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Trends in Multiple Naloxone Administrations among EMS Personnel

FDA Anesthetic and Analgesic Drug Products Advisory Committee and the Drug Safety and Risk Management Advisory Committee

October 5th, 2016

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Division of Unintentional Injury

National Center for Injury Prevention

Disclosures:

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Nothing to Disclose

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Note: The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the Agency for Toxic Substances and Disease Registry.

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Overall Goal of Session

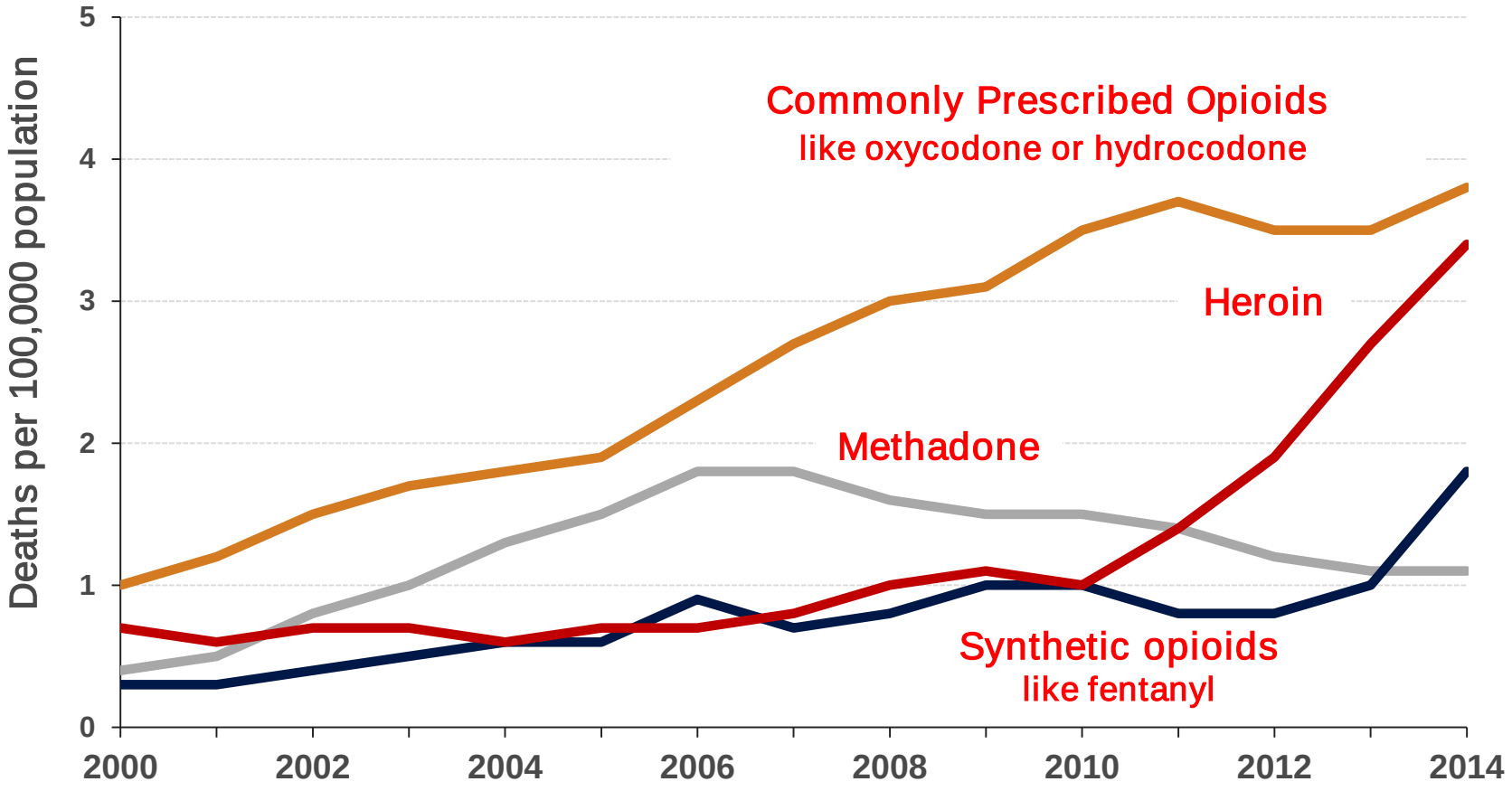
- Describe changes in Multiple Naloxone Administrations over time.
- Explain Variations in Multiple Administrations:
  - Age
  - Geography
  - Ambulance characteristics
  - Dispatch Complaint
  - Other

Burden Landscape is Changing

- Slight increases in commonly prescribed opioid overdose deaths
- Heroin overdose rate is increasing rapidly.
  - Street heroin is more potent than most opioids.
- Large increases in synthetic opioids, including Fentanyl.
  - Fentanyl can be 50 times more potent than morphine.
  - DEA issued a warning on Carfentanil on 22 Sept 2016.
  - Carfentanil can be 100 times more potent than fentanyl.

