

Tried and True Syndromic Surveillance Methods for New Data

2:30PM EST | November 17th, 2021 | 2021 SyS Symposium

Moderator: Jim Nowicki, MBA – Palantir

Presenters:

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Council of State and Territorial Epidemiologists



Sharmin Hossain, PhD, MPH
Maryland Department of Health



Effects of COVID-19 on Emergency Medical Services (EMS) Utilization in Maryland

Overdose Data to Action (OD2A)
Maryland Department of Health (MDH)

in partnership with

Johns Hopkins University
Applied Physics Laboratory (JHU/APL)



Sharmin Hossain
OD2A Surveillance Coordinator
Maryland Department of Health

November 17, 2021



Background

The COVID-19 pandemic has worsened the opioid crisis through two major avenues:

- Diversion of attention and resources
- Compounded challenges faced by individuals with opioid use disorder (OUD) through isolation

Question: How can we characterize the impact of the COVID-19 pandemic on the burden of opioid overdose in Maryland?

Objectives

Use EMS data to investigate the impact of COVID-19 on:

- Patient engagement with healthcare system
 - Did patient volume vary relative to the evolution of the pandemic in Maryland?
 - Did patients make different choices about seeking healthcare?
- Opioid vs. Non-opioid incidents
- Sub-populations (during different stages of the pandemic)

Data Source

- Maryland Institute for Emergency Medical Services Systems(MIEMSS) data available through Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE)
- Emergency medical services (EMS) data
 - Data available Nov 2019 through April 2021
 - Opioid incidents captured by MDH ESSENCE Opioid query definition

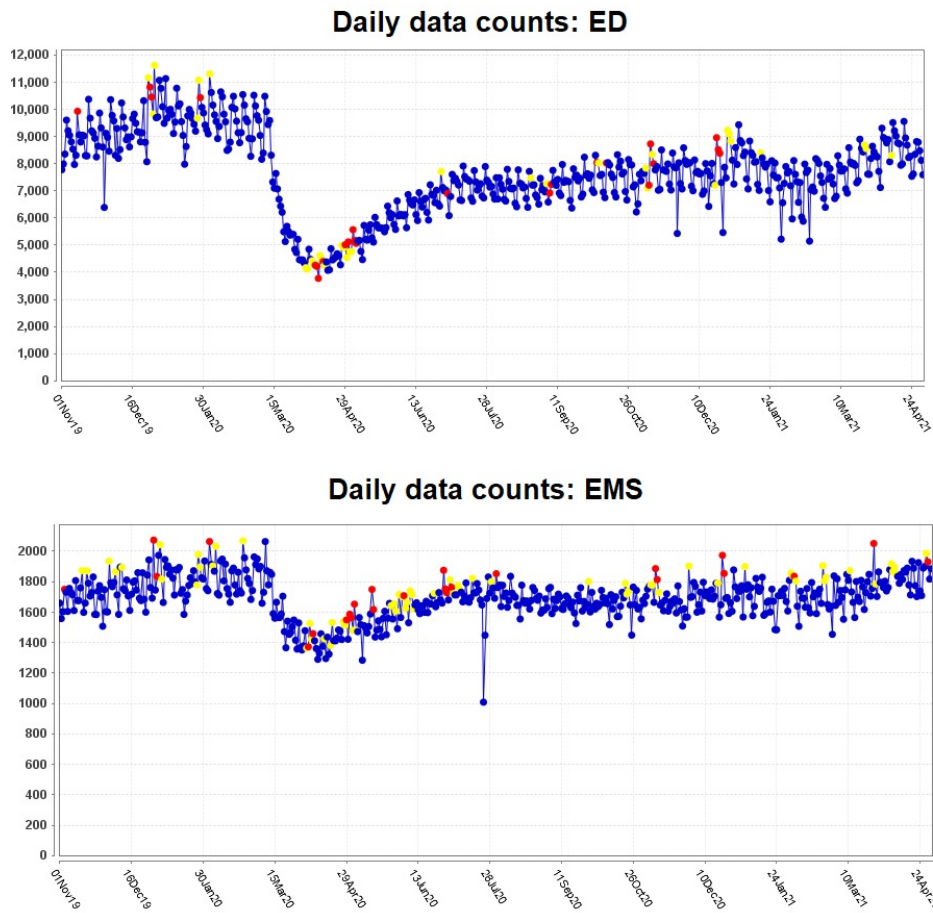
Methods

- Analysis examined three phases of the evolution of the COVID-19 pandemic in Maryland:
 - *Pre-pandemic*: up to the issuance of stay-at-home orders on March 30, 2020
 - *Mid-pandemic*: from April 1, 2020, to Sept 1, 2020, when Maryland entered Stage 3 of the Roadmap to Recovery (<https://governor.maryland.gov/recovery/>)
 - *Reopening*: Sept 1, 2020, onward
- Analysis of EMS transport captured patients' decisions to accept or reject transport to a hospital following an EMS call

Results

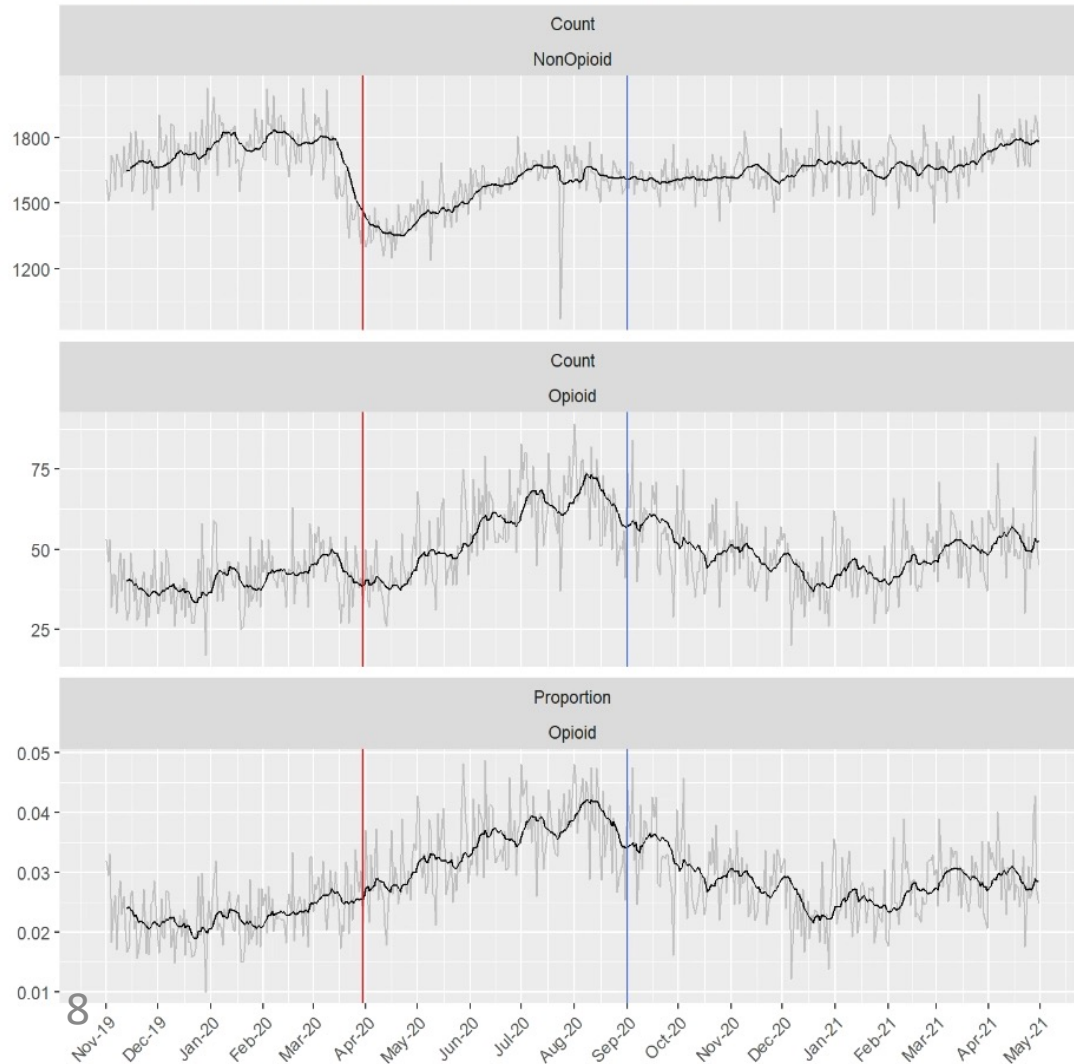
- Opioid-related calls went up (both in raw count and proportion of total calls), declined after reopening, but did not recover to pre-pandemic levels
- Transport acceptance declined (~5%) from pre- to mid-pandemic.
- The pandemic worsened the “gender gap”, such that the opioid-related call volume from male patients increased more than from female patients.
 - As of April 2021, this gap had not yet recovered to pre-pandemic levels.

Figure 1: Healthcare utilization declined at the onset of the pandemic and has not recovered



- Both ED and EMS data show a steep decline in incidents at the onset of the pandemic in March.
- **Top panel:** daily counts of ED records in ESSENCE from Nov 2019 through May 2021
- **Bottom panel:** daily counts of EMS records in ESSENCE from Nov 2019 through May 2021

Figure 2: Opioid calls accounted for a higher proportion of EMS calls during the mid-pandemic period



Top panel: non-opioid-related EMS call counts

Middle panel: opioid-related EMS call counts

Bottom panel: Proportion of EMS call counts that are related to opioid overdose

Figure 3: The pandemic changed patients' willingness to seek further medical care

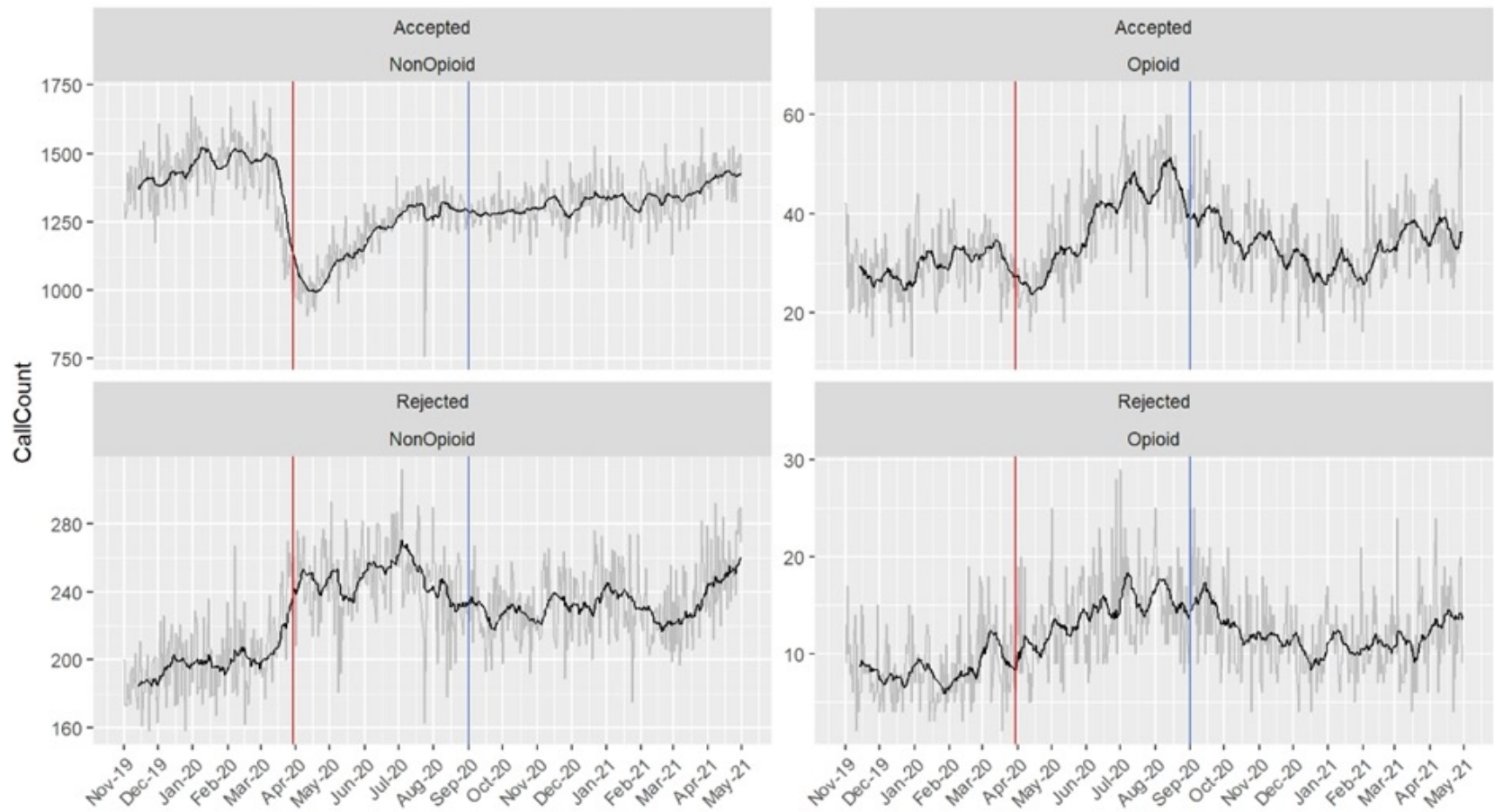
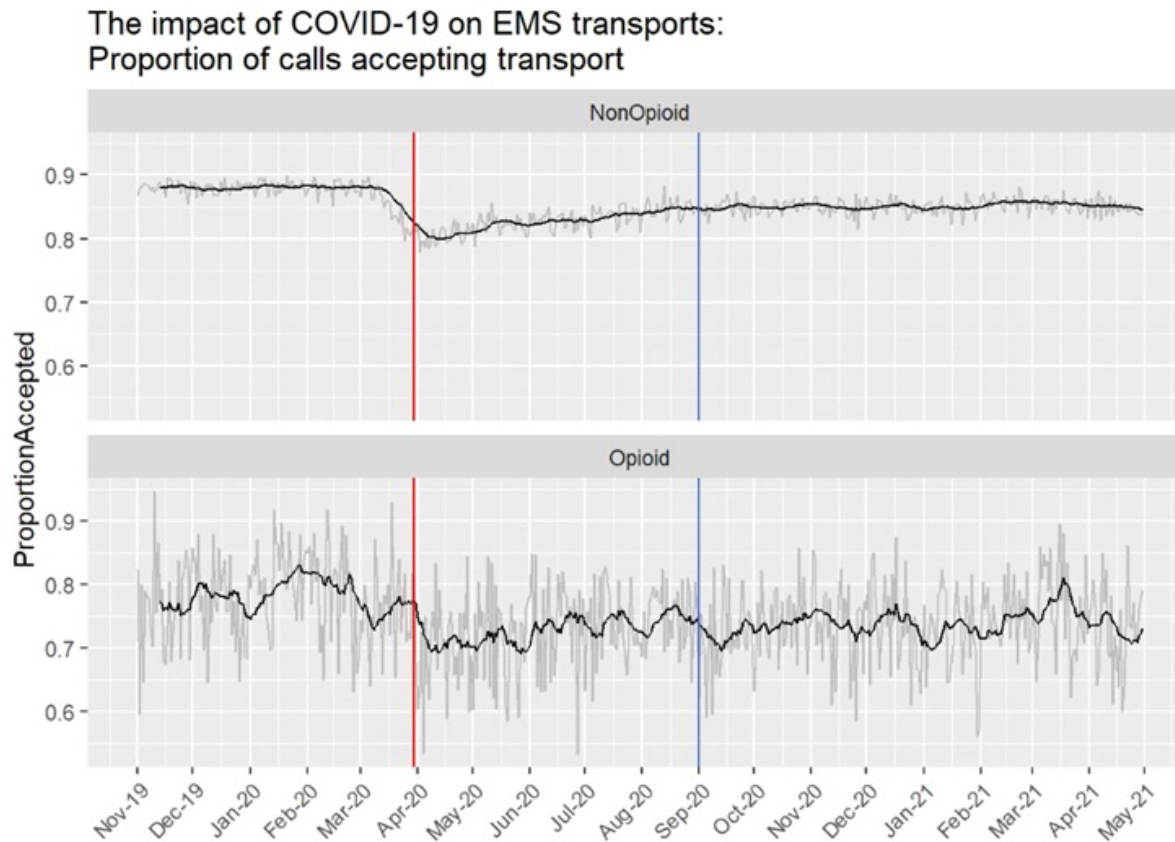


