



# Investigation into the NEMESIS Database and Emergency Response Event Delays

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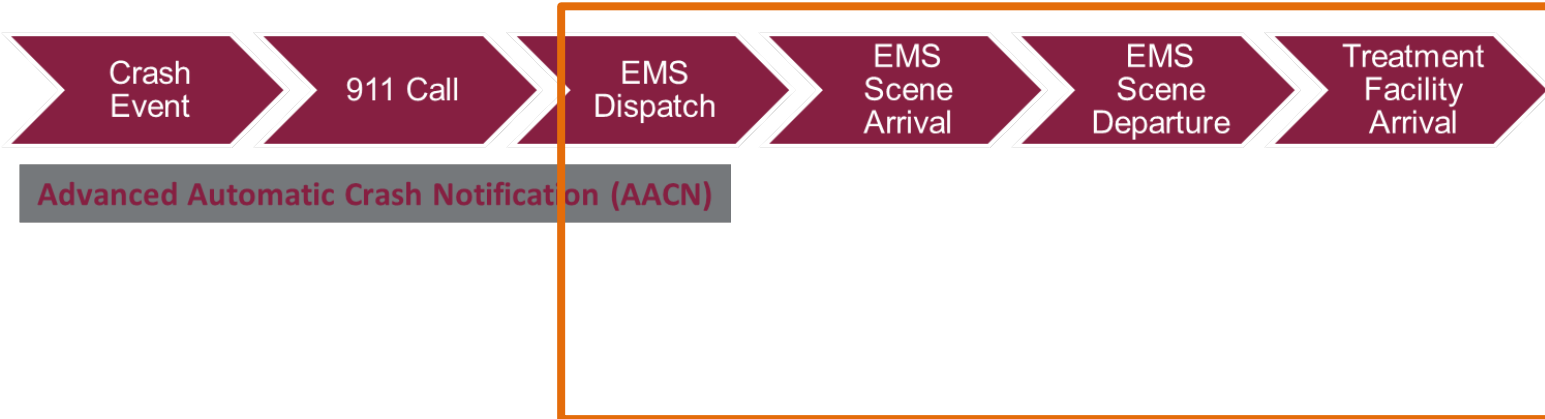
# Session Overview

- Background Research
- Introduction to NEMESIS
- Delay Analysis:
  - General delay occurrence
  - The influence of urbanicity on delays
  - Response vs. Transport delays
  - MVC-related delays
  - Relationships between delay categories
  - Delay effects on response time

# Research Background

- Improve Emergency Response to motor vehicle collisions
  - Safety
  - Efficiency