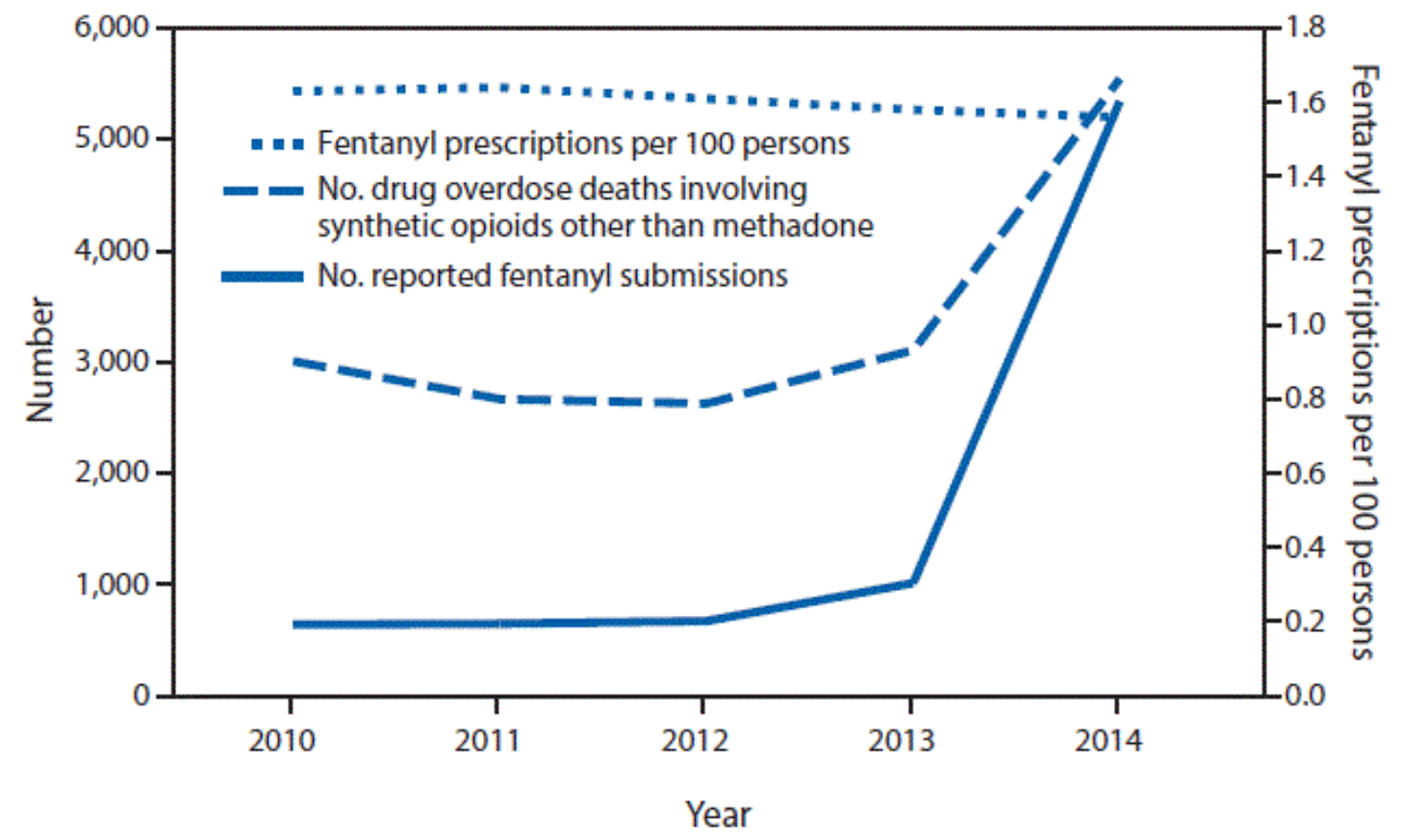
https://www.dea.gov/divisions/hq/2016/hq092216.shtml

Rise in Rx overdose deaths since 2000 and recent increase in heroin & fentanyl deaths



