SAFE TRAVEL FOR ALL

Safety Action Plan Appendix

JUNE 2025

DUPAGE COUNTY
ILLINOIS

ADOPTION DATE:
TENTATIVELY MAY 30th, 2025

Existing Safety Conditions Contents

1 Introduction

The Existing Safety Conditions (ESC) section uses historical crash data to evaluate key safety issues, high crash locations, and high-risk roadway characteristics. The ESC is not a comprehensive analysis of existing conditions or an exhaustive crash analysis. The ESC provides a data-driven snapshot, informed by lived experience, of the highest priority transportation safety issues facing DuPage County. The ESC lays the path forward for the development of strategies, policies, projects, and actions for the County and its partners to implement.

The ESC incorporates requirements of the United States Department of Transportation (USDOT) Safe Streets and Roads for All (SS4A) action plans, the Chicago Metropolitan Agency for Planning's (CMAP) safety action plan framework, and the input and direction of CMAP and DuPage County staff. The ESC fulfills USDOT's SS4A Self-Certification Eligibility Worksheet requirement #3: Safety Analysis as well as portions of #5: Policy and Process Changes.

The ESC is divided into six sections: **Existing Conditions Overview**, **High Injury Network**, **Systemic Safety Conditions**, **Railroad-related and Grade Crossing Incident Safety Analysis**, and **Data Recommendations**.

Data Sources

Unless otherwise noted, all crash data analyzed and presented in the following sections were obtained from the Illinois Department of Transportation (IDOT) via their Safety Portal and were sourced from the Illinois State Police and other local and regional enforcement agencies as provided by CMAP on April 1, 2024 within the boundary of DuPage County. Crash data cover the years of 2018 to 2022, the most recent available from IDOT at time of analysis, are used as-is for analysis purposes, and should be interpreted accordingly. In addition, the period of analysis overlaps with the onset of the Covid—19 pandemic in March 2020 and is impacted by resulting changes to travel and behavior. All figures, tables, and data points included in the ESC are based on this data set, unless otherwise noted.

Crashes that were not reported to law enforcement, do not meet IDOT's reportability criteria as laid out in the *Illinois Traffic Crash Report SR1050 2019 Instruction Manual for Law Enforcement Agencies*[i] or do not meet the American National Standards Institute (ANSI) definition of a motor vehicle crash[ii] are not included in the analyses in this memo. By ANSI and IDOT definitions, a crash must involve at least one motor vehicle. This includes multiple vehicle crashes, single vehicle crashes, and crashes involving a vehicle and another roadway user such as a pedestrian or bicyclist. A collision between a bicyclist and a pedestrian, a single bicyclist, and other collisions not involving a motor vehicle do not meet ANSI crash definitions and are thus not reflected in these analyses. Crashes that are not reported or do not meet reporting criteria (crashes in which no one is injured and property damage costs are very low) are not included. Underreporting is a major issue, especially for crashes involving a bicyclist or pedestrian. Research indicates that police data, for example, likely underreport the number of bicycle and pedestrian crashes, even those resulting in emergency room visits,[iii] and likely underrepresent pedestrian crash injury incidence.[iv] Furthermore, crash report form fields do not contain every data point that analysts may be interested in, such as detailed socioeconomic and demographic info, disability status, and other key data points. While some of this information may be included in death certificates and crash narratives, these data points are not available to analysts in an aggregated format.

2 Existing Conditions Overview

The existing conditions overview covers current plans and policies constituting a representative picture of the state of transportation safety practice and outcomes in DuPage County. The broad scope of the overview, which serves to identify the animating ideas and understand how they have been operationalized through policy, process, procedure, and/or ordinance, will provide ideas for strategies and actions to address the identified severe crash trends in latter stages of safety action plan development.

The overview has three sections: **plan review**, **policy and process assessment**, and **severe crash analysis**.

The overview covers the SS4A requirements for Safety Analysis “analysis of existing safety conditions and historical trends” and “analysis of the location where there are crashes, the severity, as well as contributing factors and crash types” in addition to Policy and Process Changes “assessment of current policies, plans, guidelines, and/or standards to identify opportunities to improve how processes prioritize safety.”

Plan Review

State Plans

IDOT produces multiple statewide plans that set goals and describe strategies for roads and highways under its jurisdiction and for the broader multimodal transportation system.

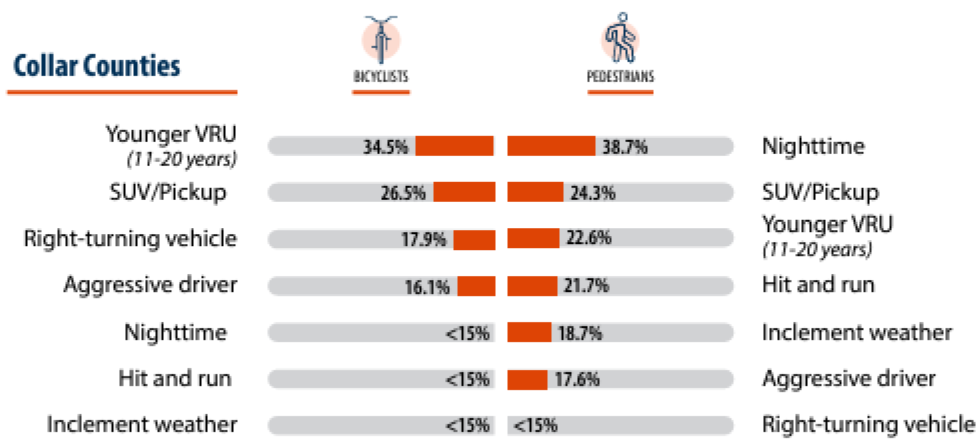
Illinois Vulnerable Roadway User Safety Assessment (2023)

IDOT completed a vulnerable roadway user (VRU) assessment in furtherance of requirements set out in the Bipartisan Infrastructure Law (BIL). The VRU assessment recognizes that historically underserved communities as defined under the Justice40 initiative in Illinois are “disproportionately affected by safety shortcomings” and that increased investment is “easy to justify and should be prioritized.” The VRU assessment includes quantitative analysis, consultation, and a program of projects and strategies to meet its vision: “a future where no one loses their life or is seriously injured while biking, walking, and rolling so that IDOT can achieve the goal of zero fatalities and serious injuries on public roadways in Illinois.”

The VRU assessment includes a bicyclist and pedestrian High Injury Network (HIN), which breaks out intersections and segments of elevated crash risk based on different areas of the state, including a category for collar counties, the five counties that border Cook County (DuPage, Kane, Lake, McHenry, and Will Counties). The top three routes, County Farm Road, Cass Street, and Illinois Route 59, pass through DuPage County. The analysis also includes cluster locations for pedestrians and bicyclists, with the top two locations – York, Vallette to Seminole and Geneva & County Farm, both Illinois Prairie Path crossings – located in DuPage County.

Systemic analysis reveals that, within the collar counties, the highest proportion of bicyclist and pedestrian crashes occur at unsignalized intersections. Specific contributing factors are also assessed by mode, as shown in Figure 1. Bicyclist crashes involving younger users, SUV/pickup trucks, and right-turning vehicles led the list of contributing factors. For pedestrians, night-time crashes, SUV/pick-up, and younger users constituted the top three.

Figure 1: Contributing Factors



Source: IDOT VRU Assessment 2023, Pg. 2-23

The systemic analysis matches up the identified crash types with facility characteristics to identify areas of high risk for proactive assessment and improvement. Within the collar counties, bicyclist right-turning vehicle crashes were most likely to occur on four-lane arterials with 15,000-30,000 annual average daily traffic (AADT), 30-35 MPH speed limit, and commercial land use. Pedestrian nighttime crashes were most likely to occur on two-lane arterials with 15,000-30,000 AADT, 30-35 MPH posted limits, and commercial land use.

The VRU assessment concludes by matching countermeasures to significant VRU crash types with an emphasis on countermeasures that align with the Safe System Approach, including increasing separation between users (i.e., safer roads) and setting and encouraging safer speeds. Additional design countermeasures include roundabouts, turn prohibitions, signal timing, enhanced crosswalks, and geometric improvement as well as systemic improvements like improved public transit access, speed enforcement, emergency response, data collection for exposure, legislation on speed limit setting, and Complete Streets policies.

Illinois Strategic Highway Safety Plan 2022-2026 (2022)

The *Strategic Highway Safety Plan* (SHSP) sets IDOT's vision for eliminating traffic fatalities and serious injuries for all users for the transportation system and identifies performance measures, emphasis areas, and a program of strategies that leverage design, technology, behavioral, and policy approaches to achieve them. The SHSP is a state-level plan, encompassing all roadways in Illinois regardless of jurisdiction. Thus, its general findings may differ from those found for individual counties like DuPage or municipalities. However, it serves as an instructive baseline for the state of the practice in Illinois and a benchmark for county- and local-level comparisons.

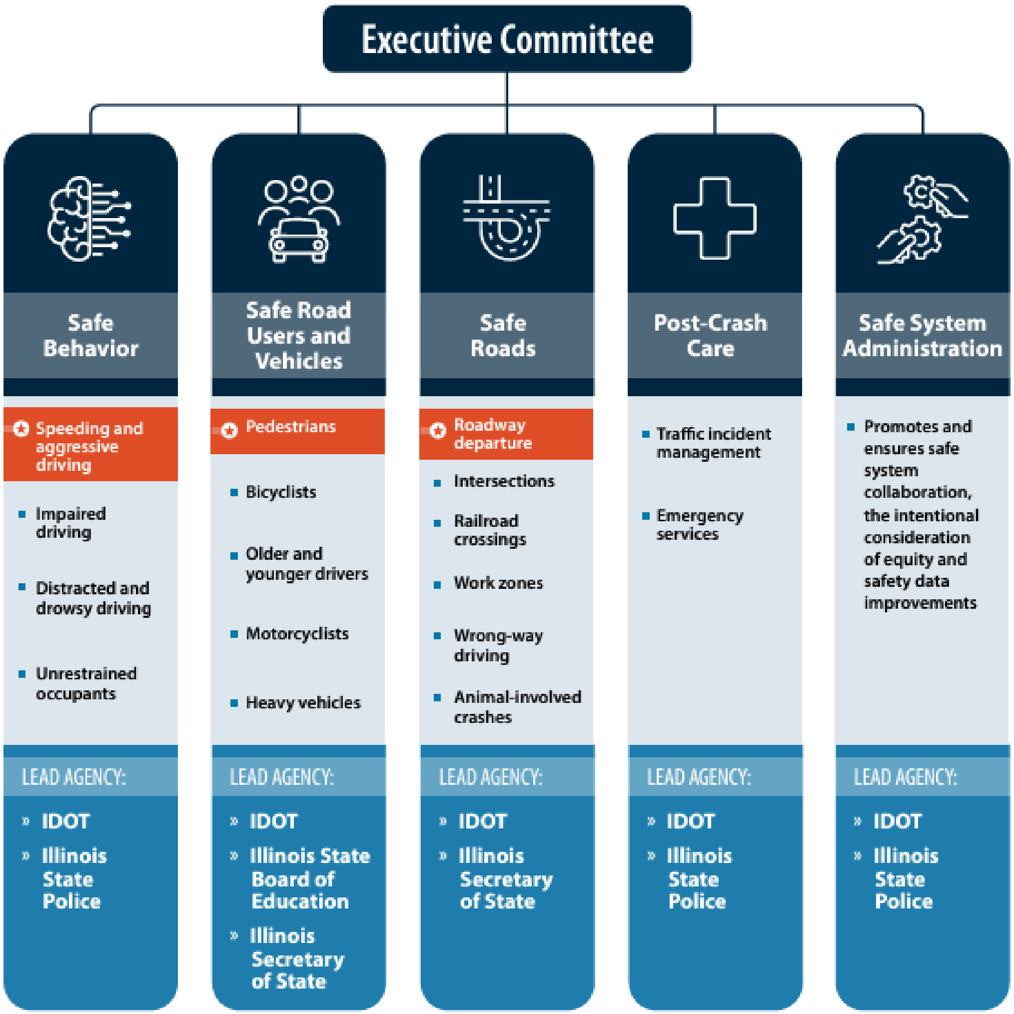
The SHSP is structured around five pillars consistent with Safe System Approach, Safe Behavior, Safe Road Users and Vehicles, Safe Roads, Post-Crash Care, and Safe System Administration, with three priority focus areas: speeding and aggressive driving, pedestrians, and roadway departure. Emphasis areas consistent with past SHSPs are also discussed and sorted under each of the five pillars. While all emphasis areas are associated with strategies and countermeasures, the three priority focus areas receive heightened attention. Recommended countermeasures are summarized in Table 1.

The SHSP assigns implementation responsibilities for the five pillars across state departments, as shown in Figure 2. Consistent with the Safe System Approach, this leadership structure reflects shared responsibility across departments for making safety the priority performance measure of the State transportation system.

Table 1: SHSP Countermeasures by Priority Focus Areas

Focus Area	Countermeasure
Roadway Departure	Countermeasures to keep vehicles from encroaching on the roadside along tangents (e.g., enhanced edge lines, shoulder rumble strips, widened shoulders)
	Countermeasures to keep vehicles from encroaching on the roadside at curves (e.g., chevrons, advanced signing, improved lighting, high friction surface treatment)
	Countermeasures to keep vehicles on the road via speed management (e.g., speed pavement markings, updated speed-limit setting policy, education)
	Countermeasures that may be implemented to reduce likelihood of crashing into an object or overturning (e.g., safer slopes, centerline rumble strips, median barriers, guardrails)
	Comprehensive effective countermeasures for mitigating roadway departure crashes (e.g., road safety audits, review design practices, stakeholder inclusion)
Speeding	Countermeasures to detect speeding and support law enforcement (e.g., strengthen speed detection, explore automated enforcement, conduct high visibility enforcement)
	Additional law enforcement resources (e.g., purchase, deploy, and use speed measuring devices, use law enforcement liaisons to link partners)
	Judicial and legislative countermeasures (e.g., support legislation to strengthen penalties, strengthen adjudication of speed citations)
	Incorporate infrastructure treatments to reduce aggressive and speeding behavior (e.g., employ traffic calming, prepare Complete Streets policies, use dynamic messaging signs)
	Improve understanding and awareness of the impacts of speed and crash outcomes (e.g., provide additional education and public information)
Pedestrians	Countermeasures to reduce pedestrian exposure (e.g., sidewalks, curb extensions, countdown times, leading pedestrian intervals, road diets, protective barrier systems)
	Countermeasures to improve visibility and awareness (e.g., crosswalk enhancements and illumination, transit stop visibility and accessibility, pedestrian hybrid beacons)
	Countermeasures for improving awareness of pedestrian safety (e.g., education, outreach, training, road safety audits, update highway design manual)
	Safe speed or slowing vehicle countermeasures (e.g., traffic calming, reduce statutory speed limits, allow creation of pedestrian safety zones, speed management training)

Figure 2: IL SHSP Leadership Structure



Source: IDOT SHSP 2022-2026, Pg. 6-2

Countywide Plans

DuPage County supplied the most recent and relevant county-level plans for review. The project team summarized each plan below, breaking out recommendations and policy directions related to safety and the Safe System Approach.

DuPage County Trails Plan (2024)

The *DuPage County Trails Plan*, developed by the DuPage County Division of Transportation (DuDOT), outlines the framework for the ownership, operations, and maintenance of DuPage County's regional trail network. This plan primarily focuses on three regional trails: the Illinois Prairie Path, Great

Western Trail, and Southern DuPage Regional Trail. The Plan aims to enhance the county's trail network by focusing on planning goals organized across path maintenance, permitting management, environmental conservation, engineering practices, unique trail elements, and creation of an accessible living document to enable interagency coordination. Strategies and action items include establishing trail crossing guidelines, implementing signage and wayfinding toolkits, and focusing on user experience to enhance opportunities for recreation and safety across the trail network.

The plan envisions DuDOT as the steward of a seamless, engaging, and well-maintained regional trail network that fosters safety, accessibility, and environmental sustainability. Regarding safety in particular, DuPage County residents identified concerns around crossings and routes where at-grade trails create conflicts with automobile traffic, indicating that high-visibility signage and clear sight lines are desired features near at-grade crossings. To standardize trail crossing enhancement guidance, DuDOT uses a table based on IDOT's *TRA-23: Guidelines for Establishing Pedestrian Crossings* policy to recommend safety countermeasures based on a roadway's posted speed limit and AADT – these include features such as high-visibility crosswalks, raised crosswalks, yield/stop lines, in-street pedestrian crossing signs, curb extensions, pedestrian refuge islands, rectangular rapid flashing beacons (RRFBs), road diets, and pedestrian hybrid beacons. Other safety themes include discomfort near high-speed bicyclists and e-bikes, as well as safe passing and trail etiquette issues.

DuPage County Mobility Framework Plan (2023)

The *DuPage County Mobility Framework Plan* lays out a comprehensive, long-term vision for enhancing the county's transportation network to meet the evolving needs of its population. Addressing challenges posed by the pandemic, the plan focuses on foundational goals and strategies while emphasizing collaboration between DuDOT, individual communities, and transit agencies. Informed by other regional planning initiatives (*CMAP Mobility Recovery Action Plan*, *RTA Transit is the Answer*, etc.) as well as community engagement, the plan identifies specific transportation needs targeted toward seniors, disabled individuals, students, and the general population.

Regarding safety, the *Mobility Framework Plan* emphasizes the role of public transportation and alternative modes like biking and walking in creating a safer and more accessible transportation network through its eight Planning Themes. Theme 8, Safety, involves enhancing the safety of transit riders, bikers, and pedestrians by improving network connectivity and implementing system safety standards. Safety interventions include improved road and rail crossings, enhanced lighting conditions, advanced warning pedestrian beacons, and protected bikeways. The plan acknowledges suburban development patterns, wide arterials, expressways, and complex intersections as barriers to pedestrian and bicyclist safety and proposes collaborative efforts between communities, service providers, and IDOT to improve infrastructure.

DuPage County Local Road Safety Plan (2021)

As fatalities and serious injuries have trended downwards in DuPage County since 2014, it remains among the top 30 counties in the state with the highest number of severe crashes. To address this issue, the *DuPage County Local Road Safety Plan* (LRSP) brought together key stakeholders to identify safety-oriented projects linked to factors contributing to severe crashes. The plan includes a system-wide safety analysis, priority emphasis areas, analysis of distinct crash types according to each emphasis area, low-cost safety treatments, and potential project locations for interventions to be deployed.

The LRSP outlines five key emphasis areas drawn from the larger list in IDOT's SHSP, including intersections, aggressive driving/speeding, older drivers, pedestrians, and pedalcyclists. The plan outlines proven strategies for each emphasis area, utilizing a framework that integrates the Four Es of Traffic Safety: engineering, enforcement, education, and emergency services. The LRSP identifies 55 miles of roadway segments and 113 intersections as potential safety improvement candidates. The plan's ultimate vision is to continuously improve safety systems, reduce fatal and serious injuries, and work towards zero deaths on local roads in DuPage County.

Table 2 summarizes the four LRSP emphasis areas, with associated goals and objectives. Two of the four emphasis areas in the LRSP, bicycle and pedestrian safety and speeding and aggressive driving align with the statewide emphasis areas defined in the SHSP.

Table 2: DuPage 2021 Local Road Safety Plan Emphasis Areas, Goals, and Objectives

Emphasis Area	Goal	Objectives
Intersections	Reduce/eliminate high severity crash types including turn, angle, and head on crashes at intersections	Monitor locations with sustained frequency of high severity crashes and evaluate intersections with high probability of future crashes
		Perform safety assessments at intersections with sustained incidence
		Identify effective countermeasures to reduce or eliminate risk and implement improvements
Bicycle and Pedestrian Safety	Ensure safety of all non-motorized transportation system users	Assess non-motorized movements and evaluate potential conflict locations
		Attain compliance with current ADA standards regarding the pedestrian environment and coordinate LRSP with established ADA Transition Plans
		Enhance pedestrian and bicycle facilities (i.e., crossings and on road facilities) with warning devices and user assists that clearly separate and prioritize non-motorized user safety
Speeding and Aggressive Drivers	Reduce speeding and aggressive behaviors that place all transportation system users at risk	Locate areas with speeding and aggressive driving clusters and assess causes
		Evaluate high severity crash risk and possible countermeasures
		Design regulatory and enforcement responses to curtail aggressive behavior and address compliance
Older Drivers	Determine locations and conditions where older drivers and non-motorized users may have difficulty safely navigating the transportation system and provide system enhancements that afford greater security	Communicate with senior users and representatives to determine their concerns regarding transportation systems
		Determine locations and network features that present confusion and risk to seniors and examine/implement improvements that provide clear guidance and consistency
		Implement senior driver and user advisory systems and encourage local information and messaging

DuPage County Long Range Transportation Plan (2021)

The *Long Range Transportation Plan* (LRTP) sets the stage for transportation infrastructure investments between 2021 and 2040, facilitating a countywide, cooperative planning process. The LRTP includes an analysis of existing travel trends and assets, projected future conditions, needs, and fiscal resources. The LRTP structure investments around five goals informed by public and stakeholder engagement, national, regional, and state goals, the *DuPage County Strategic Plan*, and other local plans: Improve Safety, Provide Mobility Choice, Efficient Operations and Maintenance, Promote Access to Opportunity and Increase Economic Vitality, and Foster Sustainability and Resilience.

Improve Safety is the first goal area in the LRTP with a vision to "improve safety on the transportation system across all modes for motorized and non-motorized users. This includes maintaining a state of good repair through continual evaluation and timely repair." The safety goal is supported by four objectives:

- Ensure a state of good repair for transportation infrastructure
- Reduce roadway incidents involving passenger and freight vehicles and non-motorized users
- Incorporate safety considerations in all transportation plans and design elements, both non- and motorized users
- Evaluate and prioritize projects that maximize safety benefit

The LRTP emphasizes that safety is DuPage County's highest priority and stresses the importance of state of good repair, with emphasis on bridges. The LRTP also references the LRSP and the importance of achieving ADA compliance for the safety of all road users. Accordingly, performance measures for the plan include pavement and bridges rated in fair to excellent condition, curb ramps upgraded to ADA standards, fatal and injury crash trends including breakouts for bicyclists and pedestrians, traffic signals modernized or repaired, and number of improvements at high crash locations.

DuPage County ADA Transition Plan (2020)

The DuPage County ADA Transition Plan, developed by DuDOT, seeks to ensure accessibility for all individuals, particularly people with disabilities, across its transportation infrastructure. The plan focuses on compliance with the Americans with Disabilities Act (ADA) and the Public Right of Way Accessibility Guidelines (PROWAG), addressing barriers in the county's 200-mile pedestrian network that includes sidewalks, curb ramps, and signalized intersections. It establishes a comprehensive framework for self-evaluation, public engagement, and an actionable strategy to improve accessibility within DuDOT rights-of-way and on the DuPage County Campus.

This plan prioritizes barrier removal and infrastructure upgrades that directly benefit vulnerable road users, such as individuals with disabilities, older adults, and children. By incorporating ADA standards into maintenance, capital programming, and permitting processes, DuDOT seeks to create a safer, more inclusive pedestrian environment. The plan also aligns with broader county goals of enhancing multimodal transportation, supporting economic self-sufficiency, and improving access to community services. Through public input, designated ADA coordinators, and a transparent self-evaluation and monitoring process, DuDOT will chart its progress toward a fully accessible transportation system that improves mobility for all.

Elgin O'Hare Regional Bicycle and Pedestrian Plan (2017)

The plan, prepared for DuPage County and CMAP, covers an approximately 70-square mile region near O'Hare Airport inclusive of 10 communities in DuPage and Cook Counties. The plan seeks to provide a vision and framework for multimodal connections along and across the Elgin-O'Hare Expressway, one of the biggest transportation network changes in decades. The core principles of the plan are as follows: Elgin O'Hare Western Access/IL 390 and I-355/I-290 will not be barriers to non-motorized travel and the plan will be multi-jurisdictional.

Applying low-stress bike- and pedestrian-friendly infrastructure to the existing street network and expanding the off-street network are the chief foci of the plan's recommended improvements. Low-stress facilities include sidepaths, separated bike lanes, and intersection improvements. The plan recommends 79 miles of multi-use paths, 22 miles of separated bike lanes, 21 miles of bike lanes, 16 miles of neighborhood greenways, 10 miles of shared lane markings, seven miles of wayfinding, traffic calming and/or streetscaping, and 4 miles of trails. The plan also includes programmatic and policy goals including commercial driver education and commuter education, pedestrian and bicycle counts in high crash areas, and Complete Street policies.

Local Plans

The project team obtained several ongoing or recently completed local plans relevant to the safety action plan. Many, but not all, municipalities in DuPage County have completed an active transportation plan. This is discussed in more detail in the Policy and Process Assessment.

Glendale Heights Bicycle & Pedestrian Plan (2024)

The *Glendale Heights Bicycle and Pedestrian Plan*, developed by the Village in partnership with CMAP, aims to create complete, connected, and safe networks for walking and biking in Glendale Heights, IL. The plan includes recommendations for bikeways, pedestrian networks, intersections, and crossings to improve safety, access, and connectivity. The plan recommends traffic calming measures, policies and programs to support walking and biking (such as Safe Routes to School), and funding and maintenance strategies to guide implementation toward a safer, more comfortable walking and bicycling experience for all residents.

One of the key aspects of the plan is the development of a future bike network, which includes adding or enhancing 28 miles of bikeways across the Village. The primary routes identified as Tier 1 facilities include shared use paths along Fullerton Avenue and Mill Pond Drive/Exchange Boulevard/Windy Point Drive, a separated bike facility along President Street, and a greenway along Belden Avenue. In addition to these bikeway recommendations, the plan addresses pedestrian infrastructure by identifying and prioritizing sidewalk gaps, especially along corridors with high pedestrian activity and at intersections and crossings near parks and schools. Project locations are prioritized based on community input, analysis of access to important destinations, and evaluation of barriers and crash hot spots. Together, the strategies and projects identified in the plan set the stage for a more walkable and bikeable Glendale Heights and align the Village with CMAP's principles of inclusive growth, resilience, and prioritized investment.

Bensenville Active Transportation Plan (2016)

The *Bensenville Active Transportation Plan* outlines a series of strategies and actions to promote active mobility options among the Village's residents. The plan encompasses various elements to enhance mobility options and improve access to local destinations. The planning process involved a six-month period of community engagement and input gathering to determine priority areas for improvement and identify major themes to guide implementation. Specific projects include the recently completed streetscape project on Irving Park Road, which has created a more pedestrian-friendly environment, and the development of a shared-use path on Church Road to improve bicycle and pedestrian connectivity. The *Bensenville Active Transportation Plan* seeks to build on this momentum and establish a robust network of streets and trails to complement these recent successes by identifying future infrastructure improvements, developing supportive policy frameworks (such as defining snow-removal responsibilities and establishing bicycle parking ordinances), and clarifying funding sources. By improving local active transportation options, Bensenville aims to help residents improve their quality of life and enable them to access local regional destinations on foot or by bike.

Policy and Process Assessment

Policy affects DuPage County's ability to reach traffic safety goals at nearly all levels. Internal municipal processes, municipal and County ordinances, control and management of right-of-way, and County and IDOT design policies shape how safety projects and programs are delivered and the safety countermeasures available to the County and municipalities alike.

This assessment focuses on the areas that DuPage County and municipalities within the county have authority over: ordinances, typical practices, standard operating procedures, and engineering guidelines, among others. The project team, however, recognizes that responsibility for creating a safe system is shared more broadly and that policies outside of the direct purview of DuPage County should be assessed. This is especially applicable as certain external policies, such as IDOT design guidelines, have local impacts and in fact influence the policy decisions of local agencies. The Safety Action Plan ultimately recommends strategies and actions incorporating improvements to traffic safety policy within the county going forward.

Assessment Process

To assess policy across levels of government, the project team reviewed documentation of existing local traffic safety policies, conducted targeted conversations with County and municipal staff, and collected input from an online survey.

Existing Surveys and Policy Inventories

The project team reviewed CMAP resources, including municipal surveys and inventories of key policies and plans, to understand the state of the practice and municipal policy priorities and sentiments within the boundaries of DuPage County. To guide its Local Technical Assistance (LTA) program and other activities, CMAP conducts a biennial survey sent to the 284 communities within the region. The project team also reviewed the *Chicagoland Bike Walk Policy & Plan Tracker*,[v] which catalogues existing Complete Streets and active transportation plans in Illinois, developed by the Active Transportation Alliance on behalf of CMAP.[vi] The project team drew on the 2022 edition of the survey.

Safety Action Plan Municipal Safety Policy Survey

The project team created an online survey about safety practices and policy needs, which DuPage County staff distributed through the DuPage Mayors and Mangers Conference (DMMC). A total of nine municipalities submitted responses. Respondents were asked to share information about existing guidance they rely on to make decisions about safe street design, barriers to achieving safe streets, and areas where they could use additional guidance.

All respondents were engineers or public works directors. While the respondents are well-qualified people in the municipalities to answer questions about the street design process and barriers, the shared background of the people filling out the survey limits the perspectives gathered.

Interviews

Project staff conducted three interviews with municipal engineering staff to gather additional details and context not captured in the survey. In addition, the project team held an interview with County transportation staff to better understand the safety policy landscape in DuPage County, including past and ongoing policy efforts and known gaps, barriers, and opportunities.

Assessment Findings

The following section catalogs the topics and themes that surfaced in the policy review. Major policy issues and opportunities that municipal and County staff raised in taking a Safe System Approach to traffic safety fell into several categories: Complete Streets and active transportation plans, speed management, jurisdiction and ownership, crash data, and design guidance.

Complete Streets and Active Transportation Plans

Many streets and roads across northeastern Illinois and in DuPage County were designed primarily to meet the needs of motorists and to facilitate their mobility. In areas outside of traditional downtowns and more urban contexts, the built environment largely lacks safe, accessible, connected, and convenient facilities for walking, rolling, and biking. While contemporary transportation planners, engineers, elected officials, and policymakers recognize the importance of designing systems that work for all users, changes to policies and practices are still underway. Designing safe streets for people outside of vehicles will continue to require intentional and consistent commitment, echoed in many recent plans completed by the County and DuPage municipalities. Creating truly multimodal networks also requires overcoming past land use decisions and permitting and regulatory challenges. Complete Streets policies and active transportation plans are key tools in delivering these safe networks for all users.

DuPage County has historically been a leader in Complete Streets, adopting its first county-level Complete Streets policy in 2004 (known as the Healthy Roads Initiative) and its first Regional Bike Plan in 1984. The policy was updated in 2008, and its first Trails Plan was completed in 2024. Other work, including an updated Active Transportation plan for the county, is ongoing.

Within DuPage County, the County government and 19 municipalities have existing Complete Streets policies (see Table 3) based on information collected through the *Chicagoland Policy Tracker*. Four communities have active transportation plans but don't yet have Complete Streets policies. Several municipalities that overlap with areas of persistent poverty in DuPage County currently lack Complete Streets policies. The institutionalization and impact of existing policies varies, as some municipalities have adopted a minimal Complete Street policy largely to meet funding requirements.

In pursuit of safe and complete networks that meet the needs of people of all ages and abilities, practitioners have significantly improved the state of the Complete Streets practice since the early 2000s. Organizations like Smart Growth America have tracked these changes and incorporated them into their Complete Streets policy ratings.[vii] Revisiting and refreshing older policies may be beneficial. Tools like Complete Streets Design Guides, Action Plans, and Checklists are also critical to moving a policy into consistent implementation across planning, design, operations, and maintenance. Assessing policies for updates on a regular schedule, no greater than ten years, embodies the principle of continuous improvement central to the Safe System approach.

Table 3: Municipal Complete Streets Policies and Active Transportation Plans

Municipality	Complete Streets Policy or Plan		Active Transportation Plan	
Addison	No	N/A	No	N/A
Aurora	Complete Streets Policy	2020	City of Aurora Bicycle & Pedestrian Plan	2009
Bartlett	Complete Streets Policy (p. 35)	2017	Bartlett & Streamwood Bicycle and Pedestrian Plan	2022
Batavia	Complete Streets Policy	2020	City of Batavia Bike and Pedestrian Plan	2023
Bensenville	Complete Streets Policy	2016	Bensenville Active Transportation Plan	2016
Bloomingdale	Complete Streets Policy	2020	No	N/A
Bolingbrook	No	N/A	No	N/A
Burr Ridge	No	N/A	No	N/A
Carol Stream	No	N/A	No	N/A
Clarendon Hills	No	N/A	No	N/A
Darien	No	N/A	No	N/A
Downers Grove	No	N/A	Village of Downers Grove Bicycle and Pedestrian Plan	2013
Elk Grove	Complete Streets Policy	2019	Elk Grove Village Bicycle Plan	2022
Elmhurst	No	N/A	City of Elmhurst Bicycle & Pedestrian Plan	2020
Glen Ellyn	Complete Streets Policy	2019	Move Glen Ellyn Active Transportation Plan	2014
Glendale Heights	Yes	2020	Glendale Heights Bicycle & Pedestrian Plan	*Anticipated 2024*
Hanover Park	Hanover Park Comprehensive Plan Update	2010	No	N/A

Municipality	Complete Streets Policy or Plan		Active Transportation Plan	
	(p. 68)			
Hinsdale	No	N/A	No	N/A
Itasca	No	N/A	No	N/A
Lemont	Complete Streets Policy	2011	Lemont Active Transportation Plan	2012
Lisle	No	N/A	Lisle Bicycle & Pedestrian Plan	2020
Lombard	Complete Streets Policy	2014	Lombard Village-wide Bicycle and Pedestrian Master Plan	2016
Naperville	Complete Streets Policy	2019	No	N/A
Oak Brook	No	N/A	No	N/A
Oakbrook Terrace	No	N/A	No	N/A
Roselle	No	N/A	No	N/A
Schaumburg	Complete Streets Policy	2018	Schaumburg Bikeways Plan	1999
St. Charles	City of St. Charles Comprehensive Plan – Ch. 7: Transportation Plan (p. 71)	2013	No	N/A
Villa Park	Complete Streets Policy	2020	Villa Park Bicycle & Pedestrian Master Plan	2018
Warrenville	Complete Streets Policy	2019	City of Warrenville Bikeway Implementation Plan	2008
Wayne	No	N/A	Bicycle Plan for Wayne Township	2015
West Chicago	No	N/A	No	N/A
Westmont	No	N/A	No	N/A
Wheaton	Complete Streets Policy	2021	Wheaton Bicycle Plan	2011
Willowbrook	No	N/A	No	N/A
Winfield	Complete Streets Policy	2016	Bicycle Plan Winfield	2014
Wood Dale	Wood Dale Comprehensive Plan (p. 83)	2018	No	N/A
Woodridge	No	N/A	No	N/A

Source: Metropolitan Planning Council Bike Ped Database

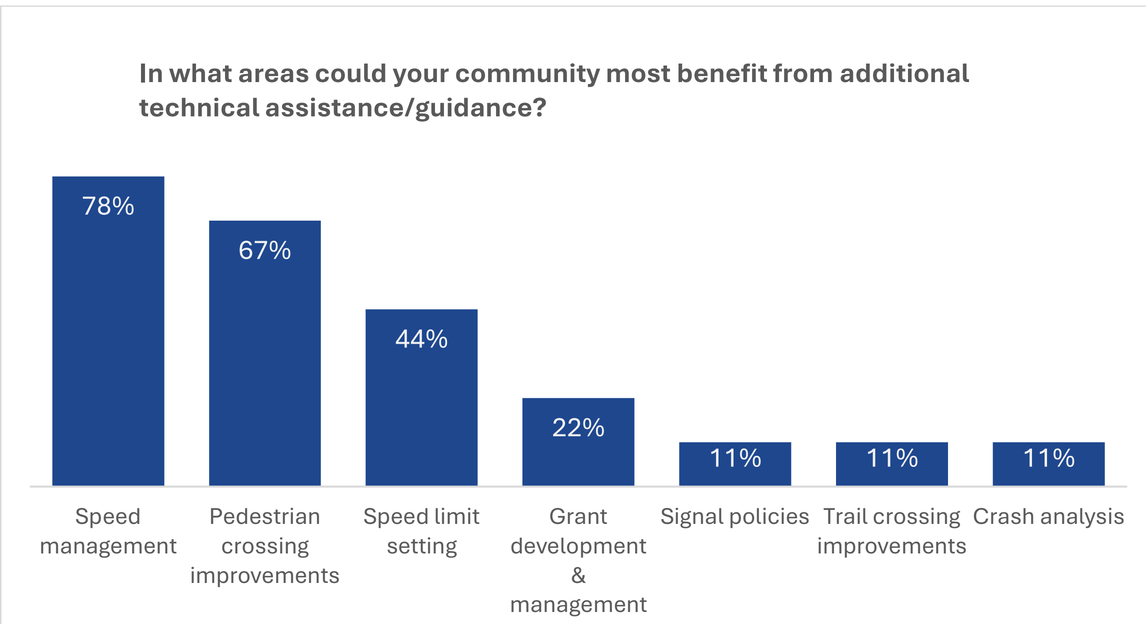
Note: The City of Chicago was removed from this list, as only unpopulated portions of O'Hare International Airport lie within the DuPage County boundary.

Speed Management

High speeds are a persistent issue at both the municipal and county level on streets across jurisdictions. As noted later in this section, speed is a leading contributor to crashes resulting in death or serious injury in DuPage County and are a priority emphasis area in the 2021 LRSP. To assess the state of speed management policy in DuPage County, transportation and safety professionals at multiple levels of government were surveyed about their current practices and technical needs.

Speed management strategies and speed limit setting guidance were two of the most requested areas for potential technical guidance in the SAP municipal survey responses, as shown in Figure 3. This finding is also supported by the results of the CMAP municipal survey, where most municipalities reported considering speeding as a high priority, with all but five considering speed management at least a low priority.

Figure 3: Municipal Technical Assistance Needs



The results of the biennial CMAP survey also indicate that many municipalities are concerned about speeding but do not connect it with Complete Streets policies and infrastructure; while most considered speeding an issue, many municipalities have yet to discuss Complete Streets policies. Municipal and County staff who participated in policy interviews noted that lowering or adjusting posted speeds should be paired with infrastructure changes that provide environmental cues to drivers to slow down.

The Illinois Vehicle Code allows municipalities to alter speed limits on local roadways based on an engineering or traffic investigation. Special speed limit zones around schools can also be established through proper signage. Opportunities for speed limit reductions are increasing as the 11th edition of the *Manual of Uniform Traffic Control Devices* (MUTCD) de-emphasizes speed limit setting based on prevailing speeds in favor of a context-sensitive approach that accounts for land use, crash history, and other factors. County and some local practitioners are awaiting IDOT to reflect these changes in their Policy on Establishing and Posting Speed Limits on the State Highway System,[viii] which models the way for many practitioners in lieu of an alternate available procedure.

Municipalities in DuPage County are taking action to set speed limits that are safe for all roadway users and consistent with residents' desires for high quality of life. In 2018, Wheaton lowered the speed limit for residential neighborhoods to 25 mph via a City Council vote. The speed limit was lowered based on a traffic study conducted by an engineering firm. Signage on the affected streets was updated, and messaging on the change was disseminated via yard signs and electronic message boards.

Several municipalities have utilized traffic calming on residential streets, predominantly using speed humps. The City of Naperville has adopted a *Traffic Calming Toolkit* that is known to safety practitioners throughout the county.[ix] City staff shared concerns about expanding traffic calming tools, especially those that utilized vertical deflection, out of concern for impacts on emergency responders.

Illinois law currently limits the use of automated safety enforcement to specific locations near parks and schools within the City of Chicago and in work zones by IDOT and the Illinois Tollway.[x,xi] In interviews with municipal and County staff, they noted that this nearly statewide prohibition renders this proven tool inaccessible and shuts down any conversations about its benefits. State law also limits the use of variable, time-of-day, speed limits. Both tools are included in FHWA's *Proven Safety Countermeasures* and are enabled in multiple states.[xii]

Jurisdiction and Funding Requirements

Many roads in DuPage County with safety concerns fall outside of local or County jurisdiction. Addressing safety issues at these locations requires substantial coordination across jurisdictions and/or does not have clear solutions. For instance, many roads and intersections are constructed to accommodate the largest vehicles and mitigate congestion, tackling these locations will require a different approach to balance safety with these current priorities. Many respondents to CMAP's municipal survey indicated that resources supporting cross-jurisdictional coordination are needed.

