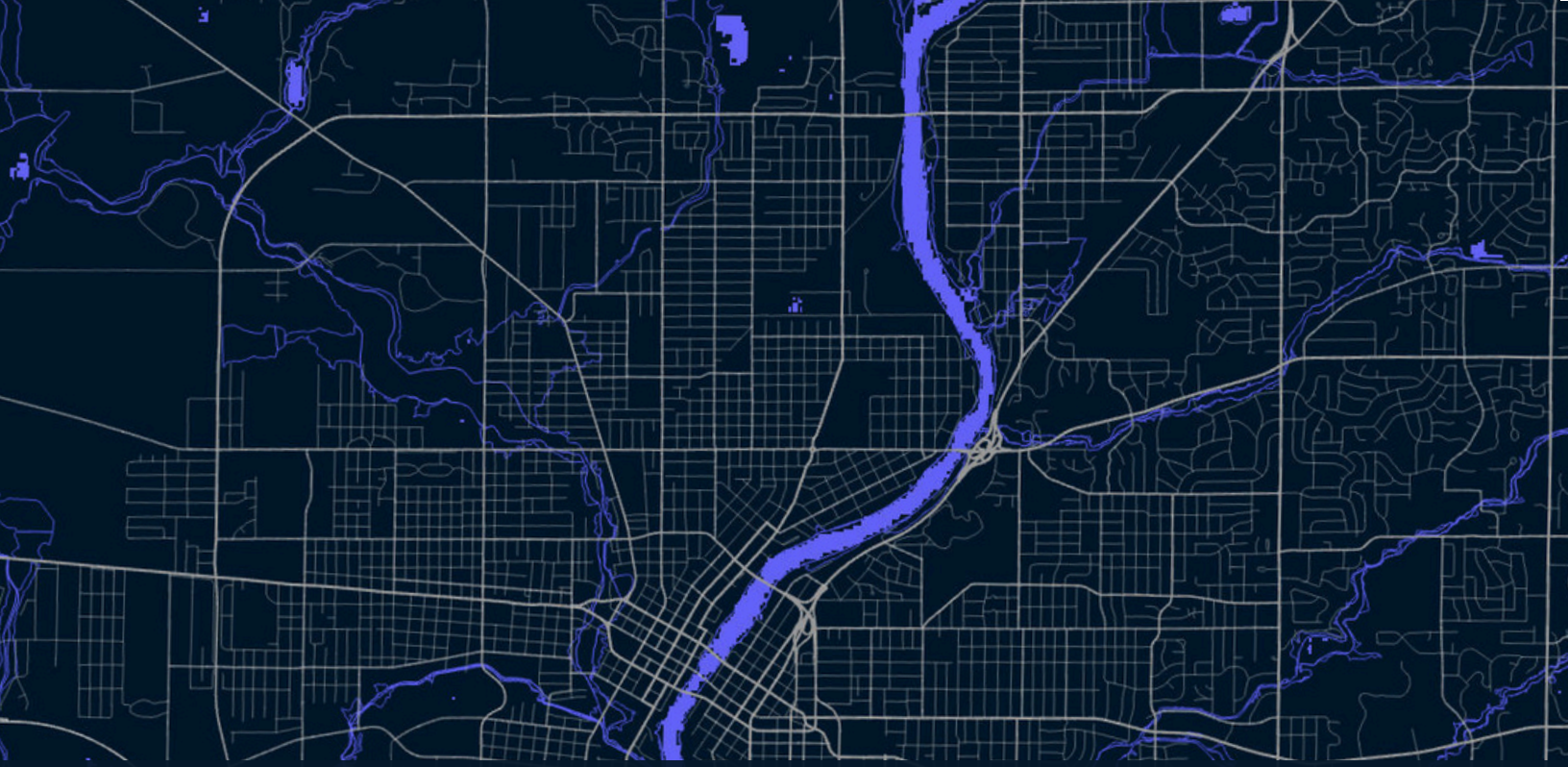


REGIONAL TRAFFIC SAFETY ACTION PLAN

Technical Report #1: Economic Impact Analysis



FINAL REPORT

2026

Introduction

A National Highway Traffic Safety Administration (NHTSA) study estimated that in the year 2019, motor vehicle crashes cost the U.S. approximately $340 billion in economic and societal impacts.[1] While substantial at the national level, these costs are also felt locally—affecting those directly involved through property damage and injuries, while affecting the wider community through traffic congestion and increased insurance premiums. Understanding the local economic impact of crashes can help illustrate the broader consequences of motor vehicle safety and inform transportation and public safety investment decisions.

Purpose of this Report

This technical report accompanies the *Regional Traffic Safety Action Plan 2025* (Action Plan) for the Rockford Metropolitan Planning Area (MPA) and provides an economic perspective on the impacts of motor vehicle crashes in the region.

The analysis estimates the economic cost of crashes by injury severity—using the KABCO scale—demonstrating how the severity of a crash affects its overall cost to the region (see Table 1-1 for the Illinois definition of the KABCO scale).[2] By quantifying these costs, this report provides a framework for understanding the potential economic benefits of preventing serious injuries and fatalities. Investments in roadway safety measures that prevent crashes or reduce their severity can help reduce the economic burden associated with each fatality and serious injury prevented.

Where possible, the analysis uses local or Illinois-specific data to reflect regional crash costs; when unavailable, national data and published research provide the basis for estimation.

Rockford MPA Crash Profile (2017–2022)

This analysis utilizes Illinois Department of Transportation (IDOT) crash datasets from 2017 through 2022, consistent with the data framework established for the *Regional Traffic Safety Action Plan*. Throughout this report, these data are referred to as the Rockford MPA crash dataset. The raw data consist of three relational extracts linked by a unique crash identifier:

- **Crash-Level Data:** Capture the circumstances and characteristics of each crash, including locations, dates, collision type, and driver actions.
- **Person-Level Data:** Contain injury severity levels of individuals involved in these crashes, in addition to their demographics and role in the crash (e.g., driver or pedestrian). **Vehicle-Level**
- **Data:** Detail the vehicles involved in these crashes, including extent of vehicle damage.

Table 1-1 and Figure 1-1 provide an overview of the number of crashes and people involved by KABCO injury severity.[2] Crashes are assigned an overall injury severity according to the highest injury severity of a person involved in a crash. For example, a K crash can involve people with injuries ranging from K-O. Because crash severity does not necessarily reflect the injury severity of each person involved, the results presented in this report are distinguished between person-level and crash-level measures, as appropriate to the type of cost being estimated.

For the purposes of this report and to maintain consistency with the Action Plan, a crash with a "severe" outcome is defined as a K or A crash. As shown in Table 1-1 and Figure 1-1, K and A crashes account for a small portion of the total number of crashes. However, these crashes account for a substantially larger share of the total economic costs estimated in this report, highlighting the disproportionate economic impacts associated with fatal and serious injury crashes.

