Tracking Infections through Time and Space

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

Moderator: Levi Schlosser, MPH – North Dakota Department of Health

Presenters:
Courtney Nawrocki, MPH – Centers for Disease Control and Prevention
Henri Menager, MD, MPH – Kansas Department of Health and Environment
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Council of State and Territorial Epidemiologists

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Centers for Disease Control and Prevention

CSTE

Emergency Department Visits for Tick Bites Consistently Predict Peak Visits for Lyme Disease in Areas of High and Medium Lyme Disease Incidence

Courtney Nawrocki, MPH
Epidemiologist
Division of Vector-Borne Diseases, CDC

National Syndromic Surveillance Symposium
November 17, 2021

Background

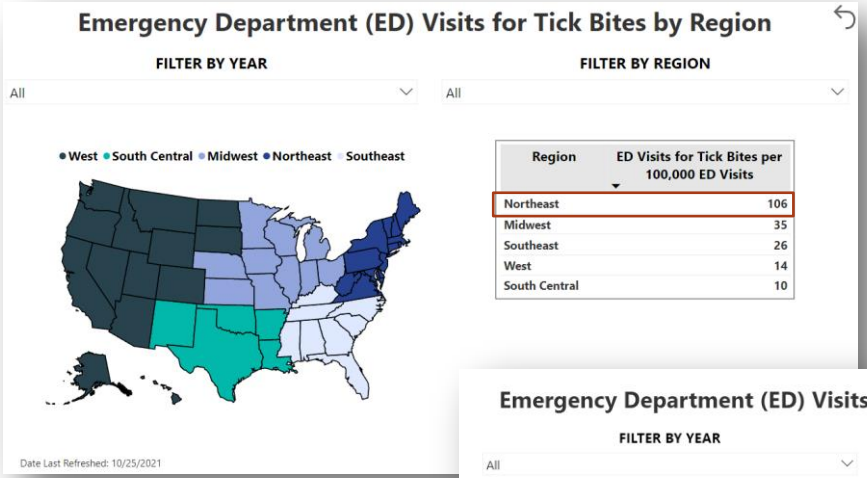
- Lyme disease is transmitted by ticks and incidence varies widely by region
- In 2019, CDC collaborated with the NSSP Community of Practice and state/local vector-borne disease epidemiologists to develop two new queries
  - **CDC Tick Exposure v1**
    - Tick ^,or,^ tick ^,^ tick,or,ticks ^,or,^ ticks ^,or,^ ticks,or,(,^ti[ck]^,AND,^bit[e]^,)
  - **CDC Lyme Disease v1**
    - (,^lyme^,or,(,(,^ lime ^,or,^lime,or,lime^,),AND,^disease^,),or,(,^Bull^,AND,^Eye^,AND,^Rash^,),or,^[;/]A69.2^,or,^[;/]A692^,),ANDNOT,(,^history l[iy]me^,or,^history of l[iy]me^,or,^lyment^,),

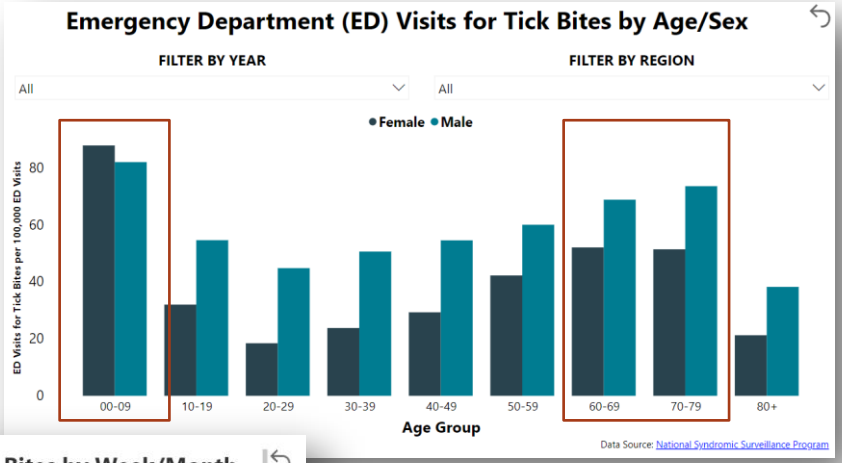
Syndromic surveillance can be a timely and complementary approach to traditional surveillance

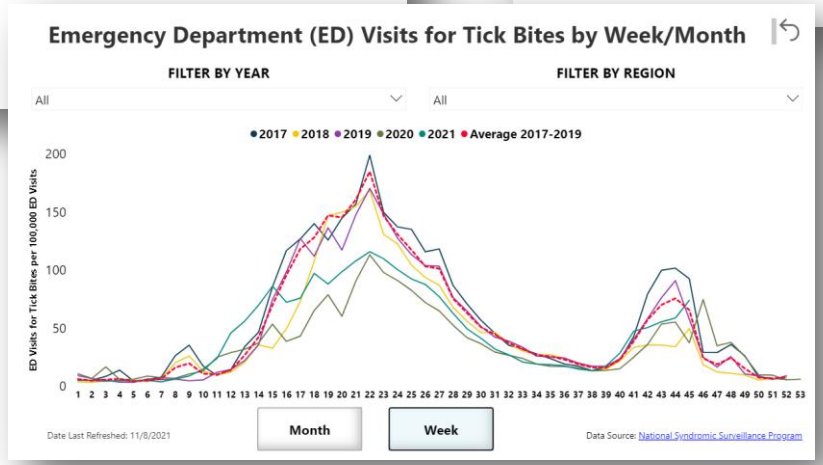
- Syndromic surveillance is currently the only approach for national tick bite surveillance
- Based on the current Lyme disease CSTE case definition, surveillance requires collection of clinical and laboratory data by state and local public health. This method is time and resource intensive and limited by:
  - Under-reporting and misclassification
  - Long delays (~2 yrs) in finalization of data and reporting

Syndromic surveillance for **tick bites** might be used as an early and timely indicator for **Lyme disease** risk.

What do we already know about ED visits for tick bite?







Tick Bite Data Tracker:
cdc.gov/ticks/tickEDvisits

Study objectives

- Describe regional patterns of ED visits for **tick bite** and for **Lyme disease**, stratified by Lyme disease incidence

- Determine whether peak ED visits for **tick bite** might predict ED visits for **Lyme disease**

Methods

Tick bite and Lyme disease queries were applied to three regions with known high, medium, and low Lyme disease incidence during 2017-2019

