Understanding What 911 Needs From Enterprise Crash Detection Solutions

May 2025

01 Introduction

Crashes on U.S. roadways are at historic levels, Emergency Communication Centers (ECCs) are more under-staffed than ever, 911 telecommunicators are bogged down with manual processes, and citizens are increasingly demanding better safety prevention and response from their public safety professionals.

As ECCs try to navigate the confluence of all these challenges, enterprises have a critical asset at their disposal to help: data. The real-time availability of location, severity, occupant information and other crash data from vehicles, sensors and mobile applications can help ECCs better allocate resources, improve response times, and ultimately save more lives.

Emergency responders describe the chaotic reality of major crash incidents:

"I've dealt with an MCI, a mass casualty event, where a tractor trailer actually hit five vehicles in a span of maybe 10 minutes. We got probably 30 911 calls and they're all different reports."

(SiriusXM Video, 2024)

But simply providing the data to ECCs in real-time isn't enough. To actually use enterprise crash data to close safety gaps, 911 telecommunicators must be able to easily access the new data-driven insights in their existing workflows through underlying platforms they know and trust. RapidSOS, Global Enterprise Security Teams (GSOCs), and ECCs can benefit from enhanced data-driven insights to improve safety on U.S. roadways. RapidSOS is already used by over 5,200 ECCs across the U.S., empowering 911 telecommunicators to integrate new safety intelligence from GSOCs into ongoing processes easily.

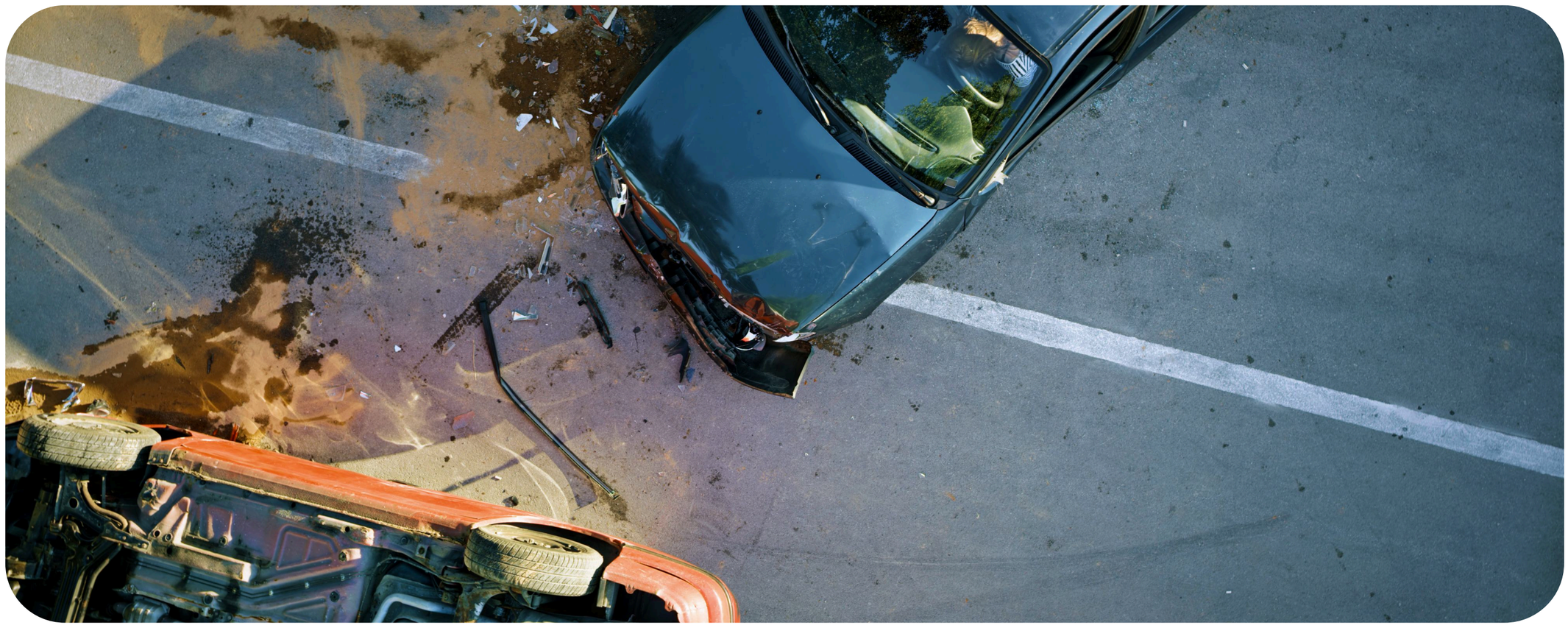
In this Crash Data Lab, we examine the critical information flow between crash detection systems and 911 centers, highlighting the essential data elements that ECCs require to respond to vehicle crashes effectively. We also identified several strategies that ECCs and GSOCs can pursue to take a more proactive approach to crash prevention, notification, and response to showcase the power of more open data sharing between enterprises and public safety organizations.

