

# Using NEMESIS Data: Community Assessment, Surveillance and Change

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# Session Objectives

- Highlights
  - What is the National EMS Information System?
  - Data availability and validity issues
  - Additional value/challenges of NEMESIS V3
  - Available EMSIS tools
  - NEMESIS V3 migration and versioning process

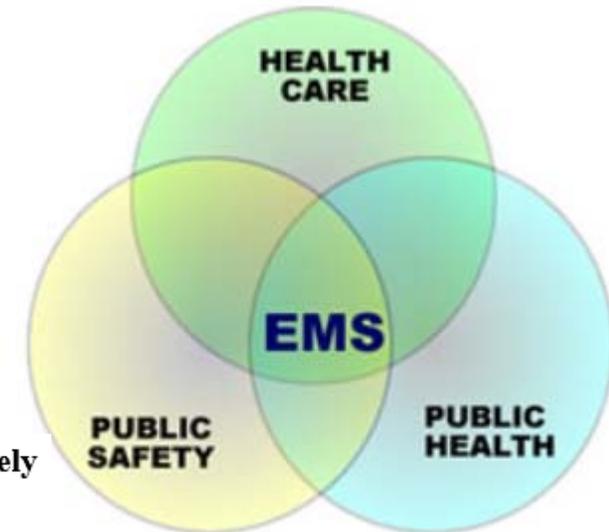
# EMS as Public Health Sentinels

CHAPTER

**27**

The Role of  
Prehospital Care  
Providers in the  
Advancement of  
Public Health

N. Clay Mann  
Jerris R. Hedges

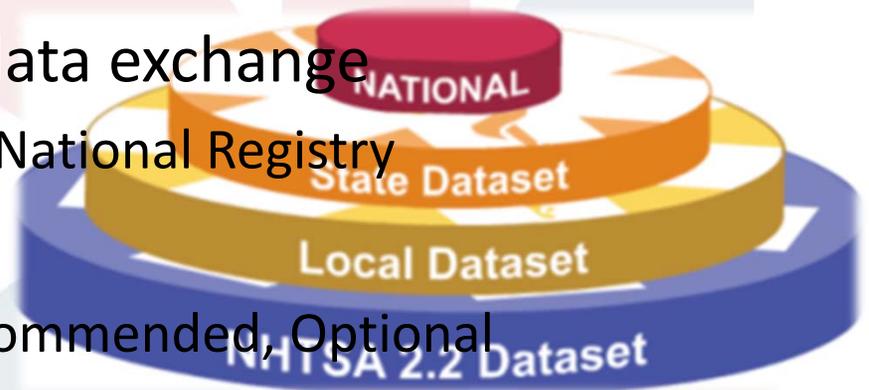


**Table 1: Public safety and health issues that may be monitored and positively impacted by EMS personnel**

- Abuse among the elderly
- Basic care and nutritional needs among the elderly
- Child abuse and neglect
- Substance abuse
- Fire hazards
- Domestic violence
- Poisoning hazards
- Fall hazards among the elderly
- Unsafe highway intersections
- Infectious disease outbreaks

# Important Attributes of NEMESIS

- NEMESIS Standard
  - Seeks a complete census
    - V2: 49 states and territories, 30 million EMS activations
    - V3: 34 states and territories, 14 million EMS activations
  - Products tested for compliance to the standard
    - Both field (ePCR systems) and State (aggregation systems)
  - Standard (structure) for data exchange
    - Always agency to State to National Registry
  - Complete data collection
    - Mandatory, Required, Recommended, Optional
  - NEMESIS is EMS activation-based, not patient-based



# Growth of NEMESIS

Statistical Year	Reporting States <sup>1</sup>	Reporting Agencies <sup>2</sup>	Number of Events	Treated and Transported 911 Response <sup>2</sup>
2009	26	1,673	5,767,090	3,367,668
2010	31	3,529	9,874,748	4,874,061
2011	35	5,395	14,371,941	7,701,605
2012	43	6,415	19,831,189	10,733,925
2013	45	8,183	23,897,212	12,595,958
2014	48	8,785	25,835,729	13,769,286
2015	49	10,137	30,206,450	15,729,516
2016	49	9,993	29,919,652	15,361,777

<sup>1</sup> Number of reporting states and territories of the United States.

<sup>2</sup> Only including the events that are 911 calls, treated and Transported by EMS.

# Value/Challenges of NEMESIS Version 3

- **Improves Data Quality**
  - Standard business rules (400+)
  - Pertinent negatives
- **Enhance Performance Assessment**
  - Provider performance, protocol adherence
- **Improves Data Transfer Automation**
  - “Real Time” - Via Web Services
- **National ANSI Standard (HL7)**
  - Synchronization of clinical content

# Pertinent Negatives

eMedications.03

State National

## eMedications.03 - Medication Given

### Definition

The medication given to the patient

National Element	Yes	Pertinent Negatives (PN)	Yes
State Element	Yes	NOT Values	Yes
Version 2 Element	E18_03	Is Nillable	Yes
Usage	Required	Recurrence	1 : 1

### Associated Performance Measure Initiatives

Airway    Cardiac Arrest    Pediatric    STEMI    Stroke    Trauma

### Attributes

**NOT Values (NV)**

7701001 - Not Applicable                      7701003 - Not Recorded

**Pertinent Negatives (PN)**

8801001 - Contraindication Noted            8801003 - Denied By Order                      8801007 - Medication Allergy  
 8801009 - Medication Already Taken        8801019 - Refused                                      8801023 - Unable to Complete

### Constraints

Data Type	minLength	maxLength
string	2	7

### Data Element Comment

List of medications based on RxNorm (RXCUI) code.