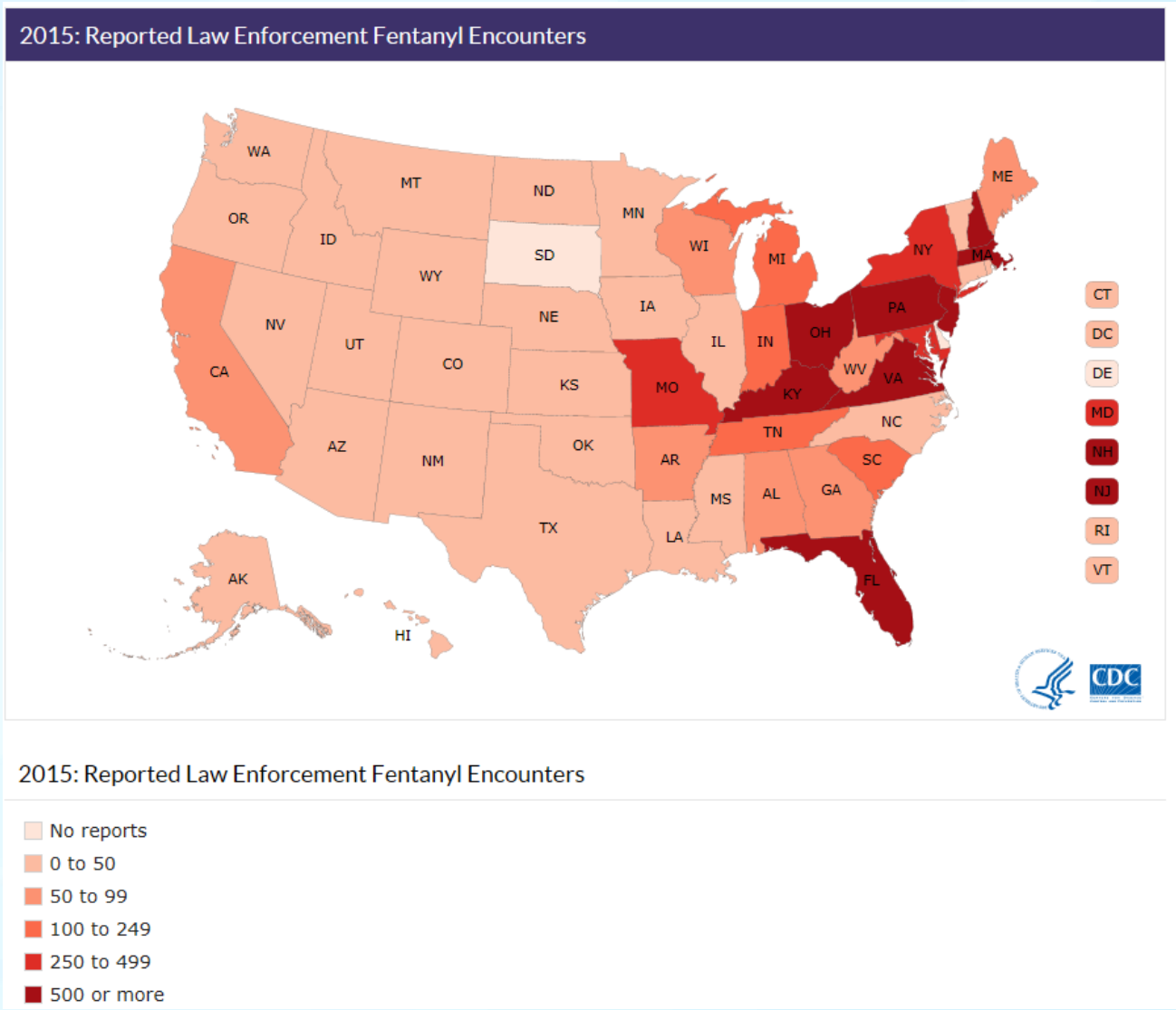
SOURCE: National Vital Statistics System Mortality File.

Trends in number of drug overdose deaths involving synthetic opioids other than methadone,* number of reported fentanyl submissions,† and rate of fentanyl prescriptions§ — United States, 2010–2014



Gladden RM, et al. Fentanyl law enforcement submissions and increases in synthetic opioid–involved overdose deaths—27 states, 2013–2014. MMWR. 2016;65.

Law enforcement Fentanyl Encounters - 2015



http://www.cdc.gov/drugoverdose/data/fentanyl-le-reports.html

Multiple Naloxone Administrations (MNA) in the Prehospital Setting

- EMS use is unique:
  - EMS is part of the health care system
  - Regulated by State and Local Government
  - Also overseen by State and Local EMS Directors
  - National EMS Scope of Practice Model provides model guidelines for states (NHTSA document)

- According to one study, Naloxone is the drug most commonly administered to adolescents in the prehospital setting (*Seidel JS. Emergency medical services and the adolescent patient. J Adolesc Health. 1991;12(2):95---100*).

Research Question

Multiple Naloxone Administrations (MNA)

- Is there an increase in the percentage of patients that receive MNA?
- What are the circumstances where MNA is more likely?