## Emergency Response Timeline



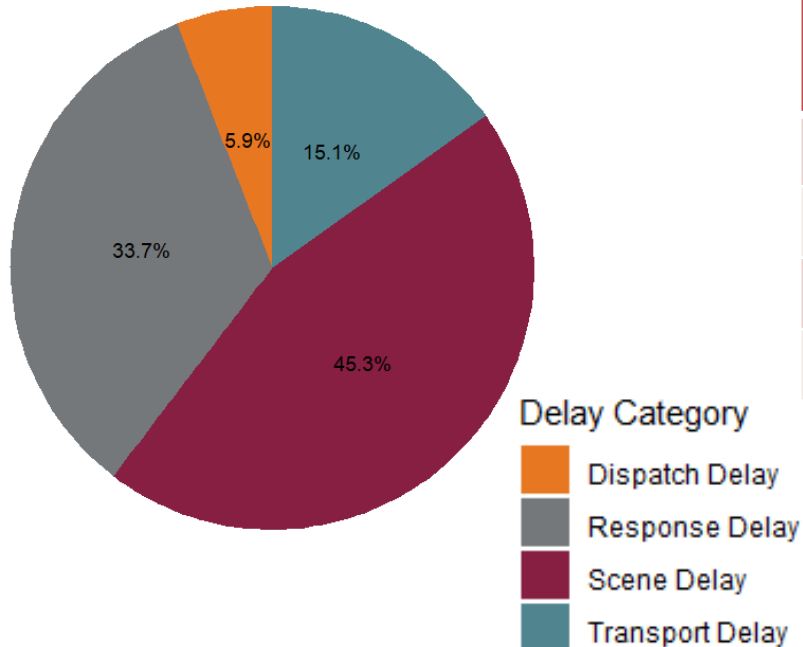
# NEMESIS

- National EMS Information System
- U.S. emergency 911 calls
- 2019 dataset
  - Pre-COVID
  - 47 of the 50 states included
  - 34.2 million events
- Included 4 delay categories
  - Dispatch, Response, Scene, & Transport
  - Each category has its own set of delay types

# General Delay Occurrence

- What is the overall occurrence of different delay types for each delay category?
- Data parameters
  - Only considered events with one recorded delay type per delay category (including “None”)
  - Excluded: “Not Recorded”, “Not Applicable”, and “Other”

# General Delay Occurrence:



Delay Category	Most Common Delay Type	Second Most Common Delay Type
Dispatch	High Call Volume	No EMS Vehicle Available
Response	Distance	Traffic
Scene	Staff Delay	Patient Access
Transport	Distance	Traffic

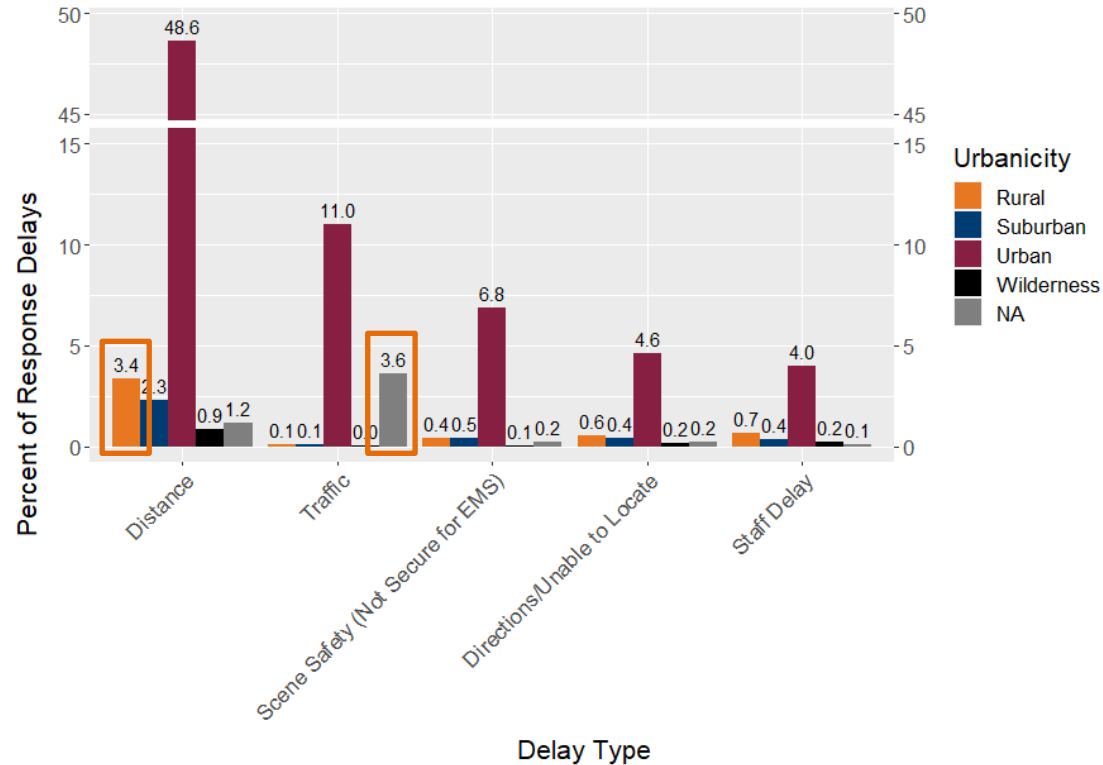
# Delay Categories and Urbanicity

- How does urbanicity influence the delay types in each delay category?
- Data parameters
  - Only considered events with one recorded delay type per delay Category (including “None”)
  - Excluded: “Not Recorded”, “Not Applicable”, and “Other”