Intersections where state-jurisdiction roads meet municipal or County roads can prove particularly challenging for funding and design. Highway Safety Improvement Program (HSIP)-Local (HSIP-L) is the main engine for moderate-sized safety projects in DuPage County. If the County or municipalities want to address a multi-jurisdictional intersection through an HSIP-funded project, they are typically only able to modify the local legs of the intersection unless they partner with IDOT, which has a separate funding allocation for HSIP projects on state routes (HSIP-S). Joint funding applications like this are rare, per staff knowledge. Based on the safety history of multi-jurisdictional intersections, these coordination challenges are concerning gaps. Other opportunities for coordinated improvements, like the STP-Shared Fund also exist and can be leveraged for future safety improvements.

Barriers exist to expanding the sidewalk network in DuPage County. While 2021 Illinois State legislation removed the local match requirement for walking and biking infrastructure on state roads, unincorporated areas fall through the cracks per County staff feedback.

Survey respondents noted challenges associated with delivering projects that utilize state and federal funds. Given the built-out nature of roadway rights-of-way in DuPage County and constrained staffing at multiple levels of government, project development timelines for many projects continue to increase. With the extended durations for coordination, reviews, permitting, design, and land acquisition, many local agencies struggle to establish and control their project budgets and timelines.

Crash Data

The format in which traffic crash data are disseminated to the County and municipalities is difficult to navigate, making incorporating safety in day-to-day work a challenge. This sentiment was shared across jurisdictions. Respondents would particularly benefit from tools that enable staff to quickly access and view crash narratives and diagrams and to assess crash patterns at the project level. These concerns were also reflected in the CMAP municipal survey, where improved access to crash data was one of the top three resources requested.

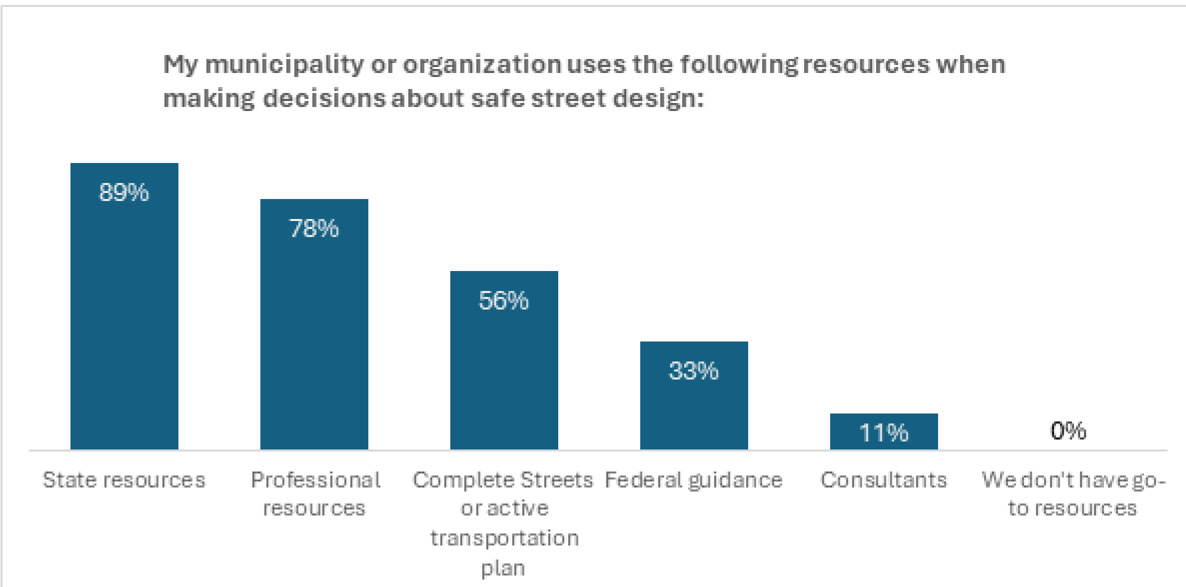
DuPage County has hosted a user-friendly online traffic crash system that allows all local agencies access to the latest crash data and system information. This online portal allows anyone to analyze localized as well as system-wide issues.

Design Guidance

There are existing and well-documented procedures, guidelines, and staff roles as part of the State and County funding processes. Many municipalities feel comfortable navigating these processes as part of their regular work. At the same time, state and federal funding requirements and timelines often impact the ability of local agencies to deliver safety projects on the schedule desired by stakeholders.

The extent to which these traffic safety infrastructure interventions are implemented on local streets in the county varies widely based on available budget, staff resources, and level of public interest and priority. In the CMAP municipal survey, respondents expressed the most interest in resources for identifying gaps in the roadway network for vulnerable road users. SAP municipal survey respondents expressed that they have access to safe streets design resources, with nearly all municipalities relying on State resources like IDOT's Bureau of Design and Environment (BDE) and Bureau of Local Roads and Streets (BLRS) manuals, as displayed in Figure 4. While these resources are standards within the state and based on commonly used guides like the American Association of State Highway and Transportation Officials (AASHTO) *Policy on Geometric Design of Highways and Streets* ("Green Book"), they are oriented toward facilitating the movement of motor vehicles rather than prioritizing safe streets for all users, including vulnerable road users. Encouragement of design flexibility and adoption of context-sensitive guidance like that produced for the National Association of City Transportation Officials (NACTO) for urban areas are potential avenues for future consideration.

Figure 4: Safe Street Design Resources



Municipal engineers are also referencing professional resources like National Association of City Transportation Officials (NACTO) and Institute of Transportation Engineers (ITE) design guides, though it is unclear from the survey responses how often tools within these guides are implemented. Within the interviews, some municipal staff acknowledged that they were aware of these guides but were not actively using them for planning or design purposes in their community or were not sure how they would apply within their community. Based on interview feedback, communities in DuPage may be slower to implement emerging safety countermeasures due to hesitations with being the "first-mover." Municipalities are interested in tools like leading pedestrian intervals (LPIs), for example, but are concerned with coordinating across corridors and jurisdictional boundaries or only applying them in limited locations.

The county and municipalities have expressed a need for clearer guidance on how to handle conflicting policies or compliance with updated state and federal requirements and guidelines that impact traffic safety. Lack of clarity about how to mitigate perceived legal liability or adjust longstanding operational practices has sometimes caused municipalities to forgo safety upgrades. For example, some have chosen to abandon lighting improvements due to concerns about conflicts with voluntary requirements like Dark Sky compliance. Others have avoided replacing markings and signage in line with minimum retroreflectivity standards published in 2022 due to uncertainty about how they would impact winter maintenance practices.

Identified Gaps, Barriers, and Opportunities

The project team identified gaps and barriers in current policies and processes, and opportunities through the interviews conducted with County staff and through the SAP municipal survey. Gaps include a lack of policies, guidance, standards, ordinances or other laws; vague or incomplete policies; or a lack of defined responsibilities that hinder the ability of implementers to make decisions. Barriers include explicit written policies, authorities, or political arrangements that expressly inhibit the ability of safety professionals to implement the projects and programs they believe are best practice. Opportunities are other areas that implementers have identified that have opening for improvement. Responses are summarized in Table 4.

Table 4: Policy and Process Gaps, Barriers, and Opportunities

Gaps	• Multiple DuPage County municipalities have not adopted Complete Streets policies. • Absence of interpretation of how to accommodate updated standards or conflicting policies can lead to inaction out of fear of noncompliance, compounded by additional costs. • Municipalities are aware of the tools available for traffic calming but do not see how the tools can be used on local roadways without unduly impacting emergency responders. • HSIP-L program funds are limited to locally-owned intersections and roadways. • Local infrastructure budgets and funding options are limited, placing high importance on state and federal programs. • Past and current policies and practices have led to sidewalk gaps where County/municipal ROW meets state ROW, resulting in incomplete networks at high-risk locations and/or locations where connectivity needs are high. • Lack of clear IDOT guidance or specific recommendations regarding pedestrian technology.

Barriers	• Automated speed enforcement is not authorized outside of municipalities with a population of 1,000,000 or more (i.e., the City of Chicago) by state law, except in work zones. • Crash narratives and diagrams are difficult to access. • Vertical traffic calming interventions face operational and weather-related challenges. • Project delivery using state and federal funds requires substantial staff resources. • Many municipalities feel limited in the action they can take on safety because larger County and State-owned roadways are perceived as the higher priority for safety improvements but outside of municipal control. • "First-mover" concerns exist around new safety countermeasures and design interventions. • Local agencies face challenges identifying sufficient funding to meet intersection lighting requirements for extended approaches and transitions. • Communities have different starting places in terms of roadway networks, land uses, and resources, resulting in varied experiences with and expectations of safety infrastructure.
Opportunities	• Encouraging the adoption of Complete Streets policies in additional municipalities. • Improving the effectiveness of existing municipal and county Complete Streets policies with the creation of a project checklist. • Creating traffic calming and / or speed management policy and toolbox county-wide to illustrate the applicability within municipalities and across roadway types. • Compiling a resource describing how to place vertical traffic calming tools and mitigate impacts on operations. • Convening a county-wide workshop for elected officials to learn about the available traffic calming tools. • Developing typical designs for trail crossing locations. • Recently adopted legislation offers counties and municipalities the opportunity to have conversations with IDOT regarding sidewalk gaps. • Adopting new local guidance for setting posted speed limits and collaborating with IDOT to align practices across the state per the 11th Edition of the MUTCD and latest best practices from FHWA. • Fatality, road safety, and walk audits to educate staff and stakeholders and develop projects. • Signage and retroreflectivity audits and replacement schedules on the high injury network (HIN) and at complex intersections/interchange through shared services. • Updates to DMMC Surface Transportation Program (STP) and STP-Shared Fund project scoring to incorporate the SAP and crashes resulting in deaths/serious injuries. • Guidance for incorporating signalization countermeasures like leading pedestrian intervals at the corridor or network level.

Severe Crash Analysis

The Safe System Approach adopted by this action plan focuses on severe crashes – those resulting in death or serious injury, also known as KSI (killed or seriously injured) or KA (fatal and incapacitating injury) – rather than taking a broad view of all crashes, including those that result only in minor injuries or property damage only. While all types of crashes may have profound effects, especially for those experiencing economic, social, or health-related insecurity, serious injuries and deaths represent outsized harms that reverberate through families and communities. The Safe System Approach also accepts that some mistakes happen because humans are not perfect actors while recognizing that tools are available to potentially lower and even prevent the risk of mistakes leading to the most serious outcomes. Therefore, the analyses in this section and throughout the ESC distinguish and emphasize those crashes that result in death or incapacitating injury separate from less severe crash outcomes, as defined by the SR 1050 crash report form KABCO scale below.

- **K, Fatality**: A fatal injury is any injury that results in death within 30 days after the motor vehicle crash in which the injury occurred. If the person did not die at the scene but died within 30 days of the motor vehicle crash in which the injury occurred, the injury classification should be changed from the attribute previously assigned the attribute "Fatal Injury."
- **A, Suspected Serious Injury:** A suspected serious injury is any injury other than fatal which results in one or more of the following:
  - Severe laceration resulting in exposure of underlying tissues/muscle/organs or resulting in significant loss of blood
  - Broken or distorted extremity (arm or leg)
  - Crush injuries
  - Suspected skull, chest or abdominal injury other than bruises or minor lacerations
  - Significant burns (second and third degree burns over 10% or more of the body)
  - Unconsciousness when taken from the crash scene
  - Paralysis
- **B, Suspected Minor Injury:** A minor injury is any injury that is evident at the scene of the crash, other than fatal or serious injuries. Examples include lump on the head, abrasions, minor lacerations (cuts on the skin surface with minimal bleeding and no exposure of deeper tissue/muscle),
- **C, Possible Injury**: A possible injury is any injury reported or claimed which is not a fatal, suspected serious, or suspected minor injury. Examples include momentary loss of consciousness, claim of injury, limping, or complaint of pain or nausea. Possible injuries are

those that are reported by the person or are indicated by his/her behavior, but no wounds or injuries are readily evident.

- **0, No Apparent Injury/Property Damage Only (PDO):** No apparent injury is a situation where there is no reason to believe that the person received any bodily harm from the motor vehicle crash. There is no physical evidence of injury and the person does not report any change in normal function.

The analysis presented in this section is based on the DuPage County IDOT crash extract prepared by CMAP for the years 2018-2022 and includes all reported crashes within DuPage County's borders including those that occurred on interstates. This differs slightly from approaches taken in other sections. By using the county boundary, IDOT data can be more readily compared with data from other sources, resulting in a more comparable analysis.

Long Range Severe Crash Trends – 2008 to 2022

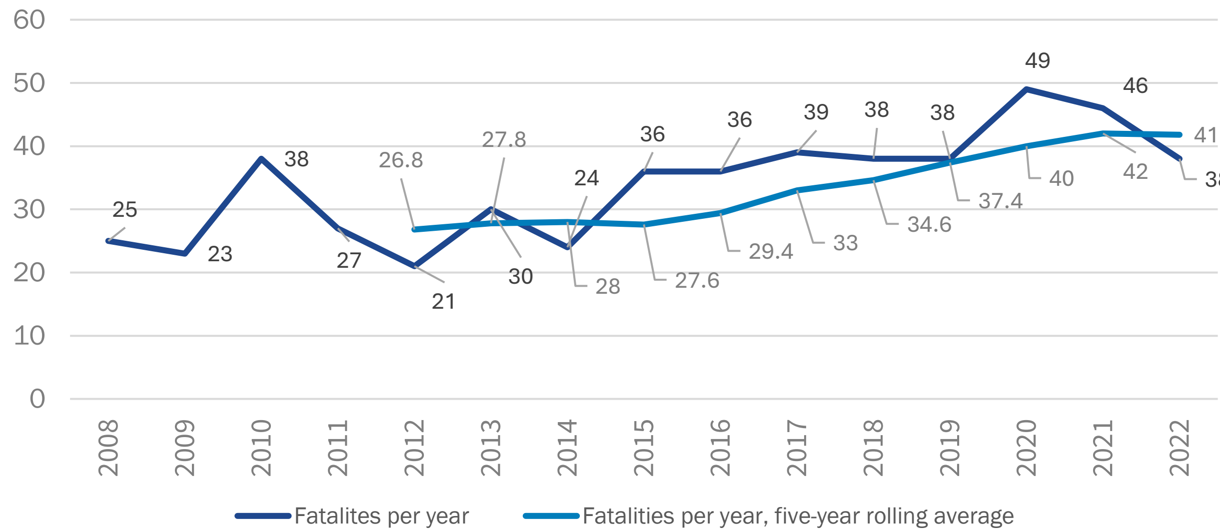
Fatalities

The National Highway Traffic Safety Administration (NHTSA) Fatality Analysis and Reporting System (FARS) is the nation's authoritative resource for fatal crash statistics. The FARS Fatality and Injury Reporting System Tool (FIRST) provides fatality data back to 2008, marking the longest time horizon for readily available fatality data comparable across county, state, and national geographies. this does not extend to serious injury data, which are not available from FARS. Analysis inclusive of crashes resulting in deaths and serious injuries is presented in the following sections for the most recent period available from IDOT at the time of writing.

All Users

In the 15 years from 2008 to 2022, 508 people died in crashes in DuPage County. As shown in Figure 5, the annual number of fatalities increased over this period, from 25 in 2008 to 38 in 2022. When transformed to a 5-year rolling average to account for year-to-year variation, the 5-year annual average increased 56% from 26.8 fatalities/year between 2008 and 2012 to 41.8 between 2018 and 2022. Large increases in total fatalities occurred between 2014 and 2015, and again between 2019 and 2020. In the most recent years, fatalities have begun to come down from the 2020 high of 49 people killed in traffic crashes in DuPage County.

Figure 5: DuPage County Fatalities, 2008-2022



Source: NHTSA, FIRST

The change in the five-year rolling fatality average from the period 2018-2022 is driven primarily by the increase in fatalities on non-interstate roadways. Over the 15-year period from 2008 to 2022, of the 508 fatalities, 99 occurred on interstates (19%), 408 occurred on non-interstates (80%), and one was marked as unknown (< 1%). Over this period, fatalities on interstates increased from 4.6 per year on average between 2008 and 2012 to 9.2 per year between 2018 and 2022, representing a 100% increase. Fatalities on non-interstates rose from 22 between 2008 and 2012 to 32.6 between 2018 and 2022, representing a 48% increase. While the increase on interstates was relatively higher, the small number of interstate fatalities is subject to greater variability. The bulk of the increase between the two periods resides primarily within non-interstate fatalities (10.6 per year on average increase).

The magnitude of the change in the five-year rolling average at the beginning and end of the period of analysis may be influenced by the historic fatality lows seen nationally and in Illinois following the Great Recession of 2008 and the surge in traffic fatalities following the onset of the Covid-19 pandemic in 2020. The increase in DuPage County's five-year rolling fatality average considerably outpaced the Illinois state average and the national average over the 15-year period, as shown in Table 5. Since the number of fatalities in DuPage County is comparatively low to the state and national averages, the size of the change is more sensitive to random variation or crashes resulting in multiple fatalities. The use of a five-year rolling average reduces this sensitivity.

Table 5: Change in 5-year Rolling Fatality Averages, DuPage, Illinois, and US

	5-Year Rolling Fatality Average, 2008-2012	5-Year Rolling Fatality Average 2013-2017	5-Year Rolling Fatality Average, 2018-2022	% Change, 2008-2012 vs. 2018-2022
DuPage County	26.8	33.0	41.8	56%
Illinois	951.0	1,016.2	1,167.8	23%
United States	34,113.2	35,280.0	39,588.2	16%

Source: NHTSA, FIRST

When adjusted per capita, the change in annual fatalities in DuPage County between 2010 and 2020 was 27% as shown in Table 6. DuPage County is growing slowly. Between the 2010 and 2020 decennial Censuses, the county grew by 16,000 residents. Table 6Notably this change is on par with that of Illinois (differences between this finding and that in the table above are due not to changes in population, but variation due to annual averages). In both 2010 and 2020, per capita fatalities were well below Illinois and the US as a whole.

Table 6: Change in Fatality Rate Per Capita, DuPage, Illinois, and US

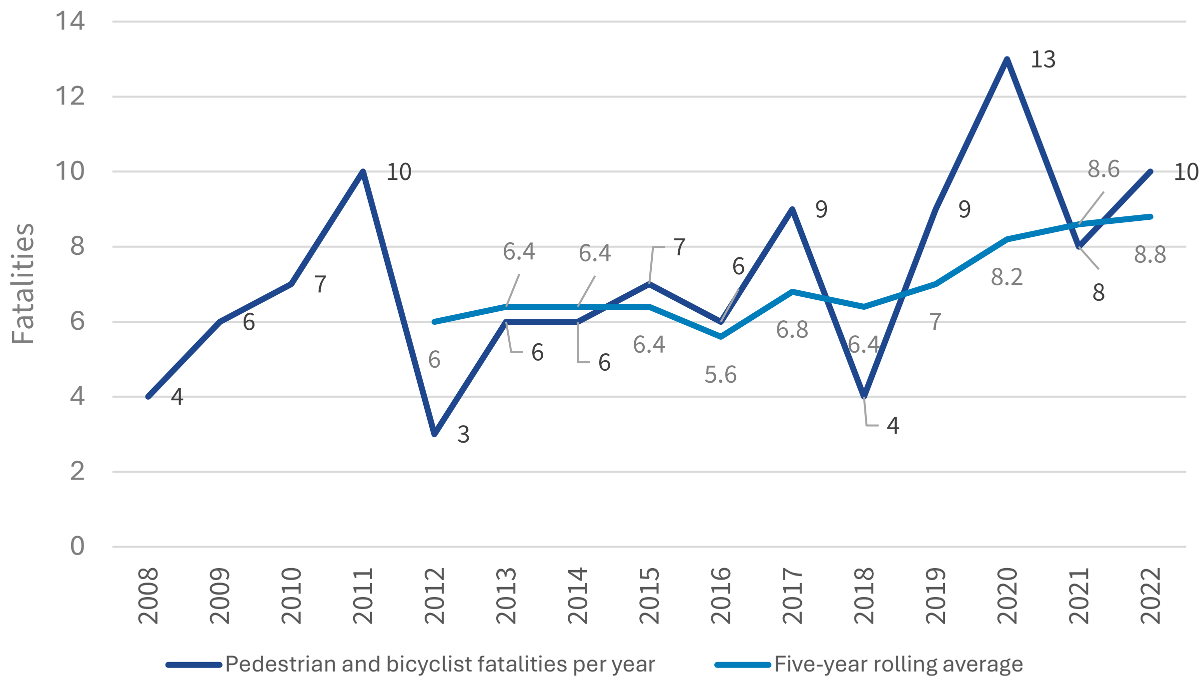
	Fatalities per 100,000 Residents, 2010	Fatalities per 100,000 Residents, 2020	% Change
DuPage County	4.14	5.25	27%
Illinois	7.22	9.31	29%
United States	10.69	11.79	10%

Source: NHTSA, FIRST; US Census Bureau

People Walking and Biking

Between 2008 and 2022, 108 people died while walking and biking in DuPage County, or 21.3% of total fatalities over the 15-year period. The annual trend and 5-year rolling average for pedestrian and bicyclist fatalities is shown in Figure 6. The 5-year rolling average from 2008-2012 to 2018-2022 increased from an average of 6 people killed while walking, rolling, or biking to 8.8, an increase of 22%. This increasing trend mirrors that in Illinois and the nation over the same period.

Figure 6: DuPage County Pedestrian and Bicyclist Fatalities, 2008-2022



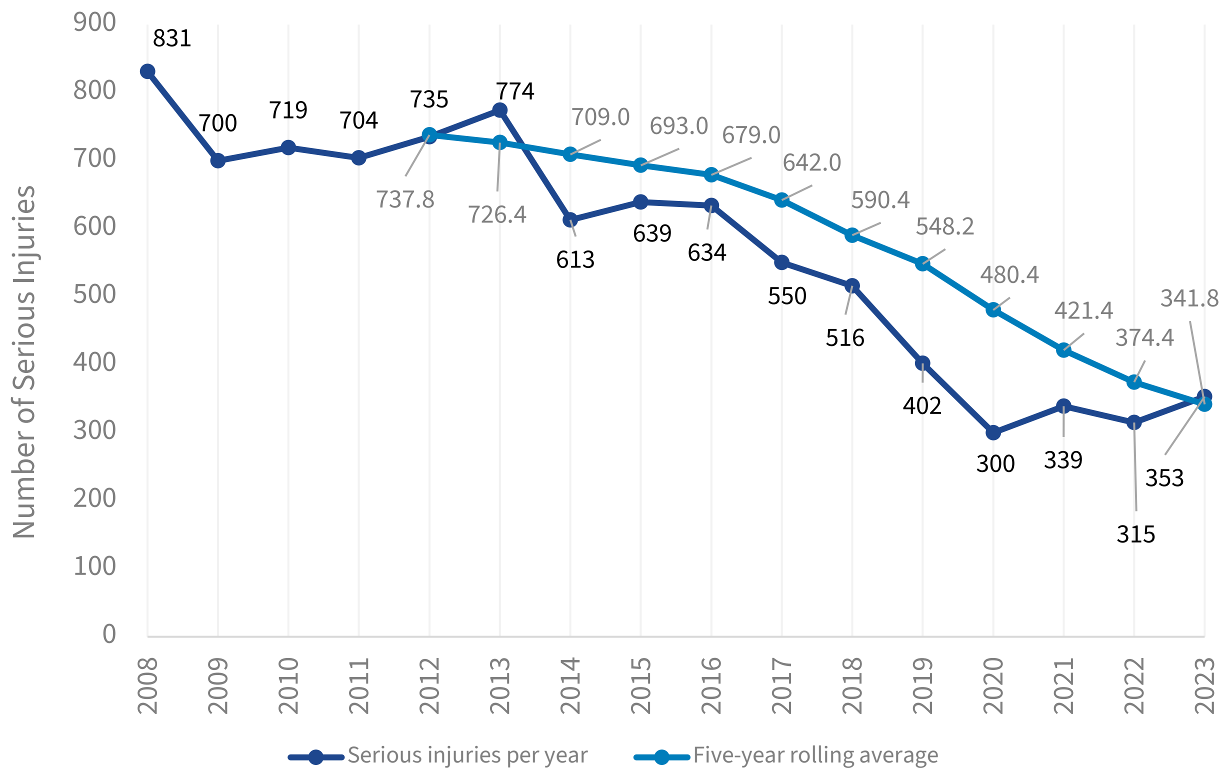
Source: NHTSA FIRST

Like the trends for all users, pedestrian and bike fatalities spiked between 2019 and 2020 with bicyclist fatalities jumping from 0 to 4 and pedestrian fatalities from 8 to 13, although both crash types have since fallen back down closer to pre-pandemic levels.

Fatalities and Serious Injuries

Late in the development of the DuPage Safety Action Plan, 15-year range of crash data spanning 2008 to 2022 became available from IDOT, enabling investigation of longer-term serious injury crash trends. The long-term trend in serious injury crashes indicates a substantial and sustained reduction, as illustrated in Figure 7.

Figure 7: DuPage County Serious Injuries, 2008-2022



Source: IDOT Crash/Occupant data set

Between 2008 and 2023, the number of serious injuries on all roadways in DuPage County fell from 831 to 353, a 58% decrease. While the trend has stalled and reversed since 2020, the long-term picture is highly encouraging. On average, there have been 32 fewer serious injuries in DuPage County, year-over-year. This downward trend significantly exceeds any increase in vehicle miles traveled, illustrating a robust improvement in safety performance.

Severe Crash Trends – 2018 to 2022

According to IDOT's historical crash database, from 2018 to 2022, there were 83,316 reported crashes across all public roadways – including interstates – in DuPage County. This includes 193 crashes resulting in at least one fatality, representing 0.2% of the total crashes, and 1,576 crashes resulting in serious injuries, accounting for 1.9% of all crashes in the county. Overall, the data indicates there were 25,999 (KABC) injuries caused by 19,185 crashes over the five-year span. The remaining 87.3% of people involved in crashes (179,259), were categorized as uninjured (0 injury), with the crash resulting in property damage only (PDO).

Table 7 summarizes the crashes by severity as well as the number of injuries sustained by people involved in those crashes; the percentage columns are rounded to the nearest tenth and may not add to exactly 100% due to rounding multiple numbers.

Table 7: DuPage County Crashes and Injuries by Severity, 2018-2022

Severity	Crashes		Injuries	
	Count	%	Count	%
K	193	0.2%	209	0.1%
A	1,576	1.9%	1,859	0.9%
B	8,317	10.0%	10,908	5.3%
C	9,099	10.9%	13,023	6.3%
0/PDO	64,131	77.0%	179,259	87.3%
KABC Subtotal	19,185	23.0%	25,999	12.7%
TOTAL	83,316	100.0%	205,258	100.0%

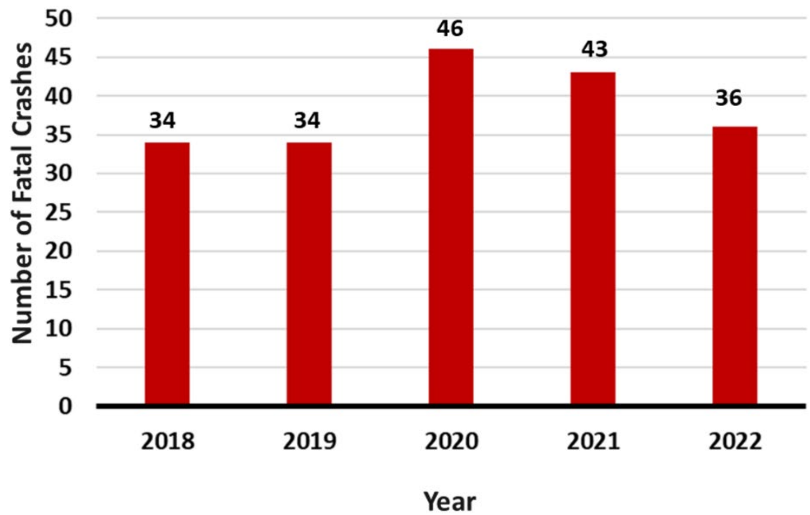
Note: crash severity is determined by the most severe outcome that occurs in a given crash

Figure 8(a) shows the number of fatal crashes in DuPage County per year from 2018 through 2022. From 2018 to 2019 the number of fatal crashes remained constant at 34 for both years. In 2020, there was an increase in fatal crashes, going from 34 in 2019 to 46 in 2020. The number of fatal crashes then decreased to 43 in 2021 and further declined to 36 in 2022.

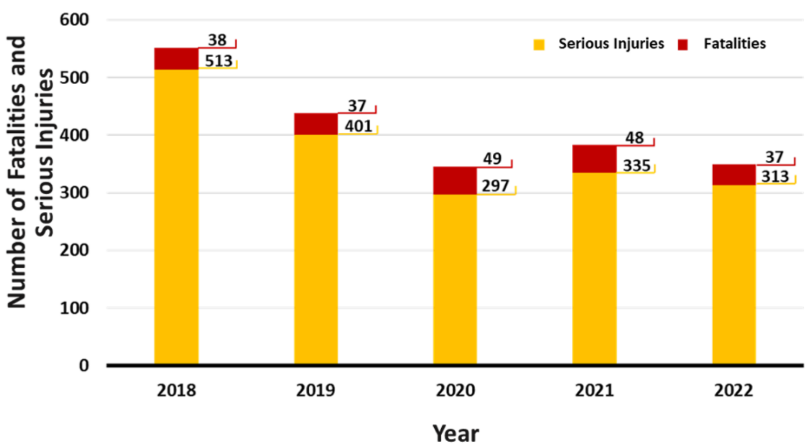
Figure 8 (b) provides a more detailed breakdown of the fatalities and serious injuries that occurred in DuPage County during the same period. Note that Figure 8(b) highlights the fatalities and serious injuries and non-fatal crashes or serious injury crashes. The yellow bars represent the number of serious injuries, while the stacked red bars indicate the number of fatalities. In 2020, while the number of fatal crashes increased, the number of fatalities also increased, but the number of serious injuries declined by roughly 25% compared to the previous year.

This divergence in 2020 suggests that although there were fewer serious injury-causing crashes, the severe crashes that occurred resulted in fatalities more often, possibly due to changes in behavior and travel patterns associated with the Covid-19 pandemic. Consequently, 2020 was an anomaly in the roadway safety trend in DuPage County, with the fewest serious injuries but the most fatalities in the five-year span.

Figure 8: DuPage County Fatal Crash, Fatality, and Serious Injury Trends, 2018-2022



(a) Total Fatal Crashes: 193



(b) Total Fatalities and Serious Injuries: 2068

The number of people killed and seriously injured in crashes in DuPage County between 2018 and 2022 differed markedly across age groups on a per-capita basis. Fatalities, serious injuries, and per capita rates by age group are presented in Table 8. Over the five-year period, the average annual fatality rate across all age groups was 4.6 per 100,000 people.[1] The average annual per capita fatality and serious injury rate was 45.0 per 100,000 people.

[1] Note that this number differs from NHTSA figures due to the difference in Census data used and time frame of analysis, due to data availability.

Table 8: DuPage County Fatalities and Serious Injuries by Age Group, 2018-2022

Age Group	Persons	Fatalities	Annual Average Fatalities/ 100,000 Persons	Serious Injuries	Fatalities and Serious Injuries	Annual Average Fatalities and Serious Injuries per 100,000 Persons
0-4	50,036	1	0.4	9	10	4.0
5-9	52,163	1	0.4	14	15	5.8
10-14	56,788	0	0.0	30	30	10.6
15-17	35,686	12	6.7	57	69	38.7
18-20	38,268	12	6.3	121	133	69.5
21-24	47,281	26	11.0	167	193	81.6
25-34	107,040	53	9.9	378	431	80.5
35-44	119,812	23	3.8	261	284	47.4
45-54	116,963	21	3.6	293	314	53.7
55-64	124,474	23	3.7	277	300	48.2
65-74	101,368	19	3.7	146	165	32.6
75-84	50,781	14	5.5	68	82	32.3
85+	18,972	5	5.3	37	42	44.3
TOTAL	**919,632**	**210**	**4.6**	**1,858**	**2,068**	**45.0**

Source: Impact DuPage, 2024

Of the 209 fatalities over the five-year period,[2] 21–24-year-olds had the highest fatality rate, at 11.0, over twice as high as the countywide baseline. Younger and older people were above average, with very young people and middle-aged adults below 4.6 per 100,000 persons. When compared, people in their teens through early thirties experienced higher fatality rates per capita than seniors.

The most-affected age groups change when serious injuries are introduced, with older and teen drivers less affected and middle-aged adults disproportionately impacted, per capita. This difference is likely shaped by the higher number of motor vehicle trips working-aged adults take. People aged 21-24, however, remain the most affected age group at 81.6 average annual fatalities and serious injuries per 100,000 people.

[2] The IDOT CRASH and PERSON data provided by CMAP differ slightly in the number of fatalities (209/210) and serious injuries (1,859/1,858), but the total number is the same across both data sets.

Crash records from FARS shed light on the disparate impact of traffic fatalities on different populations. While FARS does not include comprehensive data covering all areas of focus, race and ethnicity are recorded.

As demonstrated in Table 9, Black and Hispanic/Latino people were overrepresented in overall traffic fatalities in DuPage County and were impacted by traffic fatalities at higher rates per 100,000 residents than their peers between 2017 and 2021 (data for 2022 were not yet available at time of analysis). The fatality rate for Black residents was nearly three times as high as that of white residents (189% higher) while that of Hispanic/Latino residents was almost twice as high as that of white residents (79% higher). These disparities in traffic crash fatalities by race and ethnicity are more pronounced than that of the nation as a whole from 2015-2019, as reported by the Governors Highway Safety Association.

Table 9: DuPage County Fatalities by Race and Ethnicity, 2017-2021

	White Alone, Non-Hispanic or Latino	Black Alone	Asian Alone	Hispanic or Latino	Other Race	Unknown	Total
Fatalities 2017	20	2	3	14	0	0	39
Fatalities 2018	22	4	1	11	0	0	38
Fatalities 2019	22	3	6	7	0	0	38
Fatalities 2020	25	7	3	12	0	2	49
Fatalities 2021	23	12	1	4	1	5	46
Total Fatalities	112	28	14	48	1	7	210
Share of Fatalities	53%	13%	7%	23%	0%	3%	100%
Population	598,907	51,308	126,871	142,730	13,060	NA	932,877
Share Population	64%	6%	14%	15%	1%	NA	100%
Annual Fatalities per 100k Residents	**3.74**	**10.91**	**2.21**	**6.73**	**1.53**	NA	**4.50**

Source: NHTSA FARS, Census 2020

Severe Crash Rates

Calculating crash rates provides a high-level metric allowing one roadway network to be compared to a similar roadway network. However, comparing a largely rural county's crash rate to a largely urban county's crash rate would not necessarily result in a legitimate 'apples to apples' comparison. Annual crash rates for the entirety of DuPage County's roadway network were calculated using the segment collision rate equation provided by FHWA - this equation is provided below.[xiii] The resulting crash rate is measured per hundred million vehicle miles traveled (HMVMT), shown in Table 10.

$$KA\ Crash\ Rate, per\ HMVMT = \frac{Number\ of\ KA\ Crashes\ along\ All\ Segments * 100{,}000{,}000}{Number\ of\ Crash\ Years * County\ Segment\ Length * Segment\ AADT\ * 365}$$

Table 10: DuPage County Crash Rates by Year, 2018-2022

Year	Annual VMT*	KA Crashes	KA Crash Rate (HMVMT)	KABCO Crashes	KABCO Crash Rate (HMVMT)
2018	8,641,461,881	461	5.33	20,638	238.83
2019	8,525,783,822	380	4.46	18,859	221.20
2020	6,899,051,103	296	4.29	12,173	176.44
2021	7,417,134,898	324	4.37	15,177	204.62
2022	7,951,158,394	308	3.87	16,469	207.13
’18-‘22	39,434,590,098	1,769	4.49	83,316	211.28

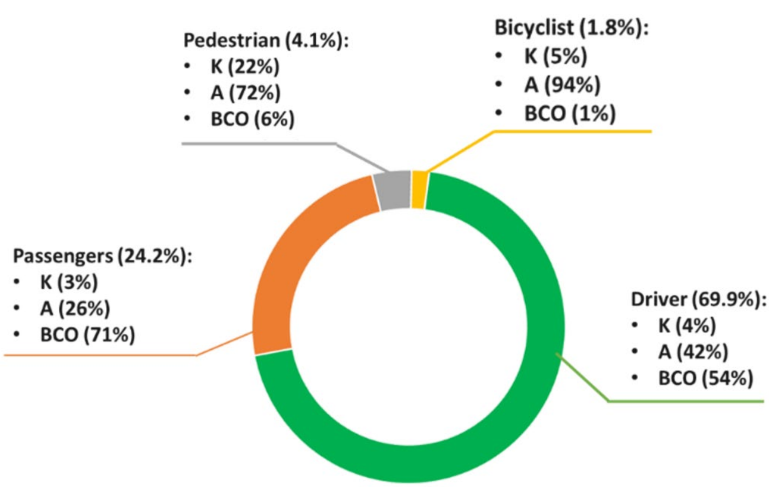
Source: 2022 Illinois Travel Statistics

Over the five-year period, the KA crash rate dropped by nearly one crash per hundred million vehicle miles traveled. This decline is largely driven by the drop in serious injury crashes over the same period.

Crash Severity by User

Figure 9 depicts the proportion of different road user types involved in crashes resulting in KA injuries, even if they did not suffer a KA injury. The pie chart shows that among all of these individuals (4,654) involved in the 1,769 KA crashes, drivers and passengers accounted for the vast majority at 94.1%, while pedestrians and bicyclists made up a combined 5.9% of those involved.

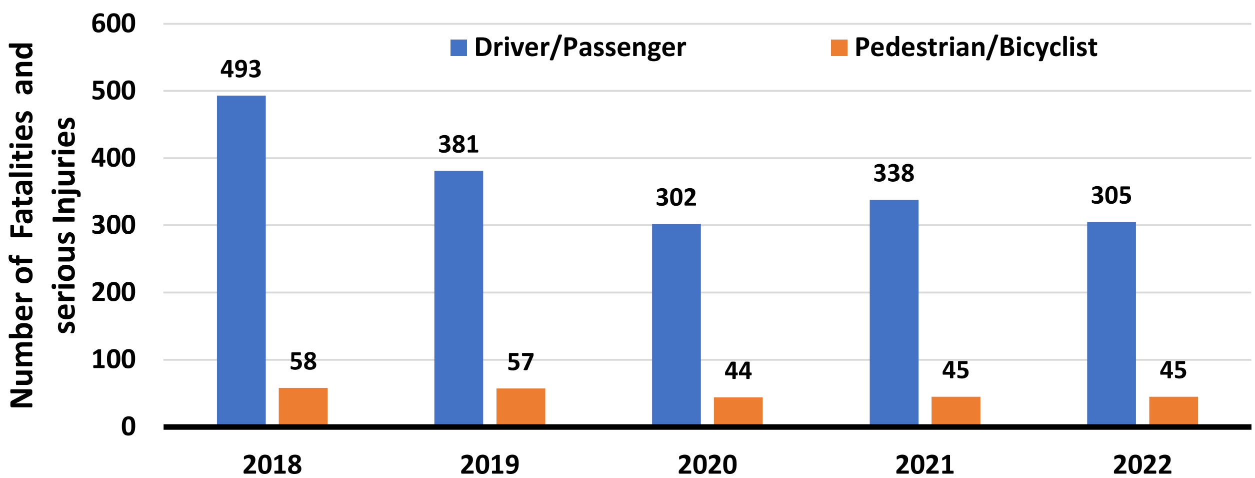
Figure 9: Crash Severity by User Type, 2018-2022



However, when examining the distribution of injuries for each of the users involved in a KA injury crash, pedestrians and bicyclists faced an extremely high risk. Almost all, 94%. of pedestrians involved in a crash sustained a KA injury. For bicyclists, 99% of crashes led to a KA injury. This highlights the disproportionate vulnerability of pedestrians and bicyclists compared to vehicle occupants when a crash occurs.