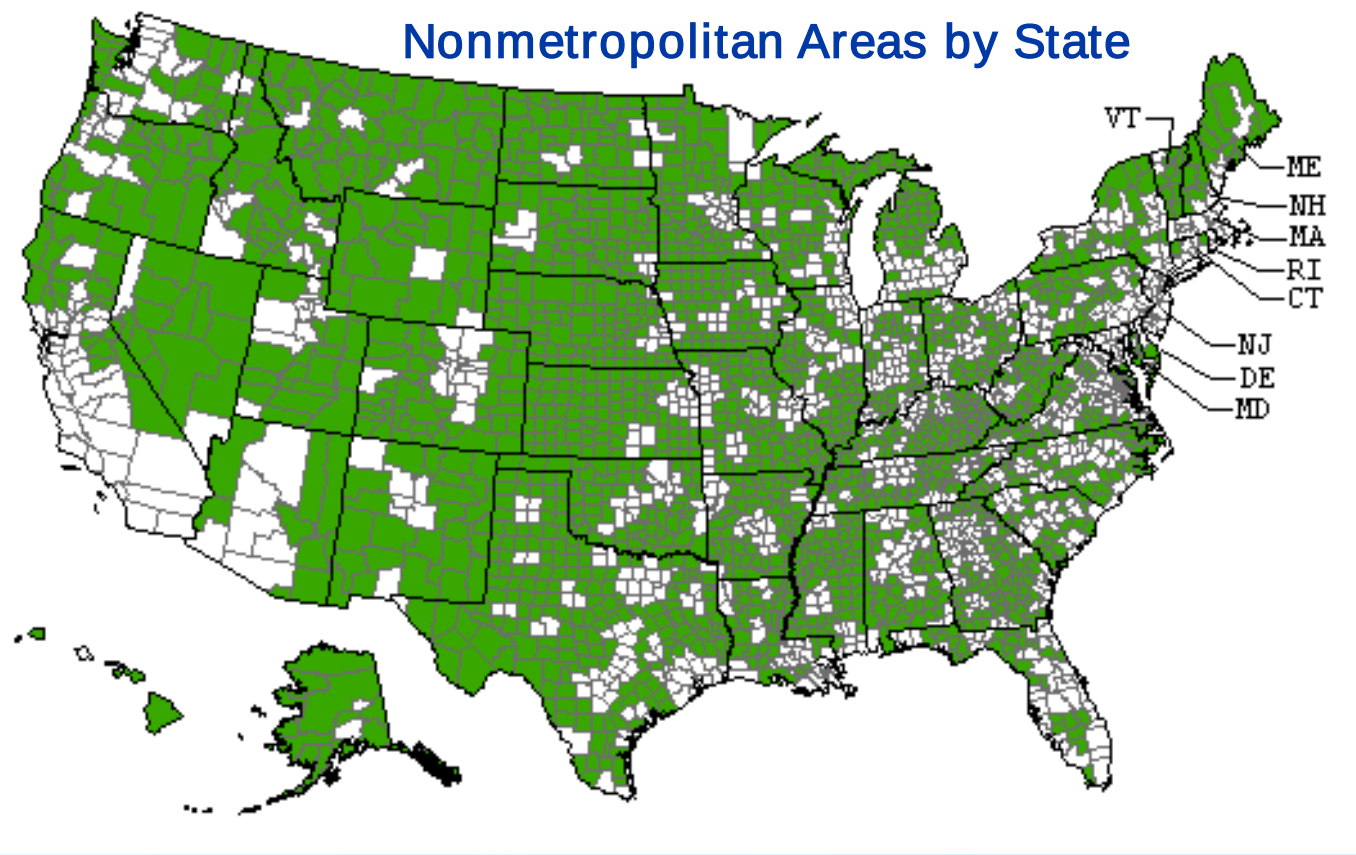
Data Source

Data Used:

- National EMS Information System: 2012 - 2015
- 19.8-30 million records of EMS events
- Includes non-injury
- Includes interfacility transfers
- 42-49 States participate
- Most comprehensive collection of EMS data in the US
- Representative of US EMS activities in 2012 *(Mann NC, Kane L, Dai M, Jacobson K. Description of the 2012 NEMSIS public-release research dataset. Prehospital Emergency Care. 2015 Apr 3;19(2):232-40)*