# Data Exchange is Automated

- Record closure in a patient's home in Lincoln NE to arrival at the National Repository
  - 7 minutes



# Health Care Standards

## ICD-10-CM or PCS

### Assessment / Care of the Patient

- Impressions
- Symptoms
- Cause of Injury
- Incident Location Type
- Patient Activity

### Patient History

- Medical/Surgical History
- Medication Allergies
- Environmental Allergies

## SNOMED CT ...for Procedures

- Procedures
  - Allowed by the State
  - Allowed by the EMS Agency
  - Administered by EMS
  - Environmental Allergies

## RxNorm ...for Medications

- Medications
  - Allowed by the State
  - Allowed by the EMS Agency
  - Administered by EMS
- Use by the Patient
  - Current Medications
  - Allergies

# Available NEMESIS Data

<https://nemesis.org/using-ems-data/request-research-data/>



NEMESIS > Using EMS Data > Request Research Data

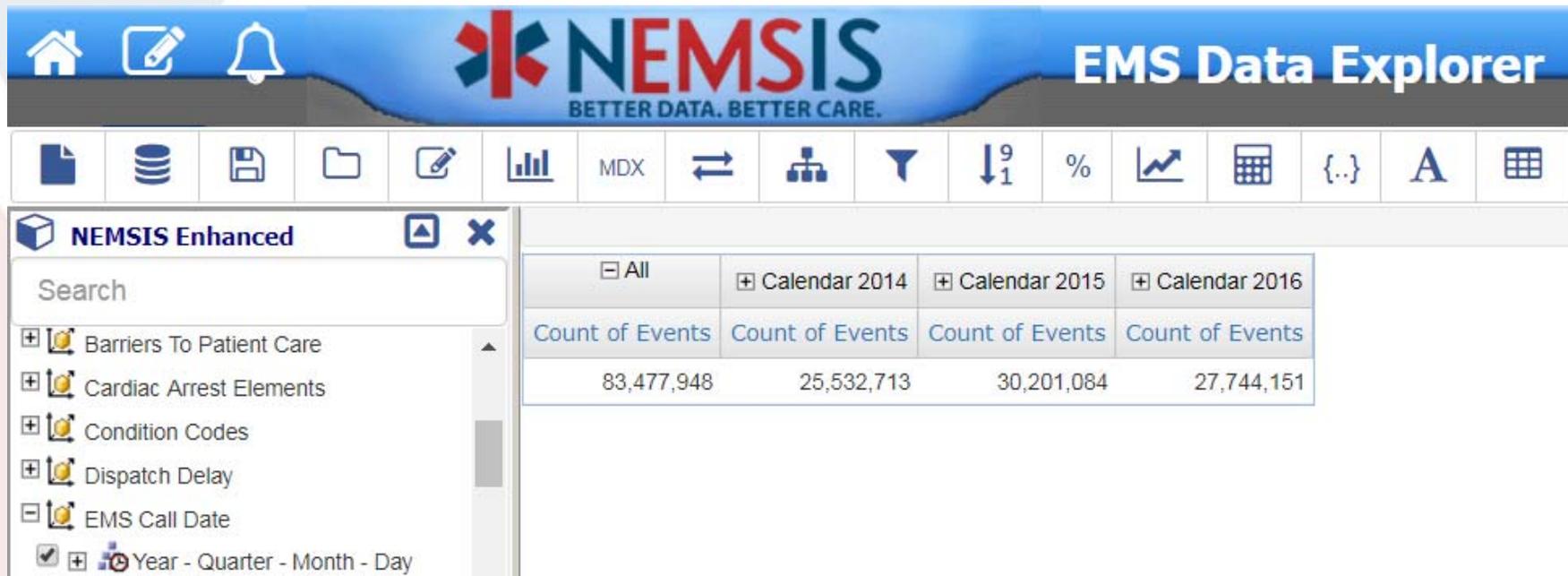
## THE 2016 NEMESIS PUBLIC-RELEASE RESEARCH DATASET IS AVAILABLE TO YOU

2016 NEMESIS Public-Release Research Dataset includes 29,919,652 EMS activations submitted by 9,993 EMS agencies serving 49 states and territories during the 2016 calendar year. The dataset does not contain information that identifies patients, EMS agencies, receiving hospitals, or reporting states. EMS events submitted by states to NEMESIS do not necessarily represent all EMS events occurring within a state. In addition, states may vary in criteria used to determine the types of EMS events submitted to the NEMESIS dataset.

To determine which states contributed to the 2016 dataset, click on this [link](#). Please review the [User Manual](#) associated with the NEMESIS Public-Release Research Dataset and the [data dictionary](#) for this dataset. Initial SAS code is available to import an [ASCII file to SAS](#), [translate M:M tables to flat file](#), [generate a data specification files](#) and, [transform age and date/time](#).

# Available NEMESIS Tools

- Version 2 OLAP Cube (EMS Data Explorer)



The screenshot displays the NEMESIS EMS Data Explorer interface. At the top, there is a navigation bar with icons for home, edit, and notifications, followed by the NEMESIS logo and the title "EMS Data Explorer". Below this is a toolbar with various icons for file operations, data manipulation, and visualization. The main content area is divided into two panes. The left pane, titled "NEMESIS Enhanced", contains a search bar and a list of categories: Barriers To Patient Care, Cardiac Arrest Elements, Condition Codes, Dispatch Delay, EMS Call Date, and Year - Quarter - Month - Day. The right pane displays a data table with the following structure:

All	Calendar 2014	Calendar 2015	Calendar 2016
Count of Events	Count of Events	Count of Events	Count of Events
83,477,948	25,532,713	30,201,084	27,744,151

# Available V3 NEMESIS Tools

## State Surveillance Dashboard - Flu Symptoms

Data Set Size

**Activations: 2,610,604**

**EMS Agencies: 4,534**

Unit Notified by Dispatch Date:  Type of Service Requested:  EMS Agency Id:

### Patient Demographics

Age (group)	Sex (group)	
	Female	Male
0-4 Years	~20K	~20K
5-9 Years	~25K	~25K
10-14 Years	~30K	~30K
15-19 Years	~35K	~35K
20-24 Years	~40K	~40K
25-29 Years	~45K	~45K
30-34 Years	~50K	~50K
35-39 Years	~55K	~55K
40-44 Years	~60K	~60K
45-49 Years	~65K	~65K
50-54 Years	~70K	~70K
55-59 Years	~75K	~75K
60-64 Years	~80K	~80K
65-69 Years	~85K	~85K
70-74 Years	~90K	~90K
75-79 Years	~95K	~95K
80-84 Years	~100K	~100K
85-89 Years	~105K	~105K
90-94 Years	~110K	~110K
95-99 Years	~115K	~115K
100+ Years	~120K	~120K
Unknown	~125K	~125K