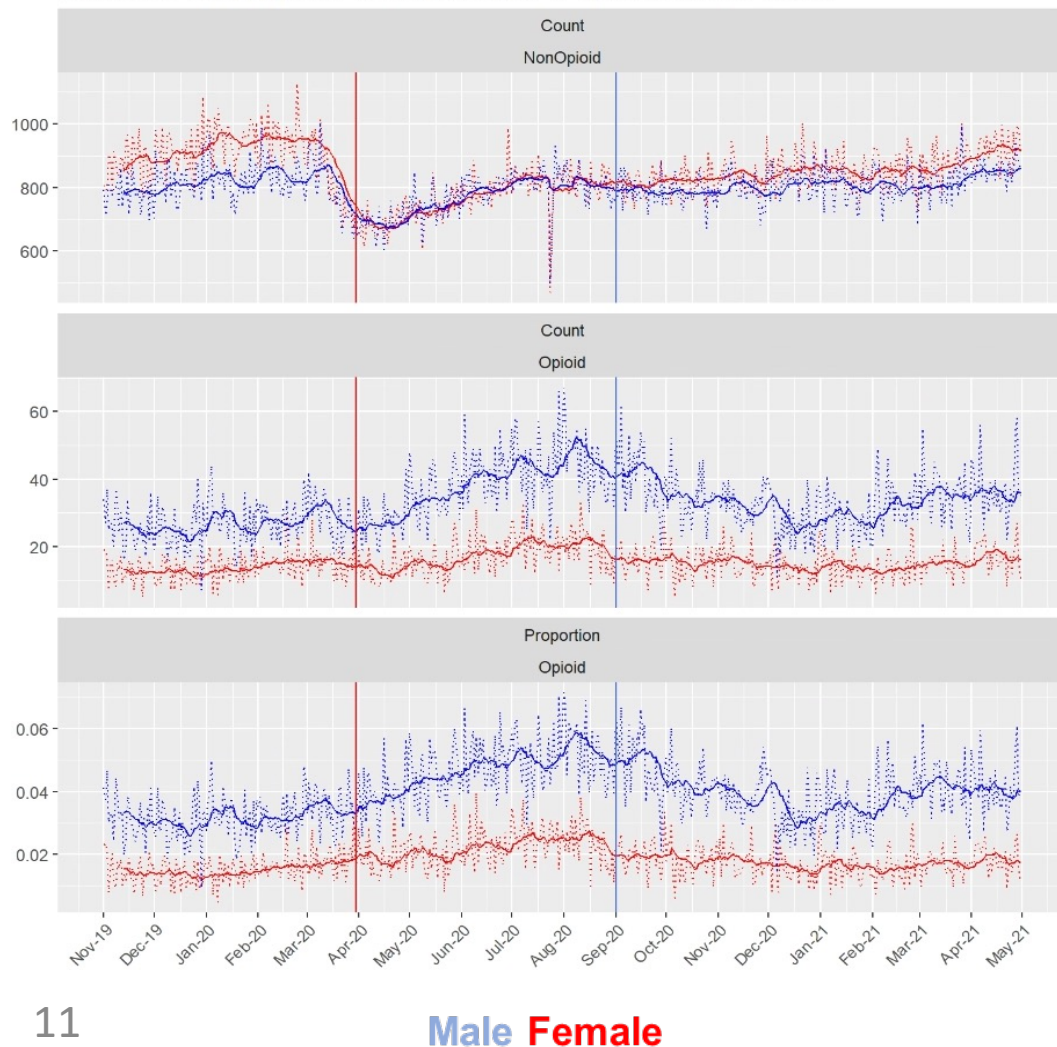
Figure 4: The rate of transport acceptance dropped slightly for opioid calls during the pandemic



Upper panel:
proportion of non-
opioid calls that
accepted transport

Lower panel:
proportion of opioid
calls that accepted
transport

Figure 5: The pandemic widened the 'gender gap' in opioid-related EMS calls

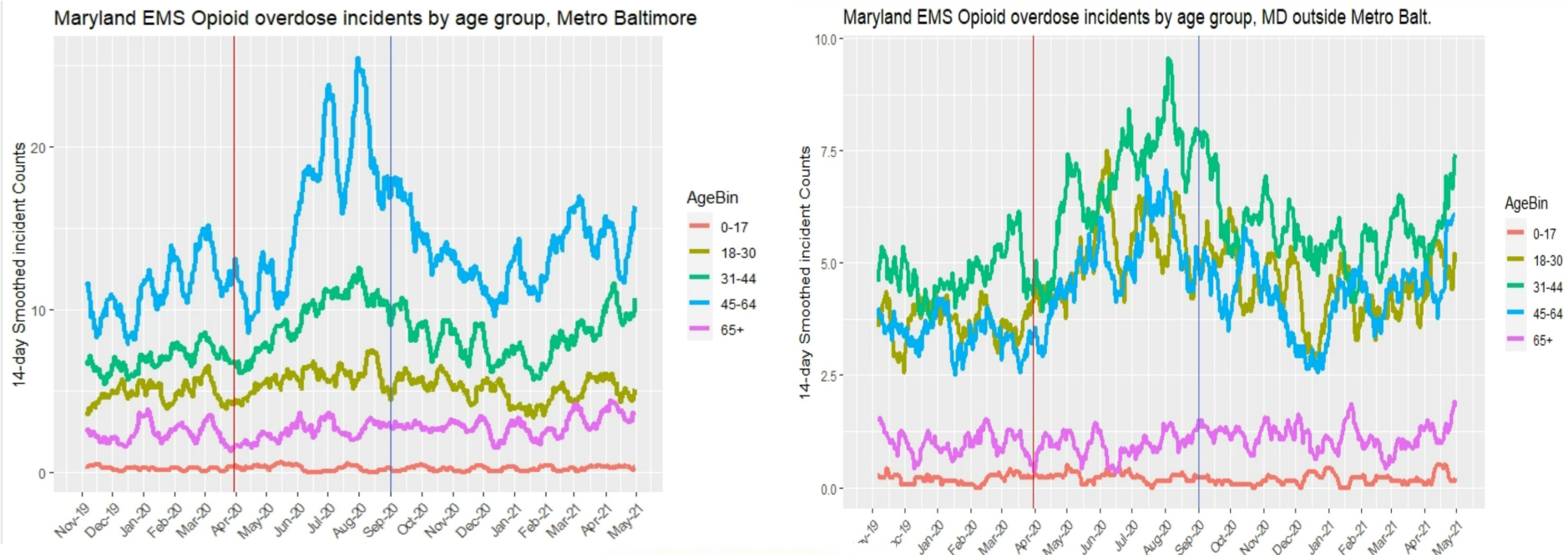


Top panel: EMS call counts for non-opioid incidents

Middle panel: EMS call counts for opioid-related incidents

Bottom panel: Proportion of EMS call counts that are related to opioid overdose

Figure 6: The pandemic differentially affected the age distribution of opioid calls in different parts of Maryland



Left panel: EMS call counts opioid-related incidents in Metro Balti



Right panel: EMS call counts for opioid-related incidents outside Metro Baltimore

Conclusions

COVID-19 worsened the opioid crisis in Maryland, impacting some populations more than others

COVID-19 also decreased the likelihood that individuals experiencing an opioid-related overdose would seek further medical care following an EMS call.

The pandemic-

- **impacted** healthcare utilization by Maryland residents
- **exacerbated** the opioid crisis in Maryland.
- **shifted the burden of overdose** to various subpopulations by sex and age

Public Health Implications

- **Sharing data with prevention partners** to support targeted and data driven interventions, including but not limited to:
 - Increasing EMS naloxone leave behind coverage and capacity
- **Promoting community naloxone distribution**, fentanyl test strips, and **harm reduction services** to **high-risk groups**, including males and younger age groups in greater Baltimore area
- **Supporting evidence-based interventions** in impacted Baltimore metropolitan areas including needle exchange, hospital bridge programs, methadone clinics, availability of buprenorphine-waivered physicians

THANK YOU

Questions?



