Roadway departures result in fatalities more often than intersection or speed related crashes, so every crash averted has a significant chance to prevent a fatality. The distracted driving emphasis area is under-reported because it is currently difficult to capture in crash reports; therefore the data used in the analysis does not associate many serious injuries or fatalities with distracted driving.²¹

For each regional emphasis area, background information and statistics were compiled using input from transportation agencies in the region and crash data provided by IDOT. Additionally, recommendations are included that transportation agencies should consider implementing in the region to actively reduce serious injury and fatal crashes in each emphasis area.

Pedestrian and bicyclist

Pedestrians and bicyclists are the most vulnerable users of the transportation system and disproportionately account for serious injuries and fatalities. Pedestrians and bicyclists comprise 0.9 percent and 0.6 percent of all people in crashes in the region, but account for 11.1 percent and 4.8 percent of all serious injuries and 21.2 percent and 4.2 percent of fatalities, respectively (Figure 7). Across the nation, the share of fatal crashes that involve pedestrians has been increasing.²² In the CMAP area, this share has been stable, but the share of all fatalities and serious injuries that are cyclists has been trending upward in the past few years. Furthermore, bicyclist and pedestrian crashes are a major equity issue, as economically disconnected areas²³ have much higher serious injury and traffic fatality rates per capita.²⁴ This difference is mostly

²¹ NHTSA, “Distracted Driving,” <https://www.nhtsa.gov/risky-driving/distracted-driving>.

²² NHTSA, “Traffic Safety Facts: 2015 Motor Vehicle Crashes: Overview” August 2016, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812318>.

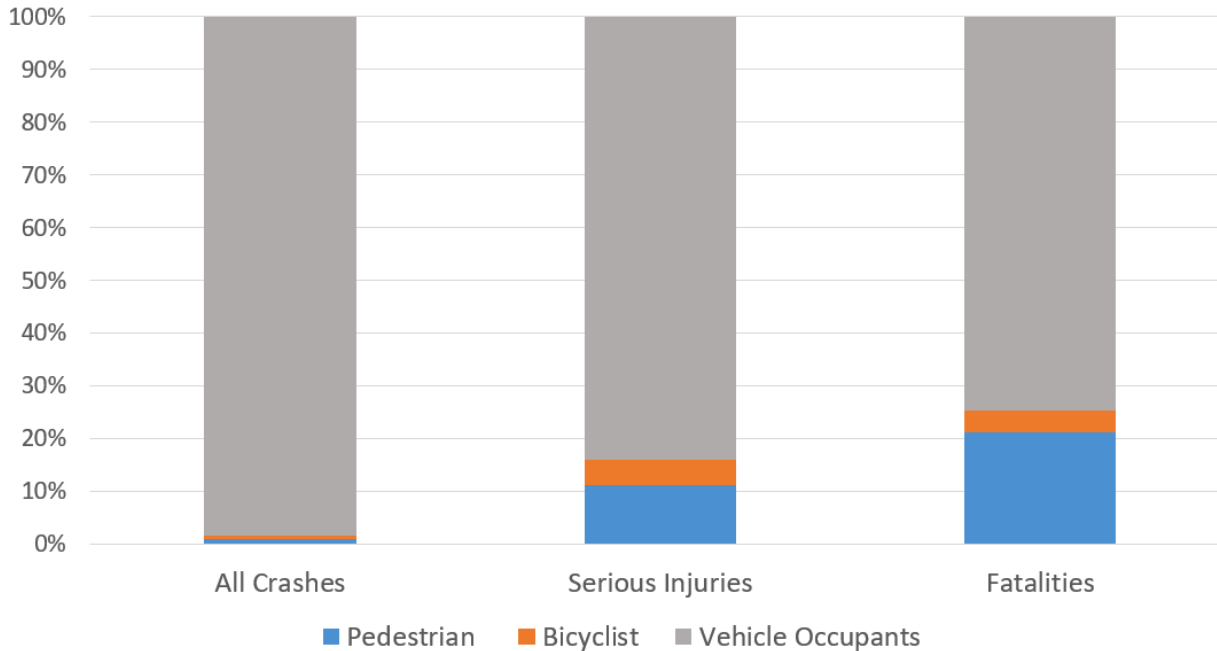
²³ Economically disconnected areas are census tracts in the CMAP region with a concentration of either low-income households and minority population or low-income households and limited English proficiency (LEP) population. See ON TO 2050 Inclusive Growth strategy paper. <http://www.cmap.illinois.gov/documents/10180/515753/Inclusive+Growth+strategy+paper/0f01488d-7da2-4f64-9e6a-264bb4abe537>.

²⁴ CMAP, “Non-Motorized Transportation,” 2017, <http://www.cmap.illinois.gov/documents/10180/620327/Non-motorized+transportation+report.pdf/1efedfc4-51cc-ec4b-e44f-aad460bef600>.



accounted for by bicyclists and pedestrians, since the serious injury and fatality rates for vehicle occupants are similar inside and outside of economically disconnected areas.²⁵

Figure 7. Pedestrian, bicyclist, and vehicle occupant shares of crashes, injuries, and fatalities CMAP region 2011-2015



Source: CMAP analysis of IDOT Safety Portal data

Given bicycle and pedestrian vulnerability to death and serious injury, crashes with vehicles must be eliminated. This puts much of the focus on engineering and design of the roadway to better accommodate bicyclists and pedestrians. In addition, pedestrians and bicyclists need to be educated about the safest ways to interact with vehicles and the dangers of being distracted or under the influence of drugs or alcohol.²⁶ Please see the [ON TO 2050 Non-Motorized Transportation White Paper](#)²⁷ for additional information about bicycle and pedestrian safety.

²⁵ Note that comparing serious crash statistics for EDAs versus non-EDAs is not the same as comparing the demographics of the people actually involved in crashes. When using Fatality Analysis Reporting System data, analysis again suggests that persons of color who are vehicle occupants have about the same rate of fatalities and serious injuries per capita as all other residents of the region (it is not possible to normalize by total VMT by race or ethnicity since this is not known). For pedestrian crashes in the region, however, the fatality rate is 1.56 per person for blacks, 1.00 for Latino, and 0.93 for all other races/ethnicities. See NHTSA FARS 2012-2015 Data. <https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars>.

²⁶ One in every three (34%) of fatal pedestrian crashes involved a pedestrian with a blood alcohol concentration (BAC) of at least 0.08 grams per deciliter (g/dL) CDC www.cdc.gov/motorvehiclesafety/pedestrian_safety/index.html.

²⁷ CMAP, "Non-Motorized Transportation," 2017, <http://www.cmap.illinois.gov/documents/10180/620327/Non-motorized+transportation+report.pdf/1efedfc4-51cc-ec4b-e44f-aad460bef600>.

Vehicle speed

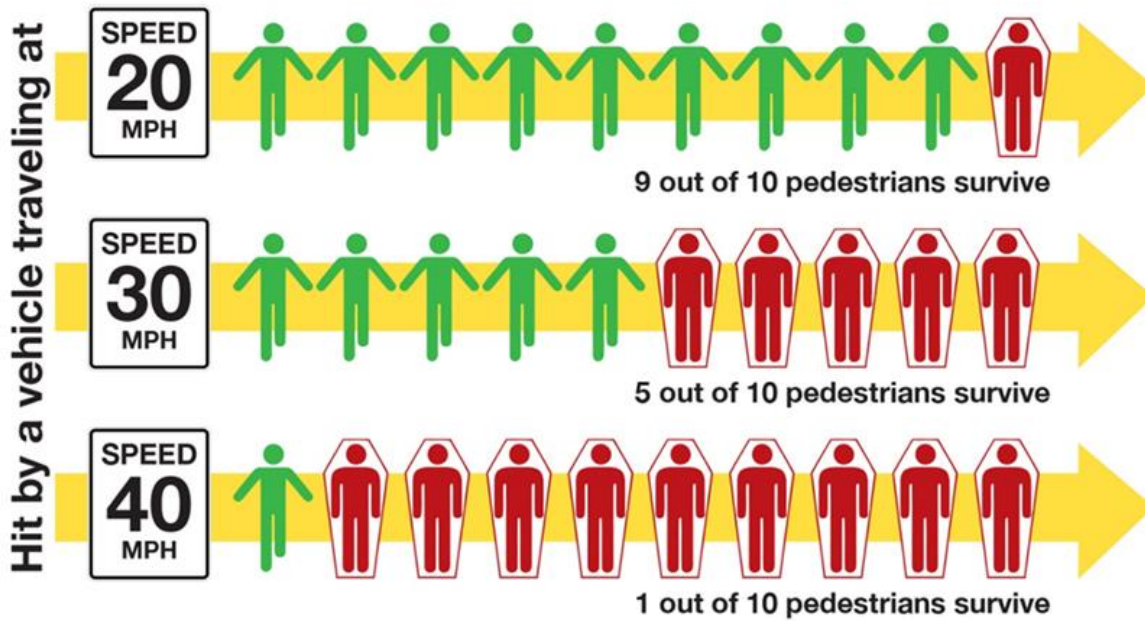
Available information suggests that vehicle speed is a leading culprit in non-motorized serious injuries and fatalities. As vehicle speeds in crashes increase, the harm to pedestrians and bicyclists increases exponentially (Figure 8).²⁸ While the crash data on pedestrian serious injuries in Illinois is often missing information on crash factors, in fatal pedestrian crashes 29 percent of the crashes with this information available listed “failing to reduce speed to avoid crash” as the primary cause.²⁹ In pedestrian crashes, failing to yield right of way is a factor for over half of serious pedestrian crashes where this data is available. Speeding was rarely cited as the cause of those serious injury and fatal crashes. Thus, within the limits of the available data, it appears that *legal* vehicle speed where pedestrians and vehicles share the road is fast enough to cause serious harm when a pedestrian is struck. This suggests that, in many cases, the currently permitted speeds are too fast for drivers to identify the actions of pedestrians and result in the drivers failing to yield the right of way. To significantly reduce the number of pedestrian and bicyclist fatalities, vehicle speeds need to be reduced in areas with pedestrians or bicyclists present.

²⁸ NextCity.Org, “Dangerous by Design report,” 2016, At 20 mph, the risk of death to a person on foot struck by a vehicle is 6 percent. At 30 mph, that risk of death is three times greater. And at 45 mph, the risk of death is 65 percent—11 times greater than at 20 mph. When struck by a car going 50 mph, pedestrian fatality rates are 75 percent and injury rates are more than 90 percent.” <https://nextcity.org/pdf/dangerous-by-design-2016.pdf>.

²⁹ Analysis shows that 34.6% of the pedestrian crashes that resulted in a serious injury did not have a cause listed. IDOT, “2014 Illinois crash data,” 2014, <http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Resources/Safety/Crash-Reports/crash-facts/2014%20CF.pdf>.



Figure 8. Likelihood of survival when pedestrians are hit at different speeds

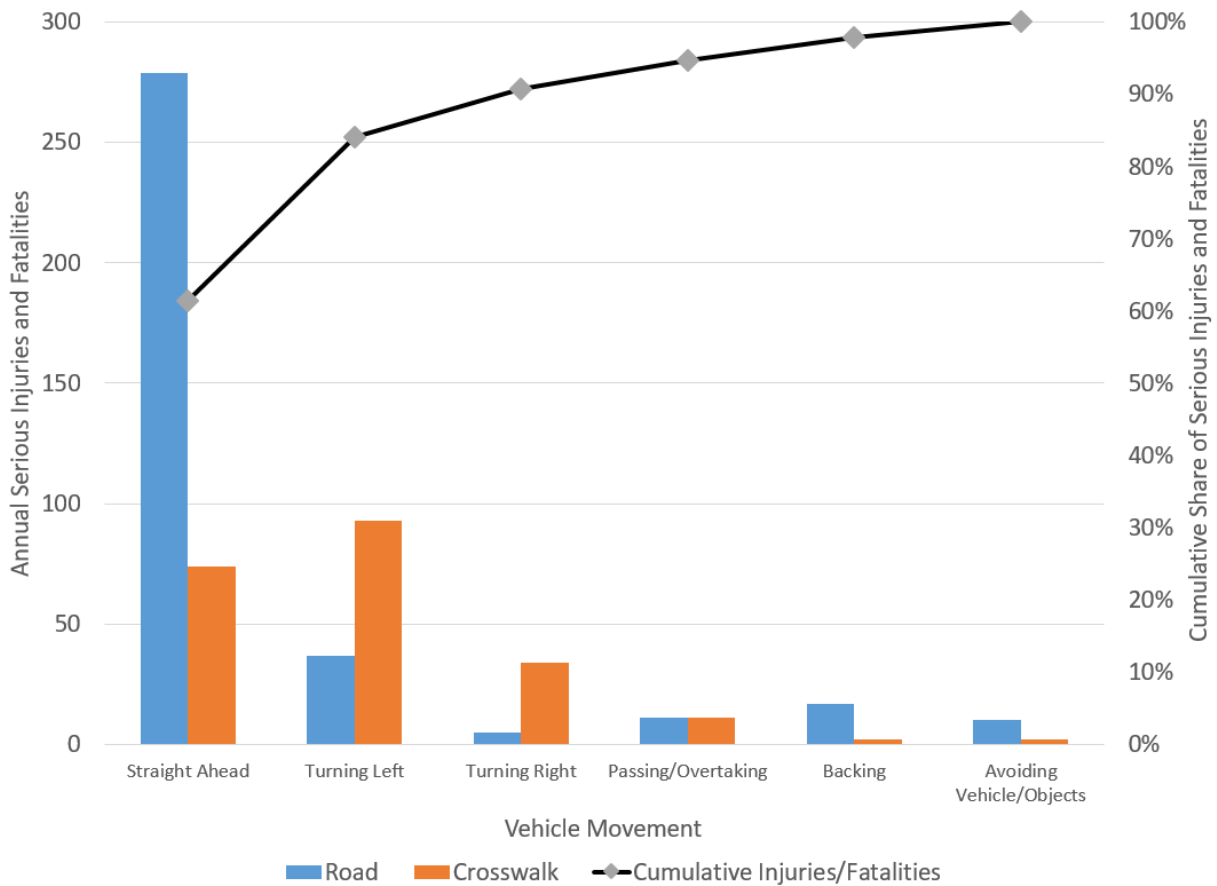


Source: Graphic designed by Placemakers, used with permission.

Location of pedestrians in severe crashes

Analysis of the data suggests that the most serious safety issues for pedestrians related to location are being hit outside of crosswalks and being hit in intersections by vehicles turning left (Figure 9). In 2014, 64 percent of the pedestrian crashes were outside a crosswalk. Where crosswalks are less common or people park mid-block and cross directly to their destination, the frequency of pedestrian activity outside a crosswalk increases, exposing them to vehicle traffic. The data generally reflects this relationship. The City of Chicago has more crosswalks compared to the rest of the region, and just over half of the severe crashes are outside crosswalks, whereas in the suburbs, three-fourths of the severe pedestrian crashes are outside crosswalks.

Figure 9. Fatalities and serious injuries to pedestrians in the crosswalk or road by vehicle movement



Source: CMAP analysis of IDOT crash data

The majority of severe pedestrian crashes that involve a pedestrian outside a crosswalk are in locations without traffic control devices. If pedestrians are crossing at an unmarked mid-block location because there are no crosswalks nearby, then these areas should be examined to determine if a pedestrian crossing is warranted. One-quarter of the severe pedestrian crashes outside crosswalks are near traffic signals or stop signs. If there are no designated crosswalks at these locations, then crosswalks should be installed. Traditional crosswalk pavement markings are not a panacea, however. National studies suggest that on low-volume, two-lane roads, crosswalk markings away from signals do not improve safety, and on higher-volume, higher-speed streets, they can worsen safety when used with no other safety improvement.³⁰ For mid-

³⁰ Campbell, B.J., Feaganes, John., Huang, Herman H., Lagerwey, Peter A., Stewart, J. Richard Zegeer, "Safety Effects of Marked versus Unmarked Crosswalks at Uncontrolled Locations: Final Report and Recommended Guidelines," 2005. <https://www.fhwa.dot.gov/publications/research/safety/04100/04100.pdf>.

block crossings, increased use of signs, beacons,³¹ and roadway markings can be effective in alerting drivers to be aware of pedestrian activity in areas without standard traffic control equipment. Lower auto speeds on roads also provide drivers with more time to see and react to pedestrians.