### Date and Time

Month and Year

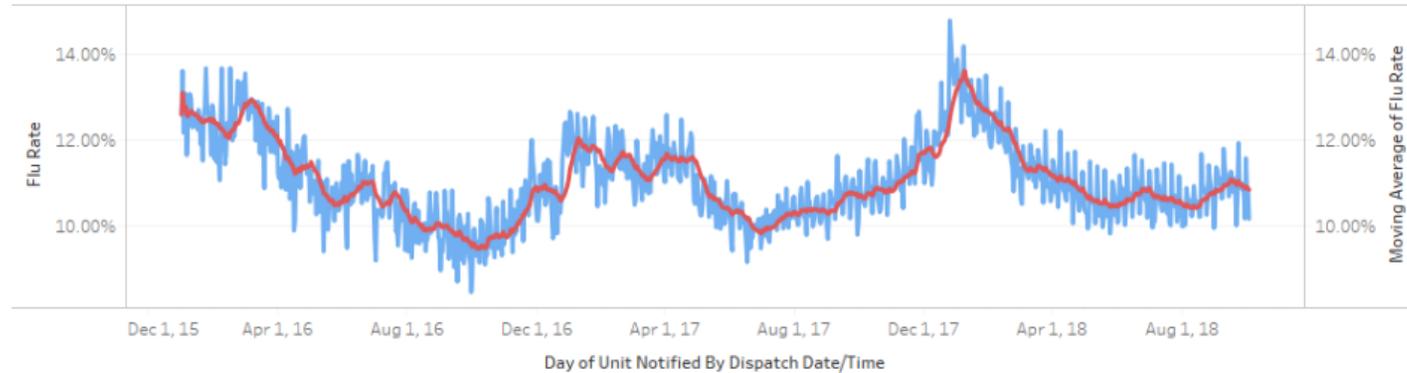
Year	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2016	12.5%	12.4%	12.4%	11.4%	10.6%	10.9%	10.4%	10.0%	9.7%	9.7%	10.5%	10.9%
2017	11.8%	11.5%	11.3%	11.5%	10.5%	10.0%	10.2%	10.3%	10.6%	10.8%	11.4%	12.4%
2018	12.9%	12.0%	11.2%	10.9%	10.5%	10.7%	10.6%	10.6%	11.0%	10.8%		

Day of Week and Time of Day

Time of Day	Day of Week						
	Sunday	Monday	Tuesday	Wednesd..	Thursday	Friday	Saturday
12am to 6am	2.196%	2.138%	2.012%	1.948%	1.957%	1.972%	2.130%
6am to 12pm	3.302%	4.435%	4.270%	4.247%	4.181%	4.160%	3.414%
12pm to 6pm	3.926%	5.033%	4.899%	4.933%	4.880%	4.893%	4.093%
6pm to 12am	3.526%	3.630%	3.503%	3.514%	3.504%	3.666%	3.636%

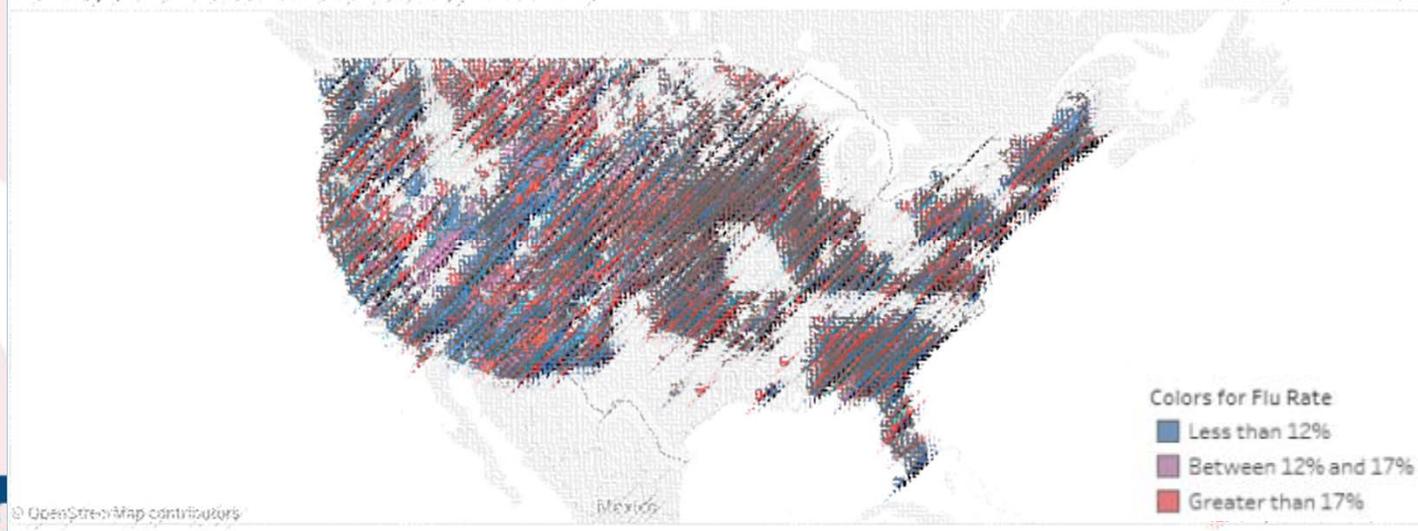
# Flu Surveillance Dashboard

Trend of Flu Symptoms by Day  
(January 1, 2016 to October 4, 2018)