02 Executive Summary

When ECCs are forced to rely on public information to help with crash response, they often struggle to surface reliable insights amid conflicting reports from frantic callers. They can have trouble identifying the cars or individuals involved.

> "Nobody knew who the initial vehicle was. Even when State Police got on scene, we didn't know who the actual vehicle was that had the fatality or who was critically injured."
>
> *(SiriusXM Video, 2024)*

In addition to the challenge of getting the right information at the right time, 911 centers across the nation are facing critical talent shortages that are increasing the pressure on the telecommunicators they do have. The more seamless, concise, and accurate the intelligence they get, the faster they can dispatch help and move on to the next emergency. And the less manual work involved in generating the insights, the better.



Among the benefits of enhanced data-sharing between ECCs and Enterprises are:

Faster Emergency Response: This leads to saved lives, reduced liability, and less downtime.

> *“This data absolutely helps speed up the time of dispatch. It shows the exact location where it is. We don't have to interrogate the caller." (SiriusXM Video, 2024)*

Improved Survival Rates: When first responders arrive faster, survival rates are estimated to increase by 13% (Motive Case Study).

> *"If we had that RapidSOS information with SiriusXM connected vehicle... the officers will be able to go directly to that vehicle and extricate that person." (SiriusXM Video, 2024)*

Enhanced Medical Response: There can be underlying medical conditions that caused the crash. But without linked medical profiles, first responders would have no knowledge of their condition, or the immediate help the person might need.

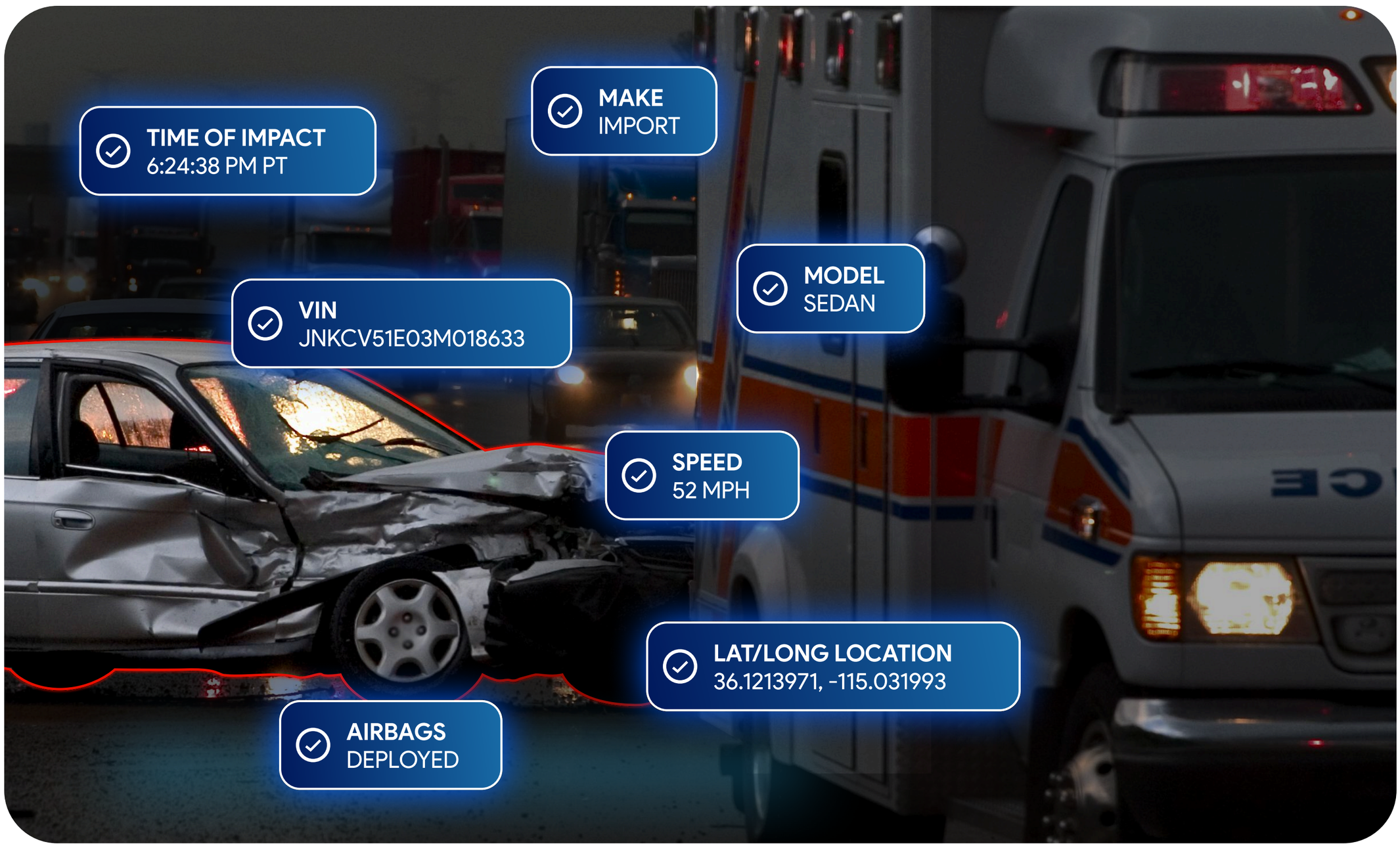
> *"The linked medical profile that can come through the portal is already helpful when it's just a regular caller calling from their house. Now imagine adding that to the SiriusXM connected vehicle data, and now we know that this person may have experienced a medical emergency and that is the reason why we had this accident in the first place." (SiriusXM Video, 2024).*