Reported Cases of Lyme Disease, United States, 2019

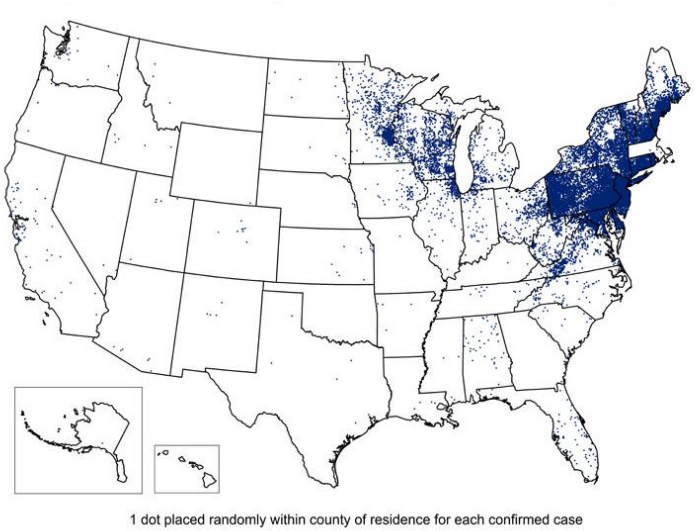


Image: hhs.gov

HHS Regional Map

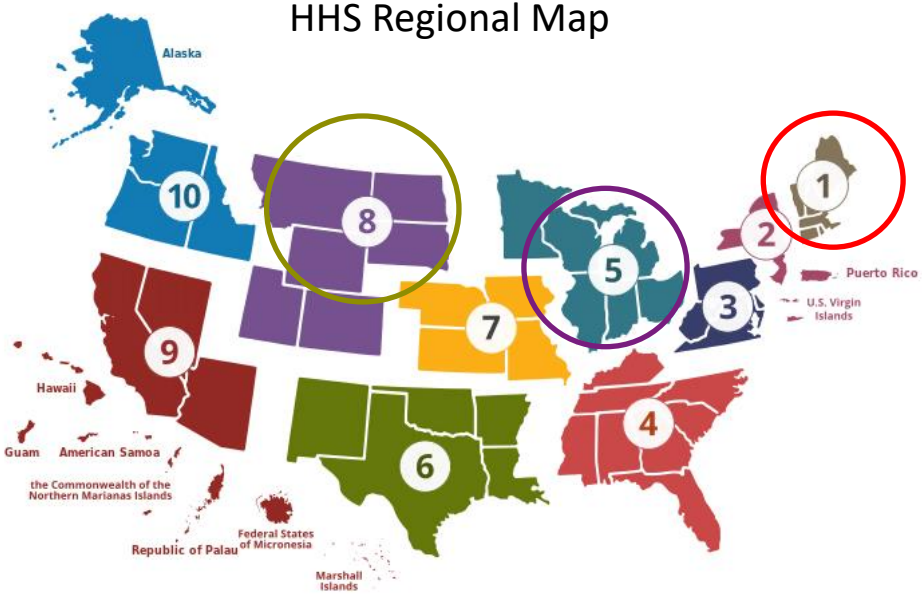


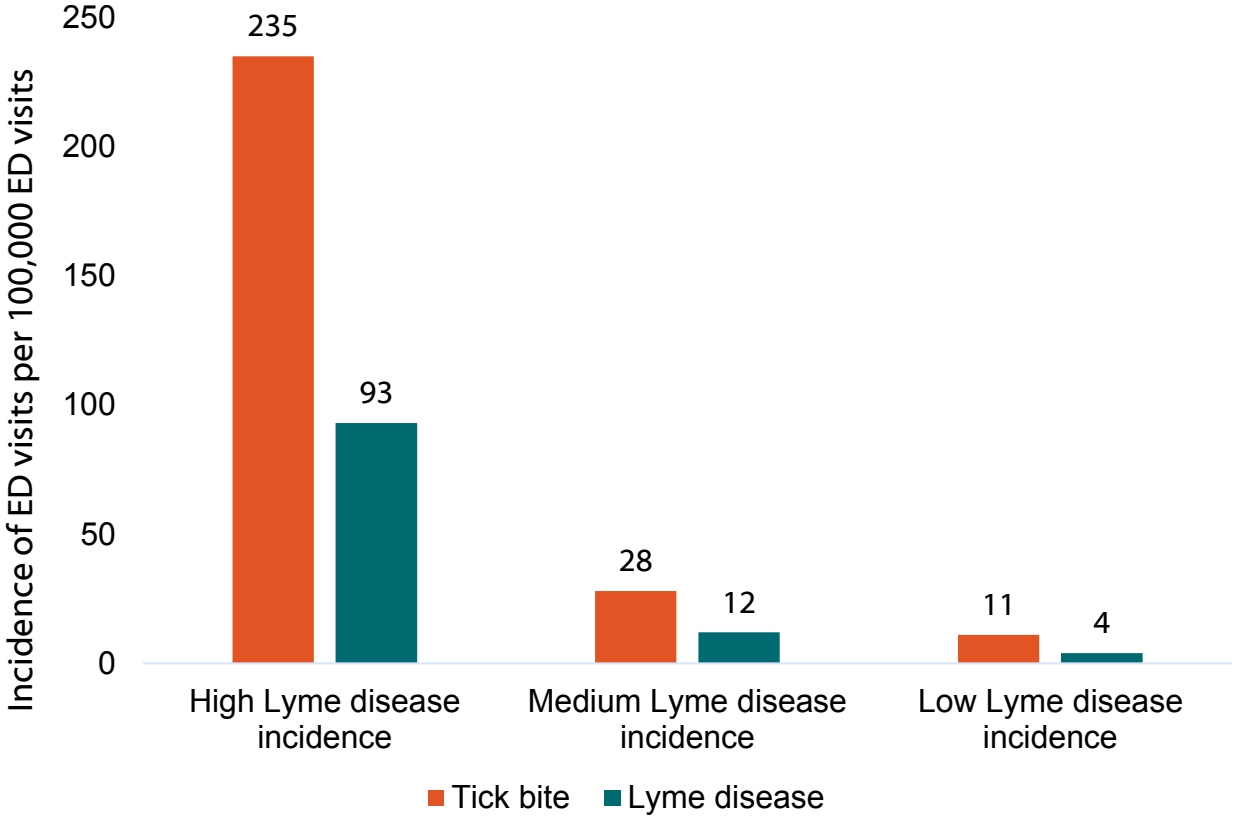
Image: cdc.gov

Methods

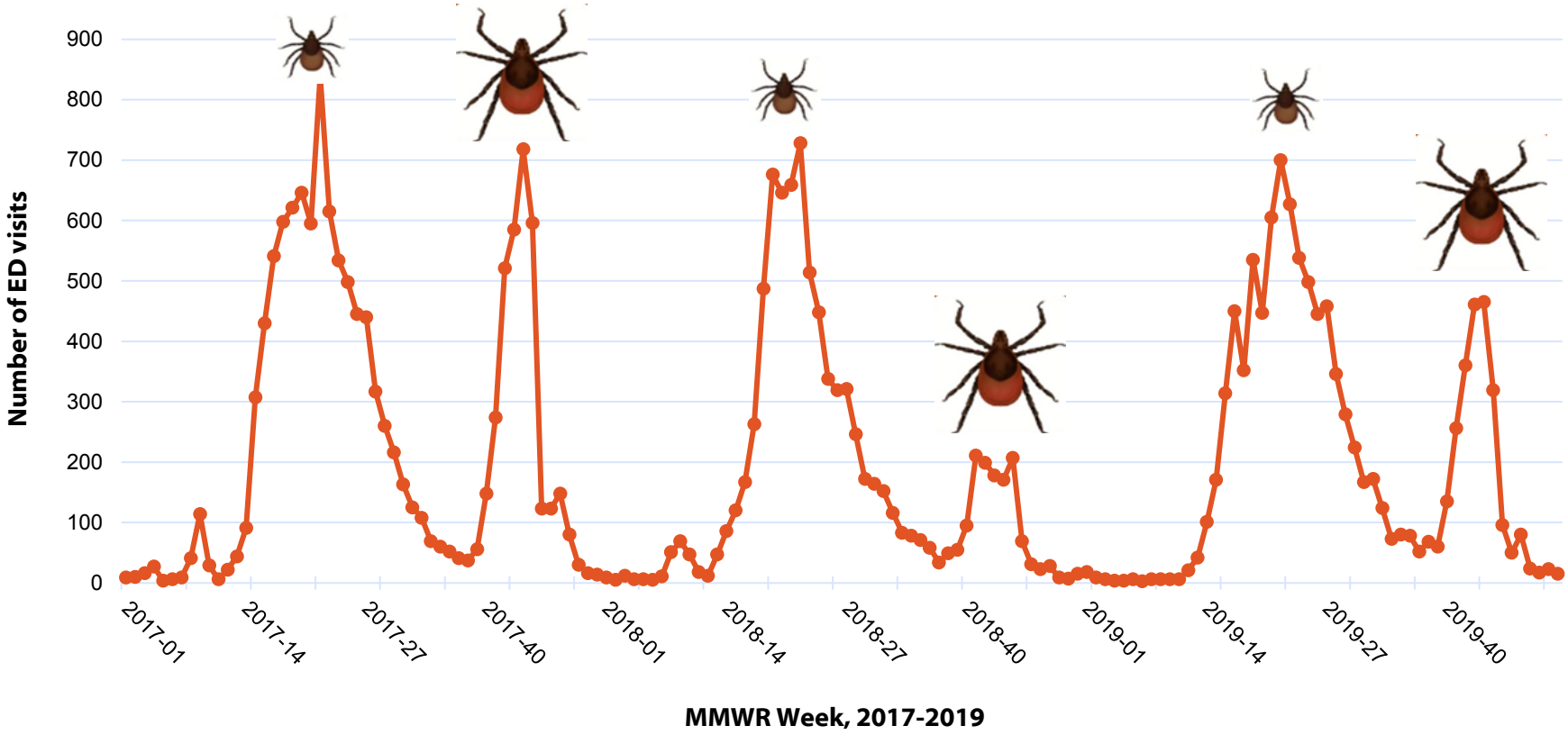
- For years 2017-2019
  - Calculated average number and incidence per 100,000 ED visits for both tick bite and Lyme disease by region
  - Identified annual peak weeks for ED visits for both tick bite and Lyme disease by region
  - Calculated average time between peak annual ED visits for tick bite and Lyme disease by region

Preliminary results

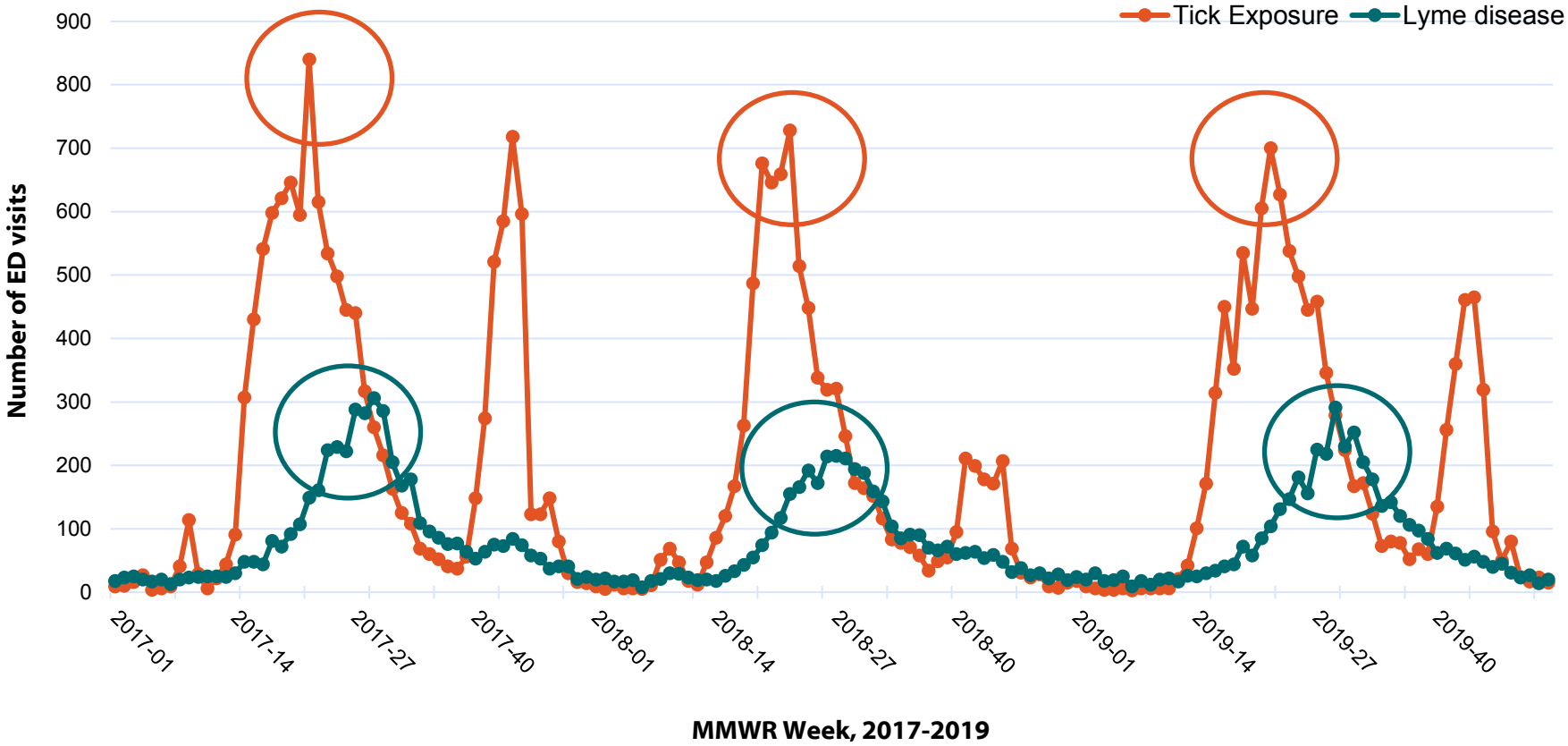
Average annual incidence of ED visits for tick bite and Lyme disease by region, 2017-2019



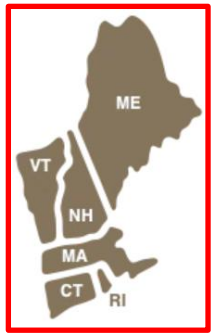
Weekly count of ED visits for tick bite, all regions