## Geography

Heat Map of Flu-related Activations Rate by Incident Zip



# Opioid Epidemic

## State Naloxone Administration Dashboard

**Data Set Size**

Activations: 154,524

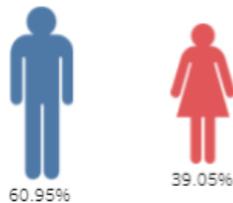
EMS Agencies: 3,421

EMS Agency: (All) ▼

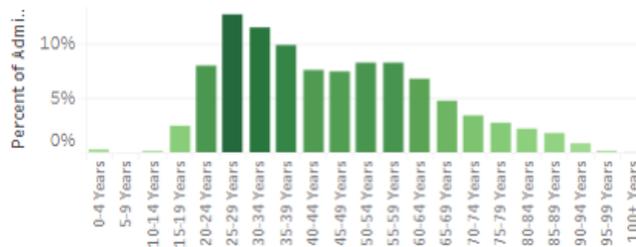
Unit Notified by Dispatch Date: January 1, 2016  August 31, 2018

### Patient Demographics

#### Sex



#### Age (years)



### Date and Time

#### Month and Year

Year	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2016	0.66%	0.81%	0.88%	0.83%	0.76%	0.79%	0.86%	0.83%	0.87%	0.87%	0.79%	0.73%
2017	0.65%	0.71%	0.73%	0.83%	0.80%	0.85%	0.78%	0.76%	0.73%	0.67%	0.69%	0.70%
2018	0.60%	0.60%	0.65%	0.65%	0.66%	0.67%	0.63%	0.63%				

#### Day of Week and Time of Day

Time of Day	Day of Week						
	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
12am to 6am	0.79%	0.64%	0.66%	0.69%	0.72%	0.75%	0.83%
6am to 12pm	0.70%	0.50%	0.52%	0.52%	0.54%	0.57%	0.69%
12pm to 6pm	0.77%	0.61%	0.61%	0.63%	0.62%	0.65%	0.79%
6pm to 12am	0.86%	0.84%	0.84%	0.85%	0.88%	0.96%	0.92%

# Vehicular Injuries and Death

## State V3 Motor Vehicle Crash Dashboard

**Data Set Size**

Activations: 783,442

EMS Agencies: 5,071

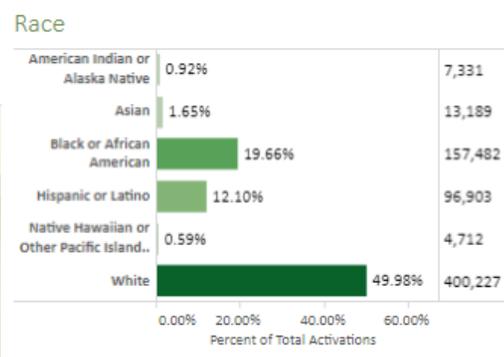
Type: (All) Incident/Patient Disposition: (All) Unit Dispatch Date: 1/1/2016 - 9/20/2018

**Demographics**

**Age and Gender**

Age (years)	Gender	
	Female	Male
0-4 Years	0.93%	1.00%
5-9 Years	1.15%	1.17%
10-14 Years	1.44%	1.51%
15-19 Years	5.26%	4.66%
20-24 Years	6.07%	6.07%
25-29 Years	5.29%	5.44%
30-34 Years	4.25%	4.46%
35-39 Years	3.69%	3.82%
40-44 Years	3.13%	3.25%
45-49 Years	3.27%	3.30%
50-54 Years	3.26%	3.46%
55-59 Years	3.06%	3.32%
60-64 Years	2.48%	2.62%
65-69 Years	1.97%	1.91%
70-74 Years	1.49%	1.33%
75-79 Years	1.06%	0.89%
80-84 Years	0.70%	0.60%
85-89 Years	0.40%	0.35%
90-94 Years	0.14%	0.13%
95-99 Years	0.03%	0.03%
100+ Years	0.03%	0.04%
Unknown	0.60%	0.63%

**Time**



**Dispatch Time**

	Sun	Mon	Tue	Wed	Thu	Fri	Sat
12 AM - 6 AM	2.01%	1.02%	0.85%	0.92%	0.97%	1.11%	1.87%
6 AM - 12 PM	2.28%	3.69%	3.85%	3.87%	3.77%	3.74%	3.00%
12 PM - 6 PM	4.88%	5.78%	6.08%	5.98%	6.13%	6.94%	5.70%
6 PM - 12 AM	3.37%	3.13%	3.37%	3.35%	3.54%	4.49%	4.30%