Karin Hoelzer, DVM, PhD
Maximus





MINING CITIZEN INQUIRIES TO PUBLIC HEALTH HOTLINES FOR SYNDROMIC SURVEILLANCE AND PUBLIC HEALTH ACTION

Tried and True Syndromic Surveillance Methods for New Data

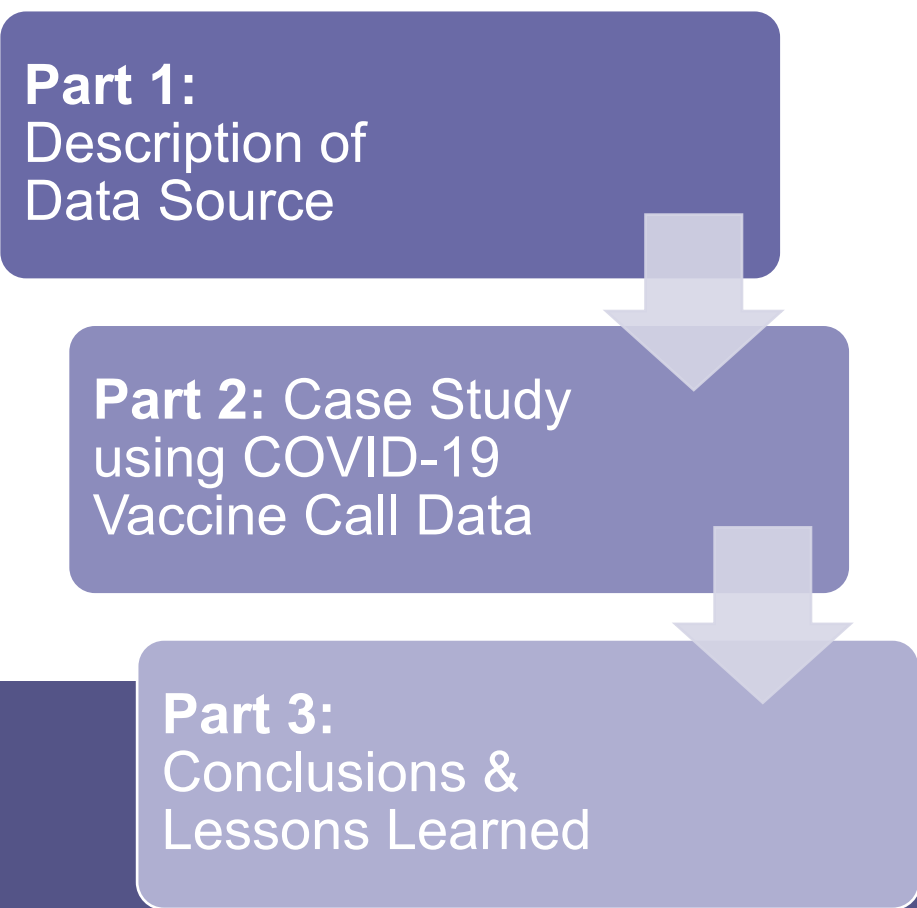
November 17, 2021

Call Transcripts as a Data Source for Syndromic Surveillance

Study Summary:

- **Hypothesis:** Calls to public health hotlines can serve as a non-traditional source of syndromic surveillance data
- **Objective:** Identify signatures of public health events & better understand the target population's unmet public health related needs
- **Approach:** Retrospective analysis of call data
 - Call volume and trends over time
 - Call content (topic mining, sentiment analysis, other Natural Language Processing (NLP) techniques)

Part 1:
Description of
Data Source



Part 2: Case Study
using COVID-19
Vaccine Call Data

Part 3:
Conclusions &
Lessons Learned

Part 1: Description of Data Sources

Strengths

Most Motivated
Individuals

Immediacy

Richness &
Granularity

Availability

Limitations

Biased Sample

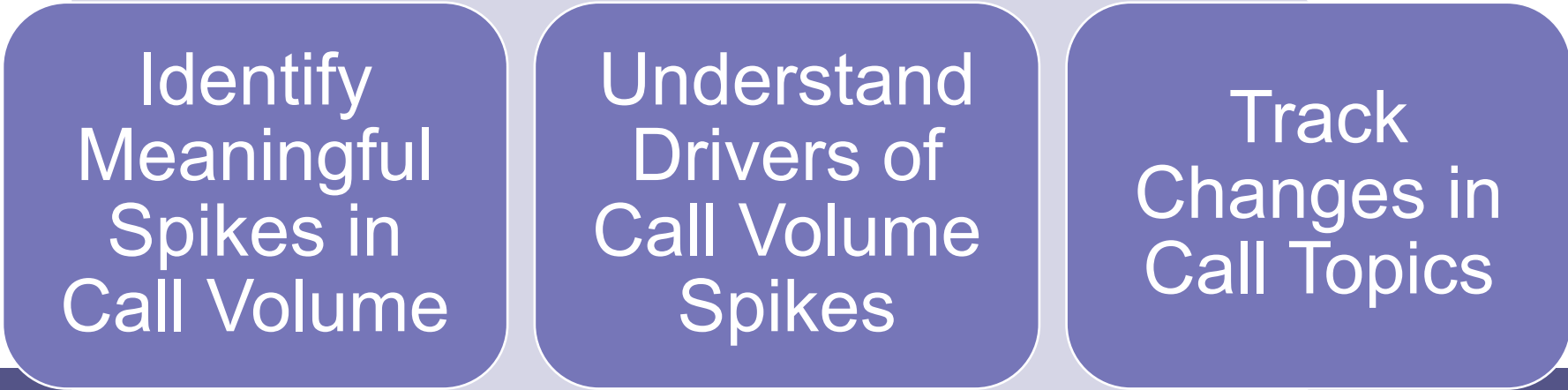
External
Influences

Analytical
challenges

How data are generated:

- **Call is recorded** (separately for caller and agent)
- **Transcription is generated** (automatic transcription; PII and PHI is removed)
- **Transcriptions & meta-data are analyzed** (call volume, call time & duration; call topics & sentiment, etc.)

Part 2: Case Study using COVID-19 Vaccine Call Data

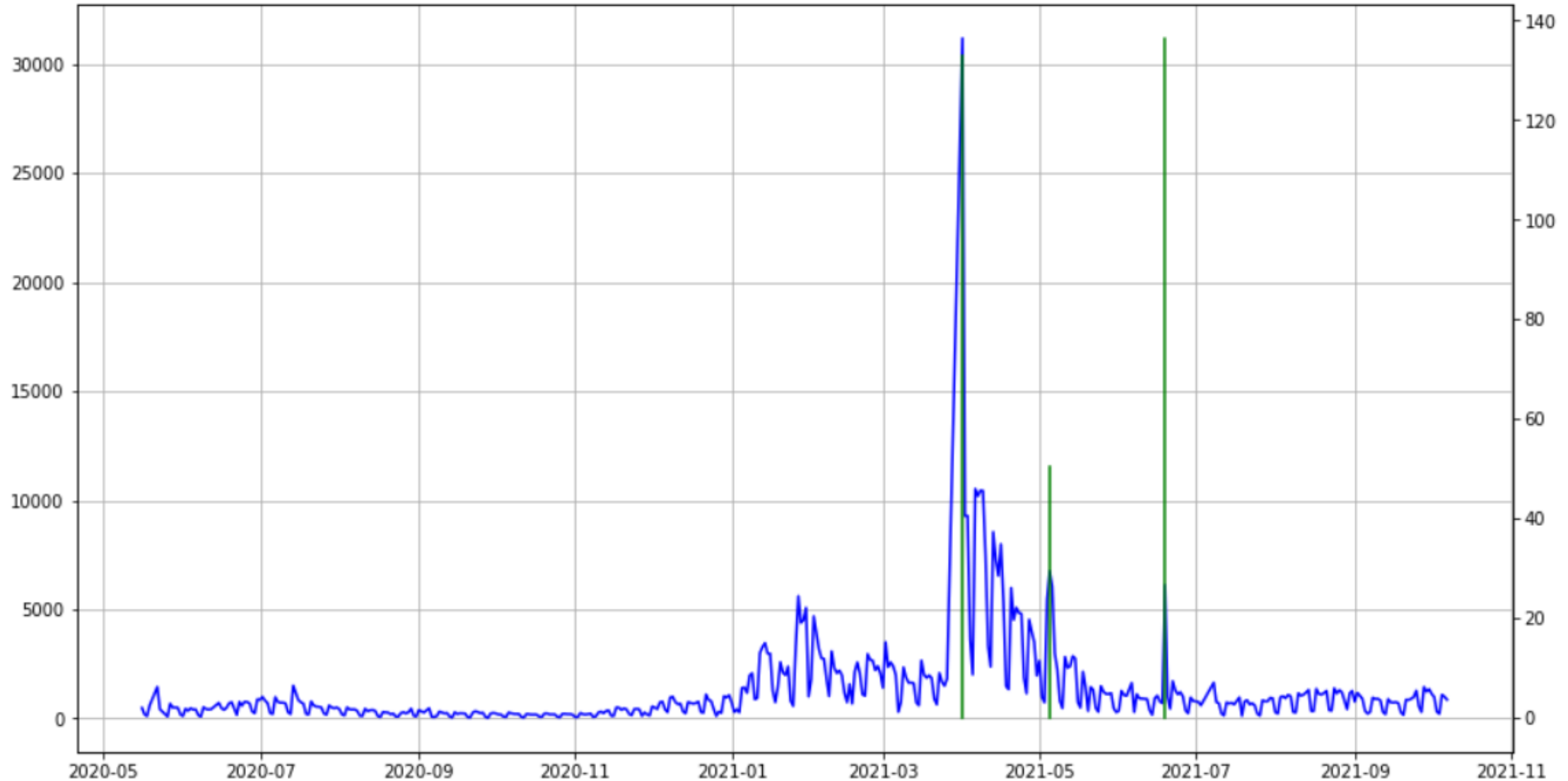


Identify
Meaningful
Spikes in
Call Volume

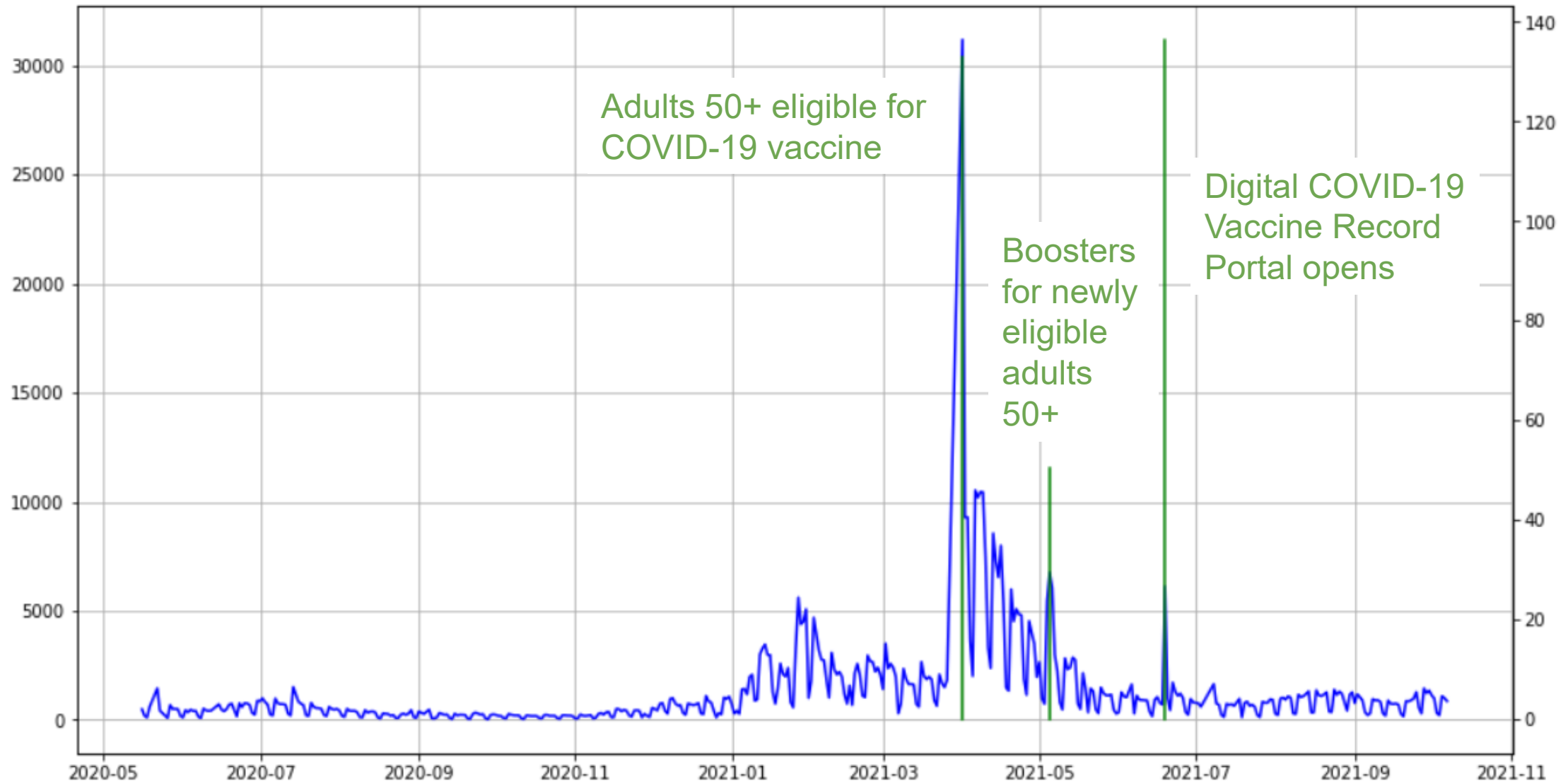
Understand
Drivers of
Call Volume
Spikes

