12.0 SAFETY

The safety of the Kansas City region's traveling public requires a commitment to a coordinated, collaborative, comprehensive and continuing transportation safety system, informed by analysis of the complex factors that influence its quality and function.

Federal legislation

Moving Ahead for Progress in the 21st Century (MAP-21), the current federal transportation bill, expands the emphasis on safety from preceding transportation legislation. It doubles funding for the Highway Safety Improvement Program (HSIP) and includes aggressive efforts to reduce highway fatalities by linking modal safety programs.

Destination Safe Coalition

In 2002, MARC adopted an explicit safety goal in its Metropolitan Transportation Plan. Later, in 2003, MARC began discussions with key stakeholders in Kansas and Missouri to develop a regionally focused transportation safety plan. MARC worked with the Kansas Department of Transportation (KDOT) and Missouri Department of Transportation (MoDOT) to form a regional transportation safety coalition, the Destination Safe Coalition.

Destination Safe adopted a regional safety blueprint in 2006 to guide safety efforts, and updated the plan in 2009. Then in 2013, the coalition adopted the *Kansas City Regional Transportation Safety Blueprint, Toward Zero Deaths – 2013-2017*, a plan that focuses on priorities and strategies to reduce the number of traffic fatalities and serious injuries in the Kansas City region.

Figure 12.1: The Destination Safe region

The Destination Safe Coalition currently includes Johnson, Leavenworth, Miami and Wyandotte counties in Kansas, and Cass, Clay, Jackson, Johnson, Lafayette, Pettis, Platte, Ray and Saline counties in Missouri. As of 2014, the Destination Safe Coalition leadership team consisted of 44 member organizations working together to improve transportation safety.
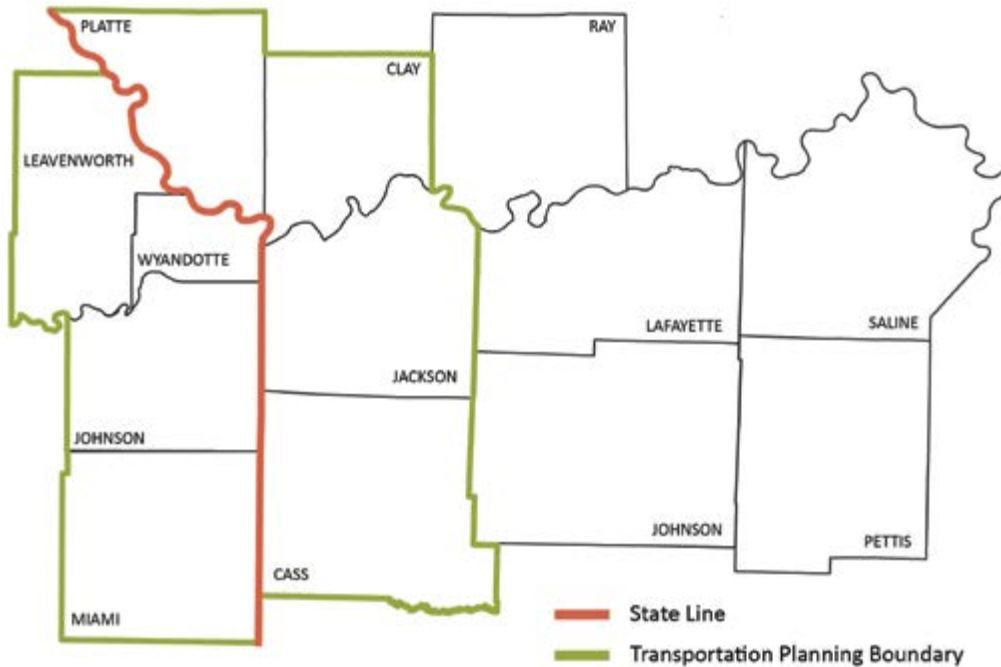
Several states, including Kansas and Missouri, and other organizations like Destination Safe have adopted the transportation safety vision of moving toward zero deaths. Destination Safe believes that every life counts, and the coalition works to help the Kansas City region protect every person's life on roadways. While the ultimate goal is zero deaths, MARC supports the Destination Safe's regional fatality education goal that includes important benchmarks to measure progress. The goals and benchmarks are included later in this chapter.

As of 2014, the Destination Safe Coalition Leadership Team had 44 members. The Destination Safe Coalition serves 13 counties, covering all of the Kansas City Metropolitan Planning Organization boundary and five additional counties. While some data in this chapter focuses on the entire 13-county Destination Safe region, the majority of crashes involving fatalities and serious injuries — 88 percent in the five-year period from 2008–2012 — occurred within the eight-county MPO boundary.

Destination Safe created the Transportation Safety Data Task Team (TSDTT), a subcommittee of the coalition. The task team has three main objectives:

- To improve the collection, management and analysis of transportation safety data.

- To improve the timeliness, accuracy and reliability of transportation safety data.