Emergency Medical Services Challenges: Rural

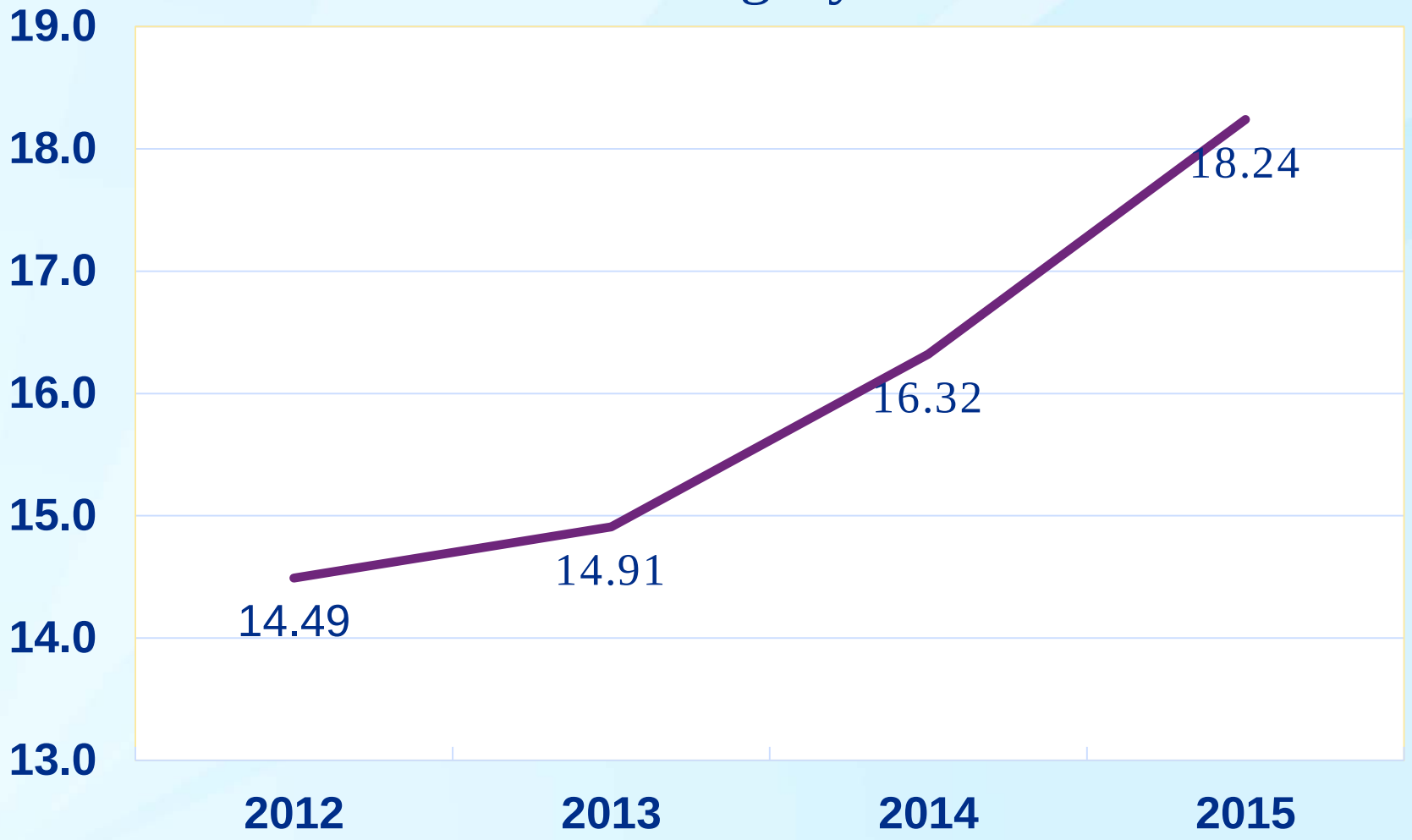
- Urban centers are served by 80% of the EMS workforce
- Rural Land Mass is 80% of the US
- Only 20% of EMS workforce serves 80% of US land mass