03 Data Collection

The dataset used in this study comprises anonymized emergency call records and vehicular crash incident data from the RapidSOS Intelligent Safety Platform, spanning 2022 to 2024. Each record contains time-stamped information, anonymized geographic coordinates, responder actions, and outcome-level metrics, representing real-world emergency responses across diverse U.S. jurisdictions.

To contextualize these records, we supplemented the dataset with publicly available road network information and focused the analysis on a curated set of 36 significant roadways. These roads were selected to represent a diverse cross-section of the national transportation network, including major interstate highways, historic U.S. routes, scenic corridors, and rural or remote highways. Examples include Interstate 95 (I-95), U.S. Route 66, California State Route 99, and the Dalton Highway in Alaska.

This targeted selection enables robust, geographically nuanced insights into crash patterns, temporal trends, and emergency response behavior across varied roadway environments



04 Key Findings:
911 Call Patterns for Vehicle Crashes

Our analysis of crash-related 911 calls revealed several key patterns that can potentially help ECCs with emergency crash response. Among the topline findings are:

Crash rates vary significantly by time and day of the week, with peaks occurring over the weekend and during daily rush hours.

Geographically-dense areas have higher crash rates, but the accidents that occur on rural roads are often more severe, and responses tend to take longer.

Seasonal fluctuations occur and vary depending on the intensity of the weather and the region, creating mixed conditions across longer roadways that can complicate emergency response.

Based on our analysis, we identified several strategies that could help enterprises and ECCs in their crash mitigation and response efforts, including:

Time-based resource allocation: Emergency services should optimize readiness and response during the most crash-prone hours. Knowing when roadways are most and least hazardous provides agencies with clear direction for timing patrol shifts, public safety campaigns, and infrastructure interventions.