For pedestrians in the crosswalk in intersections, left-turning vehicles are nearly three times as likely to seriously injure or kill a pedestrian compared to vehicles making right turns.³² Left-turning motorists may accelerate through an intersection and may be focused on opposing traffic, rather than distant pedestrians in a crosswalk. Traffic signals control traffic at the locations of three-fifths of the severe crashes where the pedestrian was in the crosswalk. In areas with substantial left-turn/pedestrian conflicts, “permissive” left turn phasing can be replaced by “protected” left turn phasing and turn bays so that walk and pedestrian clearance intervals do not coincide with left-turning vehicle movements.

At intersections without leading left-turn phases, leading pedestrian intervals can further reduce the amount of time that pedestrian crossings conflict with vehicles. The installation of accessible pedestrian islands or medians provide a refuge from vehicle traffic for all users, but especially children, the elderly population and people with disabilities using wheeled accessories. Intersections can be restriped using pedestrian scramble (diagonal) crosswalks that allow pedestrians to cross during all red signal phases that reduce total street crossing time. A working example of this type of crosswalk safety design is located in Chicago at the intersection of State Street and Jackson Boulevard. Pedestrian countdown signals, required by the Manual of Uniform Traffic Control Devices (MUTCD) for most intersections with pedestrian signals, can be prioritized in areas with high pedestrian conflict with high vehicular presence. Improved signage and crosswalk striping such as reflective striping and various pavement materials can further reduce crashes by providing advanced notice to drivers that they are approaching an intersection where pedestrians may be walking.

In general, pedestrian countdown signals, better road markings, refuge islands, shortening crossing length via bump outs, protected left turn phases, designs that lower left turn speeds, and traffic calming designs will all improve the safety of pedestrians at intersections. Communities in the region have implemented a number of these improvements in recent years, but continued progress is needed (Figure 10).

³¹ Approval for optional use of rectangular rapid flashing beacons has been terminated due to patent issues. mutcd.fhwa.dot.gov/res-interim_approvals.htm.

³² One possible explanation for this is that drivers of the left-turning vehicles are very focused on the on-coming vehicle traffic while at the same time identifying pedestrians. Also, in heavy traffic, the gap available for left turns may lead them to use higher speeds as they proceed through the intersection. Having a greater turning radius also allow left turning vehicles to attain higher speeds compared to right turn maneuvers. Drivers making right turns do not have to worry about on-coming traffic and can devote more attention to the pedestrians that are near them. “Left-Turn, Pedestrian and Bicycle Crash Study,” FHWA. <http://www.nyc.gov/html/dot/downloads/pdf/left-turn-pedestrian-and-bicycle-crash-study.pdf>.



Figure 10. Examples of pedestrian-friendly roadway designs



Source: CMAP Non-Motorized Transportation Snapshot

Complete streets and modal hierarchy

Lack of effective crosswalks and the danger of crossing against traffic turning left are part of a larger general issue with the design of the roadway environment, which has prioritized motorists in many places. To address this issue, communities should start with a complete streets policy that commits to designing and operating roads in a way that accommodates all users, regardless of age, ability, or mode of transportation. While progress has been made, more is needed; as of 2016, almost 40 communities out of 284 in the CMAP region have adopted complete streets policies.³³ In particular, communities should strongly consider adopting a default modal hierarchy that prioritizes pedestrian and bicyclist accommodation (that is, safety of vulnerable users) over cars when planning transportation system improvements.³⁴ This

³³ Smart Growth America, "Complete Streets Policy Atlas," <https://smartgrowthamerica.org/program/national-complete-streets-coalition/policy-development/policy-atlas/>.

³⁴ CMAP, "Complete Streets: Overall Design Concepts and Considerations," 2015, <http://www.cmap.illinois.gov/documents/10180/391170/FY15-0085+COMPLETE+STREETS+DESIGN+CONC.pdf/ddd3e4f6-d3be-4bf1-abd6-d6c2c2d94433>.

modal hierarchy was adopted by the City of Chicago as part of the [Complete Streets Design Guidelines](#) released in 2013; similar policies have been adopted elsewhere. As part of this, geometric improvements that benefit pedestrians and bicyclists such as median refuge areas, clearly signed and marked crosswalks, widened outside through-lanes for bikes, and physical barriers that protect pedestrians and bicyclists need to be included in the evaluation when improving roadway design to protect the most vulnerable road users.

Time of day and lighting

The most dangerous period to be a pedestrian, based on the total number of serious injuries or fatalities, is in the early evening after sunset from mid-October through the end of December. In these months when the sun sets the earliest, many people are leaving work or school when it is already dark. While other factors may increase the danger of pedestrian travel in the winter time, it is most likely the poor visibility during these months for both the drivers and the pedestrians. Initiatives that increase the detection of pedestrians by drivers would reduce pedestrian deaths. Left-turn movements with protected phases would separate the pedestrian and vehicle conflict if the pedestrian obeys their signal. Having the protected left-turn phase may reduce the chance of drivers not noticing a hard-to-see pedestrian who strays into their path.

Studies of the effectiveness of improved lighting for reducing pedestrian crashes are not definitive, but do suggest that lighting helps prevent crashes.³⁵ A study from the Netherlands estimated 13 percent reduction in crashes for intersections with lighting compared to intersections without lighting.³⁶ Older work estimated a 50 percent reduction in pedestrian crashes by improved illumination.³⁷ In areas with pedestrian activity at dusk or at night, particular emphasis should be placed on vertical illuminance, assuring that pedestrians are visible to drivers, rather than visible from the sky.³⁸ Analysis of the effectiveness of newer LED lighting has not been completed due to the lack of relevant before/after data. Improving the lighting wherever pedestrians are interacting with vehicles is likely to save pedestrian lives.

³⁵ Royal Society for the Prevention of Accidents, "Road Safety Factsheet: Street Lighting and Road Safety," March 2017. <http://www.rosipa.com/rospaweb/docs/advice-services/road-safety/roads/street-lighting.pdf>.

³⁶ Wanvik, W., "Effects of road lighting: An analysis based on Dutch accident statistics 1987-2006." *Accident Analysis and Prevention*, Vol. 41, No. 1, Oxford, N.Y., Pergamon Press, (2009) pp. 123-128. Also <http://www.lrc.rpi.edu/resources/newsroom/pdf/2007/StreetLightingSafety8511.pdf>.

³⁷ Elvik, R. "Meta-Analysis of Evaluations of Public Lighting as Accident Countermeasure." *Transportation Research Record* 1485, TRB, National Research Council, Washington, D.C., (1995): pp. 112-123. <https://trid.trb.org/view.aspx?id=451827>.

³⁸ FHWA, *FHWA Lighting Handbook*, August, 2012, https://safety.fhwa.dot.gov/roadway_dept/night_visib/lighting_handbook/.



Speeding and aggressive driving

Speeding and aggressive driving are the leading causes of fatal and serious injury crashes in the region, with 26 percent of all fatalities in the past five years having one or both as the primary cause for the crash.³⁹ A recent study conducted by the National Transportation Safety Board (NTSB) found that speeding increases the risk of being involved in a crash and increases the severity of injuries.⁴⁰ Speeding is also widespread. According to an American Automobile Association (AAA) survey, nearly half of the drivers have driven 15 mph over the speed limit on a freeway (46 percent) and have driven 10 mph over the speed limit on a residential street (46 percent) in the past 30 days.⁴¹ Because it is a behavioral issue, the majority of recommendations to prevent these types of crashes are behavioral, that is, based on enforcement, education, and training. Engineering, through complete streets and traffic calming measures, must play a significant role in reducing motorist speed and deter aggressive driving.

Traditional and automated enforcement

Enforcement can be an effective way to deter speeding and aggressive driving. With traditional on-the-ground enforcement, police presence needs to be highly visible so drivers become aware that law enforcement personnel are actively enforcing the speed limit. Through a data-driven process, law enforcement agencies should target corridors that experience a high number of fatal and serious injury crashes. Funding programs for additional enforcement, often targeted on holidays with binge drinking should also be used, as currently permitted, at locations that have consistent issues with severe crashes caused by speeding and aggressive driving throughout the year. CMAP should work with local agencies to assist in identifying corridors in the region that experience high numbers of serious injury and fatal crashes resulting from speeding and aggressive driving.

Automated speed enforcement (ASE) through speed cameras is an effective tool that will reduce speeding related serious injuries and fatalities. A review of ASE programs found fatality reductions of 17 to 71 percent.⁴² ASE can free law enforcement personnel to focus on other issues and also limits the danger of escalation from routine traffic stops. The City of Chicago has found its automated program to be a success with speeding decreasing by half at locations

³⁹ In this paper, speeding and aggressive driving are defined as any fatal or serious injury crash with a primary cause of exceeding authorized speed limit, exceeding safe speed for conditions, failing to reduce speed to avoid a crash, or operating vehicle in an erratic, reckless, careless, negligent or aggressive manner.

⁴⁰ NTSB "Reducing Speeding-Related Crashes Involving Passenger Vehicles," 2017, <https://www.nts.gov/safety/safety-studies/Documents/SS1701.pdf>.

⁴¹ AAA Foundation for Traffic Safety, "2016 Traffic Safety Culture Index," 2017, <http://aaafoundation.org/wp-content/uploads/2017/11/2016TrafficSafetyCultureIndexReport.pdf>.

⁴² Bellamy, Nicholas, Le Brocque, Robyne, Willis, Charlene, Wilson, Cecilia, Hendrikz, Joan K., "Speed Cameras for the Prevention of Road Traffic Injuries and Deaths," 2010 Cochrane Database of Systematic Reviews (11), <https://www.ncbi.nlm.nih.gov/pubmed/20927736>.



where cameras are installed within 90 days and an 18 percent decrease in injury-causing crashes in Child Safety Zones in the first year.⁴³ Currently, however, only the City of Chicago is authorized under state law to use automated speed limit enforcement (the use of automated enforcement for running red lights is more broadly allowed in the CMAP area except in Kendall County).⁴⁴ IDOT can currently only use automated enforcement for speed limit compliance in work zones. The General Assembly should broaden permissions for IDOT, the Illinois State Police, the Illinois Tollway, and municipal and county agencies to implement automated speed limit enforcement programs in locations with high numbers of serious crashes where speeding is implicated. As a last policy barrier to wider use of ASE, the FAST Act specifically prohibits using HSIP funding or NHTSA funding under 23 USC 402 to pay for ASE equipment or operation except in school zones; CMAP should support eliminating these restrictions in the next federal reauthorization.

If national statistics are representative of the Chicago area, automated enforcement is not yet a widely-supported concept. AAA found that of drivers surveyed for their 2016 Traffic Safety Culture Index that only 43 percent support using cameras on residential streets, 42 percent in urban areas, and 32 percent on freeways.⁴⁵ A significant campaign for its implementation is needed that demonstrates the safety benefits of the strategy, the rationale for the locations of cameras, and clarifies that raising revenue is incidental to the program. Equity impacts and a community focus for non-expressway locations would need to be part of the program. CMAP should provide support to agencies in the region that would like to establish an automated enforcement program. CMAP support can be in the form of public outreach about the benefits of such a program and creating brochures and reports that highlights the safety benefits of automated enforcement.

Because vehicles are travelling at such high speeds on expressways, a limited number of strategically placed automated speed cameras should be deployed on expressways in the region. While expressways are generally safer than other functional classes, the crashes that do occur have a higher likelihood of causing a serious injury or fatality because of higher speeds. European countries extensively use automated enforcement on their freeways, while it's rarely implemented the United States operate speed cameras on expressways.⁴⁶

⁴³ Chicago Department of Transportation, "Vision Zero Chicago Action Plan 2017," 2017, http://visionzerochicago.org/wp-content/uploads/2016/05/17_0612-VZ-Action-Plan_FOR-WEB.pdf.

⁴⁴ Illinois Statutes 625 ILCS 5/11-208.6, 625 ILCS 5/11-208.8, <http://www.ilga.gov/legislation/ilcs/fulltext.asp?DocName=062500050K11-208.6>.

⁴⁵ AAA Foundation for Traffic Safety, "2016 Traffic Safety Culture Index," 2017, <http://aaafoundation.org/wp-content/uploads/2017/11/2016TrafficSafetyCultureIndexReport.pdf>.

⁴⁶ Howie, Craig, "Speed cameras on U.S. highways?." CNN.com. Cable News Network, 4 June 2009, <https://www.cnn.com/2009/LIVING/wayoflife/06/04/aa.speed.cameras.highways/index.html>.



Education

Because speeding and aggressive driving are behavioral issues, educational campaigns and driver training should be encouraged regionally. As part of its Vision Zero strategy, the City of Chicago plans to emphasize education over fines by working with Chicago Police Department to make sure drivers are aware of traffic safety school options that could lower the cost of a citation and work with the Cook County Courts to ensure effective programs exist.⁴⁷ To change drivers' behaviors in the region, CMAP should support driver safety training options for drivers that receive a citation involving speeding or aggressive driving. CMAP should actively support outreach and driver educational campaigns through its social media accounts and online presence.

Traffic calming

A number of traffic calming measures are available that reduce motorists' speed and aggressive driving while at the same time enhancing the roadway environment for non-motorists. Spot design elements that create vertical deflections such as speed hump, speed table, and raised intersections, horizontal shifts such as a neighborhood traffic circle, and roadway narrowing such as a choker or center island narrowing, can influence motorists to slow down and drive safer. These traffic calming elements are best suited for lower-volume roads and are more effective when implemented along a corridor, but consideration must be made for emergency response vehicles. For example, speeds between speed humps have been observed to be reduced between 20 and 25 percent on average.⁴⁸

A "road diet" or "right-sizing" a road is a proven design treatment that can reduce motorists' speeds and help make roads safer for all users. Typically, right-sizing a road involves converting a road from four undivided lanes (two in each direction) to three lanes (one lane in each direction, plus a center two-way, left-turn lane).⁴⁹ Implementing a right-sized road also opens up space for bike lanes, pedestrian refuge islands, and transit stops. It has many safety benefits including reduced speed differential between cars, which can decrease the number and severity of crashes. It also is thought to be beneficial for older drivers with slower reaction times and reflexes.⁵⁰ A case study on implementing a road diet in Seattle found significant speed

⁴⁷ Chicago Department of Transportation, "Vision Zero Chicago Action Plan 2017," 2017, http://visionzerochicago.org/wp-content/uploads/2016/05/17_0612-VZ-Action-Plan_FOR-WEB.pdf.

⁴⁸ Institute of Transportation Engineers, "Traffic Calming Measures – Speed Hump," <http://www.ite.org/traffic/hump.asp>.

⁴⁹ FHWA, "Road Diets (Road Reconfiguration)," 2016, https://safety.fhwa.dot.gov/road_diets/.

⁵⁰ U.S. Department of Transportation Federal Highway Administration, "Road Diet Informational Guide," 2014, https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/rdig.pdf.



reduction along the corridor with more than a 60 percent reduction in motorists driving over the speed limit and 23 percent reduction in collisions.⁵¹

CMAP preliminarily identified road segments in the region that may be candidates for right-sizing (Figure 11). This is a planning-level analysis and a more thorough engineering study would be needed before implementation. Modeled after a study done for the Iowa DOT,⁵² the analysis identified 4-lane undivided roadways with total AADT less than 18,000. Segments of relatively uniform length were constructed in GIS, then crash rates were computed for each segment which can help identify which candidate locations should be a higher priority.