As shown in Figure 10, the number of fatalities and serious injuries for both drivers/passengers and pedestrians/bicyclists (Vulnerable Road Users, or VRU) exhibited an overall declining trend between 2018 and 2022. However, the reduction was more pronounced for drivers/passengers, with the number decreasing from 493 in 2018 to 305 in 2022, a 38% reduction In contrast, the number of VRU fatalities and serious injuries decreased from 58 in 2018 to 45 in 2022, showing a smaller percentage decline of 22%.

Figure 10: Fatalities and Serious Injuries by User Type, 2018-2022



High Crash Locations

Understanding where severe crashes occur most frequently can indicate future paths for analysis and opportunities for collaboration, assessment, and investment. Figure 11 shows the density of KA crashes throughout DuPage County. Red and orange areas of the map have a higher density of KA crashes, while the green and non-colored areas have few to no KA crashes. This map is purely a representation of severe crash density and is not normalized by population, traffic exposure, or any other metric. Figure 12 provides greater detail on KA crash locations across the county, while Figure 13 indicates the average number of KA crashes per square mile for each municipality in DuPage County. Between 2018 and 2022, Bensenville, Elmhurst, Lombard, Oakbrook Terrace, Downers Grove, Lisle, and Willowbrook had the highest average KA crashes per square mile of all DuPage municipalities.

Figure 11: KA Crash Heatmap, 2018-2022

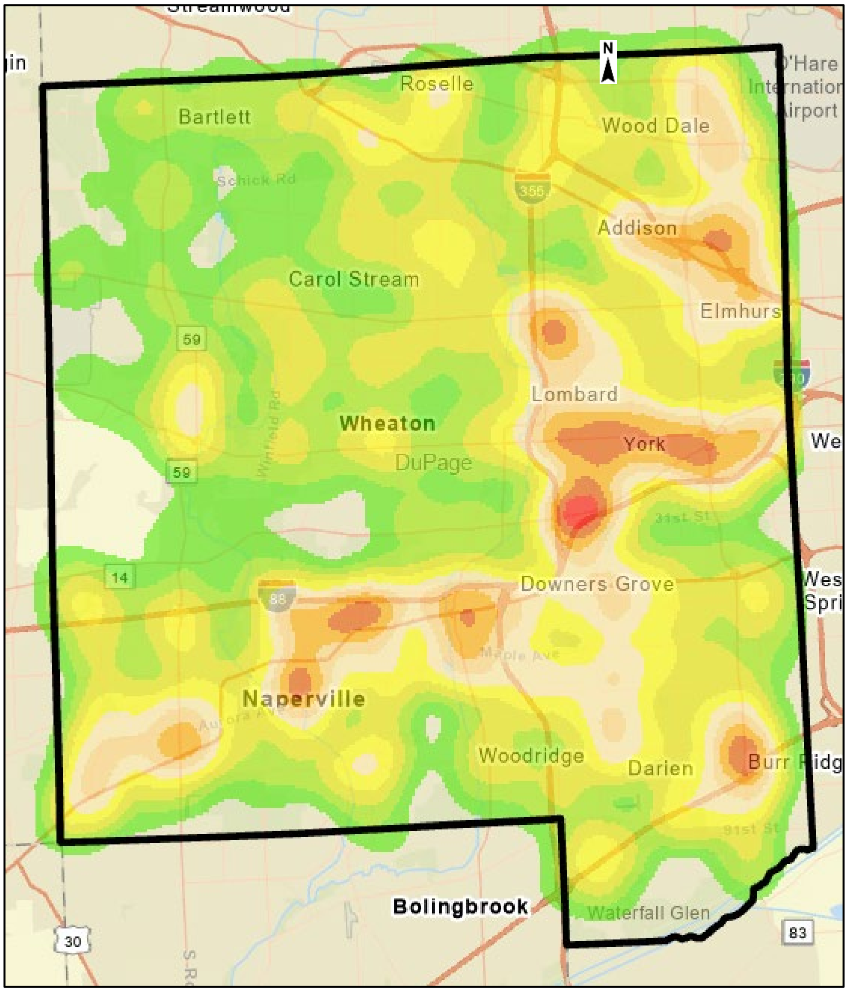


Figure 12: KA Crashes Locations, 2018-2022

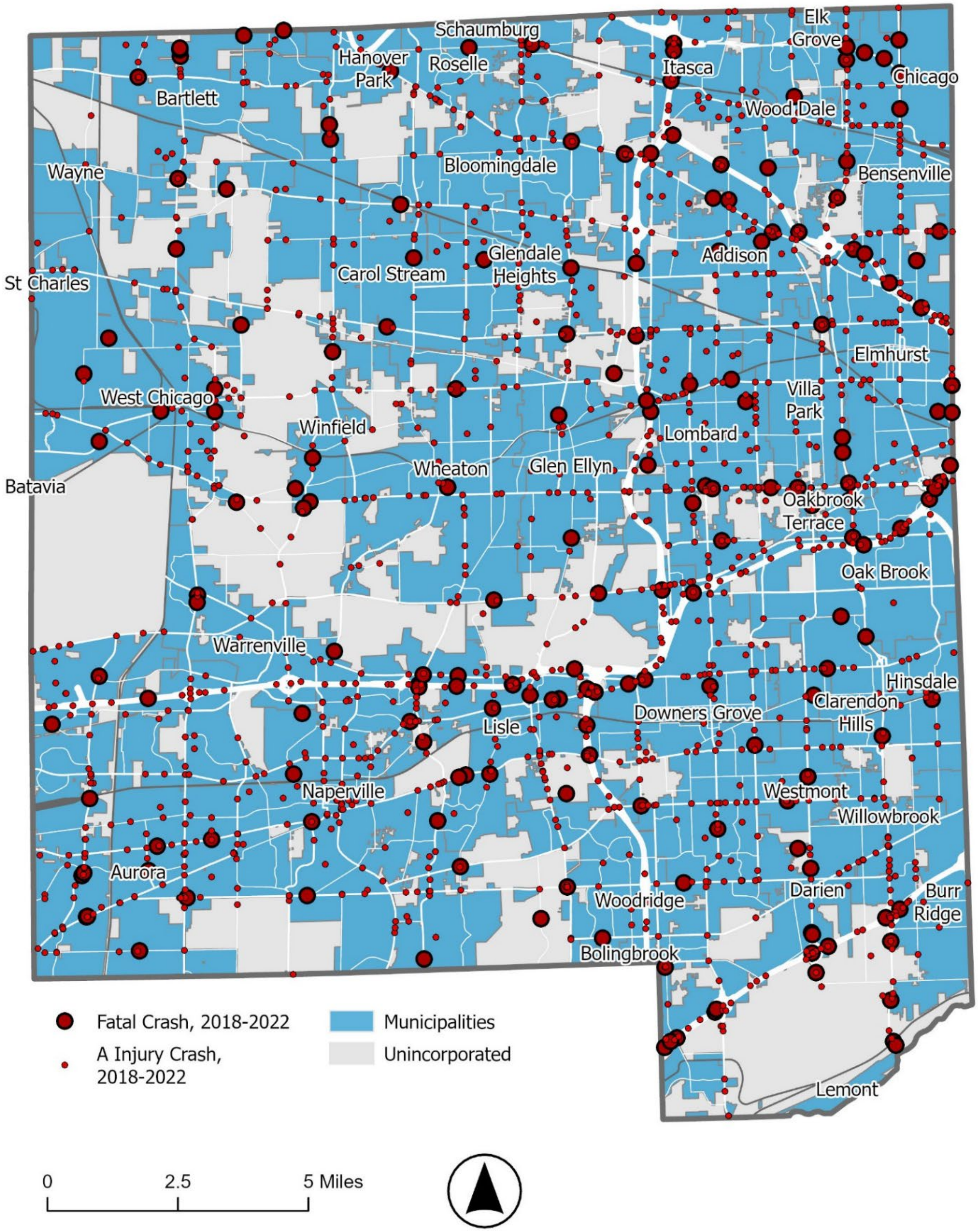


Figure 13: KA Crashes by Square Mile, DuPage Municipalities, 2018-2022

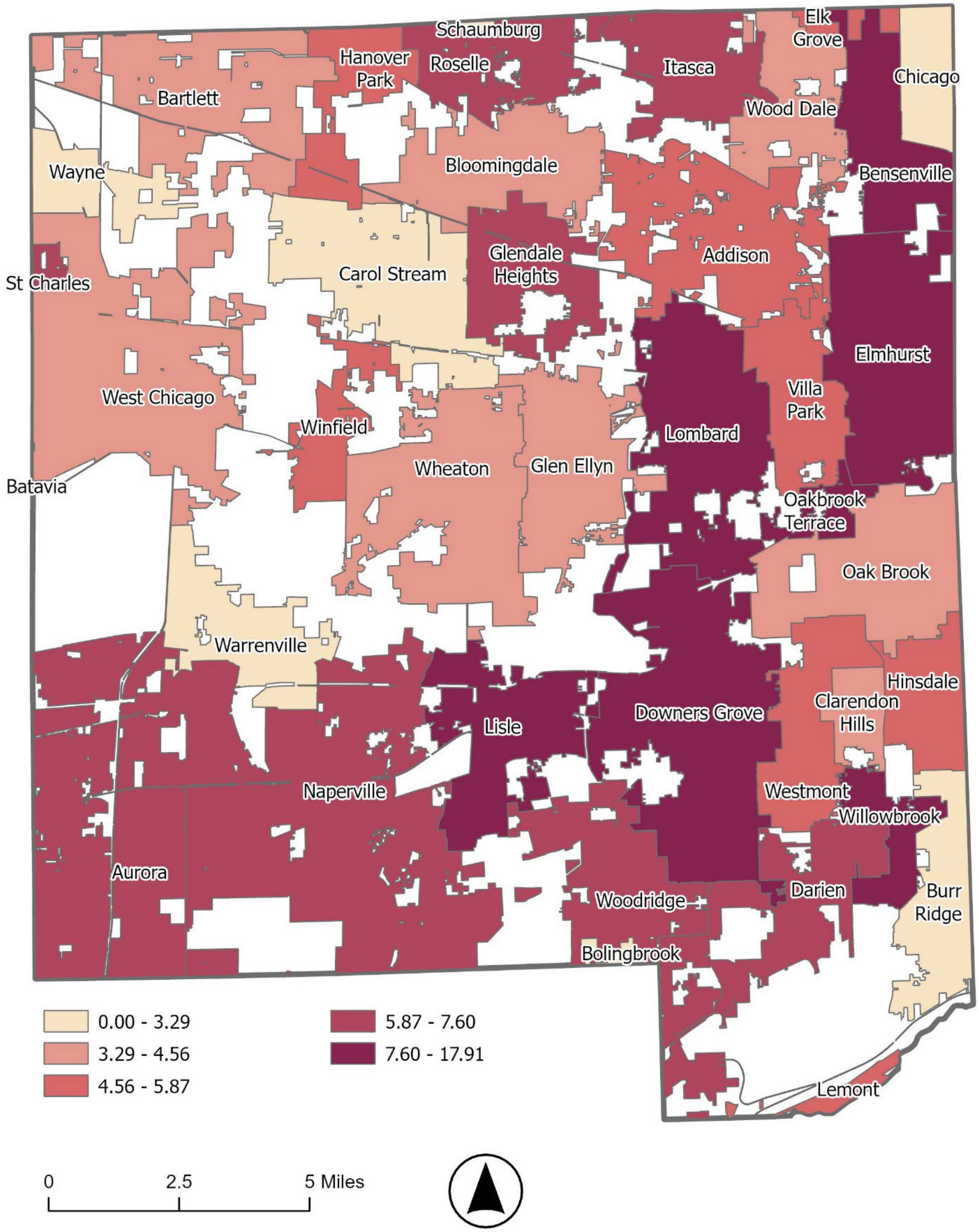


Table 11 ranks the municipalities in DuPage County by KA crashes per 100,000 people for the five-year study period.[3] Oakbrook Terrace had the highest number of KA crashes per capita at 841.6 per 100,000 people. The most KA crashes overall occurred in unincorporated areas. The municipality with the highest count of KA crashes was Naperville, 50 KA crashes higher than the next highest municipality, Downers Grove.

To normalize the findings and identify disparities, a per capita KA crash ratio was developed for each municipality. On a per capita basis, the municipalities with the highest KA crashes per 100,000 people were Oakbrook Terrace (841.6), St Charles (504.2), Wayne (400) Bensenville (329.6), and Oakbrook (294.0). These municipalities are especially overrepresented when compared to the countywide KA crashes per capita, 189.6.

Some municipalities, like Schaumburg, span multiple counties. Even though the majority of Schaumburg is in Cook County, when crashes occurred in the DuPage portion of Schaumburg, they were assigned to DuPage County. Several of these municipalities have very high KA crashes per 100,000 people, but this is due to the small area/population within DuPage.

Table 11: DuPage Municipalities by KA Crashes per 100,000 Residents, 2018-2022

KA Rank	Municipality Name	KA Total	KA %	KABCO Total	KABCO %	Population	KA Crashes per 100,000 Residents
1	Oakbrook Terrace	23	1%	915	1%	2,733	841.6
2	St Charles*	3	0%	96	0%	595	504.2
3	Wayne*	6	0%	141	0%	1,500	400.0
4	Bensenville	62	4%	2,284	3%	18,813	329.6
5	Oak Brook	24	1%	2,221	3%	8,163	294.0
6	Willowbrook	27	2%	1,421	2%	9,250	291.9
7	Lombard	130	7%	4,099	5%	44,562	291.7
8	Downers Grove	138	8%	4,772	6%	50,233	274.7
9	Itasca	26	1%	804	1%	9,543	272.5
10	West Chicago	68	4%	2,369	3%	25,614	265.5
11	Unincorporated	241	14%	13,769	17%	96,733	249.1
12	Lisle	56	3%	1,877	2%	23,767	235.6

[3] Per-capita calculations are a second-best method for normalizing crash rates with total trips being the first-best option. Many non-residents travel in or through any given place. However, these data were not available to the project team, necessitating the per-capita approach.

KA Rank	Municipality Name	KA Total	KA %	KABCO Total	KABCO %	Population	KA Crashes per 100,000 Residents
13	Winfield	21	1%	649	1%	9,788	214.5
14	Aurora*	104	6%	5,034	6%	51,588	201.6
15	Elmhurst	91	5%	3,970	5%	45,778	198.8
16	Roselle	37	2%	1,185	1%	18,953	195.2
17	Naperville*	188	11%	8,751	11%	98,016	191.8
18	Burr Ridge*	13	1%	559	1%	6,826	190.4
19	Darien	41	2%	1,844	2%	21,965	186.7
20	Bartlett*	42	2%	1,353	2%	23,797	176.5
21	Addison	55	3%	2,702	3%	35,579	154.6
22	Bloomingdale	33	2%	2,192	3%	22,382	147.4
23	Woodridge	48	3%	2,341	3%	34,137	140.6
24	Wood Dale	19	1%	886	1%	13,846	137.2
25	Hinsdale*	19	1%	1,457	2%	15,023	126.5
26	Warrenville	17	1%	1,054	1%	13,553	125.4
27	Villa Park	27	2%	1,925	2%	22,272	121.2
28	Hanover Park*	21	1%	1,123	1%	17,383	120.8
29	Glendale Heights	38	2%	2,452	3%	33,171	114.6
30	Westmont	28	2%	1,366	2%	24,446	114.5
31	Glen Ellyn	29	2%	2,225	3%	28,905	100.3
32	Wheaton	51	3%	2,840	3%	53,970	94.5
33	Carol Stream	33	2%	1,952	2%	39,817	82.9
34	Clarendon Hills	5	0%	395	0%	8,702	57.5
35	Bolingbrook*	0	0%	16	0%	1,468	0.0
36	Lemont*	2	0%	46	0%	6	0.0
37	Elk Grove Village	3	0%	220	0%	0	0.0
	Batavia*	0	0%	2	0%	0	0.0
	North Lake*	0	0%	1	0%	0	0.0
	Schaumburg*	0	0%	8	0%	0	0.0
	Grand Total	1,769	100.0%	83,316	100.0%	932,877	189.6

*Community split by county boundary, population represents the total within DuPage County will not equal full community population where a municipality spans multiple counties; unincorporated communities includes all census blocks whose centroids lie outside of official municipal boundaries

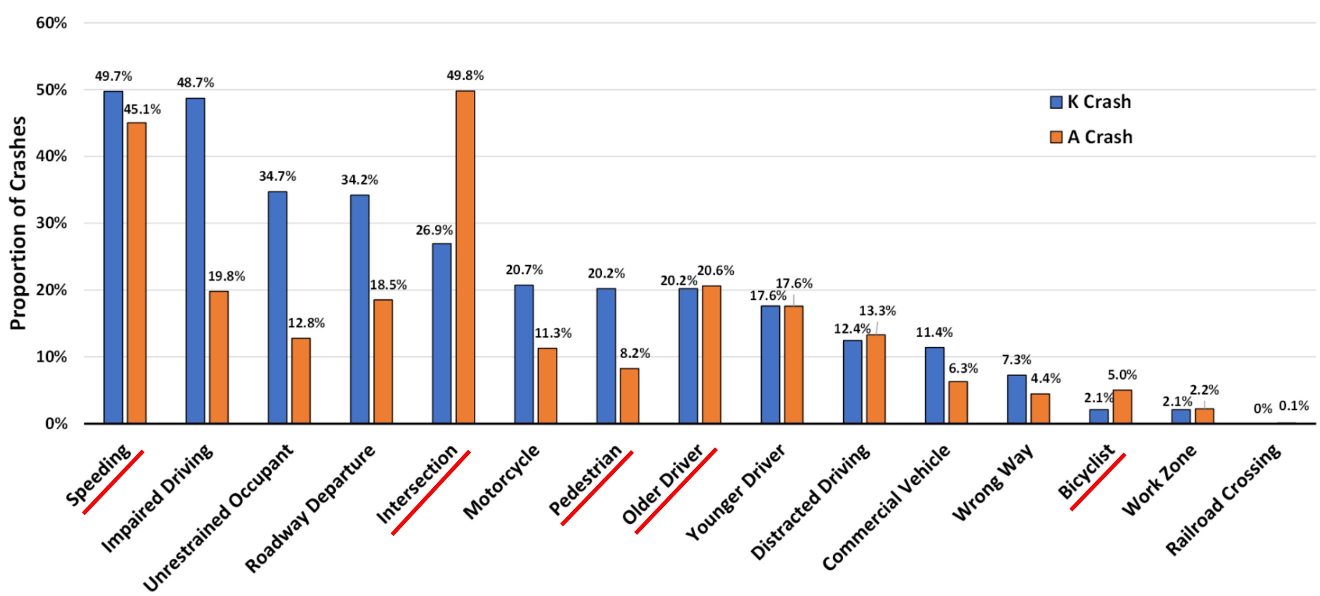
Source: Census 2020 block-level population

Priority Emphasis Areas

The project team identified county-specific priority emphasis areas to focus the direction of the Safety Action Plan. Emphasis areas are defined categories of crashes or roadway user behaviors that represent a unique area of concern. They are typically selected based on patterns in crash data, local policies, and community need, and are intended to guide and unify strategic planners and stakeholders toward the goal of reducing fatal and injury crashes and improving traffic safety for all road users. Recommendations in the following sections of the plan are structured around the priority emphasis areas, the smaller group of emphasis areas determined to most align with the safety needs and broader priorities of DuPage County.

The 15 emphasis areas defined in the Illinois Strategic Highway Safety Plan (SHSP) formed the basis of the analysis. Figure 14 presents the share of KA crashes in DuPage County from 2018 to 2022 by SHSP emphasis area. Emphasis areas underlined in red correspond to those prioritized by DuPage County and stakeholders in the *DuPage County LRSP*.

Figure 14: Share of KA Crashes by Emphasis Area, 2018-2022



Emphasis areas that represent at least 20% of fatal or serious injury crashes during the period of analysis or are of particular interest to safety practitioners are briefly discussed below.

- **Speeding:** 49.2% of fatal crashes and 46.3% of serious injury crashes were speed-related (as defined by IDOT's emphasis area definition and reported by law enforcement). With an increase in driving speed, kinetic energy increases, leading to an increased risk that a crash is more likely to result in a serious injury or fatality.[xiv] This risk is especially elevated for people outside of a vehicle since they have no occupant protection.

- **Intersections:** 50.5% of serious injury crashes and 26.9% of fatal crashes in DuPage County are intersection-related (as defined by IDOT). At intersections, there are multiple conflicting movements which create the potential for collisions – such as left-turning traffic conflicting with through traffic or right-turning traffic conflicting with a pedestrian crossing. The safety performance of these intersections can often be improved by either reducing the number of conflict points present using innovative intersection designs or signal timing strategies, or by reducing the probability or severity of crashes which may occur at existing conflict points using other safety treatments. Though intersections are commonly designed to maximize operational performance – e.g., traffic throughput – they may not yet be optimized for safety performance and may exhibit opportunities for further targeted safety improvements.
- **Pedestrian and Bicyclists:** When combined, pedestrian and bicyclist crashes account for 22.3% of fatal crashes and 13.6% of serious injury crashes in DuPage County. With fatalities of vulnerable road users on the rise across the United States, many agencies are exploring opportunities to be more pedestrian- and bike-friendly through infrastructure that better accommodates their needs and vulnerabilities, increased connectivity, and the elevation of active transportation as an essential form of travel. Identifying and addressing high-risk locations can help create a more walkable and bikeable network, protect vulnerable users, and support a reliable, sustainable, and safe culture of active and multi-modal transportation within the county.
- **Younger Drivers:** Fatal crashes and serious injury crashes included a younger driver (those between 16 and 20 years old) approximately 17% of the time in DuPage County of the five-year period. Research shows that experience leads to safer driving; as new drivers start with little real-world driving experience, they are at risk of experiencing crashes at higher frequencies than other drivers, with this likelihood decreasing over the first decade of driving.[xv] Aggressive and risky driving behaviors are also more prominent among younger drivers, endangering them as well as fellow road users.
- **Older Driver:** Older drivers are involved in 20.2% and 20.6% of all fatal crashes and serious injury crashes in DuPage County, respectively. Age-related physical and cognitive changes can present challenges. Decreased visual acuity, slower reaction times, and reduced flexibility can impact their ability to navigate complex driving situations safely. Despite this, older drivers often self-regulate their driving habits to accommodate their limitations. To support the safety of older drivers, it is essential to provide resources, educational programs, and assistive technologies that help them adapt to age-related changes. By addressing their specific needs,

we can foster a comprehensive approach to traffic safety that recognizes the value of experience while accommodating the unique challenges of aging.

- **Roadway Departure:** Crashes involving vehicles leaving their designated travel lanes account for a large portion of traffic fatalities and serious injuries: 34.2% of all fatal crashes in DuPage County were roadway departures. These roadway departure crashes occur due to factors such as driver distraction, fatigue, operating too fast for conditions, or adverse weather conditions. When a vehicle unintentionally leaves the roadway, the chances of striking fixed objects, or rolling over increase dramatically, leading to severe outcomes. Proactively addressing roadway departure risks and educating drivers can reduce the occurrence and severity of these crashes.
- **Unrestrained Occupants:** 34.7% of fatal crashes in DuPage County involved unrestrained occupants. The use of seat belts and proper restraints is demonstrated to be one of the most effective ways to reduce fatalities and serious injuries in motor vehicle crashes. Unrestrained occupants are at a significantly higher risk of being ejected from the vehicle or sustaining severe injuries in the event of a crash than those using proper restraints. Encouraging consistent seat belt use through public education campaigns, high-visibility enforcement, and the promotion of technological solutions such as seat belt reminders can help increase restraint use rates and mitigate the consequences of crashes involving unrestrained occupants.
- **Impaired Driving:** Driving under the influence of alcohol, drugs, or other substances continues to be a major contributing factor to traffic crashes, fatalities, and serious injuries: 48.2% of fatal crashes and 20.9% of serious injury crashes in DuPage County involved an impaired user. These impaired drivers exhibit diminished judgment, reduced reaction times, and weakened motor skills, putting themselves and others at risk.
- **Motorcycles:** 20.7% of fatal crashes in DuPage County involved a person riding a motorcycle. Motorcycle riders are particularly vulnerable road users due to their lack of structural protection, speeds, and reduced visibility to other motorists. Crashes involving motorcycles often result in severe injuries or fatalities. Motorcycle safety efforts focus on promoting rider education and training, increasing motorist awareness of motorcycles, and encouraging the use of proper protective gear, such as helmets and reflective clothing. Implementing motorcycle-friendly infrastructure, such as improved road surfaces, can also help reduce the risk of crashes.

Many of these emphasis areas are associated with one another. Increased rates of speed, for instance, can lead to roadway departure crashes, more severe outcomes for motorcyclists and people outside of vehicles, and lead to deaths and serious injuries of unrestrained occupants. Younger drivers may be more likely to get into severe crashes at intersections where there are more potential conflicts and risk-taking behaviors have more consequences. These associations are important to keep in mind when prioritizing emphasis areas.

Maps that illustrate the locations of the severe crashes coinciding with the emphasis areas prioritized in the DuPage LRSP illustrate that the selected emphasis areas cut across the county. Crashes may fall into multiple emphasis areas, therefore the points represented on each map are not mutually exclusive (e.g., a speed-related crash that occurred at an intersection may appear on the speeding emphasis area map and the intersection-related map), Figure 15 indicates that there is no area of the county that is not touched by severe crashes that resulted in a death or serious injury between 2018 and 2022, including more urbanized and more rural areas of the county. This pattern is borne out in Figure 16 (intersections) and Figure 18 (older drivers). Pedestrian and bicyclist crashes occurred throughout DuPage County but appear to be concentrated in the more urbanized municipalities and areas east of I-355 or south of I-88, as depicted in Figure 17.

Figure 15: KA Crashes, Speeding Emphasis Area, 2018-2022

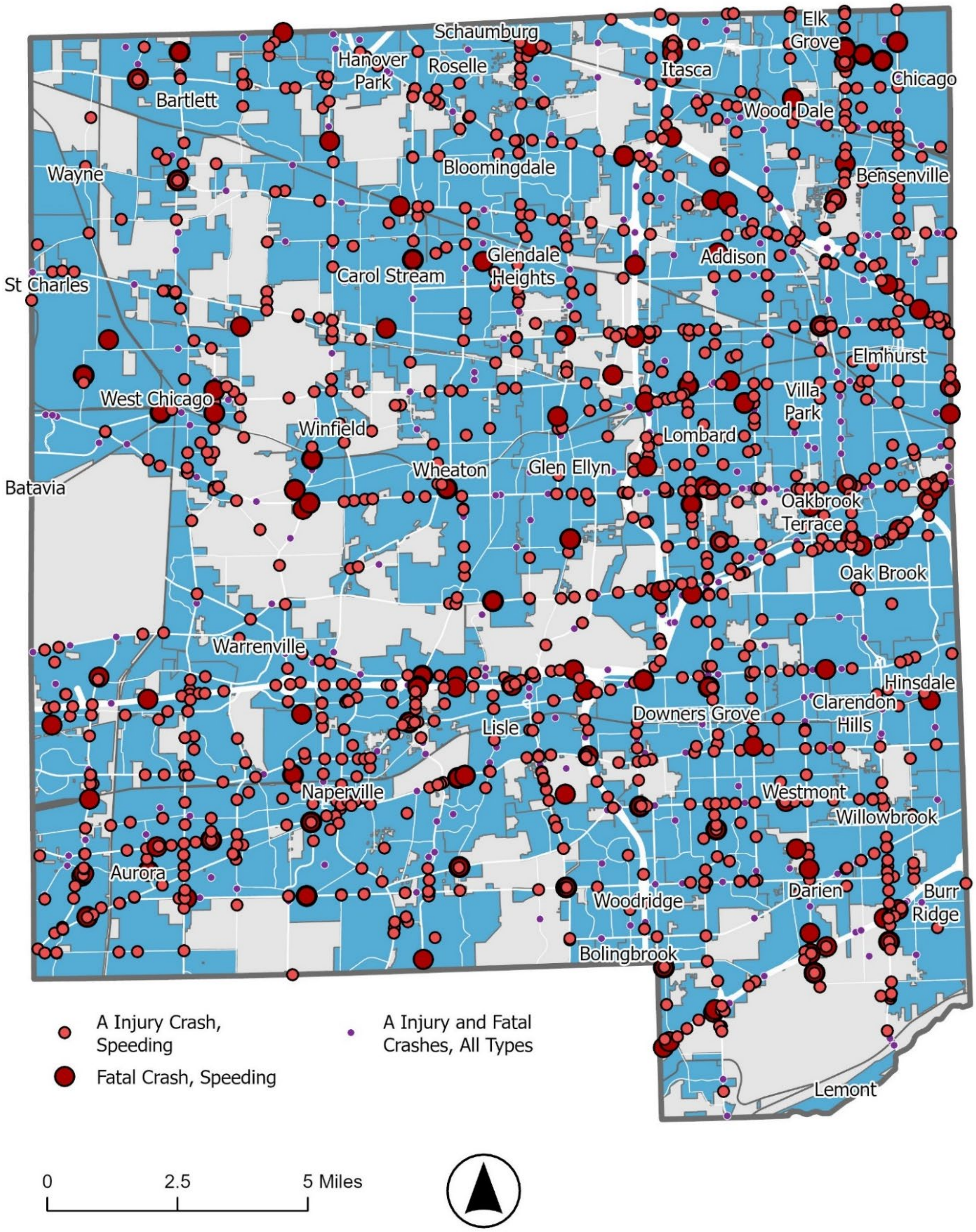


Figure 16: KA Crashes, Intersection Emphasis Area, 2018-2022

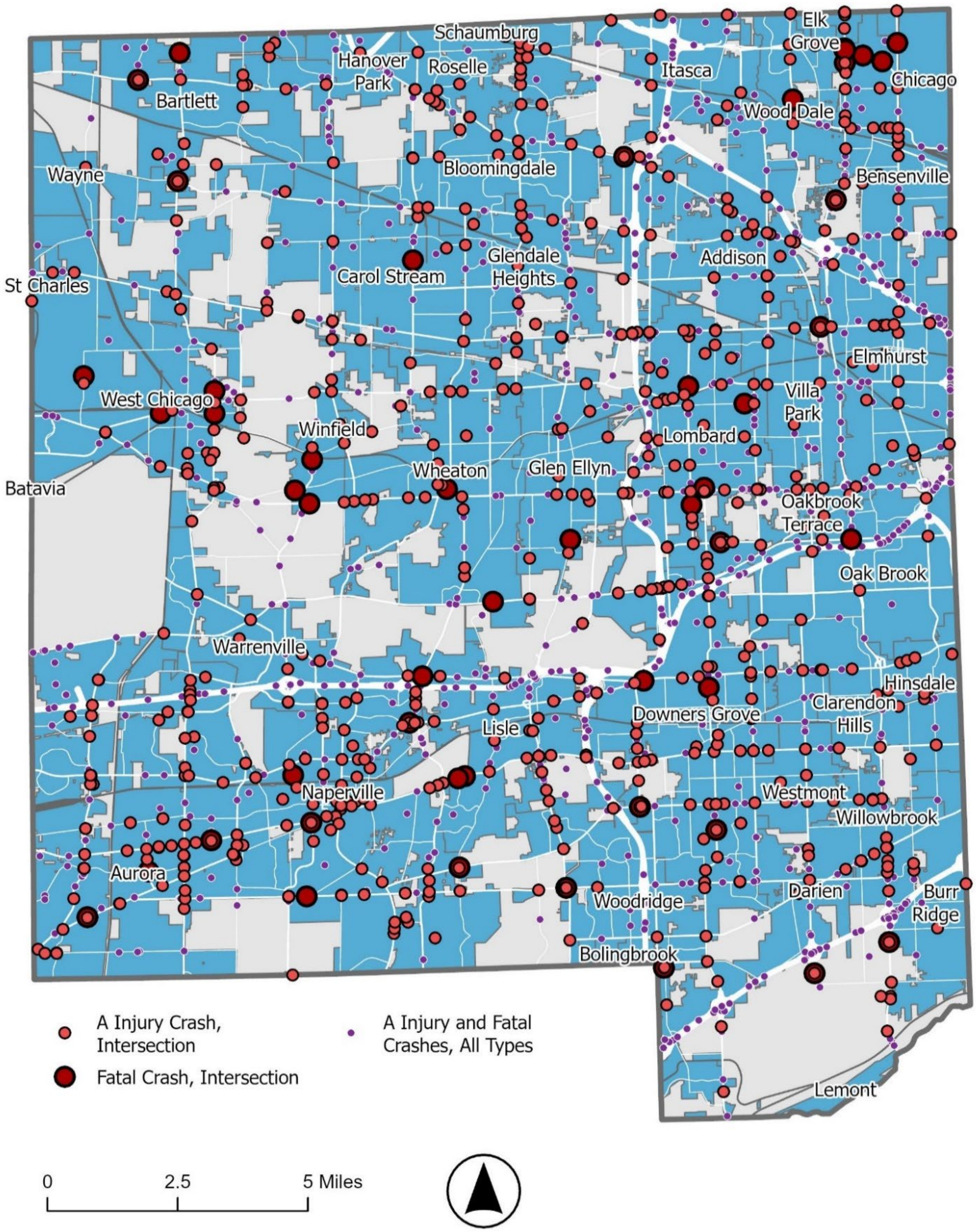


Figure 17: KA Crashes, Bicycle and Pedestrian Emphasis Area, 2018-2022

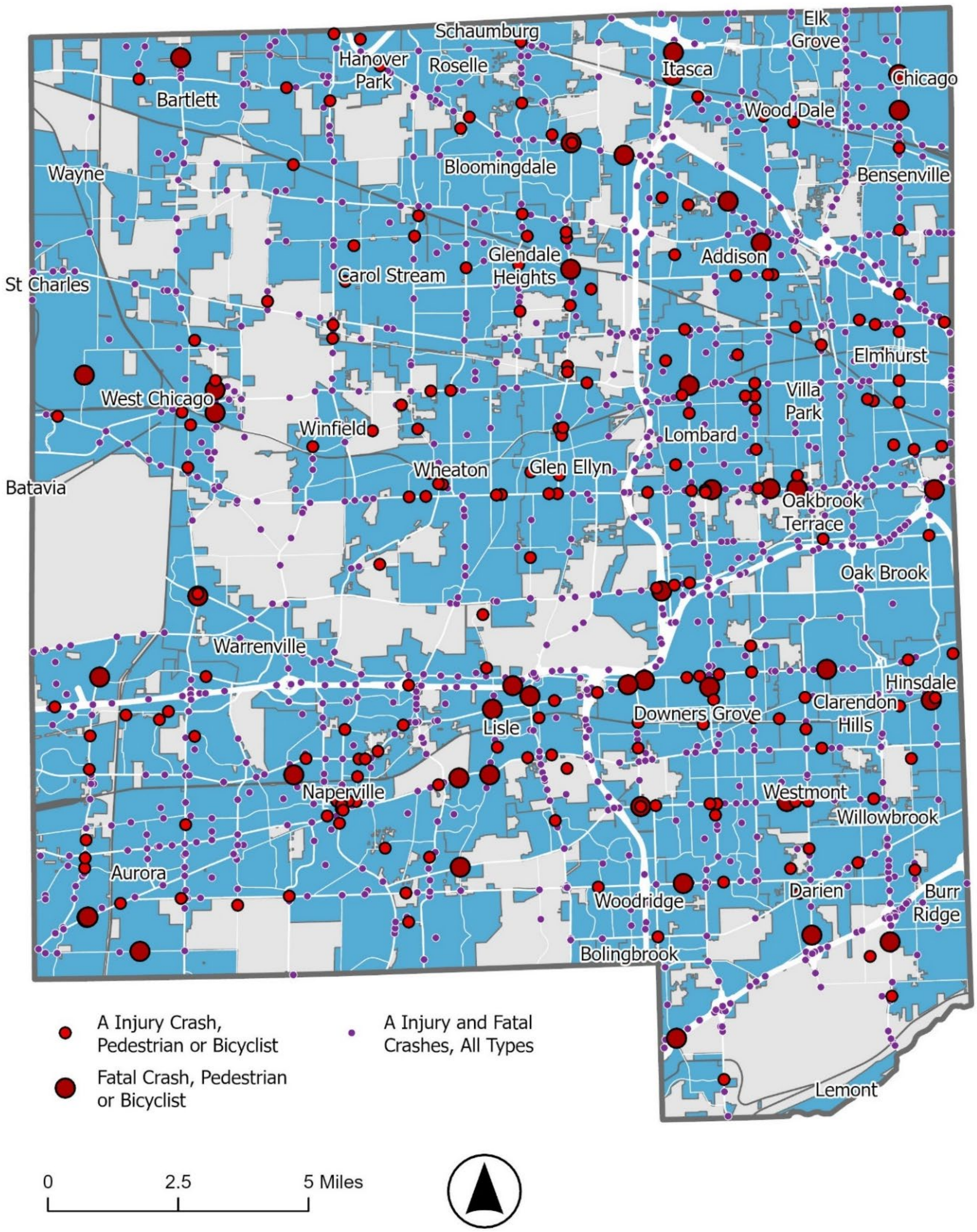
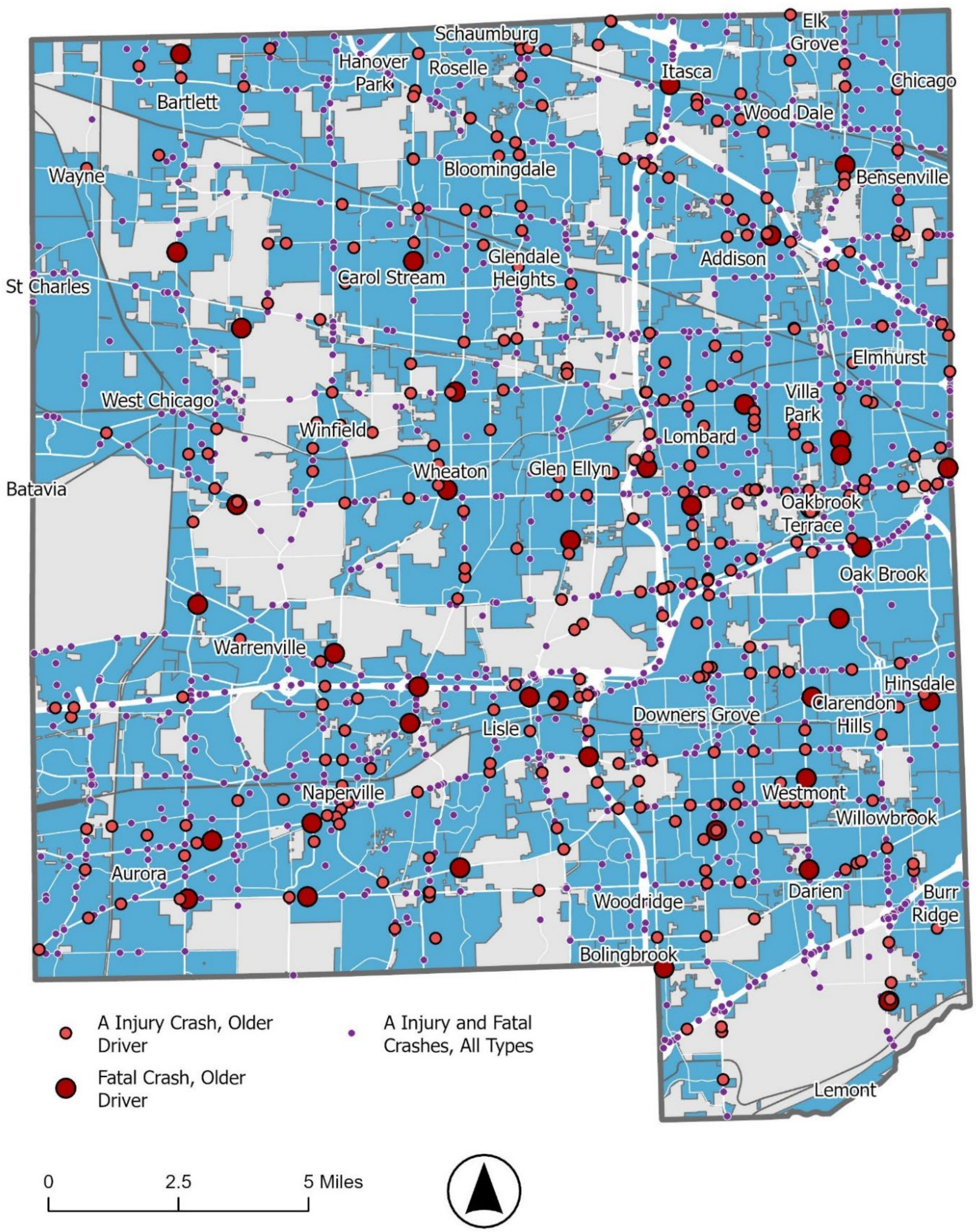


Figure 18: KA Crashes, Older Drivers Emphasis Area, 2018-2022



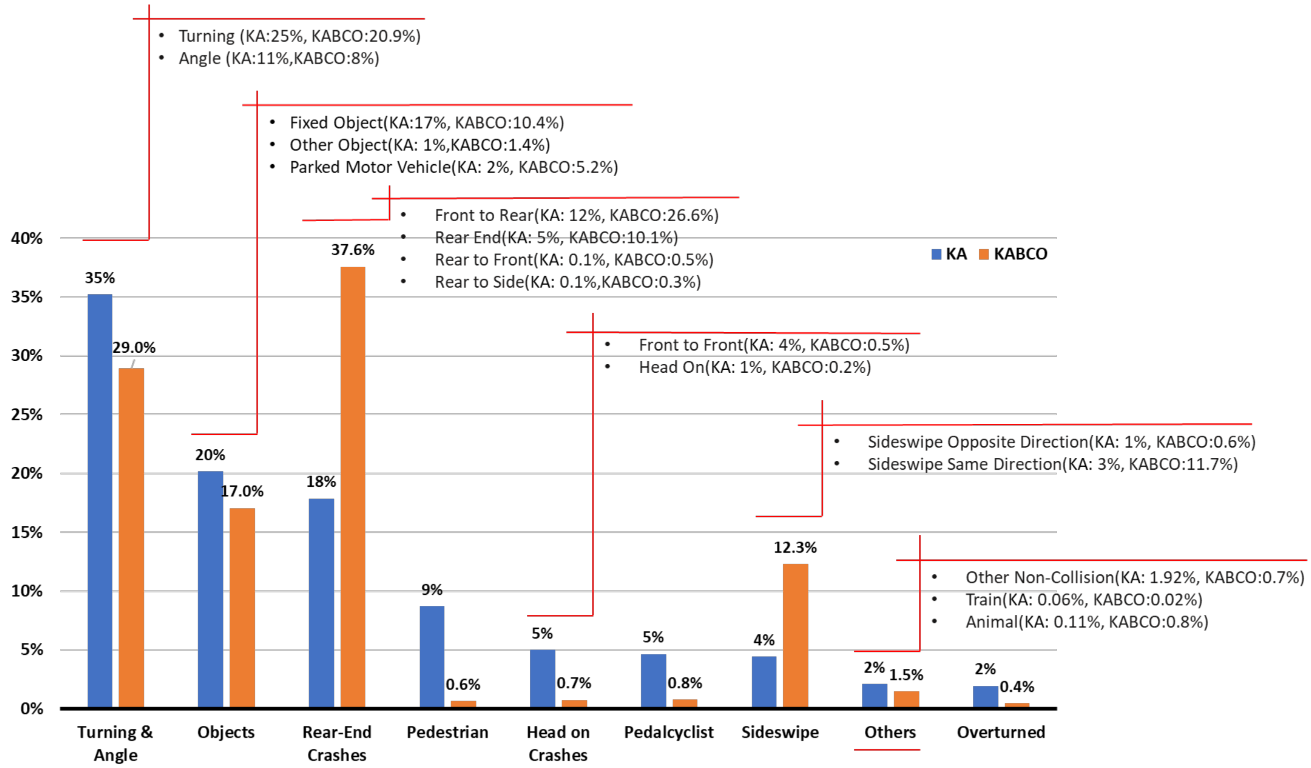
Severe Crash Types

Crash type can yield additional information about the behaviors and maneuvers that preceded crashes resulting in serious injury or fatality and the manner of collision.