Track
Changes in
Call Topics

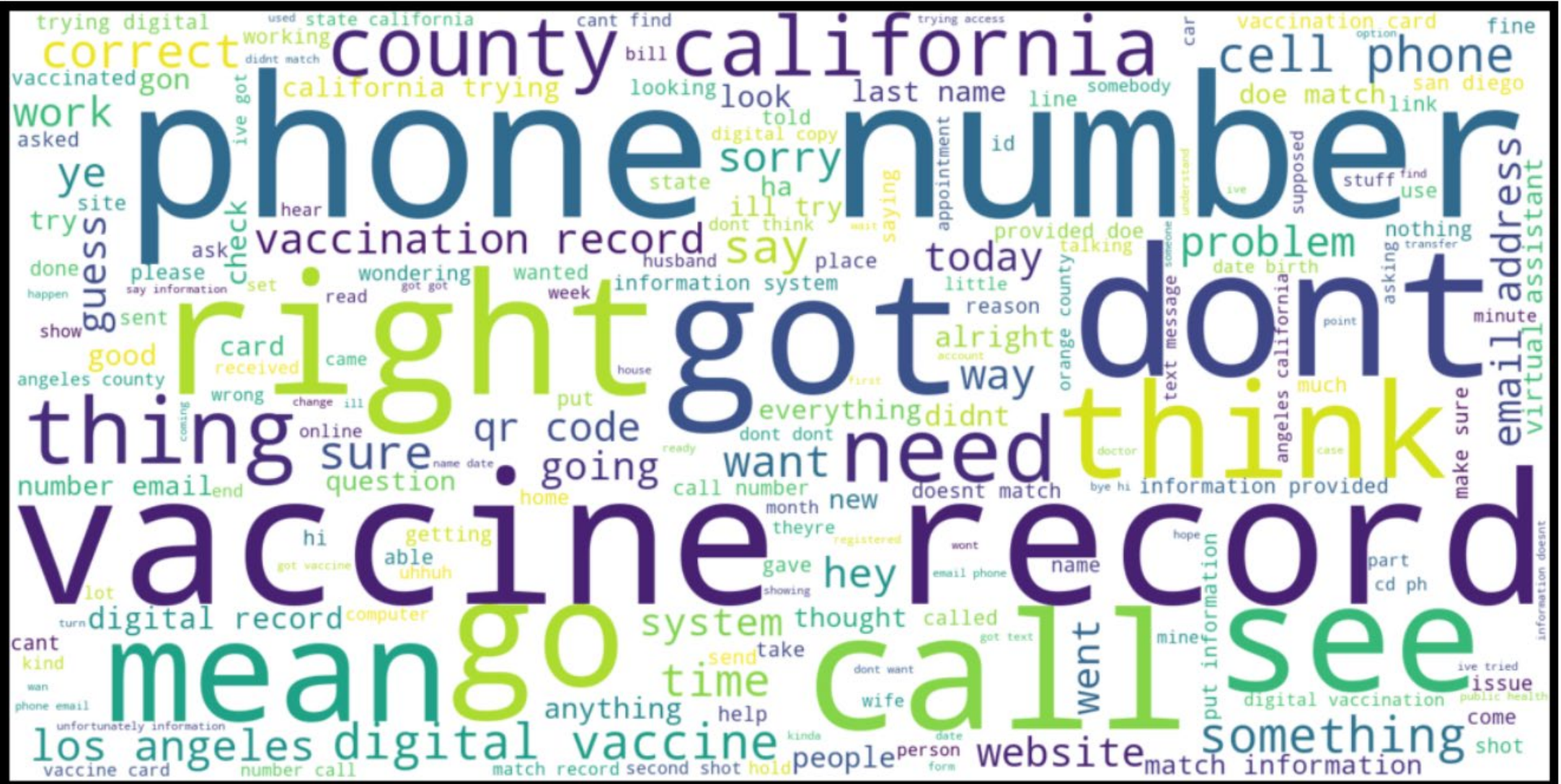
Public Health Events Drive Corresponding Spikes in Call Volume



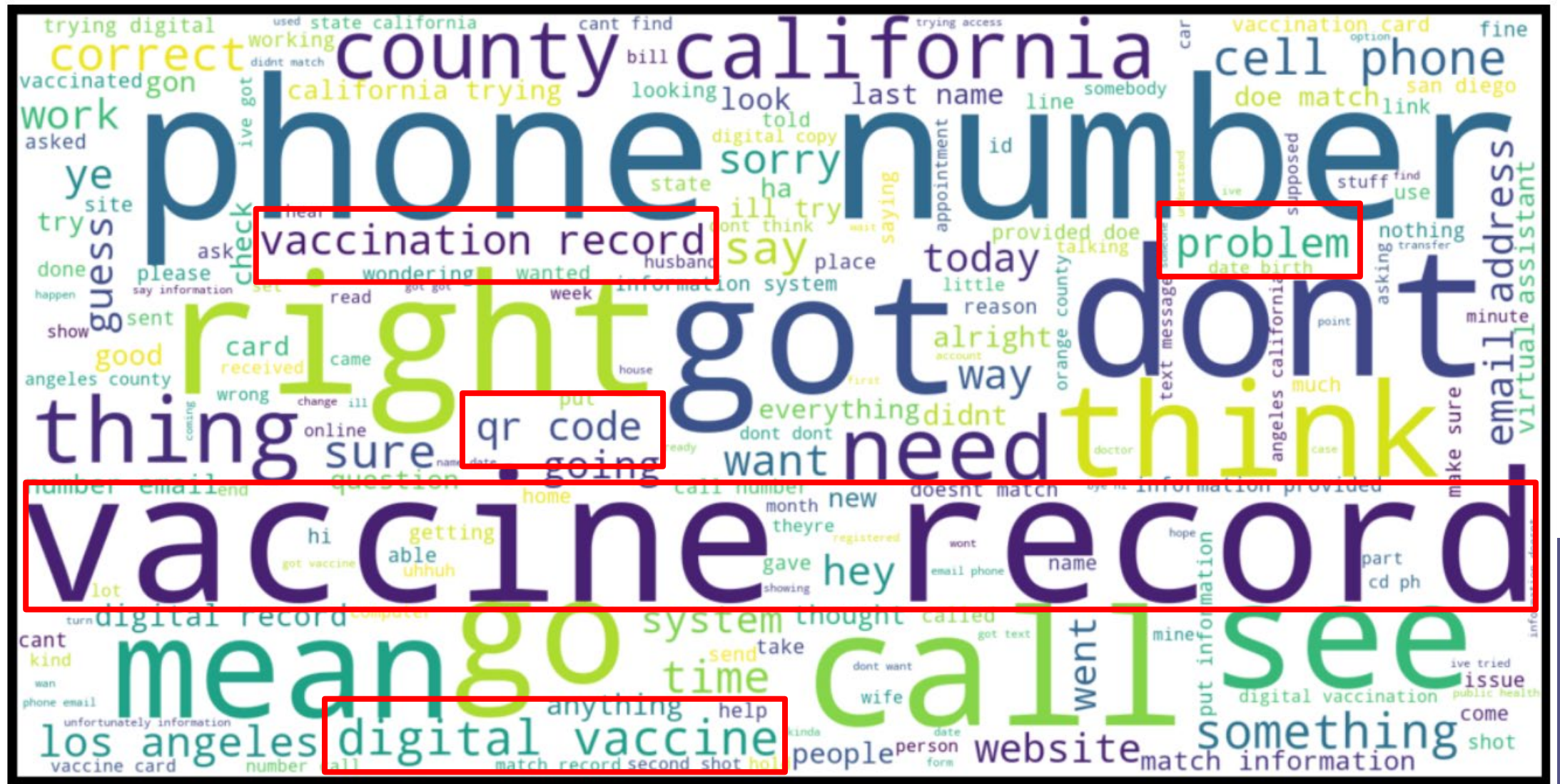
Public Health Events Drive Corresponding Spikes in Call Volume



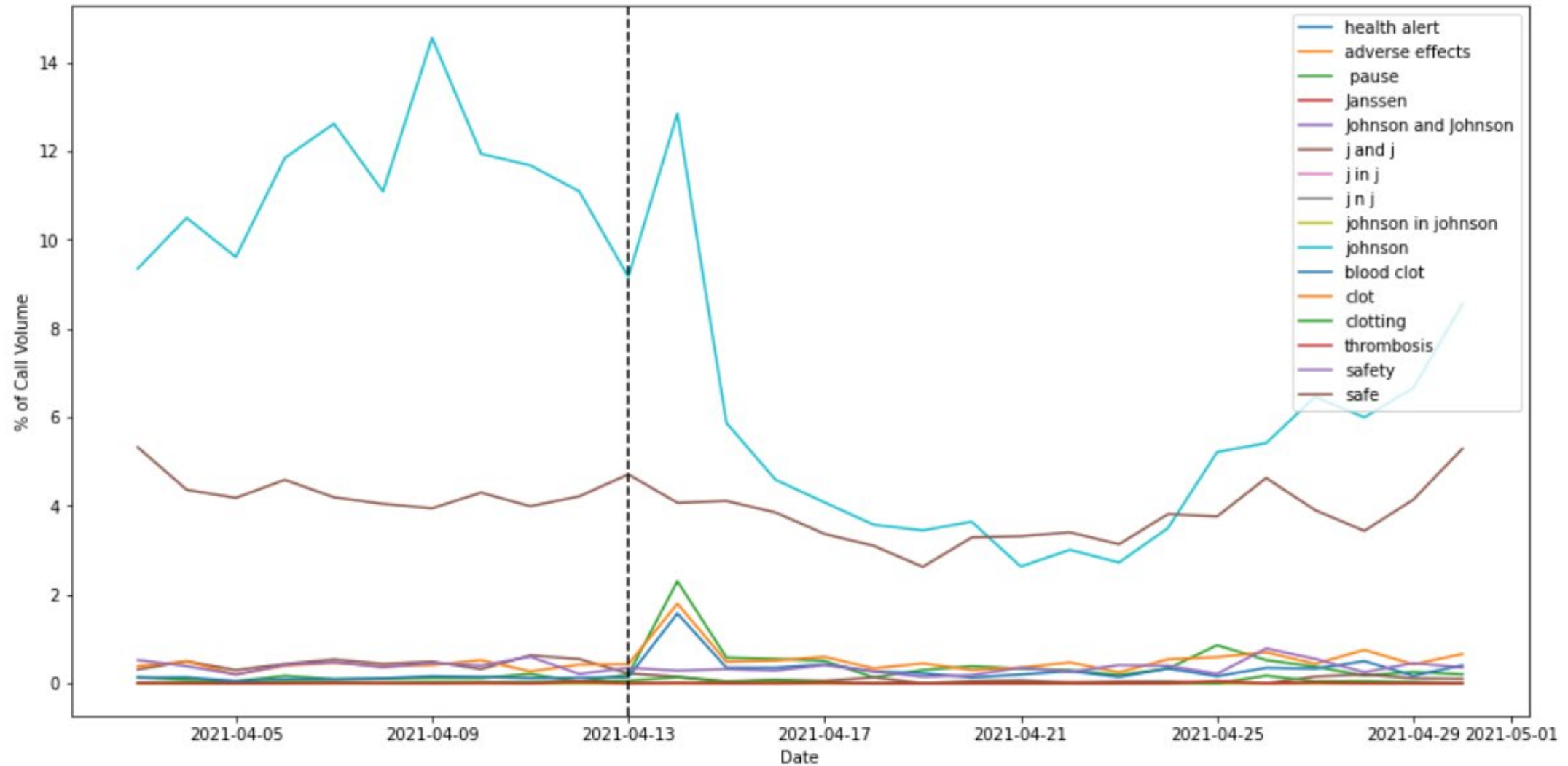
Topic Mining Can Identify Drivers of Call Volume Spikes



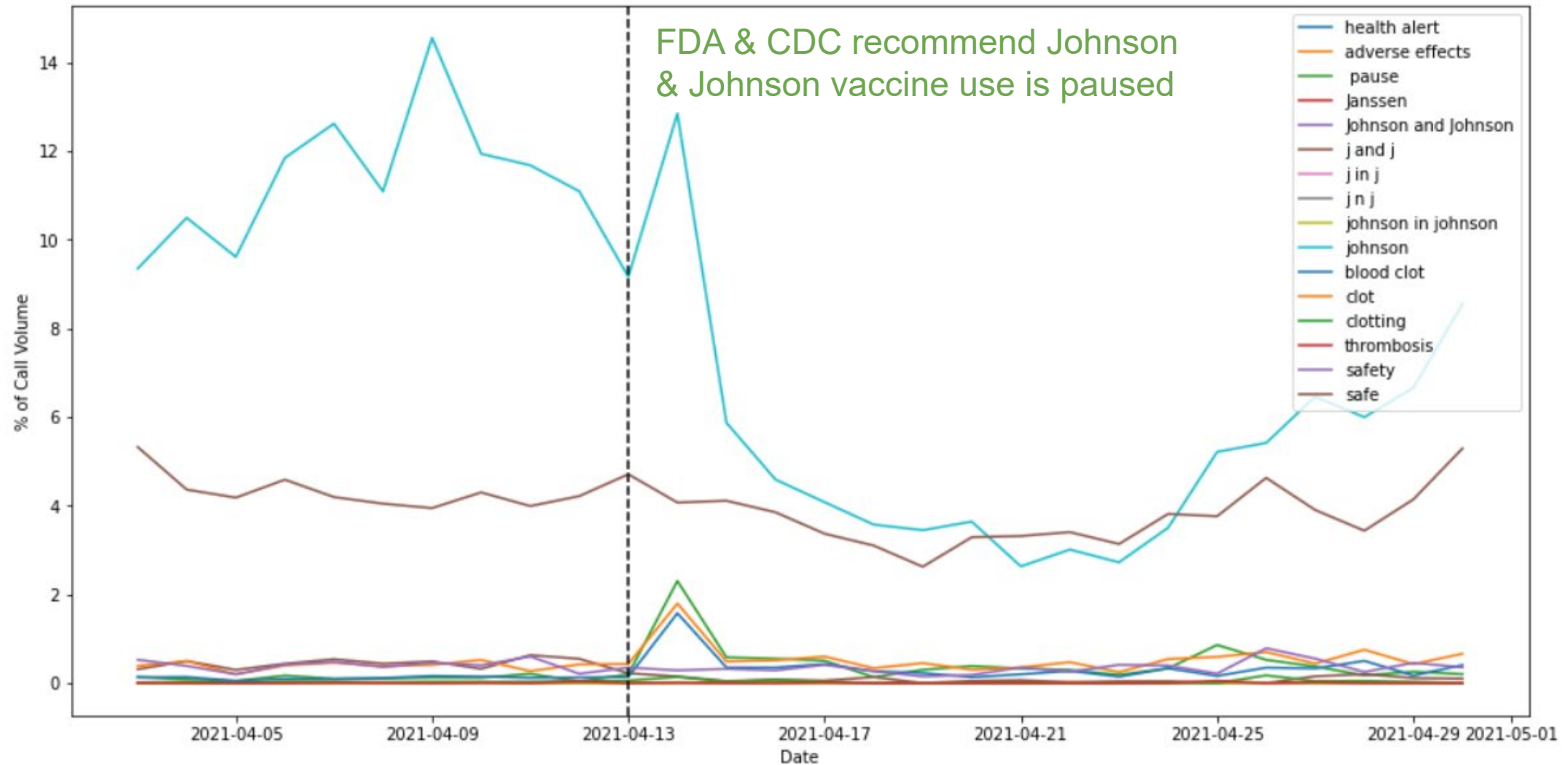
Topic Mining Can Identify Drivers of Call Volume Spikes