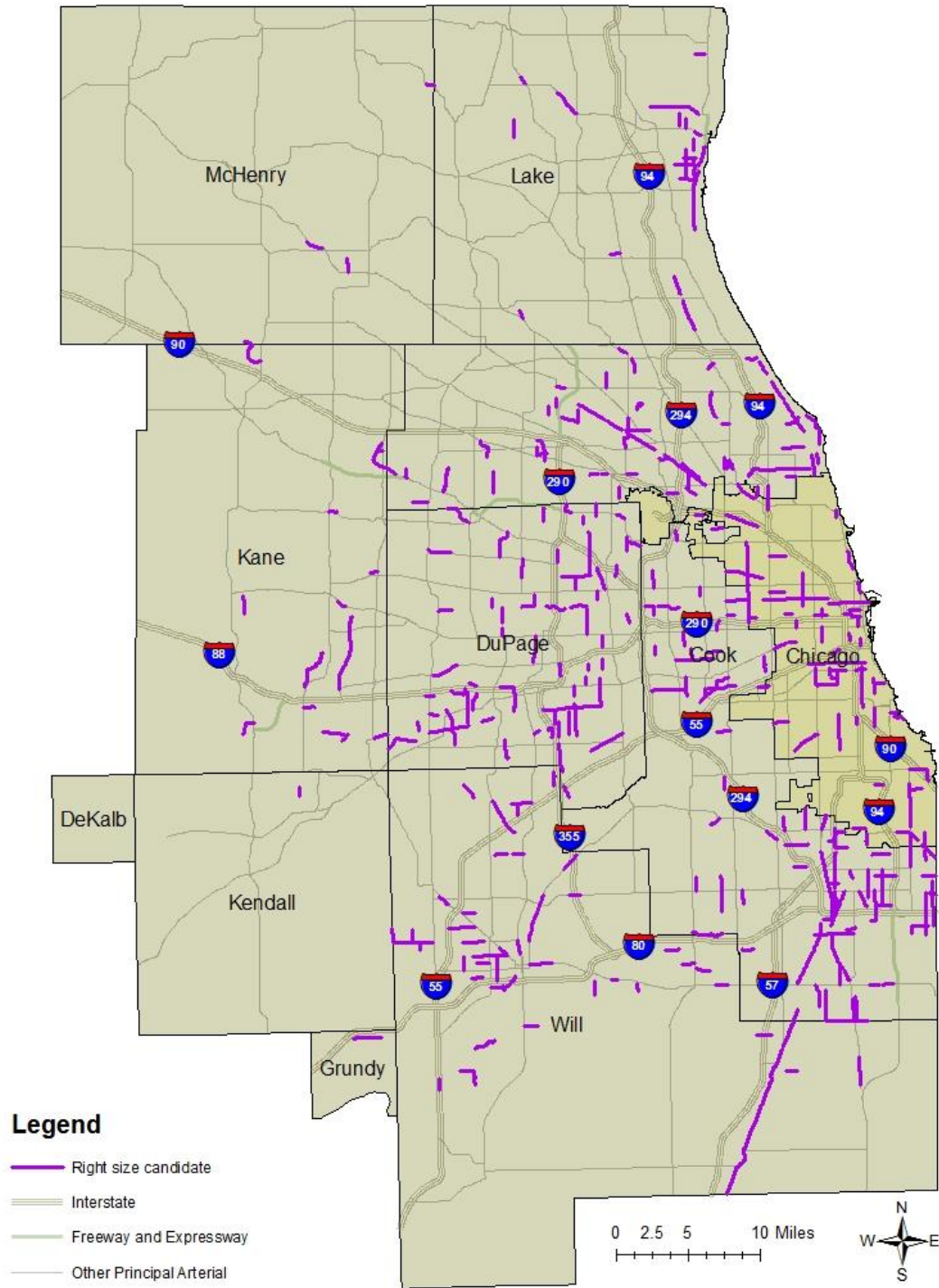
CMAP should continue to encourage and support communities to implement traffic calming measures and to right-size roads. Given the FHWA requirements to set performance targets both for safety and for mobility measures, CMAP should work with its partners to develop policy guidance on prioritizing roads for mobility and safety characteristics, including operating speed and number of lanes.

⁵¹ North Central Texas Council of Governments, "Case Study: Road Diet (San Francisco, CA)," 2014, http://www.nctcog.org/trans/sustdev/bikeped/workshops/documents/6_DPS201_RoadDiets.pdf

⁵² Iowa Department of Transportation, "Statewide Screening for Potential Lane Reconfiguration," 2017, https://iowadot.gov/systems_planning/pr_guide/Safety/StatewideScreeningforPotentialLaneReconfiguration.pdf.



Figure 11. Candidate road segments for implementing right sized roads



Source: CMAP analysis of Illinois Roadway Information System and IDOT Safety Portal data

Seat belt use

Increasing seat belt use is one of the most important steps the region could take to reduce fatalities. Analysis by NHTSA shows that the risk of fatal injuries to front seat occupants is reduced by 45 percent and the risk of moderate-to-critical injury by 50 percent when seat belts are used.⁵³ Seat belt use is mandatory in Illinois and is a primary law, meaning that a driver can be stopped and ticketed for not wearing one. Seat belt use in Illinois has increased annually, and in the last published survey results for the state (2015), 95 percent of front seat occupants were observed wearing seat belts during the daytime.⁵⁴

However, rates of seat belt usage are much lower among the vehicle occupants in fatal crashes. This is particularly the case at night and among drivers younger than 45, and has significant overlap with impaired driving (Figure 12). If seat belt use could be raised to 100 percent from 95 percent, analysis suggests that one-quarter to one-third of fatalities could be prevented.⁵⁵

⁵³ NHTSA, "Seat Belts-Consequences," <https://www.nhtsa.gov/risky-driving/seat-belts>.

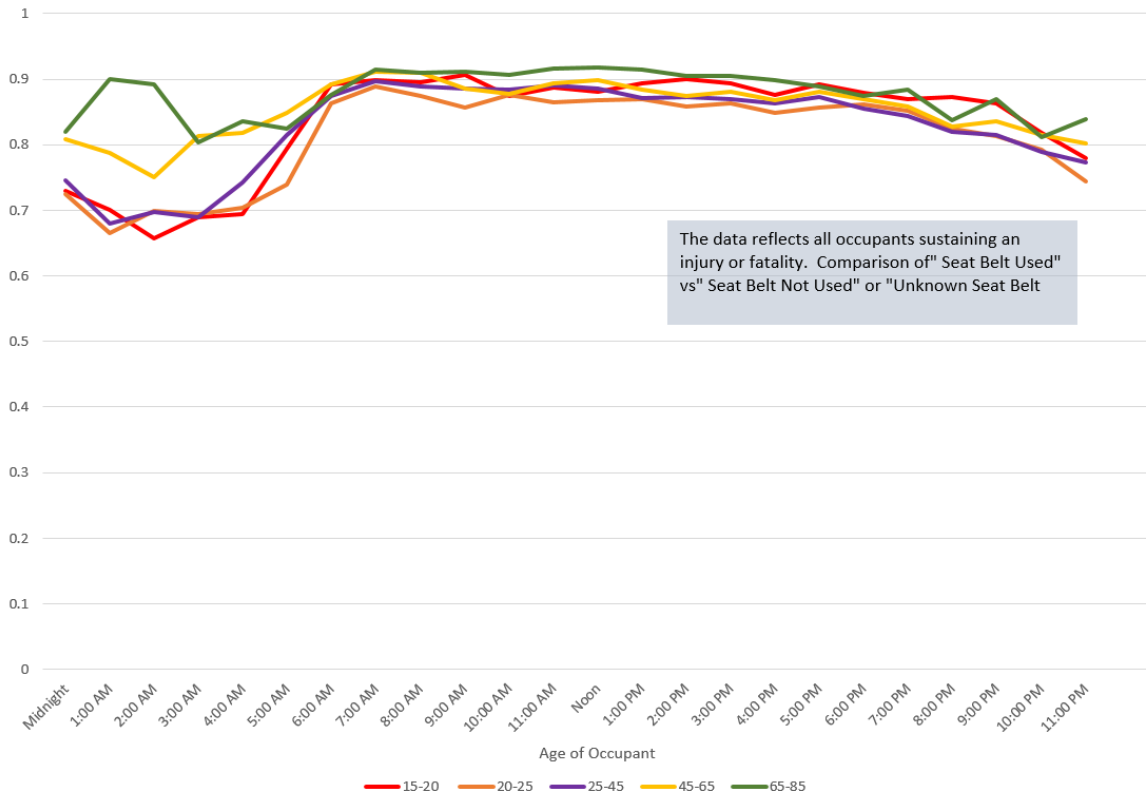
⁵⁴ IDOT, "Safety Belt Usage in Illinois," 2015, <http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Reports/Safety/Evaluations/SafetyBeltObservationReports/2015%20safety%20belt%20one%20sheet-jun2015.pdf>. Within the region, the City of Chicago had the lowest seat belt use observed at 90.4% while the rest of the region has a seat belt use of about 96.3%.

⁵⁵ Using the three most recent years of data, during the daytime between 6 AM and 6 PM, 28 percent of the drivers who died in a crash, where the status of seat belt use could be determined, were not using a seat belt. If the drivers who were not wearing seat belts had the same driving skills as those who did wear seat belts, we can assume that they would have had similar survivorship rates had they also worn seat belts. Based on 90 percent of drivers wearing seat belts, the day-time fatality numbers were 20 percent higher than they would be expected to be if all drivers wore safety belts. If 95% of drivers wore seat belts during this driving period, then raising the use of belts to 100% should result in a 24% reduction in driver fatalities.

Between the evening and late-night hours of 6 PM until 6 AM, the number of drivers who died but were not wearing safety belts increased to 53% of the drivers. During the evening and late-night hours, driver behavior, speeds and lighting conditions are different from the daytime. It is not known if drivers who decide to not wear seat belts have the same driving competence during this time frame as drivers who choose to wear seat belts. If they have similar abilities to drive, and 80% of the drivers are wearing seat belts, then 20% of the population not wearing seat belts accounts for half of the fatalities. If all of the drivers wore seat belts during this time period, the fatality rate for drivers would drop by 41% in this 12 hour period. If the nighttime drivers use seat belts at a lower rate than daytime drivers, assume 70% instead of 80%, then making all nighttime drivers wear seat belts should reduce these fatalities by 32%.



Figure 12. Share of vehicle occupants in serious injury or fatal crashes using seat belts by age of occupant and time of day, CMAP region, 2012-14



Source: CMAP analysis of IDOT crash data

CMAP should support initiatives to increase enforcement and education on the benefits and proper use of seat belts. Numerous opportunities may exist to target enforcement. Research by NHTSA shows that people have a slightly lower rate of using seat belts on local roads than on expressways. National data and Illinois data both show that people tend to wear seat belts slightly less often for shorter trips and trips on lower speed roads. These facts suggest that local police could play a major role in raising seat belt usage rates.

Besides increased fines, education, and enforcement, other economic motivators could be effective. For instance, reducing insurance benefits if seat belts are not worn might increase compliance. Currently, medical claims may be reduced in injury cases for the nonuse of a seat

belt in 16 states,⁵⁶ but not in Illinois.⁵⁷ It does not appear that the effectiveness of this policy has been studied (including unintended health outcomes), but such study is needed.

In the longer term, tying the operability of vehicles to the correct use of seat belts is the most likely way to ensure seat belt use. If a vehicle will not operate without the seat belts on, many lives will be saved. Among its other federal agenda priorities, CMAP should consider advocating for congressional or regulatory agency action to require automakers to disable ignition when seat belts are not engaged. It is unlikely that aggressive safety goals can be met without such requirements.

While occupants of light cars and trucks are the main concern, other vehicles present opportunities to improve safety through increased use of seat belts. For instance, while bus travel in general is safer than passenger car travel, there are a small number of school bus injuries each year. Requirements for seat belts on school buses in Illinois would be beneficial.⁵⁸

Alcohol use/impaired driver

Driving vehicles while under the influence of alcohol or drugs has been a major contributing factor in fatal crashes for many decades. Over 2010-14, 45 percent of the fatal crashes in the Chicago region involved a driver who had been drinking or taking drugs (Figure 13). These drivers have impaired reflexes and judgment and also increase their risk of being in a serious or fatal crash by driving aggressively. These drivers are also more likely to die in crashes due to their lower rate of seat belt use. Most of these drivers are younger, but drivers of all ages drive under the influence of drugs or alcohol. In general, alcohol use is part of a group of risk factors involving late night driving, speeding, and lower use of seat belts.⁵⁹

⁵⁶ "Legislative Statutes Alaska, Arizona, California, Colorado, Florida (See F.S.A. 316.614(10), Iowa, Michigan, Missouri, Nebraska, New Jersey, New York, North Dakota, Ohio, Oregon, West Virginia, and Wisconsin," http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&URL=0300-0399/0316/Sections/0316.614.html.

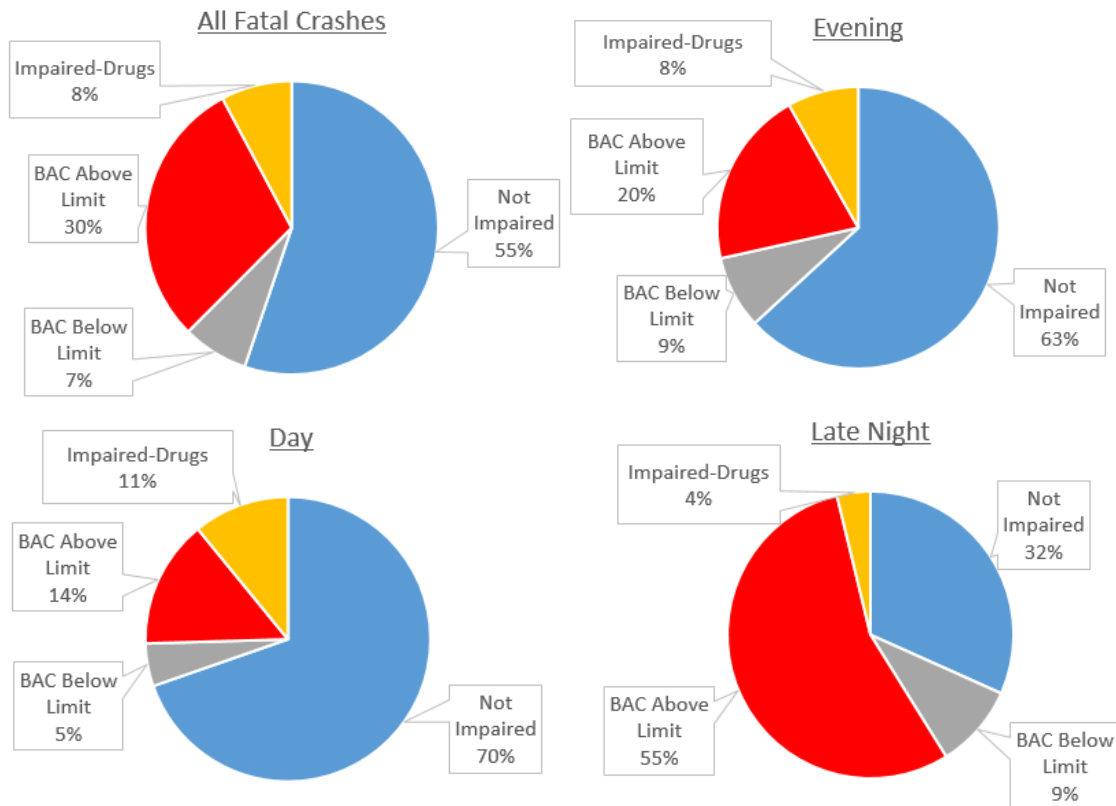
⁵⁷ Illinois Statutes "625 ILCS 5/12-603," <http://www.ilga.gov/legislation/ilcs/ilcs4.asp?DocName=062500050HCh%2E+12+Art%2E+VI&ActID=1815&ChapterID=49&SeqStart=140400000&SeqEnd=143100000>.

⁵⁸ By federal regulation, beginning in 2013, motorcoaches and other large buses have been required to install lap and shoulder straps for all new vehicles, but not regular school buses. Small school buses (with a gross vehicle weight rating of 10,000 pounds or less) must be equipped with lap and/or lap/shoulder belts at all designated seating positions. Currently six states -- California, Florida, Louisiana, New Jersey, New York and Texas -- have some sort of legislation in place requiring seat belts on school buses. The states' laws vary in levels of enforcement; some simply require two-point seat belts to be present on school buses, while others require that all passengers use the more secure, three-point belts.