The bar chart in Figure 19 illustrates the proportions of different crash types in DuPage County from 2018 to 2022 for both KA and KABCO crashes. The KA bar represents the percentage of all crashes resulting in a death or serious injury for each crash type, while the KACBO bar represents the share of all crashes represented by the stated crash type, For some sections of the chart, the percentages are broken down further to indicate additional details about the crash. The analysis reveals the following:

- **Turning & angle crashes**, which mainly occur at intersections, represent the second largest percentage of crash types based on KABCO crashes (29%) and highest percentage KA crashes (35%), highlighting a critical area for safety improvements.
- **Pedestrian crashes** constitute approximately 9% of KA crashes and 0.6% of KABCO crashes, indicating that when they occur, crashes involving people walking or rolling have a disproportionately high risk of resulting in death or serious injury.
- **Bicycle crashes** account for ~5% of KA crashes and 0.8% of KABCO crashes, underlining the vulnerability of these road users.
- **Object collisions** (20% for KA and 17.0% for KABCO) constitute a major share of KA collisions.
- **Rear end crashes** make up 18% of KA collisions and 38% of all crashes in DuPage County. They are much less likely to result in a severe outcome than most other crash types.
- **Sideswipe collisions** (both opposite and same direction) represent 4% of KA crashes and 12.3% of KABCO crashes. Overall, they are much less likely to result in a severe outcome than most other crash types. Sideswipe opposite direction crashes are comparatively more severe than sideswipe same direction crashes, with 2% of opposite direction crashes resulting in a death or serious injury, compared to less than 1% of same direction crashes.
- **Head-on crashes** represent 5% of KA crashes and 0.7% of KABCO crashes.
- **Other** types, including other non-collision, animal, and train collisions, account for 2% of KA crashes and 1.5% of KABCO crashes.

Figure 19: Share of KA Crashes, by Crash Type, 2018-2022

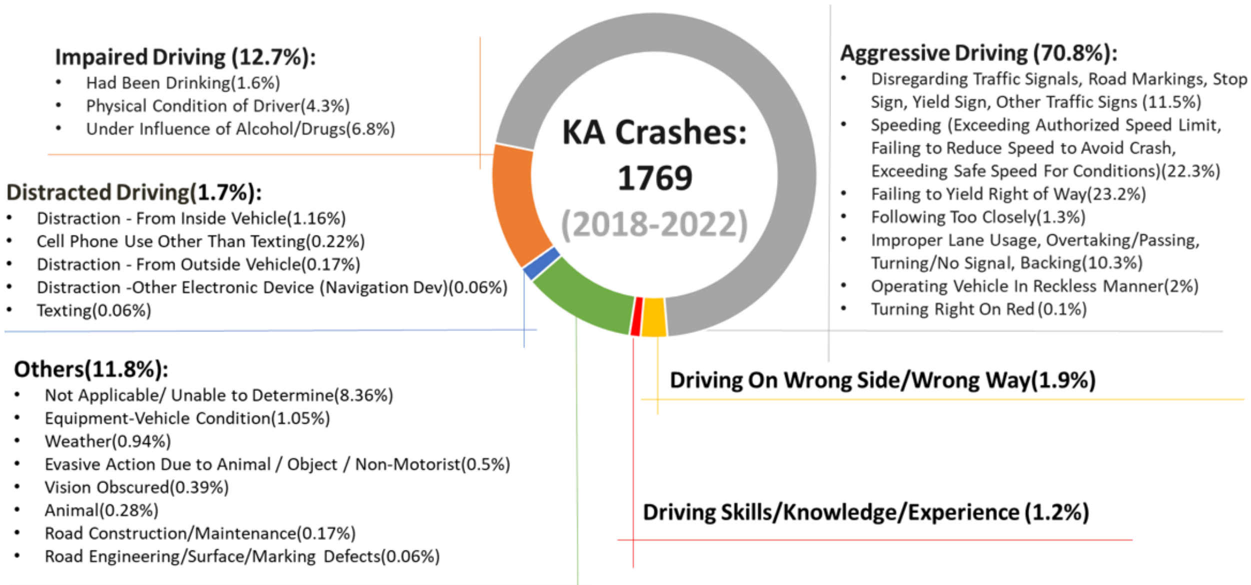


Action plans must balance being comprehensive with prioritizing a select group of crashes and behaviors for targeted and collective action. Turning and angle crashes, as the most substantial percentage for KA (35.2%), highlight an area where targeted resources and specific interventions could yield significant safety improvements. Severe crashes involving objects, pedestrians, pedalcyclists, and head-ons are all overrepresented and also command specific attention.

Leading Crash Cause

Figure 20 summarizes the leading contributing factors to KA crashes in DuPage County, as identified in the crash report by the responding officer. This analysis is similar to, but not synonymous with, emphasis area analysis. The leading crash cause only allows the officer to select a primary contributory crash cause. Emphasis area analysis, on the other hand, is not mutually exclusive, meaning one crash can satisfy multiple different emphasis areas criteria.

Figure 20: Share of KA Crashes by Leading Cause of Crash, 2018-2022



The analysis above categorizes the leading contributing causes into several key groups, many of which are made up of multiple contributory causes as defined by IDOT.

- **Aggressive Driving (70.8%)**: This is by far the largest contributing factor, with aggressive driving behaviors such as speeding (22.3%) and failing to yield (23.2%) leading the list.
- **Impaired Driving (12.7%)**: A considerable portion of the KA crashes were due to impaired driving, which includes being under the influence of alcohol or drugs (6.8%), had been drinking (1.6%) and Physical condition of drivers (4.3%).
- **Others (11.8%)**: A notable number of KA crashes are categorized under 'Others', which could encompass a range of less common causes. This ambiguity highlights a gap in data specificity that hinders targeted intervention, specifically crashes where the responding officer rules the primary contributory cause "not applicable" or "unable to determine."
- **Distracted Driving (1.7%)**: The strikingly low percentage of reported KA distracted driving crashes in the data suggests a potential under-reporting issue. Many drivers involved in crashes caused by distracted driving are reluctant to admit fault, as doing so could result in citations, penalties, or other legal consequences. This 'unwillingness to self-report' can lead to distracted driving being underrepresented in official statistics and datasets, obscuring the true extent and impact of the problem. Addressing this reporting gap is crucial for developing effective strategies to combat distracted driving and improve road safety.
- **Wrong-Way Driving and Driving Skills (3.1%):** Wrong-way driving makes up a small share of primary contributory causes at 1.9%. Knowledge, experience, and skills are an even emaller

subset of primary causes at 1.2%, well below the number of young drivers involved in KA crashes during the period of analysis. In many young driver crashes, the responding officer presumably concluded that other factors, like speeding, were more important in leading to the crash.

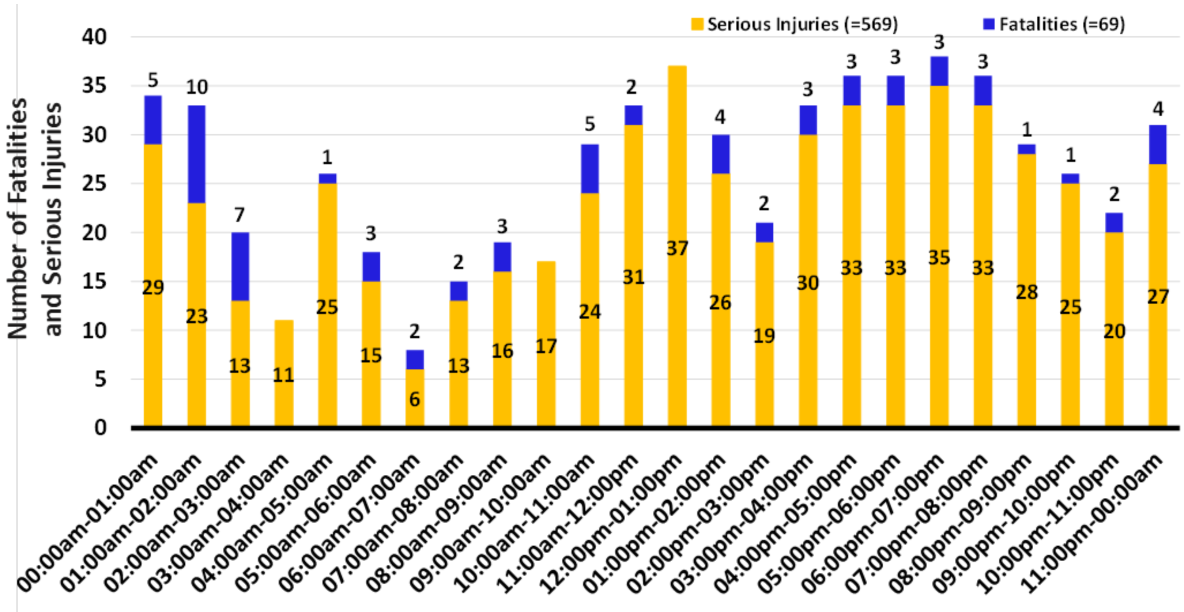
Time and Day of Week

The distribution of crashes by time of day and assessment of typical patterns and abnormalities provides insights into the severe crash causes or potential options for crash mitigation. Figure 21 summarizes the frequency of KA injuries and KA crashes during weekends and weekdays in DuPage County from 2018-2022.

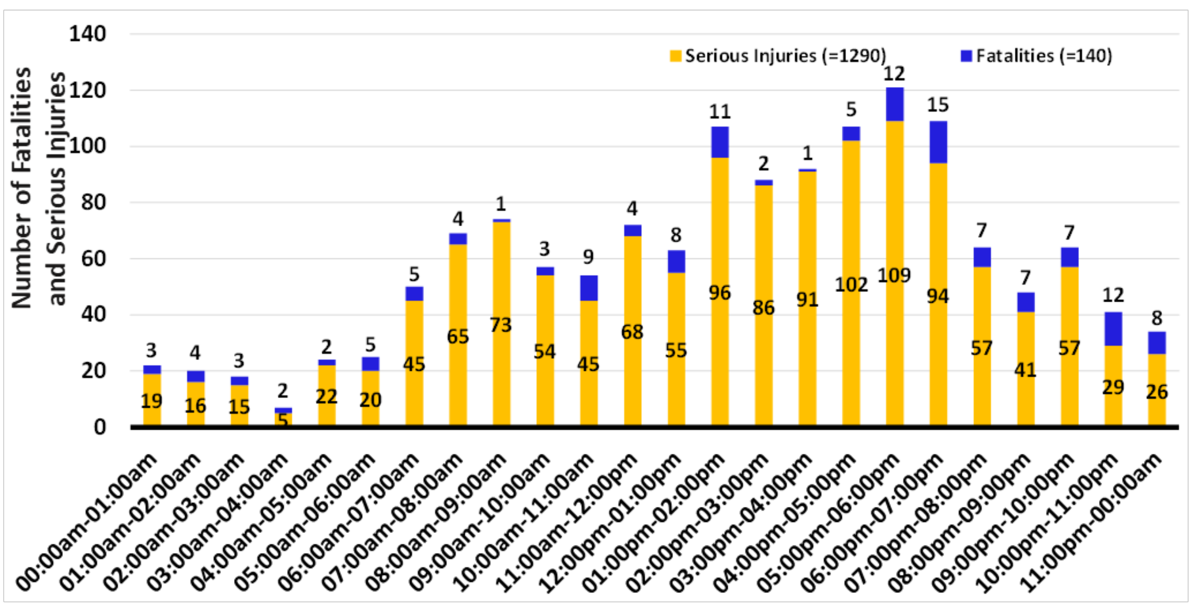
A distinct pattern of severe crashes during late night hours is apparent on weekends. In particular, the hours between 11 PM and 2 AM exhibit a high number of serious injuries and fatalities (98 total), with fatalities peaking between 1 AM and 2 AM. Of these 98 serious injuries and fatalities, 29, or 29.6%, occurred in crashes where the primary contributory cause was reported as “under the influence of alcohol/drugs” or “had been drinking” – higher than the baseline across all days and times. As the day progresses, the number of serious injuries and fatalities on weekends gradually lowers from 4 AM to 10 AM, ticking back up in the late afternoon and early evening hours.

By contrast, serious injuries and fatalities occurring on weekdays are more concentrated in the afternoon hours, with a less pronounced overnight pattern. The evening rush hour between 5 PM and 6 PM has the highest single-hour frequency of serious injuries, with the highest number of fatalities occurring between 6 PM and 7 PM.

Figure 21: Fatalities and Serious Injuries by Hour, 2018-2022



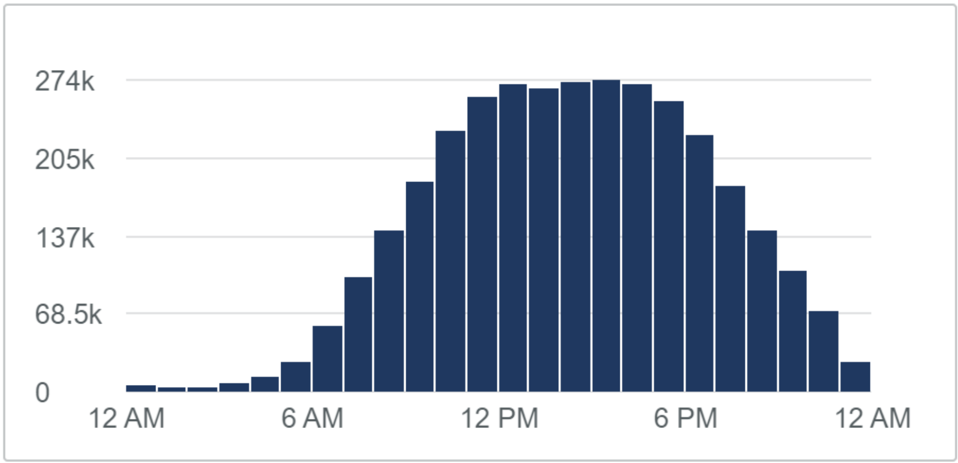
(a) Weekends



(b) Weekdays

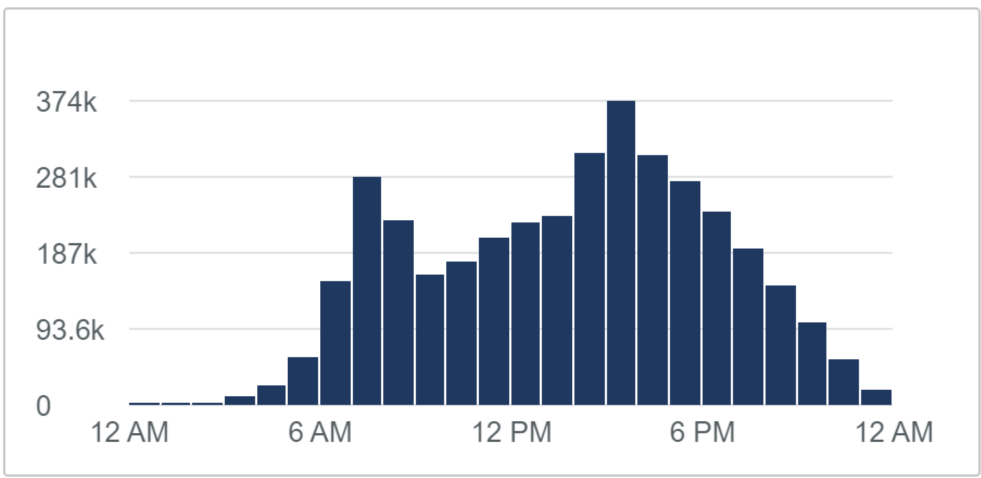
These disparities and trends are confirmed when looking at travel trends shown in Figure 22 and Figure 23, which show trip starts with origins in DuPage County in the Fall of 2022 based on simulated travel demand model data created by Replica based on cellphone data.

Figure 22: Weekend DuPage County Trip Origin Starts by Hour, Fall 2022



Source: Replica, Great Lakes, Fall 2022, Sat

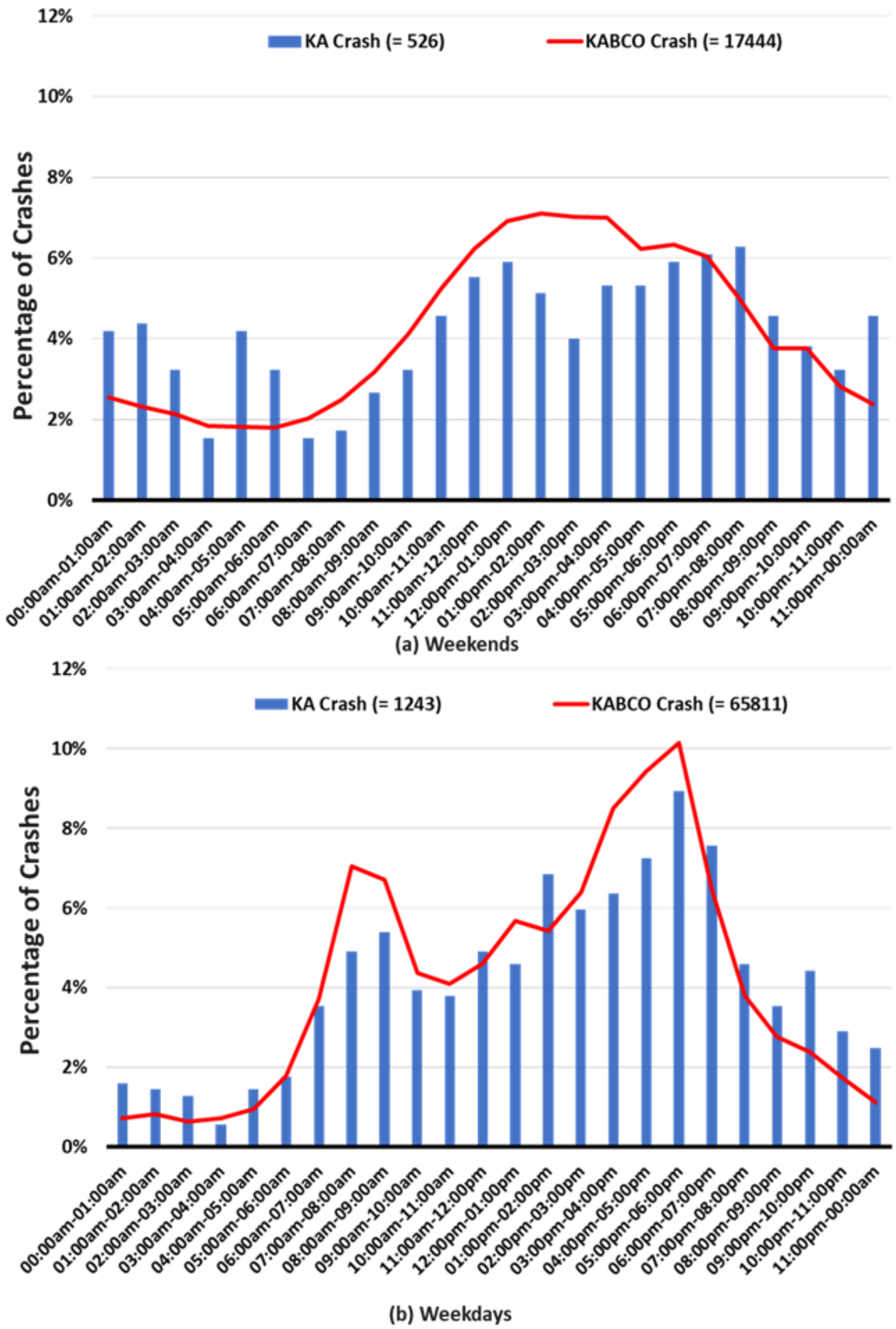
Figure 23: Weekday DuPage County Trip Origin Starts by Hour, Fall 2022



Source: Replica, Great Lakes, Fall 2022, Thurs

Figure 24 compares the KA crashes only against all KABCO crashes for both weekdays and weekends. On weekends, a distinct pattern emerges between 11 PM to 5 AM. During these hours, the proportion of KA crashes exceeds KABCO crashes. While fewer crashes generally occur during these hours, there is a higher likelihood of fatalities and serious injuries.

Figure 24: Share of KA Crashes Compared to All Crashes by Hour, 2018-2022



On weekdays, KA and KABCO crashes exhibit bimodal peaks coinciding with the AM and PM rush hours. There is less variation on weekdays between KA and KABCO crashes, although crashes are more severe overnight.

Weather and Roadway Conditions

Figure 25 illustrates the distribution of fatal and serious injury crashes in relation to prevailing weather conditions over the years 2018 to 2022. Overall, the results indicate that KA predominantly occur during clear weather, with rainy and cloudy/overcast conditions constituting only a small percentage of fatal and serious injury crashes. Cloudy conditions are prevalent in northeastern Illinois, leading to the conclusion that the breakdown between cloudy/overcast and clear assessments may be unreliable.

Figure 25: Share of KA Crashes by Weather Condition, 2018-2022

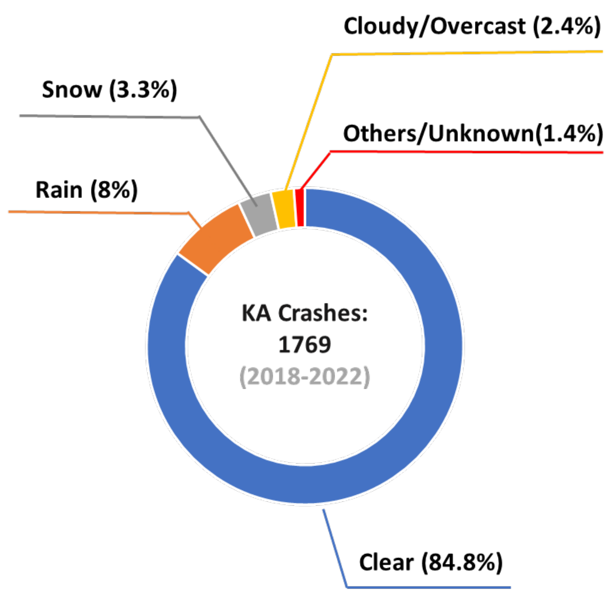


Table 12 presents the share of KA and KABCO crashes by roadway surface conditions at the time of the crash. The majority, 80.7%, of KA crashes happened on dry surfaces, a higher share than KABCO crashes as a whole. Wet surfaces were associated with 15.4% of KA crashes while ice/snow/slushy surface conditions were only 3.5% of KA crashes. Overall, the results illustrate that less severe crashes are more likely to be weather-driven than crashes resulting in serious injuries and fatalities.

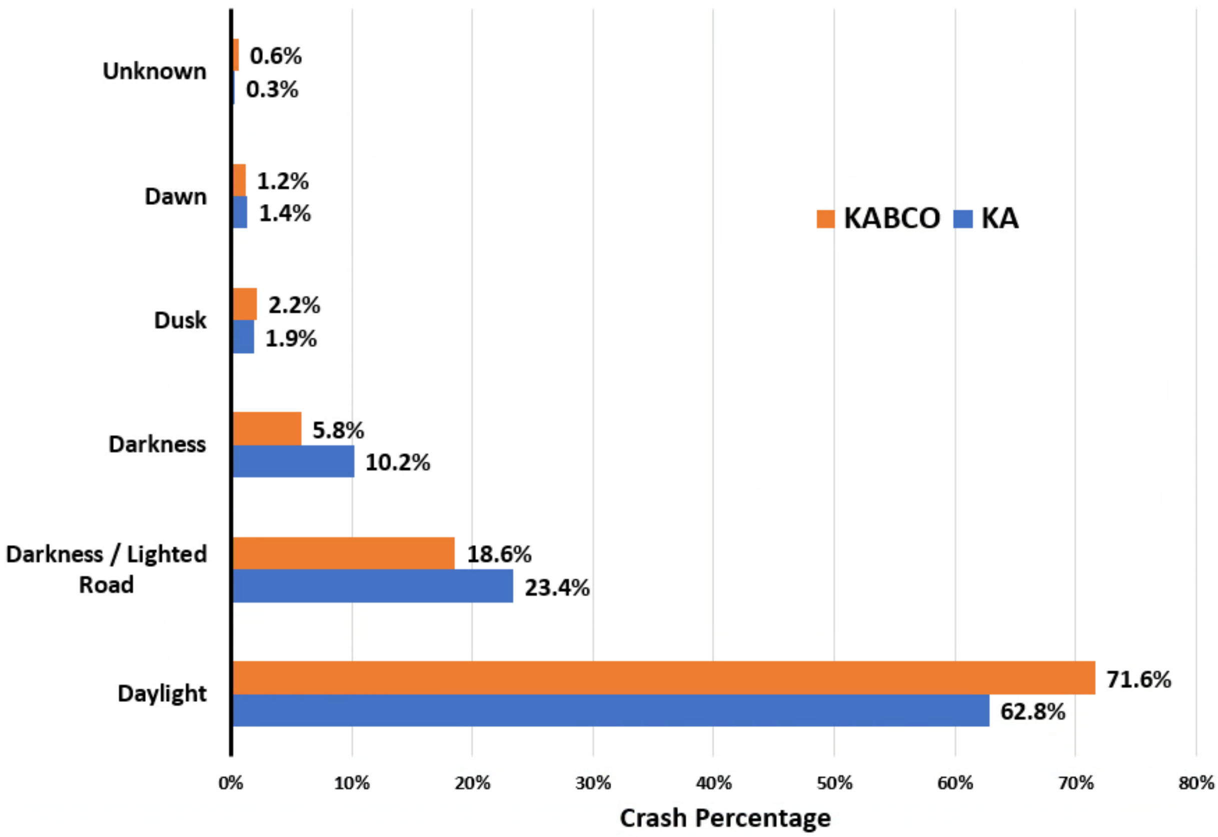
Table 12: KA and KABCO Crashes by Surface Condition, 2018-2022

Surface Condition	Percentage of KA Crashes	Percentage of KABCO Crashes
Dry	80.7%	74.7%
Wet	15.4%	16.6%
Ice/Snow/Slush	3.5%	7.6%
Other/Unknown	0.5%	1.1%

Lighting Conditions

Figure 26 shows the distribution of KA and KABCO crashes in relation to light conditions. As expected, daylight conditions account for the highest percentage of both KA (62.8%) and KABCO (71.6%) crashes. However, the proportion of KA crashes is lower in daylight compared to KABCO crashes, suggesting that daylight crashes are less likely to result in severe injuries or fatalities.

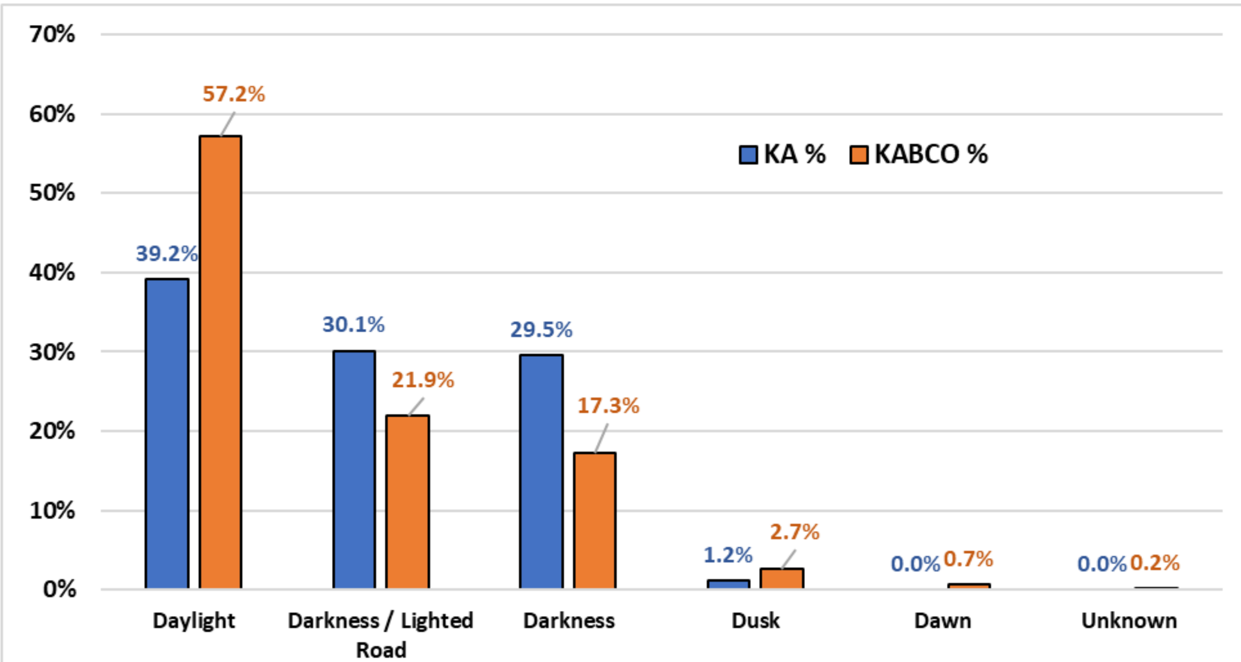
Figure 26: Share of KA and KABCO Crashes by Lighting Condition, 2018-2022



Crashes in darkness account for a higher percentage of KA crashes compared to KABCO crashes, emphasizing the critical role of visibility in crash severity during dark conditions. Specifically, crashes in darkness on lighted roads make up 23.4% of KA crashes and 18.6% of KABCO crashes, while crashes in darkness on unlighted roads account for 10.2% of KA crashes and 5.8% of KABCO crashes. While the distinction between darkness and darkness/lighted road is based on officer judgment, the results are consistent: the higher proportions of KA crashes in both dark conditions highlight the increased risk of severe injuries or fatalities when visibility is compromised.

Figure 27 shows the lighting condition at the time of pedestrian crashes. For all pedestrian crashes, daylight is about 2.5 times more likely to be the lighting condition at the time of a pedestrian crash when compared to the next highest percentage, Darkness on a Lighted Road, coming in at 21.9%. This is likely due to more pedestrian activity during daylight hours. When isolated to crashes with severe outcomes alone, the share of daylight pedestrian crashes drops sharply. Darkness/Lighted Road and Darkness account for 59.6% of all pedestrian KA crashes. This stands in contrast to KA crashes inclusive of all users, where Darkness/Lighted Road and Darkness represent 33.6% of the total.

Figure 27: Lighting Condition at Time of Pedestrian Crash, 2018-2022



Intersection and Mid-Block Crashes

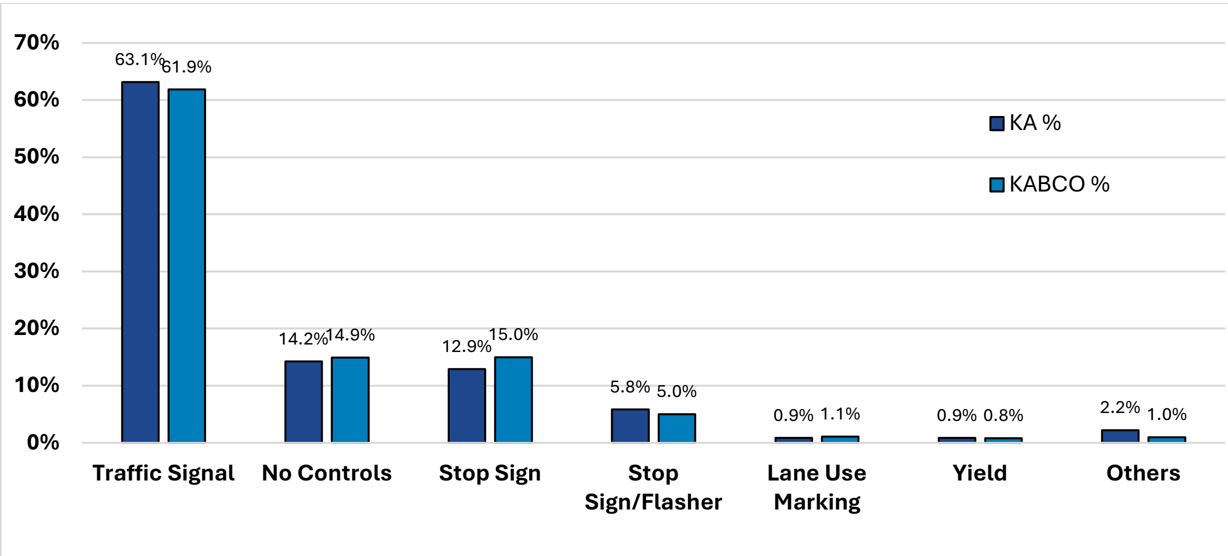
Per CMAP's intersection assignment procedure, crashes were assigned as intersection-related if the crash occurred within 200 feet of a signalized intersection's centerpoint, within 100 feet of an all-way stop-controlled intersection centerpoint, or within 50 feet of an intersection where the control type is coded as unknown (based on a comparison of several locations, this is typically an intersection where one or more legs is uncontrolled). If a crash occurred within two of these buffer areas, the crash was assigned to the nearest intersection. Crashes that did not meet any of these three parameters were considered segment related.

When viewed at the county level, the distribution of intersection to segment crashes indicates that more fatal and serious injury crashes occurred outside of intersections than at intersections. Based on

IDOT crash data, 54% (947) of fatal and serious injury (KA) crashes from 2018 to 2022 occurred at mid-block locations and 46% (822) occurred at intersections.[4]

Figure 28 reveals that 63% of intersection-related KA crashes occurred at signalized intersections, based on reporting by the responding officer. Notably, 14% of intersection-related KA crashes happened at locations with no reported traffic controls, while nearly 19% occur at intersections with stop signs or stop signs with flashing beacons.

Figure 28: Share of Intersection-related KA Crashes by Traffic Control Device, 2018-2022



Functional Classification

Figure 29 compares the percentage of KA crashes and overall crashes across different road functional classifications present in DuPage County. Other principal arterials and minor arterials, which characterize the County and State arterial systems, are the most critical, accounting for the highest percentages of both KA crashes (31% and 27%, respectively) and total crashes (29% and 22%, respectively).

Local roads and interstates have similar percentages of overall crashes (15%), but local roads have a higher percentage of KA crashes (13%) compared to interstates (11%). Collectors contribute to about 10% of KA crashes and 9% of total crashes, while unknown road classifications have the lowest

[4] Note that this result is based on the buffer distances specified by CMAP and may differ when using a larger or smaller or larger search distance.

percentages of both KA crashes (8%) and KABCO crashes (9%). These insights highlight the need for targeted interventions and safety improvements on other principal arterials and minor arterials, as they account for a disproportionately high share of severe and overall crashes.

Figure 29: Share of KA and KABCO Crashes by Functional Classification, 2018-2022

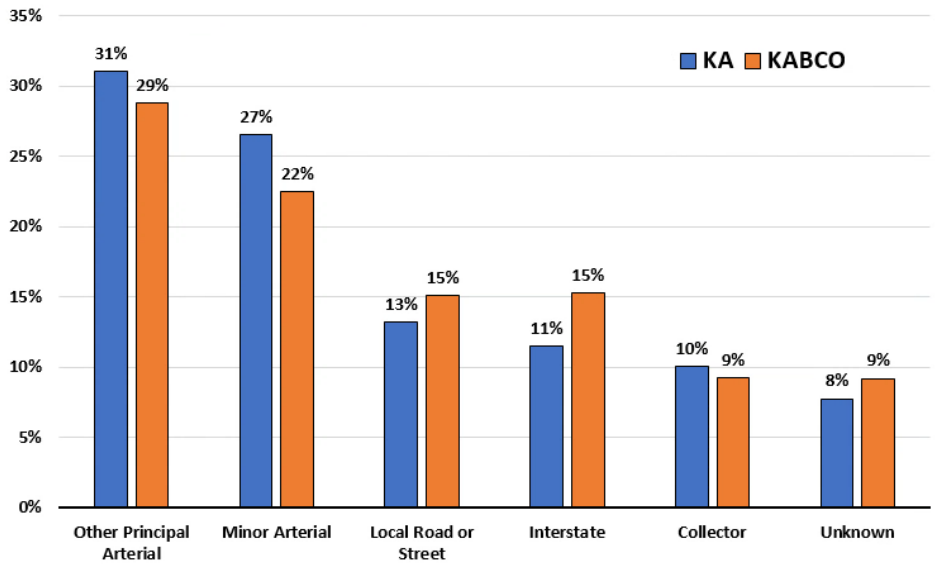


Table 13 presents the distribution of crashes and centerline mileage across different road functional classifications in DuPage County. This table allows comparison of the proportion of crashes that occur on a given road functional classification to the proportion of centerline miles in the county.