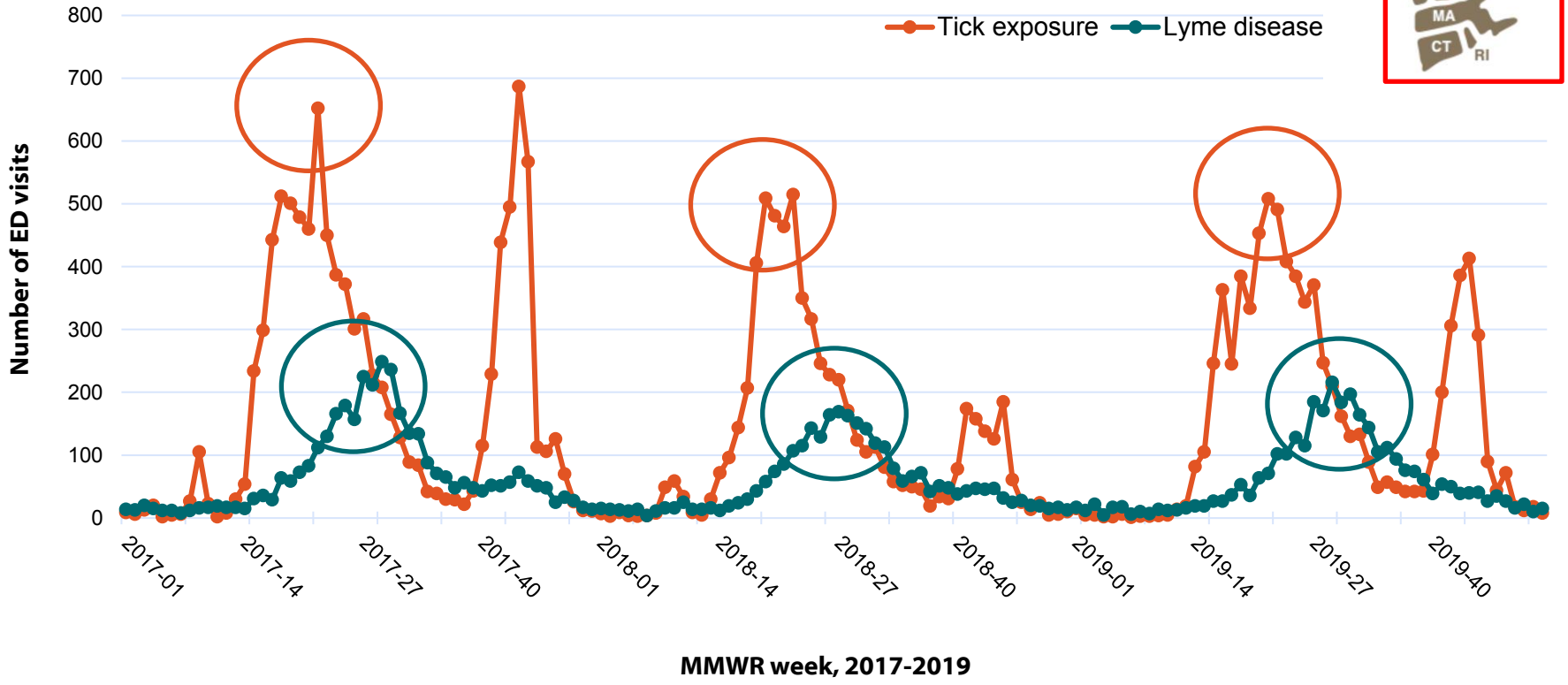


Weekly count of ED visits for tick bite and Lyme disease, all regions

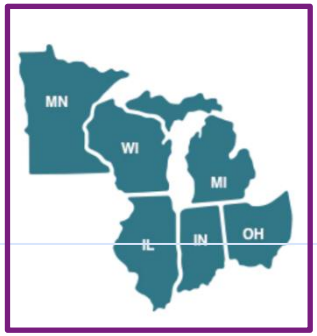


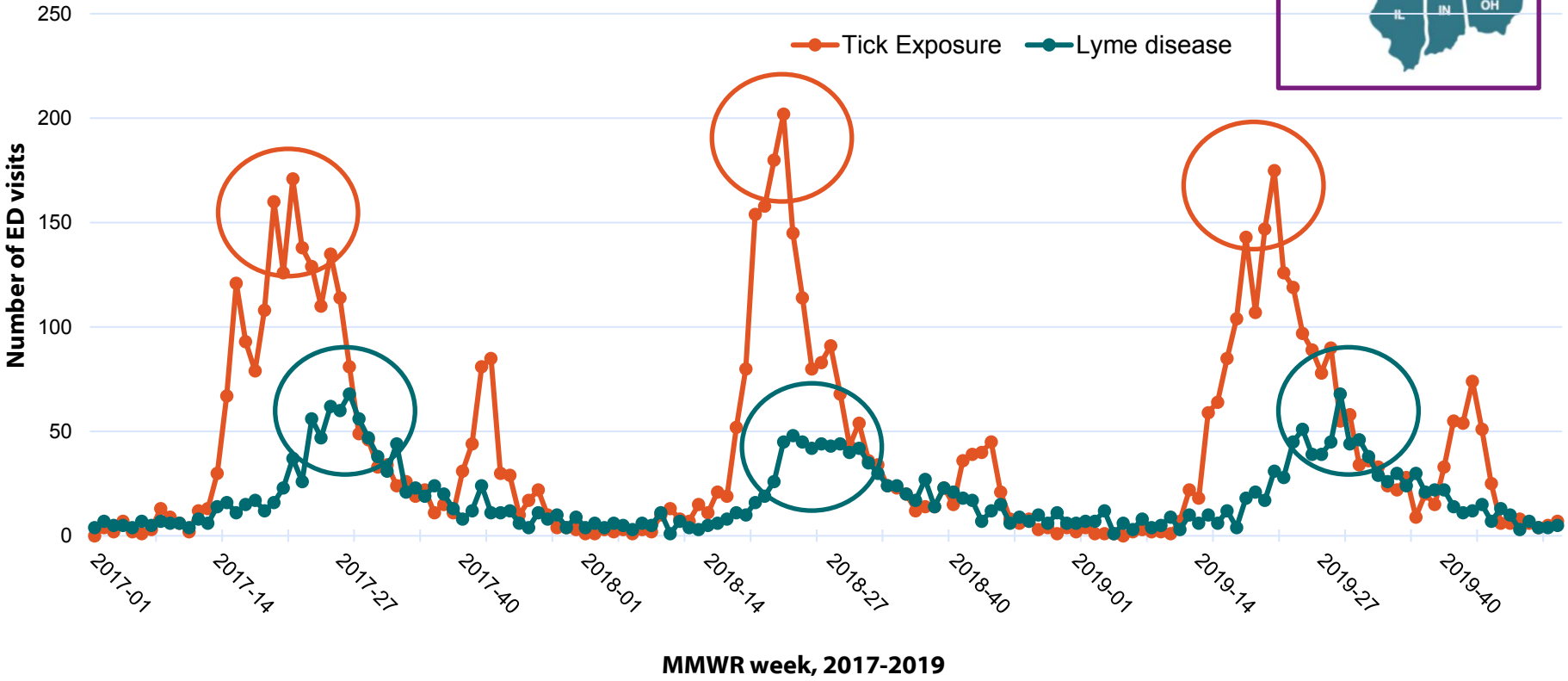
High incidence region (HHS Region 1)



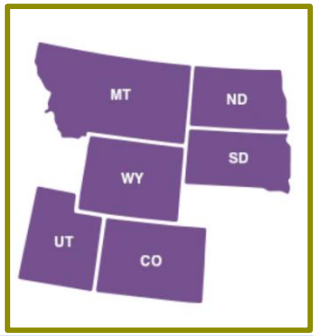


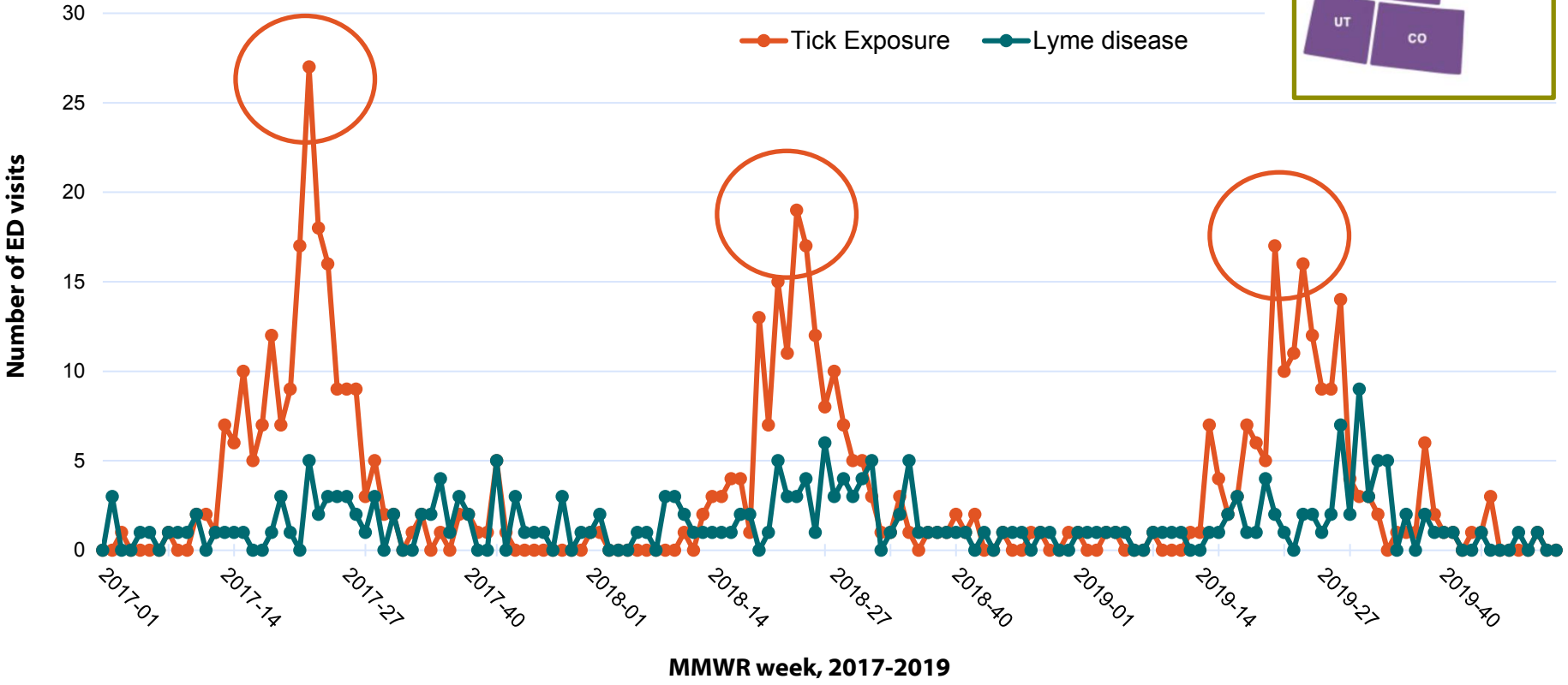
Medium incidence region (HHS Region 5)





Low incidence region (HHS Region 8)





Summary & Conclusions

Limitations

- Data granularity limited to HHS region
- May not be representative of healthcare facilities that do not contribute data
- Limited to emergency department visits
- May be more reflective of healthcare seeking behavior and diagnostic coding algorithms, which may vary by region

Summary

- Peak ED visits for tick bite reliably predicted peak ED visits for Lyme disease in regions with high and medium incidence of Lyme disease but not in a region with low Lyme disease incidence

- Two to three times as many ED visits for tick bite were detected than for Lyme disease

Acknowledgements

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For more information, contact CDC
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TTY: 1-888-232-6348 www.cdc.gov

Thank you!

Email: osm9@cdc.gov

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Kansas Department of Health and Environment

CSTE

Assessing the burden of rabies-related care on Emergency Departments in Kansas in 2020

Kansas Syndromic Surveillance Program Data

2021 NSSP Symposium, November 16-18

Henri Menager, MD, MPH, Senior Epidemiologist, Kansas Department of Health and Environment

Kansas Department of Health and Environment
Division of Public Health

Background

- Human rabies is a fatal but preventable health condition
- It affects the CNS following exposure to the virus
- Last case of human rabies reported in 1968 in Kansas
- Contacts between humans, pets and reservoir animals is common
  - In Kansas reservoir animals include bats, skunks, and raccoons
- Frequent ED visits to receive post-exposure prophylaxis, wound treatment and to address rabies concerns
- Use of syndromic surveillance data seems appropriate to assess the burden of rabies-related visits on Kansas EDs