⁵⁹ Intoxicated drivers show poor judgment in numerous ways. Data on seat belt use is difficult to verify, but the information shows interesting relationships. Ignoring the non-reported seat belt use, for drivers in fatal crashes that have some amount of alcohol or drugs in their system, 70 percent were found to have used their seat belt during the day time and evening, but in the late-night only 53 percent were found to use the seat belt in this time period. In addition, drivers using alcohol or drugs were more likely to be identified as speeding in the late-night compared to the day and evening. This is reasonable because increased levels of traffic limit the upper speed that a car can achieve (but it does not prevent drivers from driving too fast for conditions). Drivers who choose not to wear seat



Figure 13. Prevalence of alcohol and drug use in fatal crashes, CMAP region, 2010-14



Source: CMAP analysis of IDOT crash data. Note: BAC = blood alcohol content

Penalties and enforcement

Roads cannot be made completely safe for intoxicated drivers or the persons they affect. According to the NHTSA's *Countermeasures That Work*, a combination of behavioral strategies are needed to reduce driving under the influence (DUI):

- Deterrence: enact, publicize, enforce, and adjudicate laws prohibiting alcohol-impaired driving so that people choose not to drive impaired;
- Prevention: reduce drinking and keep drinkers from driving;
- Communications and outreach: inform the public of the dangers of impaired driving and establish positive social norms that make driving while impaired unacceptable; and

belts are also cited for driving too fast more often than the intoxicated drivers who choose to use their seat belts. This varies between nearly 20 percent in the late-night when there are relatively more speeding issues identified, to over 70 percent higher evening hours.

- Alcohol treatment: reduce alcohol dependency or addiction among drivers.⁶⁰

In general, Illinois' DUI laws follow best practices in comparison to those studied in *Countermeasures That Work* and may be considered an effective element of overall deterrence. Improvement could potentially be made in enforcing the laws and adjudicating cases, however. One of the most effective enforcement strategies is to expand the use of sobriety checkpoints. They are meant to be publicized, highly visible reminders of the consequences of drunk driving that deter rather than catch impaired drivers.⁶¹ They have been shown to reduce alcohol-related fatal crashes by 9 to 17 percent.⁶² To some extent, local police already have sobriety checkpoints, but putting additional resources toward expanding them would have a significant effect on fatal crashes. They are relatively costly to carry out, but NHTSA has prepared guidelines on how to conduct low-staffing (and therefore low-cost) checkpoints. Saturation patrols in areas where drunk driving is anticipated can also be effective. Note that DUI enforcement through location-specific measures also raises equity issues, as it can disproportionately affect minority areas unless appropriately designed.⁶³

Law enforcement communities should consider supporting officer training to detect the presence of other drugs that affect drivers. In the future, supplying officers with the most advanced drug testing equipment will augment the field sobriety tests and allow them to make more accurate judgments concerning a person's fitness to drive.⁶⁴ The Governors Highway Safety Association (GHSA) has called on states to take action on drug-impaired driving.⁶⁵

State law in Illinois provides severe punishment for DUI convictions.⁶⁶ While further increasing penalties has some intuitive attractiveness, evidence suggests making penalties for drunk driving incrementally more severe has little additional deterrent value; focusing instead on making punishment swift and sure is a more effective strategy.⁶⁷ For that reason, Illinois law allows for administrative license revocation (ALR) by the Secretary of State immediately upon

⁶⁰NHTSA, "Countermeasures That Work," 2015, https://mcs.nhtsa.gov/index.cfm?fuseaction=product.display&product_ID=1069.

⁶¹ Media coverage has sometimes focused on the apparent ineffectiveness of checkpoints based on the number of DUI arrests -- for instance, "Sobriety checkpoints yield thousands of minor citations but few DUI arrests," Chicago Tribune, May 8, 2015 -- when the main goal is deterrence.

⁶² NHTSA, "Countermeasures That Work," 2015, <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/812202-countermeasures-that-work-8th.pdf>.

⁶³ Caputo, Angela, "Analysis of Chicago DUI checkpoints shows minority disparity," Chicago Tribune, May 8, 2015, <http://www.chicagotribune.com/news/watchdog/ct-dui-checkpoints-chicago-met-20150507-story.html>.

⁶⁴ Gov.UK, "Drugs and driving: the law," <https://www.gov.uk/drug-driving-law>.

⁶⁵ Governors Highway Safety Association, "New Report Calls States to Take Action on Drug-Impaired Driving," 2017, <http://www.ghsa.org/resources/news-releases/duid-update17>.

⁶⁶ Illinois State Statutes, "625 ILCS 5/11-501," <http://www.ilga.gov/legislation/ilcs/documents/062500050K11-501.htm>.

⁶⁷ NHTSA, "Countermeasures That Work," 2013, <https://www.nhtsa.gov/staticfiles/nti/pdf/811727.pdf>.



arrest for DUI along with a separate license revocation that is dependent on being convicted. This is a well-supported and effective countermeasure. However, it is possible that the law does not have its full deterrent effect because ALR is not in fact automatically applied. Evidence suggests “plea deals” are used in certain counties and municipalities that end up allowing DUI arrestees to drive again, even some with prior DUI arrests.⁶⁸ It may be that ALR is not uniformly applied because it is considered too harsh for first-time offenders, which most DUI offenders (86 percent) are.⁶⁹ However, most serious injury and fatal crashes that are caused by DUI involve drivers who have not previously been arrested for DUI, so deterring them is critical.⁷⁰

Another potential approach to reduce DUI crashes is to further lower BAC limits, as the NTSB has recommended and that many industrialized countries have adopted.⁷¹ Across the US, every state enforces a BAC value of 0.08 grams of alcohol per deciliter of blood, with the exception of Utah which has a lower limit of 0.05. It is estimated that a BAC of 0.05 doubles the risk of a driver being involved in a crash.⁷² Lowering the BAC limit to 0.05 may discourage drivers from drinking anything or may make responsible drivers drink less when they have to drive. Currently 7 percent of the drivers in fatal crashes have some amount of alcohol in their system, but below the legal limit. It is not known if the small amount of alcohol in their system led to the fatal crash, but it can be assumed that a BAC value of 0.05 will prevent some fatal crashes among this 7 percent of all fatalities. However, given the much larger number of people who violate the less lenient standard, it seems apparent that enforcing the current standard better would be more effective than setting a lower standard.

Technology

As in the case of seat belts, more universally tying vehicle operability to passing a breathalyzer test would likely have a much larger impact than anything else. NHTSA has spent several years working on the Driver Alcohol Detection System for Safety (DADSS) program, which is meant to find technologies that would accomplish that goal without inconvenience or intrusiveness. Given the fact that alcohol interlock devices are required after conviction, they currently only address the problem of repeat offenders, which represent a relatively small number of the DUI driver population. As a nearer-term option, drivers could be required to carry disposable breathalyzers in their vehicles as has been mandatory in France since 2012, which may remind

⁶⁸ Gregory, Ted. Mahr, Joe, “DUI plea deals sidestep mandatory license loss,” Chicago Tribune, September 6, 2014, <http://www.chicagotribune.com/news/ct-dui-deals-met-20140905-story.html>.

⁶⁹ Illinois Secretary of State, “Illinois 2017 DUI Fact Book,” 2017, https://www.cyberdriveillinois.com/publications/pdf_publications/dsd_a118.pdf.

⁷⁰ Jones, Ralph K., Lacey, John H., “State of Knowledge of Alcohol-Impaired Driving: Research on Repeat DWI Offenders,” 2000, http://www.popcenter.org/problems/drunk_driving/PDFs/Jones&Lacey_2000.pdf.

⁷¹ NTSB, “Safety Report on Eliminating Impaired Driving - Frequently Asked Questions,” 2013, https://www.nts.gov/news/events/Pages/2013_Impaired_Driving_BMG-FAQs.aspx.

⁷² NHTSA, “Drug and Alcohol Crash Risk,” 2015, https://www.nhtsa.gov/staticfiles/nti/pdf/812117-Drug_and_Alcohol_Crash_Risk.pdf.



and provide the means for drivers to voluntarily test themselves before driving. Proof could be required at any traffic stop. The effectiveness of this requirement should be studied as it would likely face limited public acceptance in the United States.

Other technologies and transportation innovations may have an influence on drunk driving. Transportation network companies have claimed that their service reduces drunk driving, which has been supported in some studies but not in others.⁷³ Vehicle automation may ultimately raise numerous issues regarding the proper application of DUI laws.

Intersections

Intersections are one of the most dangerous elements of the transportation network. The numerous turning movements at intersections create several conflict points between users that result in an increased risk of being involved in a serious injury or fatal crash. For the last five years, almost half of serious injury and fatal crashes have occurred at intersections, and about one-fifth of these involved a pedestrian or bicyclist. For this paper, an intersection crash is a crash that occurred at or in relation to an intersection according to the IDOT crash report.

In general, consideration of safety countermeasures needs to be driven deeply into the engineering and design process, even for projects motivated mostly by the need to reconstruct the roadway or improve capacity. Rather than simply building to current standards, which are considered nominally safe, agencies need to include specific safety countermeasures that have been proven to reduce fatal and serious injury crashes whenever possible and cost-effective to substantively improve safety. Numerous safety countermeasures can be implemented at intersections and there is no one-size-fits-all solution to making an intersection safer. The judgment of traffic engineers will aid in deciding which safety improvements are the most beneficial.

Countermeasures

Agencies across the region are actively implementing safety counter-measures at intersections to make them safer for all road users. For example, Kane DOT installed flashing yellow left turn signals at two intersections on Randall Road. Flashing yellow turn signals are a proven countermeasure and reduce severe crashes at intersections. Other examples include Lake County DOT, which is taking an active role in converting intersections to roundabouts, and DuPage County DOT, which is applying for HSIP funds to add dedicated turning lanes to intersections. Other safety countermeasures that agencies in the region routinely implement include skid resistant pavement at intersections.

With the aging of the population in the region, improving visibility at intersections should be required for all intersection projects. Improving the visibility of signals and signs is an easily

⁷³ Brazil, Noli., Kirk, David S. "Uber and Metropolitan Traffic Fatalities in the United States," *American Journal of Epidemiology*, Volume 184, Issue 3, 1 August 2016, Pages 192–198, <https://academic.oup.com/aje/article/184/3/192/2195589>.



implemented, proven cost-effective safety countermeasure. Where appropriate, flashing beacons should be installed at stop-controlled intersections to alert drivers of approaching traffic controls. To improve intersection visibility regionally, it should be a requirement that all traffic signals have backplates with retroreflective borders. Additionally, all intersections in the region that have overhead mast arms should be required to include one signal head per lane.

Transportation agencies in the region should annually review intersection lighting and reflectivity of signs in and near intersections to identify locations that need improvements. For example, DuPage DOT has an inventory of signage the agency owns and annually completes an in-house testing of the retro-reflectivity⁷⁴ of their signs.

When planning for an intersection improvement, agencies should always evaluate ways to improve the channelization⁷⁵ of traffic through intersections by providing left- and right-turn bays. Channelization is an effective safety countermeasure at both signalized and unsignalized intersections by providing space for vehicles to slow down to make the turning maneuver (Figure 14).⁷⁶ Channelization also provides the opportunity to create pedestrian refuge areas that reduce pedestrian crossing distance.⁷⁷

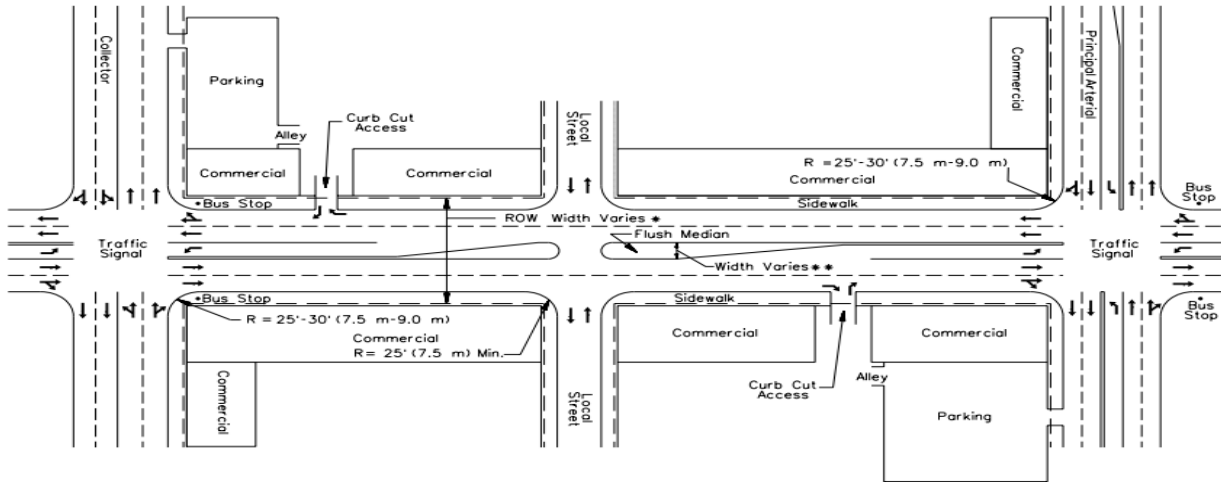
⁷⁴ Retroreflective materials redirect light back toward the source, which gives signs and pavement markings a brighter appearance at night.

⁷⁵ Channelization is defined by AASHTO's Policy on Geometric Design of Highways and Streets as "the separation or regulation of conflicting traffic movements into definite paths of travel by traffic islands or pavement markings to facilitate the safe and orderly movements of both vehicles and pedestrians. Proper channelization increases capacity, improves safety, provides maximum convenience, and instills driver confidence."

⁷⁶ Hallmark, Shauna., Hawkins, Neal., "Adding Turn Lanes/Channelization Tech Brief-Semantic Scholar," Iowa State University, Center for Transportation Research and Education, Tech Brief October, 2014, http://www.intrans.iastate.edu/publications/documents/t2summaries/Chanellization_tech_brief.pdf.



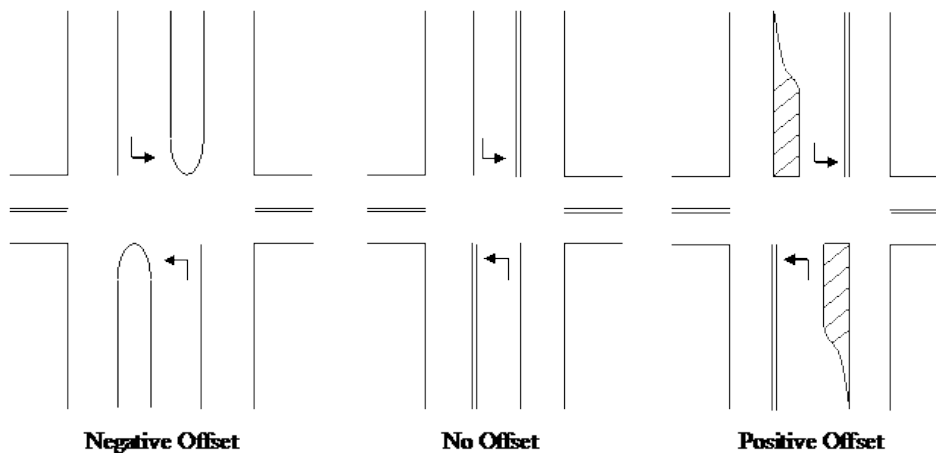
Figure 14. Roadway schematic showing channelization



Source: FHWA

Offsetting left turn lanes is another effective safety countermeasure that is a modest change over conventional practice and should be considered for all intersection improvement projects where right of way is available. Positive offset dedicated left-turn lanes improve intersection safety by increasing the sight distance of vehicles making a left turn. When left-turn lanes have a negative offset or no offset, oncoming traffic can restrict sight distance and pose a hazard for vehicles making a left turn. If the offsets increase the pedestrian crossing distance a significant amount, the signal timing would need to be adjusted to allow enough time for a pedestrian to cross the intersection.