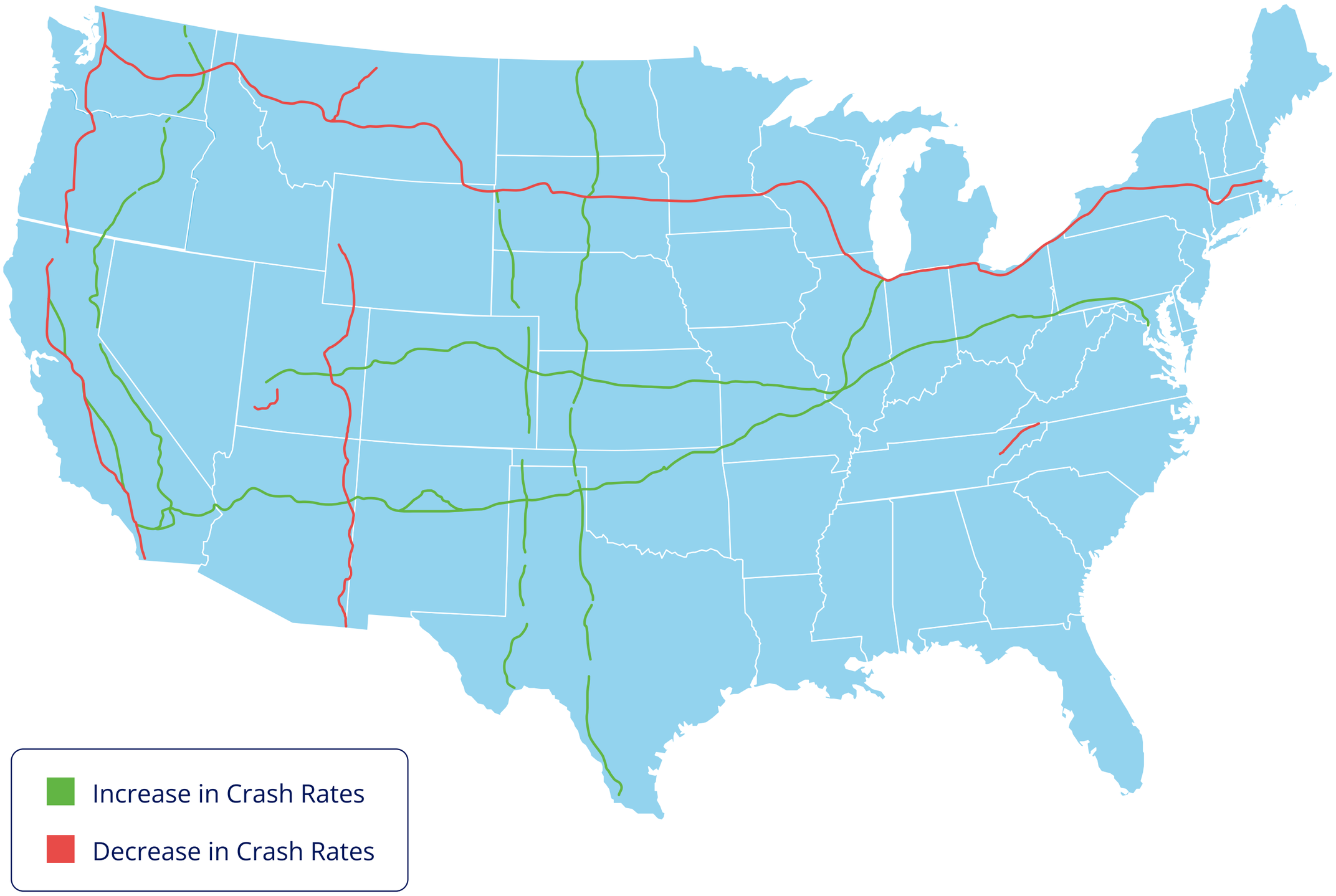
Time-sensitive crash prediction and prevention strategies: The similarity in patterns across diverse road types suggests time-based trends are widespread and systematic. This kind of predictability can help ECCs better prepare in advance for any challenges they may face in responding to emergencies. .

Region-level planning: A single road like USRT14 behaves differently across regions, indicating the importance of localized strategies. For example, winter crash response might be critical in the Midwest but less relevant in the Southwest, where resources could instead focus on holiday or tourism surges.

Adaptive safety strategies: Significant decreases at major roadways, namely California State Route 99, highlight the need for constant, data-driven evaluation to update mitigation and response plans for high-risk routes continually.

Examination:

Yearly Change in Total Crash Rate on Major U.S. Roadways (‘23-’24)



This chart shows the increase and decrease of crash rates on 36 U.S. roadways from 2022-2024. (Note: Gaps on roadways represent areas where we did not have adequate data to support an analysis.)

05 Emergency Crash Response Volumes By Time of Day

A rhythmic behavior of peaks and valleys over several weeks underscores crash incidents' strong, temporal regularity. By understanding the typical cadence of their local roadways, ECCs can allocate the right resources in advance, ensuring help is available when needed without over-burdening 911 telecommunicators and first responders.

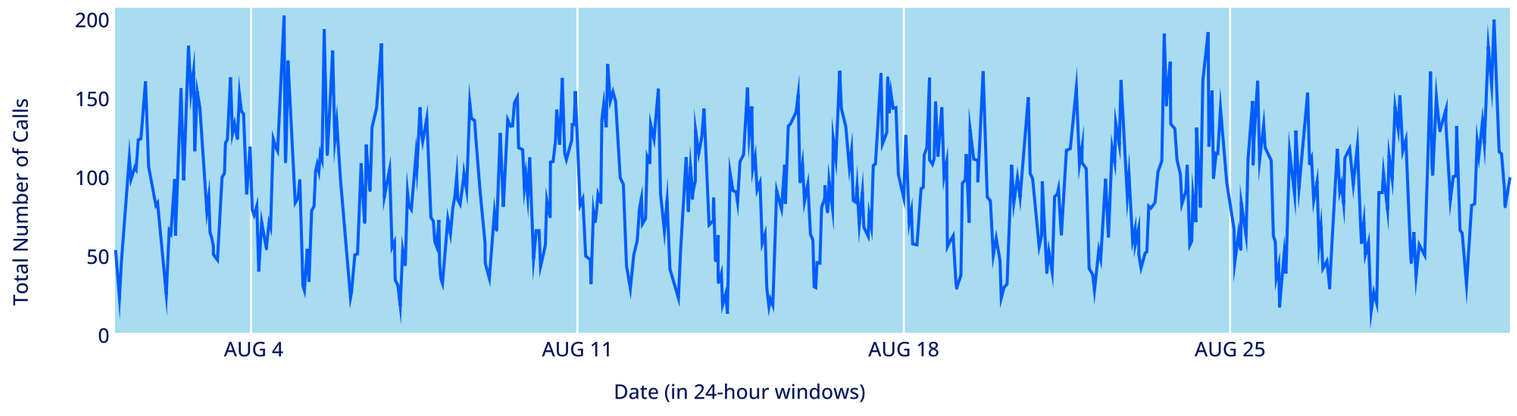
Whether it's the legendary USRT66 that connects the heart of the Midwest to the California coast, or the less-celebrated I-95 that runs North-South down the East Coast, emergency call volumes for vehicle crashes follow predictable patterns.