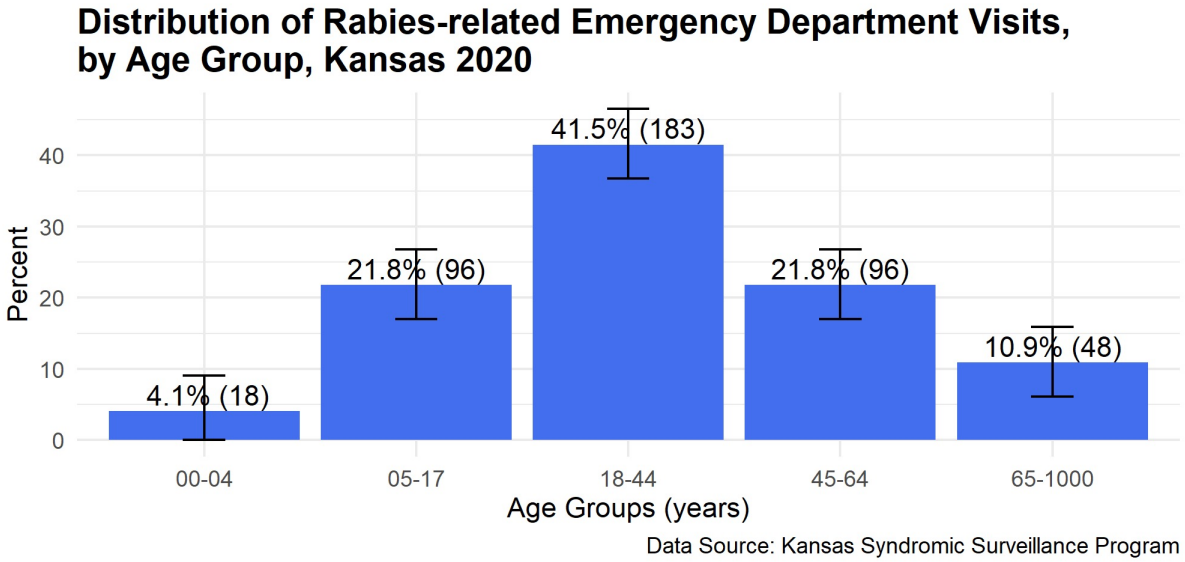
Methods

- The query
  - We used a custom query via API to access the NSSP data in ESSENCE
  - Terms applied to the ChiefComplaints field
    - "https://essence.syndromicsurveillance.org/nssp_essence/api/dataDetails/csv?endDate=31Dec20&percentParam=noPercent&datasource=va_er&startDate=01Jan20&medicalGroupingSystem=chiefcomplaints&userId=644&aqtTarget=TimeSeries&medicalGrouping=%5Erabies%5E,or,%5Erabid%5E,or,%5Erabbie%5E,or,%5Eskunk%5E,or,%5Eraccon%5E,or,%5Ecoyot%5E,or,%5Efox%5E,or,%5Ecoon%5E,andnot,(,%5Ecoonr%5E,or,%5Ecoonf%5E,),%5Ebat%5E,andnot,(,%5Eball%5E,or,%5Ebatt%5E,or,%5Ewiffle%5E,or,%5Ewifl%5E,or,%5Emetal%5E,or,%5Eplastic%5E,or,%5EAlumin%5E,or,%5Econtusion%5E,or,%5Ecombat%5E,or,%5Eassaul%5E,or,%5EBation%5E,or,%5Ebatin%5E,or,%5EBate%5E,or,%5EBatr%5E,or,%5EBAT%20Lab%5E,or,%5EBatLab%5E,or,%5EBaton%5E,or,%5EAcrobat%5E,or,%5ESabbat%5E,or,%5EBaty%5E,or,%5EBatim%5E,or,%5EBatch%5E,or,%5EAerobat%5E,or,%5EConscious%5E,or,%5ELoc%5E,or%5ELacerat%5E,or,%5Ebath%5E,or,%5Eintubat%5E,or,%5Eexacerbat%5E,or,%5Ehit%20with%20bat%5E,or,%5Ehit%20with%20a%20bat%5E,or,%5Ehit%20with%20the%20bat%5E,or,%5Ehit%20by%20bat%5E,or,%5Ehit%20by%20a%20bat%5E,or,%5Ehit%20by%20the%20bat%5E,%5Estruck%20with%5E,or,%5Estruck%20by%5E,or,%5Ehit%20in%20the%5E,or,%5Ebative%3E,or,%5Elabs%20only%5E,o

The Query

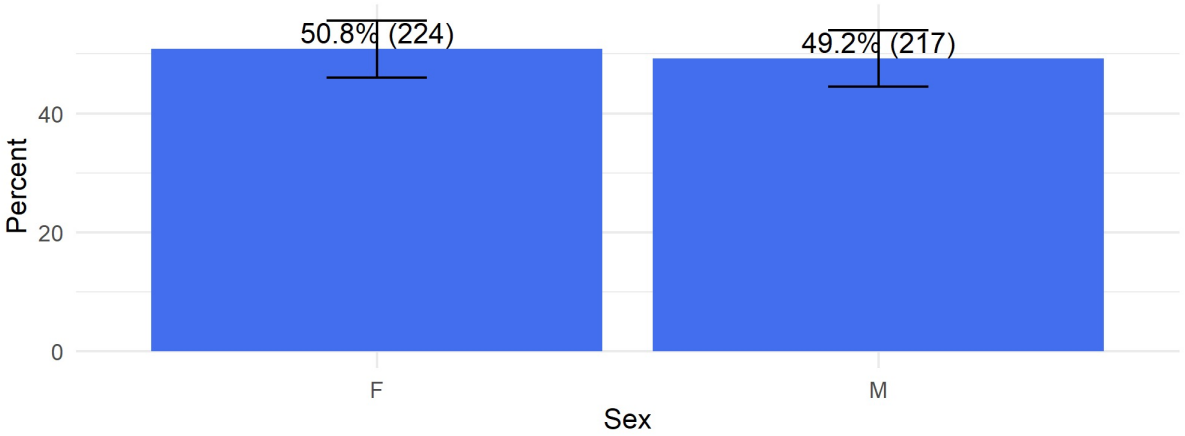
- Query Output
  - On June 3, 2021, the query retrieved 449 records.
  - ESSENCE portal version 1.22
  - Total number of ED visits for 2020 was 893,415
  - 96% of all Kansas ED visits were submitted
  - Estimated proportion of rabies-related visits <0.1%
  - Records were manually reviewed
    - 8 records (1.8%) were found to be false positive
  - Note: analysis was based on visits, not on individual patients
    - Patients may visit the ED several times for the same exposure incident.

Results



Age Group	Count	Percent	LCL	UCL
00-04	18	4.1	0.0	9.1
05-17	96	21.8	17.0	26.8
18-44	183	41.5	36.7	46.5
45-64	96	21.8	17.0	26.8
65-1000	48	10.9	6.1	15.9
Total	441	100.0	NA	NA

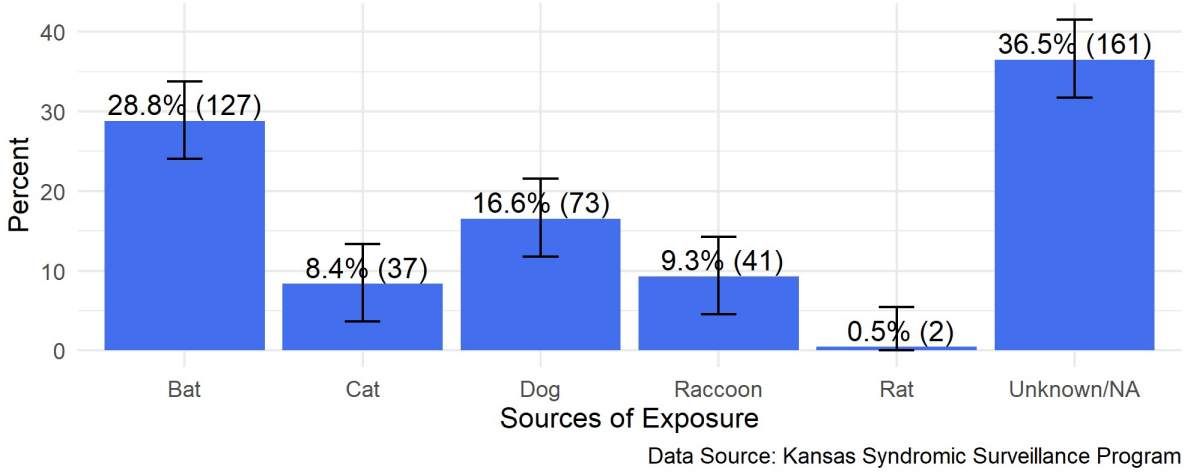
Distribution of Rabies-related Emergency Department Visits, by Sex, Kansas 2020



Data Source: Kansas Syndromic Surveillance Program

Sex	Count	Percent	LCL	UCL
F	224	50.8	46.0	55.6
M	217	49.2	44.4	54.0
Total	441	100.0	NA	NA

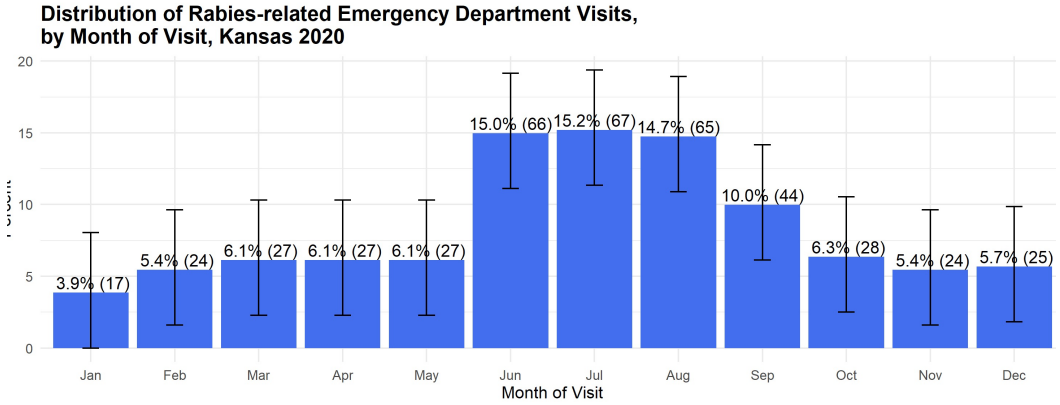
Distribution of Rabies-related Emergency Department Visits, by Reported Source of Exposure, Kansas 2020



Data Source: Kansas Syndromic Surveillance Program

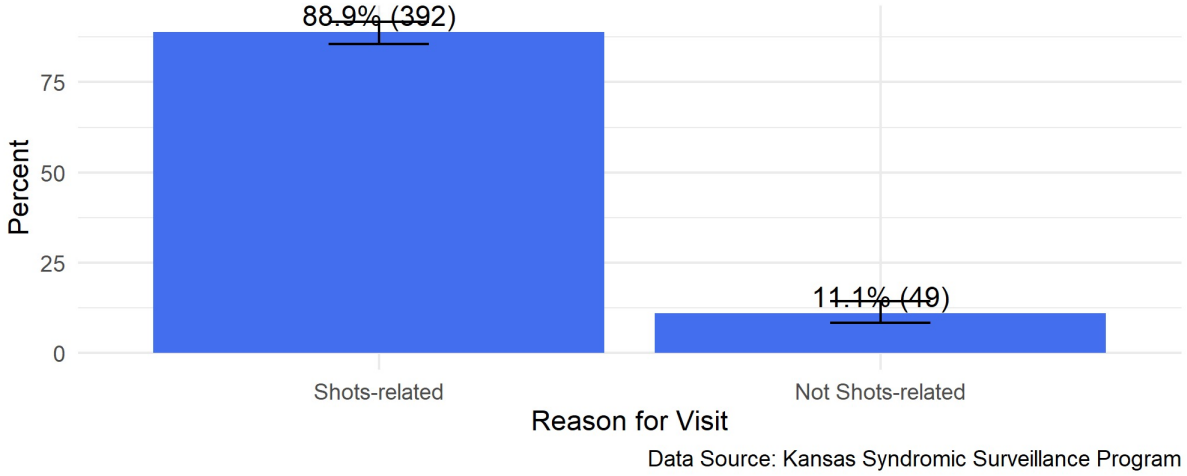
Exposure Source	Count	Percent	LCL	UCL
Bat	127	28.8	24.0	33.8
Cat	37	8.4	3.6	13.4
Dog	73	16.6	11.8	21.6
Raccoon	41	9.3	4.5	14.3
Rat	2	0.5	0.0	5.5
Unknown/NA	161	36.5	31.7	41.5
Total	441	100.0	NA	NA

- More visits occur during summer months than during winter and spring



Month	Count	Percent	LCL	UCL
Jan	17	3.9	0.0	8.0
Feb	24	5.4	1.6	9.6
Mar	27	6.1	2.3	10.3
Apr	27	6.1	2.3	10.3
May	27	6.1	2.3	10.3
Jun	66	15.0	11.1	19.1
Jul	67	15.2	11.3	19.4
Aug	65	14.7	10.9	18.9
Sep	44	10.0	6.1	14.2
Oct	28	6.3	2.5	10.5
Nov	24	5.4	1.6	9.6
Dec	25	5.7	1.8	9.9
Total	441	100.0	NA	NA