- To help regional partners make data-driven transportation safety decisions.

The group meets regularly to analyze regional transportation safety data and reports. MARC works with the TSDTT to provide data-driven reports for decision makers and safety partners.

National and regional safety trends

According to data published by the National Highway Traffic Safety Administration (NHTSA), the number of roadway-related fatalities increased in 2012 after dropping for six consecutive years (Figure 12.2). Trends are defined by using recorded deaths, vehicle miles traveled (VMT) and population. The rates produced are expressed as fatalities per 100 million VMT and fatalities per 100,000 population. Each measure provides a standard for comparison at the state and regional level. Historic data can also mirror the impact of significant events such as wars and economic recessions. Advancements in vehicle safety, safer roadway design and stricter traffic laws are also a part of this story.

In 2012, the last year for which complete data is available, NHTSA reported 33,561 roadway fatalities.

Figure 12.2: U.S. roadway fatality rate per million VMT, 1950–2011

In the past decade, roadway fatality rates have fallen to levels not seen since the 1950s.
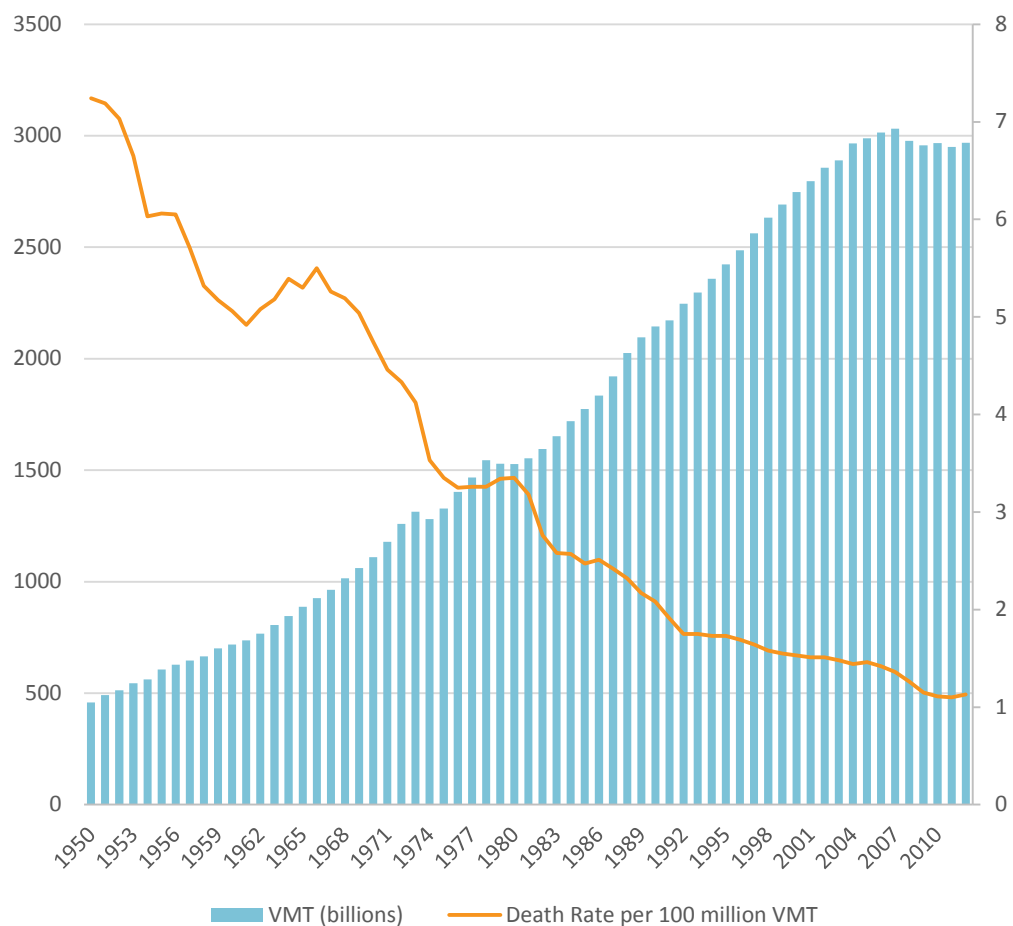
NHTSA National Highway Traffic Safety Administrations, FARS Fatality Analysis Reporting System, *List of Motor Vehicle Deaths in U.S. by Year*.

Since the Destination Safe Coalition was formed, the region has experienced significant reductions in the number of fatal motor vehicle crashes. As illustrated in Figure 12.3, regional fatalities have decreased from an average of 235.8 fatalities between 2003 and 2007 to an average of 205.2 fatalities between 2009 and 2013. The coalition wants to continue this trend of fatality reductions.