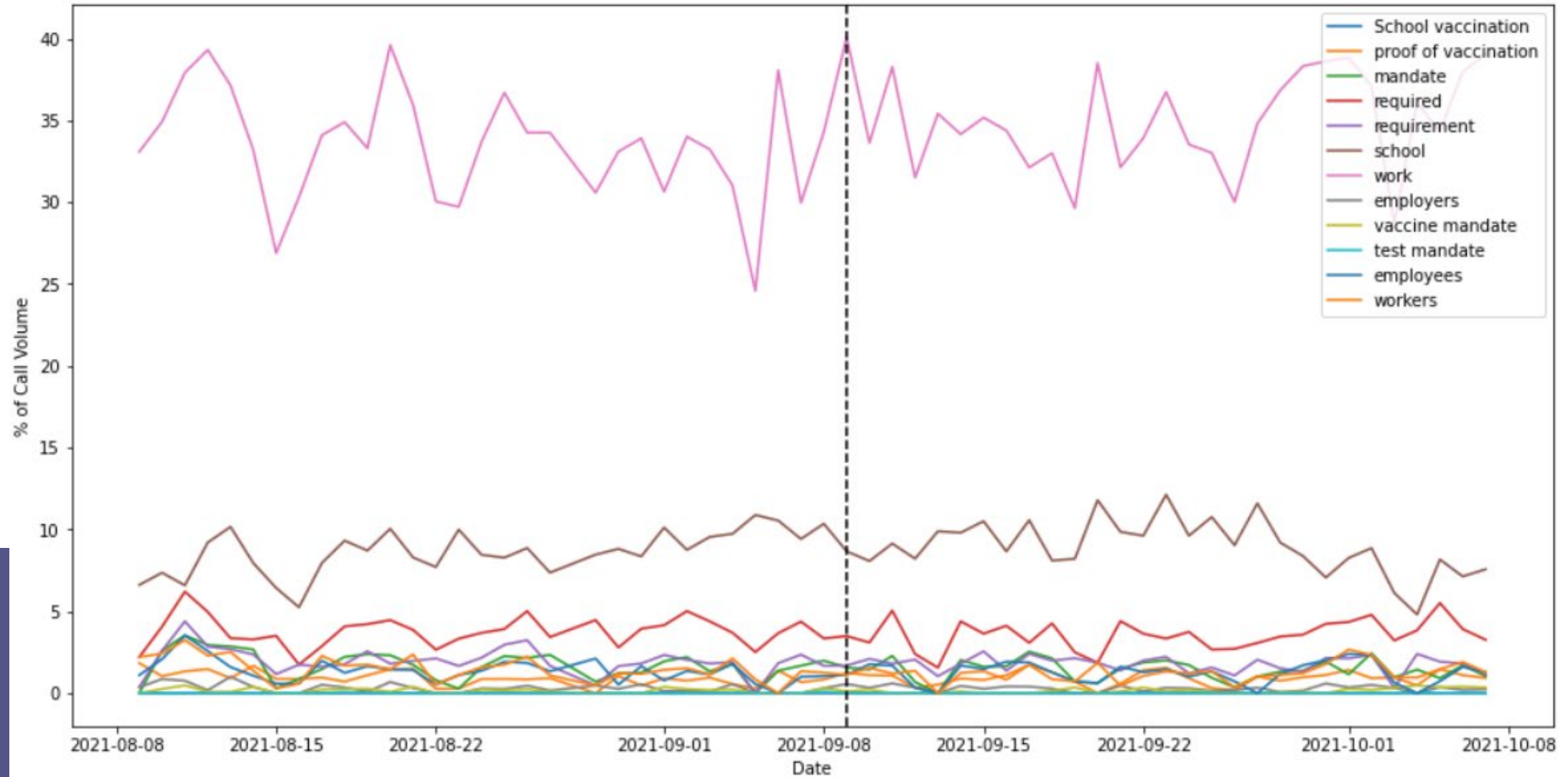
Public Health Events Drive Shifts in Call Topics



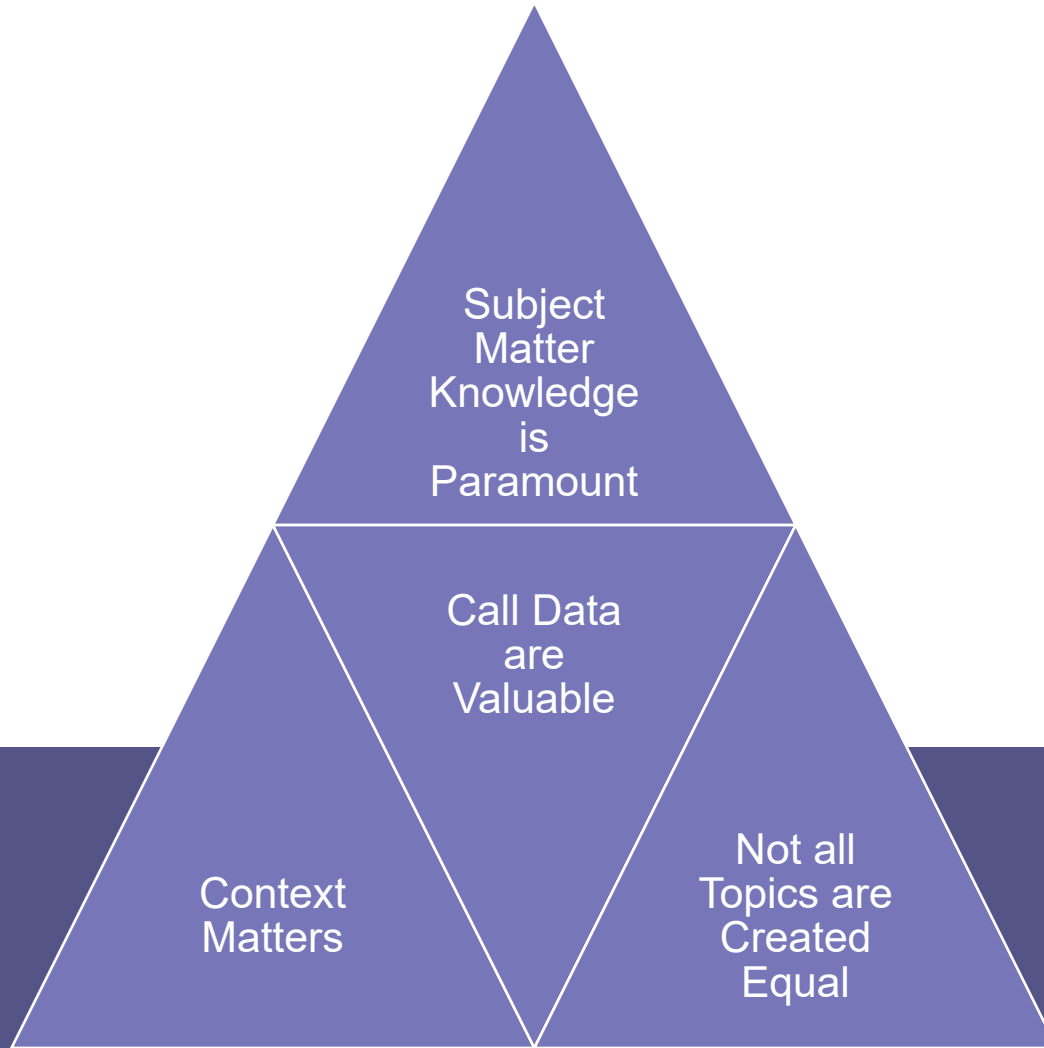
Public Health Events Drive Shifts in Call Topics



Changes in Call Topics can be Tricky to Identify



Part 3: Conclusions & Lessons Learned



Where this leaves us:

- **Call data have promise for surveillance & can identify unmet population needs**
- **Use case exposes new statistical / data science challenges**
- **Local knowledge & logistical insights are paramount for understanding external influences on call data**

Contact Me With Questions or To Continue the Conversation



"Now, that's a welcome sight! I was just beginning to miss decision-making."

Karin Hoelzer, DVM, PhD

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Maximus Inc.

Phone: 607-339-6561

Email: KarinHoelzer@maximus.com

<https://www.newyorker.com/books/novellas/many-a-little-makes>

Thank you to my co-authors who made this work possible!



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Health & Environment



Enhancing Cannabis Poison Center Surveillance in Colorado

- Syndromic Surveillance Symposium
- 11/17/2021

DeLayna Goulding, MPH
Colorado Department of Public Health and Environment

Objectives

1. To provide an overview of the collaboration between Colorado DPHE and poison center to monitor cannabis exposures
2. To describe pilot “Enhanced” Cannabis Surveillance, definitions, and methods
3. To share preliminary results, public health outcomes, and ideas for future use

Background: Changes in Cannabis Products

Evolving Environment

- Policies
- Methods of use
- Types of products

Health Outcomes

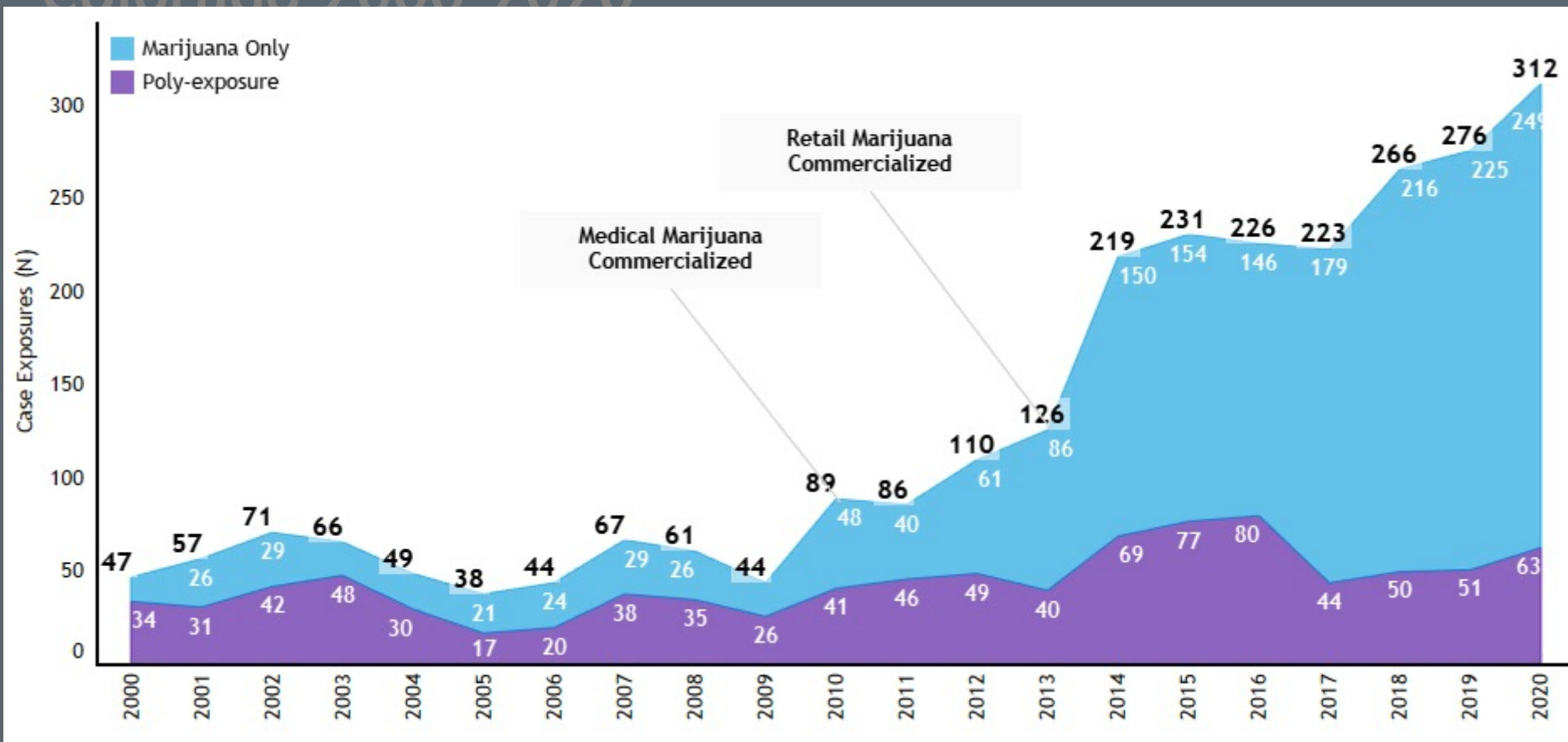
- Novel outbreaks (EVALI)
- Adverse health effects (Delta-8)