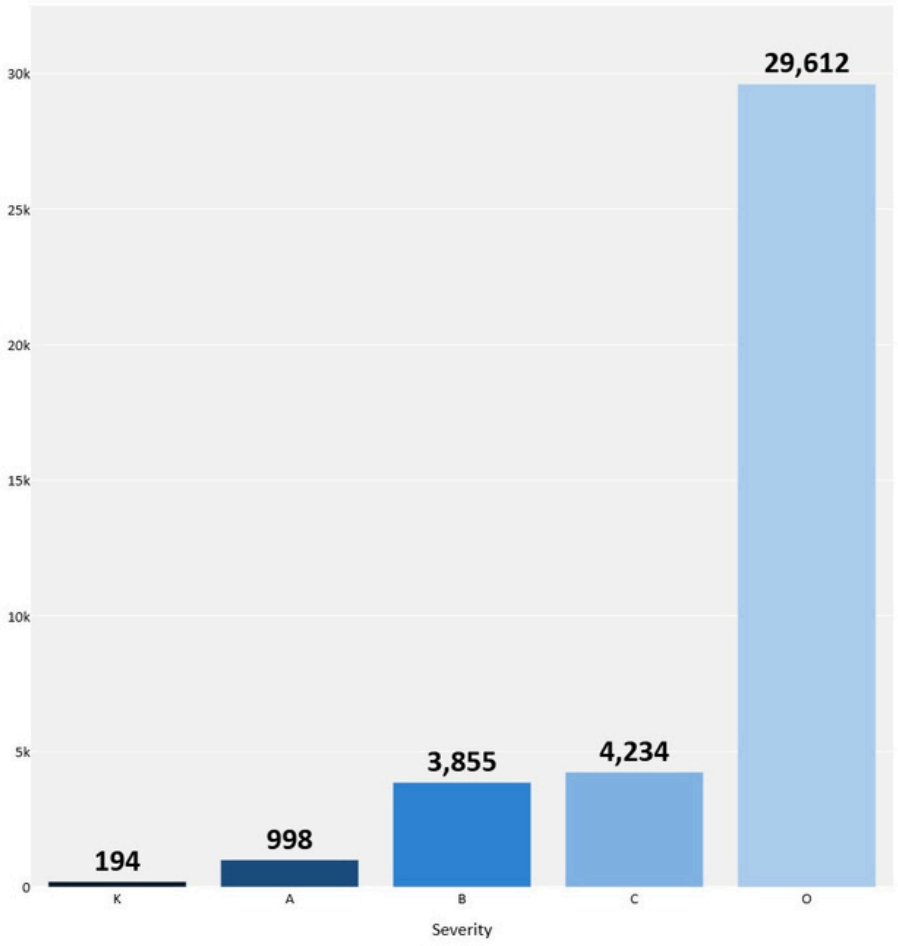
Table 1-1: Number of Crashes and People Involved by Injury Severity2 (Rockford MPA, 2017–2022)

KABCO Severity	Number of Crashes	Number of People
K: Fatal	194	204
A: Incapacitating Injury	998	1,260
B: Non-incapacitating Injury	3,855	5,357

C: Reported/Not evident Injury	4,234	6,368
O: No indication of injury	29,612	82,759
Total	**38,893**	**95,949**

*136 crashes with no KABCO severity

Figure 1-1: Number of Crashesby Injury Severity (Rockford MPA, 2017–2022)



Economic Impact Data Sources and Methodologies

The IDOT crash data provide the characteristics and outcomes of crashes occurring within the Rockford MPA, but do not directly provide the economic costs associated with those crashes. To estimate these costs, the analysis in this report draws on a variety of external data sources and published research. These sources provide direct cost estimates, as well as data and methodologies used to derive cost estimates through additional calculations. The specific sources and methods used are discussed in greater depth in their respective sections.

A major methodological reference for this analysis is the NHTSA report *The Economic and Societal Impact of Motor Vehicle Crashes, 2019*.[1] The report provides estimates and methodologies for calculating the economic and societal costs associated with motor vehicle crashes. Where appropriate, this report applies and adapts the NHTSA methodologies using the previously described external sources.

Economic Impact Overview

Across the six-year study period, motor vehicle crashes in the Rockford Metropolitan Planning Area (MPA) generated an estimated $872 million in tangible economic costs, increasing to $3.8 billion when the estimated value of lost quality of life is included. These impacts extend from the immediate aftermath of a crash through the lifetime of those affected. Approximately $683 million in costs were incurred within the first year following crashes, while additional costs accrue over the longer term through medical expenses, lost earnings, and other lifetime impacts. At the crash level, costs include property damage and congestion; at the person level, they include medical expenses, lost earnings, and quality-of-life losses. Results are broken down by KABCO injury severity and expressed in 2024 dollars throughout.

In general, costs per crash increase with crash severity; however, for several critical cost categories, severe crashes account for a disproportionately large share of total costs relative to their share of all crashes. As shown in Table 1-1, severe crashes account for approximately 3 percent of all crashes. Despite their relatively small share of crashes, they account for 60 percent of the tangible economic costs estimated in this report. When the estimated value of

lost quality of life is included, severe crashes account for 82 percent of the total economic impact.

Short-Term Economic Costs (First Year Post-Crash)

The first subset of short-term economic costs is crash-level costs, including estimated property damage and traffic congestion costs associated with delays caused by crashes, shown in Table 2-1.

Table 2-1: Crash-Level Costs (Rockford MPA, 2017–2022) in 2024 Dollars

Cost Category	K Crashes	A Crashes	B Crashes	C Crashes	O Crashes	Total
Property Damage	$1.5M	$7M	$27.8M	$28.3M	$148M	$213M
Congestion Costs	$761,738	$2.8M	$12.1M	$6.7M	$69.8M	$92.3M
Total	$2.3M	$9.9M	$39.9M	$35M	$217.9M	$305M
Average per Crash	$11,723	$9,913	$10,352	$8,263	$7,359	$7,842

The second subset of short-term economic costs is person-level costs, including medical expenses, work losses, and losses related to reductions in quality of life incurred during the first year after the crash. In this report, person-related costs are constrained to confirmed injuries (K, A, and B severity). Notably, C and O injuries were excluded from the economic impact analysis. The Federal Highway Administration (FHWA) classifies C injuries as "possible injuries," and estimates that approximately 40 percent of individuals coded as C are ultimately uninjured.[3] Including this category would risk a systematic overestimation of medical, work loss, and quality-of-life impacts for a population that may not have sustained any injury at all. O injuries, by definition, indicate no injury was sustained.

Fatality-related costs are treated differently from costs associated with non-fatal injuries. Although fatalities generate costs immediately following a crash, including emergency medical services and administrative processes such as death certification, the primary economic impact of a fatality is represented by the estimated economic value of the life lost. Because a one-year work-loss estimate is not applicable to individuals who die as a result of their injuries, K injuries are presented separately from the short-term, one-year person-level cost estimates. Fatality-related medical and administrative costs are still included in the overall economic impact, while the value of the life lost is presented as a longer-term economic consequence.

Beyond the timing of costs, crashes are also categorized by tangibility. Tangible costs are those directly paid by someone, such as a victim paying medical bills or an employer compensating lost wages during recovery. Crashes also generate intangible costs, specifically reductions in quality of life (QoL), which have no direct marketplace value. Because these losses cannot be captured through market transactions, they are monetized using willingness to pay for reductions in mortality risk and quality-adjusted life years (QALYs) lost.[4] Intangible costs are typically far greater in magnitude than tangible costs because they reflect the full human toll of a crash—not merely what is billed or compensated, but the intrinsic value of health, independence, and life itself. When applied to fatalities and serious injuries, these values can reach several million dollars per person across their lifetime. Given this difference in magnitude, tangible and intangible costs are presented separately to provide clarity and to highlight the impact of crashes on survivors that tangible costs alone do not fully capture.