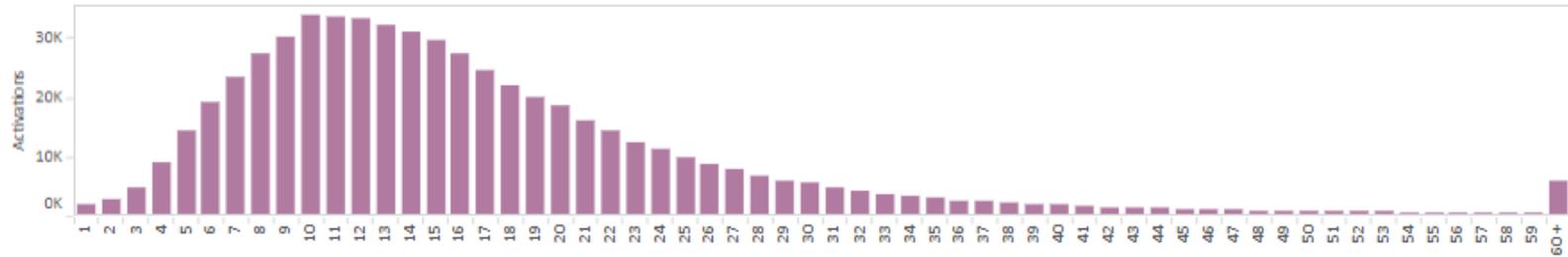


# Assessment of Injury Severity

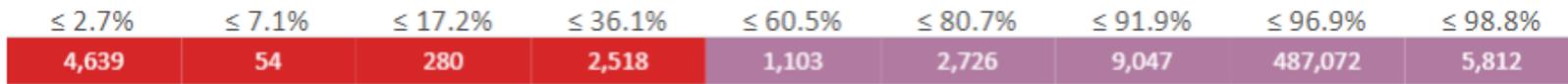
Incident Details

## Scene Time

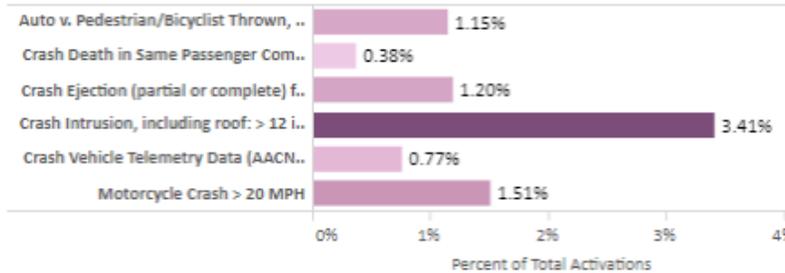
Scene Time ▾



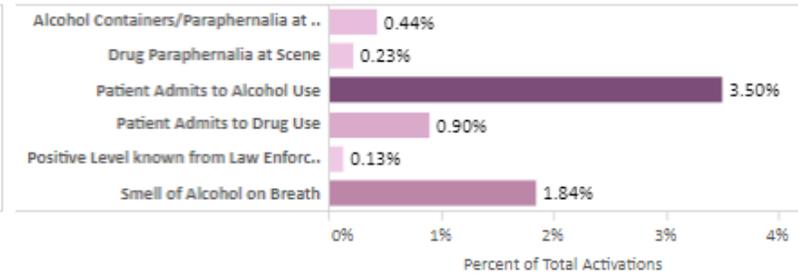
## Probability of Survival



## Injury Risk Factor



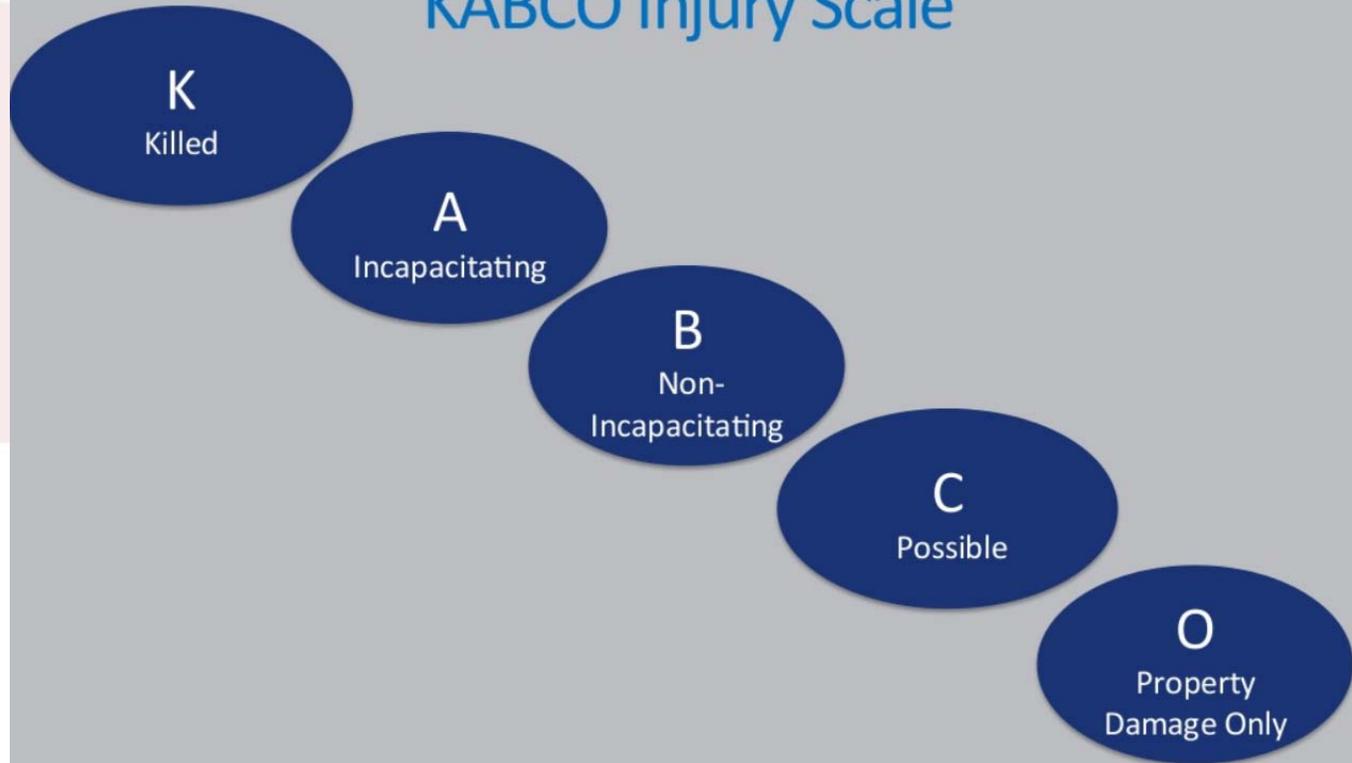
## Type of Drug/Alcohol Indication (Percent of Total) 5.50%