Public Health

- Enhance surveillance
- Improve response capacity



Frequency of cannabis product exposures reported to poison center, Colorado 2000-2020



Rocky Mountain Poison & Drug Safety

- Serves as Colorado's poison center (PC)
- RMPDS collaborates to monitor cannabis exposures in Colorado

Generic Code	Generic Code Names
0310146	Cannabidiol (CBD)
0310096	eCigarettes: Marijuana Device Flavor Unknown
0310034	eCigarettes: Marijuana Device With Added Flavors
0310033	eCigarettes: Marijuana Device Without Added Flavors
0310097	eCigarettes: Marijuana Liquid Flavor Unknown
0310036	eCigarettes: Marijuana Liquid With Added Flavors
0310035	eCigarettes: Marijuana Liquid Without Added Flavors
0310124	Marijuana: Concentrated Extract (Including Oils and Tinctures)
0083000	Marijuana: Dried Plant
0310121	Marijuana: Edible Preparation
0310122	Marijuana: Oral Capsule or Pill Preparation
0310126	Marijuana: Other or Unknown Preparation
0310125	Marijuana: Topical Preparation
0310123	Marijuana: Undried Plant

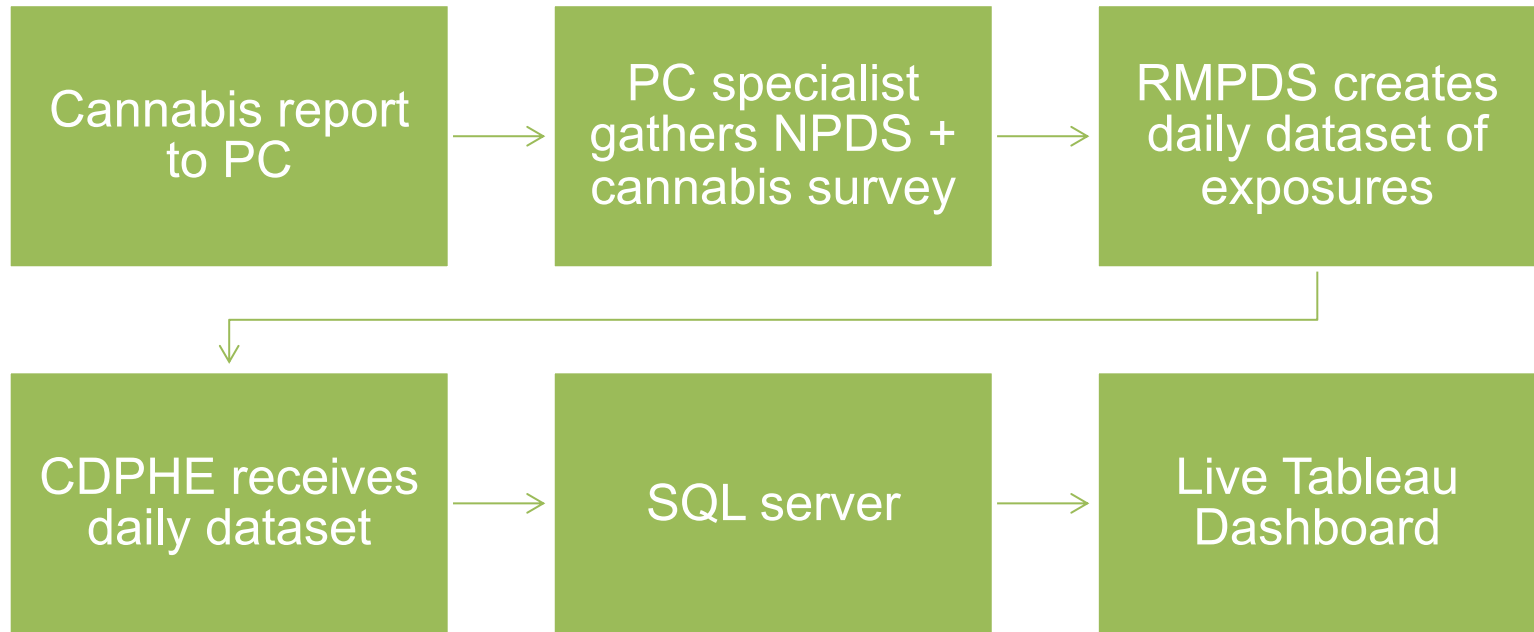
- Get annual NPDS dataset (closed)
- Get direct PC data (open)
- Survey questions specific for cannabis products

Pilot: Enhanced Poison Center Surveillance

Goal: Pilot methods to enhance this process to improve surveillance & response capacity

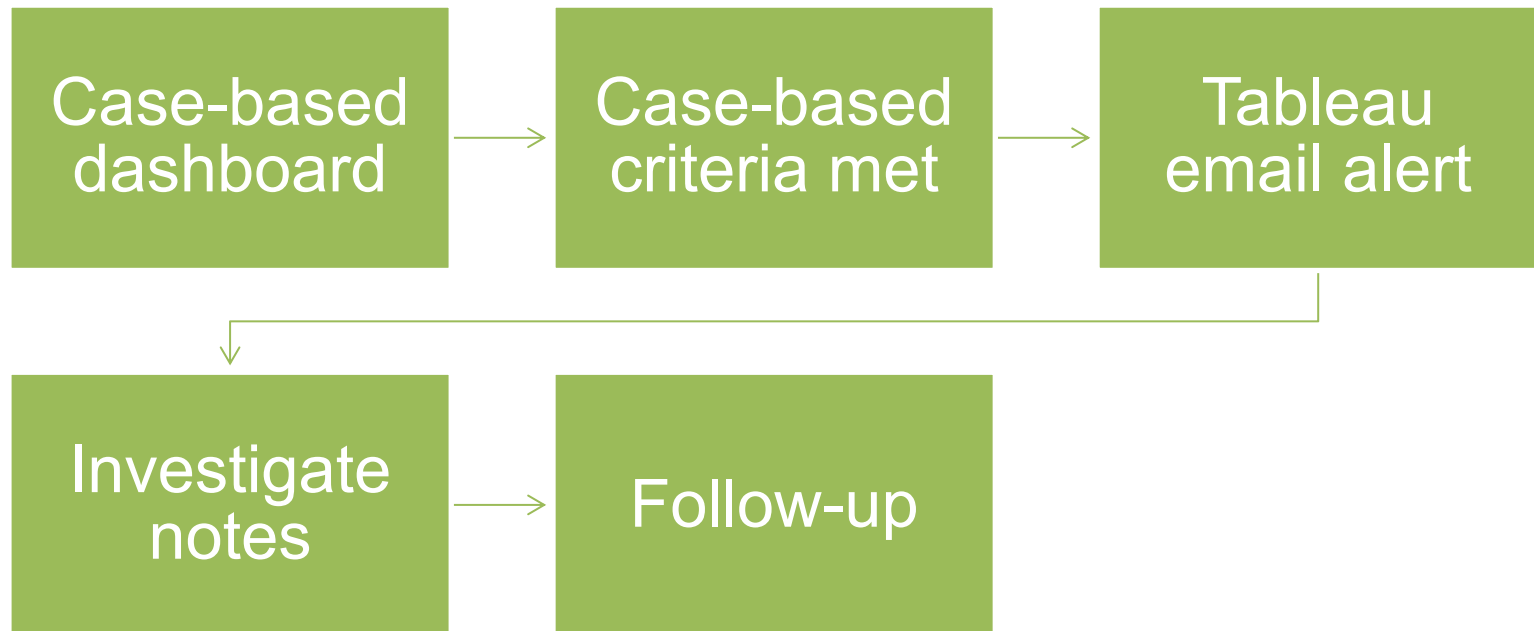
Method	Description	Purpose
Case-based	Immediate investigation into cannabis exposures that meet definition criteria	Increased response for known adverse effects in areas of public health significance
Volume-based	Monitor increases and detect outliers in the volume of reports	Monitor patterns & timely priority setting
Survey	Gather more detailed information on cannabis product and related effects	Active surveillance
Outbreak	Examine location, obtainment, brand	Outbreak response

Data Flow



Case-based: Methods

- Immediate investigation into cannabis exposures that meet definition criteria
- Cannabis exposure meets case definition
- Clinical investigation & follow-up



Case-based: Definition

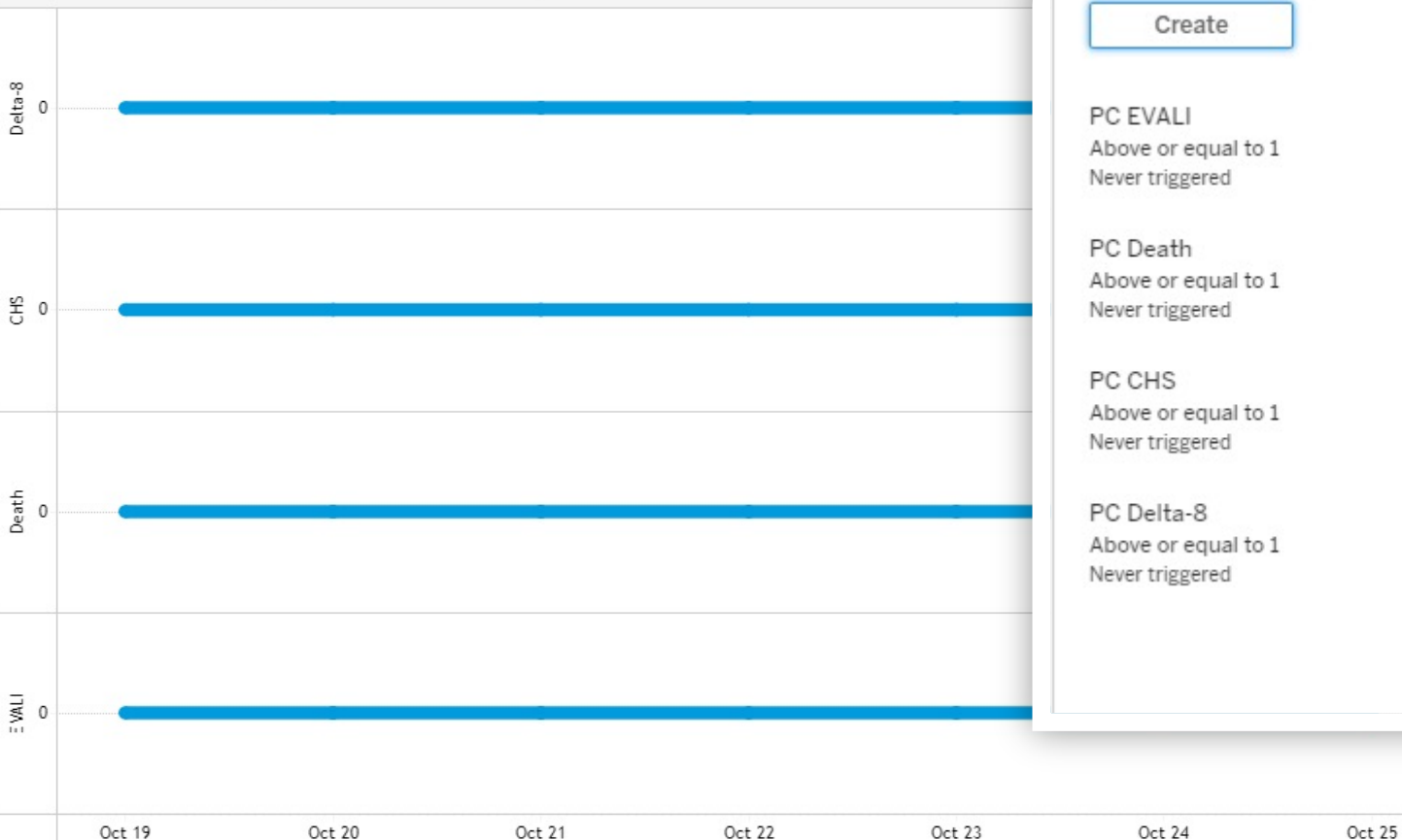
- Reported cannabis exposure meets criteria
- Piloting sensitivity