Table 2-2 presents the short-term person-level costs, showing totals both including and excluding quality-of-life costs.

Table 2-2: One-Year Person-Level Costs (Rockford MPA, 2017–2022) in 2024 Dollars

	Cost Category	A Injuries	B Injuries	Total
Tangible Costs	Medical Expenses	$54.6M	$31M	$85.6M

	Work Loss	$9.9M	$11.3M	$21.2M
	Subtotal	$64.5M	$42.3M	**$107M**
Intangible Costs	Reduced Quality of Life	$115M	$156M	$271M
Grand Total		$179M	$199M	**$378M**
Per-Person Benchmarks	Average per person (incl. QoL)	$143,208	$37,188	$57,327
	Average per person (excl. QoL)	$51,532	$7,918	$16,202

Long-Term Economic Costs

Severemotorvehiclecrashes canpermanently alter victims' lives, generating person-level economic consequences that extend well beyond the initial year post-crash.[4] While short-term work losses account for lost market productivity within the first 12 months, long-term lost earnings capture multi-year income losses resulting from lasting disability or premature death.[5,6] Future lost earnings are discounted at an annual rate of 3 percent to express all long- term impacts in present-value 2024 dollars.

The Value of a Statistical Life (VSL) represents the collective economic willingness to pay for small reductions in mortality risk, providing a standardized monetary basis for valuing health and safety outcomes.[1] VSL is not intended to represent the intrinsic or personal value of an individual life; rather, it provides a consistent economic measure of the value society places on reducing the risk of death. In this analysis, VSL is applied as a standardized measure to estimate the economic impact associated with fatal injuries. For non-fatal injuries, VSL also provides the basis for assigning a monetary value to quality-adjusted life years (QALYs), where one QALY represents one year of life in perfect health. Reductions in QALYs represent losses in health and functioning and can therefore be expressed in monetary terms using the VSL-based valuation.[4]

As shown in Table 2-3, long-term person-level costs totaled $567 million in tangible lost earnings, increasing to $3.5 billion when incorporating lifetime quality-of-life reductions.

Table 2-3: Lifetime Person-Level Costs (Rockford MPA, 2017–2022) in 2024 Dollars

	Cost Category	K Injuries	A Injuries	B Injuries	Total
Tangible Costs	Medical Expenses	$2.9M	$69.3M	$34.5M	$107M
	Lost Earnings	$424M	$6.9M	$29.1M	$460M
	Subtotal	$427M	$76.2M	$63.6M	**$567M**
Intangible Costs	Value of a Statistical Life/Reduced Quality of Life	$2.4B	$229M	$299M	$2.9B
Grand Total		$2.8B	$305M	$363M	**$3.5B**
Per-Person Benchmarks	Average per person (incl. QoL)	$13.8M	$250,030	$69,720	$524,185
	Average per person (excl. QoL)	$2.1M	$62,483	$12,225	$85,248

The overall economic cost of motor vehicle crashes is the sum of short-term crash-level costs and long-term person-level costs. This approach captures both the immediate economic costs associated with crashes and the longer-term consequences experienced by individuals as a result of crash-related injuries and fatalities. Considering these costs together provides a more

complete measure of the economic impact of crashes and illustrates how the relatively small number of K and A severity crashes can account for a disproportionately large share of total economic costs.

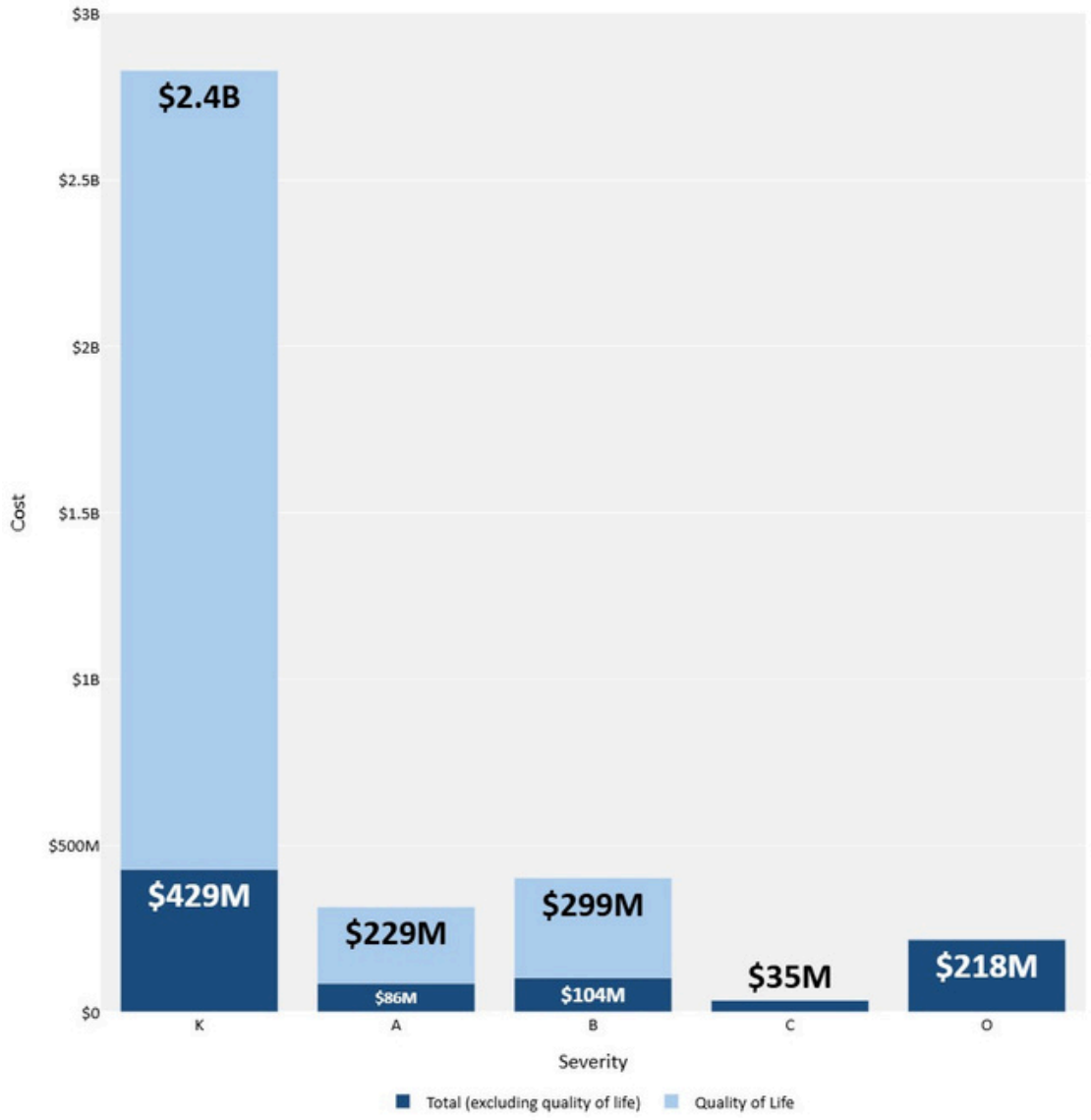
Table 2-4 shows the resulting total economic costs of motor vehicle crashes in the Rockford MPA from 2017–2022. This total reflects both immediate first-year expenses and the discounted present value of long-term future losses, such as ongoing medical care, lifetime earning reductions, and permanent quality-of-life impacts. Consequently, while some of these costs have already been absorbed, a significant portion represents future economic losses stemming from crashes during the study period. As discussed, K and A severity crashes represent only 3 percent of all crashes in the Rockford MPA, yet they account for approximately 60 percent of tangible economic costs and 82 percent of the total economic impact when intangible quality-of-life costs are included.