Analyzing these two roadways shows clear and consistent daily cycles in crash-related emergency calls consistent with many of the other routes analyzed. These patterns reveal:

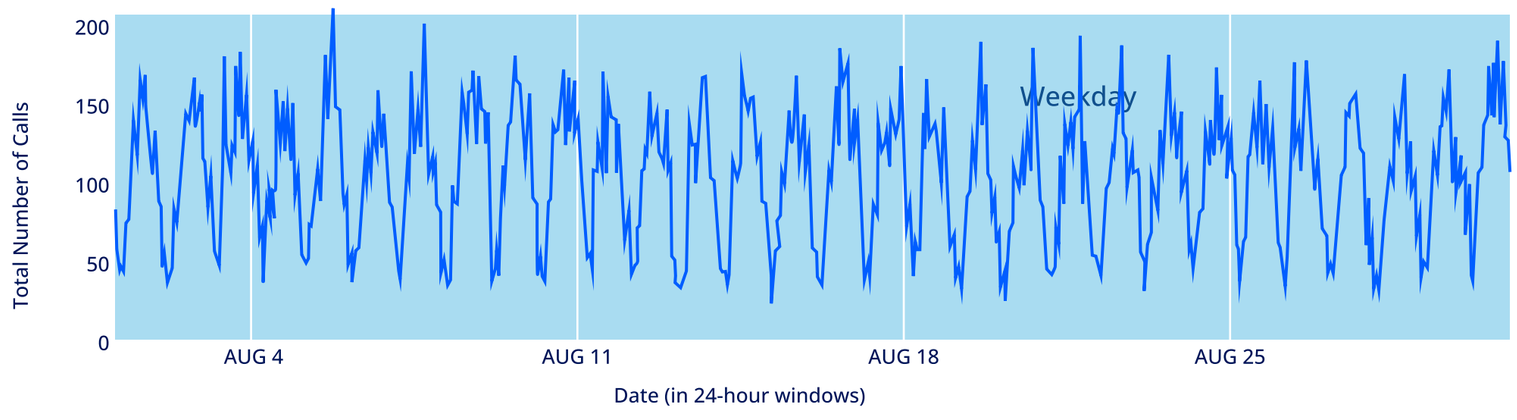
> **Peak volumes typically occur during the morning and evening rush hour periods**
>
> **Early morning hours (3-5 AM) show the lowest call volumes**
>
> **Sudden increases appear during morning commute times**

Examination: Crash Response Volumes By Time of Day

This chart shows the daily change in emergency call volumes on US i95 over several August days in 2024.



This chart shows the daily change in emergency call volumes on US RT 66 over several August days in 2024.