# Delay Categories and Urbanicity: Response Delay

- No obvious trends across dispatch, scene, or transport
- Top 5 delay types
- As expected, distance is listed frequently in rural cases
- High frequency of traffic delays in unspecified locations

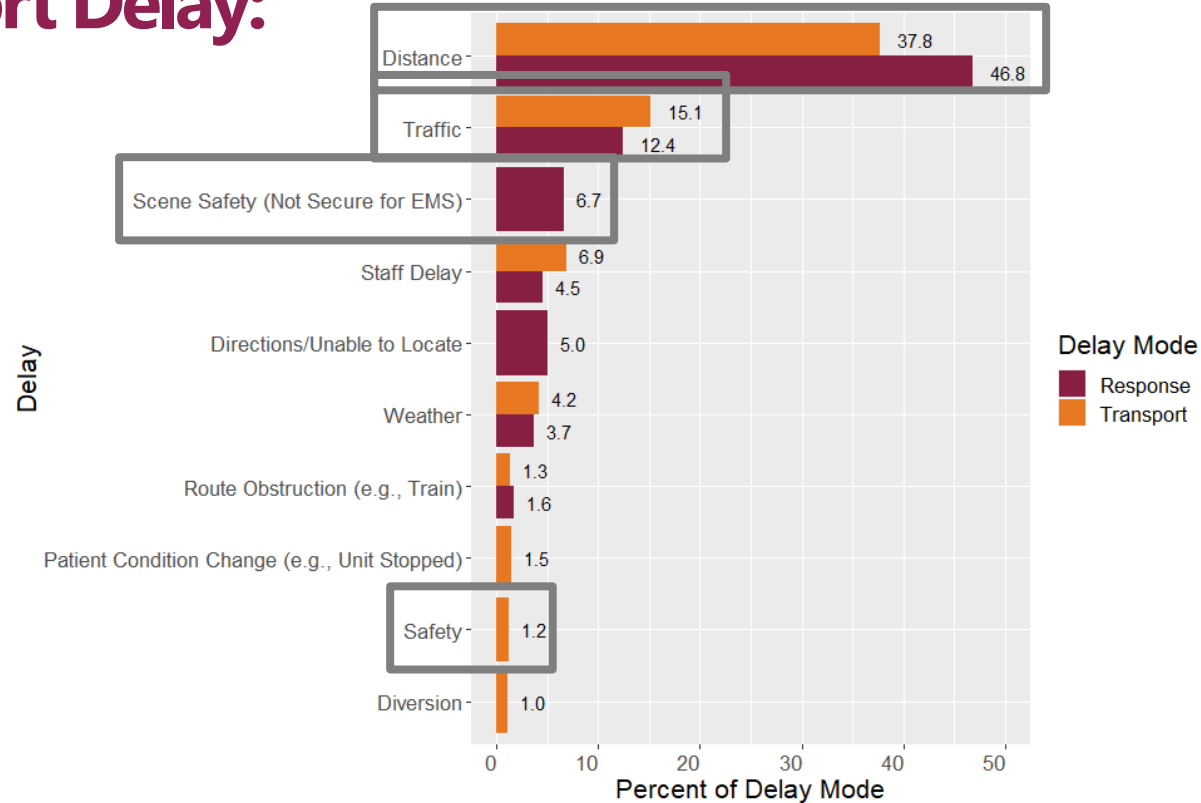


# Response vs. Transport Delays

- Due to their similarities in delay types, how do response delays compare to transport delays?
- Data parameters
  - Only considered events with one recorded delay type per delay Category (including “None”)
  - Excluded: “Not Recorded”, “Not Applicable”, and “Other”
  - Overall, there were more response delays than transport delays ~2:1