In the five-year period between 2008 and 2012 (the blueprint baseline), the region experienced 1,057 fatalities and 7,784 serious injuries associated with motor vehicle crashes — an average of about 211 fatalities and 1,557 serious injuries per year. While the region has a lower fatality rate compared to state and national rates, local decision makers continue to emphasize the importance of transportation safety, and understand that 205 deaths per year is unacceptably high. Again, 88 percent of these fatalities and serious injuries occurred in the eight-county MPO area. The Destination Safe Coalition has adopted a goal of reducing both fatalities and serious injuries by 15 percent for the five-year period from 2013–2017.

Figure 12.3: Regional traffic fatalities and serious injuries, five-year averages

Destination Safe has set a goal of achieving a 15 percent reduction in fatality and serious injury rates from the previous five-year average.

Regional traffic fatalities, five-year averages

Regional traffic serious injuries, five-year averages
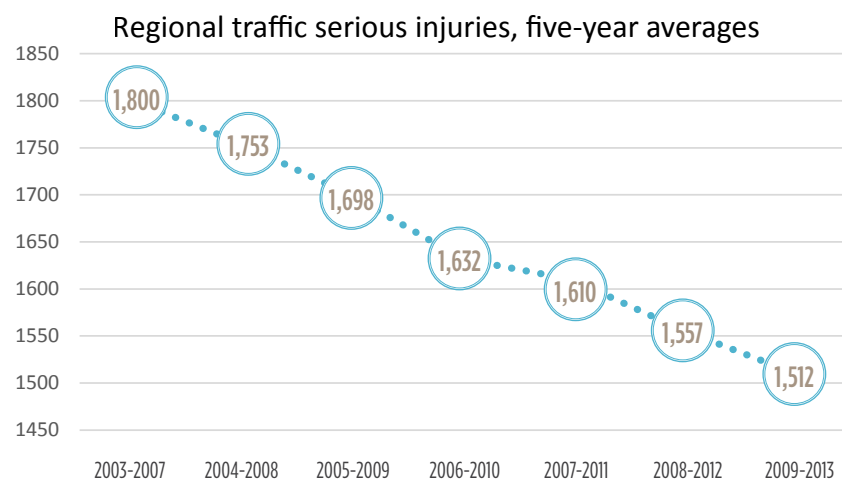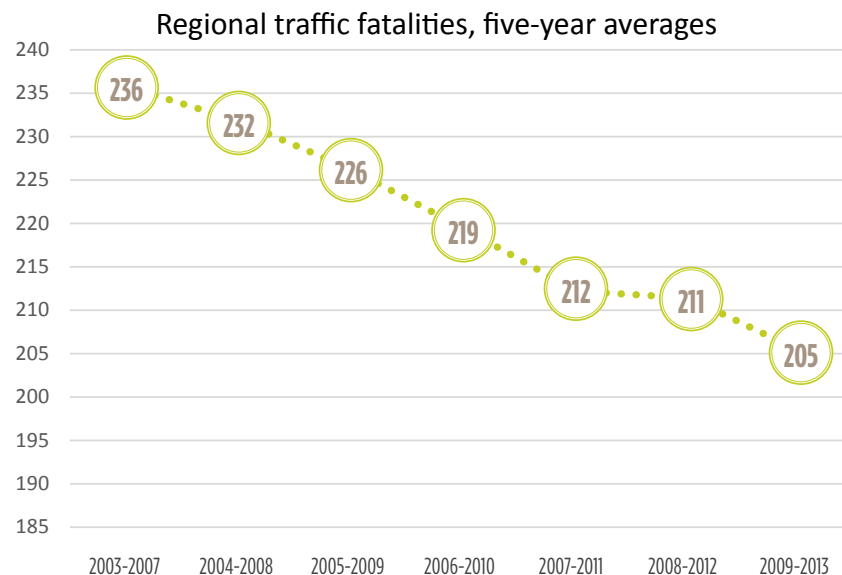
As shown in Figure 12.4, roadway crash fatalities are generally dispersed across the region, and do not cluster at specific locations but share common contributing circumstances and crash types. Fatal crashes tend to occur along major highways were traffic volumes and speeds are highest. Although intersections represent a small part of the roadway system, they account for a large percentage of the fatal and serious injury crashes in the region.