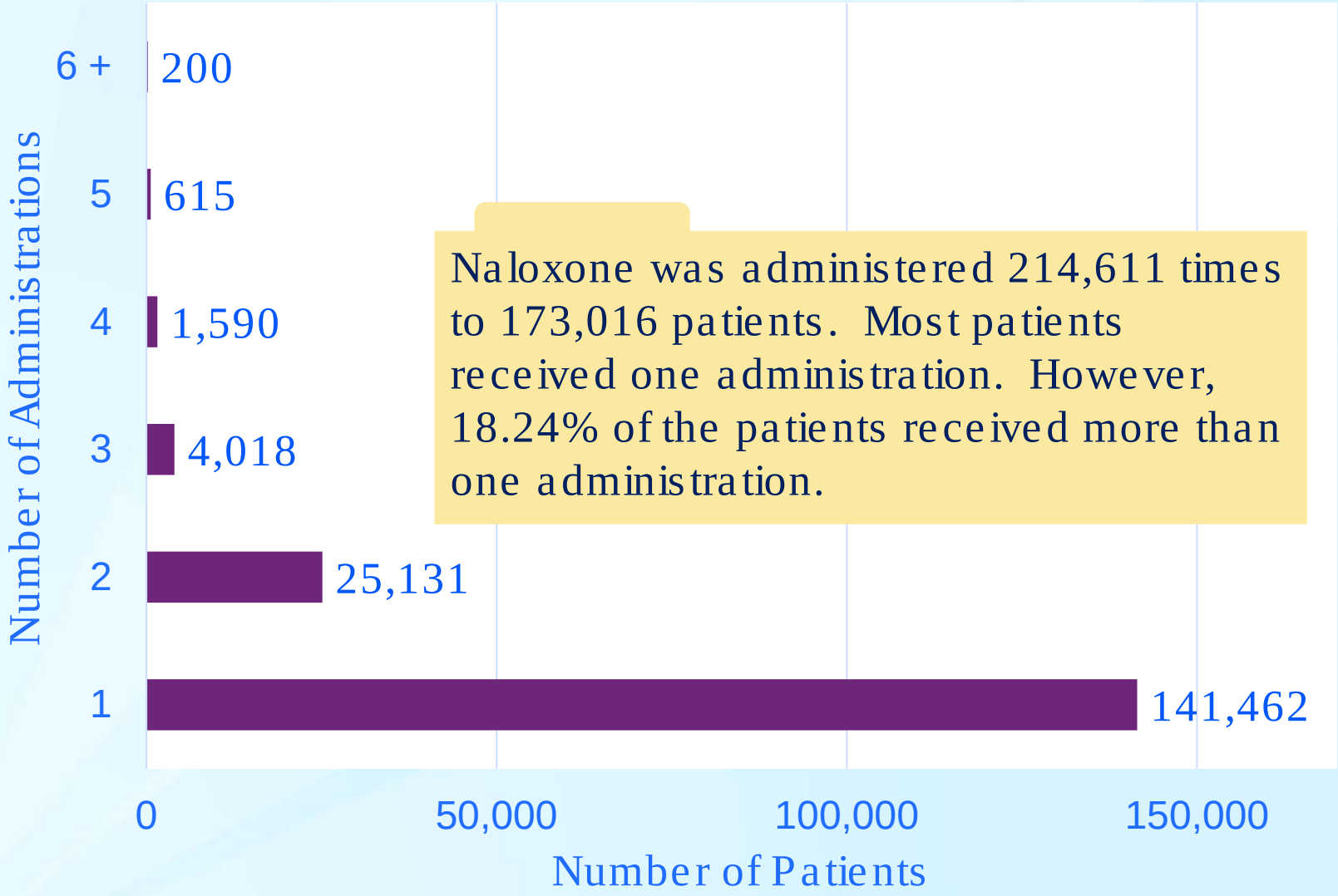
Methods

- Defining an event for the study:
  - Any event where Naloxone was administered.
  - Each administration is recorded in the Medication table
- Statistical Procedure:
  - Logistic Regression
  - Dependent Variable: MNA (Yes or No)
  - Independent Variables:
    - Age
    - Gender
    - US Census Region
    - Urbanity
    - Lay Naloxone
    - Dispatch Complaint
    - Primary symptom
    - Oxygen
    - Patient Disposition

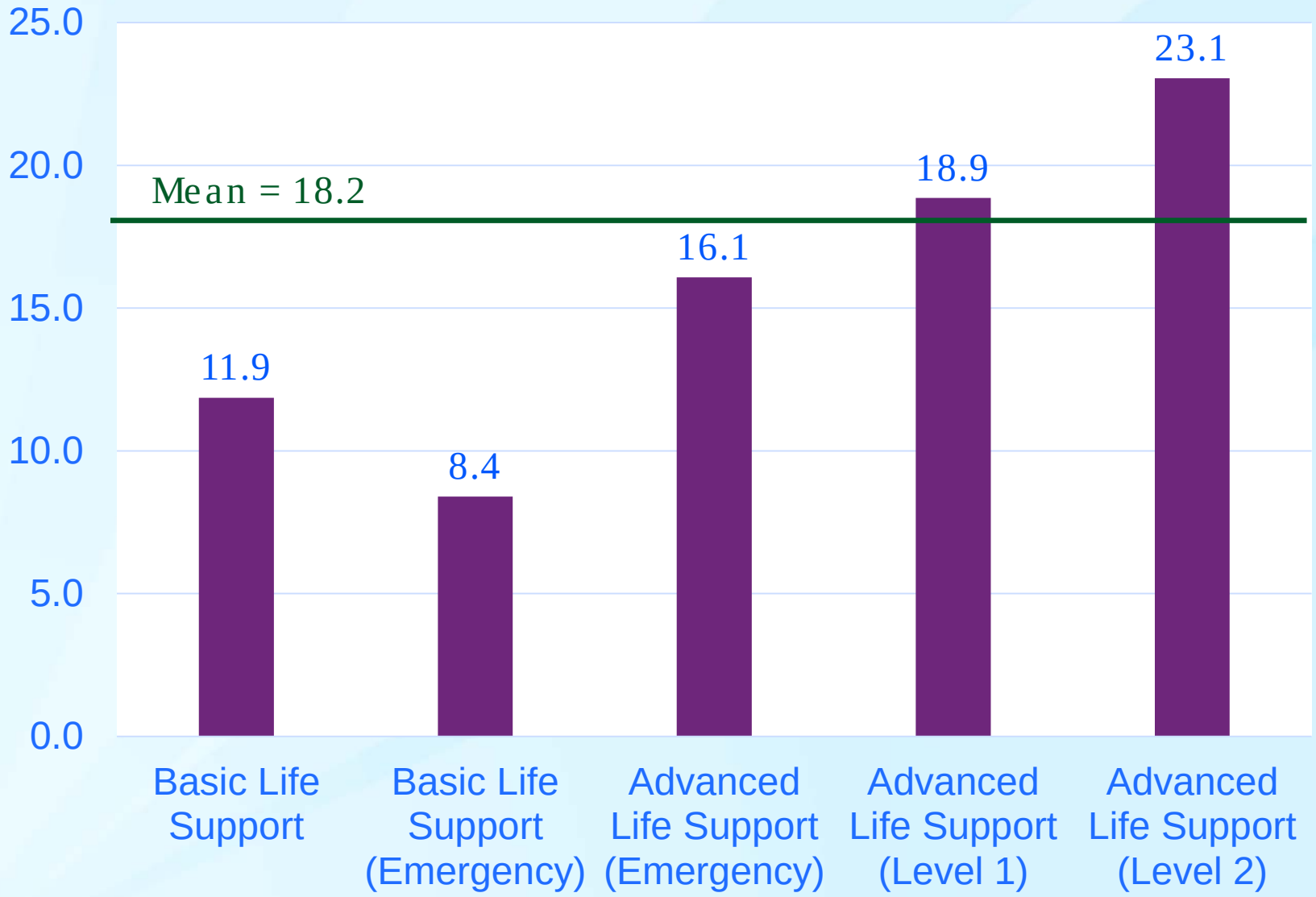
Percentage of Patients Requiring Multiple Naloxone Administrations in an EMS Setting by Year