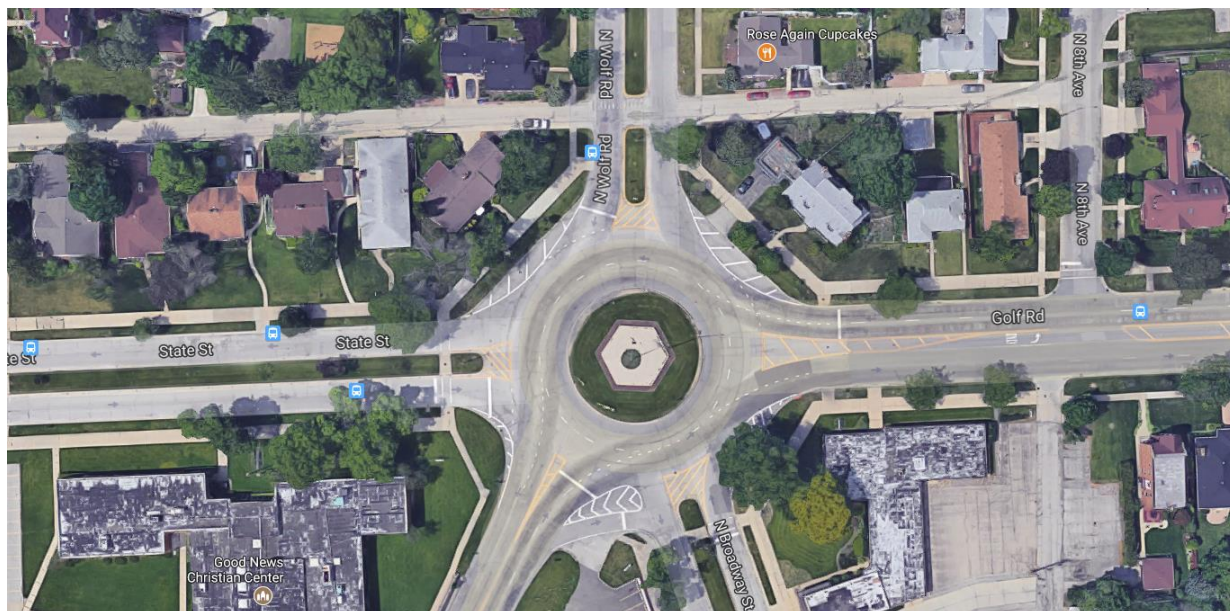
Figure 15. Illustration of offset left turn lanes



Source: FHWA

Converting an intersection to a roundabout is an effective and proven design that typically reduces fatal and serious injury crashes and improves mobility (Figure 16).⁷⁸ Roundabouts reduce the number of conflict points in an intersection and help reduce speeds. The reduction in vehicle speed in roundabouts results in reducing the severity of crashes that might occur. Transportation agencies in the region should consider converting intersections to roundabouts whenever they plan a major upgrade or improvement to an intersection.

Figure 16. Roundabout example

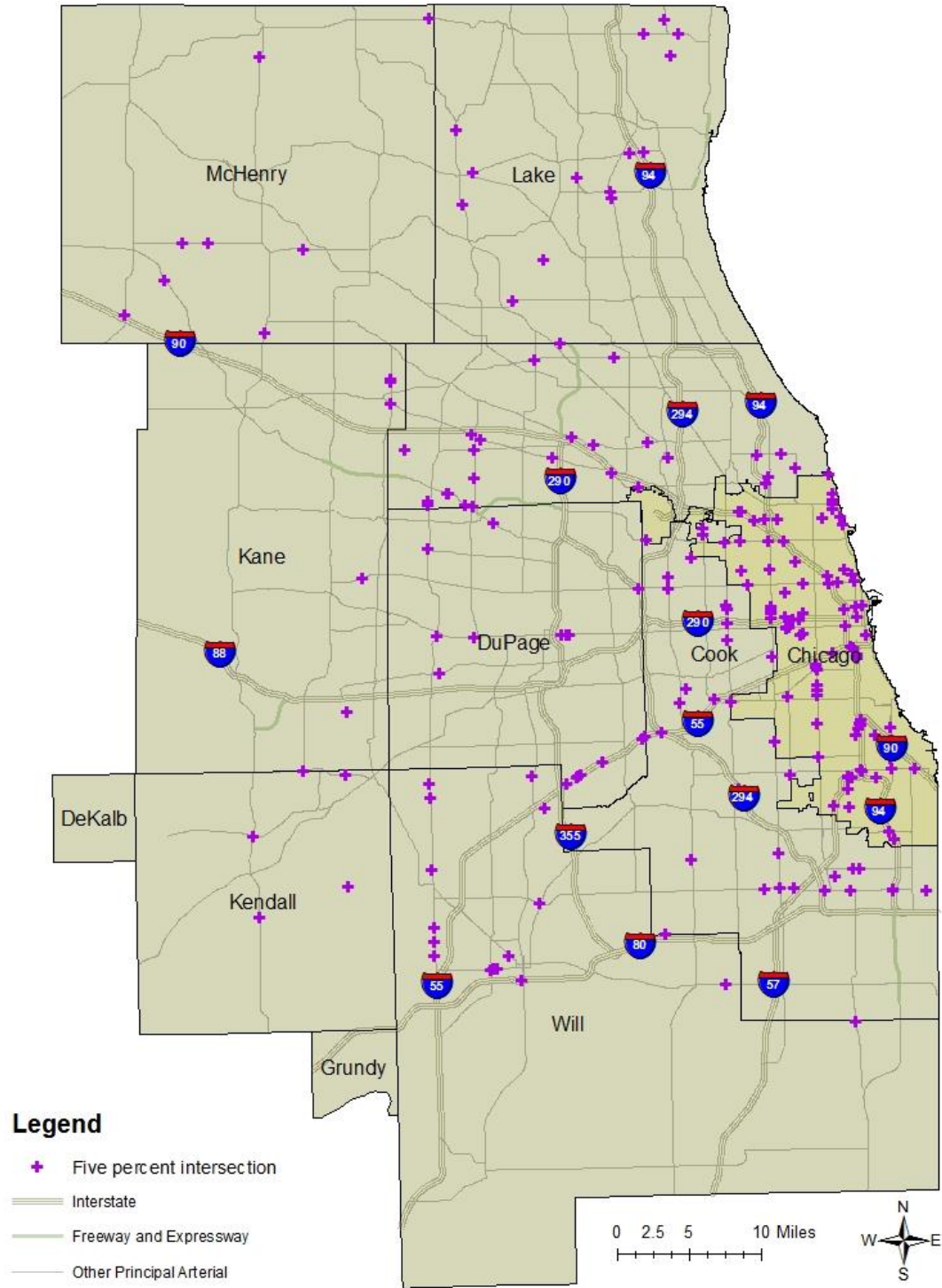


Source: FHWA

More major intersection redesigns are warranted at locations that continually experience high rates of fatal and serious injury crashes. There are many alternative intersection designs that improve safety through eliminating conflict points at intersections (that is, places where the paths of vehicles, bicycles, or pedestrians diverge, merge, or cross), including the median U-turn (MUT) intersection, displaced left turn intersection (DLT), restricted crossing U-turn intersection (RCUT), and diverging diamond interchange (DDI). Transportation agencies should consider alternative intersection designs at high volume intersections that experience high rates of fatal and serious injury crashes and that have right-of-way available if needed. IDOT's 5 percent intersection locations on the State Route system (Figure 17) can be used to initially identify locations in the region where alternative intersections should be considered. A more detailed description for each alternative intersection design including informational guides and tech briefs are available on the FHWA's alternative intersection design [website](#).

⁷⁸ Washington State Department of Transportation, "Roundabout benefits," <https://www.wsdot.wa.gov/Safety/roundabouts/benefits.htm>.

Figure 17. Five percent intersection locations on the State Route system as potential locations for alternative intersection design



Source: Illinois Department of Transportation

Automated enforcement at intersections

Automated enforcement at intersections is a proven safety countermeasure that the region should actively support at locations with a high number of serious injury and fatal crashes. Although its program has faced some implementation challenges, the City of Chicago has taken a very active role in intersection safety with red light camera (RLC) enforcement that has a goal to reduce angle (“T-bone”) crashes, one of the most hazardous types of crashes at intersections. A study of the City of Chicago’s RLC program conducted by the Northwestern University Transportation Center found that a RLC placed at an intersection reduces angle and turn crashes by 19 percent, and increases rear-end crashes by 14 percent.⁷⁹ Angle and turn crashes tend to be more severe than rear-end crashes. Data collected from eight municipalities in the City of Toronto found that collisions resulting in deaths and personal injuries were reduced by more than 25 percent at intersections with automated enforcement.⁸⁰ Another study that evaluated red light cameras at four to six intersections in San Francisco found that injury crashes decreased by about 9 percent and fatalities were 50 percent lower (although the numbers are small) using five years of before and after crash data.⁸¹ The Insurance Institute for Highway Safety analyzed 14 cities with red light cameras and 48 cities without red light cameras. This study found that between 1992-96 and 2004-08, the cities without red light cameras had a 14 percent reduction in red light running fatalities, but the cities that used the cameras had a 35 percent reduction in these types of fatalities.⁸² The researchers estimated that the red light cameras that were in service over the 4 years of analysis prevented crashes that would have resulted in 83 fatalities.

Roadway departure

Roadway departure crashes are very dangerous events. As defined in IDOT crash data, these crashes include circumstances where a vehicle overturned, hit a fixed object, sideswiped in opposite direction, or hit a vehicle head-on.⁸³ Adding rumble strips to the edge and center of the lanes will alert the drivers to their danger. Installing large chevrons to alert drivers about turns in the roads will enhance safety for all drivers. Larger shoulders will increase the recovery area for drivers who leave the road. Installing cable barriers will prevent head-on collisions on

⁷⁹ Elfar, Amr. Johnson, Breton L. Mahmassani, Hani S. Mittal, ArchakOstojic, Marija. Schofer, Joseph L. Verbas, Omer. “Chicago Red Light Camera Enforcement: Best Practices & Program Road Map, 2017,” Northwestern University Transportation Center, <http://www.transportation.northwestern.edu/documents/research/featured-reports/RLC-Report-Web.pdf>.

⁸⁰ City of Toronto, “Red Light Cameras,” <https://www.toronto.ca/services-payments/streets-parking-transportation/traffic-management/pavement-markings/red-light-cameras/>.

⁸¹ Transportation Research Board, “NCHRP Synthesis 310: Impact of Red Light Camera Enforcement on Crash Experience,” 2003, http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_310.pdf.

⁸² Fagin, Michael, “Statement before the Ohio State Senate Government Oversight and Reform Committee: Red Light Camera Research,” Insurance Institute for Highway Safety, February 19, <http://www.iihs.org/media/a514e38f-e14f-496a-83f7-d56930d9d924/DXOggg/Testimony/testimony-02-19-2014.pdf>.

⁸³ Head-on collisions typically are addressed by different countermeasures than other types of roadway departure crashes. These categories were combined to match categories that are used in the IDOT Illinois Strategic Highway Safety Plan 2017.



separated highways. Removing ditches and fixed objects from roadsides will improve safety as will surrounding fixed objects with crash barrels and similar devices.

While roadway departure is an emphasis area amenable to engineering solutions to make the roadway more “forgiving,” behavioral factors are generally behind the departure. Going too fast was identified as the cause in about one out of five departure crashes with fatalities or serious injuries. Thus, traffic calming and increased enforcement can decrease the number of drivers traveling at dangerous speeds and so decrease the incidence of roadway departure. Automated speed control of vehicles will be an option in the future whether they serve as a warning or actually limit the speed of a vehicle will have to be debated. As vehicle technology advances, more vehicles are expected to have lane departure warnings as standard features, and this will help reduce roadway departure.

Other factors in road departure crashes include animals, debris in the road, construction, or unexpected events that lead drivers to veer off the road. Within our region, Cook County has a very large number of crashes involving deer. Increased warning signs may help drivers to be alert for dangerous areas and reducing speeds would give drivers more time to react, but deer are very common in the region and it is difficult to identify where they will be the greatest hazard because deer are common in the region and have no pattern for crossing roads.

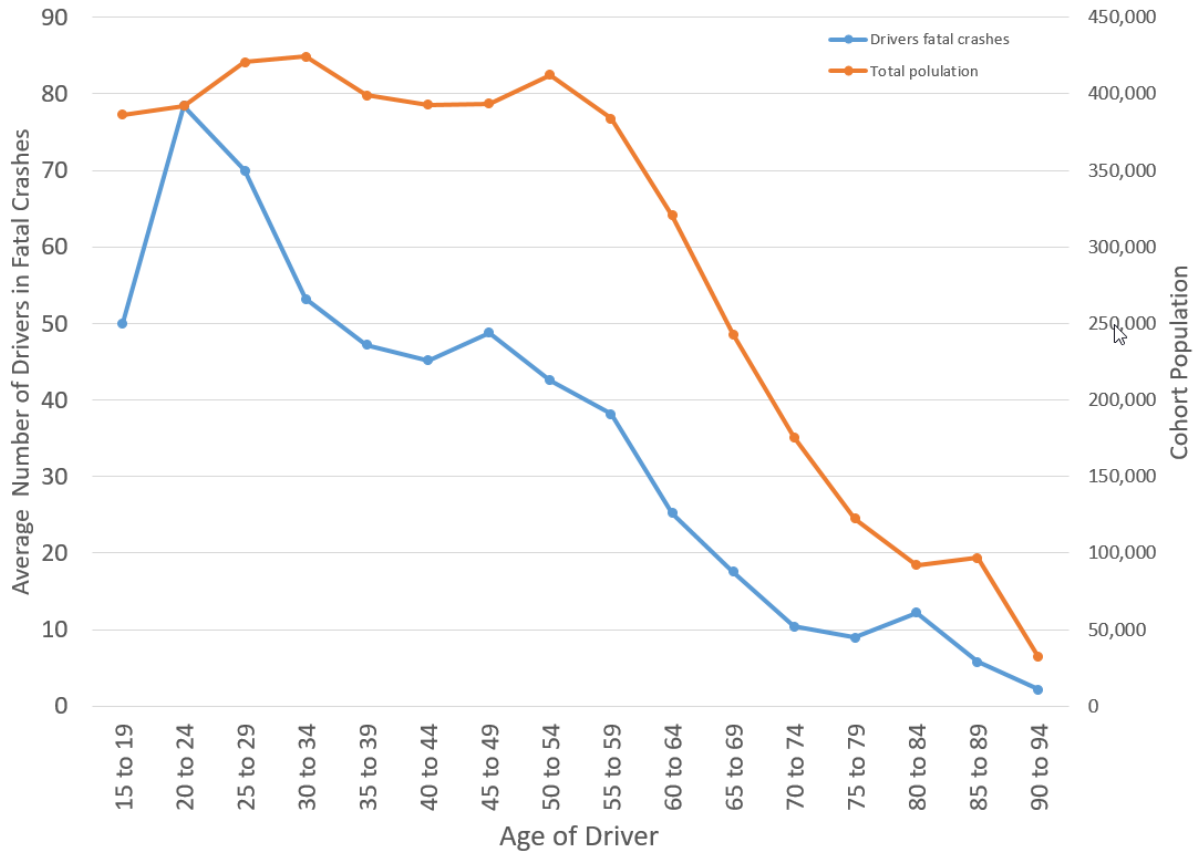
Age of drivers

The age of drivers is correlated with risk of crashes and serious injuries or fatalities, with the 20-to-35-year-old group having the highest number of traffic fatalities.⁸⁴ Fatalities drop off as drivers age, then pick up again at advanced ages (Figure 18). Young drivers are less experienced than older drivers at both the physical tasks of driving and at understanding the amount of focus on the road that a driver needs to avoid crashes. At the other end of the experience spectrum, as drivers age, many of their physical skills diminish and the physical task of driving becomes more challenging. In the near and medium term, more aged drivers are expected to be on the road.

⁸⁴ National Academy of Sciences, “Summary of Travel Trends: 2009 National Household Travel Survey,” October 2017. <https://trid.trb.org/view.aspx?id=1107370>. Drivers aged 15 to 20 drive less than people who are in the workforce full time, according to the National Household Travel Survey (2009) for drivers aged 16 to 19. The youngest drivers’ crash rate per VMT is probably the highest of the groups under 65 years of age.