Table 2-4: Total Economic Costs (Rockford MPA, 2017–2022) in 2024 Dollars

	Cost Category	Total	K and A Total	K and A Portion
Tangible Costs	Property Damage	$213M	$8.5M	4%
	Congestion Costs	$92.3M	$3.6M	4%
	Medical Expenses	$107M	$72.2M	67%
	Lost Earnings	$460M	$431M	94%
	Subtotal	**$872M**	**$515M**	**60%**
Intangible Costs	VSL/Reduced QoL	$2.9B	$2.6B	90%
Grand Total		**$3.8B**	**$3.1B**	**82%**

Figure 1-1 previously demonstrated the relatively small share of K and A severity crashes. Together with Figure 2-1, "Total Economic Costs by Injury Severity," these figures visually highlight the economic impact of severe injury crashes, showing how K and A crashes dominate the total economic costs despite what their frequency alone would suggest.

Figure 2-1: Total Economic Costs by Injury Severity (Rockford MPA, 2017–2022) in 2024 Dollars



The following sections detail the data sources, analytical formulas, and economic assumptions used to calculate the aggregate impacts presented above. To evaluate the underlying

mechanics of these estimates, the technical analysis is organized into two primary methods for modelling costs:

- **Crash-Level Cost Models:** Focus on quantifying property damage and system-wide traffic congestion delays across the road network.
- **Person-Level Cost Models:** Focus on individual medical expenditures, short-term work losses, long-term lost earnings, and quality of life impacts.

This organizational approach allows for detailed analysis on the cost impacts associated with the crash as a whole, as well as those resulting from individual injuries and fatalities from those involved in the crash.

Crash-Level Costs: Property Damage and Insurance Payments

To establish a robust estimate of property damage across the Rockford Metropolitan Planning Area (MPA) during the years 2017–2022, this analysis utilizes empirical insurance claim payment data rather than relying on subjective, field-reported cost estimates. While bodily injury claims are also reported, they are excluded from the primary economic impact totals to avoid double-counting medical, productivity, and other person-level losses detailed later in this report. The methodology and results for an insurance payment analysis including bodily injury insurance payments are provided in the Appendix.

Data Sources and Methodology

The insurance payment estimates are derived by combining crash, person, vehicle, and fault information from the Rockford MPA crash dataset with Illinois-specific insurance claim data published by the National Association of Insurance Commissioners (NAIC). Claim severity estimates for Illinois are derived from the NAIC Auto Insurance Database Report for years 2019/2020 and 2022/2023.[7,8] These data provide average claim severity by insurance coverage type and are used to estimate the insurance payments associated with crashes in the study area.

In the NAIC datasets, average claim severity represents the average financial loss associated with an insurance claim and is calculated as incurred losses divided by incurred claims. This measure provides an estimate of the average amount paid by an insurer per claim for each type of coverage.

Three insurance coverage types are included in the property damage analysis: Property Damage (PD) Liability, which covers damage to other vehicles and property resulting from an at-fault driver's actions; Collision, which covers damage to the policyholder's vehicle regardless of fault, subject to the applicable deductible; and Uninsured Motorist Property Damage (UMPD), which provides first-party coverage for property damage caused by an uninsured at-fault driver.

Comprehensive coverage is excluded because these claims are primarily associated with non-collision events, such as theft and hail damage, that are not represented in the Illinois Department of Transportation (IDOT) crash data. As noted, Bodily Injury (BI) Liability and Uninsured Motorist Bodily Injury (UMBI) coverage are addressed separately in the Appendix.

The coverage-specific severity estimates used in this analysis are summarized in Table 3-1. The full table, including bodily injury coverage, is provided in Table A-1.

Table 3-1: NAIC Average Incurred Loss per Claim by Year and Coverage Line (Illinois) in Nominal Dollars[7],[8]

Year	PD Liability	Collision	UMPD
2017	$3,754.99	$3,960.82	$2,611.14
2018	$3,946.01	$4,153.81	$2,829.64
2019	$4,075.62	$4,263.59	$2,934.09
2020	$4,557.04	$4,602.17	$3,222.66
2021	$5,222.18	$5,387.80	$4,261.36

2022	$5,973.44	$6,259.63	$4,527.10

Fault Inference Methodology

Determiningfault ineachcrashis animportant step in the insurance payment analysis because fault determines which insurance coverage may apply to the resulting vehicle damage. In general, property damage caused by an at-fault driver is associated with PD Liability coverage, while damage to a driver's own vehicle is associated with Collision coverage. Accurately identifying which drivers are at fault is therefore necessary to estimate the number and type of insurance claims associated with each crash.

Fault is inferred using the Driver Action field in the Rockford MPA crash dataset, which identifies the specific driver action associated with a crash. In the fault inference analysis, Driver Action codes are classified as indicating an at-fault driver, no contributing action, or an unknown or missing driver role. These classifications are used to identify crashes as having a single at-fault driver, shared fault, no identified fault, or indeterminate fault.

Crashes in which at least one driver was identified as at fault, but other drivers had unknown or missing fault status are classified as low-confidence fault assignments. For these crashes, drivers with unknown fault status are treated as not at fault based on the observed frequency of shared fault in crashes with complete fault information.

For indeterminate crashes, fault is imputed based on the number of vehicles involved and the observed distribution of fault in crashes with known fault information. This approach assigns a liability weight to each driver, ranging from 0.00 (no fault) to 1.00 (full fault). Among single-vehicle crashes with complete data, 64.34 percent had an identified at-fault driver, while 96.49 percent of multi-vehicle crashes had a known at-fault driver. These observed fault rates were used to estimate fault for crashes with indeterminate information, resulting in an average imputed liability weight of 0.877 per crash.

Property Damage and Collision Methodology

Imputed Damage Status

Damage extent was not recorded in the Rockford MPA crash dataset until 2019, largely contributing to 46 percent of vehicle records having an unknown or unreported damage status. Damage statuses in these cases are imputed based on the distribution of known damage statuses by collision type. For example, front-to-front collision types have an 80 percent damage probability based on the known-damage crashes.

Assigning Coverage Type

Each damaged vehicle is assigned Property Damage (PD) Liability and Collision coverage based on the vehicle's estimated share of fault. A vehicle with more than 50 percent of the crash fault is assigned entirely to Collision coverage, while a vehicle with 50 percent or less fault is assigned a corresponding share to PD Liability and Collision. This approach ensures that the estimated PD Liability and Collision claim fractions sum to one for each damaged vehicle and prevents the same damage from being counted under both coverage types.