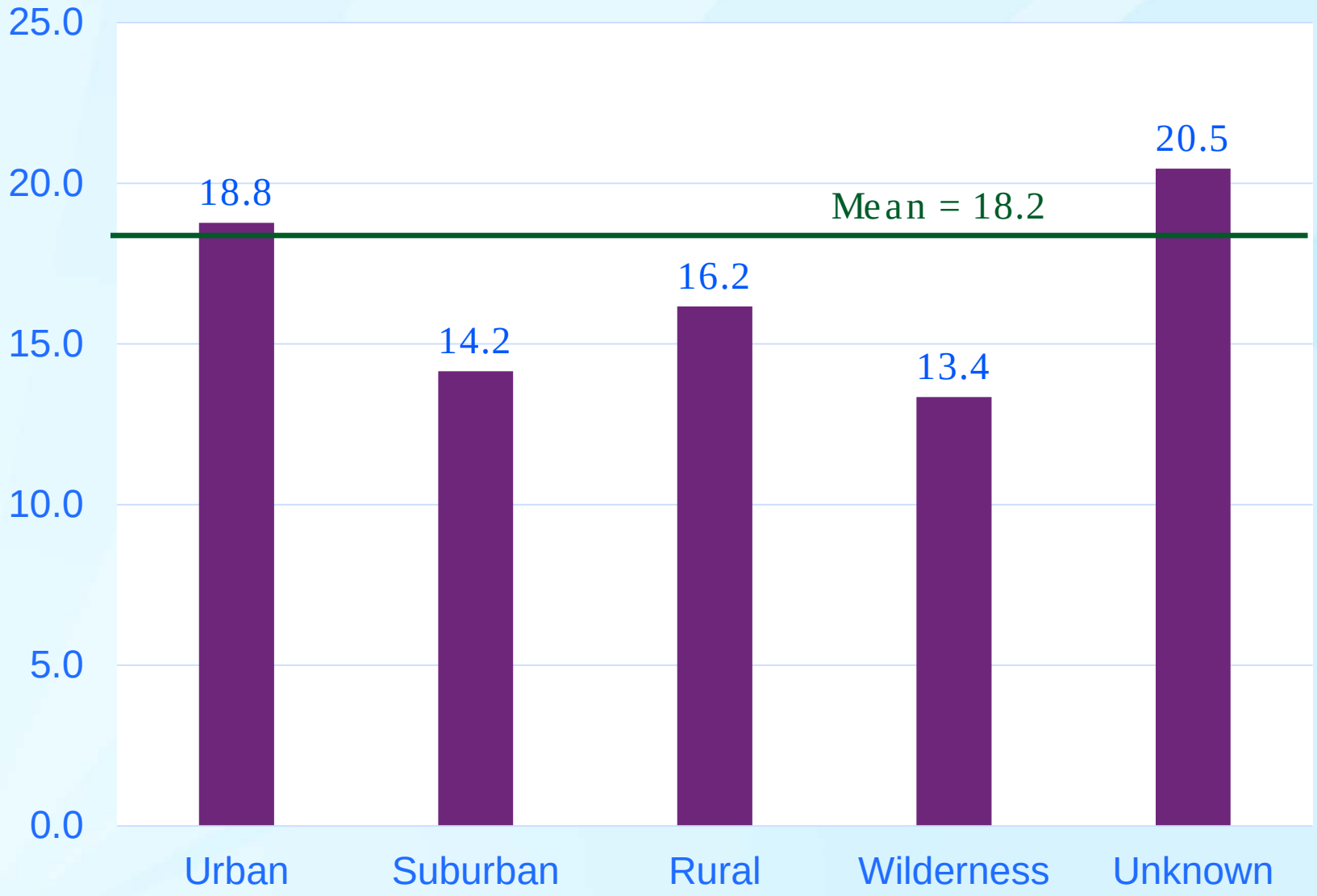
Number of Naloxone Administrations by EMS: 2015



Percent of MNA by Ambulance Service Level: 2015



Percent of MNA by Geography: 2015



Naloxone Administration Doses and Population Characteristics as Reported by Emergency Medical Service Providers: 2015 (read=173016, used in model =173016)

	Odds Ratio Estimate	Lower CI	Upper CI
Gender			
Female	1.00	--	--
Male	1.13	1.10	1.16
Unknown	1.13	0.94	1.37
Age			
ages 0-19	1.00	--	--
ages 20-29	1.29	1.21	1.39
ages 30-49	1.27	1.18	1.35
ages 50-64	1.05	0.98	1.12
ages 65 plus	0.84	0.78	0.91
Region			
Midwest	1.00	--	--
Island Areas	1.39	0.28	7.02
Northeast	1.18	1.13	1.22
South	0.53	0.51	0.55
West	0.99	0.95	1.03
Urbanicity			
Urban	1.00	--	--
Rural	0.85	0.80	0.89
Suburban	0.76	0.72	0.80
Wilderness	0.76	0.68	0.84
Unknown	1.12	1.05	1.19