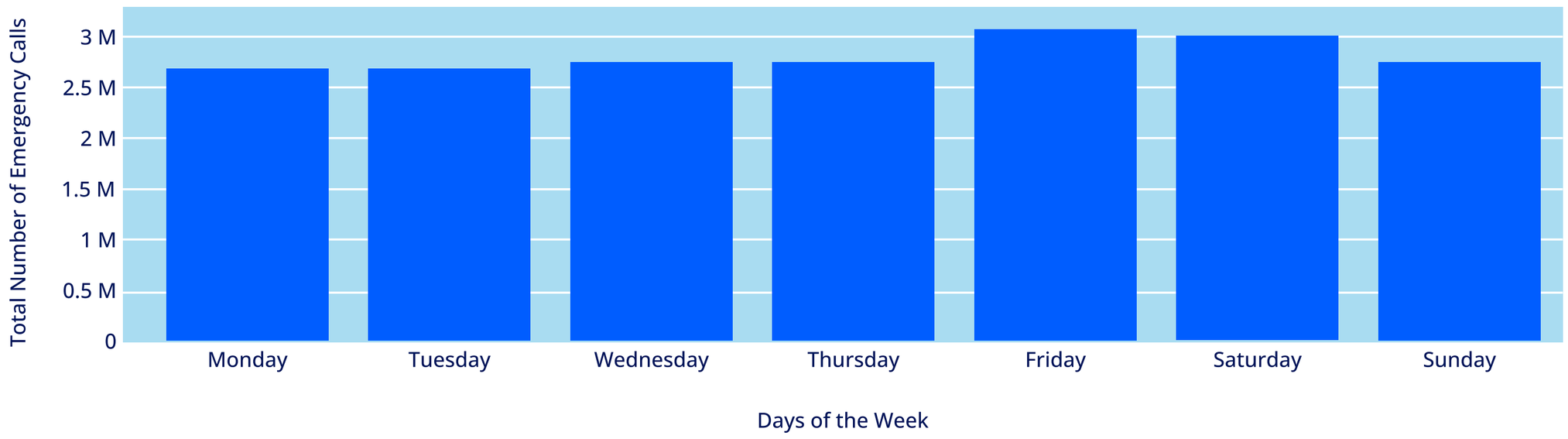
06 Emergency Crash Volumes By Day of the Week

Aggregated over the 2022–2024 period, the breakdown by day of the week identified critical windows for proactive safety planning, with volumes stable and relatively uniform Tuesday to Thursday, and peak volumes occurring on Friday. This type of transparency can help ECCs design their schedules to make sure peak hours are staffed appropriately.

Our analysis shows crash-related emergency call volumes vary meaningful variation across the week, shaped by differing traffic patterns, behaviors, and mobility demands. Among the key findings include:

> **Weekend days typically show higher crash-related call volumes, though there's a noticeable dip on Sundays.**
>
> **Peak call volumes are consistently observed on Friday, reflecting end-of-week travel.**
>
> **Traffic patterns influence crash frequency and severity. For example, Monday had some of the lowest call totals, suggesting slower morning ramp-ups or reduced weekend carry-over risk.**

Examination: Emergency Crash Volumes By Day of the Week



This chart shows the average weekly volume of emergency calls on 36 U.S. roadways

07 Emergency Crash Data By Geographic Distribution

Understanding the meaningful variations across the U.S. roadways and the influence of regional traffic density, road types, and jurisdictional boundaries can help local ECCs to better manage conditions and activity across their individual segments, ensuring all portions of the potentially hundred mile roadways are covered.

Roads that cut across many regions not only carry heavier operational loads, but also demand interagency collaboration and standardized safety protocols to mitigate crash impacts at scale. Based on our analysis:

Urban centers generate higher overall call volumes, a result of traversing dense population areas and heavy, daily use.

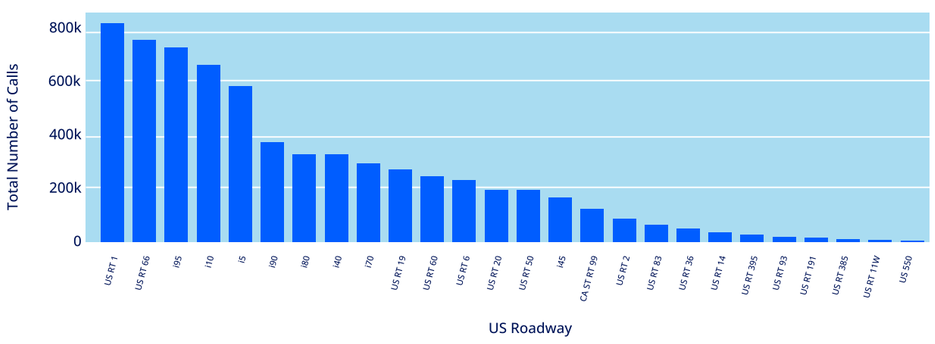
Rural crashes often result in more severe injuries and delayed response times, highlighting the unique challenge of overseeing less-traveled roads.

Highway corridors show concentrated incident patterns, suggesting a need for enhanced monitoring and incident management on high-speed roadways.