Non-Filers

Minor vehicle damage may go unreported to insurers when the cost of filing a claim is perceived to outweigh the potential reimbursement, particularly when the estimated damage is near or below the applicable deductible. The National Highway Traffic Safety Administration (NHTSA) report provides a non-filing rate of 24.67 percent, which is applied to the estimated Collision claims in this analysis.[1]

Other Assumptions

Fixed-object damage is not included in the available vehicle data and therefore is not separately estimated.

Animal-collision damage is in practice covered under comprehensive insurance rather than collision coverage. However, comprehensive insurance is outside the scope of this analysis because comprehensive claims are not observed in the available data. Identifiable animal-

collision damage is therefore included as a subset of collision-related own-vehicle damage and valued using the collision claim severity assumptions applied elsewhere in the analysis.

Uninsured Driver Methodology

The Rockford MPA crash dataset does not specify which drivers carried insurance; therefore, a 15.42 percent rate of uninsured drivers is assumed, the rate taken from the Insurance Information Institute.[9] Once the total number of claims under the PD (or BI) coverage is determined, 15.42 percent of claims are reallocated to corresponding Uninsured Motorist (UM) coverage lines. UMPD severity runs approximately 18 to 30 percent below the PD Liability severity. In the process of reallocating these 15.42 percent of claims, no claim is created or removed; the dollar total moves only because uninsured-motorist claims settle at different average values than liability claims.

Results

Table 3-2 summarizes the estimated insurance payments associated with property damage for crashes in the Rockford MPA from 2017 through 2022. The estimates include payments associated with Property Damage Liability, Collision, and Uninsured Motorist Property Damage coverage and are used to estimate the property damage component of the total economic impact.

Results are also presented by crash severity to illustrate how property damage impacts vary with crash severity. Although the average cost per crash generally increases with injury severity, the total determined property damage is primarily influenced by the number of crashes at each crash severity.

Table 3-2: Property Damage Costs by Crash Severity (Rockford MPA, 2017–2022) in 2024 Dollars

Crash Severity	PD Liability	UMPD	Collision	Total	Average per Crash
K	$670,354	$92,190	$749,951	$1.51M	$7,525
A	$3.25M	$438,229	$3.4M	$7.05M	$7,065
B	$13.1M	$1.78M	$12.9M	$27.8M	$7,209
C	$13.5M	$1.8M	$12.9M	$28.3M	$6,678
O	$68.4M	$9.2M	$70.5M	$148M	$4,994
Unknown	$152,132	$19,991	$139,209	$311,332	$3,751
Total	**$99.2M**	**$13.4M**	**$100M**	**$213M**	**$5,458**

Crash-Level Costs: Congestion

Data Sources and Methodology

Congestion costs encompass a variety of expenses associated with excess travel time resulting from car crashes.[1] These delays can arise from lane closures, detours, emergency vehicle response, queuing, and rubbernecking. The costs included in this analysis comprise added criteria pollutant costs, added greenhouse gas costs, added fuel consumption costs, and the value of lost travel time. Cost estimates are based on National Highway Traffic Safety Administration (NHTSA) rates per crash, categorized by road classification and crash severity, as

shown in Table 4-1.[1] NHTSA rates are originally given in 2019 dollars and converted to 2024 dollars.

Table 4-1: NHTSA Congestion Costs by Roadway Type and Injury Severity (United States) in 2024 Dollars1

Road Type	Fatal	Injury	Property Damage Only
Urban Interstate	$209,497	$44,256	$37,649
Urban Arterial	$17,045	$3,784	$2,294
Urban Other	$2,301	$1007	$606
Rural Interstate	$15,352	$2,841	$2,884
Rural Other	$1,098	$280	$233
Average	$28,311	$7,520	$7,360

Roadway classifications from the Rockford Metropolitan Planning Area (MPA) crash dataset are first converted to align with NHTSA definitions. Where NHTSA-provided examples of road types are available, those are applied directly; where no direct example exists, classifications are determined by alignment with the most comparable road type definition. Each crash is then mapped to its corresponding NHTSA cost based on road type and severity level. In cases where road classification is unknown, the NHTSA average cost is assigned.

While other sections of this report are segmented by injury severity, NHTSA found no significant difference in congestion costs across injury levels. Therefore, crashes are categorized as fatal, injury, or property damage only, rather than following the full KABCO scale. Crashes in

which the most severe injury was classified as A, B, or C are assigned to the injury category. Where severity is unknown, the property damage only cost is applied.

Results

Total costs related to congestion summed to over $92 million. The vast majority of these costs came from property damage only crashes, due to the large number of these crashes compared to crashes with injuries. Despite having a higher per-crash cost, injury and fatal crashes combined contributed about $22.4 million to the total cost due to their lower frequency. Urban interstate crashes are the most expensive by road type, since crashes there affect more cars than crashes on less busy roadways. Meanwhile, rural interstate crashes are the least costly, since there are fewer of these roadways.

According to the NHTSA, congestion costs are primarily driven by the value of lost time (approximately 91 percent), followed by excess fuel consumption (just over 5 percent) and increased emissions (just under 4 percent). These proportions shift slightly by crash severity and roadway type.[1] Applying these shares to the total estimated cost, approximately $84 million is attributable to lost time, $4.6 million to excess fuel consumption, and $3.7 million to emissions.

Table 4-2: Estimated Congestion Costs by Roadway Type and Injury Severity (Rockford MPA, 2017–2022) in 2024 Dollars

Road Type	K	A	B	C	O	Total
Urban Interstate	$505,597	$1.8M	$8.3M	$2.7M	$46.7M	$60.1M
Urban Arterial	$195,254	$718,324	$2.8M	$2.8M	$15.7M	$22.2M

Urban Other	$33,842	$210,720	$783,401	$1.1M	$5.8M	$7.9M
Rural Interstate	$22,772	$24,101	$92,226	$28,580	$500,791	$668,473
Rural Other	$4,269	$46,588	$160,766	$144,459	$1.1M	$1.5M
Total	$761,738	$2.8M	$12.1M	$6.7M	$69.8M	$92.3M

Congestion costs can also be roughly estimated by calculating a percentage of the observed vehicle hours of delay in a region. The Federal Highway Administration (FHWA) estimates that traffic incidents account for 25 percent of all congestion.[10] According to StreetLight, Rockford had an observed 2.2 million total vehicle hours of delay in 2022.[11] Applying the 25 percent estimate yields approximately 550,000 vehicle hours of incident-attributable delay. Multiplying this figure by the NHTSA average cost per vehicle hour produces an estimated $16.8 million in annual delay costs.[1] This estimate captures the value of lost travel time only and excludes additional costs associated with excess fuel consumption and increased emissions.

For comparison, the crash-level methodology described in this report produces an estimated $14 million per year in lost travel time costs. The two estimates differ by less than 9 percent, providing an independent cross-check of the estimated economic burden of congestion attributable to motor vehicle crashes in the Rockford MPA.

The crash-level methodology described in this report estimates approximately $15.4 million in total annual congestion costs. Based on NHTSA estimates that lost travel time accounts for approximately 91 percent of congestion costs, about $14.0 million of this amount is attributable to lost travel time.[1] Comparing the two estimates of lost travel time costs yields a difference of approximately 17 percent. Although the estimates differ in their underlying data sources and

calculation approaches, their relative magnitude provides a useful cross-check of the estimated economic burden of congestion in the Rockford MPA.