Figure 12.4: Regional roadway fatalities, 2009–2012
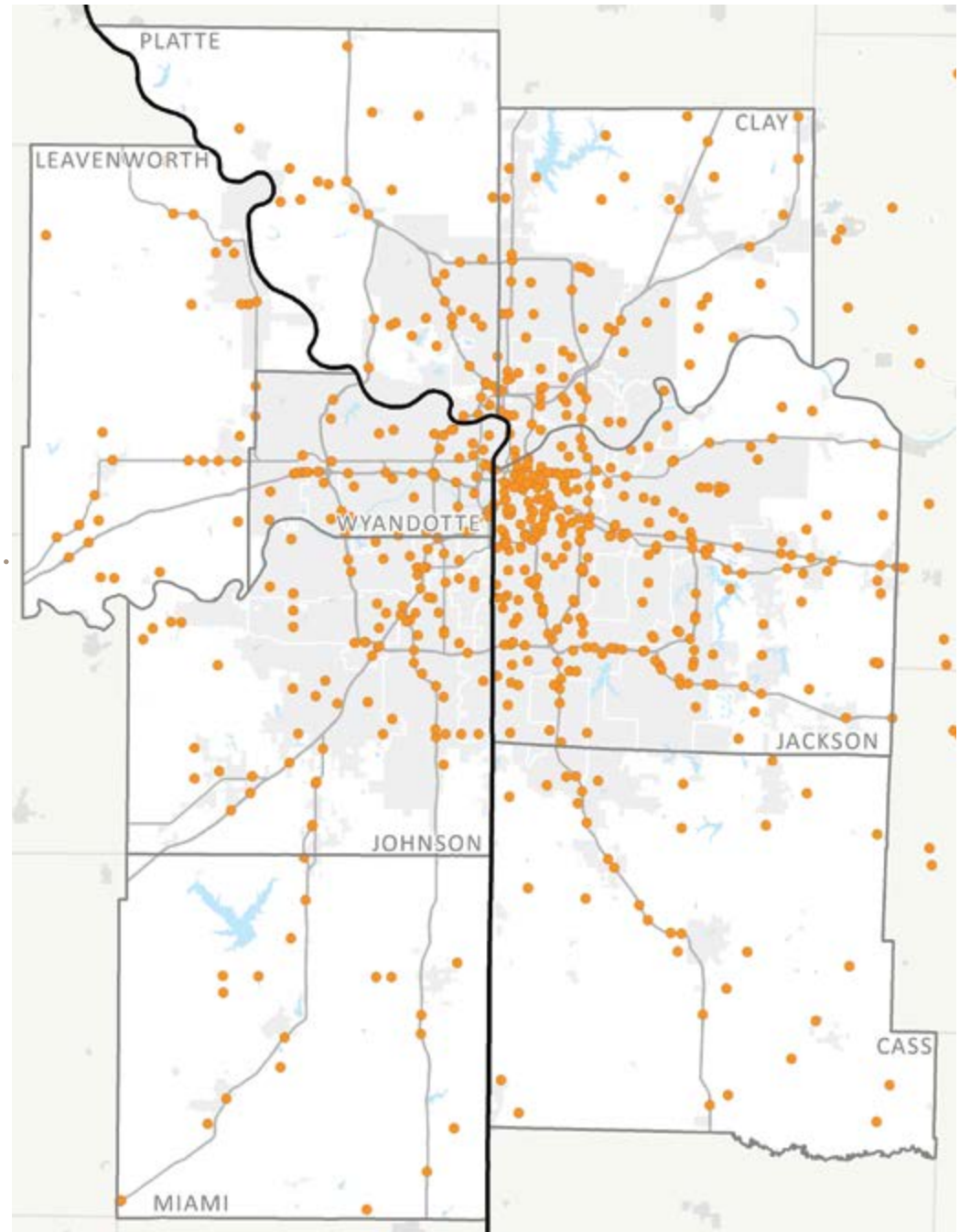
Economic impact of traffic crashes

Since 2008, regional data shows the significant economic impact of traffic crashes in the Kansas City area — almost $12 billion. Economic costs include productivity losses (workplace and household); property damage; medical care and rehabilitation; congestion; legal and court expenses; emergency services; insurance administration; and other costs. Using the U.S. Department of Transportation's estimate of the cost to prevent a single human fatality ($5.8 million),[1] reaching the coalition's goal of no more than 180 fatalities per year from 2013 to 2017 could save the region approximately $580 million.

Economic costs represent only one consequential aspect of motor vehicle crashes. People injured in crashes often suffer physical pain and emotional anguish that cannot be measured in dollars. The Destination Safe Coalition, MARC and local stakeholders are working to help reduce the impact traffic crashes have on the region, ultimately saving both money and lives.
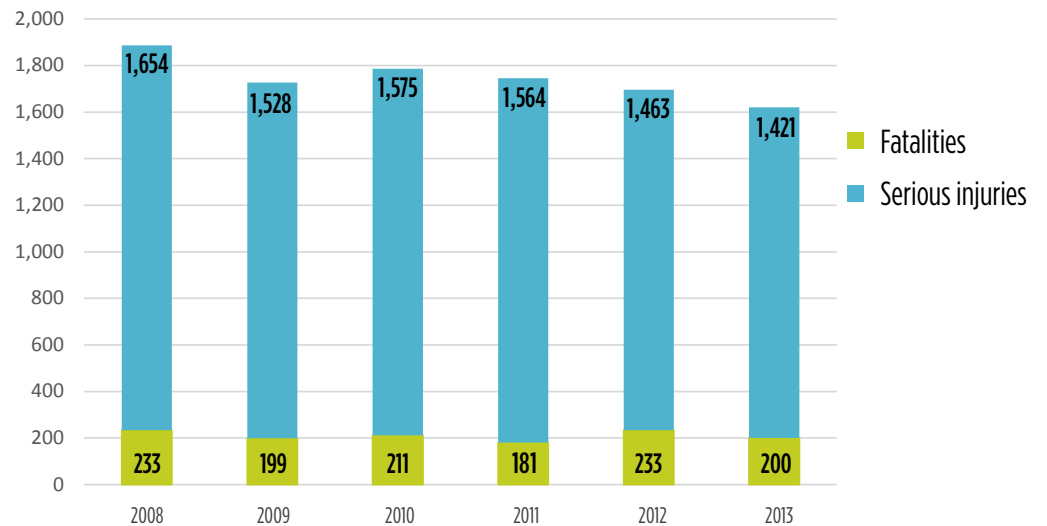
Figure 12.5: Regional traffic crashes