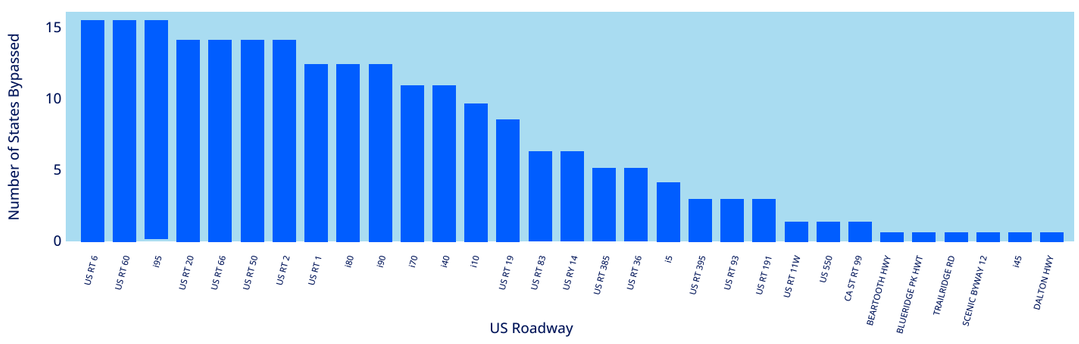
Multi-state roads are more likely to accumulate higher crash volumes, likely due to higher exposure and diverse usage contexts.

Cross-jurisdictional coordination challenges emerge in border areas, raising the need to harmonize data sharing, emergency response protocols, and traffic enforcement across borders to improve safety outcomes.

Examination: Emergency Crash Data By Geographic Distribution



This chart shows the total average emergency calls for 36 U.S. roadways in 2024.



This chart shows the total number of states that 36 U.S. roadways traverse through.

08 Emergency Crash Data By Season

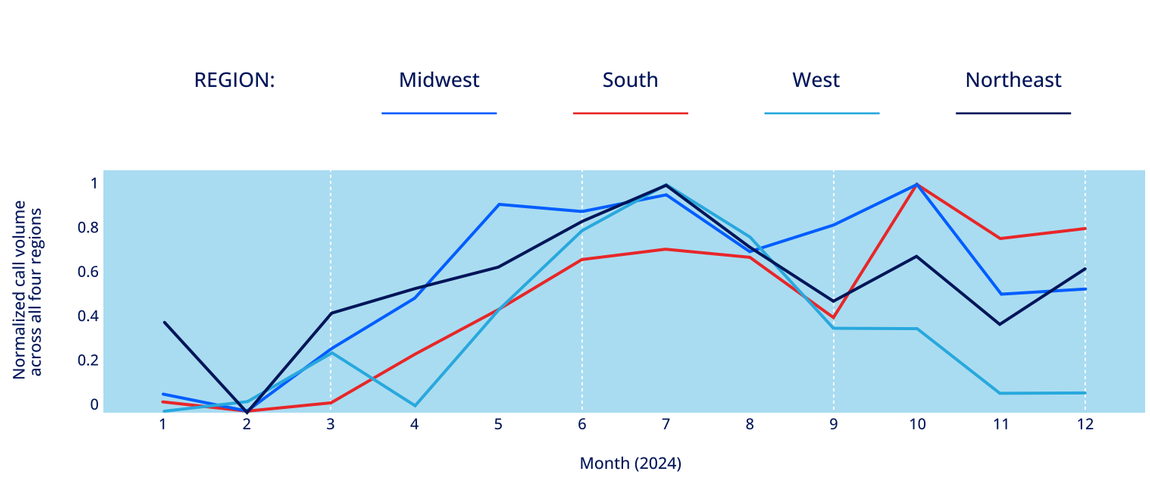
Spanning potentially hundreds of miles, roadways in the U.S. experience vastly different weather conditions across the different regions that shift depending on the time of year, highlighting the need for region-level planning.

A single road like USRT14 behaves differently in the Midwest vs. West, highlighting the importance of localized strategies even when managing the same highway. Based on our research, we identified several seasonal crash trends, including:

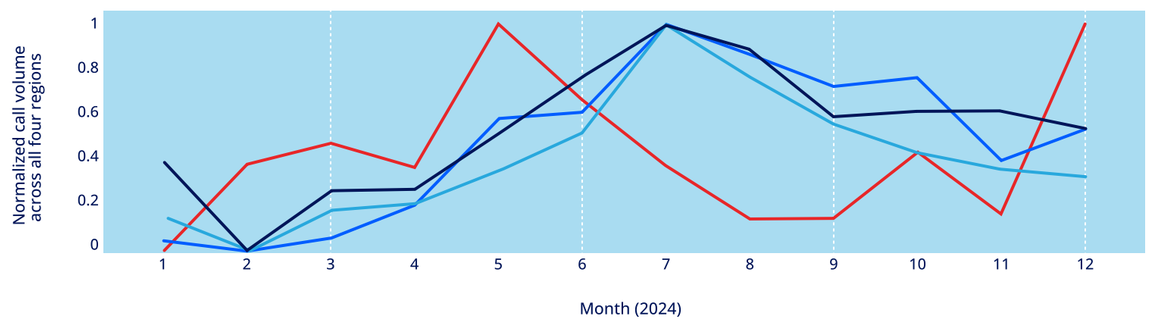
> **Summer peaks are common across most regions—**especially visible in the Midwest, West, and Northeast—suggesting increased travel and congestion during warm months contributes to elevated crash volumes.
>
> **Southern regions show more variability in their peak months.** Warmer winters reduce seasonal constraints, allowing for high call volumes even in typically low-crash months for other regions. For example, USRT2's southern segments show spikes in both May and December, reflecting non-traditional seasonal behavior.
>
> **Some multi-region roads, like i70 and USRT2, illustrate asynchronous peaks across regions.** This indicates that weather, tourism, agriculture, and migration patterns all contribute to road-specific seasonality, which may not align neatly across geographies.