Person-Level Costs

Person-level costs represent the collective impacts associated with the people involved in motor vehicle crashes and include medical expenses, lost productivity, and reductions in quality of life resulting from crash-related injuries and fatalities. These costs generally increase with the severity of the injury, as more severe injuries tend to require greater medical care, result in longer periods of lost productivity, and have greater impacts on quality of life.

Data Sources and Methodology

Overview of Cost Categories

The analysis separates fatal injuries from non-fatal injuries because a fatal crash results in the loss of a person's remaining life, while a non-fatal injury results in varying degrees of physical harm and disruption to a person's life; fatalities and non-fatal injuries are therefore valued using different approaches. Non-fatal injury costs reflect medical expenses, work loss, and reductions in quality of life (QoL) associated with the injury. These costs are further split into one-year and lifetime estimates to reflect both immediate and long-term economic impacts. For fatalities, costs are valued using the Value of a Statistical Life (VSL), a standardized economic measure of society's willingness to pay for reductions in mortality risk, to estimate the economic impact associated with a loss of life. VSL incorporates the economic consequences associated with lost productivity and quality of life. Person-level costs are assigned based on injury severity, crash year, and victim demographics.

Primary Data Sources

The analysis integrated data from several federal and academic sources. The Centers for Disease Control and Prevention's (CDC) Web-based Injury Statistics Query and Reporting System (WISQARS) served as the primary source for one-year medical, QoL, and work loss estimates for non-fatal injuries, as well as total medical and VSL costs for fatal injuries.[5] Data were collected for 2017 to 2022 and stratified by age, sex, and injury mechanism. The Census

Quarterly Workforce Indicators (QWI), filtered to Winnebago, Boone, and Ogle counties, provided the basis for lifetime work-loss estimates.[6] The National Highway Traffic Safety Administration (NHTSA) report supplied adjustment ratios for lifetime medical costs and the lost productivity multiplier.[1] Miller et al. provided adjustment ratios for lifetime quality-of-life costs, differentiated by victim type.[4]

Data Mapping and Normalization

Rockford Metropolitan Planning Area (MPA) crash victims are mapped to WISQARS injury outcome categories using the KABCO scale, with K-level injuries mapping to the fatal dataset, A-level injuries to the hospitalized dataset, and B-level injuries to the Emergency Department (ED) treat-and-release dataset. For non-fatal outcomes, the mechanism filter is set to "Transportation"; for fatal outcomes, it is set to "Motor Vehicle, Overall." WISQARS age ranges are expanded to assign values to discrete ages, with missing values imputed through linear interpolation. For victims with an unidentified gender, costs are calculated as the mean of the male and female values for the corresponding age.

Average annual salaries in the region are derived from monthly QWI earnings. Because QWI reports data in age cohorts, a second-order polynomial interpolation is applied to assign earnings to individual ages. For ages falling below the youngest available age cohort, earnings are extrapolated from the available age-specific estimates.

Estimation Methodologies

Medical Costs

Medical costs encompass inpatient and outpatient care, medications, and ancillary expenses such as ambulance fees and autopsy costs.[5] WISQARS estimates these costs by separating injury-related spending by cause, distinguishing expenditures attributable to motor vehicle crashes from baseline medical spending and other injury causes. The resulting estimates therefore reflect only crash-related costs. One-year estimates for non-fatal injuries and total estimates for fatal injuries are sourced directly from WISQARS and applied to each crash victim based on accident year, age, and gender. Lifetime medical costs for non-fatal injuries are calculated using 18-month to lifetime cost adjustment ratios, which convert short-term costs to lifetime costs without requiring detailed injury data. The resulting values reflect total medical

costs from the injury, inclusive of one-year costs.[4] Since lifetime costs are derived from one-year rather than 18-month data, these estimates are likely conservative.

Work Loss and Productivity

Work loss costs capture the economic impact of productivity lost due to injury. One-year estimates from WISQARS represent workdays lost due to crash injuries, adjusted for typical missed work absent any injury and monetized using daily market productivity.[5] Lifetime estimates are derived from QWI Full Quarter Employment Average Monthly Earnings data, stratified by age and gender.

Lifetime wages are assigned to each K, A, and B injury victim based on year of injury, age, and gender, with cumulative earnings summed through 2024 and carried forward thereafter using 2024 values. A three percent discount is applied to future earnings. Because most non-fatal victims regain the ability to work, a full loss of earnings is not assumed. Instead, the NHTSA estimate of a 0.26 percent permanent decrease in lifetime productivity is applied to cumulative lifetime wages, representing the average long-term reduction in productivity following a crash injury. Total lifetime wages are assumed to decrease proportionally to this reduction in productivity, capturing the effect across all future working years.[1] Victims with zero estimated future lifetime wages, generally those over age 75, are excluded from the aggregate results.

Notably, one-year and lifetime work loss estimates are not directly comparable: one-year costs reflect lost productivity value, while lifetime costs reflect the present value of foregone wages.

Value of a Statistical Life (VSL)

VSL, as defined by the NHTSA, represents individuals' willingness to pay for a marginal reduction in their risk of death and is used to quantify the societal value of avoiding a fatality.[1] It is not intended to assign a monetary value to any individual human life; rather, it encompasses broader aspects of living, including productivity and quality of life. VSL estimates for fatal injuries are sourced directly from WISQARS.

Quality of Life (QoL)

Quality of life costs are quantified using the change in quality-adjusted life years (QALYs) resulting from an injury.[5] QALYs account for both the quality and duration of life affected by an injury; a loss of one QALY is equivalent to losing one year of life in perfect health.

VSL is used to assign a monetary value to QALYs.[1,5] A per-QALY dollar value is derived by dividing VSL by the remaining life expectancy at a given age, yielding an age-adjusted value for each QALY. This per-QALY value is used to translate the functional impairment of an injury into a monetized quality-of-life cost.

One-year QoL estimates are sourced from WISQARS, while lifetime estimates are calculated by multiplying the one-year estimates by one-year to lifetime cost ratios from Miller et al.[5,4]

Results: Fatal Injuries

Table 5-1 shows the fatal injury costs resulting from this analysis. As VSL is on the order of several million dollars per person, this cost category dominates the fatal injury costs. Medical costs, by contrast, are a comparatively minor component.

Table 5-1: Fatal Injury Costs (Rockford MPA, 2017–2022) in 2024 Dollars

Cost Categories	K Injury (Fatal) Costs	Average per Person	Range per Person
Medical	$2.9M	$12,294	$9,345 - $34,256
Value of a Statistical Life	$2.4B	$11.7M	$2.3M - $19.6M
Total	$2.4B	$11.7M	$2.3M - $19.6M

Results: Non-Fatal (A and B) Injuries

1-Year Costs

Table5-2 presents the non-fatal injury costs in the first year following the crash. The total for B injuries is slightly higher than the total for A injuries due to the higher volume of B injuries.

Quality-of-life loss is the largest cost component across both injury severity levels, accounting for approximately 70 percent of total non-fatal injury costs. Second to quality-of-life loss are medical costs, followed by work loss costs.