Figure 18. Average annual number of drivers in fatal crashes by age cohort, 2010-14



Source: CMAP analysis of IDOT Safety Portal data

Driver licensing and education

Illinois has already implemented significant reforms to the driver licensing process. As adult drivers age in Illinois, requirements to renew driver licenses become more frequent and tests are given more often. After age 80 licenses are renewed every two years and after age 87 they are renewed annually. Drivers over 75 are given a road test at time of renewal. When drivers of any age face physical limitations, their permitted times of driving may be limited. Among the options are no night driving, no driving during peak hours, or prohibiting expressway driving.⁸⁵

⁸⁵ DMV.com, "Senior Drivers in Illinois," <https://www.dmv.com/il/illinois/senior-drivers>.

To increase the safety of younger drivers, Illinois instituted a graduated driver license (GDL) program.⁸⁶ This program increases the amount of practice driving to 50 hours, includes night time driving restrictions and limits the number of passengers to one for drivers under 18.⁸⁷ After the full implementation of this program, the number of fatalities for drivers or occupants aged 16 to 19 has decreased 51 percent while drivers and occupants of all other ages decreased 22 percent. The decrease in traffic fatalities for those aged 16 to 19 represent 23 percent of the total decrease in driver and occupant fatalities.⁸⁸

While driver licensing has become more restrictive, driver education is being taken by fewer students in high school classrooms. In Illinois, nearly 22 percent of the people under the age of 18 do not take a driver's education class offered by a high school or a commercial driving school. This is partly due to the increased cost to the families for the driver education program.⁸⁹ Furthermore, driver education itself in the state could be improved. NHSTA reviewed the Illinois driver education program and found that the state should increase behind-the-wheel instruction time from six hours up to 10 hours to match national standards. The agency also called for increasing classroom time and 10 hours of in-car observation.⁹⁰ It was also recommended that a second stage of driver education be introduced as elsewhere recommended by NHTSA.⁹¹

Instead, however, some school districts have been granted waivers to substitute simulation driving for actual driving and only require three hours behind the wheel to pass driver education.⁹² As a result, the developers of the Illinois driver education curriculum should investigate additional training for young drivers such as advanced simulations and advanced on-the-road training.

⁸⁶ Initiated in 1998. Program enhanced 2004, 2005, 2006, and 2008. Illinois Department of Transportation, "2011 Illinois Crash Facts & Statistics," 2011, <http://www.idot.illinois.gov/assets/uploads/files/transportation-system/resources/safety/crash-reports/crash-facts/2011%20crash%20facts.pdf>.

⁸⁷ Office of the Illinois Secretary of the State, "Graduated Driver License," http://www.cyberdriveillinois.com/departments/drivers/teen_driver_safety/gdl.html.

⁸⁸ In Illinois, from 2005 to 2007 there were an average of 1288 traffic fatalities, of which 143 were drivers/occupants aged 16 to 19. From 2008 to 2016 there were an average of 997 traffic fatalities including an average of 70 drivers/occupants aged 16 to 19.

⁸⁹ Baker, Suzanne, "District 203 driver's ed fee hike up to state to decide," Naperville Sun News, August 23, 2015, <http://www.chicagotribune.com/suburbs/naperville-sun/news/ct-nvs-203-drivers-ed-st-0821-20150823-story.html>.

⁹⁰ National Highway Traffic Safety Administration Technical Assistance Team, "State of Illinois Technical Assessment of the Driver Education Program," http://www.ihscedea.org/documents/2015_driver_education_assessment_recommendations-illinois.pdf.

⁹¹ NHTSA, GDL Model as identified by Novice Teen Driver Education and Training Administrative Standards (NTDETAS), 2017, www.anstse.info/Images/2017%20Home/001%20-%202017%20NTDETAS.pdf.

⁹² New Trier Township High School District 203 Regular Meeting of the Board of Education July 17, 2017 New Trier Township High School.



Time of day effects

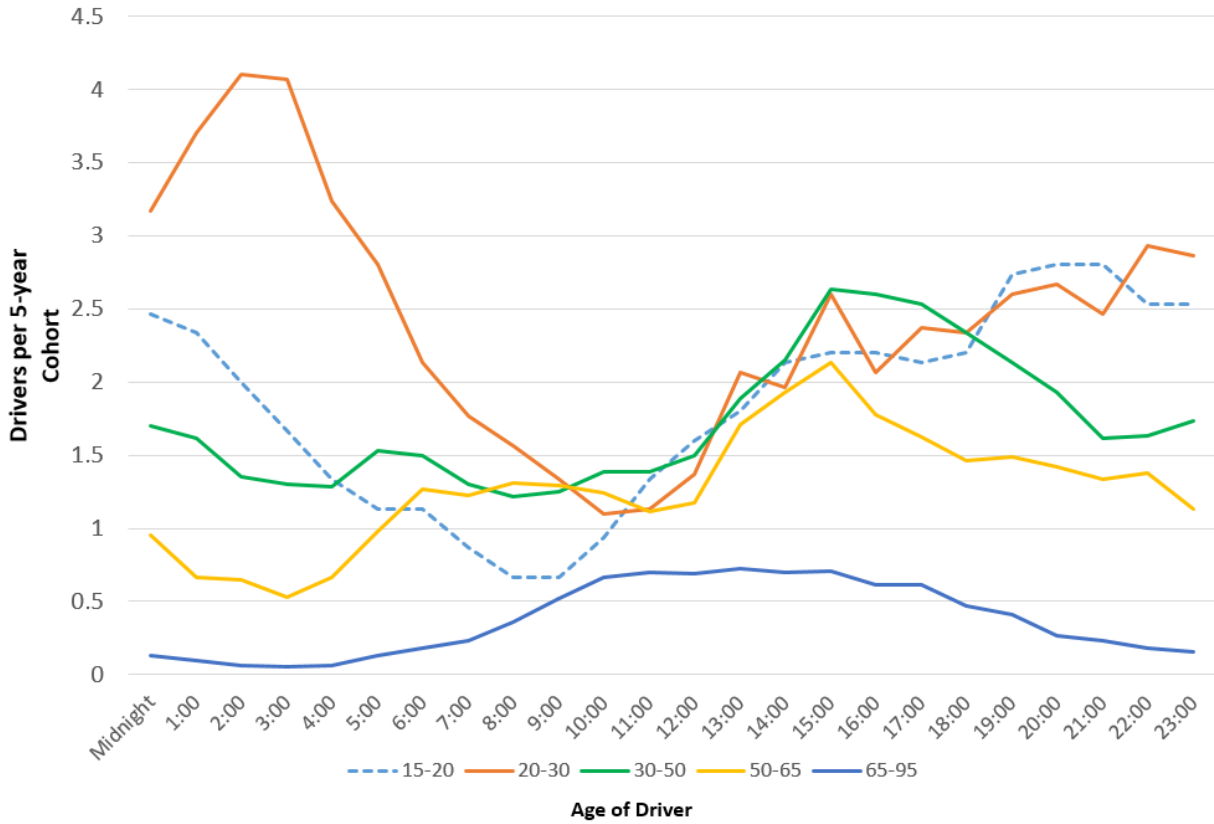
Younger drivers are exposed to a constellation of risk factors such as drinking and drug use, night-time driving, speeding, and not wearing seat belts that produce a significant number of the traffic fatalities in the region. The 20-to-30 age group has the highest number of total fatalities and shows very large spikes in traffic deaths in late evening and particularly after midnight, which strongly suggests that these drivers are more crash-prone and that driver behavior is responsible (Figure 19). This late-night trend is also prevalent for the drivers under the age of 20. During the daytime hours, these two groups have crash totals similar to other groups, outside of the over-65 group that is mostly retired and has different travel patterns.⁹³ By contrast, the distribution of the combined fatal and serious injury crashes by age does not include such large evening spikes for young drivers (Figure 20).⁹⁴ Nevertheless, for almost every hour of the day, the drivers between the ages of 20 and 30 are involved in the most or second-most crashes.

⁹³ The eldest drivers have the majority of their serious and fatal crashes during the daylight hours and early evening. They have very few late-night crashes. Data on all crashes, which tend to reflect general travel patterns, show an even larger share of elderly driver activity in the daylight hours. The elderly tend to self-select to drive when conditions are favorable for their skill set. Making most trips in the daytime is easier when they are retired and do not need to make the work commute. Some seniors are also restricted from driving at night. One difference between the time distributions of serious crashes versus all crashes is that there is a higher representation of serious crashes in the evening for the older drivers. It appears that the crashes in the evening are more likely to result in a serious injury.

⁹⁴ Six percent of the serious injury or fatality crashes include a fatality.

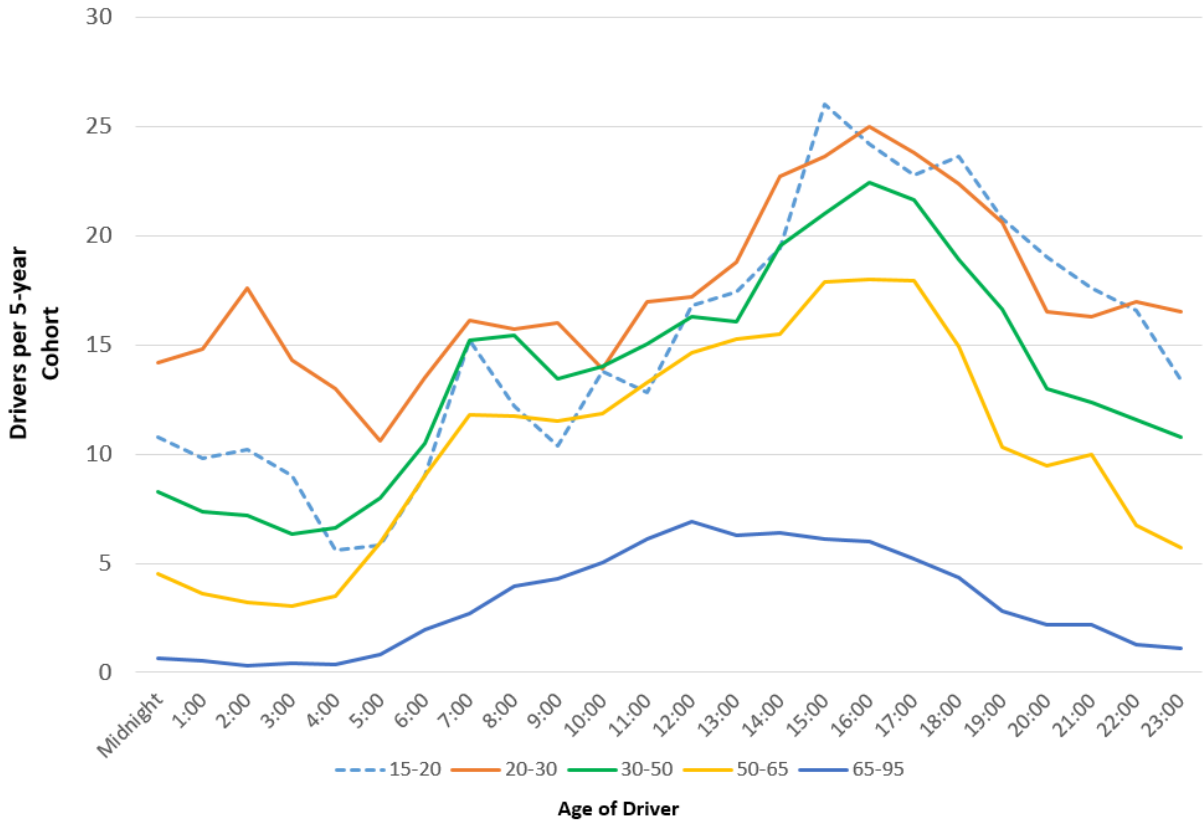


Figure 19. Time of day of fatal crashes by age of driver 5-year cohort, 2010-14 (normalized by size of cohort)



Source: CMAP analysis of IDOT Safety Portal data

Figure 20. Time of day of serious injury and fatal crashes by age of driver 5-year cohort, 2010-14 (normalized by size of cohort)



Source: CMAP analysis of IDOT Safety Portal data

Besides the education efforts suggested above, a critical element of reducing late-night crashes has to be enforcement targeted by time of day. Those drivers on the road late at night are much more likely than others to be speeding or impaired or both. Additional local police resources, therefore, should be devoted to this time of day. While this will have budgetary and staffing impacts, it might be possible to utilize speed cameras to notify police of reckless driving in real time. Increased fines for speeding late at night or automatic suspension of license could also contribute to helping drivers understand the seriousness of late-night speeding.

Design for older drivers

The engineering imperative is to make the driving environment safer for all ages. For older drivers this would include such improvements as more and effective lighting, distinct pavement markings, improved signs, less complicated intersections, pedestrian refuge islands, offset left-turn lanes, and all-red clearance intervals (a short period of time in which a traffic

signal is all-red so that cars can clear the intersection before a green phase begins). A number of these changes would be most appropriately implemented system-wide.

Distracted drivers

Distractions to drivers cause crashes, and recent advances in technology have increased the number of things that can distract drivers. However, it is not known with much precision how many crashes are due to distraction or if it is becoming more of a problem. Nationally, 2014 crash and fatality data implicate driver distraction in 10 percent of fatal crashes, 18 percent of injury crashes, and 16 percent of all motor vehicle traffic crashes in 2014.⁹⁵ However, information on distracted driving crashes has only recently begun to be collected and it is difficult to determine the accuracy of crash data that tracks this behavior.⁹⁶ Other studies have suggested that up to 25 percent of crashes involve distraction.⁹⁷ It is estimated that at any point in time, about 7 percent of US drivers are using their cell phones.⁹⁸

Reducing distracted driving likely requires a combination of improved education, enforcement, and changes in vehicle and phone technology. In some US states, crashes with injuries where cell phone use was identified are prosecuted like reckless driving or DUI cases. Illinois has made texting while driving a primary offense with a fine starting at \$75 but allows “hands-free” use of communication devices. By comparison, in the UK a first-time offender now faces a fine of approximately \$250 and six “points” on their driver’s license, compared to the three points a driver would get for speeding. (Six points for someone who has been driving for less than two years would mean an automatic loss of their license, while older drivers are only allowed 12 points before they would lose their license.) Interestingly, Sweden, which has a very low fatal crash rate, does not ban cell phone use, but instead focuses on educating its drivers on the dangers of distracted driving and appropriate ways to use cell phone technology.

⁹⁵ NHTSA, “Traffic Safety Facts Research Note: Distracted Driving 2014,” 2016, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812260>.

⁹⁶ People who survive crashes need to self-report their distraction as a cause of a crash. If phone records are available, it is challenging to match them with the exact moment of a crash. There are electronic methods that may provide information on electronic device use in a vehicle, but this will not be the complete story of distractions in crashes.

⁹⁷ Southeastern Transportation Research, Innovation, Development, and Education Center (STRIDE), “Technology Transfer: Distracted Driving – Overview Summary of Ways to Alleviate (Project # 2016-013),” 2017, <https://stride.ce.ufl.edu/wp-content/uploads/2017/03/Distracted-Driving-Assessment-of-Ways-to-Alleviate-STRIDE-2016-013.pdf>.

⁹⁸ National Safety Council, “Hands-free is not Risk-free,” <http://www.nsc.org/learn/NSC-Initiatives/Pages/distracted-driving-hands-free-is-not-risk-free-infographic.aspx>.