Case-based Definition	Criteria
Death	Marijuana or cannabidiol exposure where medical outcome is death
Delta-8	Marijuana exposure where at least one product code is delta-8
Cannabinoid Hyperemesis Syndrome	<u>Intentional</u> cannabis exposures reporting clinical effects of nausea, vomiting, and 1 or more of the following: Abdominal Pain, Alkalosis, Dehydration, or Electrolyte abnormality
EVALI	Electronic device/liquid exposures reporting clinical effects of dyspnea, cough, and 1 or more of the following: chest pain, fever, nausea, pneumonitis, tachycardia, or vomiting

Case-based: Investigation

Case Based Surveillance

Frequency of Case-based cannabis exposures,
Colorado October 19, 2021 to October 25, 2021



Alerts

Create

PC EVALI
Above or equal to 1
Never triggered

Actions ▼

PC Death
Above or equal to 1
Never triggered

Actions ▼

PC CHS
Above or equal to 1
Never triggered

Actions ▼

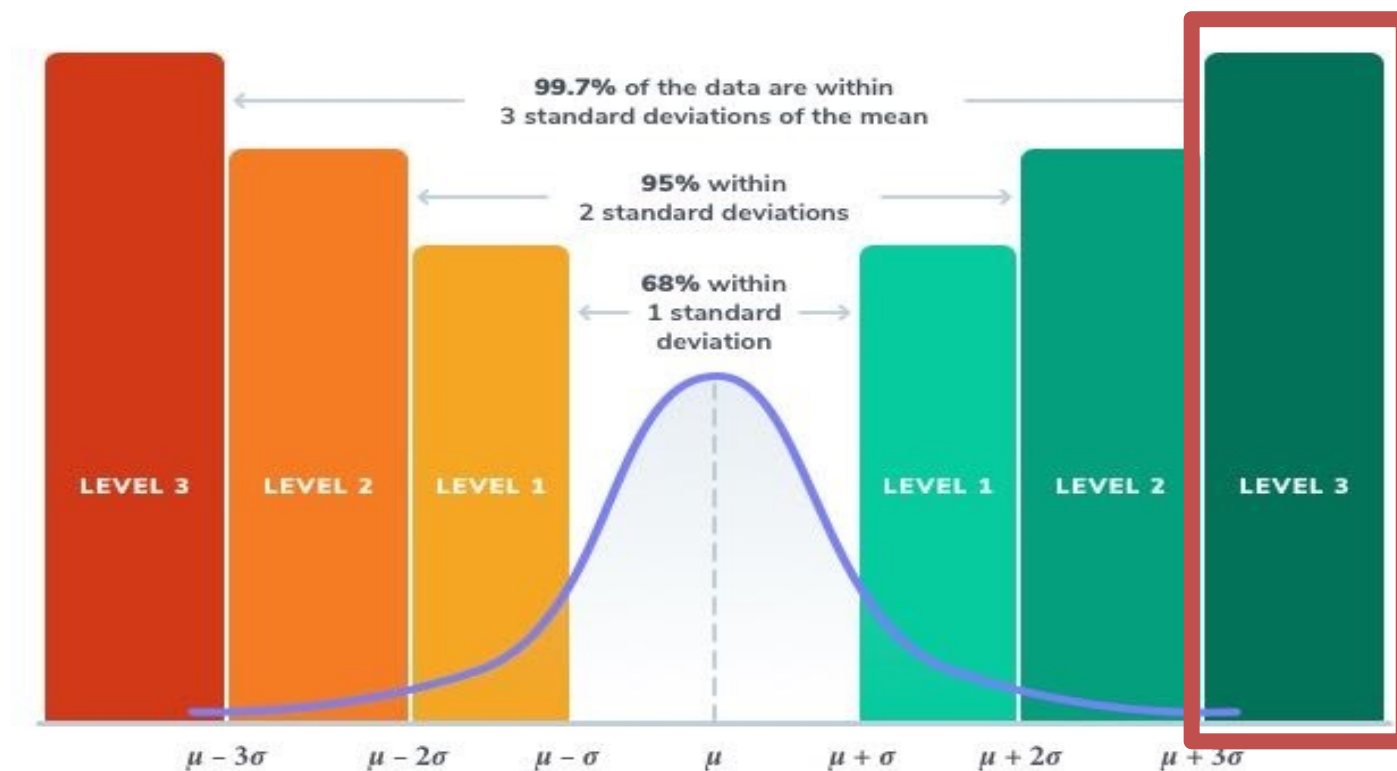
PC Delta-8
Above or equal to 1
Never triggered

Actions ▼



Volume-based: Method

- Monitor increases and detect outliers in the volume of reports
- Limitations: No denominator, quick investigation tool in tableau



Volume-based: Definition

- Weekly or monthly frequency of exposures or clinical effects outside expected range
- Compared to past 3-years

Volume Definition	Time Range	Baseline Comparison	Baseline Comparison Inclusion	Outlier
Weekly Exposure Frequency	Last 7 day count (Nw)	Past 3-year week average (3yrw Avg)	Same week +-7 days	Nw >3 Standard Deviations
Monthly Exposure Frequency	Current month count (Nm)	Past 3-year month average (3yrM Avg)	Same month	Ne > 3 Standard Deviations
Monthly Clinical Effect Frequency	Current month count by clinical effect (Nce)	Past 3-year month average (3yrM Avg)		Nce >3 Standard Deviations

Volume-based: Investigation

Filter Surveillance Criteria

Call Information

Report Date

1/1/2017 7:40:35 PM 10/25/20



Caller Type

- ☒ Health Care
- ☒ Family or Friend
- ☒ Self
- ☒ Other/Unknown
- ☒ Pet Owner

Case Information

Age

- ☒ (All)
- ☒ 0-5 years
- ☒ 6-12 years
- ☒ 13-19 years
- ☒ 20-29 years
- ☒ 30-39 years
- ☒ 40-49 years
- ☒ 50-59 years
- ☒ 60+ years
- ☒ Unknown Age

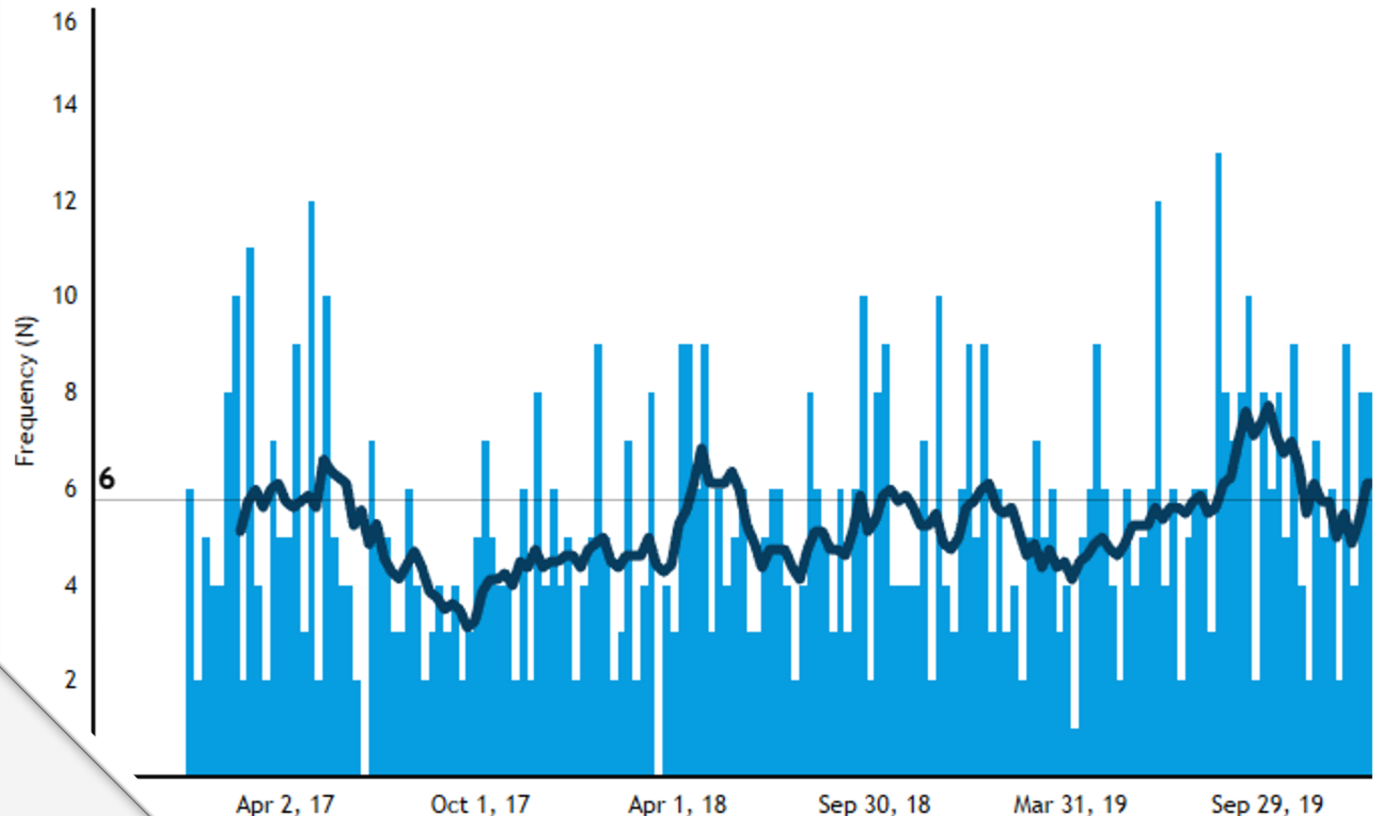
Sex

- ☒ Female
- ☒ Male
- ☒ Unknown

epicurve of Marijuana Exposures Reported to Rocky Mountain Poison

Exposures Last 7 Days

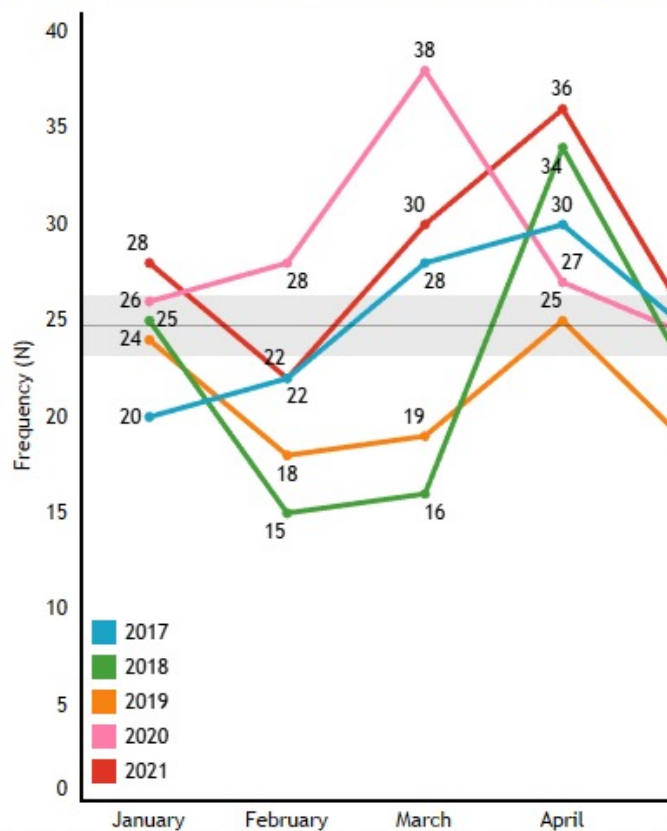
$\bar{N}=5$ (5.2; Same)



Volume-based: Investigation

Monthly Call Volume

Frequency of Reported Marijuana Exposures



Outlier Detection, 2021

January	28
February	22
March	30
April	36
May	24
June	32
July	33
August	
September	
October	
November	
December	

In July, 2021 33 Cannabis Exposures Reported
Past 3-year Monthly Average: **24.7**
Standard Deviation: **4.7**
Outlier: **Same**

Volume-based: Tableau LOD Variables

COUNT_month

 PC Case Details

```
{ FIXED DATETRUNC('year',[Call Date]),DATETRUNC('month',[Call Date]) :COUNTD([Receptor ID]) }
```

AVG_month_3year

 PC Case Details

```
{FIXED DATETRUNC('month',[Call Date]):  
AVG(IF { FIXED : max(DATEPART('year',[Call Day])) - DATEPART('year',[Call Day]) <=3  
and { FIXED : max(DATEPART('year',[Call Day])) - DATEPART('year',[Call Day]) >0  
THEN [COUNT_month] END) }
```