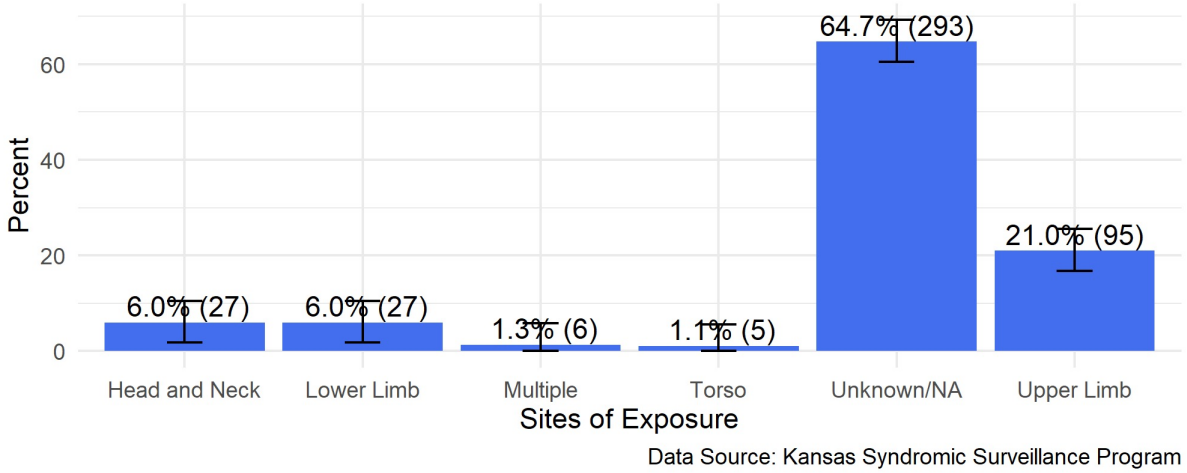
Proportion of Rabies-related Emergency Department Visits Associated with Rabies Shots, Kansas 2020



Data Source: Kansas Syndromic Surveillance Program

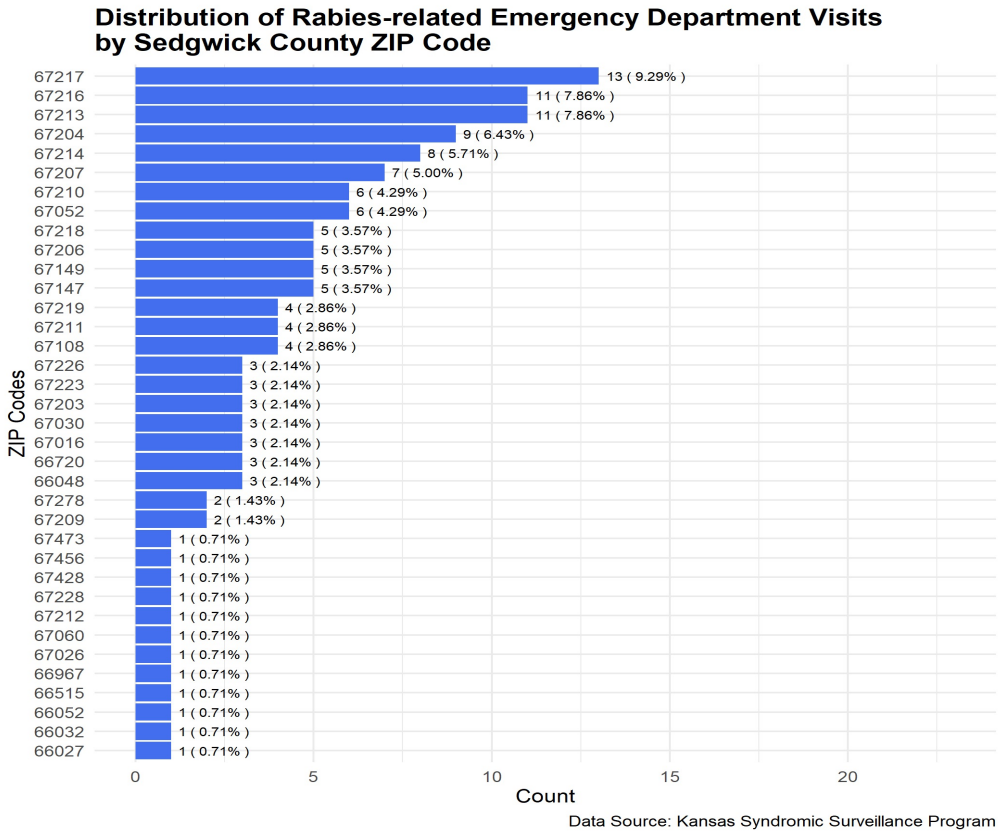
Shots – related	Count	Percent	LCL	UCL
Shots-related	392	88.9	85.6	91.7
Not Shots-related	49	11.1	8.3	14.4
Total	441	100.0	NA	NA

Distribution of Rabies-related Emergency Department Visits, by Site of Exposure, Kansas 2020



Data Source: Kansas Syndromic Surveillance Program

Exposure Site	Count	Percent	LCL	UCL
Head and Neck	27	6.0	1.8	10.5
Lower Limb	27	6.0	1.8	10.5
Multiple	6	1.3	0.0	5.9
Torso	5	1.1	0.0	5.6
Unknown/NA	293	64.7	60.5	69.2
Upper Limb	95	21.0	16.8	25.5
Total	453	100.0	NA	NA


Distribution of Rabies-related Emergency Department Visits by Sedgwick County ZIP Code
67217 13 (9.29%)
67216 11 (7.86%)
67213 11 (7.86%)
67204 9 (6.43%)
67214 8 (5.71%)
67207 7 (5.00%)
67210 6 (4.29%)
67052 6 (4.29%)
67218 5 (3.57%)
67206 5 (3.57%)
67149 5 (3.57%)
67147 5 (3.57%)
67219 4 (2.86%)
67211 4 (2.86%)
67108 4 (2.86%)
67226 3 (2.14%)
67223 3 (2.14%)
67203 3 (2.14%)
67030 3 (2.14%)
67016 3 (2.14%)
66720 3 (2.14%)
66048 3 (2.14%)
67278 2 (1.43%)
67209 2 (1.43%)
67473 1 (0.71%)
67456 1 (0.71%)
67428 1 (0.71%)
67228 1 (0.71%)
67212 1 (0.71%)
67060 1 (0.71%)
67026 1 (0.71%)
66967 1 (0.71%)
66515 1 (0.71%)
66052 1 (0.71%)
66032 1 (0.71%)
66027 1 (0.71%)
ZIP Codes
0
5
10
15
20
Count
Data Source: Kansas Syndromic Surveillance Program

- Limitations
  - Data used for this analysis was produced by a customized query. Validation of the query is warranted
  - The accuracy of the query is unknown and other fields may need to be added
  - Some large counties such as Shawnee, Lyon, and Reno were under or not at all represented in the data
    - Specific issues such as accessibility to vaccines and immunoglobulins from other point of care may be responsible for that

- Conclusion
  - Rabies-related ED visits represented in 2020 less than 0.1% of all visits.
  - Not enough information to obtain reliable cost information from these data
  - EDs constitute the main point of care for rabies in many locations in Kansas
  - Men and women were equally likely to visit the ED for rabies
  - June through September were the months with the largest number of visits
  - Most exposures were related to animal bites or scratches
  - Bats and dogs were the most frequently cited exposure source of exposure
  - Upper limbs were the most common reported site of exposure
  - In Sedgwick county, 35% of those visits were made by residents of 4 ZIP codes

- Thank you
  - Gabe Haas, MPH
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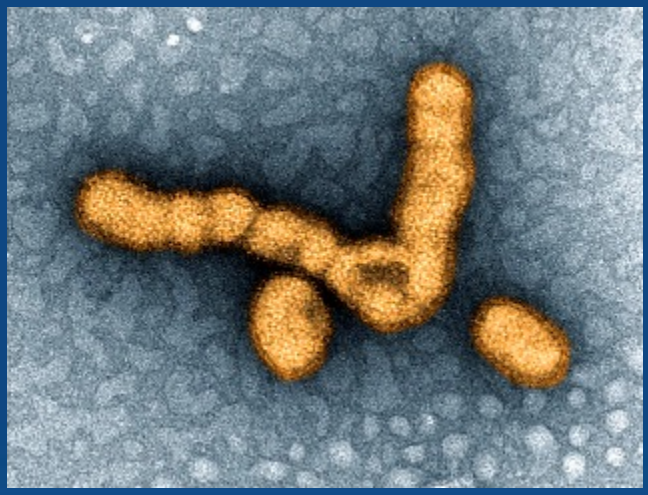
    - Infectious Disease Epidemiology and Response, KDHE
  - Farah Ahmed, PhD, MPH
    - State Epidemiologist and Environmental Health Officer, KDHE

Cynthia Lucero-Obusan, MD
Department of Veterans Affairs

CSTE

U.S. Department of Veterans Affairs



Surveillance for Influenza and Respiratory Syncytial Virus (RSV) - Veterans Health Administration (VHA), 2020-2021

Cynthia Lucero-Obusan MD CIC

VHA Office of Population Health

Public Health Program Office

nothing to disclose

Background

- RSV is an increasingly recognized cause of acute respiratory illness in older adults
- VHA's large elderly population is at higher risk for flu & RSV complications, including hospitalizations and deaths
- 2020-21 had historically low flu & RSV activity nationally, however increased circulation of RSV was reported beginning in April 2021
- We examined national trends in flu & RSV across VHA

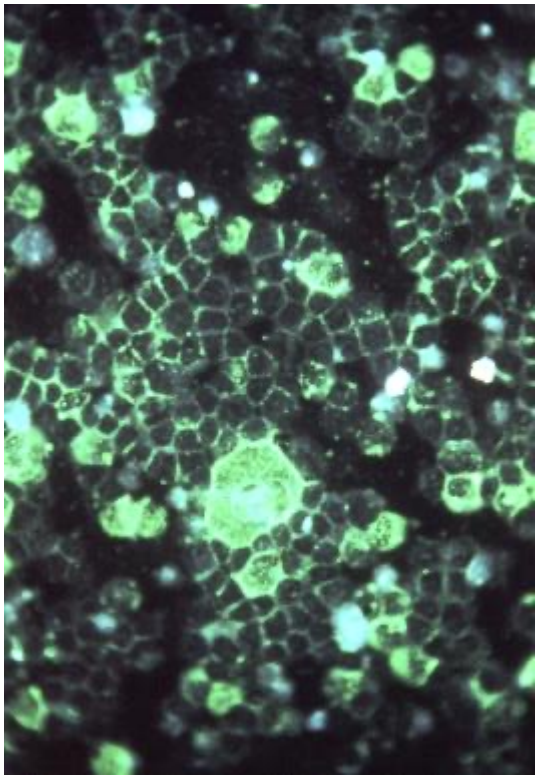


Photo credit (this slide & title slide): CDC Public Health Image library

Methods

- Collected electronic lab results for influenza & RSV for 2020-21 (thru 7/31/21) using Praedico Public Health Surveillance System
  - Positive results, repeat testing and demographic characteristics reviewed
  - Flu & RSV antibody and rejected/cancelled tests excluded
- Reviewed telephone triage, flu antivirals, ICD-coded outpatient encounters (including ILI syndrome) and hospitalizations for the same time period and compared to prior seasons

Results

- Testing for flu & RSV increased dramatically
- ILI remained below average (0.3-0.6% per week)

Influenza Metrics	2017-18	2018-19	2019-20	2020-21*
Telephone Triage	14,185	11,821	23,339	17,329
ICD-coded Outpatient Visits	39,381	21,673	27,728	1,038
ICD-coded Hospitalizations Deaths (%)	10,341 398 (4%)	5,261 188 (4%)	5,691 177 (3%)	276 32 (12%)
Total Flu Tests	161,994	141,277	183,897	602,755
Flu Test Positive (%)	33,292 (21%)	17,062 (12%)	23,420 (13%)	169 (.03%)
Flu Antivirals	68,858	36,105	41,594	531