# Response vs. Transport Delay:

- Higher percentage of “distance” delays in response than transport
  - Geographic location of EMS resources
  - Urgency to get to any treatment facility
- Small difference in “traffic” delays
- Differences between related variables

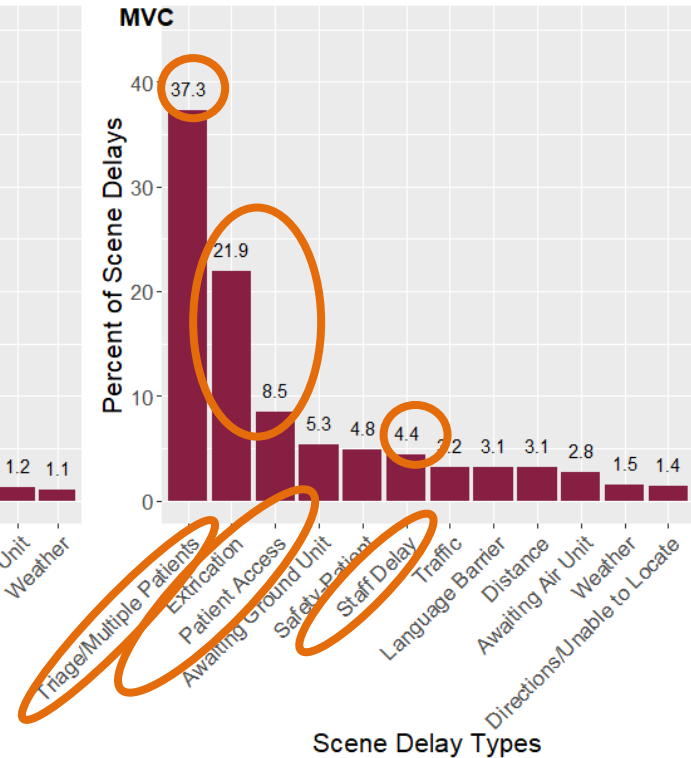
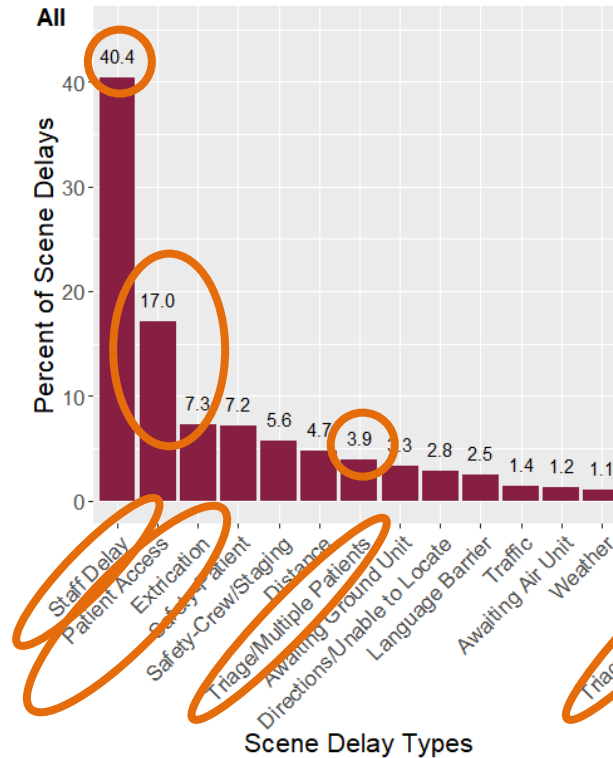


# Motor Vehicle Collision Delays

- How does the occurrence of delay types change when considering only MVCs?
- Data filtering
  - Only considered events with one recorded delay type per delay Category (including “None”)
  - Excluded: “Not Recorded”, “Not Applicable”, and “Other”
  - ICD 10 codes used to identify MVC-related injuries