Table 13: KA Crashes by Functional Classification Mileage and AVMT, 2018-2022

Functional Classification	KA Crashes	Centerline Miles**	KA/Centerline Mile**	KA Crashes per 100M AVMT**
Unknown	136	n/a	n/a	n/a
Interstate, Freeway/Expressway	204	56.97	3.58	7.46
Other Principal Arterial	549	195.14	2.81	26.73
Minor Arterial	469	253.3	1.85	35.07
Collector	35	n/a	n/a	n/a
Major Collector	118	272.33	0.56	27.65
Minor Collector	25	110.86	0.23	30.51
Local Road or Street	233	2,738.26	0.09	20.74
Total	**1,769**	**3,626.86**	**0.49**	**22.44**

*Recent changes in the latest version of the IRIS dataset exclude "Collector" as a functional class." Collector" crashes are combined with Major collectors in KA/Mile and KA Crashes per 100M AVMT.

**Source: IDOT 2023 Illinois Travel Statistics

Despite having the highest centerline mileage, local roads did not experience the highest percentage of crashes. Other Principal Arterials show the highest proportion of KA as well as KABCO crashes and account for a much smaller share of centerline miles of unrestricted roadways. Minor Arterials have a higher proportion of crashes, considerably higher compared to their centerline mileage. Even when adjusted for average vehicle miles traveled (AVMT), high-volume arterials still exhibit above-average KA crash rates with minor arterials exhibiting the highest crash rate over the five-year period at 35.07, over 50% greater than the countywide average. Arterials account for a disproportionate number of KA crashes in both percentage and rate while being a relatively small share of overall centerline miles, making them a high priority for safety improvements.

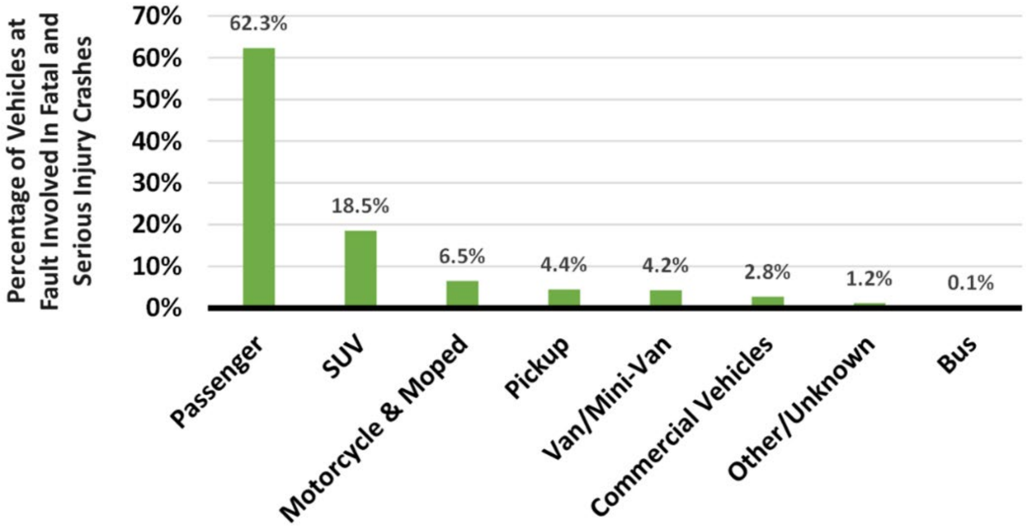
A small percentage of crashes (2.7%) are attributed to an unknown functional classification, indicating the need for improved data collection and reporting.

Overall, the table highlights the importance of considering both crash data, centerline mileage, and volumes when analyzing safety performance and prioritizing interventions across different functional classifications of roads. It suggests that targeted safety improvements may be warranted for specific road types, such as Minor Arterials, Major Collectors, and Interstates, to address their disproportionate share of crashes relative to their mileage. Further discussion on roadway risk factors can be found in Section 4: Systemic Safety Conditions.

Vehicles Involved

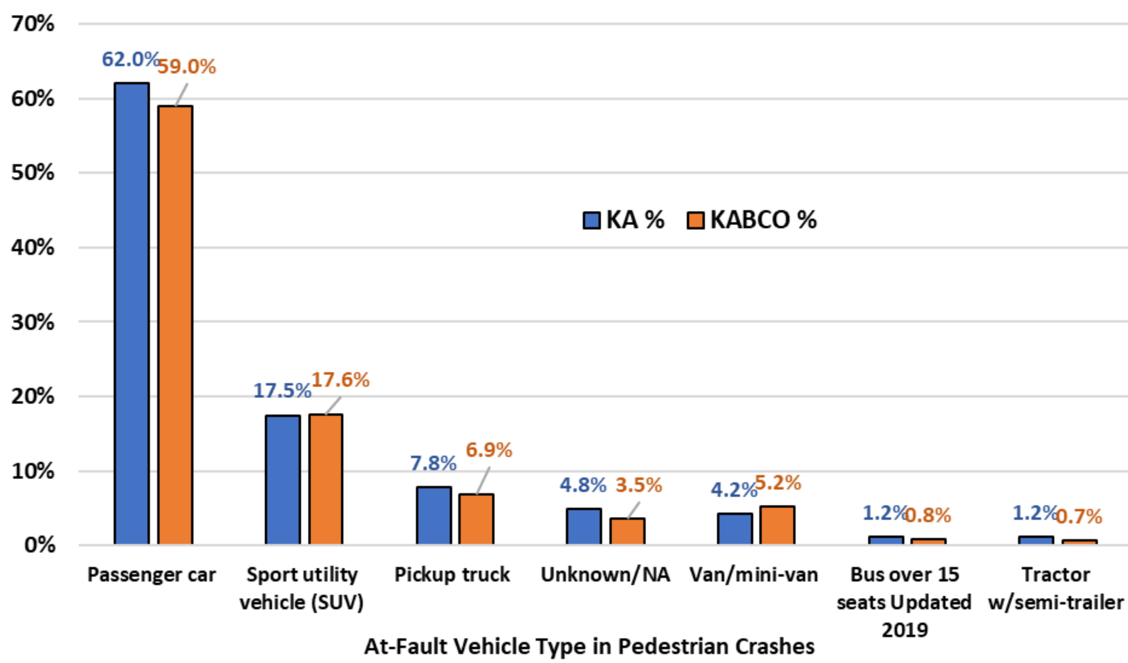
As shown in Figure 30, passenger cars were the primary at-fault vehicle type, accounting for 62.3% of fatal and serious injury crashes. Sport utility vehicles (SUVs) were the second most prevalent at-fault vehicle type, responsible for 18.5% of fatal and serious injury crashes. Due to their larger size and weight, SUVs can contribute to increased crash severity whether they are at fault or not, potentially causing more fatalities and serious injuries. Similar to SUVs, pickup trucks are generally larger than passenger vehicles and drivers of these vehicles were at fault in 4.4% of fatal and serious injury crashes. Despite their substantial size, blind spots, and increased stopping time, commercial vehicles and buses collectively accounted for 2.9% of at-fault fatal and serious injury crashes. Motorcycles and mopeds, often viewed as high-risk regardless of who is at fault, were at fault in 6.5% of fatal and serious injury crashes.

Figure 30: Distribution of Vehicles at Fault for KA Crashes by Type, 2018-2022



Regardless of the size of the vehicle, crashes between a vehicle and pedestrian are often very unforgiving to the pedestrian. Figure 31 shows the vehicle type of the at-fault party in a crash where a pedestrian is involved. Any vehicle type that accounted for at least 1% of KA or KABCO is shown in Figure 31 while all others are excluded. When compared to all KA crashes, SUVs represented a slightly reduced share of pedestrian-involved KA crashes, while pickup trucks were at-fault at an elevated rate.

Figure 31: Vehicle Type of At-Fault Party in Pedestrian Crashes, 2018-2022



3 High Injury Network

The High Injury Network (HIN) is a tool for identifying the roadways and intersections with the highest number of crash fatalities and serious injuries in DuPage County. HINs, composed of a limited set of corridors and/or intersections within a given geography, are frequently used to identify safety study locations and potential safety projects, to prioritize investments, and to direct campaigns and engagement. The HIN enables focused action to address the most potentially significant safety concerns and demonstrate progress towards a goal to eliminate all deaths and serious injuries.

The HIN section is broken into four sections: **data preparation and interpretation**, **high injury network segments**, **high injury network intersections**, and **validation with community feedback**.

The HIN section meets the SS4A Safety Analysis requirement “geospatial identification of higher risk locations.”

Data Preparation and Interpretation

Analysis Area and Network

Unlike the severe crash analysis in an earlier section, at the direction of CMAP and the *Regional Framework* (June 3, 2023 version), the development of the HIN is not based only on the boundaries of DuPage County. As discussed earlier in the ESC, many municipalities along DuPage County’s borders cross over into another adjacent county (e.g., Burr Ridge is split between DuPage and Cook Counties). To correct for this and to provide HIN segments applicable to complete municipalities, CMAP assigned municipalities to DuPage County that roughly, but do not exactly, conform to its borders and total population. Similarly, segments and intersections in some municipalities (e.g., Aurora) are included in the HINs of other counties. The municipalities that make up the DuPage Safety Action Plan HIN analysis area, in addition to all of unincorporated DuPage, are listed in Table 14. No unincorporated portions of other counties are included.

Table 14: HIN Analysis Area Municipalities

Municipalities Fully within DuPage	Border Municipalities Assigned to DuPage	Border Municipalities Assigned to Other Counties
Addison	Bartlett	Aurora
Bloomingdale	Bensenville	Bolingbrook
Carol Stream	Burr Ridge	Chicago (O'Hare)
Clarendon Hills	Elmhurst	Elk Grove
Darien	Hanover Park	St Charles
Downers Grove	Hinsdale	
Glen Ellyn	Itasca	
Glendale Heights	Naperville	
Lisle	Oak Brook	
Lombard	Roselle	
Oakbrook Terrace	Wayne	
Villa Park	West Chicago	
Warrenville	Wood Dale	
Westmont	Woodridge	
Wheaton		
Willowbrook		
Winfield		

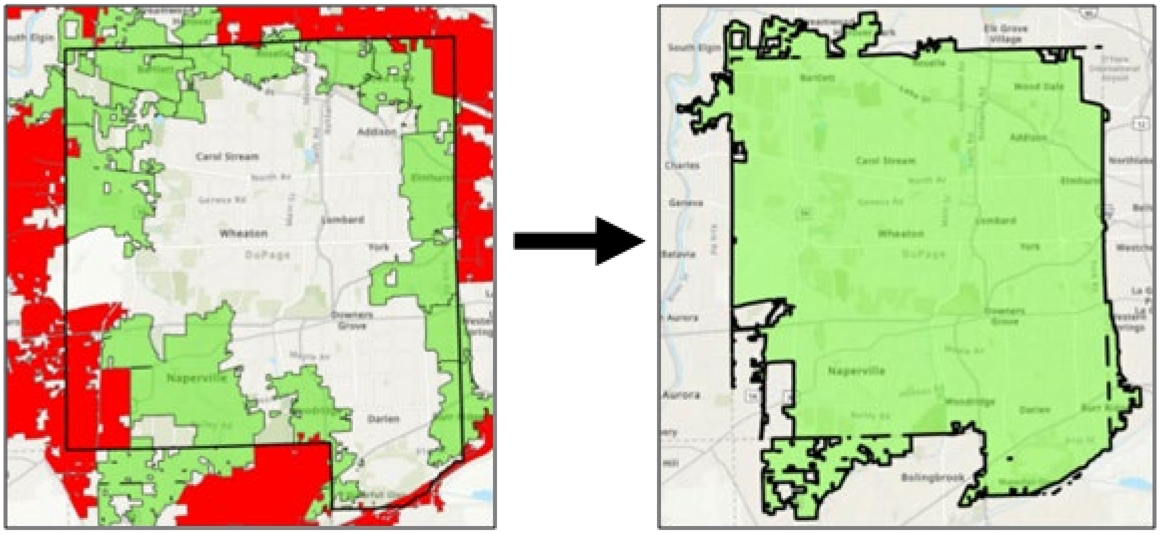
Source: CMAP

Figure 32 illustrates the analysis area used for all HIN analyses, with the official border of DuPage County on the left shown side-by-side with the final analysis area, illustrated in green on the right. Municipalities shown in red were not assigned to DuPage County, therefore the portions that fall within the county boundary are excluded. Through the remainder of the ESC, this area will be referred to as the "DuPage SAP analysis area."

CMAP took a similar approach to assigning streets on County and municipal borders so that no streets were accidentally omitted from the analysis. These assignments are also carried through the HIN analyses.

The HIN is based on five years of IDOT fatal and serious injury crash data, 2018-2022, consistent with IDOT data analyzed in the severe crash analysis earlier in the ESC. Unlike those earlier analyses, crash data for the HIN are analyzed using the DuPage SAP analysis area – they therefore include some crashes outside the DuPage County boundary and exclude others in municipalities assigned to other counties (e.g., Aurora).

Figure 32: Development of the DuPage SAP Analysis Area



The number of crashes in the HIN analysis area is summarized in Table 15. Between 2018 and 2022 there were 1,829 severe crashes resulting in 2,153 deaths and serious injuries, or 1.17 deaths and serious injuries per severe crash. This compares to the 1,769 severe crashes resulting in 2,068 deaths and serious injuries within the DuPage boundary over the same period, with the same ratio of crashes to deaths and serious injuries.

Table 15: HIN Analysis Area Crash Data Summary, 2018-2022

Basis	Metric	Segment-related Count	Intersection-related Count	Total Count
Crashes	Fatal Crashes	123	83	206
	Serious Injury Crashes	559	1,064	1,623
	Subtotal – KA Crashes	**682**	**1,147**	**1,829**
Injuries	Fatalities	133	90	223
	Serious Injuries	677	1,253	1,930
	Subtotal – KA Injuries	**810**	**1,343**	**2,153**

Segment HIN Assignment and Calculation

Segment crashes, those that CMAP did not assign to an intersection using the methodology described in the *Regional Framework,* are assigned to a simplified network of candidate street centerline segments (inclusive of all functional classifications) supplied by CMAP within the analysis area. To create the candidate segments, the project team dissolved and then split street segments at signalized and four-way stop intersections to create longer segments for analysis and to better align with potential logical termini for future project development. Therefore, each candidate segment includes smaller segments to, from, and between minor intersections (the typically uncontrolled intersection of a local functional classification street and a collector or arterial) located between major intersections. Crashes were then assigned to the nearest street segment, with limited exceptions for crashes found to be within private parking lots or crashes incorrectly located far away from street centerlines, which were screened out of the data set.

Based on the instruction in the *Regional Framework*, the project team calculated the number of deaths and serious injuries (person-level, not crash-level) involving all users for each candidate segment based on the assigned crashes. The project team then calculated the number of KA injuries per segment centerline mile to normalize each candidate for segment length. No weighting is applied to deaths or serious injuries (both are counted equivalently) and no distinction is made between users (e.g., pedestrian fatalities were not broken out or given additional weight).

Following assignment and calculation, the project team reviewed the data and developed a limited number of screening criteria in consultation with the criteria in the *Regional Framework*. To control for excessively high KA injuries per centerline mile, the project team removed all segments with lengths less than 0.1 miles (based on project team assessment, setting a threshold of 0.25 miles would remove many downtown segments in downtown/village center contexts). To ensure that the HIN was indicative of locations where more than one KA injury occurred in the last five years, all segments with one KA injury were dropped from consideration. To back up this determination, the project team posits that a segment with one KA injury reflects a tragic collision but does not reflect a pattern and thus is not eligible for inclusion.

Intersection HIN Assignment and Calculation

CMAP assigned intersection crashes to the center point (centroid) of intersecting roadway centerlines across the region prior to receipt of the data. No additional assignment was undertaken by the project team. Crashes were joined to intersection centroids that fell within the HIN analysis area. Like segments, the project teams calculated the number of deaths and serious injuries involving all users for each intersection. Like the segment analysis, no weights were applied.

Certain complex intersections may be represented by multiple intersection points. Offset intersections, for example, may function as one intersection but could be represented in a GIS shapefile as two intersection points. Complex intersections may have multiple points where the centerlines of constituent segments overlap. The project team did not assess these situations or make changes to the CMAP-supplied intersection file due to the high number of potential intersections in the study area.

Interpretation

Per the CMAP regional framework, the project team created two versions of the HIN: the comprehensive HIN and the contextual HIN. The comprehensive HIN includes all functional classes, including interstates, for the purposes of fulfilling USDOT guidelines for the preparation of safety analyses. Interstates are not included in the contextual HIN. The only significant difference between the comprehensive and contextual HINs are at the segment level. Since there are no true intersections on the interstate system (entrance and exit ramps are merges), all intersections belong to both contextual and comprehensive HINs.

Across both comprehensive and contextual HINs, KA injuries per mile are used to compare the relative severity of each included segment. The project team assessed the data and methodology at multiple steps in the HIN development process to check the utility of the outputs. Due to the large extent of the HIN analysis, all segments could not be checked for appropriate termini, whether changes in land use or roadway features occurred along the segment, or whether adjacent segments should be extended, combined, or shortened. Therefore, while KA injuries/mile are useful for comparison purposes, it is not a precise tool. Segments that are artificially short due to how the DuPage SAP analysis area boundary was constructed, for example, may be over-represented. Intersections cannot be normalized by length and are thus represented as a raw frequency.

The methodology used to create the HIN segments and intersections is based purely on historical IDOT crash data for all users and excludes crashes that did not result in a death or serious injury. Systemic and predictive factors are not factored in the development of the HIN, based on instruction in CMAP's *Regional Framework*. Future users of the HIN may seek to apply their own weighting factors and overlay other characteristics to produce more context-sensitive analyses or to create project prioritization indices.

A step-by-step methodology used to prepare the HIN can be found in the Appendix: HIN Development for Segments and Intersections Technical Memorandum.

High Injury Network Segments

HIN segments indicate corridors of potential concern and priority for safety assessment and intervention. The selected segments must therefore constitute a high concentration or density of fatalities or serious injuries, represent a relatively small fraction of the overall network, and indicate a pattern of severe crashes.

CMAP's *Regional Framework* suggests thresholds for HIN network lengths (5% minimum, 40% maximum) and fatalities or serious injuries (60% study area minimum). Most crashes that resulted in deaths and serious injuries in DuPage County and in the DuPage SAP analysis area between 2018 and 2022 occurred at intersections, limiting the pool of KA injuries for assessment. After screening out segments that did not meet the criteria laid out in the previous section, the project team determined that all eligible segments with two or more fatalities or serious injuries were needed to achieve CMAP's recommended threshold for the comprehensive HIN. Based on the diffuse pattern of KA injuries in the study area for the contextual HIN, achieving this threshold would require selecting many candidates with only one KA injury over the study period. As a result, the ability of the HIN to illuminate patterns of severe crashes would be diminished. In this case, the HIN segments would simply map where KA crashes have occurred.

The DuPage analysis area segments included in the comprehensive and contextual HINs are described in Table 16. The comprehensive HIN segments represent 60.9% of segment KA injuries between 2018 and 2022 but only 3.4% of the overall network. The contextual HIN segments, those that exclude interstate segments, represent 35.0% of KA injuries (50.1% of all KA injuries when interstates are excluded) and are only 2.0% of the total network in the analysis area by length.

Table 16: DuPage Analysis Area Segment HIN Summary

Segment Type		Count	Length (mi)	Percent Total Length	Segment KA Injuries	Percent Total KA Injuries
All Segments		16,383	3,954.3	100%	810	100%
Comprehensive	Candidate Segments	16,383	3,954.3	100%	781*	96.4%
	HIN Segments	135	133.3	3.4%	494	60.9%
Contextual	Candidate Segments	16,340	3,892.7	98.4%	567	70.0%
	HIN Segments	99	79.3	2.0%	284	35.0%

Source: CMAP

*29 crashes with KA injuries were removed from consideration as they were assessed to be located on private property (principally located in parking lots)

On a KA injuries per mile basis, the comprehensive HIN experienced 3.71 KA injuries per centerline mile while the contextual HIN experienced 3.58 KA injuries per centerline mile between 2018 and 2022, illustrating rough comparability.

Comprehensive and contextual HIN segments in the DuPage SAP analysis area are shown in Figure 33. In addition to the interstates, significant portions of IL-83, IL-56 (Butterfield Road) and IL-38 (Roosevelt Road) on the eastern side of DuPage County are identified in both the comprehensive and contextual HINs.

The top ten segments by KA injuries per centerline mile in the comprehensive and contextual HIN are listed in Table 17. While the comprehensive HIN includes interstates, none had sufficient KA injuries per mile to make the top ten list, so the comprehensive and contextual top ten segment lists are mutually inclusive. A complete table of candidate and scored segments can be found in the Appendix.

Figure 33: Comprehensive and Contextual HIN Segments

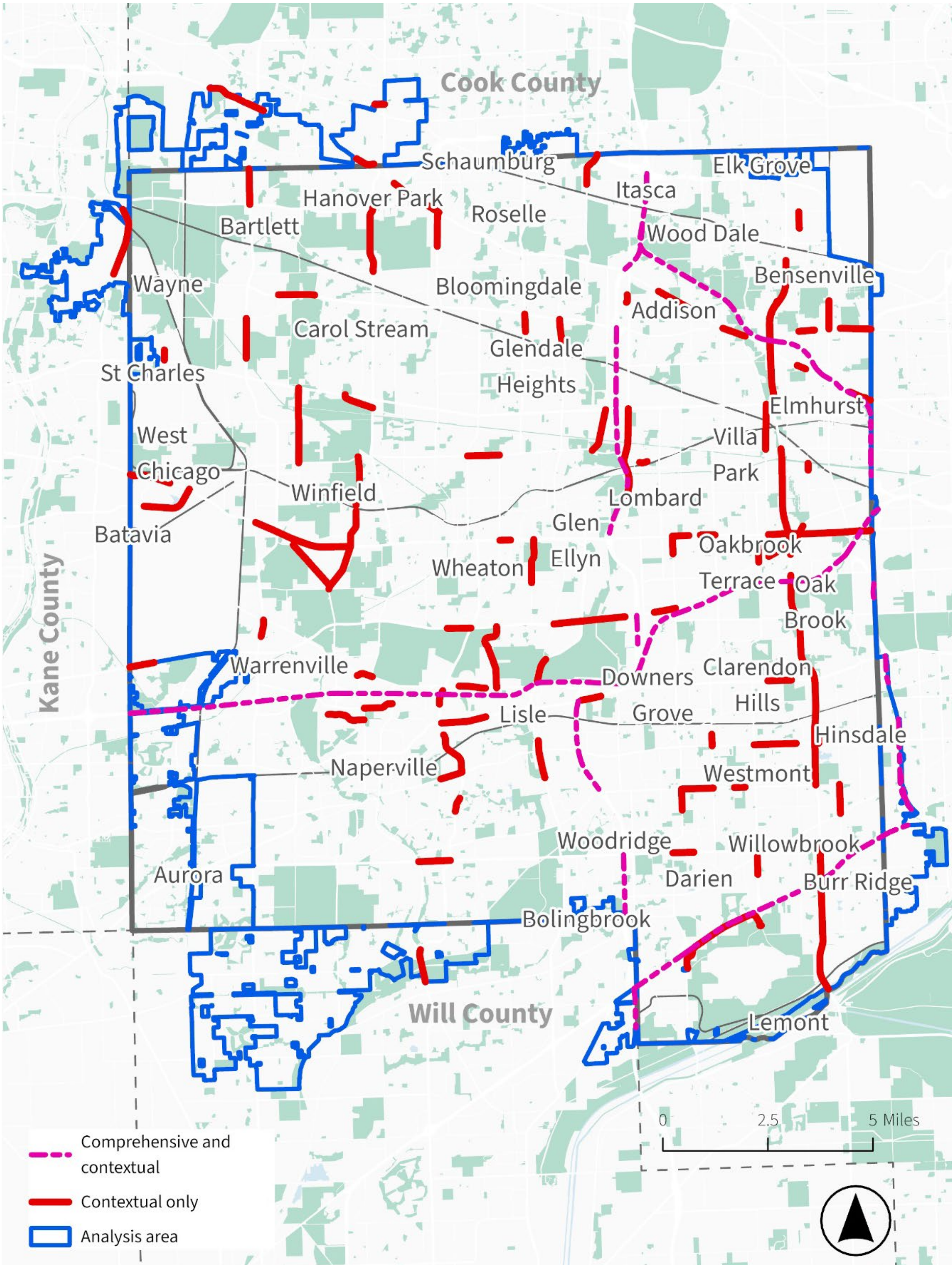


Table 17: Top 10 Comprehensive and Contextual HIN Segments by KA Injuries per Mile

Corridor	From	To	Municipality	Jurisdiction	KA Injuries 2018-2022	Length (mi)	KA Injuries /mi
Lake Street (US-20)	Horizon Drive	IL-59	Bartlett	IDOT	7	0.44	16.0
Naperville Rd	Diehl Road	Tollway Sign Shop/Central Park Signal	Naperville/ Lisle	DuPage County	5	0.34	14.9
Lake Street (US-20)	N Church Road	N Walnut Street	Elmhurst	IDOT	3	0.22	13.8
Lincoln Ave (IL-53)	Main Street	Maple Avenue	Lisle	IDOT	3	0.24	12.9
S Spring Road	Prairie Path Lane	W Vallette Street	Elmhurst	Municipal	2	0.16	12.2
Dunham Road	Canadian National Railway	Union Pacific Railroad	Wayne	Kane County	5	0.41	12.1
W St Charles Road	Crescent Boulevard	S Elizabeth Street	Lombard	Municipal	2	0.18	10.9
Lake Street (US-20)	I-355 SB Off Ramp	I-355 NB On Ramp	Hanover Park	IDOT	3	0.28	10.8
Washington Street	S Washington St	Royce Rd	Naperville	Municipal	3	0.28	10.8
Lake Street (US-20)	Greenbrook Blvd	Bartels Rd	Hanover Park	IDOT	4	0.37	10.7

The DuPage SAP analysis area includes assigned municipalities and unincorporated DuPage County (no unincorporated areas of Will County, Kane County, or Cook County are included). A breakdown of HIN segments by municipality is presented in Table 18. The project team assigned segments that pass through multiple municipalities to the municipality that represented the highest percentage of the segment length. Interstate segments are broken out as they pass through multiple municipalities and represent the exclusive set of non-contextual HIN segments. The municipalities with the highest mileage of HIN segments are West Chicago, Westmont, and Naperville. Hanover Park, Bartlett, and Naperville had the highest number of KA injuries on HIN segments. When adjusted for KA injuries per mile, Elmhurst (7.3), Bartlett (6.6), and Lisle (6.0) led peers with over a mile of contextual HIN segments within their borders (inclusive of all jurisdictions).

Table 18: Comprehensive and Contextual HIN Segments by Municipality

Municipality	Total HIN Segment Miles	KA Injuries	KA Injuries/mi
Interstate	53.97	210	3.9
West Chicago	7.6	16	2.1
Westmont	5.4	10	1.9
Naperville	4.9	18	3.6
Hanover Park	4.3	20	4.6
Oakbrook Terrace	4.0	15	3.8
Winfield	4.0	9	2.3
Downers Grove	3.6	14	3.9
Darien	3.5	7	2.0
Lombard	3.5	15	4.3
Wheaton	3.3	9	2.7
Burr Ridge	3.1	14	4.6
Bartlett	3.0	20	6.6
Unincorporated DuPage	3.0	10	3.3
Lisle	2.9	17	5.8
Elmhurst/Addison	2.9	7	2.5
Addison	2.8	8	2.9
Bensenville	2.6	15	5.8
Villa Park	2.1	5	2.3
Glen Ellyn	2.1	4	1.9
Elmhurst	1.6	12	7.3
Wayne	1.6	9	5.6
Clarendon Hills	1.6	4	2.5
Oak Brook	1.5	4	2.7
Glendale Heights	1.0	5	5.0
Willowbrook	1.0	4	4.2
Roselle/Itasca	0.8	2	2.5
Aurora	0.6	3	5.1
Bolingbrook	0.5	3	6.0
Total	**133.3**	**494**	**3.7**

A summary of comprehensive HIN segments by jurisdiction is included in Table 19 and a summary of comprehensive segments is presented in Table 20. Roadways under the jurisdiction of IDOT constitute the largest portion of both the comprehensive and contextual HINs by length and number of KA injuries on the HIN. When interstates are removed (and thus Illinois Tollway-owned facilities), the second highest share of length and KA injuries shifts from Tollway jurisdiction to County. Despite owning the most roadway on a per-centerline-mile basis, municipalities own just 9% of the comprehensive HIN and 15% of the contextual HIN.

Table 19: Comprehensive HIN Segments by Jurisdiction

Jurisdiction	HIN Length (mi)		KA Injuries	
	Count	%	Count	%
County	19.9	15%	78	16%
IDOT	61.6	46%	237	48%
Municipality	12.1	9%	42	9%
Tollway	36.1	27%	129	26%
Township or Road District	3.5	3%	8	2%
Total	**133.3**	100%	**494**	100%

Table 20: Contextual HIN Segments by Jurisdiction

Jurisdiction	HIN Length (mi)		KA Injuries	
	Count	%	Count	%
County	19.9	25%	78	27%
IDOT	43.8	55%	156	55%
Municipality	12.1	15%	42	15%
Township or Road District	3.5	4%	8	3%
Total	**79.3**	100%	**284**	100%

High Injury Network Intersections

High Injury Network intersections illustrate the intersections where the highest frequency of KA injuries occurred in the DuPage SAP analysis area between 2018 and 2022. The HIN intersections are the same across the comprehensive and contextual HINs as there are no true intersections on interstates and none are apparent on review of CMAP's intersection file.

The project team established a minimum threshold of three KA injuries per intersection over the five years between 2018 and 2022 based on an assessment of the variation in KA injuries across intersections eligible for analysis. As illustrated in Table 21, this threshold results in 117 intersections encompassing 473, or 35.0%, of KA injury crashes at intersections. Lowering the threshold to two KA injuries more than doubles the number of potential HIN intersections to 293 and significantly increases the coverage of KA injuries to 829 (61.3% of all intersection KA injuries). However, using this lower threshold tilts the HIN intersection list towards locations with single KA crashes resulting in multiple serious injuries. For this reason, the project team recommends using the smaller sample for greater precision and prioritization.

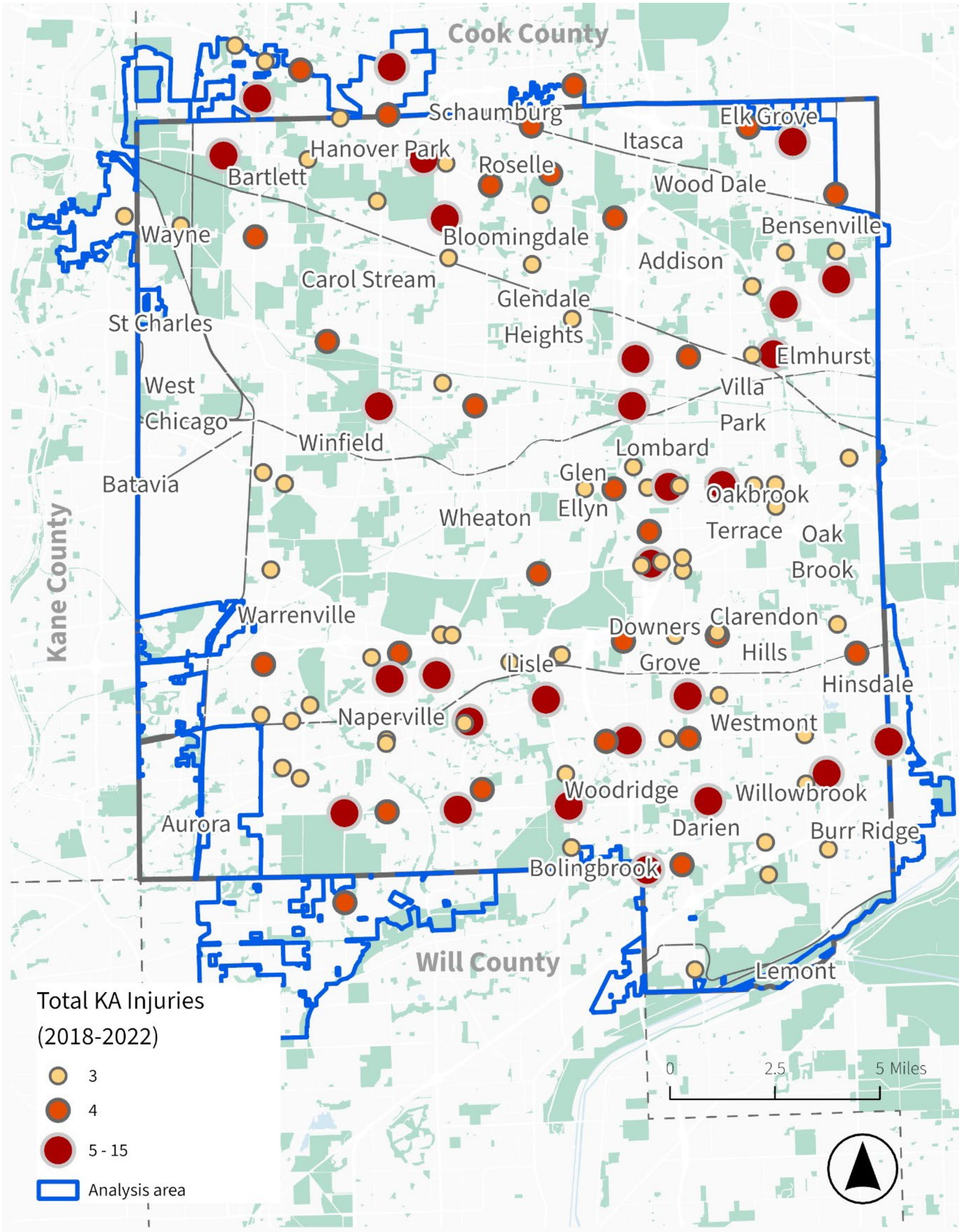
Table 21: DuPage Analysis Area HIN Intersection Summary

Intersection Type	Count	Percent of Intersections	Intersection KA Injuries	Percent Total KA Injuries
All Intersections	21,444	100%	1,352	100%
HIN Intersections	117	0.6%	473	35.0%

The distribution of the 117 HIN intersections across the DuPage SAP analysis area and the variation in KA injuries by intersection are shown in Figure 34. HIN intersections are located across the DuPage SAP analysis area but are more sparsely distributed on the western side of it. There are multiple adjacent HIN intersections along US-20 (Lake Street), IL-64 (North Avenue), IL-38 (Roosevelt Road), IL-56 (Butterfield Road), US-34 (Ogden Avenue), 63rd Street, and 75th Street. Of the 117 intersections on the intersection HIN, 59 (50%) are state jurisdiction (complete information on jurisdiction was not included in the CMAP intersection file so only state-owned intersections can be broken out).

The top twenty intersections by KA injuries are listed in Table 22. At 15 KA injuries between 2018 and 2022, the intersection of IL-64 and IL-53 has almost double the number of KA injuries as the next highest ranked intersections. Multiple intersections along 75th Street, IL-64 (North Avenue), and IL-53 appear in the top twenty. Seven of the twenty intersections are included in crash analyses created by the DuPage Division of Transportation using the three most recent years of crash data based on an injury severity-weighted formula (this differs from that recommended by CMAP due to its inclusion of PDO and minor injury crashes). Multiple intersections have been improved since 2019. A full list of HIN intersections is provided in the Appendix.

Figure 34: HIN Intersections by KA Injuries



HIN intersections are predominantly signalized. One hundred out of 117 are signalized, two are all-way stops, and the remaining 15 are at intersections with one or more uncontrolled approaches. All HIN intersections either have three legs or four; none are located at complex, multi-legged intersections based on the information provided in CMAP's intersection file. Most HIN intersections have high combined average annual daily traffic (AADT); 74 of 117 had over 30,000 vehicles per day on average, inclusive of major and minor leg volumes. Twenty-two had combined AADTs greater than or equal to 50,000.

Table 22: Top 20 HIN Intersections by KA Injuries

Major Road Name	Minor Road Name	State Juris.	KA Injuries	Rank	Municipality	Recently Completed Project
IL-64 (North Ave)	IL-53 (Columbine Ave)	Yes	15	1	Lombard	
IL-59 (Sutton Rd)	West Bartlett Rd	Yes	8	2	Bartlett	Yes
IL-38 (Roosevelt Rd)	Westmore-Meyers Road	Yes	8	2	Lombard	
Naper Blvd	75th St		8	2	Naperville	Yes
IL-53	75th St	Yes	8	2	Woodridge	
Grand Ave	York Rd		8	2	Bensenville	Yes
75th St	Fairmount Ave		7	7	Darien	Yes
Stearns Rd	Munger Rd		7	7	Bartlett	Yes
Barrington Rd	Irving Park Rd	Yes	6	9	Hanover Park	Yes
Plainfield Rd	County Line Rd		6	9	Burr Ridge	
County Farm Rd	Geneva Rd		6	9	Winfield	
IL-56 (Butterfield Rd)	Finley Rd	Yes	6	9	Downers Grove	
Gary Ave	Schick Rd		6	9	Bloomingdale	
Main St	55th St		6	9	Downers Grove	Yes
63rd St	Belmont Rd		6	9	Downers Grove	
IL-83 (Busse Rd)	Bryn Mawr Ave	Yes	6	9	Bensenville	
US-34 (Ogden Ave)	Iroquois Ave	Yes	6	9	Naperville	
Catalina Dr	Arlington Dr E.		5	18	Hanover Park	
IL-64 (North Ave)	Villa Ave	Yes	5	18	Villa Park	
Kingery Hwy (IL-83)	Plainfield Rd	Yes	5	18	Willowbrook	Yes

HIN intersections are in 27 municipalities and unincorporated DuPage County. Naperville has the highest number of HIN intersections at 20, followed by Downers Grove with 15 (in both municipalities, less than a third of HIN intersections are under IDOT jurisdiction). A full count of HIN intersections by municipality is listed in Table 23.