*through July 31, 2021

Results

- RSV outpatient visits, hospitalizations, deaths and were below average in 2020-21
- Increased percentage of RSV outpatient visits in the ED

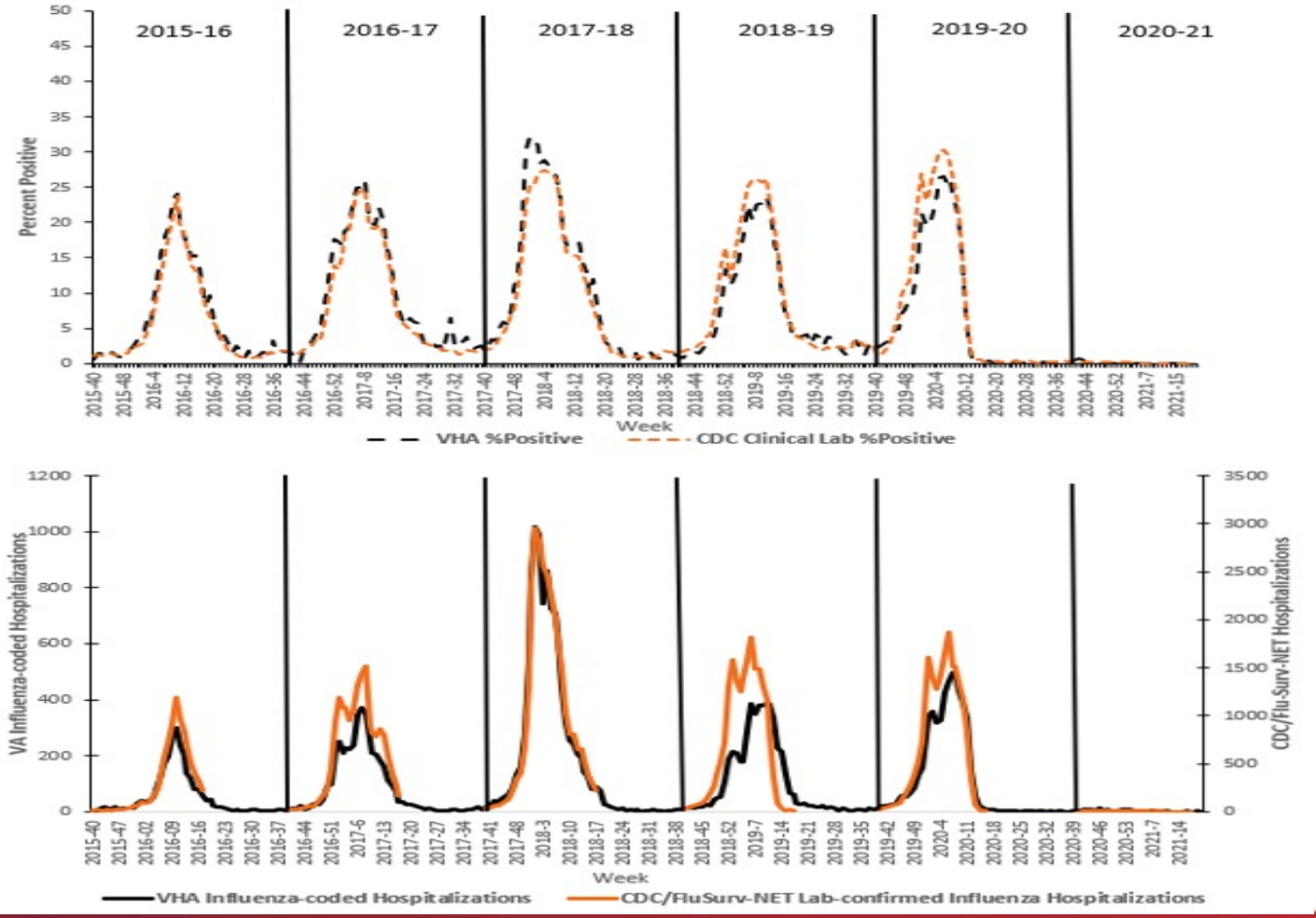
RSV Metrics	2017-18	2018-19	2019-20	2020-21*
ICD-coded Outpatient Visits (ED, %)	1,427 (530, 37%)	1,361 (533, 39%)	1,821 (812, 45%)	573 (308, 54%)
ICD-coded Hospitalizations Deaths (%)	953 41 (4%)	861 24 (3%)	1,240 36 (3%)	143 3 (2%)
Total RSV Tests	41,470	41,722	71,234	460,923
RSV Test Positive (%)	2,194 (5%)	1,818 (4%)	2,242 (3%)	977 (0.2%)

*through July 31, 2021

Results

- No distinct peak in influenza activity

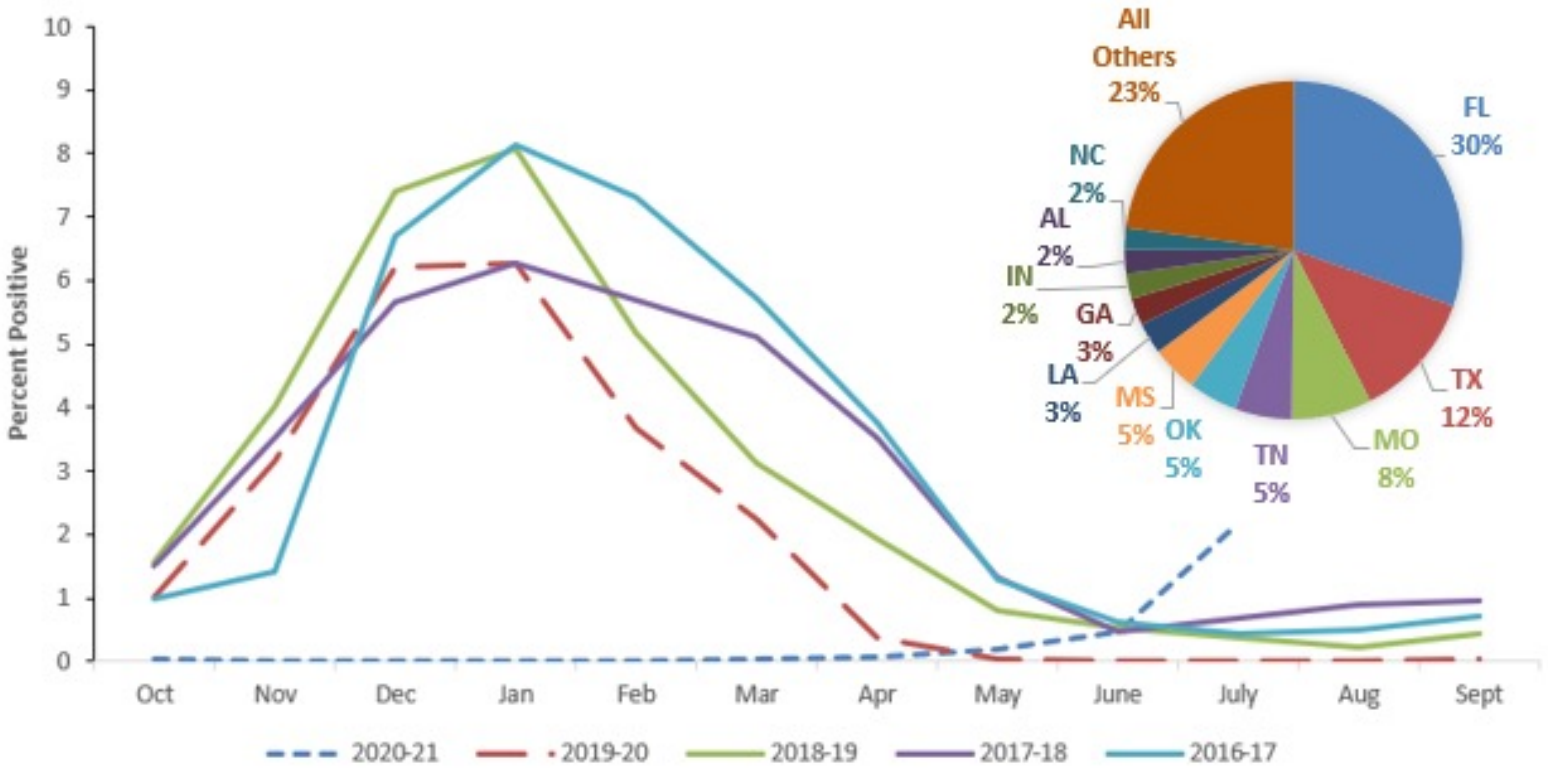
Figure 1. Comparison of select VHA and CDC Influenza Indicators. Influenza % positive laboratory tests (top) and influenza hospitalizations (bottom), by season



Results

- RSV activity was low Apr 2020-Apr 2021, then through July 2021, mostly in midwest/south

Figure 2. Percentage of VHA specimens testing positive for RSV, by month, 2016-17 through 2020-21 seasons (left). Distribution of RSV positive tests by state, 2021 (right).



Conclusions

- COVID-19 pandemic and mitigation efforts (masking, ⬇travel, physical distancing) likely contributed to low flu & RSV activity in 2020-21
- Testing for flu & RSV increased dramatically due to multi-pathogen testing
  - Low number of influenza/RSV positives in 2020-21
- Increased inter-seasonal RSV activity was noted beginning in April 2021 and tracked closely with national data/trends
- Circulation of flu/RSV may increase as pandemic restrictions relax. Providers should continue to consider flu/RSV infections along with COVID-19

Acknowledgements

- Patricia Schirmer, MD
- Gina Oda, MS
- Mark Holodniy, MD

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CSTE

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COVID-19 Activity Indicators

Assessing the Utility of COVID-like Illness

Alicia Sloughfy, MPH
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A little bit of “historical” context..

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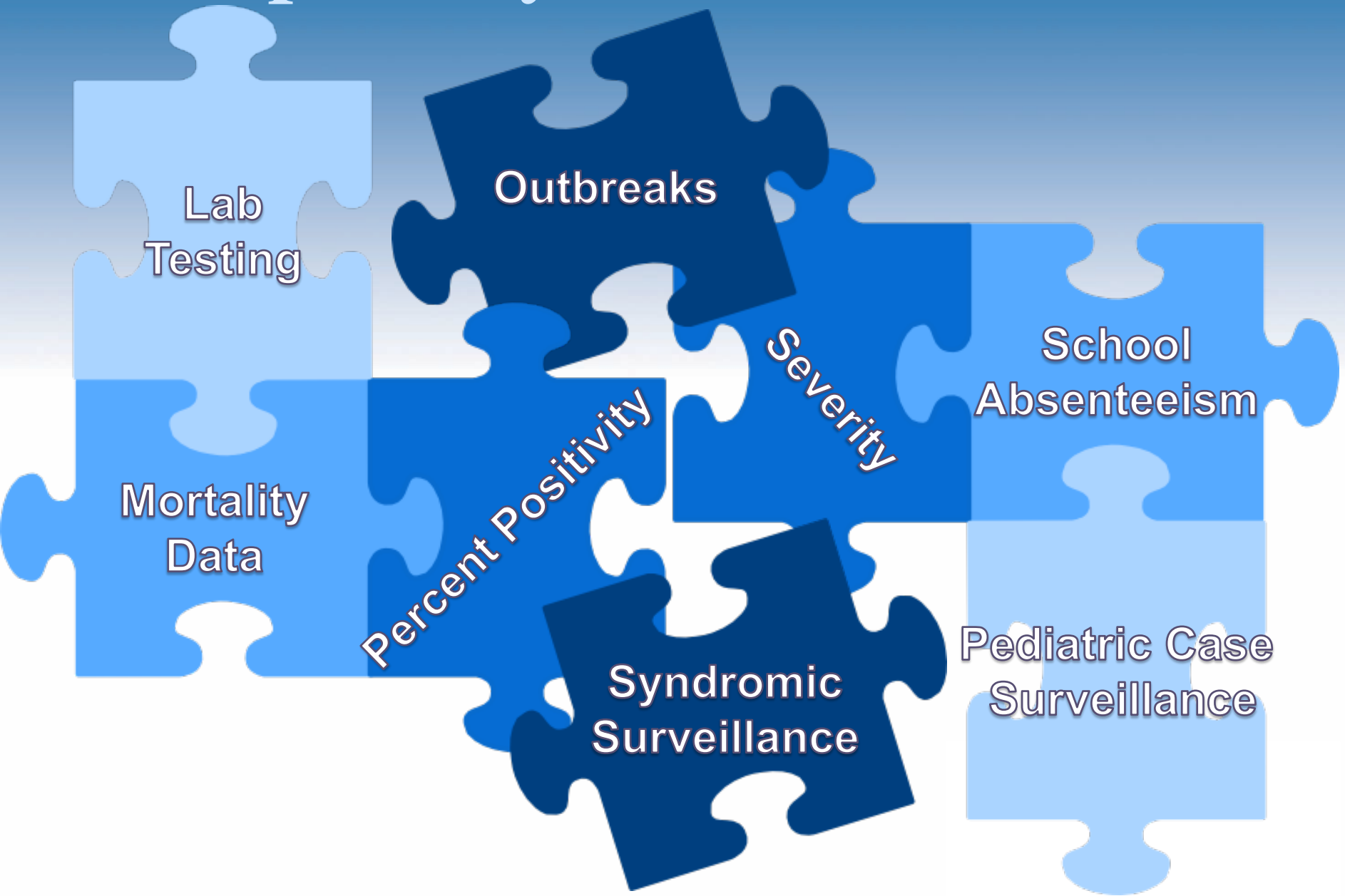
New Jersey Department of Health