Table 5-2: Non-Fatal Injury One-Year Costs (Rockford MPA, 2017–2022) in 2024 Dollars

Cost Categories	A Injury (Hospitalized) Costs	B Injury (Treat and Release) Costs	Total
Medical	$54.6M	$31M	$85.6M
Quality of Life	$114.8M	$156.3M	$271.1M
Work Loss	$9.9M	$11.3M	$21.2M
Total	$179.3M	$198.5M	$377.8M
Average per Person	$123,208	$37,188	
Range	$107,388 - $159,521	$27,357 - $50,697	

Lifetime Costs

Finally, Table 5-3 shows the lifetime non-fatal injury costs. Quality-of-life loss remains the dominant cost component, followed by medical costs. Relative to one-year costs, costs following the first year added $18.3 million in medical expenses and $256.8 million in quality-of-life losses.

The difference in work loss costs between hospitalized and treat-and-release injuries is attributable solely to the difference in injury volume between the two categories, as the lost productivity factor is applied equally across both injury classes. As discussed, lifetime work loss costs cannot be compared to the one-year costs, since the lifetime costs represent lost wages while the one-year costs represent lost productivity.

Table 5-3: Non-Fatal Injury Lifetime Costs (Rockford MPA, 2017–2022) in 2024 Dollars

Cost Categories	A Injury (Hospitalized) Costs	B Injury (ED Treat and Release) Costs	Total
Medical	$69.3M	$34.5M	$103.9M
Quality of Life	$228.8M	$299.1M	$527.9M
Work Loss	$6.9M	$29.1M	$36M
Total	$305M	$362.7M	$667.7M
Average per Person	$250,030	$69,720	
Range	$178,128 - $288,892	$50,862 - $92,314	

Limitations and Future Work

Crash-Level Costs: Property Damage and Insurance

Several limitations affect the estimation of property damage andinsurance-related costs. Illinois requires a crash report for any death or bodily injury, or for more than $1,500 in property damage when all drivers are insured ($500 if any driver is uninsured).[12] Consequently, the least severe property-damage-only crashes may not be represented in the crash database, even though many might still generate claims. The analysis therefore likely understates the number and total value of property damage claims associated with crashes in the Rockford Metropolitan Planning Area (MPA).

Damage to fixed objects and other non-vehicle property is captured only when the recorded collision type is Fixed Object. Damage to a guardrail, utility pole, building, or other fixed object that occurs in a crash recorded under a different collision type, such as any of the multi-vehicle crashes, is therefore not separately captured. In addition, these damages are valued using the average National Association of Insurance Commissioners (NAIC) property damage liability claim severity, which primarily reflects vehicle repair costs and may not accurately represent the cost of repairing non-vehicle property. Future work could improve this estimate by incorporating separate cost assumptions for common types of fixed-object damage.

Several limitations also arise from missing crash-level information. Missing driver action codes are concentrated in fatal and parked-vehicle crashes, meaning that fault is least likely to be observed in some of the crashes with the highest potential costs. When driver action codes are unavailable, fault is imputed using the approach described in the Fault Inference Methodology section. This imputation slightly increases estimated Property Damage (PD) Liability relative to an approach that excludes crashes with missing fault information. Crashes in which no person is recorded as at fault are retained because some may represent hit-and-run crashes in which the responsible driver was not identified. To the extent that some of these crashes are not attributable to an unidentified driver, liability-related claims are correspondingly overstated.

The analysis applies a statewide Uninsured Motorist (UM) rate of 15.42 percent to the Rockford MPA, although the local rate may differ. Because UM and Liability claims have different average

severities, differences between the assumed and actual local uninsured rate could affect the estimated costs, particularly the allocation between UM and Liability coverage.

Vehicle damage is also imputed when damage status is unknown, assuming that vehicles with unknown status have the same likelihood of being damaged as those with known status within the same collision type. Although this assumption may slightly understate vehicle damage costs, checks across the study period suggest that its overall effect is limited.

Future work could reduce these limitations by incorporating more detailed information on property damage, improving the treatment of fixed-object claims, using locally representative uninsured-driver rates, and developing alternative methods for assigning fault when driver action information is missing.

Crash-Level Costs: Congestion

Per-crash congestion costs are based on national averages, which may not accurately reflect regional conditions. Local factors—including traffic patterns, road characteristics, and crash frequency—influence how long and how much a crash disrupts traffic flow and, consequently, the true cost of that disruption. This analysis would benefit from locally derived congestion cost data to improve the precision of these estimates.

In exploring this possibility, local traffic data from StreetLight and Replica were explored as potential inputs, but neither source provided the granularity required for this analysis. Accurate estimates depend on daily data to account for variations in traffic flow by day and time of day, a level of detail these sources do not offer.

Additionally, per-crash costs vary significantly by road type, making accurate road classification essential to the validity of the results. The National Highway Traffic Safety Administration (NHTSA) cost data use six road type classifications, while the dataset used in this analysis contains 28, requiring the two systems to be reconciled. This mapping introduces subjectivity and the risk of misclassification, which can propagate error through the final congestion cost estimates.

Furthermore, per-crash congestion costs are derived from 2019 data and applied uniformly across all report years. While adjusted for inflation, these costs do not account for changes in traffic volume, which affects the duration and cost of post-crash delays. Traffic volume in Rockford decreased by an average of 13.5 percent between 2019 and 2022,[12] suggesting that congestion cost estimates for those years are likely overestimates.

Person-Level Costs

One limitation of person-related cost estimates is that they are heavily dependent on the location and nature of the injury sustained. This analysis assigns costs only based on age, gender, and the reported injury level on the KABCO scale. While the approach is useful for broad estimation, it does not account for the considerable variation in medical expenses, quality of life impacts, and work loss that arise from injury-specific factors. Future analyses would benefit from datasets that incorporate injury-specific cost breakdowns to improve the precision of these estimates.

Additionally, this analysis assumes A injuries resulted in hospitalization, B injuries were treated and released, and C injuries received no medical treatment. While this framework provides a structured approach to cost assignment, it does not account for the natural variation in treatment practices and individual medical judgment. As a result, there are likely cases where injuries were treated at a higher level of care than assumed—for example, a B injury requiring hospitalization—meaning the associated costs are underestimated. The person-related cost estimates produced by this analysis are therefore likely conservative, and future analyses would benefit from treatment-level data linked directly to injury records to allow for more precise cost assignment.

Furthermore, lifetime costs are estimated using broad actuarial ratios that, in some cases, do not account for differences in injury severity—most notably in work loss calculations. Applying a uniform ratio across severity levels assumes consistent economic impact regardless of injury type, which is unlikely to reflect reality. These ratios may also be outdated, as medical costs, wage rates, and the economic burden of motor vehicle injuries shift over time due to inflation, rising healthcare costs, and changes in crash severity distributions. Future analyses would

benefit from severity-stratified ratios derived from recent data to improve accuracy and relevance.

Despite these limitations, the analysis provides an estimate of the substantial economic costs associated with motor vehicle crashes in the Rockford MPA and illustrates the range of direct and longer-term impacts that crashes impose on individuals and the region. The following section summarizes the principal findings and their implications.

Conclusions

Motor vehicle crashes in the Rockford Metropolitan Planning Area (MPA) generated substantial economic impacts between 2017 and 2022, with an estimated $872 million in tangible economic costs, increasing to $3.8 billion when accounting for the estimated monetary value of lost or reduced quality of life. The results demonstrate that crash consequences extend beyond immediate property damage and emergency response. Medical expenses, lost productivity and earnings, traffic congestion, and reductions in quality of life collectively represent a significant economic burden. The concentration of costs among severe crashes is particularly notable: K and A (severe injury) crashes represented approximately 3 percent of all crashes, but accounted for 60 percent of tangible costs and 82 percent of total costs when quality-of-life impacts are included.