# Use of KABCO



## KABCO Injury Scale



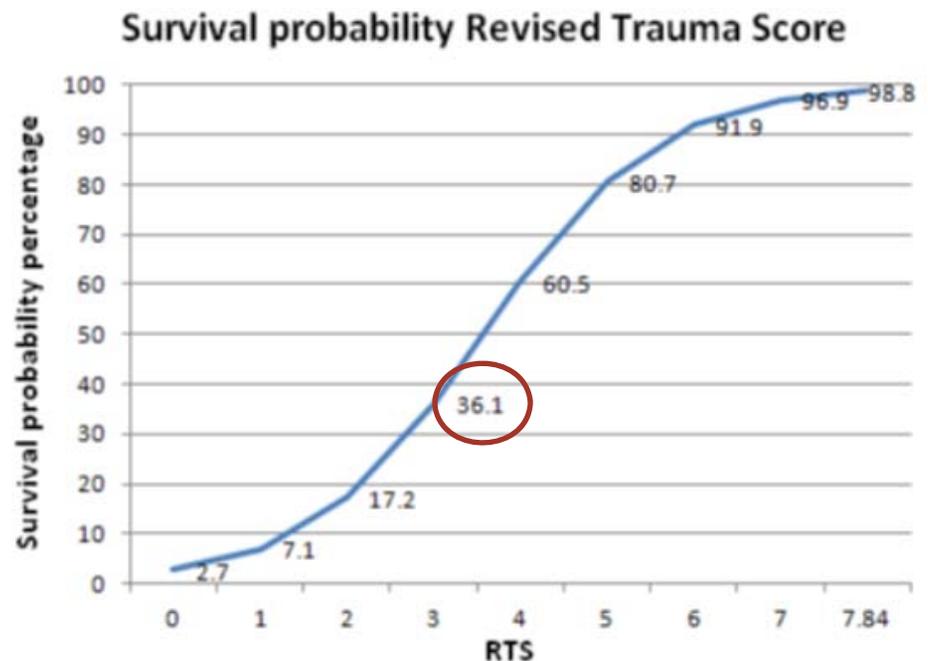
# Revised Trauma Score (RTS)

GCS	SBP	RR	Coded Value
13-15	>89	10-29	4
9-12	76-89	>29	3
6-8	50-75	6-9	2
4-5	1-49	1-5	1
3	0	0	0

$$RTS = 0.9368 \text{ GCS} + 0.7326 \text{ SBP} + 0.2908 \text{ RR}$$

- + Easier to use
- + Part of TRISS (most widely used)
- Survival basis: MTOS (1990)

Champion HR et al. A Revision of the Trauma Score, J Trauma 29:623-629,1989.



# Brief Reflection on Research!

## NATIONAL CHARACTERISTICS OF EMERGENCY MEDICAL SERVICES RESPONSES IN THE UNITED STATES

Henry E. Wang, PhD, MS, Karen E. Jacobson, BA, NREMT-P, Mengtao Dai, MS, Gregory Mass-casualty

Description of Medication Administration by Emergency Medical Services

National Characteristics of Emergency Medical Services in Frontier and Remote Areas

Landon R. Mueller BS, John P. Donnelly MSPH, Karen E. Jacobson BA, NREMT-P, Justin N. Carlson MD, MS, N. Clay Mann PhD, MS & Henry E. Wang MD, MS



Google Scholar

NEMESIS

Out-of-hospital

Henry E. Wang, PhD, MS, Karen E. Jacobson, BA, NREMT-P, Mengtao Dai, MS, Gregory Mass-casualty

Articles

About 762 results (0.07 sec)

Procedures Performed by Emergency Medical Services in the United States

Justin N. Carlson MD, MS, Christopher Karns DO, NREMT-P, Karen E. Jacobson BA, NREMT-P, Mengtao Dai MS, Henry E. Wang MD, MS

Epidemiology of Pediatric Prehospital Basic Life Support Care in the United States

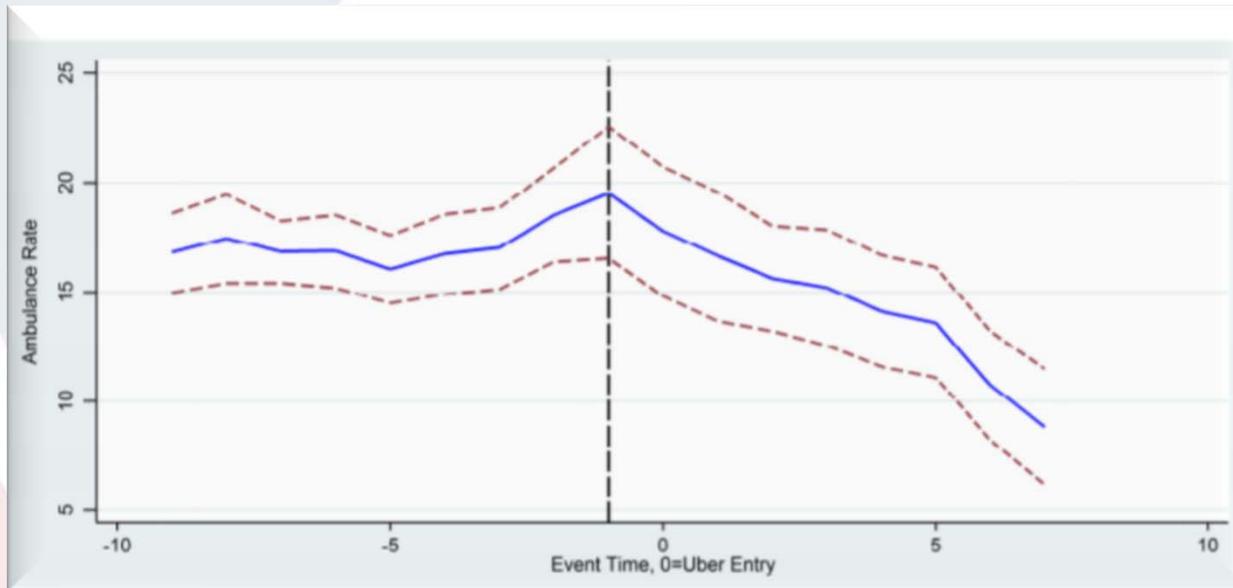
UT, United States

Leigh Ann Diggs MPH, Manasi Sheth-Chandra PhD & Gianluca De Leo PhD, MBA

Cost of Over-triage: Emergency Medical Services Support Patterns and Acute Care Costs Among Low-Risk Injured Patients



# Did UberX reduce ambulance volume?



Leon S. Moskatel & David J.G. Slusky, 2017. "Did UberX Reduce Ambulance Volume?," WORKING PAPERS SERIES IN THEORETICAL AND APPLIED ECONOMICS 201708, University of Kansas, Department of Economics, revised Oct 2017.

Pre/Post Uber introduction study including 43 states and 766 cities.

7% decrease in the per capita ambulance rate when Uber enters a city.