Examination: Emergency Crash Data By Season

*Average call volumes for i70 across the Midwest, South, West, Northeast through 2024. Each plot is normalized per region to highlight **relative monthly variation**, and **dotted lines** represent **season transitions** (spring, summer, fall, winter).*



*Average call volumes for USRT2 across the Midwest, West, Northeast, South, and Southwest through 2024. Each plot is normalized per region to highlight **relative monthly variation**, an **dotted lines** represent **season transitions** (spring, summer, fall, winter).*



09 Understanding the Safety Gap: What ECCs Currently Receive vs. What They Need

"We got probably 30 911 calls and they're all different reports. Nobody knew who the initial vehicle was. Even when State Police got on scene, we didn't know who the actual vehicle was that had the fatality or who was critically injured."

When crashes are reported through traditional channels, 911 centers typically receive:

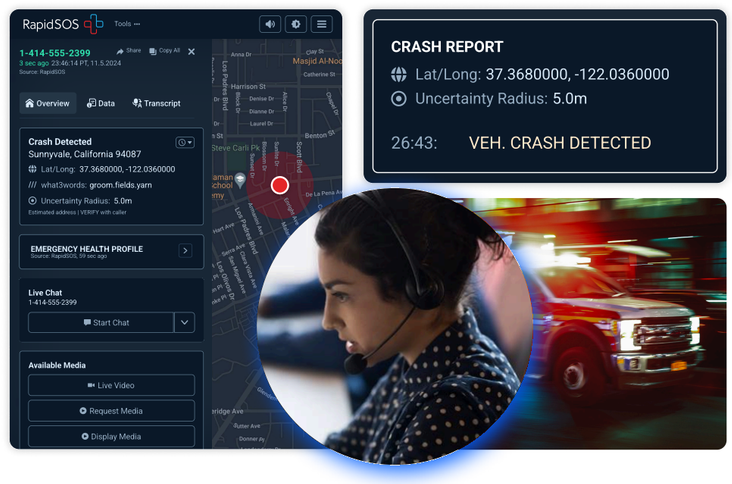
- **Approximate location descriptions**
- **Limited information about vehicle type**
- **No data on crash severity**
- **No occupant information**
- **Delayed notification**
- **Conflicting accounts from multiple callers**
- **Information relayed by distressed or injured callers who may be unable to provide clear details**

When a collision occurs, 911 centers need specific data points to dispatch appropriate resources and prepare first responders, including:

- **Precise Location Data:** Exact coordinates, direction of travel, highway mile markers or cross-streets
- **Crash Severity Indicators:** Impact details, airbag deployment status, vehicle damage assessment
- **Occupant Information:** Number of passengers, names of those involved or who the vehicles are registered to
- **Vehicle Details:** Make, model, and color, license plate, vehicle Identification Number (VIN)
- **Temporal Data:** Time of impact

With RapidSOS integration, 911 centers receive:

- **Precise GPS coordinates**
- **Vehicle identification details (make, model, color)**
- **Crash severity data and airbag deployment status**
- **Occupant information**
- **Immediate notification**



A 911 dispatcher explains what would help:

> "If we had that RapidSOS information with SiriusXM connected vehicle, we would be able to find out which car had the airbag deployments, how many people were in that car, what's the make model and color of that vehicle."

(SiriusXM Video, 2024)

As another dispatcher noted:

> "The information provided through SiriusXM connected vehicles and RapidSOS... you don't spend a lot of time on the phone because all the information's there. So as long as you confirm the location and that specific vehicle, you don't really have to ask them any questions because it's all on the screen."

(SiriusXM Video, 2024)

10 Conclusion

The operational gap between enterprise crash detection systems and emergency response represents a significant opportunity to save lives on roadways. By designing solutions that meet the specific needs of 911 centers and emergency responders, enterprise systems can move beyond simply detecting crashes to enabling faster, more effective emergency response.

When lives depend on minutes—or even seconds—integrated crash data transforms emergency response capabilities. Learn more about how RapidSOS can help here.