**Figure 12.6: Economic cost to society, Destination Safe region**

On average, each crash-related emergency department visit costs about $3,300 and each hospitalization costs about $57,000.[2]

Nationwide, in 2012 alone, crash injuries totaled $18 billion in lifetime medical costs, while work lost due to crash injuries cost an estimated $33 billion.

Year	Fatalities	Serious Injuries
2008	$326.2 million	$1.82 billion
2009	$278.6 million	$1.68 billion
2010	$295.4 million	$1.73 billion
2011	$253.4 million	$1.72 billion
2012	$326.2 million	$1.61 billion
2013	$280.0 million	$1.56 billion
Total	**$1.76 billion**	**$10.13 billion**

Emerging technologies

Technology can play an important role in the safety and security of all transportation users. While the Destination Safe Coalition and MARC aren't involved in the development of vehicle technologies, these innovations play a significant role in transportation safety. Over time, car manufacturers have designed vehicles to better withstand collisions and introduced safety technology that helps drivers prevent crashes. Occupant-protection systems (seat belts and child-safety seats), crash avoidance equipment (lights and reflectors) and driver assistance systems (electronic stability control and automatic braking) have all led to decreases in the number of fatal and serious injuries. Over the next several years, additional emerging technologies will play a role in the region's transportation safety:

- **Rear-view visibility systems —** In 2014, NHTSA announced that rear-view visibility systems will be required in all light vehicles — including cars, SUVs, trucks and vans built on or after May 1, 2018. This technology, commonly known as back-up cameras, provides drivers with up to a 10-by-20-foot view of the zone immediately behind the vehicle.

- **Autonomous vehicles –** Autonomous vehicles, also referred to as self-driving or driverless cars, are motorized vehicles capable of sensing their environment and navigating roadways without human input. A number of research and engineering institutions estimate that within two decades these vehicles could make up 75 percent of all vehicles on the market. The use of autonomous cars could reduce many behavior-related crash types and result in fewer traffic crashes. Their use, however, creates many challenges, including establishment of government regulations, interaction
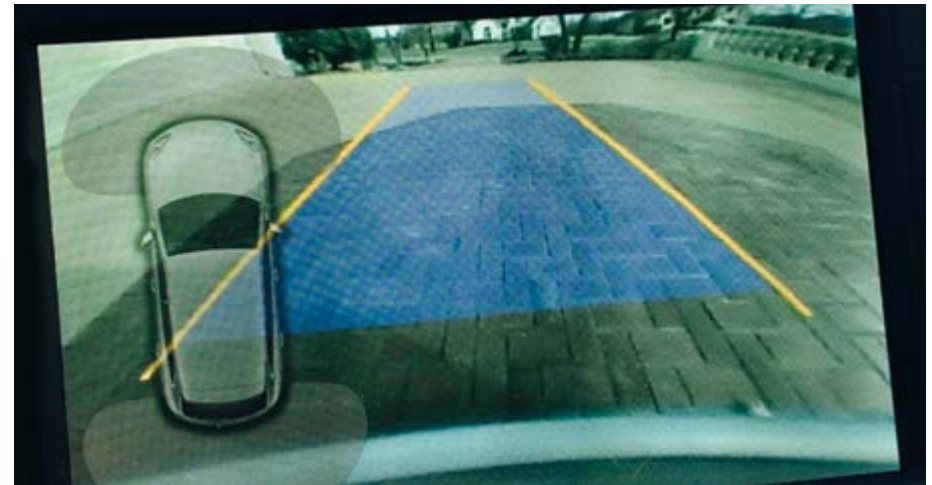
Back-up cameras
Rear-view visibility systems will be required in all light vehicles — including cars, SUVs, trucks and vans — built on or after May 1, 2018.

between autonomous vehicles and traditional human-driven vehicles, determination of liability responsibilities for crashes and more.