The findings also demonstrate the importance of considering both short and long-term consequences when evaluating the economic effects of vehicle crashes. Property damage and congestion generate immediate regional costs, while injuries and fatalities can produce economic consequences that extend for years, even over a person's expected lifetime. Quality-of-life losses constitute a particularly large share of the estimated impact, underscoring that severe crash consequences cannot be fully represented by readily observable expenditures alone.

The estimates are subject to limitations, particularly where national or statewide benchmarks, imputation, and generalized severity-based assumptions are used in place of localized or injury-specific data. The results should therefore be interpreted as estimates of the magnitude and distribution of crash-related economic impacts rather than precise measures of every cost

incurred. Despite these limitations, the analysis provides a regional framework for understanding crash-related economic consequences and the disproportionate burden associated with fatal and serious-injury crashes. Continued improvements in localized crash, injury, traffic, and cost data would support more precise estimates in future analyses.

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Appendix: Complete Insurance Payment Costs

Thisappendixexpandstheinsurance paymentsanalysisto include estimates oftotal reimbursements to policyholders for bodily-injury-related claims, providing a more complete picture of total insurance reimbursements to policyholders who were involved in crashes in the Rockford Metropolitan Planning Area (MPA) from 2017–2022.

The two additional bodily-injury-related insurance coverages are Bodily Injury (BI) Liability, which covers injuries to other parties resulting from an at-fault driver's actions; and Uninsured Motorist Bodily Injury (UMBI), which provides coverage for injuries caused by an uninsured at-fault driver. Table A-1 shows the average incurred loss per claim for the five coverage categories featured in the expanded insurance payment analysis.

Table A-1: NAIC Average Incurred Loss per Claim by Year and Coverage Line (Illinois) in Nominal Dollars7,8

Year	BI Liability	PD Liability	Collision	UMBI	UMPD
2017	$20,616.44	$3,754.99	$3,960.82	$29,978.45	$2,611.14
2018	$21,024.43	$3,946.01	$4,153.81	$30,349.54	$2,829.64
2019	$20,942.12	$4,075.62	$4,263.59	$30,412.35	$2,934.09
2020	$24,354.80	$4,557.04	$4,602.17	$32,171.83	$3,222.66
2021	$25,486.36	$5,222.18	$5,387.80	$33,663.05	$4,261.36
2022	$27,476.69	$5,973.44	$6,259.63	$39,368.71	$4,527.10

Bodily Injury

BodilyInjury Liability claims were estimated using the number of injured people rather than the number of crashes. Because National Association of Insurance Commissioners (NAIC) BI severity is based on claims per injured claimant, the analysis constructed a claimant population from the Rockford MPA person-level data.

For BI Liability, claimants were defined as injured persons classified as K, A, B, or C on the KABCO scale who were involved in a liability-bearing crash. At-fault drivers were excluded from the claimant population, while pedestrians and bicyclists were included because they may receive compensation through the at-fault driver's BI Liability coverage. Each claimant was assigned the liability weight associated with the crash. This allowed injured persons in indeterminate-fault crashes to contribute proportionally rather than being treated as either fully compensable or completely ineligible.

The estimated total for BI Liability claims is $156.5 million in nominal dollars, based on the statewide average BI claim severity reported by NAIC. However, this statewide average does not capture the differences in claim costs associated with varying injury severities. To account for these differences, the total BI Liability cost is distributed across KABCO injury severity levels using injury-severity-specific cost weights. Injury cost weights are counted as a share of total cost of injury-related costs, such as medical, emergency medical services, market productivity, household production, insurance administration, workplace, and legal, taken from the National Highway Traffic Safety Administration (NHTSA) report.[1]

Multiple BI Liability limits were tested to determine the most reasonable assumption for the analysis. This approach preserves the overall $156.5 million total and remains consistent with the NAIC average severity while providing a more representative distribution of costs across injury severities. Varying the BI Liability limit affects the percentage share of different injury tiers. Table A-2 shows the distribution of BI Liability costs split by injury severity, and the results of varying the per-person limit.

For the final estimate, a Bodily Injury (BI) Liability limit of $100,000 per person is used to reduce the extent to which estimated BI payouts are constrained by the policy limit.[1] The rationale for using a limit above the Illinois statutory minimum of $25,000 per person is that the 2022

statewide average BI claim severity was $27,477, already exceeding the minimum limit. Using the statutory minimum would therefore constrain a substantial share of claims and could understate the costs associated with more severe injuries. A $100,000 limit provides greater capacity to capture variation in claim severity while avoiding excessive influence from exceptionally severe claims.

Table A-2: Bodily Injury Liability Costs by Injury Severity Under Per-Person Limit Assumptions (Rockford MPA, 2017–2022) in Nominal Dollars

Assumed Per-Person BI Limit	K Injuries	A Injuries	B Injuries	C Injuries	Total BI	K+A Share
$25,000 (Illinois statutory minimum)	$2.11M 1.3%	$17M 10.8%	$76.1M 48.6%	$61.4M 39.2%	$156.5M	12.2%
$100,000 (current headline)	$5.97M 3.8%	$48.2M 30.8%	$58.7M 37.5%	$43.7M 27.9%	$156.5M	34.6%
$250,000	$12.8M 8.2%	$54.7M 34.9%	$51M 32.6%	$38.1M 24.3%	$156.5M	43.1%
$254,500 (Blincoe 2019, from Miller et al. 1991)	$12.99M 8.3%	$54.58M 34.9%	$50.96M 32.6%	$38.01M 24.3%	$156.5M	43.2%

Uncensored (Blincoe 2019 raw ratios)	$52.91M 33.8%	$39.58M 25.3%	$36.44M 23.3%	$27.62M 17.6%	$156.5M	59.1%

Uninsured Motorist (UM) Bodily Injury

The methodology here is similar to Uninsured Motorist (UM) Property Damage, where once the total number of BI claims are found, 15.42 percent are reallocated to UMBI claims. UMBI severity is roughly 32 to 45 percent above BI liability across the study years. That could be explained by UM claims skewing towards more serious injuries, as minor claims are not often pursued.

Complete Insurance Payment Costs Results

Table A-3 summarizes the estimated insurance payment costs across the five coverages included in this analysis. The total estimated cost is $375.5 million in nominal dollars, **equivalent to $448 million in constant 2024 dollars.** These estimates complement the results presented in the main report, particularly those related to bodily injury costs. Taken together, the results suggest that bodily injury insurance payments account for a portion of the broader economic costs associated with injuries, including medical expenses and work losses, but do not fully capture the economic value of quality-of-life losses.

Table A-3: Estimated Insurance Claim Cost by Coverage Line (Rockford MPA, 2017–2022) in Nominal Dollars

Coverage Line	Claims	Average Severity	Total (Nominal Dollars)	% of Total
BI Liability	6,755	$23,175	$157M	41.7%

PD Liability	18,286	$4,554	$83.3M	22.2%
Collision	17,782	$4,748	$84.4M	22.5%
UMBI	1,232	$32,516	$40M	10.7%
UMPD	3,334	$3,370	$11.2M	3.0%
Total	47,388	—	$376M	100.0%