Table 23: HIN Intersections by Municipality

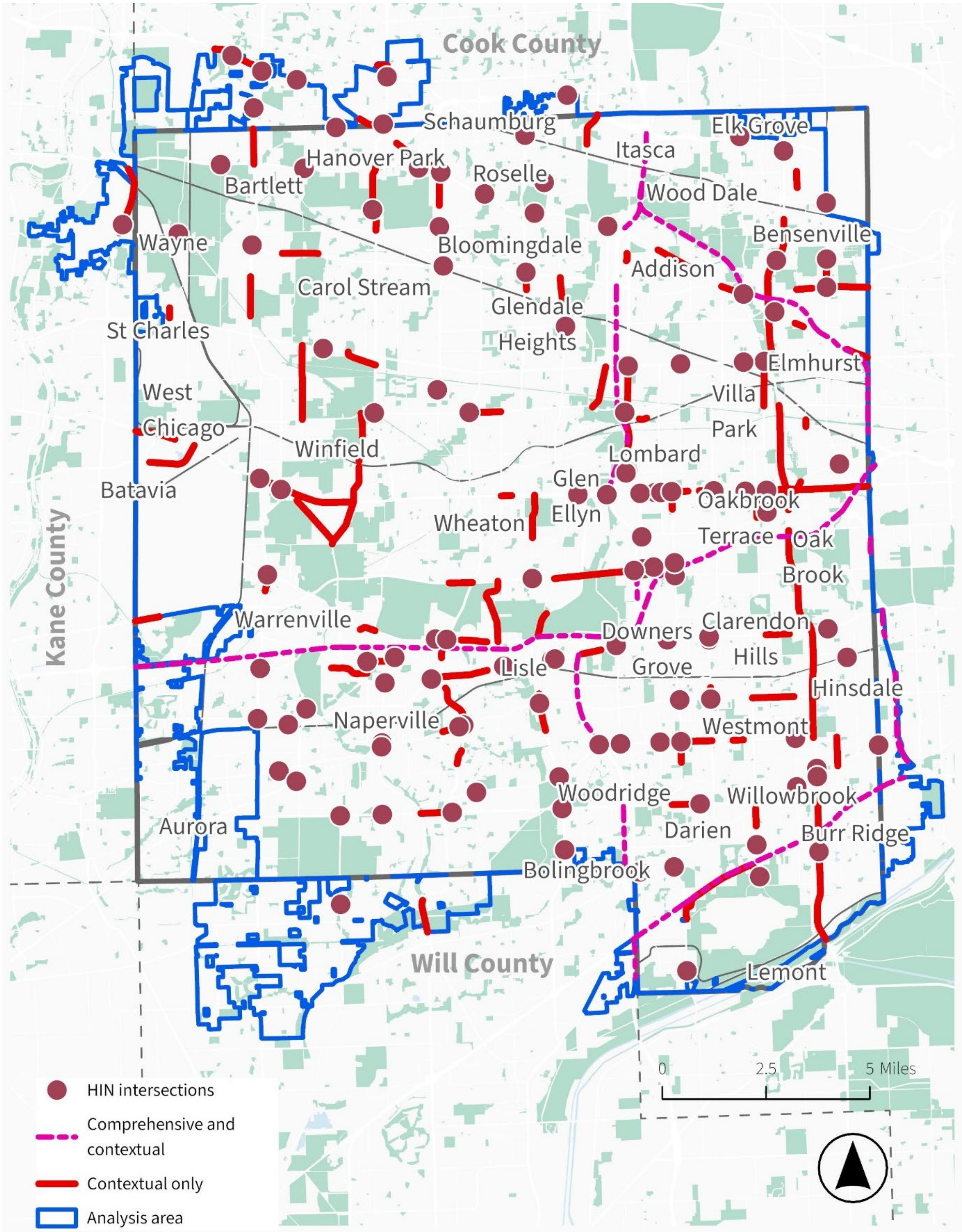
Municipality	HIN Intersection	KA Injuries
Naperville	20	77
Downers Grove	15	61
Lombard	11	58
Bartlett	8	35
Woodridge	6	26
Bensenville	4	21
Roselle	5	19
Hanover Park	4	18
Unincorporated	4	15
Lisle	4	14
Darien	4	13
Bloomingdale	3	12
Elmhurst	3	11
Villa Park	3	11
Willowbrook	3	11
Wheaton	2	8
Addison	2	7
Hinsdale	2	7
Burr Ridge	1	6
Glendale Heights	2	6
Oakbrook Terrace	2	6
Wayne	2	6
West Chicago	2	6
Winfield	1	6
Wood Dale	1	4
Carol Stream	1	3
Glen Ellyn	1	3
Warrenville	1	3
Grand Total	**117**	**473**

When segments and intersections are combined into one network, the comprehensive HIN represents 44.9% of all KA injuries in the DuPage SAP analysis area while the contextual HIN represents 35.4% of all KA injuries (39.1% when interstates are dropped). A complete summary is provided in Table 24. This network represents a small number of total intersections and segment miles, enabling planners and engineers to focus on limited portions of the network to break a complex, seemingly impossible task down into smaller and more manageable tasks to address. The complete HIN is also shown in Figure 35.

Table 24: Complete HIN Summary

HIN Component	Count	Percent Total	KA Injuries	Percent Total KA Injuries	Percent KA Injuries, Excluding Interstates
Comprehensive Segments	133.3 miles	3.4%	494	22.9%	n/a
Contextual Segments	79.3 miles	2.0%	284	13.3%	14.7%
Intersections	117 intersections	0.6%	473	22.0%	24.4%
Comprehensive Total			**967**	44.9%	n/a
Contextual Total			**757**	35.2%	39.1%

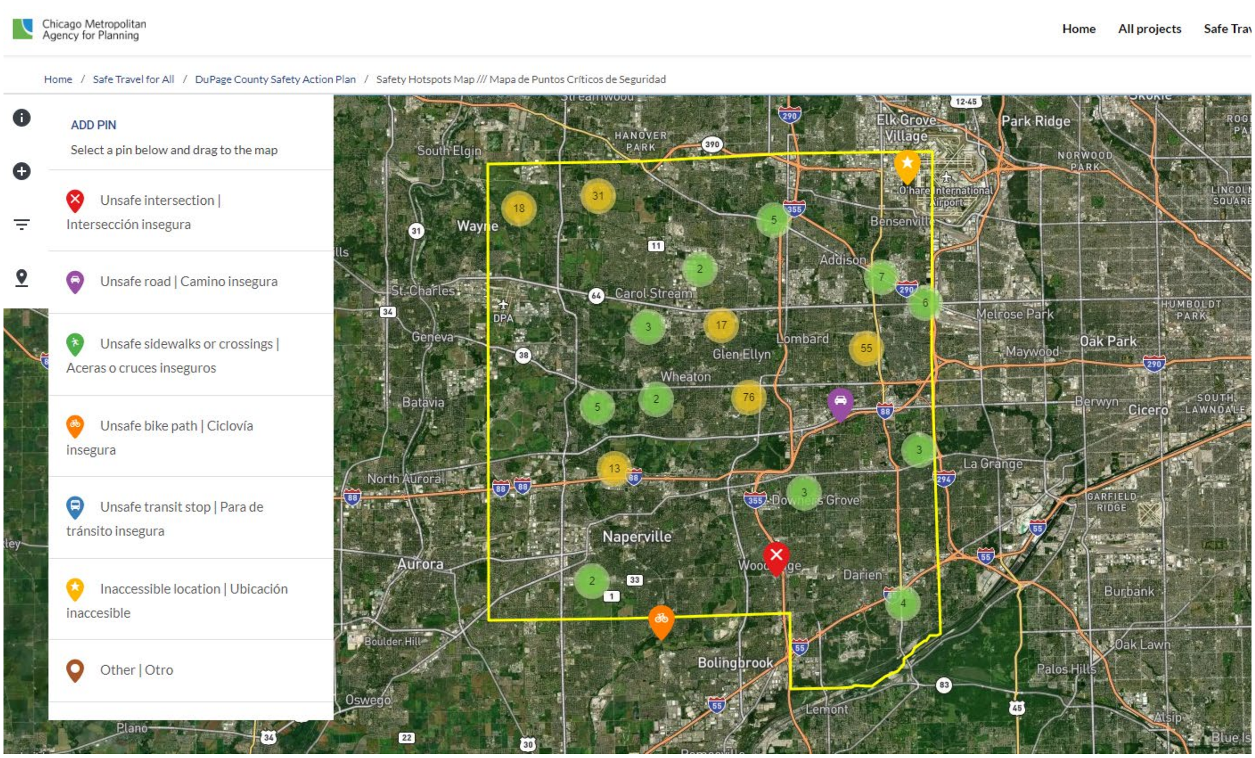
Figure 35: Complete HIN, DuPage Analysis Area



Validation with Community Feedback

The DuPage SAP utilized in-person and virtual engagement tactics to identify perceived safety hotspots across the county. The project engagement website, based on the EngagementHQ platform, included a Safety Hotspots Map interactive widget. The interactive map prompted visitors to add pins to flag locations they felt were either unsafe intersections, unsafe roads, unsafe sidewalks or crossings, unsafe bike paths, unsafe transit stops, inaccessible locations, or had other safety concerns. Visitors could enter as many comments as they liked and also provide an image. A screen capture of the web map is provided in Figure 36. A companion physical mapping activity was conducted as part of the DuPage SAP Open House in Elmhurst on September 12, 2024 and the DuPage SAP Open House in Bensenville on November 14, 2024. As of the end of the consultation on January 31, 2025, participants had contributed 626 concerns in-person or via the web map. No HIN materials had been posted prior to soliciting comments on location-based safety concerns.

Figure 36: DuPage SAP Safety Hotspots Map



Many participant-submitted comments point to identified HIN segments and intersections, but most tend to identify safety concerns along other corridors and intersections. Locations of comments received are shown in Figure 37. Prominent clusters of comments were received in the center of the county in Villa Park, Lombard, Glen Ellyn, Wheaton, and Winfield, with smaller clusters of comments in other areas.

Areas flagged in respondent comments that overlapped the HIN included:

- Purnell/Winfield/IL-38/Roosevelt Rd triangle in Winfield near Cantigny Park and Blackwell Forest Preserve, inclusive of the West Branch DuPage River Trail crossing at IL-38/Roosevelt Rd & Garys Mill Rd
- Il-56/Butterfield Rd between Naperville Rd and Highland Ave

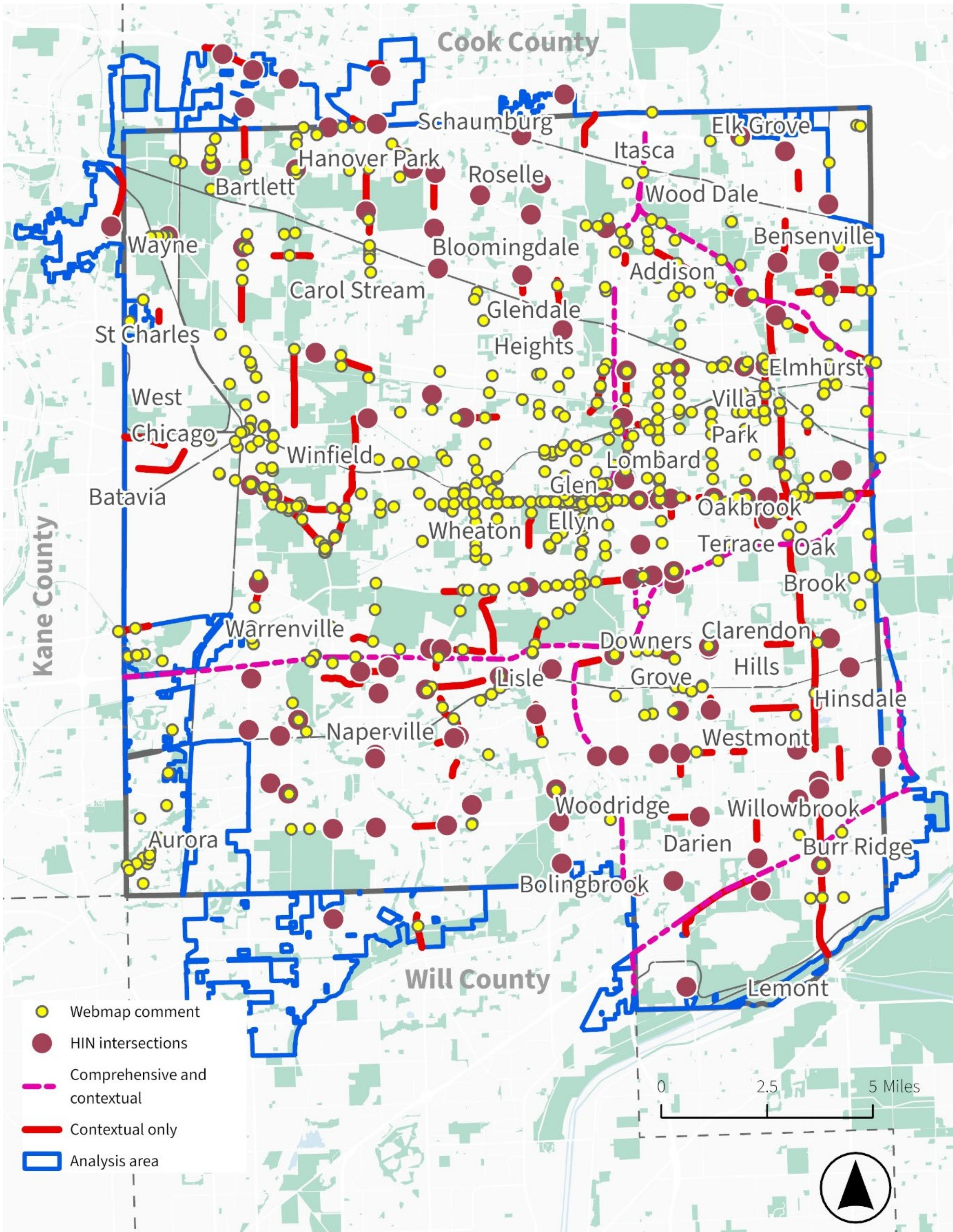
Areas that respondents flagged but that did not coincide with the HIN included:

- Il-38/Roosevelt Rd through Wheaton and Glen Ellyn
- IL-53 from Roosevelt Rd to Warrensville Rd, passing the Morton Arboretum and into Lisle
- Il-59/Neltnor Blvd in West Chicago (also identified through a separate VRU analysis by DuPage County)
- Naperville Road through Wheaton
- St Charles Road through Villa Park
- Main Street through Lombard
- Grace Street through Lombard
- Crossings along the Illinois Prairie Path

Few comments were received in southern DuPage County including Naperville. This is more likely a reflection of a need for additional outreach and engagement through future roadway safety engagement efforts than an absence of safety concerns.

Investigation into the responses illustrates that just like any methodology, the HIN methodology has limitations. It cannot capture all areas where improvement is desired or would be beneficial or all aspects of safety. These results indicate that perceptions of locations with safety concerns (at least the perceptions of those who participated in the survey) may differ from the locations where severe crashes occur most frequently. Many of the responses and locations are associated with barriers to walking and biking. This reflects the need to consider how high-speed roadways, disconnected networks, and other roadway engineering and behavioral conditions create perceived barriers that might not be borne out in crash data but are meaningful in the lives or DuPage County residents and visitors.

Figure 37: Complete HIN and Web Map Comments



Recent Investments

Roadway agencies in DuPage County are actively utilizing crash analysis to identify and prioritize locations for safety improvements. IDOT, the DuPage County Division of Transportation (DuDOT), and multiple municipalities perform crash analysis and coordinate with law enforcement agencies to identify crash hot spots and locations where there is a history of behavioral concerns.

DuDOT regularly creates and disseminates segment- and intersection-level crash severity rates for arterial and collector roadways. These rates are based on the most recent three years of IDOT crash data, average daily traffic (ADT), fatal crashes, injury crashes, and property damage only crashes. Intersections are broken out by type of control and ADT. DuDOT integrates crash performance into its signals database, enabling engineers to identify opportunities for upgrades to meet safety needs.

Multiple intersections and segments identified through the HIN analysis have received safety improvement during the 2018-2022 analysis period and in the years since or are slated for improvements. These locations are summarized in Table 25. This table, however, does not include all locations where municipalities have made or are planning safety investments.

Table 25: Recent HIN Location Infrastructure Investments

HIN Location	Jurisdiction	Improved by	Municipality	Description
75th Street at Plainfield-Naperville Road	DuDOT	County	Naperville	Improved in 2017-18, the project added dual left turn (LT) on 75th and right turn (RT) lanes. Improvement restricts LT to protected only to reduce angle and turn crashes.
75th Street at Modaff Road	DuDOT	County	Naperville	Recently completed addition of RT lanes on 75th Street and extension of LT storage on 75th Street legs to reduce rear end crashes.
75th Street at Naper Boulevard	DuDOT	County	Naperville	Added dual LT on 75th Street in 2020, prohibiting unprotected left turns to reduce or eliminate turn and angle crashes.
IL 53 at 75th Street	IDOT	IDOT	Woodridge	IDOT improvement pending, addition of dual left and right turns to reduce turn and angle crashes.
87th Street at Woodward Avenue	DuDOT	County	Woodridge	Completed in 2024, the project added dual LT on all but the north leg to reduce turn and angle crashes.
IL 83 at Plainfield Road	IDOT	Permit/ IDOT	Willowbrook	Completed in 2020-21, the project added dual LT on Plainfield Road. to reduce or eliminate turn and angle crashes.
US 34 at Finley-Belmont Road	IDOT	County/ IDOT	Downers Grove	The project is currently in Phase I engineering to widen intersection and include dual LT on all legs and restrict unprotected left turns. Construction is expected in 2028-29.
55th Street at Fairview Avenue	DuDOT	County	Downers Grove	The project, completed in 2020-2021, added left lanes on N, E and W legs and upgraded signals and pedestrian accommodations for a potential reduction of rear end, night-time, pedestrian, and sideswipe same direction crashes.

HIN Location	Jurisdiction	Improved by	Municipality	Description
63rd Street at Main Street, Downers Grove	DuDOT	County	Downers Grove	In 2023, DuDOT completed installation of protected left turn phasing to reduce turning and angle crashes and installed new signal mast arms and signal heads with reflective back plates to increase nighttime visibility and reduce crashes.
63rd Street - Williams to Americana	DuDOT	County	Westmont, Willowbrook	DuDOT is proposing to install Flashing Yellow Arrow protocol in the corridor to reduce turn and angle crashes at Cass Avenue and Clarendon Hills Road
County Farm Road at Geneva Road	DuDOT	County	Winfield	County has initiated Phase I engineering to study geometric options to reduce turn and angle as well as pedestrian-vehicle conflicts.
Fabyan Parkway - IL 38 to Technology Blvd	DuDOT	County	West Chicago	DuDOT expects to widen Fabyan Parkway in 2026-27. Design includes raised medians, striping, lighting and retroreflective markings to reduce head on and sideswipe crashes.
Grand Avenue at York Road	DuDOT	County	Elmhurst/ Bensenville	DuDOT improved the geometrics, lighted street signs and new signals with reflective backplates at the intersection to provide better pedestrian accommodations, better overall visibility and improved delineations to reduce pedestrianand nighttime crashes.
County Farm Road - Schick Road to Stearns Road	DuDOT	County	Hanover Park	DuDOT improved County Farm and Schick Road in 2017-18 to include new signals, signal heads with reflective backplates, and new lighting to reduce night time crashes and peak hour rear end crashes.
Gary Avenue at US 20/Lake Street	IDOT	IDOT	Hanover Park/ Roselle	Intersection improvement in 2023/24 including new signals and new pedestrian accommodations.
IL 19 /Irving Park Road at York Road	IDOT	IDOT	Bensenville/ Chicago	Major geometric improvement at intersection tied to O'Hare Modernization Program and Western Access. Completed in 2019, the project added dual left turn lanes NB and SB and improved signalization for visibility and to reduce turn and angle crashes.

HIN Location	Jurisdiction	Improved by	Municipality	Description
Army Trail Road at Munger Road	DuDOT/Muni	County	Wayne/Bartlett	DuDOT installed all-way stop control in 2023 and Forest Preserve added high-visibility trail crossing. Feasibility/Phase I study underway to evaluate further improvements.

4 Systemic Safety Conditions

Systemic safety analysis seeks to understand where crashes that result in deaths and serious injuries are more likely to occur, identifying the collection of characteristics that are associated with higher rates of these crashes. Using these collections of features, safety analysts can then screen entire networks to identify segments and intersections that are associated with higher severe crash risk, even if deaths and serious injuries have not yet occurred. Systemic safety tools can then be matched to crash and the segment and intersection types to develop project lists. Used in this way, systemic safety analysis can form the basis of a proactive approach.

As demonstrated in the HIN analysis, the number of deaths and serious injuries, particularly on segments, are relatively low and may not constitute defined patterns. Systemic analysis is therefore an especially important tool where anticipating, rather than responding to, severe crashes may be more effective to eliminate deaths and serious injuries.

This section is broken into several parts, each of which build on one another. **High risk crash types** identify the types of severe crashes that are of particular concern in DuPage County. The **roadway features systemic risk factor analysis** then quantifies the relative risk for the high-risk crash types based on segment and intersection characteristics.

Like the HIN analysis, the systemic analysis is based on crashes, segments, and intersections for municipalities assigned to DuPage County by CMAP and thus all analysis is for the DuPage SAP analysis area.

The systemic safety conditions section meets the SS4A Safety Analysis requirement “Analysis or systemic and specific safety needs.”

High Risk Crash Types

Traffic crashes represent a major concern no matter where or how they occur across the transportation network. However, research indicates that not all types of crashes pose the same levels of risk. Additionally, some severe crash types may be more or less likely to occur based on the presence (or absence) of certain roadway features and nearby land use development patterns. A central goal of this countywide safety action plan is to eliminate the most dangerous types of crashes affecting DuPage County: those resulting in serious injuries or fatalities. To that end, this literature review examines crash types that are most likely to impact DuPage County’s Priority Emphasis Areas and the associated street features or land uses that elevate or mitigate the most severe crash outcomes. The County's Priority Emphasis Areas include bicycles and pedestrians, intersections, older drivers, and speed-related crashes.

Bicycle and Pedestrian Crashes

Crash types that most severely impact bicycles and pedestrians include crashes at intersections, crashes involving turning vehicles, midblock, on road crashes with vehicles going straight, and crashes that take place after dark. For pedestrians, crashes at signalized intersections were found by a 2022 FHWA study to be positively related with both increasing pedestrian and vehicle volumes (i.e., more pedestrian- and vehicle-heavy intersections tend to experience more crashes) – while this positive association is not surprising, pedestrian crash risk at these intersections is further compounded by increasing corner radii and shoulder widths. Additionally, the number of pedestrian crashes was higher when both intersection legs were one-way streets with traffic moving away, or when there was a mix of two-way and one-way operations at the intersection. When on-street parking existed on the approach leg of a signalized intersection, however, fewer pedestrian crashes occurred.[xvi]

For both bicyclists and pedestrians, vehicle turning movements play a major role in determining crash risk and severity. In Illinois, for example, bicyclists tend to be at greater risk from right-turning vehicles, with 17.9% of all bicycle crashes in the collar counties involving a driver making this maneuver. According to the IDOT *Vulnerable Road User (VRU) Assessment*, these crashes also tend to be associated with roadway and land use characteristics such as four-lane corridors, arterial streets, streets with between 15,000 and 30,000 AADT, 30 to 35 MPH speed limits, and commercial land uses.[xvii] Conversely, pedestrians face greater crash risks at intersections from left-turning vehicles. Key variables associated with left-turning pedestrian crashes include increasing motor vehicle volumes, the number of intersection legs, and the number of lanes at intersections.[xviii] In other words, pedestrian crash risk from permissive left-turning vehicles increases with greater intersection complexity and vehicle throughput, even where pedestrian crossing signals are present.

Unsurprisingly from the descriptive crash analysis, bicyclists and pedestrians both face elevated risk of severe crash outcomes for crashes occurring after dark. Darkness and lack of visibility associated with nighttime conditions was the single highest contributing factor to VRU crashes in Illinois, with 28% of these crashes occurring at night.[xix] For pedestrians, after dark crash risk increases significantly when motor vehicle volumes increase from low (0-5,000 AADT) to medium (5,000-10,000 AADT); beyond this, increasing crash risk is only marginal. Another crash type adversely impacting pedestrians are crashes on segments with vehicles going straight, otherwise known as mid-block crashes. These crashes are more likely to occur when blocks are longer and pedestrians have fewer convenient options to cross at a designated intersection, making them more prone to attempt a crossing mid-block. These types of crashes are also more likely to fall along state roads and arterials as opposed to local streets.[xx]

Intersection Crashes

Intersections are more prone to traffic crashes due to the complex and conflicting movements of vehicles, bicyclists and pedestrians converging from different directions. Many of the crash types across other DuPage County Emphasis Areas occur at intersections, which further compound other forms of risk. Of particular concern are angle crashes at intersections, or crashes in which two vehicles traveling in different directions collide at an angle where drivers or passengers are most vulnerable (also known as T-Bone crashes). High-speed roadways with wide medians and/or side-street, stop-controlled intersections may present greater risk of severe angle crashes.[xxi]

According to Montgomery County, Maryland's *Predictive Safety Analysis*, angle crashes at intersections in Montgomery County were more likely to occur on state roads, where crash risk is 225% higher relative to county roads. Such a discrepancy in crash risk across jurisdictions is likely attributable to the types of traffic that state roads tend to carry and the land uses they travel through. Nationally, many state roads experience greater throughput and higher speeds on average than roads under county or local control, putting them at greater risk. In addition to design and physical factors, policy also plays a significant role. According to the *Predictive Safety Analysis*, higher posted speed limits increase the likelihood of severe crash types such as angle crashes – increasing the speed limit by 5 MPH increases crash risk by 15%, while increasing it by 10 MPH increases risk by 32%.[xxii]

To prevent angle crashes at intersections, agencies such as FHWA and California Department of Transportation (Caltrans) recommend that signalized intersections should be designed as close to 90 degrees as possible, and should not be designed to less than 75 degrees.[xxiii] In situations where perpendicular intersections or interchange ramps are infeasible, such as through high-angle channelized right turns, for example, pedestrian refuge islands can be an effective countermeasure.[xxiv]

Another design feature that can mitigate angle crashes at intersections are reduced conflict intersections (RCIs), which have been shown to reduce severe crashes of this type by 70%.[xxv] RCI is a general term used to describe several types of design strategies to improve safety and traffic flow by reducing the number of potential conflict points. The most common type of RCI design involves the elimination of left turns from side streets onto busier main roads; these intersection designs simplify decision-making for drivers by allowing them to focus on one direction of traffic at a time rather than look for a gap in high-volume, bidirectional traffic. For example, a restricted crossing U-turn (RCUT) is a type of RCI that requires minor road traffic to make a right turn followed by a U-turn at a nearby designated location to continue in the desired direction. According to FHWA, conversion of an unsignalized intersection to an unsignalized RCUT can reduce fatal and serious injury crashes by 63%.[xxvi] RCIs offer a lower-cost alternative to grade separation infrastructure and may be more effective at reducing severe angle crashes than signalization strategies.

Other alternative intersection designs, such as roundabouts, have been found by FHWA to be broadly effective at reducing fatal and serious injury crashes for all road users when compared to traditional signalized intersections. Planning and design of these facilities are critical in achieving safer outcomes, and FHWA provides detailed design guidance for implementing projects that effectively center vulnerable road users like pedestrians and bicyclists in a variety of configuration types.[xxvii] While roundabouts may sometimes lead to short-term increases in minor crash types such as side-swipes or rear ends, more severe crash types such as angle crashes are often virtually eliminated due to all vehicles being brought into the same direction at a lower speed.[xxviii]

Older Driver Crashes

Crashes among older drivers (65 years and over) are of significant concern in DuPage County, especially as this segment of the population continues to grow at a faster rate than other age demographic groups. While the effects of aging on people as drivers, pedestrians, or bicyclists are highly individual, common challenges that may impact people as they age include declining vision, decreased flexibility and psychomotor performance, and changes in perceptive and cognitive ability.[xxix] Older drivers, then, may be particularly susceptible to crashes at points where the transportation network becomes most complicated, such as intersections (both signalized and unsignalized), interchanges, networks that do not conform to a predictable pattern such as a grid, and in instances where visibility becomes especially challenging, such as when driving after dark and/or in adverse weather.

According to a Florida State University study on aging road users and intersection safety, estimates of a perception reaction time to yellow signals, often assumed as one second, were found to be inadequate in accounting for age-related changes; the study ultimately recommends that this standard should be increased.[xxx] Additionally, left-turn lanes at suburban unsignalized intersections can be challenging roadway features to navigate effectively. According to the FHWA, crashes and undesirable driving behaviors among older drivers tend to increase as the corresponding median width increases.[xxxi] As people age and may begin to drive less frequently, older adults may also be more vulnerable than the average population as pedestrians. Countermeasures such as pedestrian countdown signals, refuge islands, high-visibility crosswalks, and longer walk times become especially warranted when emphasizing reducing crashes among older users of the transportation network.[xxxii]

Speed-Related Crashes

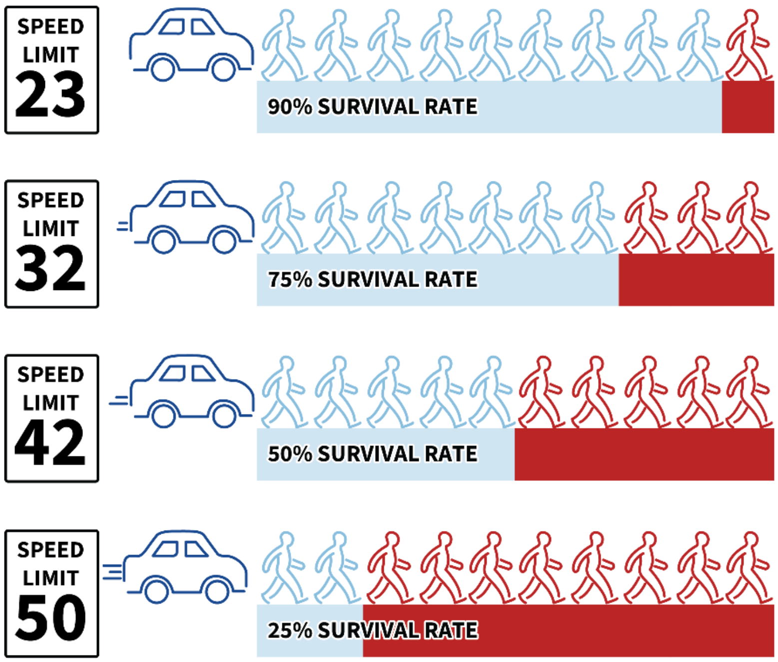
Crashes involving speeding are crucial targets for reducing the number of fatal and serious injury crashes in DuPage County. Speeding results in greater potential of losing control of a vehicle, less time for driver perception responses to avoid crashes, the need for increased stopping distances, and increased crash severity (especially for people outside of a vehicle). As a result, speed-related crash types of particular concern involve single vehicle crashes to fixed objects along roadway segments and speed-related crashes involving pedestrians or bicyclists.

Key variables associated with speed-related single vehicle crashes along roadway segments include increasing motor vehicle traffic and the presence of a traffic signal at adjacent intersections. This indicates that single vehicle crashes may be more likely when there is a concentration of other vehicles on the road and drivers feel the need to perform complicated maneuvers to maintain high speeds at pace with other traffic. The presence of traffic signals, meanwhile, provides drivers with the expectation that it is safe to continue through an intersection while maintaining their speed, potentially diminishing their ability to react appropriately when encountering unexpected changes in roadway conditions. This can prove especially risky when roadway features on new segments change even slightly, giving speeding drivers even less time to react and adjust.

Interestingly, pedestrian traffic is inversely related to speed-related crashes involving single vehicles with fixed objects – increasing daily pedestrian traffic from 10 to 100 and from 100 to 1,000 pedestrians decreases predicted crashes by 21%.[xxxiii] This indicates that sidewalks and the presence of other road users may be discouraging factors when it comes to speeding, increasing attention to both their environment and driving behavior. These factors provide insight into the types of street features that can form the basis of a proactive county approach to reducing and eliminating speed-related crashes.

High-speed crashes are extremely dangerous for pedestrians and bicyclists, who are unprotected by a vehicle shell. As illustrated in Figure 38, as vehicle speeds rise, pedestrian survivability decreases significantly. While pedestrians hit by a vehicle traveling 20 MPH face a 5% likelihood of a fatal crash outcome, this risk jumps to 85% for a vehicle traveling at 40 MPH.

Figure 38: Vehicle Speed and Pedestrian Survival Rate



Source: FHWA

While interstates typically have the highest speeds anywhere across the transportation network, speeding-related fatalities in northeastern Illinois occur more frequently on non-interstate roads. These roads are more likely to serve multiple modes of travel, connecting to neighborhoods, business districts, and other settings where there are likely to be a variety of road users. Indeed, the highest rate of speed-related fatalities and serious injuries (fatal or serious injury crashes per 100 million miles of vehicle miles traveled) in the CMAP region for both drivers as well as bicyclists and pedestrians occur on streets with a posted speed limit of 30 MPH.[xxxiv] Countermeasures to curtail speed-related crashes on these sorts of urban and suburban streets include lower speed limits as part of street redesign projects, installation of traffic calming infrastructure such as speed tables and raised intersections, and implementation of targeted enforcement measures, including automated speed cameras where allowed by statue.

A summary of high-risk crash types identified in the literature by DuPage County Priority Emphasis Area, along with associated street features and potential countermeasures, is presented in Table 26.

Table 26: Summary of Systemic Crash Types from the Literature Review, by Emphasis Area

DuPage County Emphasis Area	Crash Type	Associated Street Features or Land Uses	Potential Countermeasures
Bicycle and Pedestrian Crashes	Crashes at Signalized Intersections	• Increasing curb radii (+) • Increasing shoulder widths (+) • One-way streets (+) • Mix of two-way and one-way operations (+) • Presence of on-street parking (-)	• Smaller curb radii or truck aprons • Narrower shoulder widths • Corner islands
	Pedestrian Crashes Involving Left-Turning Vehicles	• Suburban and Town Center area types (+) • Motor vehicle volumes (+) • Number of intersection legs (+) • Number of intersection lanes (+)	• Protected/permissive and/or flashing yellow arrow left turn signals • Protected-only left turn signals • Leading pedestrian intervals
	Bicycle Crashes Involving Right-Turning Vehicles	• Four-lane corridors (+) • Arterial streets (+) • 15,000 – 30,000 AADT (+) • 30 – 35 MPH speed limits (+) • Commercial land (+)	• Protected bike lanes or shared use paths • Protected intersection designs • Signal phasing and timing strategies (e.g., leading bicycle intervals)
	Crashes After Dark at Intersections	• Pedestrian traffic (+) • Motor vehicle traffic (+) • Maximum number of through lanes (+) • Presence of a traffic signal (+)	• Improved street lighting • High-visibility crosswalks and bike lanes
	Pedestrian Crashes with Vehicles Going Straight	• Motor vehicle traffic (+) • Block length (+) • State road jurisdiction/arterial classification (+)	• Mid-block crossings • Pedestrian refuge islands • Rectangular Rapid Flash Beacons (RRFBs) • Pedestrian Hybrid Beacons • Road diets
Intersection Crashes	Angle Crashes at Signalized Intersections	• State road jurisdiction (+) • High speeds/posted speed limits (+) • Non-perpendicular intersections (+)	• Reduced conflict intersections • Roundabouts • Lower speed limits • Protected-only left turn signals • Positive offset or zero offset left turn lanes • Red light cameras • All-red clearance intervals • Grade separation

DuPage County Emphasis Area	Crash Type	Associated Street Features or Land Uses	Potential Countermeasures
Older Drivers	Crashes at Signalized Intersections	• Longer yellow signal timing (-) • High speeds/posted speed limits (+)	• Pedestrian countdown signals • Enhanced intersection lighting • Daylighting • High-visibility crosswalks • Increased vehicle clearance or change intervals
	Crashes at Unsignalized Intersections	• Left turn lane median width (+)	• Reduced left-turn conflict intersections • Roundabouts
	Crashes After Dark	• Rainy weather (+) • Dark roadways (+)	• Improved roadway and/or intersection lighting • On-demand public transportation
Speed-Related Crashes	Single Vehicle Crashes (Fixed Objects) Along Segments	• Motor vehicle traffic (+) • Presence of a traffic signal at adjacent intersections (+) • Pedestrian traffic (-)	• Narrower travel lanes • Speed enforcement, including automated enforcement (speed cameras) • Dynamic speed feedback signs • Clear zones • Safety Edge • Rumble strips • Guardrail • Lighting
	Speed-Related Pedestrian or Bicyclist Crashes	• Non-interstate roads (+) • Streets with 30 MPH posted speed limits (+)	• Narrower travel lanes • Wider sidewalks • Speed enforcement, including automated enforcement (speed cameras) • Protected bicycle lanes • Reduced speed limits

Note: (+) indicates a positive relationship with the specified crash type and associated street feature or land use; (-) indicates a negative relationship with the specified crash type and associated street feature or land use

Roadway Features Systemic Risk Factor Analysis

The roadway features systemic risk factor analysis summarizes the relative likelihood of serious injuries and fatalities occurring at or on various intersection and roadway segment types in DuPage County by subtypes or groupings of different intersection and segment features consistent with the summary of the research in the preceding section. This section includes a description of data preparation followed by high-level findings at the intersection and segment level. Complete analysis tables are provided in the Systemic Risk Factor Analysis Appendix.

Subtypes and Data Preparation

The project team assigned crashes from 2018 to 2022 to segments and intersections with the DuPage SAP analysis area using the same methodology and data sets described in the earlier HIN section. Crashes that occurred at intersections, as defined by the buffer distances set in the CMAP framework, are analyzed together; while all other crashes, those determined to be midblock, are analyzed at the segment level.

The project team reviewed intersections and segment data for the analysis area provided in the CMAP-provided database "CMAP_SS4A_final.gdb." The team assessed the consistency of data included in key fields that aligned with features in typical systemic analysis and the high-risk crash types research. Available features selected for use in the systemic analysis are summarized in Table 27. Each of the values for each feature then became a variable for future cross tabulations.

Table 27: Systemic Feature Fields

Type	Data Source	Consistently Available Features
Intersection	CMAP_Intersections	• Control Type (Uncontrolled/Unknown,[5] All-way sop, Signal) • AADT_Major (range) • AADT_Minor (range)
Segment	CMAP_Segments (IDOT IRIS)	• AADT (range, n/a assumed to be no observation) • FUNC_CLASS (1-7) • JUR_TYPE (1-9) • LNS (1-12) • SP_LIM (0-70)

[5] In CMAP's data set, the associated variable is "Unknown." Project team spot reviews using Google Streetview concluded that intersections with "Unknown" controls were predominantly 2-way stop location where at least one leg was uncontrolled but infrequently include intersections with no controls present (like a slip ramp) or other forms of control.

The project team determined that a useful intersection systemic analysis could not be created with the CMAP_Intersections file without breaking down intersections by the types of functional classifications that intersect at those locations. Functional classifications were assigned to CMAP intersections based on the Illinois Roadway Information System (IRIS) functional classification of intersecting roadways in the CMAP_Segments file (based on field FUNC_CLASS). The project team created the following three intersection functional classifications to simplify the analysis to meaningful levels:

- Arterials/Collectors Only - all intersecting roadways are listed as functional classifications 3, 4, 5, or 6.
- Arterials/Collectors & Local - at least one intersecting roadway is listed as functional classifications 3, 4, 5, or 6 and at least one intersecting roadway is listed as functional classification 7.
- Local Only - all intersecting roadways are listed as functional classification 7.

Besides classifying intersections by functional classification, the project team made no further changes to the CMAP_Intersections file and was unable to validate the accuracy of provided data. Since the analysis is at the county-level, the effect of errors may be washed out due to the large number of intersections and segments.

Notably, the systemic analysis is limited by the lack of some fields or inconsistently available fields in both data sets. Presence of a median and lane width, for instance, are not consistently available. While some of these data are available at a regional level, like presence of a sidewalk or bikeways, accurately incorporating these disparate data sets would be a significant effort outside the scope of this project. While the available data sets include information on vehicle volumes, they lack information on exposure of people walking, rolling, and biking. Data sets like Replica that leverage big data from cellphones and employ sophisticated simulation may provide estimates that suffice for high-level differentiation but were similarly not within project scope.

DuPage County Division of Transportation maintains more detailed intersection and segment data for major intersections and segments in the county. This data set contains many of the desired missing features, land uses, and proximity to points of interest and is consistently quality controlled by staff. Data do not extend outside of county boundaries, however. Based on the instruction of CMAP, the project team used the more limited CMAP-supplied database as it covers segments and intersections in parts of assigned municipalities that lie outside of DuPage County. County data may be leveraged for deeper dives into areas of particular interest in later project phases.

Interpretation

The risk factor analysis is based on a modified matrix approach adapted for available intersection and segment data based on person-level injury data (e.g., number of fatalities, number of serious injuries). Similar to crash trees, intersections and segments are broken down into types (e.g., arterial) and then further broken down into subtypes, also referred to as typologies (e.g., four-lane arterial with a posted speed limit of 30 MPH). The frequency of fatalities and serious injuries for each severe crash emphasis area were then calculated based on crashes assigned to intersections or segments within each subtype. The variation in observed frequencies across subtypes forms the basis of findings.

Unlike the typical matrix or crash tree approach, however, serious injury and fatality frequencies were normalized by the number of intersections within each subtype or the mileage of segments within each subtype, depending on the unit of analysis. Without performing this adjustment, the most common subtypes (primarily local residential streets and intersections) would be overrepresented in the analysis. In typical crash tree approaches, for instance, this usually results in the local system being overrepresented.