Naloxone Administration Doses and Population Characteristics as Reported by Emergency Medical Service Providers: 2015

	Odds Ratio Estimate	Lower CI	Upper CI
Layperson Administration			
Previous Naloxone	1.00	--	--
No Previous Naloxone	0.55	0.46	0.65
Location			
Street or Highway	1.00	--	--
Home/Residence	1.42	1.36	1.48
Other Location	1.26	1.19	1.33
Residential Institution (Nursing Home, jail/prison)	1.12	1.05	1.19
Trade or service (business, bars, restaurants, etc)	1.22	1.14	1.30
Unknown	1.42	1.33	1.52
Dispatch Complaint			
Other	1.00	--	--
Ingestion/Poisoning	1.12	1.09	1.16
Unknown	1.00	0.97	1.03
Ambulance Service Level			
BLS	1.00	--	--
BLS Emergency	0.45	0.30	0.68
ALS, Level 1	1.58	1.07	2.32
ALS, Level 1, Emergency	1.15	0.78	1.69
ALS, Level 2	2.15	1.45	3.16
Unknown\Other	1.46	0.99	2.15
Oxygen			
Provided	1.00	--	--
Not Provided	0.84	0.82	0.86

Naloxone Administration Doses and Symptoms as Reported by Emergency Medical Service Providers: 2015

	Odds Ratio Estimate	Lower CI	Upper CI
Primary Symptom			
None	1.00	--	--
Bleeding	0.75	0.52	1.07
Breathing Problem	1.41	1.25	1.59
Change in responsiveness	1.28	1.15	1.43
Choking	0.97	0.56	1.68
Death	0.76	0.67	0.86
Device/Equipment Problem	<0.001	-	-
Diarrhea	2.41	0.96	6.03
Drainage/Discharge	1.72	0.61	4.89
Fever	1.51	0.90	2.53
Malaise	0.70	0.55	0.88
Mass/Lesion	<0.001	-	-
Mental/Psych	0.93	0.81	1.07
Nausea/Vomiting	0.59	0.46	0.78
Pain	0.87	0.74	1.02
Palpitations	0.83	0.52	1.33
Rash/Itching	0.28	0.04	2.13
Swelling	1.12	0.38	3.32
Transport Only	0.73	0.44	1.21
Unknown	1.06	0.95	1.19
Weakness	0.82	0.71	0.96
Wound	0.85	0.57	1.27

Naloxone Administration Doses and Population Characteristics as Reported by Emergency Medical Service Providers: 2015

	Odds Ratio Estimate	Lower CI	Upper CI
Disposition			
Dead at the Scene	1.00	--	--
Treated and Released	1.09	0.96	1.23
Treated, Transferred Care	1.44	1.29	1.61
Treated, Transported by EMS	1.61	1.47	1.76
Treated, Transported by Law Enforcement	0.78	0.33	1.84
Treated, Transported by Private Vehicle	0.90	0.32	2.57

Summary – Multiple Naloxone Administrations

- Descriptive:
  - 214,611 administrations
  - Among the 173,016 patients receiving naloxone, only 28,811 of the 911 calls indicated it was a drug poisoning (16.6%)
  - MNA is growing over time:
    - 14.49% in 2012
    - 18.24% in 2015
- Circumstances where MNA is more likely:
  - Men more often than Women
  - Ages 20-29
  - Northeastern USA
  - Urban environments
  - Where layperson naloxone was previously administered
  - In home/residence
  - Dispatch complaint gave notice of drug use/poisoning
  - Advanced life support (Level 2) ambulance dispatch
  - O2 was provided
  - Primary symptom was "breathing problems" or "change in responsiveness"
  - When treated and transported by EMS

Limitations – Multiple Naloxone Administrations

- Limitations:
  - No measure of injury severity to evaluate MNA need.
  - The NEMSIS research dataset do not allow for a State level analysis.
  - The 2015 NEMSIS data is ~ 95% complete.
  - Can only indirectly infer that MNA was restricted by supply and personnel issues.
  - Law enforcement and layperson use of naloxone have some limited effect on MNA.
  - MNA may be a proxy for drug potency, but it is likely confounded by EMS response times and other variables.
- Impact of Limitations:
  - Probably consistent over time.

EMS Implications: How do we Save More Lives?

- Manuscript provides support for the change:
  - The public's need to increase the accuracy of the 911 call may lead to better dispatch of equipment and staff.
  - Dispatching the best ambulance with the proper equipment and staffing might help increase MNA and potentially save more lives.
  - Rural areas may not have sophisticated dispatch systems or sufficient ALS response units.
  - Use local surveillance data to determine the future need for naloxone supply and to inform protocol.
  - More guidance is needed on MNA.
  - Dosage used should be examined given that synthetic drug usage is growing.

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Thank you!
Questions and Comments

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