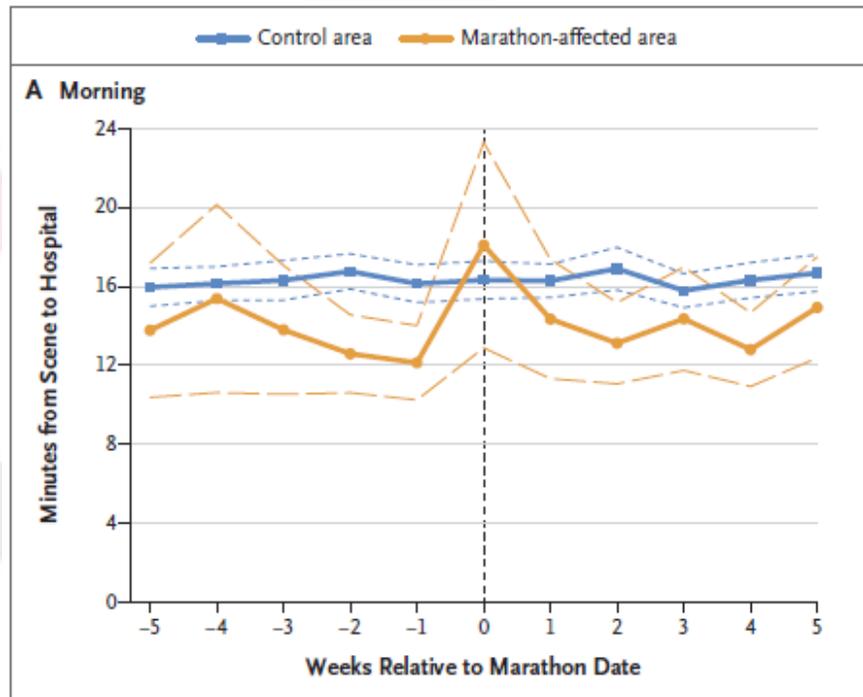
# Do neighborhoods behind street barriers set up for marathons receive delayed EMS care compared to neighborhoods not close to the barriers?

Jena AB, (2017). Delays in Emergency Care and Mortality during Major U.S. Marathons. N Engl J Med, Apr 13(376), 1441-1450.

11 largest US urban marathons...3 yrs.

62,890 EMS activations for >65 yrs. chest pain patients.

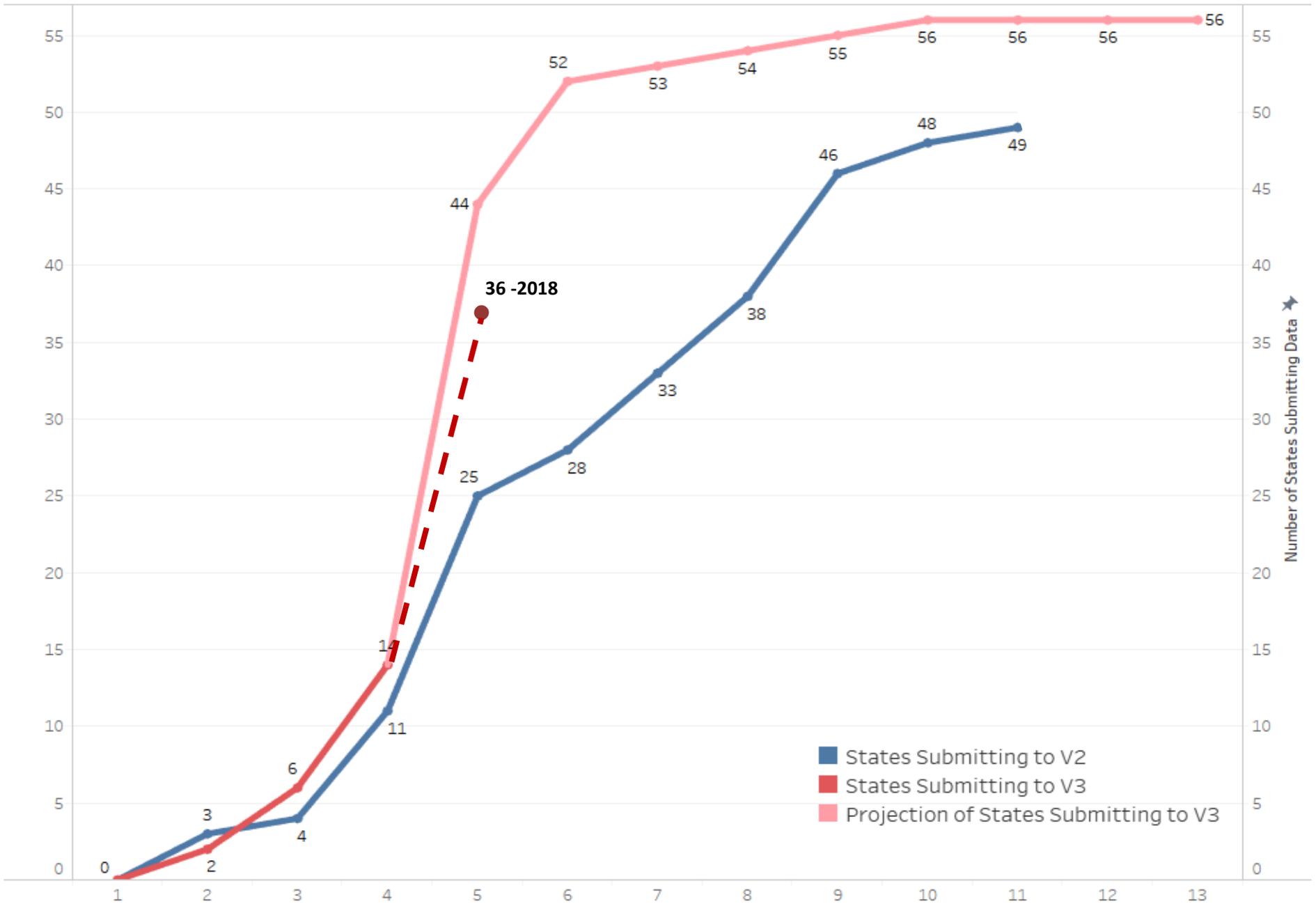
On average, transport times increased 4.4 mins.