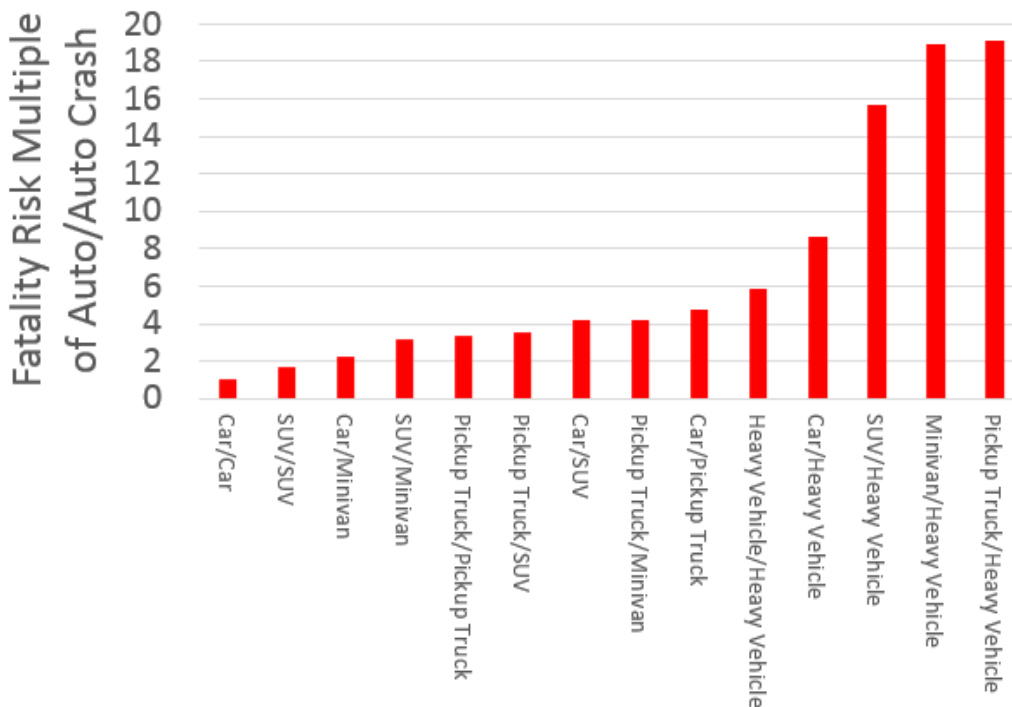


There are many ways phones themselves could limit their own use by drivers. Apps are available that prevents a phone from chiming if a person is driving.⁹⁹ Phone manufacturers have also started to offer “driver mode,” so that the phone can turn off texting or other functions if a navigation app is on or if the phone is moving at driving speed, among many other possibilities. This is an area the federal government should consider regulating.

Vehicle type

With the exception of trucks on certain routes, vehicles of all sizes and weights are allowed to use the same roads. However, the mix of vehicles that are on the road has an effect on safety. When vehicles collide, the heavier vehicles are safer for their passengers and deadlier for the vehicle that they crash into. Figure 21 gives the risk of fatality for different combinations of vehicles as a multiple of the fatalities resulting from an average car/car crash. For instance, when autos collide with a SUV, four times as many auto drivers die. To show the significance of this issue, if all travel in the region could be completed using autos and the fatality and occupancy rates remained the same, the five-year fatalities in two-vehicle crashes would hypothetically drop from 468 to 174, or a 63 percent reduction.

Figure 21. Driver fatality rates for the lighter vehicle in two-vehicle crashes



Source: CMAP analysis of IDOT Safety Portal data

Note: Only the fatalities from the lighter vehicle are shown. Excludes motorcycles. Analysis of only the drivers avoids the issue of number of occupants and the location in the vehicle.

⁹⁹ Life360, “Driver Protect,” <https://www.life360.com/driverprotect/>.



Clearly it would be difficult to limit the types of vehicles that use public roads given consumer preferences and the need for different vehicles for different purposes. For light vehicles, differential vehicle registration fees could be imposed based on weight as a predictor of safety costs, with the revenue potentially dedicated to safety programs. However, it is unlikely that any realistic set of fees would significantly change purchasing decisions. Perhaps more significant would be road user charges, particularly a VMT fee, that incorporates differential safety impacts for larger vehicles per mile traveled.

From the standpoint of focusing on the biggest risks, keeping the heaviest vehicles apart from the lighter cars would save lives. Given that truck traffic, including both over-the-road and delivery truck traffic, is expected to increase faster than auto traffic, this issue will likely worsen. CMAP advocates for the region to designate truck routes (where geometric design would improve driving conditions for trucks) coupled with signage that encourages trucks to travel on streets that are designed for safe travel by trucks. CMAP recently completed the O'Hare Subregion Truck Routing and Infrastructure report that developed a conceptual framework for identifying truck routes. Over the longer term, the region should seek opportunities to develop truck-only facilities to channel larger volumes of trucks.

Vehicle design and technology can also aid in preventing or reducing the seriousness of certain crashes involving heavy vehicles. Side guards on trucks can reduce the seriousness of pedestrian, bicyclist, and motorcycle crashes, although these affect a fairly limited¹⁰⁰ set of crashes.¹⁰¹ The City of Chicago recently passed an ordinance mandating the installation of side guards on trucks used by City contractors.

Motorcycle crashes are so dangerous that they need special consideration. Motorcyclists account for around 14 percent of fatalities in the region annually, yet comprise only 1.4 percent of VMT. Illinois is one of only three states that has no requirements for riders to wear helmets. While they certainly will not completely eliminate fatal crashes, motorcycle users should be required to wear helmets.

¹⁰⁰ Based on 2015 crash data for the Chicago region, there were 22 bicyclist fatalities, of which two were identified as involving a "Truck Single Unit" or a "Tractor with Semi-Trailer". One additional fatality involved a "Van/Mini-Van" that was determined to be a commercial vehicle. Of the 383 vehicles involved in crashes with a fatality of serious injury to a bicyclist, seven were with trucks and three additional vehicles were vans identified as commercial. For all bicyclist crashes, 1.8 percent involve one of these vehicles with 25 percent of these crashes involving a side impact. When bicyclist collide with the side of a truck, the risk of a fatality is very high.

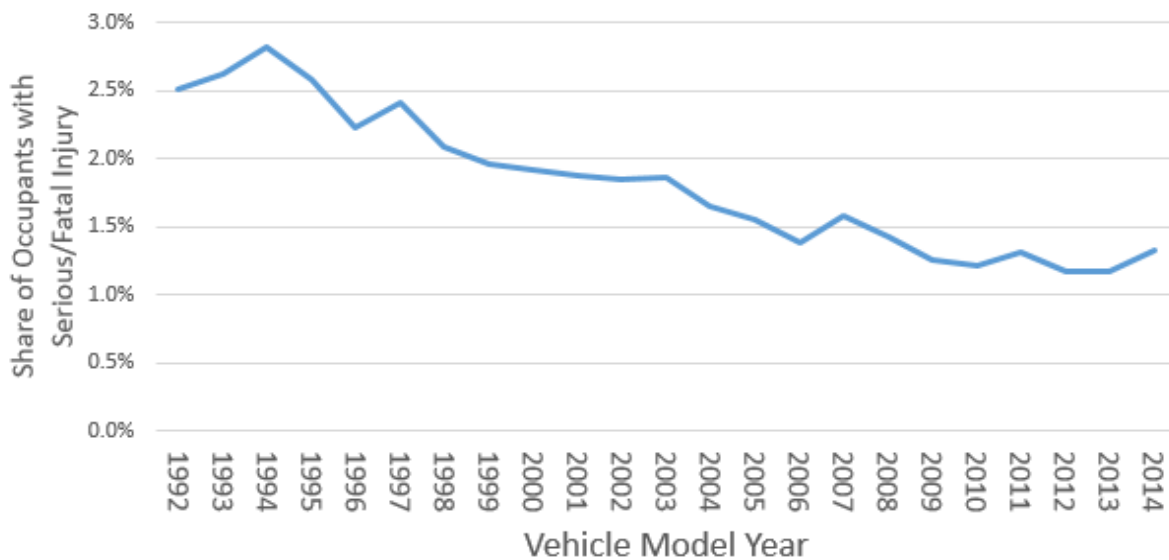
¹⁰¹ Volpe Center, "Truck Side Guards Resource Page," <https://www.volpe.dot.gov/our-work/truck-side-guards-resource-page>.



Advances in transportation technology

Perhaps one of the most promising areas for safety improvement is in vehicle technology. Each new model year has more safety features than the previous one. This is a result of national standards, automotive corporations' ingenuity, and demand by consumers. Drivers of newer car models tend to suffer lower rates of serious injuries and fatalities, simply because of improved safety features in newer vehicles (Figure 22).¹⁰² However, it can take decades for a safety innovation to have its maximum effect because of the slow speed of fleet turnover.¹⁰³ Furthermore, not all groups share in technology's benefits to the same degree; often the youngest or lower income groups drive older vehicles which have the fewest number of safety features.

Figure 22. Share of vehicle occupants in crashes who sustain serious injury or fatality by vehicle model year, Illinois statewide, 2014



Source: CMAP analysis of IDOT Safety Portal data

Much progress has been made in automobile designs that absorb crash energy with effective crumple zones and keep the occupant area rigid. Features like improved air bags similarly increase survivability. Newer advances seek to avoid crashes altogether, like lane departure warnings, forward collision warning, blind spot detection, and other systems that can warn drivers of a threat. Other systems, such as collision imminent braking (CIB), actually take

¹⁰² Vehicle maintenance is an issue in 2 to 3 percent of crashes, but previous analysis at CMAP has shown that vehicle keep much of their safety characteristics as they age.

¹⁰³ For instance, electronic stability control devices, which sense an impending rollover and cut the throttle and apply the brakes to allow the driver to regain control, has been available on some models for many years, but has been mandatory since 2012. According to estimates, in almost 2,000 lives were saved in 2015 in the US by this technology, yet half of the vehicles on the road still do not have the feature.



control of a vehicle to help avoid a crash. Additional research is focused on pedestrian detection systems.

Another promising technology is intelligent speed adaptation (ISA), which uses speed sign-recognition, camera, and/or GPS-linked speed limit data to advise drivers of the speed limit and automatically limit the speed of the vehicle. Current versions of ISA allow drivers to override the speed limiter. In Europe, the European Transport Safety Council estimates that this technology could eliminate 20 percent of the traffic fatalities if standard on all vehicles, and the technology would clearly have an impact on aggressive driving.¹⁰⁴ This safety feature should become standard on all new vehicles sold in the United States. As discussed above, seat belt usage and impaired driving could also be positively affected by federally mandated technology.

Autonomous and connected vehicles are expected to have major positive impacts on traffic safety. These technologies effectively take some or all of the human factors – including risky behaviors and imperfect abilities – out of driving, and as a result the roadways are expected to be much safer. The goal is to incorporate vehicle to vehicle communication (V2V) into the US auto fleet as soon as is reasonable. In late 2016, NHTSA released a notice of proposed rulemaking that would mandate V2V communication be capable on all light vehicles, which would allow cars to communicate to each other to avoid crashes.¹⁰⁵ Other efforts will attempt to achieve the same functionality without specifying the technology¹⁰⁶. The benefits of these technologies are partly a function of the rate of market penetration. Also, as the technology advances, autonomous vehicles will raise many questions about fault, indemnity, and the culture of driving which will have to be answered at national and state levels. CMAP staff should continue to stay on top of the fast-changing technology that is coming to vehicles in the near future. CMAP staff also should work with its partners to support legislation maximizing the safety benefits of autonomous and connected vehicle technology.

¹⁰⁴ European Transport Safety Council, “Weekly Deaths on European Union Roadways,” <http://etsc.eu/wp-content/uploads/ETSC-ISA-infographic.pdf>.

¹⁰⁵ NHTSA, “U.S. DOT advances deployment of Connected Vehicle Technology to prevent hundreds of thousands of crashes,” 2016, <https://www.nhtsa.gov/press-releases/us-dot-advances-deployment-connected-vehicle-technology-prevent-hundreds-thousands>.

¹⁰⁶ Fierce Wireless, “Report: DSRC mandate moving off the table for automakers,” 2017, <https://www.fiercewireless.com/wireless/report-dsrc-mandate-moving-off-table-for-auto-makers>.



Potential CMAP roles

Incorporate safety measures into local programming

While numerous actions are needed by the public and private sectors to improve traffic safety, CMAP may have a particular role in some areas. One role is incorporating safety performance as a larger priority in transportation project selection, which builds upon CMAP's role in project selection for locally programmed federal funds. Incorporating safety performance measures into programming decisions will help achieve regional safety targets and make sure this vital aspect of transportation receives adequate consideration.

Highway projects funded with Congestion Management Air Quality

Since the region does not meet federal air quality standards for ozone, the region receives Congestion Mitigation and Air Quality (CMAQ) funding to improve air quality and relieve traffic congestion. Even though the primary measure for evaluating CMAQ proposals is the cost-effectiveness of air emissions reductions, CMAP has successfully incorporated other performance measures, with safety being one of the highway measures, into CMAQ programming decisions, starting informally in the 2014-18 cycle and formally in the 2016-20 cycle.

In the CMAQ program, the safety performance measure is an all-or-nothing measure where according to the CMAQ Program Application Booklet "a proposal receives five points if the project addresses an IDOT 5 percent report location and 0 if it does not." The IDOT 5 percent report identifies high priority locations on the road network where highway safety, particularly fatal and serious injury crashes, is an issue.

Going forward, a more thorough evaluation of potential safety benefit should be incorporated into the programming process. Not only should a proposed project be located at a high-crash location to receive additional priority, the project should also include proven safety countermeasures. The safety evaluation would apply only to proposed highway and bicycle projects. There are several possible approaches to this. One would be to use crash modification factors and the details of the project to estimate the crash reduction benefits, then convert the raw crash reduction value or cost-effectiveness of crash reduction into a weighted score like the other factors used in the CMAQ scoring process. Another approach would be to identify a specific list of safety countermeasures for sponsors to evaluate during engineering. Different counter-measures could simply be assigned point values in the CMAQ scoring process. Examples of specific safety countermeasures for intersection improvement projects include signal heads over all lanes, positive offset left-turn lanes, flashing yellow left turn signals, all-red clearance interval, or an exclusive pedestrian phase. CMAP would work in consultation with partner agencies to develop a list of proven and innovative safety countermeasures for the CMAQ programming process. For any approach, IDOT's evaluation techniques for HSIP would likely be adapted for CMAQ. These requirements could realistically be added to project scoring, as preliminary engineering already has to be complete before project selection.



Highway projects funded with local Surface Transportation Program

The local Surface Transportation Program, which funds transportation improvement projects on any federal aid eligible road, also should evaluate candidate projects for their safety benefits. Most of the Councils of Mayors already have a measure of safety factored into their project selection methodologies. The safety scores account for 10 to 25 percent of the point totals. Six of the councils compare the three-year average of a facility to IDOT's average for that classification of roadway and proposed projects at locations with a higher than average crash rate receives more points. Two councils consider bicycle and pedestrian crashes in addition to automobile crashes, while other councils give additional points if a project will specifically address an at-grade crossing or provide for a new alignment.

In order to enhance the consideration of safety in the local STP project selection, CMAP and its partners should collaborate in the development of a regional menu of safety countermeasures that are considered, at the Council's option, during the project selection process. Any of the approaches recommended for CMAQ above could be used for STP. The menu of safety countermeasures would be segregated by project type and can be updated on an annual basis to account for changing trends in the region. Another method of incorporating safety into the local STP process would be to score proposed projects on the expected crash benefit of the project. The project implementers (or the Council or CMAP staff) would analyze the effectiveness of the countermeasures that are to be implemented as part of the proposed project. Projects could then be scored based on how many fatal and serious injury crashes they are expected to reduce.

Bicycle projects funded by Transportation Alternatives Program

Bicyclist serious injuries and fatalities have been increasing in the region. The local Transportation Alternatives Program (TAP), which currently is targeted at building off-street trails that are part of the Regional Greenways and Trails Plan, does not directly consider safety. However, scoring for projects that are candidates for TAP funding should include a safety component. CMAP staff should do more research on how safety benefits for candidate bicycle projects can be estimated and compared.

Assist local agencies in safety planning

Crashes occur on all roadway types regardless of jurisdiction, but in the CMAP region 59 percent of fatal crashes and 64 percent of serious injury crashes occurred on non-state controlled roads from 2012 to 2014. In interviews with partner agencies, a commonly identified role that CMAP could play would be to work through its committee structure and the Council of Mayors to assist municipalities in highway safety planning and programming.

Produce actionable safety analysis for communities

CMAP should develop data-driven crash analyses highlighting safety initiatives that CMAP's local partners can implement to make their roads safer for all users. An annual regional report should be created to identify the crash types, causes, locations, etc. that the reports should



concentrate on. In addition, it will assist in identifying which localities are experiencing a high number of the identified crash types and locations where they are problems.