- **Vehicular communication system —** This is a type of intelligent transportation system (ITS) network that allows vehicles and roadside units to communicate and provide each other with information such as safety warnings and traffic information. V2V (vehicle-to-vehicle) technology uses ITS communication between vehicles to warn drivers about approaching dangers from other vehicles, upcoming obstacles or abrupt changes in the roadway. NHTSA believes vehicular communication systems could help avoid up to 79 percent of all vehicle target crashes.[3]

Four E's of transportation safety

Transportation safety planning efforts in the region focus on the four E's: education, engineering, enforcement and emergency services. Because time, money and personnel are limited, multiple groups must work together to leverage resources and response efforts to have the greatest impact on the region's transportation safety issues.

Education

Educational efforts typically involve informing users about unsafe behaviors and suggesting ways to improve safety when using the transportation system.

Engineering

Local public works departments or state departments of transportation often implement engineering improvements to enhance transportation safety. Planners and engineers are embracing new roadway safety countermeasures along with new methods and approaches to improve roadway safety. For example, the Federal Highway Administration promotes nine proven safety countermeasures[4]; transportation engineers and planners use Crash Modification Factors (CMFs) to help identify the most appropriate solutions for particular safety needs. CMFs are used to calculate the expected number of crashes that will occur after given countermeasures are implemented at a specific locations.

Enforcement

Enforcement strategies, with the assistance of law enforcement officers and agencies, can play a valuable role in transportation safety in a manner that encourages appropriate driving behaviors, prevent motor vehicle crashes and deter criminal acts.

Figure 12.7: The four E's
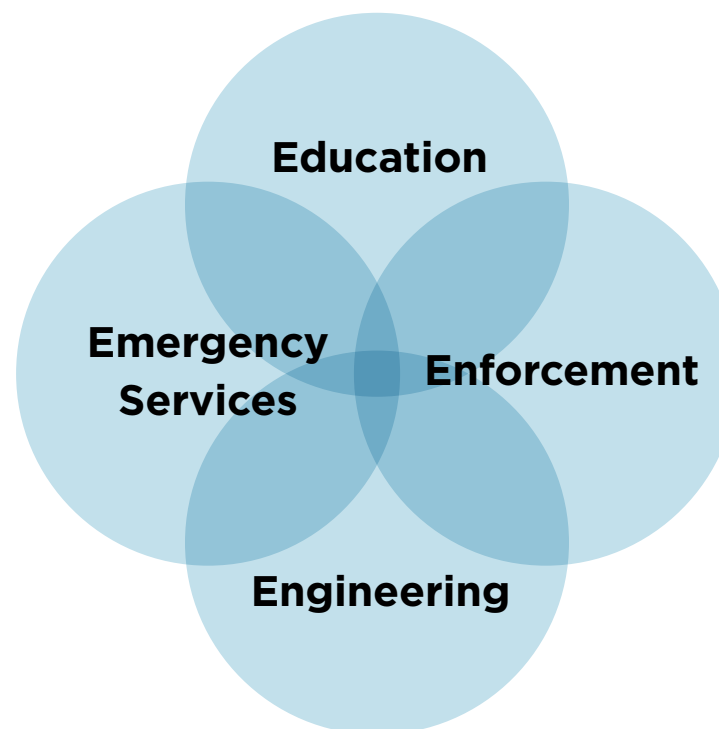
Emergency services

Paramedics, first responders and medical professionals often play a role in minimizing additional deaths and disabling injuries after an initial incident occurs.

More information about the four E's of transportation safety is available in the [Kansas City Regional Transportation Safety Blueprint](#).

Crash data and crash reports are maintained by the appropriate state agencies in Missouri and Kansas. By law, all crashes that cause property damage (greater than $500 in Missouri or $1,000 in Kansas), and those that involve injuries or fatalities must be reported to the appropriate state agency. All fatal crashes are also reported to the Fatality Analysis Reporting System (FARS) maintained by NHTSA.

Needs assessment

Transportation safety data

The collection of accurate data is necessary to effectively analyze safety issues in the Kansas City region. A major challenge for this bistate region is that Missouri and Kansas maintain separate data sets for tracking traffic data. Most transportation safety data includes reported incidents, not unreported incidents or near misses. Also, a significant data gap exists for non-motorized vehicular data that involves bicyclists or pedestrians on either on-road and off-road facilities.

Another key challenge is the scarcity of financial resources needed implement new data collection technologies. Some repetitive, manual data entry is necessary, which adds to costs. Less is known about safety along the local transportation system than along the state system.

The region is making successful strides in the collection and use of data:

- Planners advocate for the collection and maintenance of data, on a regional and county level, to help examine transportation safety trends for communities and the region.

- Kansas and Missouri state agencies are taking steps to improve the reliability, accuracy and timeliness of traffic records data. Each state continues to make progress in the development of a traffic records system through Traffic Records Coordinating Committees.

- Jurisdictions such as Overland Park, Kansas, collect video surveillance of the arterial roadway network to review traffic crash incidents and provide footage to law enforcement.

- Law enforcement officers are actively involved in reporting and providing expertise about motor vehicle crashes.