Respiratory Illness Surveillance



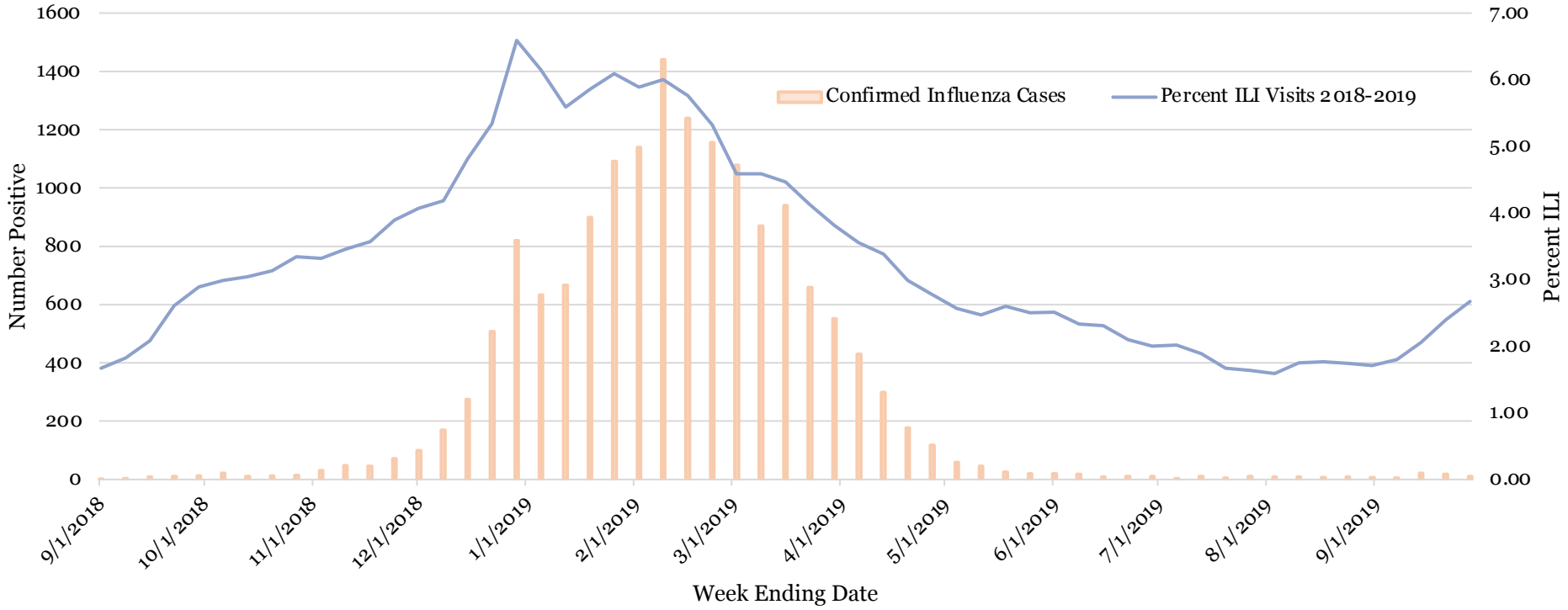
Respiratory Virus Surveillance Report[1]

New Jersey Department of Health

Communicable Disease Service

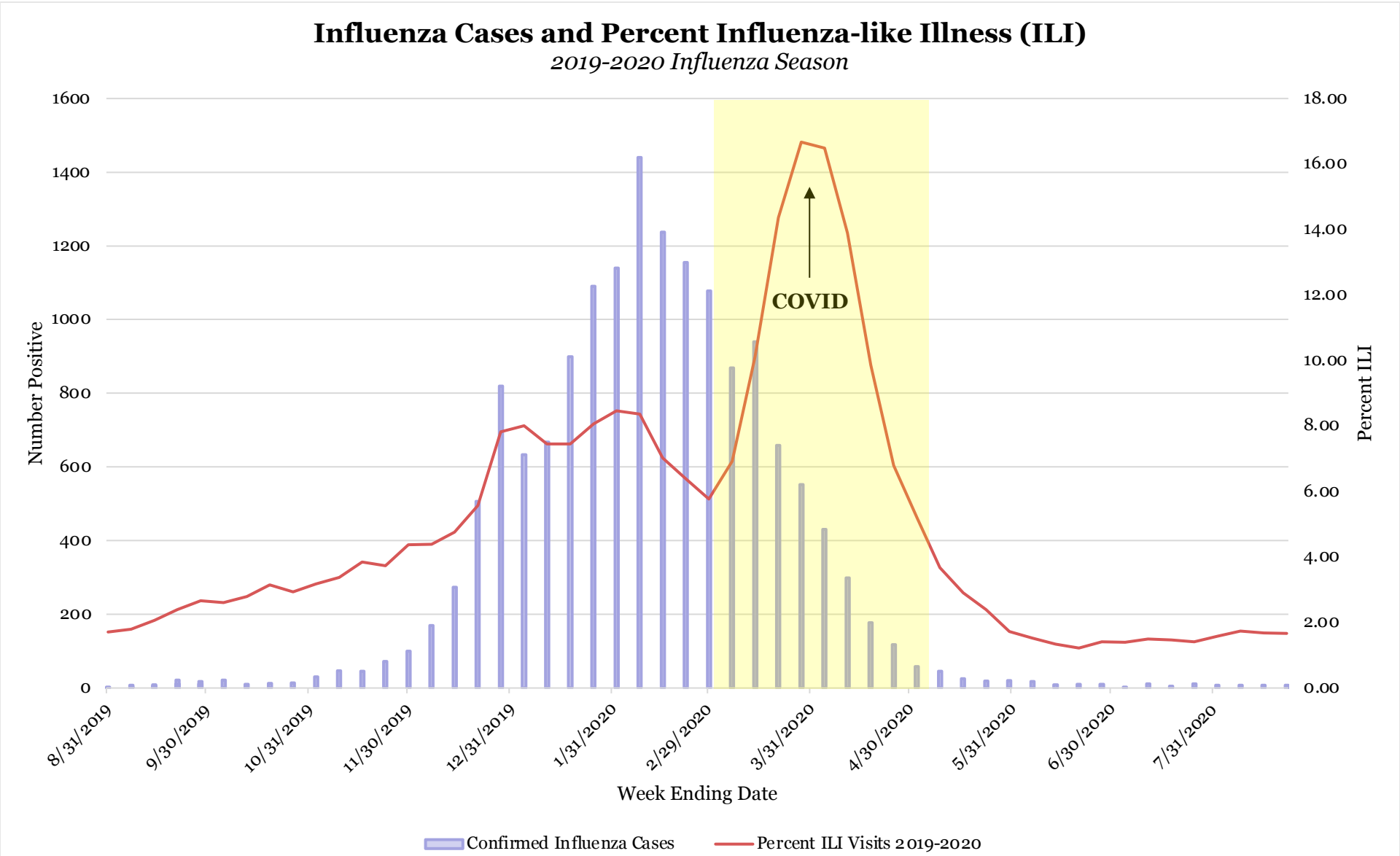
Week ending September 28, 2019 (MMWR week 39[2])

Confirmed Influenza Cases and Percent Influenza-like Illness (ILI)
2018-2019 Influenza Season

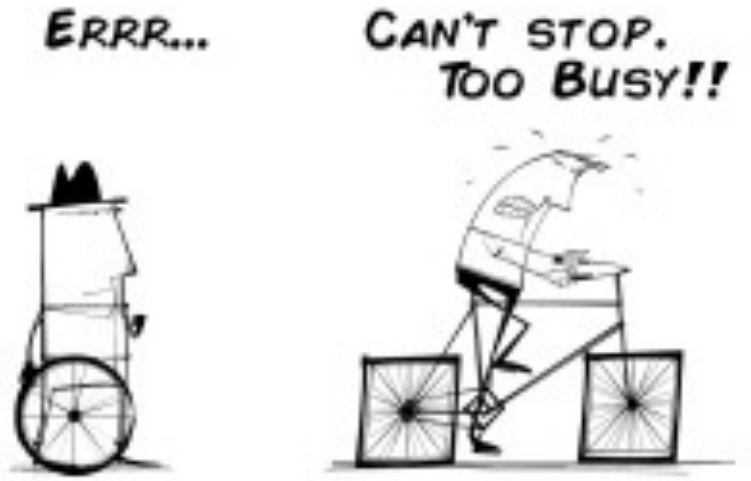


- **Influenza-like Illness (ILI)** is defined as fever (> 100°F [37.8°C], oral or equivalent) and cough and/or sore throat (in the absence of a known cause other than influenza). Data is collected via EpiCenter (i.e., NJDOH syndromic surveillance).
- **Percent ILI=** $\frac{\text{Emergency Department Visits Associated with Influenza Illness}}{\text{Total Emergency Department Visits}} \times 100$

And an early warning signal it was..