The reports should identify a common set of approaches to addressing the crash types identified in the regional report. The special reports would pinpoint problem locations and feature one or more low-cost countermeasures that alleviate safety risk. Local law enforcement officials could use the focused safety reports to target enforcement at high crash locations. For example, the report could provide a map of locations that are experiencing a high crash rate due to speeding; a local police department could focus more speed enforcement around that location to help prevent crashes. Additionally, the report could provide support in identifying locations where automated enforcement would be effective. The biennial municipal survey should include questions related to the safety reports to ensure their usefulness.

Developing a regional version of the United States Road Assessment Program (usRAP) to identify potential projects for municipalities to consider is another safety analysis tool that CMAP should explore. The usRAP tool is a roadway safety-planning kit that builds upon other successful international models developed for Europe (EuroRAP) and Australia (AusRAP). The software analyzes sections of roadway for existing safety elements and identifies programs of potential projects to improve safety performance. The basis for project selection is the estimated benefit associated with specific engineering improvements.

IDOT participated in an usRAP pilot study through the USDOT that analyzed rural state highways. The pilot project used data from 2002 to 2006 and focused on risk mapping, that is, identifying roadways with the greatest crash risk based on crash history. CMAP should take a lead role in developing or at a minimum research the opportunity to develop a regional version of usRAP. The software requires a significant amount of data collection, but it provides a structured, straightforward way to identify and screen potential safety improvement projects at the municipal level.

Support communities in developing local Highway Safety Improvement Program funding applications

The Highway Safety Improvement Program (HSIP) is a core federal-aid program continued in the FAST Act that provides funding to reduce the number of traffic fatalities and serious injuries on all public roads. After set-asides for special programs, IDOT splits the remaining HSIP funds into two programs, the HSIP state road program (receiving 80 percent) and the HSIP local road program (receiving 20 percent), the latter being programmed through a competitive call for projects at the district level. HSIP funds are required to support engineering and operations solutions to traffic safety.

However, IDOT District 1 has consistently been unable to program its proportional share of local HSIP funds due to limited numbers of quality applications. A variety of factors may be responsible for this situation, including the perceived difficulty of the application process and



the requirements to expend funding effectively within two years. To help address this problem, CMAP should assist municipalities in applying for local HSIP funding. Additionally, CMAP and IDOT should work together to supplement the application process by directly identifying potential projects on local routes and seeking a municipal partnership to implement them. CMAP has the opportunity to support many aspects of the funding process from holding training sessions to assisting in the analytical sections of the HSIP application.¹⁰⁷ CMAP should work through the Council of Mayors to determine the best approach to work with municipalities on applying for local road HSIP funding.

Support local road safety plans and road safety audits (RSA)

Because serious injury and fatal crashes occur on all roadway types, CMAP should encourage communities, through possible technical assistance, to develop local road safety plans (LRSP). A LRSP is a proven safety countermeasure that provides a framework to identify and prioritize safety improvements that reduce fatal and serious injury crashes on the local road network. The LRSP is developed through stakeholder engagement, collaboration, and data analysis to tailor it to local safety issues. It is important for the plan to be actionable and updated as necessary to reflect changes in local needs and priorities regarding traffic safety.¹⁰⁸

A road safety audit (RSA) determines roadway elements that pose a risk to roadway users and under what conditions those elements are a safety concern, then presents solutions to eliminate or ease the safety issues identified on that road.¹⁰⁹ The usRAP software discussed above creates high-level RSAs through remote sensing methods, while the traditional RSA requires an in-person site evaluation. CMAP and IDOT should consider hosting RSA training for partner local agencies in the region on a regular basis and research ways of making an RSA less labor intensive. The FHWA also offers RSA training.

Seek safety behavioral funding at the Metropolitan Planning Organization level

While the HSIP program focus on engineering improvements for safety, funding authorized at 23 USC 402 (“Section 402”) provides for highway safety grant funds that focus on safety education and enforcement programs. This would be an entirely new role for CMAP to take on, but other MPOs have secured Section 402 grant funds for their region. For example, the Mid America Regional Planning Commission (MARC) through its Destination Safe Leadership

¹⁰⁷ All the elements that should be included in the local HSIP application can be confusing, especially if local agencies do not have the experience or time to work with crash data. The local HSIP application is data driven and requires local agencies to submit many different sections with the project proposal. The local HSIP application includes sections on location, location characteristics, the crash emphasis area the proposed project targets, fatal and serious injury crash reports, Road Safety Assessment findings, analysis of proposed counter-measures and benefit cost analysis of proposed project. The elements that are required for the local HSIP application can be overwhelming to local municipalities if they have never applied for local HSIP funding.

¹⁰⁸ FHWA, “Local Road Safety Plans,” https://safety.fhwa.dot.gov/provencountermeasures/local_road/.

¹⁰⁹ FHWA, “Road Safety Audits (RSA),” <https://safety.fhwa.dot.gov/rsa/>.



Team received a grant from the Kansas DOT and Missouri DOT to support its Destination Safe Media Campaign to promote its safety initiative “Destination Safe.” The City of Chicago received section 402 funds to promote its Vision Zero initiative. If CMAP decided to pursue joining the Vision Zero initiative, CMAP could potentially use section 402 funds to promote Vision Zero at the regional level.

Collaborate with IDOT to expedite the release of regional safety data

Currently, there is nearly a year lag in the release of annual crash data by IDOT. The delay hinders agencies’ ability to react to safety issues as they arise. Working through the councils of government and partner agencies, CMAP should support IDOT by trying to help local law enforcement agencies in the region implement electronic crash reporting systems.¹¹⁰ Less than half of local agencies are using electronic reporting currently. Additionally, CMAP could assist in bringing together multiple law enforcement agencies in the region to submit an HSP application to help agencies electronic crash reporting system at the regional level. Other opportunities to work with IDOT to accelerate the release of crash data should be explored.

To analyze safety initiatives that affect many locations, and in total have large numbers of crashes, having a timely measure of the effectiveness of the program would help to improve the projects and save lives. Currently, at the extreme, it could take almost two years to measure the effectiveness of a project that was begun in January of a year. A goal to strive for would be for IDOT to release monthly batches of crash reports three months after the month of the crashes. IDOT has made significant strides in sharing crash data through their on-line Safety Portal and is in the process of improving it. The City of Chicago will now use mobile crash reporting technology to send all crash reports to IDOT.¹¹¹ These efforts will help to streamline the collection and sharing of crash data. In collaboration with IDOT, the challenge to process the crash data more quickly should be addressed to determine if combing state, local and regional resources and manpower can accomplish the goal more effectively.

¹¹⁰ Law enforcement personnel collect crash information by an electronic crash reporting system or manually have to fill out paper crash reports. The law enforcement agencies send the crash reports to IDOT, whose staff then enter the crash information into the statewide crash information system (CIS). The electronic crash reporting systems allow agencies to electronically capture and submit crash reports to IDOT. This method of crash data collection is preferred because it is more efficient and easily entered into IDOT’s CIS. When law enforcement agencies submit paper crash reports, IDOT staff have to enter manually the crash report information into the CIS that results in a bottleneck in the processing of crash reports. Currently, 315 out of 878 agencies are submitting electronic crash reports to IDOT. The City of Chicago received HSP funds to implement their Crash Data Integration Project that includes the implementation of an electronic crash reporting system by the Chicago Police Department (CPD). The CPD is expecting to have an electronic crash reporting system implemented in its mobile units by August 2017. This should lead to a dramatic reduction in time spent by IDOT staff entering crash report data from the City of Chicago into the statewide CIS.

¹¹¹ IDOT, “2016 Illinois Highway Safety Program Annual Evaluation Report,” 2016, http://www.idot.illinois.gov/Assets/uploads/files/Transportation-System/Reports/Safety/HSP/AER16-singles_010317.pdf.



Consistency of the data itself would be improved if officers were trained the same way on evaluating crashes and completing crash reports. Also, the definition of a serious or incapacitating injury needs to be exactly defined so that the measures are meaningful. Information on seat belt use, cell phone use and reckless driving is difficult to verify after a crash and could be obtained more accurately through electronic data recorders in vehicles if legal hurdles concerning privacy can be overcome. IDOT is releasing a new and more detailed crash reporting form that will go into effect January 1, 2019 and this will provide improved crash information.

The crash data is one part of the combined Traffic Records Program¹¹² area. This program includes crash reports, roadway, driver, vehicle, citation, and health care data. When these datasets are linked together they provide a more complete picture of the history of the driver in crashes, the roadway conditions that may have contributed to the crash, and detailed information on the health related consequences of the crash.¹¹³

Hold annual safety summit

In order to keep safety a priority for the region, CMAP should hold an annual or semi-annual traffic safety summit that convenes regional safety stakeholders to discuss the status of safety in the CMAP region. The summit would bring together a broad group of individuals so determining an agenda that is relevant to all stakeholders is key. The meeting should cover the benefits of mobile capture units and encourage use region wide, the importance of crash reports, present current regional crash trends and hotspots, and serve as a platform to discuss upcoming safety funding opportunities. CMAP staff should work with a small group of partners to see if there is interest in the region, develop a list of agencies to invite, and an actionable agenda for the initial regional safety summit.

Developing regional safety targets

In the spring of 2016, the FHWA published the HSIP and Safety Performance Management Measures (Safety PM) Final Rules in the Federal Register. The overarching goals for the HSIP and Safety PM are to significantly reduce the number of fatalities and serious injury crashes that occur on all public roads. The Safety PM rule requires the following measures to be reported on an annual basis as five-year rolling averages: (1) the number of fatalities, (2) the rate of fatalities per 100 million VMT, (3) the number of serious injuries, (4) the rate of serious injuries per 100 million VMT, and (5) the number of non-motorized fatalities and non-motorized serious

¹¹² Illinois Traffic Records Coordinating Committee 2017 Traffic Safety Information Systems Strategic Plan. Illinois Department of Transportation Bureau of Safety programs and Engineering. June 30, 2017.

¹¹³ The full traffic records program is not complete at this time, but IDOT has made improvements such as modernizing the database for the roadway information and improved the processing of data for the SAFETYNET program. Planned improvements affect EMS, driver information as well as the Statewide Injury Surveillance System (SWISS) Records. This data will be integrated through systems like CODES (Crash Outcome Data Evaluation System) and will be shared on platforms such as the Safety Portal. This data integration effort will provide superior outcomes for crash analysis and CMAP should work to encourage all agencies to assist in providing the relevant information.

injuries. All public roads are to be included, regardless of functional classification or jurisdiction.

State DOTs and MPOs must set annual targets for each safety measure, with state DOTs required to establish quantitative targets. The actual target should be set to what the state believes it can achieve; the rule does not specify or provide guidance for how ambitious the targets are to be. Each year the FHWA is to evaluate whether states have met, or made significant progress toward meeting, their targets. FHWA will consider states to be in compliance if they have met or improved from the baseline at least four of the five required performance targets. This cycle of setting targets and evaluating performance will recur annually, but with a significant time lag before the evaluation occurs. If states do not meet their targets, they will be required to use all of their Highway Safety Improvement Program funds for highway safety projects – although this does not affect IDOT since all HSIP money is currently used for safety purposes -- and submit a plan for how to meet the targets.

By contrast, MPOs can either choose to set quantitative targets or commit to help implement the state's target by planning for and programming safety projects. State DOTs are to establish their five safety targets by the time the annual HSIP report is due to FHWA at the end of August of each year. MPOs have until the end of February to establish their targets, but are not required to wait until the state DOT develops its targets. After that, MPOs are to update their safety targets each year in a report to the state DOT.

For the first round of setting safety targets for 2018, IDOT established 2018 safety targets in August 2017 as part of its HSIP submittal to FHWA. CMAP had until February 2018 to decide to set local quantitative safety targets or support IDOT's statewide safety targets. The CMAP Board and MPO Policy Committee voted to support IDOT's statewide safety targets for 2018.

ON TO 2050 safety targets

Because traffic deaths and serious injury crashes are preventable and CMAP's partners have established aggressive safety goals, CMAP should adopt aggressive safety targets for 2025 and 2050. In order to support the City of Chicago "Vision Zero" initiative, IDOT's safety initiative of "Driving Zero Fatalities to a Reality", and FHWA's Towards Zero Deaths program, both targets should be aggressive. For the 2025 target, the region should commit to halving the current five-year average of 405 fatalities to 203 fatalities, a goal based on the safety progress the region made over 2010 – 2015.

Advances in safety technology in the near future have the potential to result in a significant decrease in the number of traffic related fatalities. It takes time for the safety features to be installed on the majority of the vehicles on the road since only around 5 to 7 percent of the vehicles on the road are the newest model year. The safety improvement from technological advances will increase as they become available on more models, then slow down as the technology becomes widely implemented. This has been the experience with other safety



initiatives such as the standardization of anti-lock brake system (ABS). The cycle of drops and plateauing will continue as new safety standards are put into place until fatalities drop to zero.

For the 2050 target, the region should set a zero-fatality goal. In addition, CMAP should join one of the zero fatality initiatives to solidify CMAP's goal of achieving its target of zero traffic related fatalities in the region by 2050. CMAP has the opportunity to join and participate in the Vision Zero initiative and Towards Zero Deaths program. CMAP should officially support IDOT's safety initiative Driving Zero Fatalities to a Reality.

In order for the region to achieve the safety targets that are proposed, safety will need to become the leading factor in all planning and programming decisions in the region. If every agency in the region is committed to making roads as safe as possible for all users this goal should be attainable. CMAP will need to take a leading role and make traffic safety a top priority in ON TO 2050.



Next steps

Ensuring the safety of all people using the region's transportation system should be a top priority for all agencies related to transportation. While much has been done over the past decades to make the transportation system safe, this report shows that much more needs to be done and there are many opportunities for improvement and better collaboration. CMAP should take a leading role in planning and programming for a safer transportation system in our region. To do this, ON TO 2050 should address safety and include recommendations and policies that will make the transportation system a safer place for all users. The safety white paper outlined initial steps CMAP can take to advance a safety-first agenda, but this is only the beginning. Implementing such a plan is where real change occurs. CMAP staff should continue working on the federal safety performance measures and work with partner agencies to determine if the region should continue to support IDOT's targets or set its own safety targets in the future. CMAP should also continue to find ways to increase consideration of safety in the programming decision-making process.



Acronyms

AAA American Automobile Association
AADT Annual average daily traffic
ABS Anti-lock brake system
ALR Administrative license revocation
ASE Automated speed enforcement
BAC Blood alcohol content
CDOT Chicago Department of Transportation
CIB Collision imminent braking
CIS Crash Information System
CMAP Chicago Metropolitan Agency for Planning
CMAQ Congestion Mitigation and Air Quality Improvement Program
CPD Chicago Police Department
DADSS Driver Alcohol Detection System for Safety
DUI Driving under the influence
FARS Fatality Analysis Reporting System
FAST Fixing America's Surface Transportation
FHWA Federal Highway Administration
GDL Graduated Driver Licensing
GHSA Governors Highway Safety Association
HSP Highway Safety Plan
HSIP Highway Safety Improvement Program
IDOT Illinois Department of Transportation
ISA Intelligent speed adaptation
LRSP Local Roads Safety Plan
MARC Mid-America Regional Council
MPO Metropolitan Transportation
MUTCD Manual on Uniform Traffic Control Devices
NHTSA National Highway Traffic Safety Administration
NTSB National Transportation Safety Board
RLC Red light camera
RSA Road Safety Audit
SHSP Strategic Highway Safety Plan
SRI Safe Roads Index
STP Surface Transportation Program
TAP Transportation Alternatives Program
uSRAP United States Road Assessment Program
VMT Vehicle miles traveled
V2V Vehicle 2 Vehicle



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The Chicago Metropolitan Agency for Planning (CMAP) is our region's comprehensive planning organization. The agency and its partners are developing ON TO 2050, a new comprehensive regional plan to help the seven counties and 284 communities of northeastern Illinois implement strategies that address transportation, housing, economic development, open space, the environment, and other quality-of-life issues. See www.cmap.illinois.gov for more information.

ON TO 2050 reports will define further research needs as the plan is being developed prior to adoption in October 2018.