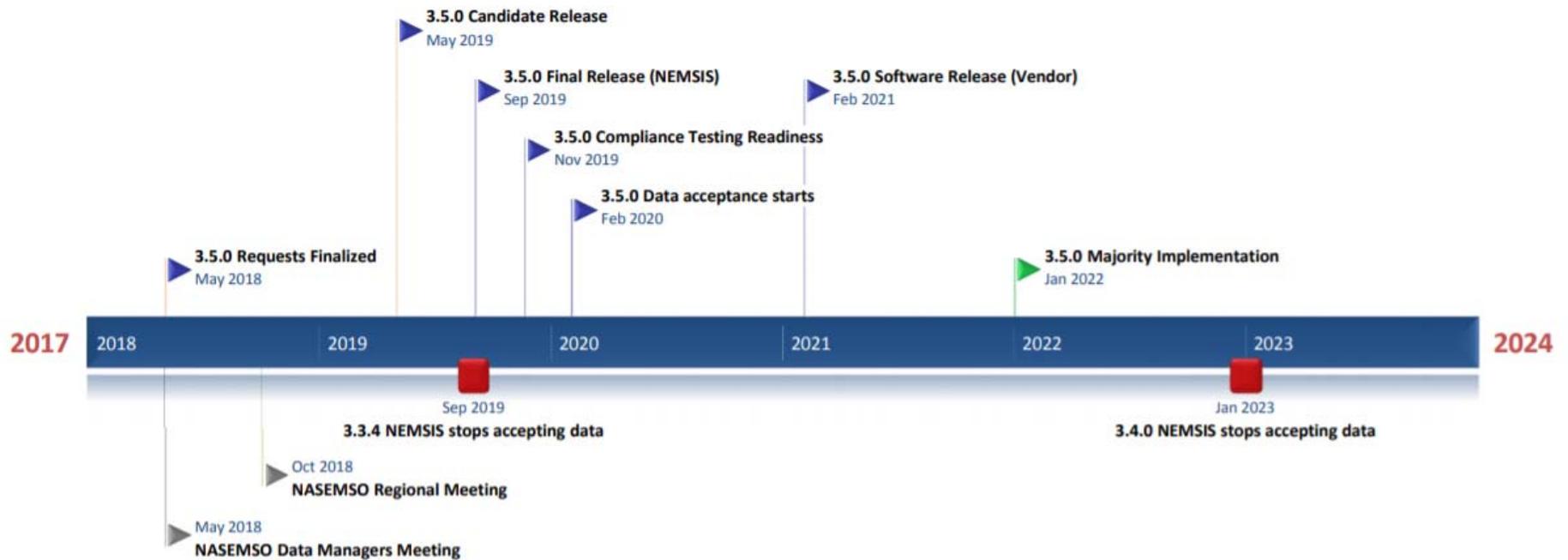


# V2 and V3 State Submission to NEMESIS by Year

Years Since Standard Release



# NEMESIS Versioning Process



**Questions!**



Clay,

Wanted to reach out to thank you and the staff at the TAC for your support for our project. I know Jeremy primarily engaged your team for the data but we recognize that none of this work would have been possible without your support.

I also wanted to send over the most recent Altmetrics which provides an idea of the impact and dissemination of the study so far. It has performed in the 99<sup>th</sup> percentile and is in the top 5% of all research outputs tracked by Altmetrics.

Thanks again!

Ash



**Ashish R. Panchal, MD, Ph.D.**

Research and Fellowship Director

**National Registry of EMTs**

P: 614-888-4484 ext.164

W: [www.NREMT.org](http://www.NREMT.org) E: [apanch](mailto:apanch)



## Naloxone Administration Frequency During Emergency Medical Service Events — United States, 2012–2016

Overview of attention for article published in MMWR: Morbidity & Mortality Weekly Report; August 2018



About this Attention Score

In the top 5% of all research outputs scored by Altmetric

Mentioned by

- 7 news outlets
- 1 blog
- 113 tweeters
- 1 Facebook page

What is this page?

SUMMARY News Blogs Twitter Facebook

**Title** Naloxone Administration Frequency During Emergency Medical Service Events — United States, 2012–2016  
**Published in** MMWR: Morbidity & Mortality Weekly Report; August 2018  
**DOI** 10.15585/mmwr.mm6731a2  
**Pubmed ID** 30091966  
**Authors** Rebecca E. Cash  
**Abstract** As the opioid epidemic in the United States has continued since the early 2000s (1,2), most...

[View on publisher site](#)

[Alert me about new mentions](#)

TWITTER DEMOGRAPHICS

ATTENTION SCORE IN CONTEXT

This research output has an **Altmetric Attention Score** of **132**. This is our high-level measure of the quality and quantity of online attention that it has received. This Attention Score, as well as the ranking and number of research outputs shown below, was calculated when the research output was last mentioned on **16 August 2018**.

ALL RESEARCH OUTPUTS

**#85,662**  
of 11,616,515 outputs

OUTPUTS FROM MMWR: MORBIDITY & MORTALITY WEEKLY REPORT

**#230**  
of 1,855 outputs

OUTPUTS OF SIMILAR AGE

**#2,220**  
of 135,208 outputs

OUTPUTS OF SIMILAR AGE FROM MMWR: MORBIDITY & MORTALITY WEEKLY REPORT

**#12**  
of 40 outputs

Altmetric has tracked 11,616,515 research outputs across all sources so far. Compared to these this one has done particularly well and is in the 99<sup>th</sup> percentile: it's **in the top 5% of all research outputs ever tracked** by Altmetric.

# Word to the Wise: States

- Lift the NEMESIS Burden on States:
  - Only collect the National elements
    - No custom elements
    - Ready-made Schematron file (complete validity rules)
  - Legislate: “the latest NEMESIS standard”
  - Don’t use business rules to influence user navigation
  - Maintain a StateDataSet file
  - Correctly apply NOT values