- MARC continues to seek safety-related data for additional travel modes (such as bicycle and pedestrian travel) and for crashes on local streets and deaths involving non-traffic, non-crash motor vehicle-related events.

Data sources

The crash report is the primary source for transportation safety data. A law enforcement officer completes this report at the crash scene. This valuable tool summarizes crash details including contributing factors, driver behaviors, incident location, driver characteristics, vehicle characteristics and other information. The reports are important on a regional and local level to identify high crash locations, transportation mode involvement, public education needs, outreach opportunities and specific demographics that may be prone to collisions. While crash reports are beneficial for data analysts, many crashes — specifically those on the non-motorized network or incidents between motorized vehicles and bicyclists/pedestrians — go unreported; this information gap makes it more difficult for transportation planners to understand comprehensive crash trends for the region.

Crash data is not the only source of information in a data-driven process. Other potential external data sources may include ITS, hospital emergency room data, motor vehicle data, traffic citations and other specialized information. Recent advancements in automated counting technology and new smartphone applications for pedestrians and bicyclists hold the potential to help planners better understand travel patterns, develop exposure rates and capture historically undocumented crashes or near misses.

Haddon Matrix

Crashes are predictable and preventable. The scientific study of crash prediction and prevention can be summarized in the Haddon Matrix, which divides crash factors into three phases and three categories. For example, prudent driver behavior and in-vehicle

Figure 12.8: The Haddon Matrix

Phase	Human factors	Vehicle and equipment factors	Environmental factors
Pre-crash	• Information • Attitudes • Impairment • Police enforcement	• Roadworthiness • Lighting • Braking • Speed management	• Road design and road layout • Speed limits • Pedestrian facilities
Crash	• Use of restraints • Impairments	• Occupant restraints • Other safety devices • Crash-protective design	• Crash-protective roadside objects
Post-crash	• First-aid skills • Access to medics	• Ease of access • Fire risk	• Rescue facilities • Congestion

crash avoidance technology can work together to prevent crashes. When a crash does occur, the use of occupant restraints and side-impact air bags can reduce injury severity. Emergency responders can also play a role by transporting injured occupants to hospitals.

The data-driven process is expanding in new and exciting ways, but with challenges. Partners in the Destination Safe Coalition are involved with data-driven programs working to address

human behavioral factors like speeding, texting and drunk driving. Vehicle safety devices and technology advancements are taking place on a national level, but are still relevant to the region. One key data application is the "systemic" approach which identifies both the crash types and risk factors most prevalent in fatal and serious injury crashes. This process identifies risk factors, based on data, and applies low-cost safety solutions, even when complete data is unavailable. Local agencies need to understand roadway and intersection features, including geometric and operational conditions, to assess risk. This data is not available for the larger regional level, and may be incomplete at the local level.

State traffic records systems

Although most transportation safety data is used in a reactive manner, some data is available for use as part of proactive planning measures. The Traffic Records System (TRS) integrates independent information systems (e.g., crash records, traffic citations, motor vehicle registration, roadway data and emergency room registries), so that authorities can share information. This should lead to better traffic safety decision-making and long-range transportation planning. The State Traffic Records Coordinating Committee provides a forum to address collection and management of data sources. Destination Safe Coalition operational managers routinely attend STRCC meetings in Missouri and Kansas to stay informed.

Priorities and focus areas

As part of the development of the *Regional Transportation Safety Blueprint*, the Destination Safe Coalition gathered crash data for the region from MoDOT and KDOT, and ranked the crash types and

contributing factors. This process allowed the coalition to identify transportation safety priorities and focus areas for the region.

The selected focus areas each contributed to more than 100 fatalities and 400 serious injuries over the previous five-year period. The 15 contributing factors identified as focus areas for the regional blueprint are organized into three priority categories as follows:

- Infrastructure-related crashes.

- Behavior-related crashes.

- Crashes that involve special users.

Any crash may have multiple contributing factors that affect the incident's outcome. For example, a crash may involve an inexperienced young driver (special user) who was distracted by an incoming text message (behavior) while navigating a curve (infrastructure). This categorization allows local safety partners to focus on the contributing factors and strategies that can create the most impact. An engineer may focus on strategies that highlight the roadway alignment or alter the curve. A policymaker may consider young driver licensing requirements. A law enforcement officer may target distracted driving. An educator may create a distracted driving program for high school students. The coalition encourages its partners to direct attention and investments to focus areas that will have the greatest impact in lowering fatalities and serious injuries. A more comprehensive review of priorities, focus areas, and funding and implementation strategies can be found in the *Kansas City Regional Transportation Safety Blueprint, 2013–2017.*

Infrastructure

Infrastructure-related crashes are those that are most commonly attributed, at least in part, to an element of the roadway or roadside. In the Kansas City region, the most common infrastructure-related crashes are lane departure crashes — especially at curves — and intersection-related crashes.