The systemic risk factor analysis goes one step further, calculating a baseline number of deaths and serious injuries per intersection or segment subtype and developing a relative risk score. A relative risk score of 1.0 indicates that the subtype is at the baseline, or mean, number of deaths and serious injuries per intersection or per mile across the whole system. A score under 1.0 indicates that there is a below average level of death/serious injury risk for that subtype, and a score above 1.0 that the level of risk for that subtype is above average.

Relative risk is calculated for all crash emphasis areas and crash types listed in Table 26 for intersections as well as segments (the intersection-related emphasis area is assumed to be covered by the intersection systemic risk factor analysis). However, as crash emphasis areas and network characteristics are broken down more finely, observed deaths and serious injuries become less frequent, even at the county scale of the analysis. Where the number of deaths and serious injuries or total intersections or mileage fall below a critical threshold, findings have been omitted. These thresholds are discussed in more detail below.

Intersection Systemic Risk Factor Analysis

This section presents an overview of severe crash risk across intersections. For the analysis, intersections were defined as any location where IRIS roadway segments met, including both controlled and uncontrolled intersections within municipalities and on border streets assigned to DuPage County by CMAP.

The analysis breaks out intersections by general functional classification (as described above), control type, and net AADT.[6] To prevent excessively small numbers from overbiasing the findings, the project team established several thresholds: all intersection subtypes/typologies with fewer than ten intersections or fewer than three KA injuries (similar to the HIN methodology) were excluded from the analysis. These subtypes are present but grayed-out in the tables included in the following sections and in the Appendix. Intersections with an unknown AADT (shown as N/A in tables below) were also grayed out. Based on spot checks, the analysis team found errors in coding intersection control type and/or functional classification but did not systemically quality control or edit provided data. Errors were assumed to be random and that their impact would not impact the generalizability of the findings.

All Crashes

The systemic risk factor analysis for all intersection crashes in the analysis area between 2018 and 2022 is shown in Table 28. Relative risk for each subtype is found in the far-right column.

When compared to other types of intersections, the intersections of two major streets, either an arterial and another arterial, an arterial and a collector, or a collector and another collector, are substantially overrepresented in the relative risk of death and serious injury. Signalized intersections have the highest risk, with risk rising as traffic volumes increase. The 56 signalized intersections with over 50,000 AADT have over 37.3 times the number of deaths and serious injuries per intersection (2.34) than the baseline (0.06) and over three times that of all other major intersections (0.74). Nearly across the board, as volumes rise, risk rises, with the most significant jumps from lower volumes (<25,000 AADT) to higher volumes (25,000 – 50,000 AADT).[7]

Whether looking at all crashes or at specific emphasis areas, the relative risk factors of certain subtypes are so high because the relative risk of the predominant intersection type in the DuPage analysis area – local-local with at least one uncontrolled leg and less than 25,000 AADT is so low (0.2 KA injuries per intersection). Since all relative risk ratios, however, are calculated from a common baseline, they can all be compared to one another to illustrate which subtypes are highest risk, either

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[6] Net AADT captures the summed AADT of minor and major legs of each intersection (AADT_Major + AADT_Minor). To simplify analysis, net AADT was broken down into three categories: <25K, 25K-50K, >50K mirroring typical DuPage County Division of Transportation practices.

[7] This may also be affected by posted speed/design speeds, which tend to be higher at busier intersections. These attributes, unfortunately, are not available at the intersection level and thus were not included in the analysis.

across the whole network or within each functional classification type. Risk for each subtype is provided to facilitate these comparisons.

Table 28: Intersection Systemic Risk Factors, All Intersection Crashes, 2018-2022

Functional Class Type	Control Type	AADT	Int Count	Injury Count			Injuries, per-Int.			Relative Risk		
				A	K	KA Total	A	K	KA Total	A	K	KA Total
Arterial-Arterial, Arterial-Collector, or Collector - Collector	All Stop	<25K	37	4	0	4	0.11	0	0.11	1.9	0.0	1.8
		25K-50K	1	0	0	0	0	0	0	0.0	0.0	0.0
	Signal	<25K	128	54	2	56	0.42	0.02	0.44	7.2	4.7	7.0
		25K-50K	200	261	15	276	1.3	0.08	1.38	22.2	18.8	22.0
		>50K	56	126	5	131	2.25	0.09	2.34	38.5	21.2	37.2
		N/A	103	60	4	64	0.58	0.04	0.62	9.9	9.4	9.9
	Uncontrolled/ Unknown	<25K	127	18	0	18	0.14	0	0.14	2.4	0.0	2.2
		25K-50K	25	4	0	4	0.16	0	0.16	2.7	0.0	2.5
		>50K	3	1	0	1	0.33	0	0.33	5.6	0.0	5.3
		N/A	75	4	0	4	0.05	0	0.05	0.9	0.0	0.8
		Subtotal	**755**	**532**	**26**	**558**	**0.70**	**0.03**	**0.74**	**12.0**	**8.1**	**11.8**
Arterial - Local or Collector - Local	All Stop	<25K	232	27	0	27	0.12	0	0.12	2.1	0.0	1.9
		N/A	4	0	0	0	0	0	0	0.0	0.0	0.0
	Signal	<25K	282	91	13	104	0.32	0.05	0.37	5.5	11.8	5.9
		25K-50K	164	131	16	147	0.8	0.1	0.9	13.7	23.5	14.3
		>50K	19	19	0	19	1	0	1	17.1	0.0	15.9
		N/A	5	2	0	2	0.4	0	0.4	6.8	0.0	6.4
	Uncontrolled/ Unknown	<25K	4,032	243	18	261	0.06	0	0.06	1.0	0.0	1.0
		25K-50K	479	88	14	102	0.18	0.03	0.21	3.1	7.1	3.3
		>50K	22	4	1	5	0.18	0.05	0.23	3.1	11.8	3.7
		N/A	80	2	0	2	0.02	0	0.02	0.3	0.0	0.3
		Subtotal	**5,319**	**607**	**62**	**669**	**0.11**	**0.01**	**0.13**	**2.0**	**2.7**	**2.0**
Local - Local	All Stop	<25K	15	4	0	4	0.27	0	0.27	4.6	0.0	4.3
		N/A	2	0	0	0	0	0	0	0.0	0.0	0.0
	Signal	<25K	17	1	0	1	0.06	0	0.06	1.0	0.0	1.0
		N/A	12	7	0	7	0.58	0	0.58	9.9	0.0	9.2
	Uncontrolled/ Unknown	<25K	13,040	96	2	98	0.01	0	0.01	0.2	0.0	0.2
		N/A	2,259	1	0	1	0	0	0	0.0	0.0	0.0
		Subtotal	**15,345**	**109**	**2**	**111**	**0.01**	**0.00**	**0.01**	**0.1**	**0.0**	**0.1**
Unknown	Signal	N/A	18	8	1	9	0.44	0.06	0.5	7.5	14.1	8.0
		Total/Baseline	21,427	1,256	91	1,347	0.06	0.00	0.06	1.0	1.0	1.0

Summaries by Priority Emphasis Areas

High-level summaries for each priority emphasis area follow to illustrate the similarities and differences among the top high-risk intersection features. Detailed systemic analysis tables for each emphasis area and specific crash types within those priority emphasis areas are provided in the Appendix for purposes of space and brevity.

All Crashes

The top five intersection subtypes, by relative risk of death and serious injury, for all crashes are summarized in Table 29, with high-level discussion in the bullets below:

- All subtypes within the top five were signalized intersections.
- For all KA injuries across all crashes in the study period, signalized arterial/collector intersections with >50,000 net AADT had the highest relative risk, at over 37 times the countywide baseline KA injuries per-intersection. Signalized arterial/collector intersections with lower net AADT 25K-50K have the second highest relative risk at 22 times the baseline for all crashes.
- Risk was also elevated at high-volume (>25,000 net AADT), signalized intersections where an arterial/collector met local streets.

Table 29: Top Five Intersection Subtypes, All Crashes

Rank	Functional Class	Control Type	Net AADT	Relative Risk
1	Arterial-Arterial, Arterial-Collector, or Collector - Collector	Signal	>50K	37.2
2	Arterial-Arterial, Arterial-Collector, or Collector - Collector	Signal	25K-50K	22.0
3	Arterial – Local or Collector - Local	Signal	>50K	15.9
4	Arterial – Local or Collector - Local	Signal	25K-50K	14.3
5	Arterial-Arterial, Arterial-Collector, or Collector - Collector	Signal	<25k	7.0

Many intersections of concern to safety professionals and members of the public are uncontrolled. While these intersection subtypes have a lower relative risk when compared to major signalized intersections, it is instructive to understand which stand out the most. The results in Table 30 assume that all intersections marked “unknown” in CMAP’s intersection data set are uncontrolled on at least one leg – that is, not controlled by a signal or all-way stop. Uncontrolled intersections of minor, local streets and high-volume major streets (arterials and collectors with an AADT above 25,000) outstrip other intersection subtypes with relative risk scores of 3.7 and 3.3. Relative risk drops notably at similar locations on lower volume major streets with AADTs <25,000. This may in part reflect other related characteristics that are not coded to the intersection level like posted limits, number of lanes, and widths.

Table 30: Top Five Unsignalized Intersection Subtypes, All Crashes

Rank	Functional Class	Control Type	Net AADT	Relative Risk
1	Arterial- Local or Collector - Local	Uncontrolled/ Unknown	>50K	3.7
2	Arterial- Local or Collector - Local	Uncontrolled/ Unknown	25K-50K	3.3
3	Arterial-Arterial, Arterial-Collector, or Collector - Collector	Uncontrolled/ Unknown	25K-50K	2.5
4	Arterial-Arterial, Arterial-Collector, or Collector - Collector	Uncontrolled/ Unknown	<25K	2.2
5	Arterial- Local or Collector - Local	Uncontrolled/ Unknown	<25K	1.0

Uncontrolled intersections between major streets are a mix of contexts, which could be broken out in future analyses. These include some unsignalized intersections of collectors with arterials in commercial and industrial areas as well as slip lanes and ramps between arterials without signalization. Of these, almost half of these locations (47%) are collector-collector, 33% are arterial-collector, and 20% are arterial-arterial.

Pedestrian Crashes

The top five intersection subtypes, by relative risk of death and serious injury, for pedestrians[8] are summarized in Table 31, with high-level discussion in the bullets below:

- Signalized intersections constitute four of the five highest relative risk ratings for pedestrian crashes.

[8] Pedestrian injuries are assumed to be all injuries in crashes marked as FirstCrashType == Pedestrian

- Relative risk for KA pedestrian injuries per intersection was highest (0.11 or 22 times the baseline of <0.01) at mid-AADT (25,000 – 50,000) signalized intersections where arterials or collectors met local streets. The relative risk for this subtype was even more pronounced looking at KA pedestrian injuries per intersection with dark lighting conditions (0.09 or 29 times the baseline of <0.01). This subtype also had the highest risk of left-turn crashes resulting in a pedestrian death or serious injury (0.02 or 18.7 times the baseline of <0.01).
- At signalized intersections between only arterials and collectors, pedestrian KA injury risk was also higher at locations with lower volumes (<50,000 net AADT).

Table 31: Top Five Intersection Subtypes, Pedestrian Crashes

Rank	Functional Class	Control Type	Net AADT	Relative Risk
1	Arterial – Local or Collector - Local	Signal	25K-50K	22.0
2	Arterial-Arterial, Arterial-Collector, or Collector - Collector	Signal	25K-50K	13.0
3	Arterial-Arterial, Arterial-Collector, or Collector - Collector	Signal	<25K	12.5
4	Arterial – Local or Collector - Local	Signal	<25K	7.1
5	Arterial – Local or Collector - Local	Uncontrolled/ Unknown	<25K	5.4

Bicycle Crashes

The top five intersection subtypes, by relative risk of death and serious injury, for bicyclists[9] are summarized in Table 32, with high-level discussion in the bullets below:

- While most of the intersections subtypes within the top five were signals, one unsignalized subtype, all-way stops at intersections between major streets and smaller local streets, made the top five.
- Relative risk for KA bicycle injuries was highest at higher volume (>25K net AADT), signalized intersections featuring only arterials and collectors (major-major intersections).

[9] Bicycle injuries are assumed to be all injuries in crashes marked as FirstCrashType == Pedalcyclist

Table 32: Top Five Intersection Subtypes, Bicyclist Crashes

Rank	Functional Class	Control Type	Net AADT	Relative Risk
1	Arterial – Local or Collector - Local	Signal	25K-50K	18.4
2	Arterial-Arterial, Arterial-Collector, or Collector - Collector	Signal	>50K	16.2
3	Arterial-Arterial, Arterial-Collector, or Collector - Collector	Signal	25K-50K	15.1
4	Arterial – Local or Collector - Local	All-way Stop	<25K	5.2
5	Arterial – Local or Collector - Local	Signal	<25K	3.2

Other Emphasis Areas and Crash Types

The systemic analysis also includes analysis of older-driver crashes as well as detailed subtypes within pedestrian and bicycle crashes. These analyses are more limited since the pool of crashes tends to be smaller. High-level findings of leading intersection subtypes for these crash types that meet the threshold criteria are as follows:

- Relative risk for KA injuries resulting from angle crashes was highest at signalized intersections with only arterial or collector legs and >25,000 net AADT, at over 31 times the countywide baseline KA angle crash injuries per-intersection. There is a major jump in relative risk from lower volumes (5.3 at <25,0000 ADT to 32.6 between 25,000 and 50,000).
- For KA crash injuries sustained by older drivers (people 65+), signalized arterial/collector only intersections with >25,000 net AADT had the highest relative risk, at over 22 times the county-wide baseline.
- Speed-related crashes resulting in bicyclist or pedestrian deaths or serious injuries were most likely to occur at signalized intersections of collectors or arterials with local streets with 25,000 to 50,000 net AADT, similar to all pedestrian and bicyclist crashes. Other subtypes were not analyzed due to low numbers of KA injuries.

Segment Systemic Risk Factor Analysis

This section presents an overview of severe crash risk across roadway segments. For the analysis, all IRIS roadway segments were included.

The analysis breaks up roadway segments into jurisdiction types (local, county/township, IDOT/state, Tollway, and other) and then into subtypes by functional classification, total number of through lanes (broken down into two categories, less than or equal to two or greater than or equal to three),[10] posted speed limit (broken down into less than or equal to 25 MPH, 30 to 35 MPH, and greater than or equal to 40 MPH), and AADT (less than 10,000, 10,000 to 20,000, and 20,000 or greater; segments without an observed AADT are identified as "n/a"). Injuries and fatalities are tabulated for each roadway segment subtype and used to calculate a relative risk score, indicating subtypes/typologies with above or below average injuries and fatalities per-mile.

All segment subtypes with fewer than three total miles or fewer than three KA injuries were excluded from the analysis, alongside any segments where AADTs were unknown. These subtypes are present but grayed-out in the tables below and those included in the Appendix.

All Crashes

The systemic risk factor analysis for all midblock crashes in the analysis area between 2018 and 2022 is shown in Table 33. Relative risk for each subtype is found in the far-right column. At the summary-level, roadway segment jurisdiction is dropped for comparability to the intersection information and to cut down on the high number of subtypes that were screened out based on the criteria above.

Like intersections, high risk ratios are the result of a low baseline attributable to the low number of fatalities and serious injuries on low-volume local network segments. For instance, local functional classification segments account for nearly three-quarters of total centerline mileage and had a risk ratio of 0.21. As with the intersection systemic analysis, the baseline ensures comparability among all segment subtypes.

Expressway segments with three or more through lanes, speed limits over 40 MPH, and AADTs over 20,000 have the highest relative risk of deaths and serious injuries per mile among all types of qualifying segment subtypes, at nearly 15 times (2.85 KA per mile) the baseline (0.2). In general, state-

[10] Number of lanes indicates the prevailing number of through-traffic lanes covering both directions during peak hour operation, per the IDOT IRIS manual.

and Tollway-owned roadway segments, with a relative risk of 2.25 and 2.42, respectively, have the highest relative risk per any jurisdiction type for all KA injuries.

Among qualifying non-expressway segment subtypes, arterial segments with three or more total through lanes, speed limits over 40 MPH and AADTs over 20,000 have the highest relative risk of deaths and serious injuries across all crashes in the study period, at roughly six and a quarter times the baseline.

Table 33: Segment Systemic Risk Factors, All Midblock Crashes, 2018-2022

Functional Classification	Number of Lanes	Posted Speed Limit	AADT	Length (mi)	Count A	Count K	Count KA Total	Per Mile A	Per Mile K	Per Mile KA Total	Relative Risk
Local	<=2	<=25	<10K	280.4	6	2	8	0.02	0.01	0.03	0.15
		30-35	<10K	57.0	10	1	11	0.18	0.02	0.19	0.99
		N/A	<10K	2561.2	93	7	100	0.04	0.00	0.04	0.20
	Subtotal			**2,921.56**	**111**	**10**	**121**	**0.04**	**0.00**	**0.04**	**0.21**
Collector	<=2	<=25	<10K	95.2	8	3	11	0.08	0.03	0.12	0.59
		30-35	<10K	128.7	24	4	28	0.19	0.03	0.22	1.12
		40+	<10K	45.3	13	4	17	0.29	0.09	0.38	1.93
		N/A	<10K	72.4	11	0	11	0.15	0.00	0.15	0.78
	Subtotal			**393.23**	**64**	**11**	**75**	**0.16**	**0.03**	**0.19**	**0.98**
Arterial	<=2	30-35	<10K	26.7	10	3	13	0.37	0.11	0.49	2.51
		40+	<10K	18.6	5	3	8	0.27	0.16	0.43	2.21
			10K-20K	19.8	10	0	10	0.51	0.00	0.51	2.61
	3+	30-35	<10K	17.6	4	0	4	0.23	0.00	0.23	1.17
			10K-20K	58.5	30	5	35	0.51	0.09	0.60	3.08
			>20K	31.4	29	5	34	0.92	0.16	1.08	5.57
		40+	<10K	28.9	8	3	11	0.28	0.10	0.38	1.96
			10K-20K	119.1	65	14	79	0.55	0.12	0.66	3.41
			>20K	127.5	129	26	155	1.01	0.20	1.22	6.25
	Subtotal			**467.70**	**297**	**59**	**356**	**0.64**	**0.13**	**0.76**	**3.92**
Interstate	3+	40+	>20K	65.4	152	34	186	2.33	0.52	2.85	14.65
	Subtotal			**72.20**	**158**	**39**	**197**	**2.19**	**0.54**	**2.73**	**14.04**
Total				**3,854.7**	**630**	**119**	**749**	**0.16**	**0.03**	**0.19**	**1.00**

Note: sums will not total to 100% as rows that do not meet the criteria are not included in this table, but are reflected in subtotals and total

When like-for-like arterial segments are compared, differences emerge. For instance, when controlling for AADT, arterials with higher numbers of through lanes and higher posted speeds have higher risk ratios that streets with fewer through lanes and lower posted speeds. Arterials posted with speed limits of 40 MPH or greater with two or fewer through lanes in the 10K-20K AADT range, for instance, have a relative risk of 2.61 as compared to the same segments with three or more lanes, which come in at 3.41, all else being equal.

These differences become more pronounced when roadway ownership is added in. IDOT-owned segments are significantly over-represented in risk, as summarized in Table 34. While arterial roads with two through lanes have a lower relative risk across the board, the trend is consistent with arterials with three or more through lanes across jurisdiction. Eligible state-owned, two-lane arterial segments have a higher relative risk than county/township- or municipally owned facilities with the same characteristics.

Table 34: Multi-lane Arterial Segment Relative Risk, All Crashes, 40+ MPH

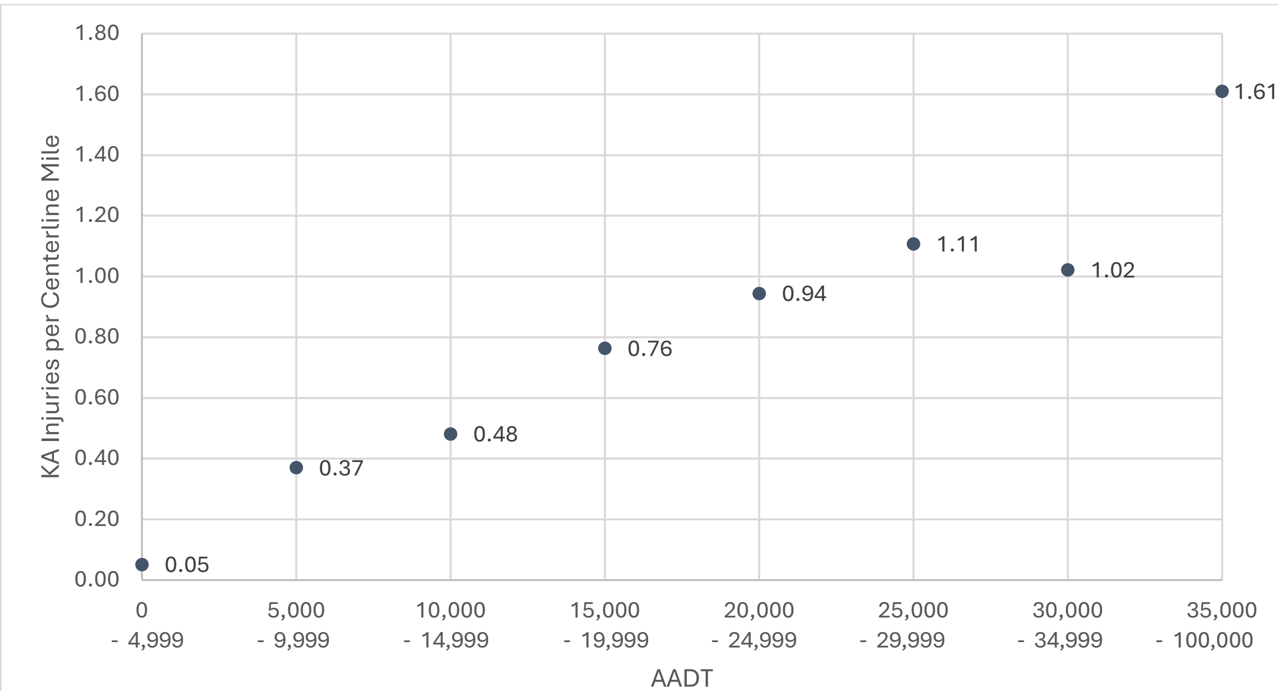
Jurisdiction	Functional Class	Thru Lanes	Speed Limit	AADT	Relative Risk
State	Arterial	>= 3	40+	10K-20K	5.8
County or Township	Arterial	>= 3	40+	10K-20K	3.2
Municipal	Arterial	>= 3	40+	10K-20K	0.9

Differences in relative risk at the segment level cannot be chalked up to AADT alone. Table 35 and Figure 39 illustrate that at AADTs below 30,000, KA crashes per centerline mile rise relatively linearly with AADT for non-expressway segments. Above 35,000 AADT, however, KA crashes per mile spike, nearly doubling in certain 5,000 AADT bands (although these individual bands might be biased by small-numbers and are thus not presented below). This observation may help to explain why arterials tend to have higher severe crash rates when adjusted for volume, as previously found in Table 13.

Table 35: Segment KA Crashes by AADT, Non-Expressway Segments

AADT Range	Length (mi)	Count			Per Mile
		A	K	KA Total	KA
0-4,999	3,224.1	150	17	167	0.05
5,000-9,999	170.0	49	14	63	0.37
10,000-14,999	145.3	62	8	70	0.48
15,000-19,999	81.1	52	10	62	0.76
20,000-24,999	42.4	32	8	40	0.94
25,000-29,999	37.9	36	6	42	1.11
30,000-34,999	40.1	34	7	41	1.02
35,000+	41.6	57	10	67	1.61

Figure 39: Segment KA Crashes per Centerline Mile and AADT, Non-Expressway Segments



Summaries by Emphasis Area

High-level summaries for each emphasis area follow to illustrate the similarities and differences among the top high-risk segment features. Detailed systemic analysis tables for each emphasis area and specific crash types within those emphasis areas are provided in the Appendix for purposes of space and brevity.

All Crashes

The top five segment subtypes, by relative risk of death and serious injury, for all crashes are summarized in Table 36, with high-level discussion in the bullets below:

- Four of the five subtypes are expressway segments with moderate or high posted speed limits, the remaining subtype is arterial.
- Four of the five subtypes are state-jurisdiction, one is Tollway.

Table 36: Top Five Segment Subtypes, All Crashes

Rank	Jurisdiction	Functional Class	Thru Lanes	Speed Limit	AADT	Relative Risk
1	State	Expressway	>= 3	>=40	>20K	17.1
2	Tollway	Expressway	>= 3	>=40	>20K	12.3
3	State	Expressway Ramps	<= 2	30-35	<10K	6.5
4	State	Arterial	>= 3	>=40	>20K	6.4
5	State	Expressway Ramps	<= 2	<=25	<10K	6.1

All Crashes – Non-Expressway Segment Subtypes

The top five non-expressway segment subtypes, by relative risk of death and serious injury, for all crashes are summarized in Table 37, with high-level discussion in the bullets below:

- Four of the five subtypes are arterial segments with moderate or high posted speed limits, the remaining is a lower-speed arterial.
- Four of five subtypes are state-jurisdiction, the remaining subtype is county or township.

Table 37: Top Five Non-Expressway Segment Subtypes, All Crashes

Rank	Jurisdiction	Functional Class	Thru Lanes	Speed Limit	AADT	Relative Risk
1	State	Arterial	>=3	>=40	>20K	6.4
2	State	Arterial	>= 3	>=40	10K-20K	5.8
3	State	Arterial	>= 3	30-35	10K-20K	5.2
4	State	Arterial	>= 3	30-35	>20K	5.2
5	County or Township	Arterial	>= 3	>=40	>20K	3.3

Pedestrian Crashes

The top five segment subtypes, by relative risk of death and serious injury, for pedestrians[11] are summarized in Table 38, with high-level discussion in the bullets below:

- All five subtypes are segments with moderate or high posted speed limits.
- Ownership varies between state (top two slots), Tollway, and county or township
- State-owned arterials with three or more through lanes, a posted speed limit between 30 and 35 MPH, and AADT greater than 20,000, has the highest relative risk at 9.5 times higher than the baseline. These same segments have more than 17 times the baseline for KA pedestrian injuries in dark lighting conditions.
- While expressways account for two of the five subtypes, it is likely that these crashes represent persons outside of their vehicle on the expressway shoulder (possibly changing a tire) and point to a different type of safety risk than non-expressway segments.

[11] Pedestrian injuries are assumed to be all injuries in crashes marked as FirstCrashType == Pedestrian

Table 38: Top Five Segment Subtypes, Pedestrian Crashes

Rank	Jurisdiction	Functional Class	Thru Lanes	Speed Limit	AADT	Relative Risk
1	State	Arterial	>= 3	30-35	>20K	9.5
2	State	Expressway	>= 3	>=40	>20K	7.6
3	Tollway	Expressway	>= 3	>=40	>20K	6.4
4	County or Township	Collector	<=2	>=40	<10K	5.8
5	State	Arterial	>= 3	>=40	>20K	3.8

There was insufficient data to compare pedestrian crashes across comparable subtypes by jurisdiction.

Bicycle Crashes

There were too few data points within subtypes to meet the criteria set by the project team and thus no reportable results.

Speed-related Crashes

The top five segment subtypes, by relative risk of death and serious injury, for crashes categorized as speed-related through the emphasis area fields in the CMAP-provided crash data, are summarized in Table 39, with high-level discussion in the bullets below:

- The highest risk ratio is on high-speed and high-volume state-owned expressways, at 18.7 times the baseline. Tollway segments are also in the top five, at 17.5 times the baseline.
- High-volume state-owned arterials with three or more through lanes and speed limits above 40 MPH are the only non-expressway in the top five, at 6.0 times the baseline.

Table 39: Top Five Segment Subtypes, Speed-related Crashes

Rank	Jurisdiction	Functional Class	Thru Lanes	Speed Limit	AADT	Relative Risk
1	State	Expressway	>=3	>=40	>20K	18.7
2	Tollway	Expressway	>=3	>=40	>20K	17.5
3	State	Expressway Ramps	<=2	30-35	<10K	11.6
4	Tollway	Expressway	<=2	>=40	10K-20K	8.6
5	State	Arterial	>=3	>=40	>20K	6.0

The top five non-expressway segment subtypes, by relative risk of death and serious injury, for crashes categorized as speed-related through the emphasis area fields in the CMAP crash data, are summarized in Table 40, with high-level discussion in the bullets below:

- Four of the five subtypes are state-owned arterial segments with three or more lanes and moderate or high posted speed limits.
- Low volume municipally owned arterials are the outliers on the list, with nearly as many speed-related KA crashes per mile as high-volume state arterials, at 4.5 times the baseline.

Table 40: Top Five Segment Subtypes, Speed-related Crashes

Rank	Jurisdiction	Functional Class	Thru Lanes	Speed Limit	AADT	Relative Risk
1	State	Arterial	>=3	>=40	>20K	6.0
2	State	Arterial	>=3	30-35	10K-20K	4.7
3	Municipal	Arterial	<=2	>=40	<10K	4.5
4	State	Arterial	>=3	>=40	10K-20K	3.5
5	State	Arterial	>=3	30-35	>20K	3.3

When comparing multi-lane arterials like-for-like across ownership/jurisdiction, variation persists, as shown in Table 41.

Table 41: Multi-lane Arterial Segment Relative Risk, Speed-related, >=40 MPH, 10K-20K AADT

Jurisdiction	Functional Class	Thru Lanes	Speed Limit	AADT	Relative Risk
State	Arterial	>= 3	>=40	10K-20K	3.5
County or Township	Arterial	>= 3	>=40	10K-20K	3.1
Municipal	Arterial	>= 3	>=40	10K-20K	1.7

Other Emphasis Areas and Crash Types

The systemic analysis also includes an analysis of specific emphasis area crashes, including older-drivers, angle crashes, and roadway departure crashes. These analyses are more limited since the pool of crashes tends to be smaller. High-level findings of leading segment subtypes for these crash types that meet the threshold criteria are as follows:

- KA angle crash injuries have high relative risk on multiple types of expressway and arterial roadways;[12] however, the highest relative risk is found on state expressways with three or more lanes, at least 40 MPH speed limits, and greater than 20,000 AADT.
- KA roadway departure crash injuries are at highest risk on state expressways with three or more lanes, at least 40 MPH speed limits, and greater than 20,000 AADT. This crash type also has an elevated risk on state-owned arterial roadways and Tollway-owned expressways.
- KA crash injuries involving older drivers in dark conditions are at highest risk on Tollway-owned expressways with three or more lanes, at least 40 MPH speed limits, and greater than 20,000 AADT. This crash type also has an elevated risk on state-owned arterial roadways with three or more lanes, at least 40 MPH speed limits, and greater than 20,000 AADT.

[12] Since these crashes do not, by definition, occur at intersections, they may be related to driveways.

5 Railroad-related and Grade Crossing Incident Safety Analysis

Multiple passenger and freight railroads run across DuPage County. The Illinois Commerce Commission (ICC), roadway owners, and railroads have a long history of collaboration around safety, particularly around grade crossings where railroad lines intersect with other transportation networks. Metra owns and operates four rail lines (Rock Island, Metra Electric, Milwaukee District North and Milwaukee District West). Three Metra lines are operated by Metra employees over tracks owned by freight railroads through trackage rights or lease agreements (Heritage Corridor, North Central Service and SouthWest Service). Four additional Metra lines are operated directly by freight railroads through purchase-of-service agreements (BNSF, Union Pacific North, Union Pacific Northwest and Union Pacific West). Along the lines that are owned by other railroads, Metra works cooperatively to implement proposed safety improvement projects.

Data Preparation and Interpretation

Like the HIN and Systemic analyses, the railroad-related and grade crossing incident safety analysis pertains to the DuPage SAP analysis area consistent with the municipalities and unincorporated DuPage County areas assigned by CMAP and listed in the first two columns of Table 14.

Unlike other analyses in the ESC, the railroad safety analysis is based on the northeastern Illinois regional rail incident data set created and provided by CMAP in cooperation with the Illinois Commerce Commission (ICC).[13] The data set, spanning 2012 to 2021, includes crashes involving trains and vehicles but also collisions where motor vehicles are not involved, such as trains striking people walking, rolling, or biking. Therefore, the number of incidents may not exactly align with train-related crashes in the IDOT data set.

A subset of rail incidents within the analysis area were created for the following analysis. The data is broken out by reported incidents as well as deaths and injuries. Injury severity was not included in the CMAP/ICC data set and thus may not be comparable to IDOT crash injury severities.

[13] https://cmapgis.maps.arcgis.com/home/item.html?id=9e3ad7852549472aa4877fa2f411170d

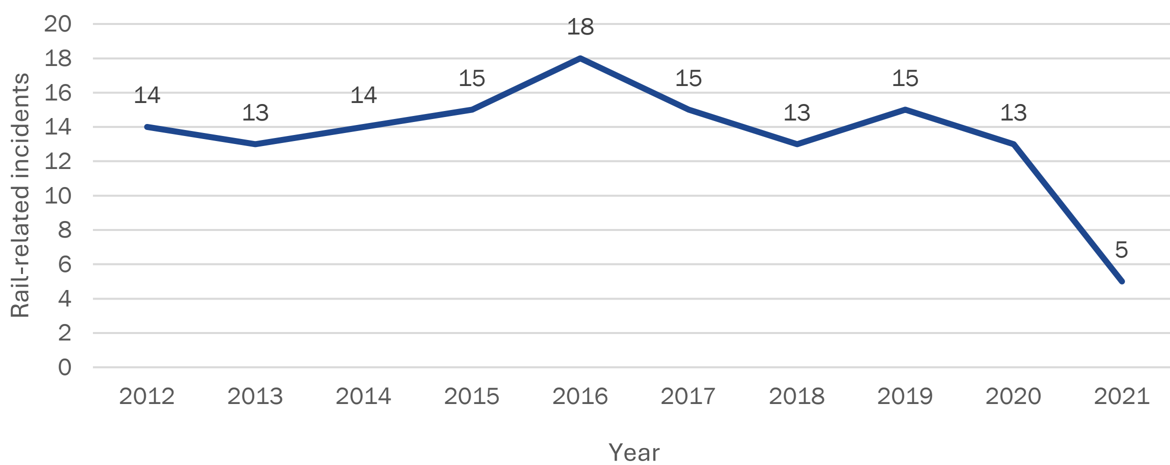
Railroad Safety Trends

Annual Trends

Over the ten-year period between 2012 and 2021 there were 135 reported rail-related incidents in the DuPage analysis area, an average of 13.5 per year. As shown in

Figure 40, the trend has been decreasing in the last five years, with a peak of 18 incidents in 2016 and a low of 5 incidents in 2021, the most recent year in the CMAP data set. When 2021 and 2016 are removed from the analysis, however, the trend is mainly flat, accounting for minor variation year to year.

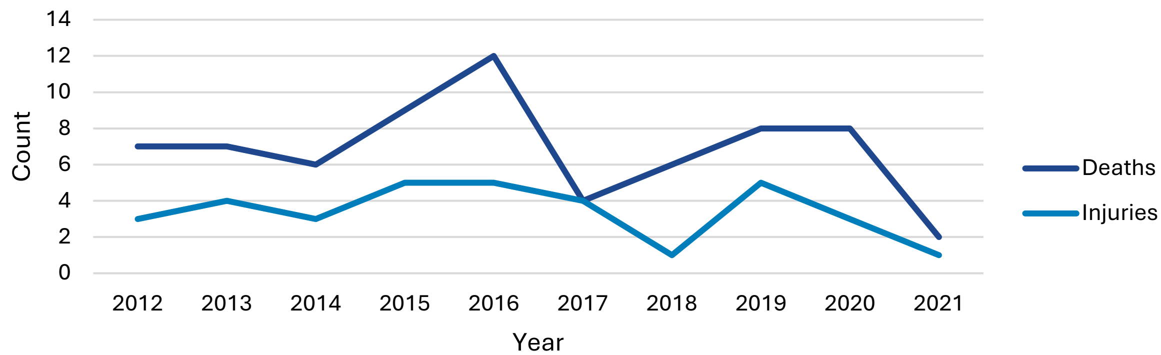
Figure 40: Rail-related Incidents per year, 2012-2021



Source: CMAP, ICC

As a result of those 135 incidents, 69 people were killed and 34 others injured, 10.3 in total on an average year. Figure 41 illustrates the annual trend for fatalities and injuries, which, like incidents, has peak in 2016 and a sharp decline in 2021. In every year beside 2017, more people were killed than injured in rail-related incidents.

Figure 41: Rail-related Fatalities and Injuries, 2012-2021



Source: CMAP, ICC

More recent data within the official borders of DuPage County shared by ICC with the project team illustrate that 2021 may have been an outlier, with total incidents rising to 15 in 2022 and 10 in 2023. This appears to be borne out with the 2022 and 2023 ICC data, suggesting that this low number may not be an artifact of the data set and surveillance protocols but a potential low observation. While 2021 was in the midst of the Covid-19 pandemic, it is unlikely that the pandemic was the only factor contributing to the record low in 2021, considering that there were more than twice as many events in 2020 than in 2021, and travel was significantly reduced in 2020 during the pandemic's onset.

Incidents, deaths, and injuries are detailed by year in Table 42.

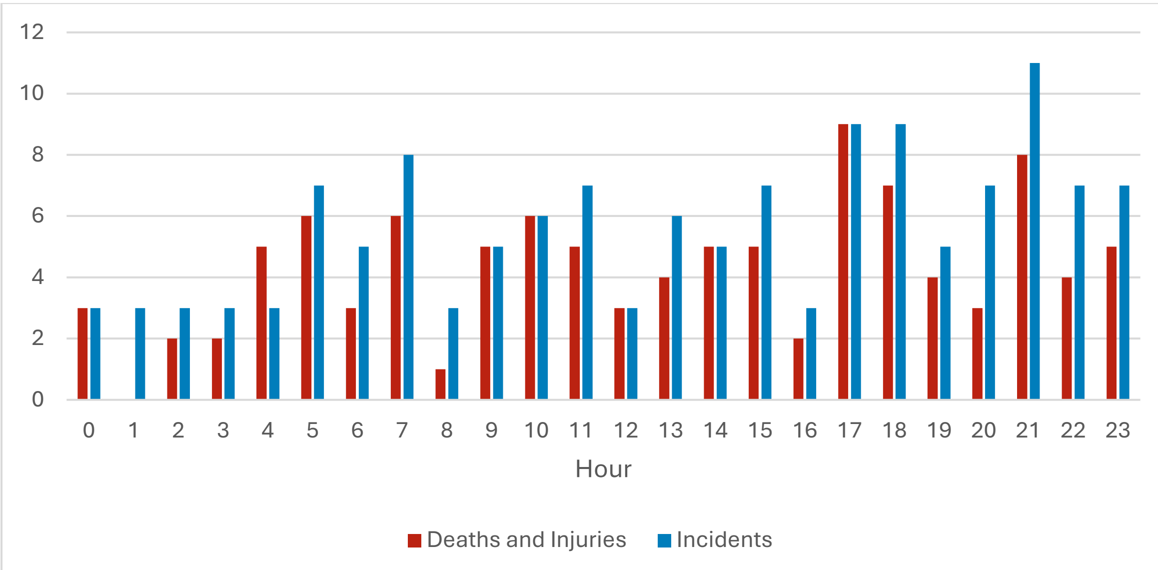
Table 42: DuPage County Railroad Incidents, 2012-2021

Year	Trespass			Non Trespass			Total		
	Incidents	Injuries	Deaths	Incidents	Injuries	Deaths	Incidents	Injuries	Deaths
2012	7	2	5	7	1	2	14	3	7
2013	3	0	3	10	4	4	13	4	7
2014	6	0	6	8	3	0	14	3	6
2015	8	1	7	7	4	2	15	5	9
2016	7	2	5	11	3	7	18	5	12
2017	4	2	2	11	2	2	15	4	4
2018	6	1	5	7	0	1	13	1	6
2019	11	4	7	4	1	1	15	5	8
2020	7	1	6	6	2	2	13	3	8
2021	3	1	1	2	0	1	5	1	2
Total	**62**	**14**	**47**	**73**	**20**	**22**	**135**	**34**	**69**

Source: CMAP, ICC

Between 2012 and 2021, incidents, deaths, and injuries varied across the day, as illustrated in Figure 42. Peaks appear in the AM and PM commute periods, dropping slightly during the daytime but remain high through the evening hours: incidents hit their maximums overnight between 9:00-10:00 PM. The most deaths and injuries occurred at rush periods, between 5:00 PM and 6:00 PM.