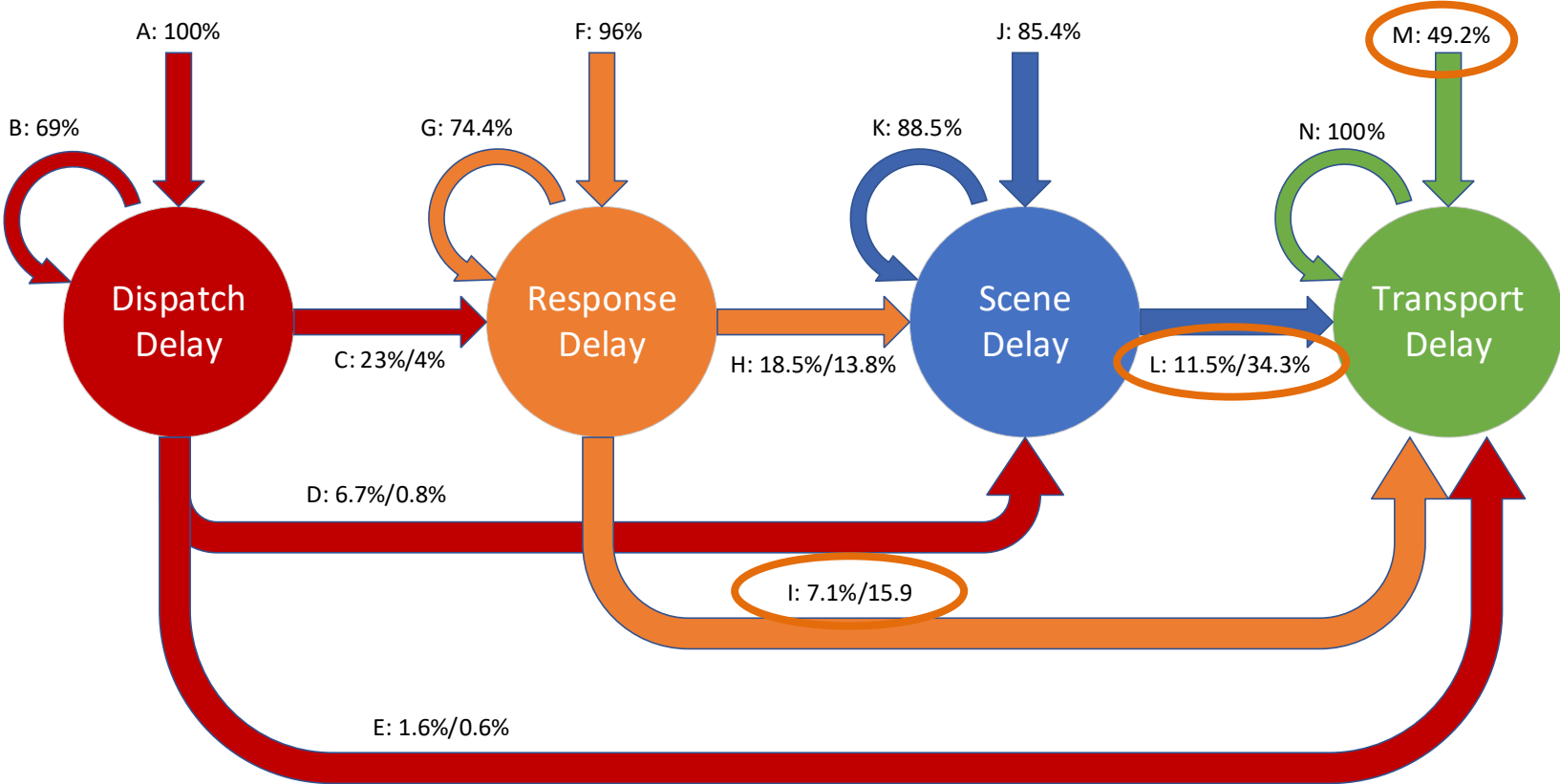
# MVC Delays: Scene Delay

- No obvious trends across dispatch, response, or transport
- Change in order and magnitude of delay types
  - 2 vehicles → 2+ patients
  - Patient access ~ extrication
  - MVC trauma urgency