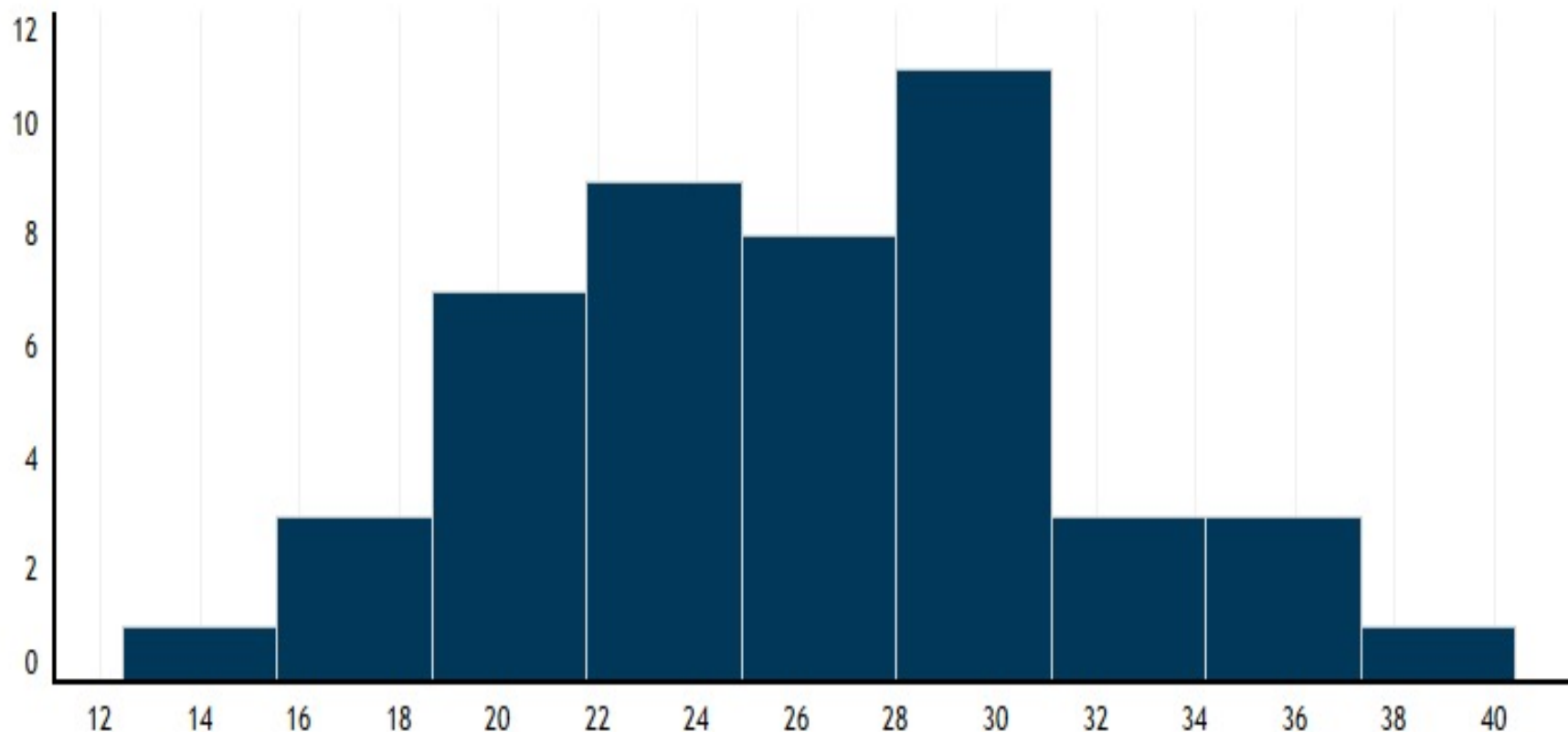
Outlier Month

 PC Case Details

```
IF avg([CNT_month_current])>= (AVG([AVG_month_3year])+(STDEV([AVG_month_3year])*3)) THEN "Outlier"  
ELSE "Same"  
END
```

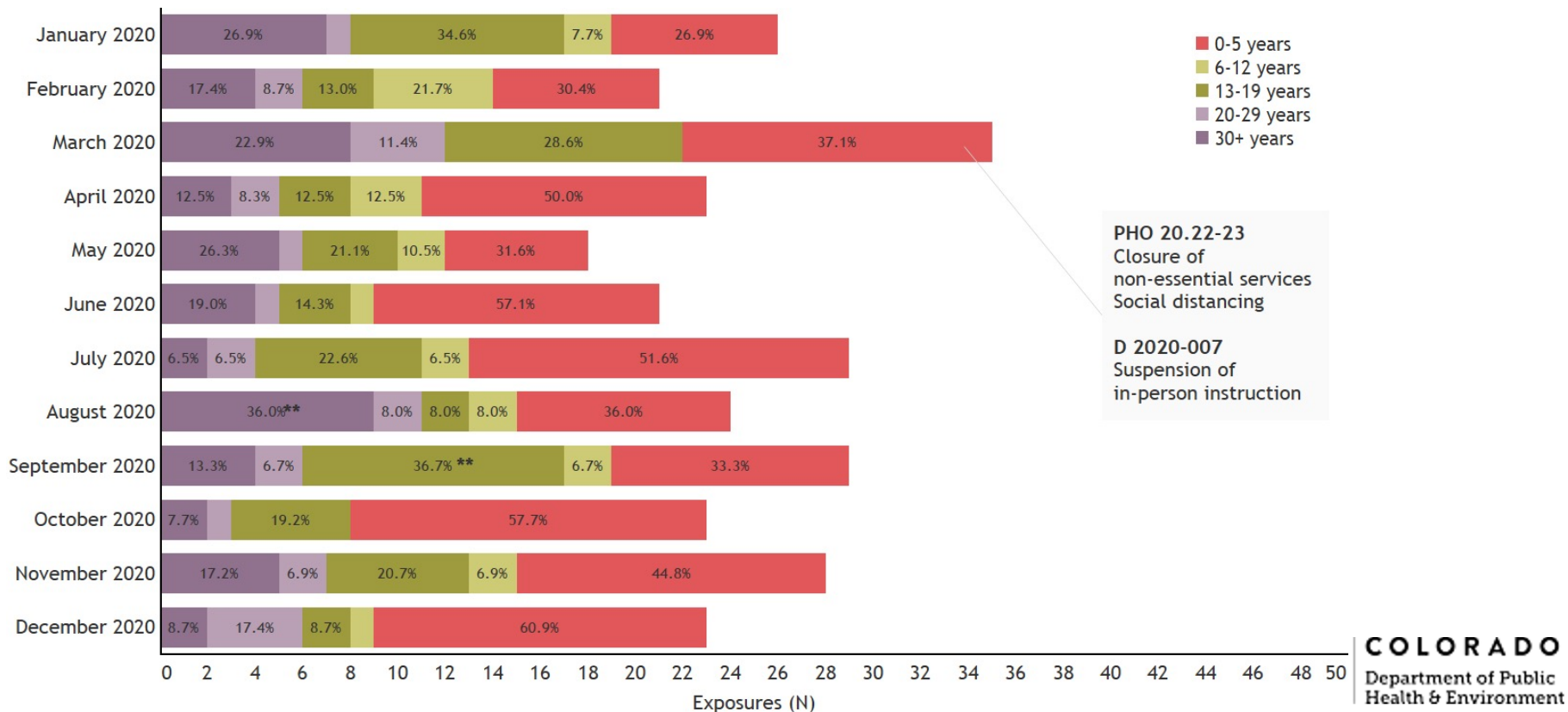
Volume-based: Tableau Normality Check

Past 3-year Distribution



Preliminary Results

- Immediate investigation Delta-8 reports
- Monthly reports for leadership (CBD)
- Monitor & prioritize during COVID



Conclusions

- Tableau alerts have improved response capacity (product)
- Tableau dashboards increased ability to monitor and investigate trends
- Improved prioritization communication to prevention services department
- Enhanced collaboration between CDPHE & Poison Control

Future Directions

- Continue to pilot sensitivity
- Investigate clinical effect specificity with case based definitions
- Develop “outbreak” definitions & brand specific
- Integrate additional data sources

THANKS!

Rocky Mountain Poison & Drug Safety Marijuana Health Monitoring Program Retail Marijuana Public Health Advisory Committee

Contact Information:

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COLORADO
Department of Public
Health & Environment

Q & A



Definitions

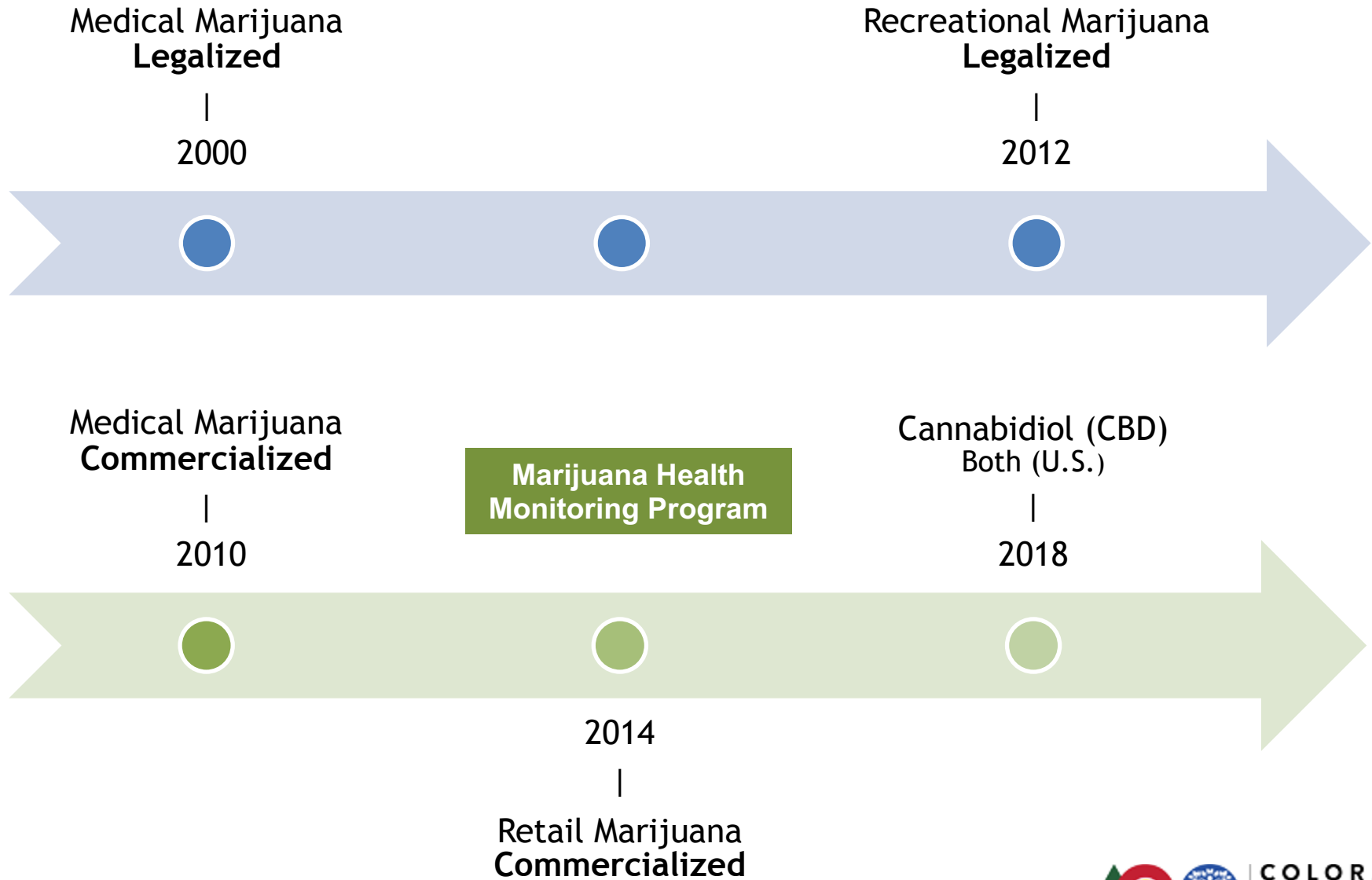
THC Concentration: THC content per volume or weight of marijuana products, usually measured in milligrams or percentage.

Method of Use: The manner in which marijuana is consumed.

Potency: An expression of the activity of a drug, in terms of the amount required to produce a defined effect.

Dose: Specified amount of THC taken (inhaled or milligrams consumed) at one point in time.

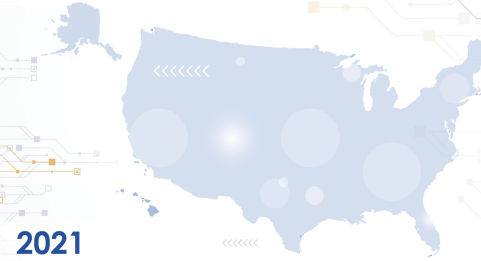
Cannabis in Colorado



National Syndromic Surveillance Program

Community of Practice

Resources that Advance the Science and
Practice of Syndromic Surveillance



2021

Syndromic Surveillance Symposium

Week of November 15, 2021



KAHUINA
CONSULTING