Figure 42: Rail-related Incidents, Deaths/Injuries by Hour of Day, 2012-2021



Source: CMAP, ICC

Between 2012 and 2021 the highest number of incidents were trespasser-involved, followed by passenger vehicle (car, pick-up truck, and van) and pedestrian and bicyclists.[14] Table 43 provides annual detail. Auto-related incidents remained relatively constant across the period with a peak in 2014 at 8. Pedestrian and bicyclist incidents were relatively rare but exhibited two spikes, the first in 2013 and the second in 2016. Trespasser incidents exhibit more variability year-over-year, with a high of 11 in 2019.

[14] Incidents reviewed in CMAP data did not enable breakouts into pedestrians and bicyclists. One record, a motorized bicycle, was included in the pedestrian and cyclist statistics.

Table 43: Annual Rail-related Incidents by Mode, 2012-2021

Year	Auto	Pedestrian or Bicyclist	Truck-Trailer	Employee	Trespasser	Total
2012	5	2	0	0	7	14
2013	3	6	0	0	3	12
2014	8	0	0	0	6	15
2015	4	2	1	0	8	15
2016	4	7	0	0	7	18
2017	5	4	2	1	3	15
2018	6	1	0	0	6	13
2019	3	1	0	0	11	15
2020	3	2	1	0	7	13
2021	1	1	0	0	3	5
Total	**42**	**26**	**5**	**1**	**61**	**135**

Source: CMAP, ICC

When broken down into deaths and serious injuries as in Table 44, rail-related incidents in the study area most affected trespassers and people walking and biking across the ten years in the period of analysis. Forty-seven people were killed in trespass-related incidents and 13 more injured. Twenty-two people were killed while walking, biking, or rolling and four more were injured in the same timeframe. People in passenger vehicles and trucks were less likely to be killed or injured. Between 2012 and 2021, no drivers or passengers died in the 42 rail-related incidents in the data set.

Table 44: Annual Rail-related Deaths and Injuries by Mode, 2012-2021

Mode	Deaths	Injuries	Total
Auto	0	10	10
Pedestrian or Bicyclist	22	4	26
Truck-Trailer	0	6	6
Employee	0	1	1
Trespasser	47	13	60
Total	**69**	**34**	**103**

Source: CMAP, ICC

Railroad incidents, deaths, and fatalities occurred on tracks owned by eleven railroads in the study area between 2012 and 2021. As demonstrated in Table 45 , the highest number of incidents of all kinds, 53, occurred on property associated with the Union Pacific West (UP-W) Metra line: 53. Incidents on public crossings most frequently occurred on UP-W (21), and Milwaukee District West (MD-W) Metra line (10). Over the same period, the railroads with the highest frequencies of trespassing incidents were the UP-W (29) and Burlington Northern Santa Fe (24) or BNSF Railway (BNSF) Metra line

Table 45: Rail-related Incidents by Railroad Owner and Type, 2012-2021

Railroad Owner	Trespassing	Ped Crossing	Private Crossing	Public Crossing	Total
Amtrak	2	0	0	1	3
Burlington Northern Santa Fe	24	1	0	15	40
Canadian National – Chicago Central and Pacific	1	0	0	6	7
Canadian National – Elgin, Joliet, and Eastern	2	0	0	1	3
Canadian National – Wisconsin Central	0	1	0	3	4
Canadian Pacific Kansas City	0	0	0	2	2
Progressive Railroad	0	0	0	4	4
Milwaukee District West	4	5	0	10	19
Union Pacific West	29	2	1	21	53
Total	**62**	**9**	**1**	**63**	**135**

Source: CMAP, ICC

As shown in Table 46, the highest number of total deaths and injuries occurred on the UP-W and BNSF lines. Thirty deaths, the highest for any railroad owner in the period of analysis, occurred on UP-W property, the majority of which were trespass-related.

Table 46: Rail-related Deaths and Injuries by Railroad Owner, 2012-2021

Railroad Owner	Deaths	Injuries	Total
Amtrak	1	2	3
Burlington Northern Santa Fe	24	9	32
Canadian National – Chicago Central and Pacific	2	4	6
Canadian National – Elgin, Joliet, and Eastern	1	1	2
Canadian National – Wisconsin Central	0	2	2
Canadian Pacific Kansas	0	1	1
Progressive Railroad	0	0	0
Milwaukee District West	11	2	13
Union Pacific West	30	14	44
Total	**69**	**34**	**103**

Source: CMAP, ICC

Table 47 breaks down incidents by railroad operator. Of the 135 incidents reported between 2012 and 2021, 63 involved freight trains, 71 involved passenger trains, and 1 involved maintenance of way equipment. Of the 63 freight incidents, 26 were trespass-related and 33 occurred at public crossings.

Table 47: Rail-related Incidents by Railroad Operator and Type, 2012-2021

Operator	Trespasser	Ped Crossing	Private Crossing	Public Crossing	Total
Amtrak-BNSF	3	0	0	1	4
Freight	26	3	1	33	63
Metra-BNSF	11	0	0	9	20
Metra-MILW-West	4	5	0	10	19
Metra-UP-West	18	1	0	9	28
Maintenance of Way Equipment	0	0	0	1	1
Total	**62**	**9**	**1**	**63**	**135**

Source: CMAP, ICC

Of the 103 deaths and injuries in the analysis period, 41 involved freight operators, 61 involved passenger operators, and one involved maintenance of way equipment, as shown in Table 48.

Table 48: Rail-related Deaths and Injuries by Operator, 2012-2021

Operator	Deaths	Injuries	Total
Amtrak-BNSF	2	2	4
Freight	22	19	41
Metra-BNSF	13	5	18
Metra-MILW-West	11	2	13
Metra-UP-West	21	5	26
Maintenance of Way Equipment	0	1	1
Total	**69**	**34**	**103**

Source: CMAP, ICC

Railroad Incident Clusters

The project team identified clusters in the DuPage analysis area based on locations with multiple reported incidents as well as sections of railroad with multiple adjacent incidents.

Individual Location Clusters

Incidents occurred at 123 different locations in the DuPage SAP analysis area between 2012 and 2021, inclusive of grade crossings and different locations on railroad property, and deaths and injuries occurred at 95 unique locations. The 11 locations with multiple incidents or deaths and injuries are listed in Table 49.

Table 49: Locations with Multiple Rail-related Incidents or Deaths and Injuries, 2012-2021

Location	Incidents		Location	Deaths and Injuries
Main Street, Downers Grove	6		Main Street, Downers Grove	5
Grace Street, Lombard	4		Grace Street, Addison	3
Finley Road, Lombard	3		Grace Street, Lombard	3
Garfield Avenue, Hinsdale	3		Prospect Avenue, Roselle	2
Prospect Avenue, Roselle	3		Stough Street, Hinsdale	2
Sunset Avenue, Winfield	3		Villa Park Depot, Villa Park	2
Villa Park Depot, Villa Park	2		Washington Street, Wheaton	2
Washington Street, Wheaton	2		West Avenue, Elmhurst	2

The characteristics of locations with either multiple reported incidents or multiple deaths and injuries in the DuPage analysis area are summarized in Table 50. The project team determined location characteristics based on the most recent available Google Streetview and aerial imagery.

Locations with multiple incidents vary in terms of location type, land use context, and activity levels. There are several potential patterns. Four of the eleven are adjacent to Metra stations (Main Street, Downers Grove; Garfield Avenue, Hinsdale; Villa Park Depot, Villa Park; Stough Street, Hinsdale) and are associated with both grade-crossings and pedestrian crossings internal to the station. Three are in mixed-use downtown areas (Main Street, Downers Grove; Garfield Avenue, Hinsdale; Prospect Avenue, Roselle). The location with the highest number of incidents, Main Street, Downers Grove, has three crossings within the functional area of the station Most, but not all, are located on streets with low- or moderate vehicle volumes, with multiple AADTs in the hundreds and all AADTs save one (Grace Street, Lombard) under 10,000.

Multiple-incident clusters tend to have similar roadway configurations – one through lane in each direction. Only one location (Grace Street, Addison) had multiple through lanes. Safety equipment was also consistent across locations. All crossings with multiple incidents, injuries, or deaths had active warning devices including beacons and gate arms. Two locations (Main Street, Downers Grove and Grace Street, Lombard) have strategically located concrete medians to deter attempts to drive around closed gates. No locations have gate arms that provide full roadway closures in both directions. Finally, all locations had open track access – lacking high fencing suitable for preventing trespass.

Table 50: Cluster Characteristics, 2012-2021

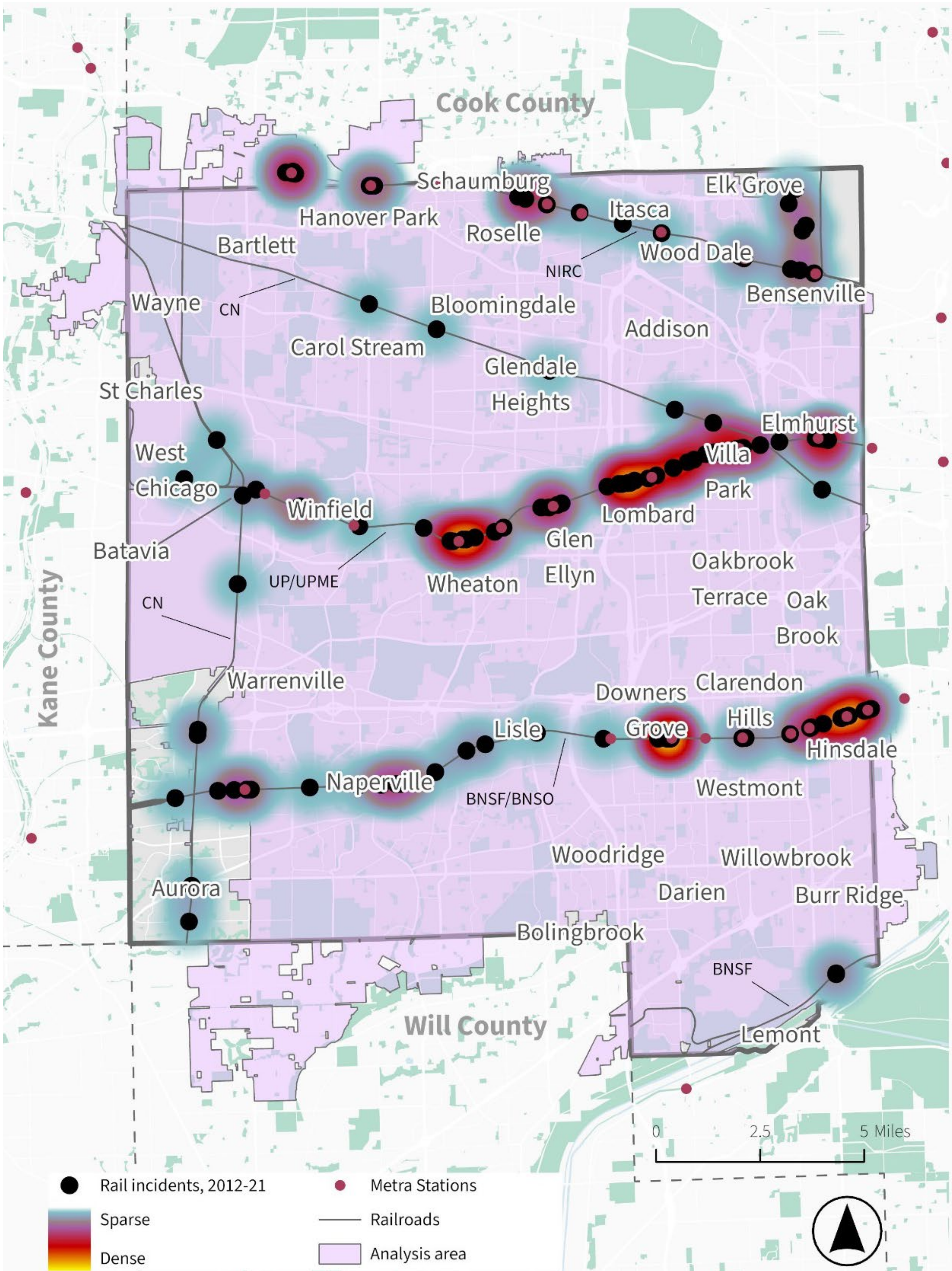
Location	RR	Location Type	Land Use	Roadway Configuration	Safety Equipment
Main Street, Downers Grove	BNSF	At-grade triple-track crossing adjacent to Metra station	Downtown mixed use	One thru lane and dedicated right turn lane in each direction; concrete median; sidewalks on both sides; 6,800 AADT (IDOT 2020)	Active warning devices incl. beacons and partial coverage gate arms with concrete median; sidewalk gate arms
Finley Road, Lombard	UP-W	At-grade triple-track crossing	Low-density residential	One thru lane in each direction; sidewalk on east side only; 6,800 AADT (IDOT 2020)	Active warning devices incl. beacons and partial-coverage gate arms; sidewalk gate arms
Garfield Avenue, Hinsdale	BNSF	At-grade triple-track crossing adjacent to Metra station	Downtown mixed use	One thru lane and dedicated left turn lane in each direction; sidewalks on both sides; 7,100 AADT (IDOT 2020)	Active warning devices incl. beacons and partial-coverage gate arms; sidewalk gate arms
Grace Street, Lombard	UP-W	At-grade triple-track crossing	Low-density residential; commercial; park	One thru lane in each direction; concrete median; sidewalk on both sides; 14,500 AADT (IDOT 2020)	Active warning devices incl. beacons and partial coverage gate arms with concrete median; sidewalk gate arms
Grace Street, Addison	CN	At-grade single track crossing	Industrial; open space	Two thru lanes in each direction; no sidewalks; 5,300 AADT (IDOT 2020)	Active warning devices incl. beacons and partial gate-arms
Prospect Avenue, Roselle	MD-W	At-grade double track crossing	Downtown mixed use	One thru lane in each direction; sidewalks on both sides; 325 AADT (IDOT 2020)	Active warning devices incl. beacons and partial gate-arms; sidewalk gate arms

Location	RR	Location Type	Land Use	Roadway Configuration	Safety Equipment
Sunset Avenue, Winfield	UP-W	At-grade triple-track crossing	Low-density residential	One thru lane in each direction; 700 AADT (IDOT 2020)	Active warning devices incl. beacons and partial gate-arms
Villa Park Depot, Villa Park	UP-W	Triple-track ped crossing at Metra station	Medium-density residential	Ped crossing	Active warning devices incl. beacons and gate-arms
Washington Street, Wheaton	UP-W	At-grade triple-track crossing	Medium-density residential; educational institution; adjacent to Illinois Prairie Path	One thru lane in each direction; sidewalks on both sides; 2,500 AADT (IDOT 2020); Pace service	Active warning devices incl. beacons and partial-coverage gate arms; sidewalk gate arms
Stough Street, Hinsdale	BNSF	At-grade triple-track crossing adjacent to Metra station	Low-density residential; park	One thru lane in each direction; sidewalks on both sides; 850 AADT (IDOT 2020)	Active warning devices incl. beacons and partial-coverage gate arms; sidewalk gate arms
West Avenue, Elmhurst	UP-W	At-grade triple-track crossing	Industrial low-density residential; educational institution	One thru lane in each direction; sidewalk on east side only; 5,300 AADT (IDOT 2020)	Active warning devices incl. beacons and partial-coverage gate arms; sidewalk gate arms

Railroad Segment Clusters

The project team assessed rail segments with multiple incidents between 2012 to 2021 in the DuPage SAP analysis area to determine potentially related clusters of crashes. The 135 incidents are mapped inFigure 43. A kernel density or heat map, illustrating the relative density of incidents, is displayed. The project team referred to this kernel density map to identify the most densely clustered incidents for deeper investigation along three lines: Milwaukee District West, Union Pacific West (, and BNSF Railway. Significant segment-level clusters were not present on other lines in the analysis area such as Canadian National freight rail corridors. Several of the areas that appear as “dense” in the heat map are in the location cluster list identified above.

Figure 43: Rail-related Incidents, DuPage SAP Analysis Area, 2012-2021



Milwaukee District West Segments

Beyond location clusters, there was one notable segment-level cluster on the Milwaukee District West line around Bartlett Metra station, as summarized in Table 51.

Table 51: Milwaukee West District Segment Clusters, 2012-2021

Location	Limits	Total Incidents	Total Deaths	Total Injuries	Trespass Incidents
Bartlett Metra Station	Western Ave to Main Street (Bartlett)	5	1	1	0

There were five incidents along the Bartlett Metra Station segment, resulting in one death and one injury. The incidents occurred between Western Avenue on the western end of the segment and the Bartlett Depot east of S Oak Avenue on the eastern end, as shown in Figure 44. Of the five incidents along the segment, four involved vehicles (four personal vehicles and one truck and trailer) and one involved a pedestrian. While two of the incidents were marked as occurring at the Bartlett Depot pedestrian crossing, one involved no pedestrians but instead a vehicle. Incidents occurred at various hours throughout the day with no discernable trend. The Bartlett Depot area is similar to other downtown Metra stations in the DuPage SAP analysis area: parking and access is provided along frontage roads along either side of the rail line with limited designated pedestrian crossings. The platform itself is on a small embankment.

Figure 44: Bartlett Metra Station Cluster

Union Pacific West Segments

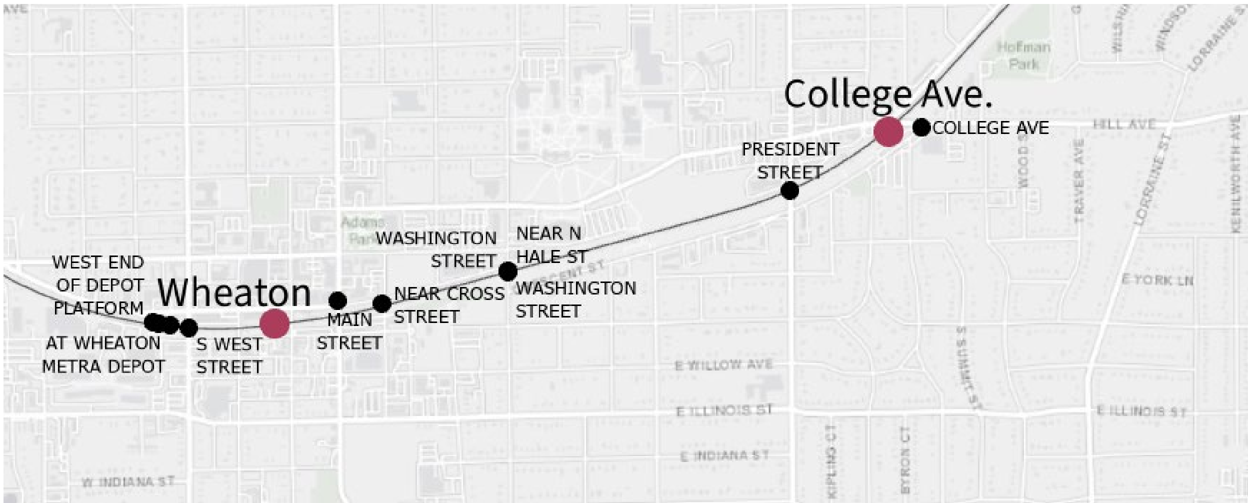
The project team identified four segment-level clusters on the Union Pacific West Line as summarized in Table 52. Three, Wheaton, Glen Ellyn, and Elmhurst, were located in suburban downtown environments. Finley Road, located half a mile to the west of the Lombard Metra station, was the outlier.

Table 52: Union Pacific West Segment Clusters, 2012-2021

Location	Limits	Total Incidents	Total Deaths	Total Injuries	Trespass Incidents
Wheaton	Ellis Avenue to Hill/College Avenue (Wheaton)	11	6	4	5
Glen Ellyn	Prospect Avenue to N Montclair Avenue (Glen Ellyn)	5	4	0	3
Finley Road	I-355 to St Charles Rd (Glen Ellyn/Lombard)	8	4	1	4
Elmhurst	Cottage Hill Avenue to Haven Avenue (Elmhurst)	6	3	2	3

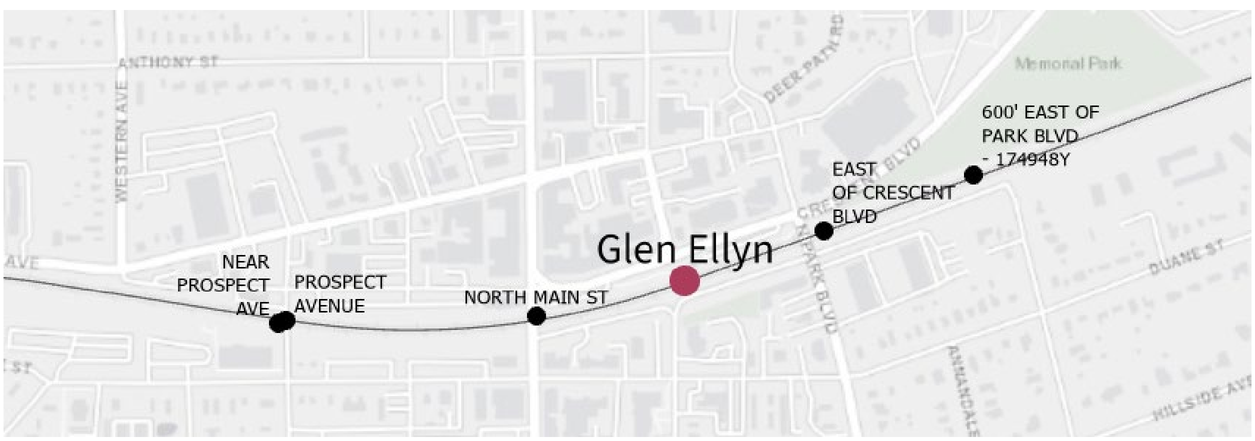
Eleven incidents occurred in Wheaton during the study period in the segment between the Wheaton and College Avenue stations, resulting in six deaths, marking it as the cluster with the most incidents on the Union Pacific West line. The cluster, shown in Figure 45, includes the Washington Street location described above. Five incidents along the segment were trespassing-related, with three trespassing incidents at the Wheaton Metra station. Three additional incidents involved people walking and biking. The cluster runs parallel to the Illinois Prairie Path and serves Wheaton College. Like many downtown Metra stations, network connectivity is higher around the station than upstream or downstream of the station. Incidents, including trespassing, occurred throughout the day.

Figure 45: Wheaton Cluster



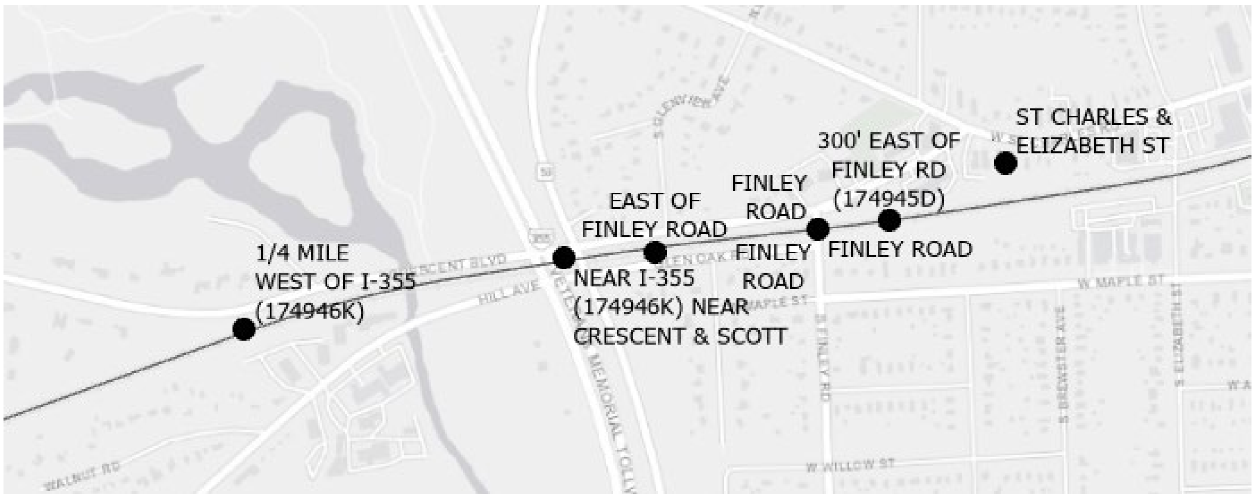
Five incidents occurred in the area around the Glen Ellyn Metra station between Prospect Avenue and approximately N Montclair Avenue, as shown in Figure 46. Four incidents, three of which were trespass-related, resulted in deaths, all involving people outside of vehicles. Like the Wheaton and Bartlett segments, this pattern roughly matches the limits of downtown Glen Ellyn and like Wheaton and is located along the Illinois Prairie Path. Two of the three trespasser incidents occurred east of the Metra platform in the area of the Montclair Parking Lot, which is fenced to the north but open on the southern side.

Figure 46: Glen Ellyn Cluster



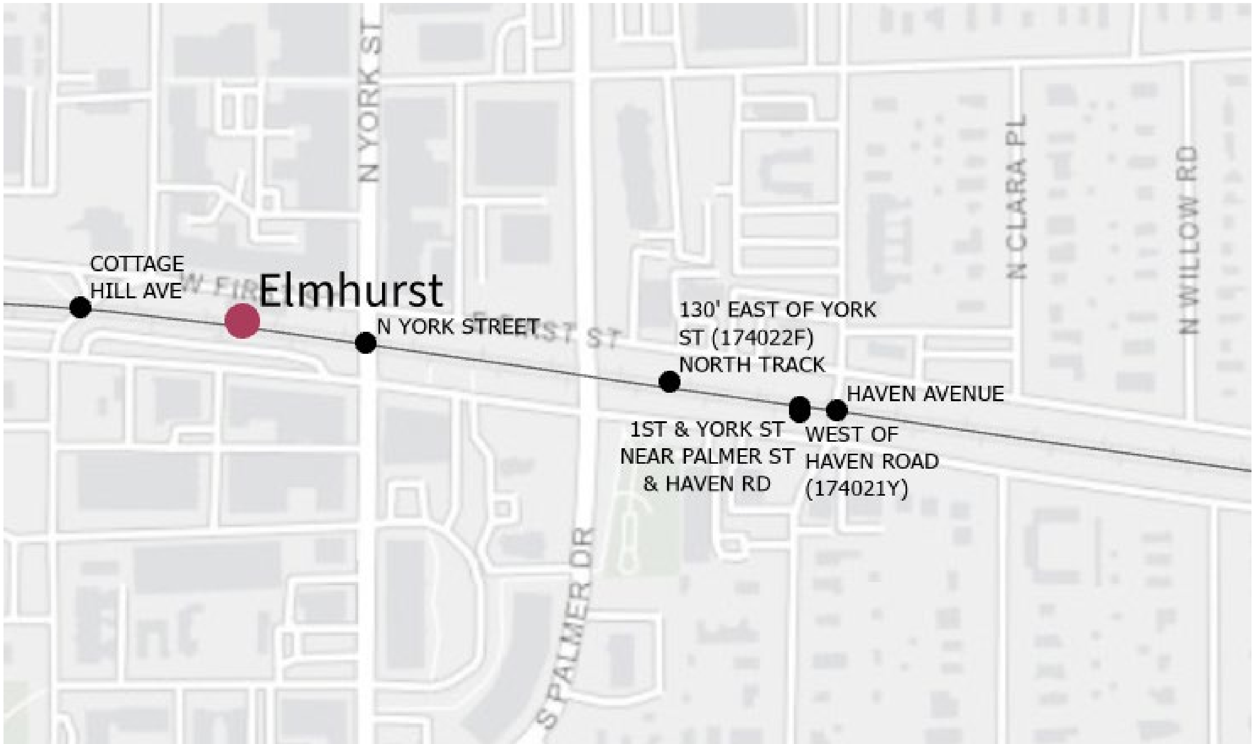
Between 2012 and 2021 there were eight rail-related incidents in the area around Finley Road on the eastern border of Glen Ellyn and the western border of Lombard seen in Figure 47. The types of incidents and modes involved are very different than those in the downtown environments. Four incidents were trespassing-related and the remaining four involved motor vehicles. Vehicle-related incidents were a minority in the downtown clusters. Several natural and manmade barriers, the East Branch of the DuPage River and I-355, limit connectivity in the area. The nearest north-south crossing to the west of Finley Road is at Taylor Avenue, 1.4 miles to the West. This connection is constricted and impracticable for most drivers, making the nearest feasible at-grade crossing west of Finley Road at Park Avenue in downtown Glen Ellyn, 1.8 miles away. All but one incident on this segment occurred during darkness.

Figure 47: Finley Road Cluster



The easternmost cluster along the Union Pacific West was in the area around Elmhurst Metra station in downtown Elmhurst. Figure 48 shows the six incidents between Cottage Hill Avenue and Haven Avenue between 2012 and 2021. Four of six incidents were trespasser-related or involved a pedestrian; all four of which occurred between S Palmer Drive and Arlington Avenue/Haven Road. Railroad right-of-way in this area is open and unfenced. Incidents along this segment predominantly occurred during the daytime.

Figure 48: Elmhurst Station Cluster



BNSF Railway Segments

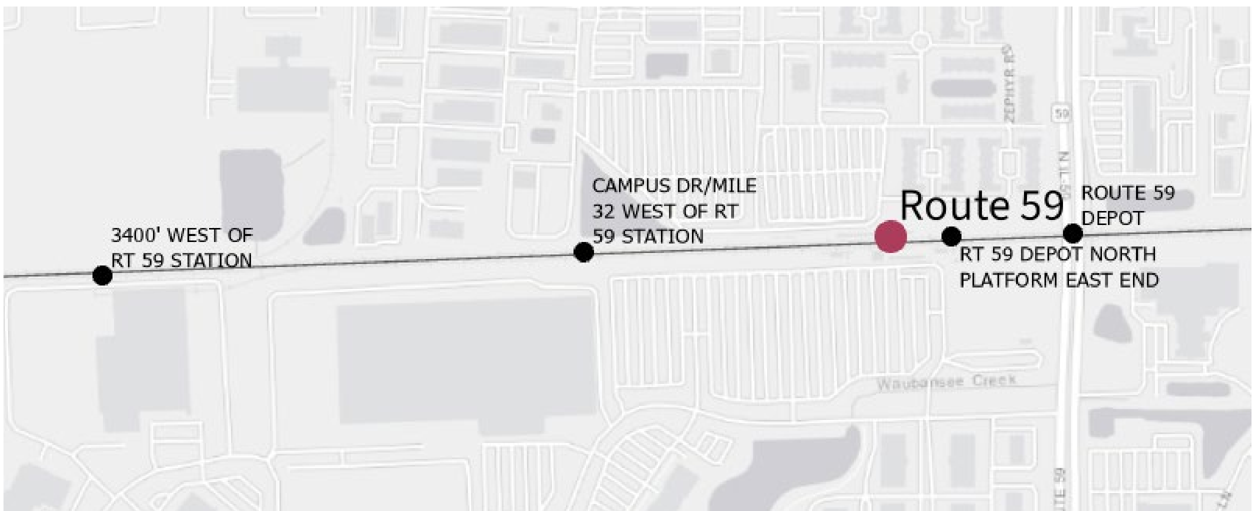
Over the analysis period three segment-level clusters appeared, all in the vicinity of Metra stations along the BNSF line. Main Street and Hinsdale are coincident with location-specific clusters identified in the previous section.

Table 53: BNSF Railway Segment Clusters, 2012-2021

Location	Limits	Total Incidents	Total Deaths	Total Injuries	Trespass Incidents
Route 59	3,400' West of Route 59 to Route 59 Depot (Naperville)	4	1	3	4
Main Street	1,000' West of Forest Avenue to Main Street (Downers Grove)	9	6	2	4
Hinsdale	Lincoln Street to Garfield Avenue (Hinsdale)	6	1	0	1

Four incidents occurred in the area around the Route 59 Metra station between 2012 and 2021, as shown in Figure 49 all of which were trespass-related and occurred between early morning and early afternoon. Unlike other clusters along the BNSF, Route 59 is not located in a traditional commuter-suburb downtown – it is instead on the exurban edge between Naperville and Aurora. Major parking lots abut the station on both sides of the tracks with multifamily housing to the northwest and major job centers all around. Besides the pedestrian crossing at the station there are no easily accessible crossings connecting the land uses on either side of the tracks. Tracks in the station area are open and unfenced. A single below-grade access point at the east end of the parking lots that serve the station connects the northern and southern Metra platforms.

Figure 49: Route 59 Station Cluster



The segment with the highest number of incidents on the BNSF between 2012 and 2021 was around Main Street Metra station in Downers Grove. Nine incidents occurred in the area indicated in Figure 50, including the Main Street at-grade crossing previously identified. Like other downtown segments, most of the incidents involved people outside of vehicles – only one involved a personal vehicle at the Main Street crossing. The area around the station is walkable with destinations on both sides of the tracks, which are open and unfenced. Almost half of the incidents, four of nine, occurred overnight.

Figure 50: Main Street Station Cluster

The third and final segment on the BNSF is Hinsdale Metra station between Lincoln Street and Garfield Avenue, as shown in Figure 51. The six incidents between 2012 and 2021 occurred in the area around downtown Hinsdale and include the at-grade crossing at Garfield Avenue identified earlier. All incidents occurred either early in the morning or overnight. Unlike other downtown areas, almost all of the incidents involved motorists at the Washington, Garfield, and Lincoln at-grade crossings.

Figure 51: Hinsdale Station Cluster

Shared Cluster Characteristics

Across location and segment-based clusters several patterns emerge:

- Incidents involving people trespassing, walking, and biking account for nearly all deaths.
- Most clusters are at or near downtown/village center Metra stations with destinations along both sides of the rail line. The majority of incidents at these locations involve people outside of vehicles and include at-grade crossings as well as crossings through depot areas and near parking lots.
- Stations where clusters occur are predominantly open.
- Incidents at clusters typically occur across the day with no dominant patterns.
- Adjacent network connectivity is a potentially important factor in trespassing and may also contribute to higher rates of gate violations where partial gates are in place.

The above findings indicate that at a systemic-level, station-area planning is necessary to determine where and how to install context-appropriate solutions to educate or prevent people outside of vehicles from going around lowered gates or entering restricted areas. Further analysis into whether these incidents were intentional or unintentional is also needed to shed light on potential countermeasures. The clusters in this list could constitute a starting point to develop a station-area planning list.

6 Data Recommendations

While developing the ESC, the project team uncovered areas where enhanced or improved data would open opportunities to be more data-driven, accurate, or proactive in identifying and addressing severe crashes in DuPage County and throughout the region. Most recommendations are likely beneficial to other agencies and communities in northeastern Illinois.

Crash Data

Complete, accurate, detailed, and timely crash data are a prerequisite to effective safety analysis and response. Beyond legal system and insurance reporting needs, crash data may be analyzed at the network level to identify trends and priorities, as the ESC illustrates, at the project-level, and at the individual crash level.

SR1050 Reports and IDOT Crash Data

Incomplete SR1050 crash reports reduce the level of certainty with which analysts can report findings at a high level and may obscure crash details at a project level. In IDOT crash data reviewed for the ESC, it appears that responding officers filled out crash data fields like Primary and Secondary Contributory Cause as “other” or “unknown.” If the officer did not input any data into the crash report, the post-processing efforts may have yielded an empty cell, ‘null’, or ‘<blank>’. These types of inputs do not provide sufficient context or value to data analysts, resulting in potential holes or missed opportunities for identifying improvements. When a crash results in a fatality or an A-injury, the responding officers should thoroughly and accurately fill out the crash form to help provide data analysts with a complete view of what occurred at the scene of the crash and identify next steps for mitigations.

Feedback from respondents to the DuPage SAP policy survey note the importance of the SR1050 crash narrative and diagram in identifying potential safety issues and mitigations. Narratives and diagrams provide a more granular level of detail illustrating exactly where crashes occurred, the sequence of events, and much more. Facilitating access to these aspects of the crash report, particularly in bulk, is a priority for roadway safety professionals in DuPage County.

E-mobility devices like e-bikes and scooters have proliferated in Illinois and across the country. These devices cannot be explicitly identified using the most current SR1050 form and are not mentioned, leading to potential for misclassification. E-mobility devices and their classifications/motor sizes may be mentioned in the narrative, which is currently unavailable in the IDOT crash data set, but not in a way that can be readily picked up in network-level analyses. Upcoming updates to the SR1050 should provide clear direction and explicit field(s) to identify whether the crash involved an e-mobility device and its type. The NTSB has identified that the lack of e-scooter and e-bike codes in crash report forms nationwide inhibits assessing the risk and prevalence of e-mobility crashes.[xxxv] Similar changes made to incorporate dooring crashes have been instrumental in creating safer streets in northeastern Illinois.

Alternative Crash Data Sources

The ANSI standard for crashes limits the definition of crashes to collisions involving motor vehicles. Reports and data on crashes involving non-motorized users, like bicyclists, are highly desired by safety analysts, planners, and engineers. DuPage County is home to multiple off-street trail systems but does not have comprehensive information on severe crashes, limiting ability to understand potential safety issues.

As cited earlier in the ESC, research has shown that crashes involving people walking and biking are significantly underreported, even those that lead a person to seek medical attention following the event. Emergency room data, collected at scale, could be evaluated to determine the level of additional need. Collaboration between health system and transportation professionals to utilize this information and spatially locate the underreported crashes would be beneficial for identifying high injury locations for people walking and biking.

Systemic Data

The regional segment and intersection data sets, based on IDOT's Highway shapefile, are a good starting point for systemic analysis, but are limited. Certain parts of the region do not meet existing reporting standards, leading to reduced ability to identify safety needs and opportunities in certain communities or in certain portions of communities. To meet the desired elements mentioned in the research conducted in the systemic analysis section, roadway and intersection data should exceed the Model Inventory Roadway Elements (MIRE) 2.1 standard.[xxxvi] DuPage County Division of Transportation has produced an excellent example that includes additional roadway features as well as adjacent land use information. CMAP also produces a sidewalk inventory and regional bicycle information system (BIS) that could supplement existing roadway information.

Improving roadway features and adjacent land-use data should be coordinated and regional in scale. Even county-level data is potentially insufficient for yielding reportable systemic results, especially for more uncommon crash types or detailed roadway feature subtypes. As demonstrated earlier in the ESC, there were insufficient data points to arrive at conclusive findings for pedalcyclist crashes in the DuPage SAP analysis area. Robust findings would likely require analysis at the scale of multiple or all collar counties.

Rail Incident Data

Northeastern Illinois is privileged to have a comprehensive rail incident data set that includes crashes with vehicles and collisions with people outside of vehicles on public and railroad rights-of-way. Fields available in the data set limit understanding of the circumstances and details of individual incidents. For instance, there were no data points in the provided data set to indicate whether a trespassing-related incident was intentional or unintentional or information about the people involved (e.g., age, gender). Privacy concerns may limit the availability of these data. Additional information is needed to provide informed recommendations on safety treatments either at specific locations or systemically. As with the crash data, narratives and diagrams are of high value.

Demographic Data

IDOT crash data and NHTSA's FARS provide limited data on the people affected by and at-fault in crashes resulting in deaths or serious injuries. Information on age, sex, and race/ethnicity (in the case of NHTSA FARS) are critical but insufficient to pinpoint who is most affected. As assumptions are unhelpful and counterproductive, analysts must go without these data points. As the ESC demonstrates, crash data provide significant value in understanding crash types and locations, but little information on the people involved. This creates implications for crafting messaging, developing communications and targeted behavior change campaigns, and understanding the demographic impacts of severe traffic crashes. More information is needed regarding where people involved in severe crashes live (at least at the census tract level), their socioeconomic background (e.g., income, educational attainment), and their disability status, at minimum. To protect personally identifiable information, care must be taken in providing this data at the appropriate level, balancing privacy with potential use cases.

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