Behavioral

Unsafe driving actions, whether they are caused by decision-making or motor skills, are often a contributing factor in traffic crashes. In many cases, they are the primary factor. A high percentage of crashes in the Kansas City region can be attributed to poor behavior on behalf of the driver, such as aggressive, impaired or distracted driving, or failure to use safety belts.

Special users

Special users of the roadway include those who use different modes or vehicle types — such as pedestrians, motorcyclists and drivers of large trucks — or have driver-related characteristics associated with inexperience or age.

Any one crash may have multiple contributing factors.

For example, a crash may involve an inexperienced young driver (special user) who was distracted by an incoming text message (behavior) while navigating a curve in the road (infrastructure). Categorization of contributing factors allows safety partners to focus on strategies that can have the greatest impact on safety.
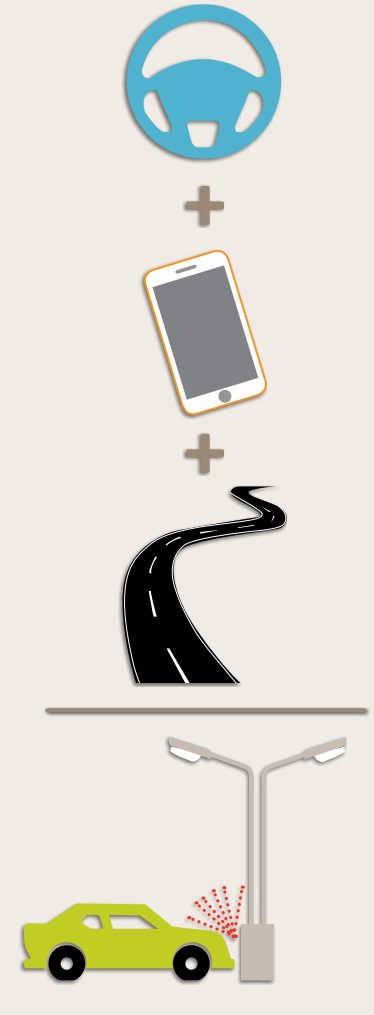
Strategies

The overarching goal of a safe transportation system is to reduce risk and prevent the loss of life or serious injury. Below are strategies for MARC and its planning partners to improve transportation safety in the region.

12-1: Work with partners to decrease the number of fatal and serious injury crashes in the region.

a. Support the work of the Destination Safe Coalition, its Leadership Team and supporting task teams.

b. Work with the Kansas and Missouri Departments of Transportation to collect and maintain crash data for all focus and priority areas identified by the Destination Safe Coalition.

c. Provide regular reporting and analysis of crash data and safety information to planning partners and local stakeholders.

12-2: Continue integrating safety considerations into MARC's planning and programming processes.

a. Work with regional safety partners to support the Road Safety Audit (RSA) process.

b. Share best practices to improve transportation safety through webinars, special workshops and training courses with the assistance of MARC's Government Training Institute (GTI).

c. Factor safety into scoring measures for project evaluation.

12-3: Build complete streets

a. Promote the concepts of context-sensitive solutions and complete streets in the region's transportation planning, project development and project selection processes.

b. Develop a technical framework to analyze and identify opportunities for incremental complete street improvements.

c. Encourage, facilitate and incentivize the development and adoption of complete street policies by local jurisdictions.

12-4: Advocate for the safety priorities of local stakeholders in state and federal legislation.

a. Develop legislative agendas with regional enforcement entities and other safety stakeholders.

Policy framework strategies and goals	4–1: Reduce crashes	4–2: Integrate safety issues	4–3: Complete Streets	4–4: Legislative advocacy
Transportation Outlook 2040				
Economic vitality	X	X	X	
Placemaking	X	X	X	
Equity			X	X
Transportation choices			X	
Safety and security	X	X	X	X
System condition			X	
System performance			X	
Public health	X	X	X	
Environment			X	
Climate change and energy use			X	

Notes

1 Lindley J. A. (March 19, 2008). INFORMATION: Treatment of the Economic Value of a Statistical Life in Departmental Analyses [Memorandum]. U.S. Department of Transportation, Federal Highway Administration.

2 Centers for Disease Control and Prevention (October 2014). Motor Vehicle Crash Injuries Costly but Preventable. Atlanta, GA: National Center for Injury Prevention and Control, Division of Unintentional Injury Prevention. Available online at: http://www.cdc.gov/vitalsigns/pdf/2014-10-vitalsigns.pdf

3 Najm, W. G., Koopmann, J., Smith, J. D., Brewer, J. (2010, October) Frequency of Target Crashes for IntelliDrive Safety Systems (US DOT HS 811 381). Cambridge, MA: U.S. Department of Transportation, Research and Innovative Technology Administration.

4 U.S. Department of Transportation (2012). Proven Safety Countermeasures | Federal Highway Administration. Washington, DC: U.S. Department of Transportation, Federal Highway Administration. Available online at: http://safety.fhwa.dot.gov/provencountermeasures/