# Relationships Between Delay Categories

- How does the presence of upstream delays relate to the presence of downstream delays?
- Data filtering
  - Only considered events with one recorded delay type per delay Category (including “None”)
  - Excluded: “Not Recorded” or “Not Applicable”



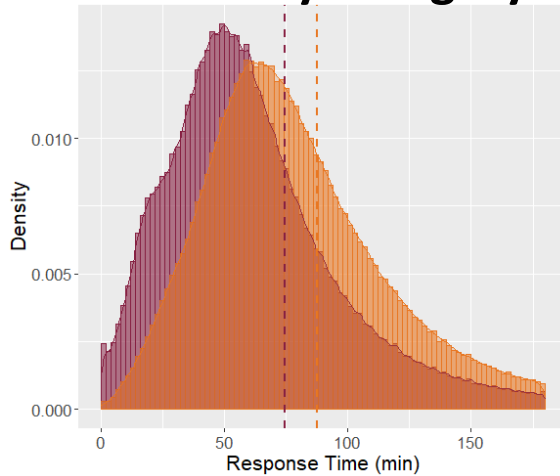
# Delay Effects on Response Time

- How does the number of delays impact overall response time?
- Data filtering
  - Only considered events with one recorded delay type per delay Category (including “None”)
  - Excluded: “Not Recorded” or “Not Applicable”
  - Excluded: Cases with NA for Total Call Time

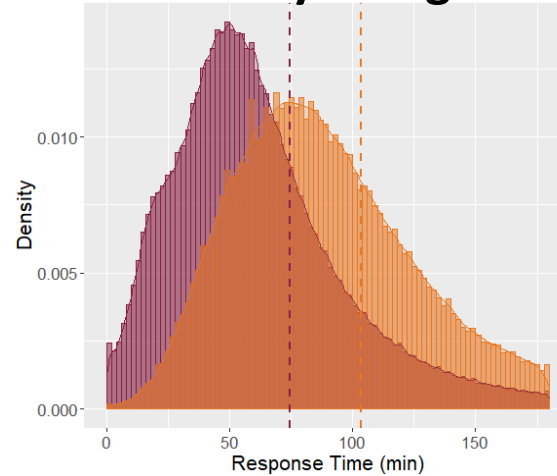


# Delay Effects on Response Time:

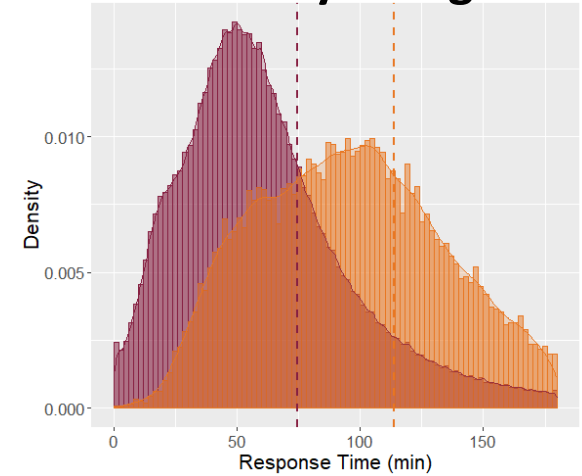
## One Delay Category



## Two Delay Categories



## Three Delay Categories



# Limitations

- “Other” delay type
- Events with multiple delay types per category
- Missing data
  - Cause of injury & response times

# Summary

- Most delays occur during response and on-scene phases
  - True for MVCs
- Need to develop a better understanding of distance- and traffic-associated delays to improve emergency response
- Presence of delays leads to increases in overall response time
  - Compounds when multiple delay categories are present



# Questions?