Don’t Reinvent the Wheel



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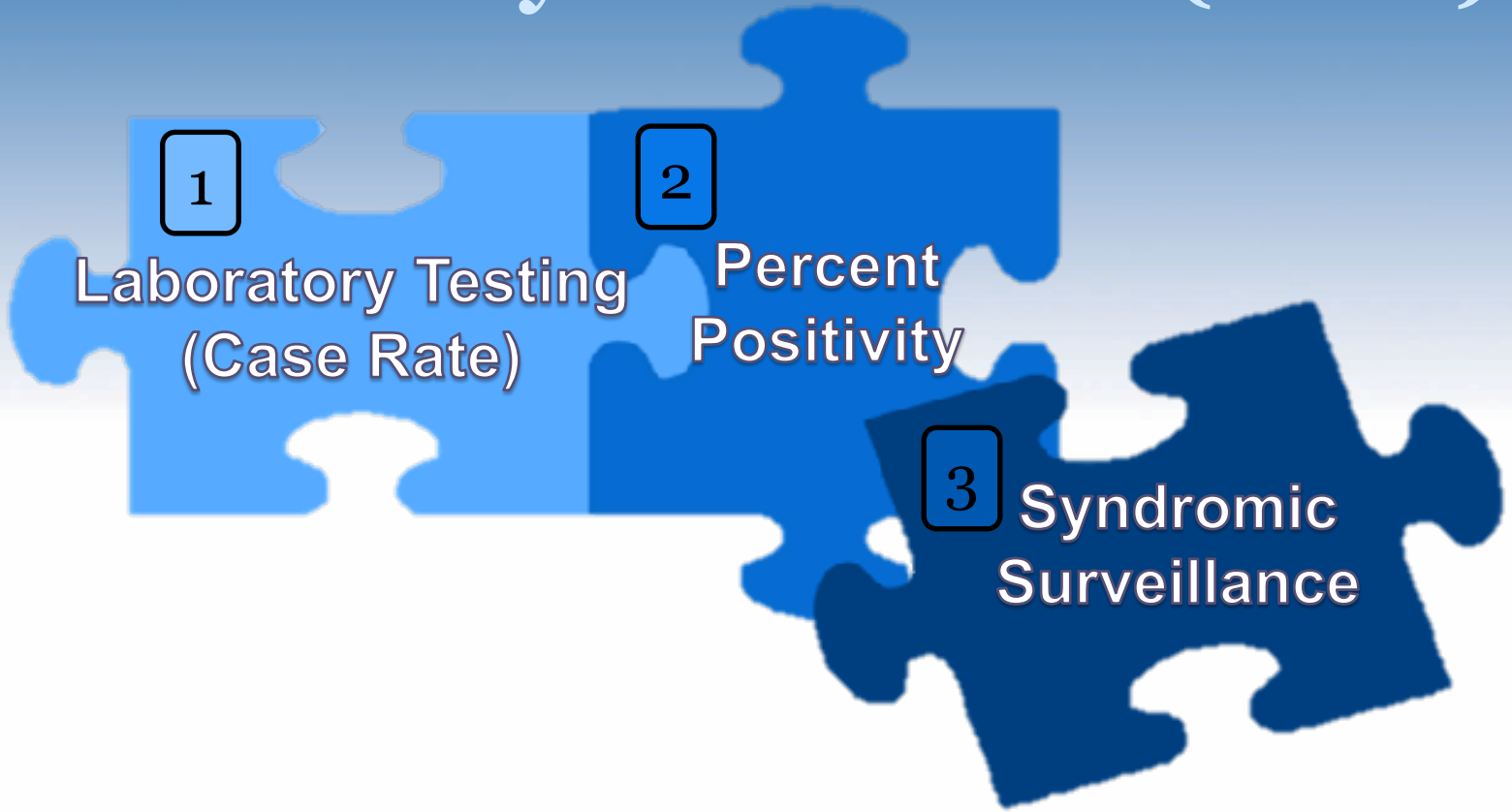
COVID Activity Level Index (CALI)

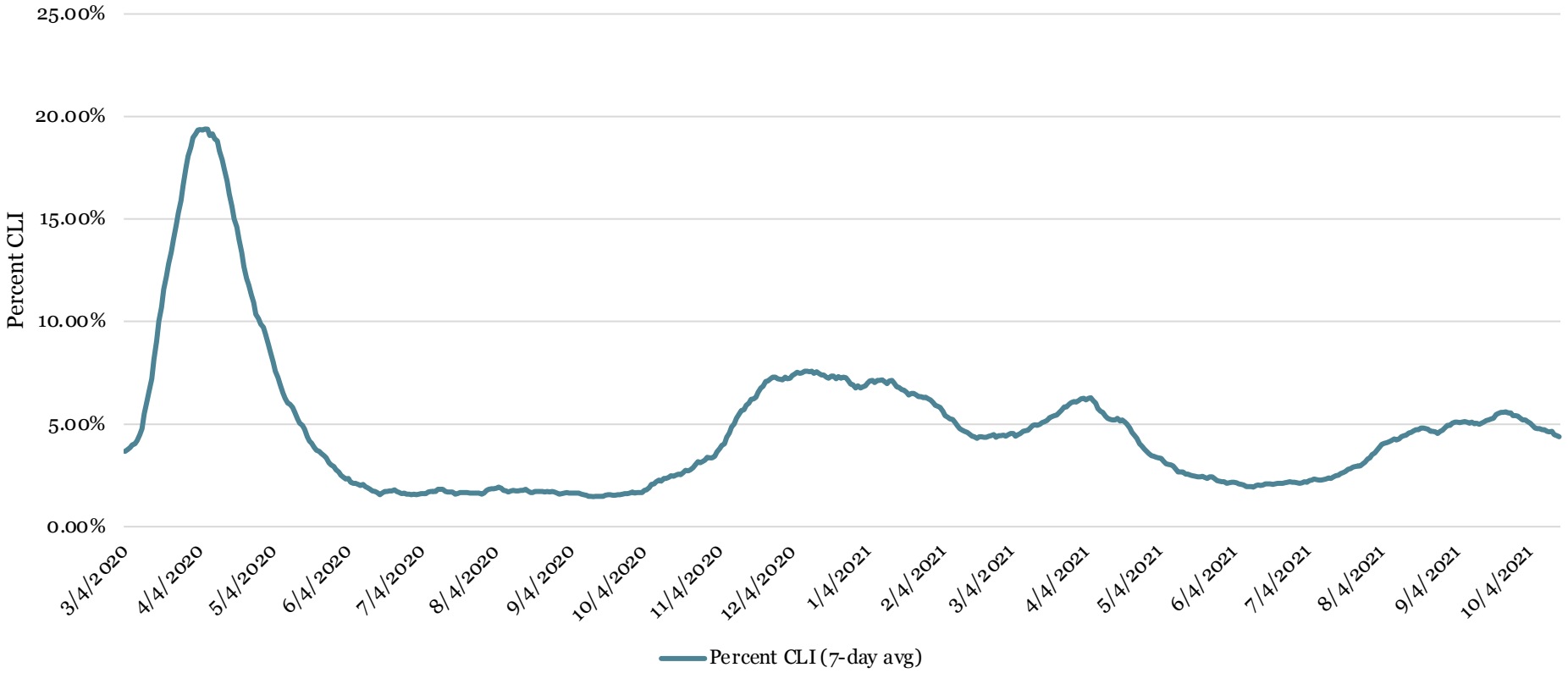


The CALI report is published weekly and has been referred to in:

- ✓ *Long Term Care Facility guidance*
- ✓ *Exclusion Criteria for Schools*
- ✓ *Contact Tracing Escalation or De-Escalation*

Percent COVID-like Illness (CLI)

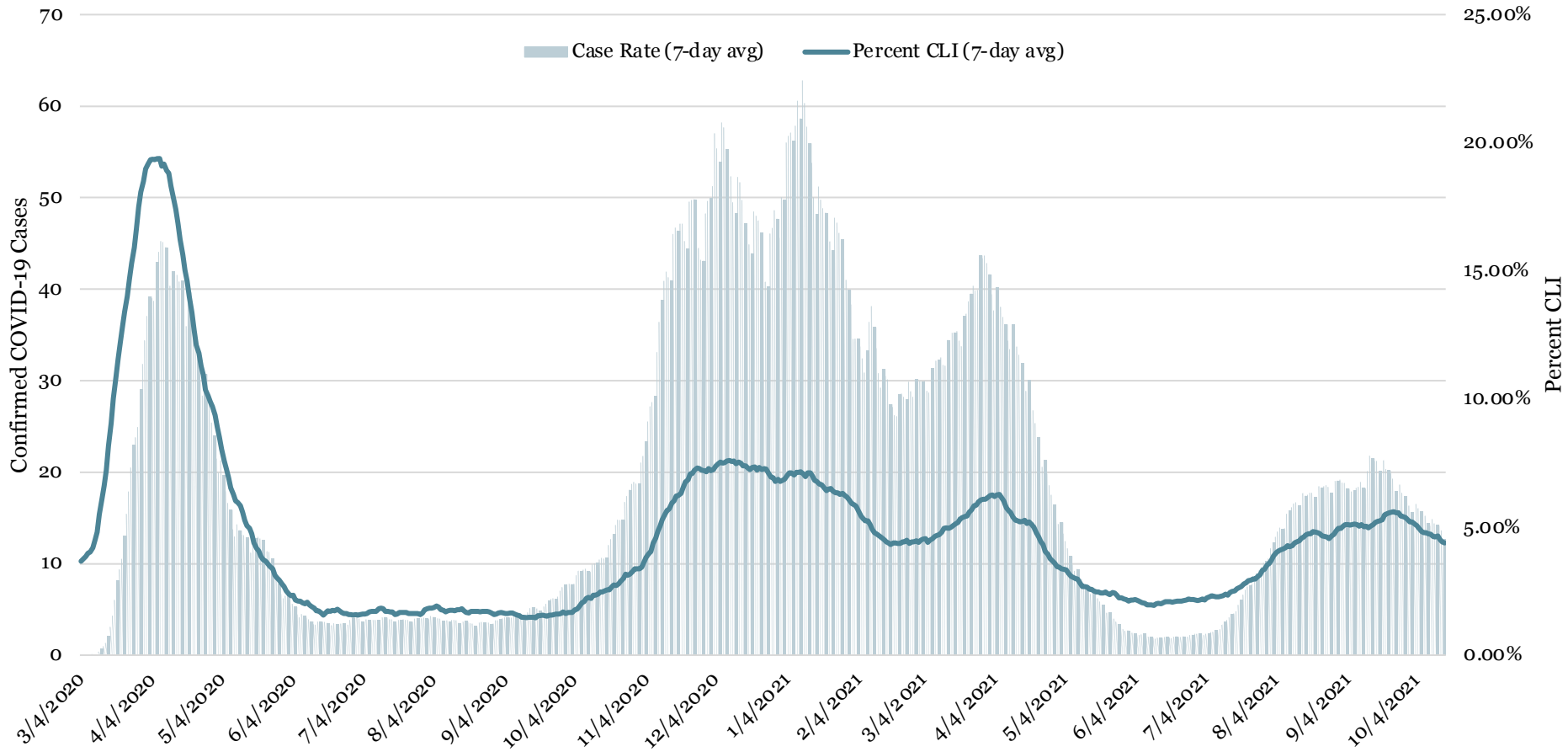
March 2020-October 2021



- **COVID-like illness (CLI)** is defined as fever and cough or dyspnea (shortness of breath, difficulty breathing, etc.) or the presence of coronavirus diagnosis codes. With the intention to focus on CLI rather than Influenza-like illness the diagnosis of another specified respiratory pathogen (influenza, parainfluenza and RSV) is excluded. Data is collected via EpiCenter (i.e., NJDOH syndromic surveillance).
- **Percent CLI** = $\frac{\text{Emergency Department Visits Associated with COVID-like Illness}}{\text{Total Emergency Department Visits}} \times 100$
- Percent CLI is monitored as a 7-day weekly average.

COVID-19 Case Rate and Percent COVID-like Illness

March 2020-October 2021



Spearman's Correlation (ρ)

March 2020- September 2020	October 2020-May 2021	June 2021-October 2021
n= 204	n= 243	n= 131
ρ= 0.78	ρ= 0.97	ρ= 0.94

March 2020-October 2021

N= 578

ρ= 0.82

Assessing the Utility of CLI

Strengths

- ✓ **Early Warning Signal**
  CLI syndromic surveillance is real time data, so it is likely to precede laboratory result reporting
- ✓ **Measure of Severity**
  If a patient is going to the ED for COVID symptoms, presentation is likely more severe, or patient is high risk
- ✓ **Strong Correlation with Lab Data**
  The high correlation between case rate and CLI indicate that CLI was a good proxy for lab tests during the peak of the pandemic

Limitations

- **Background Respiratory Noise**
  During the pandemic, non-COVID respiratory illness was very low. This correlation does not account for other respiratory illnesses such as Influenza.
- **Impacted by Health Seeking Behavior**
  Those with a less severe presentation and/or are lower risk are likely to seek healthcare elsewhere.

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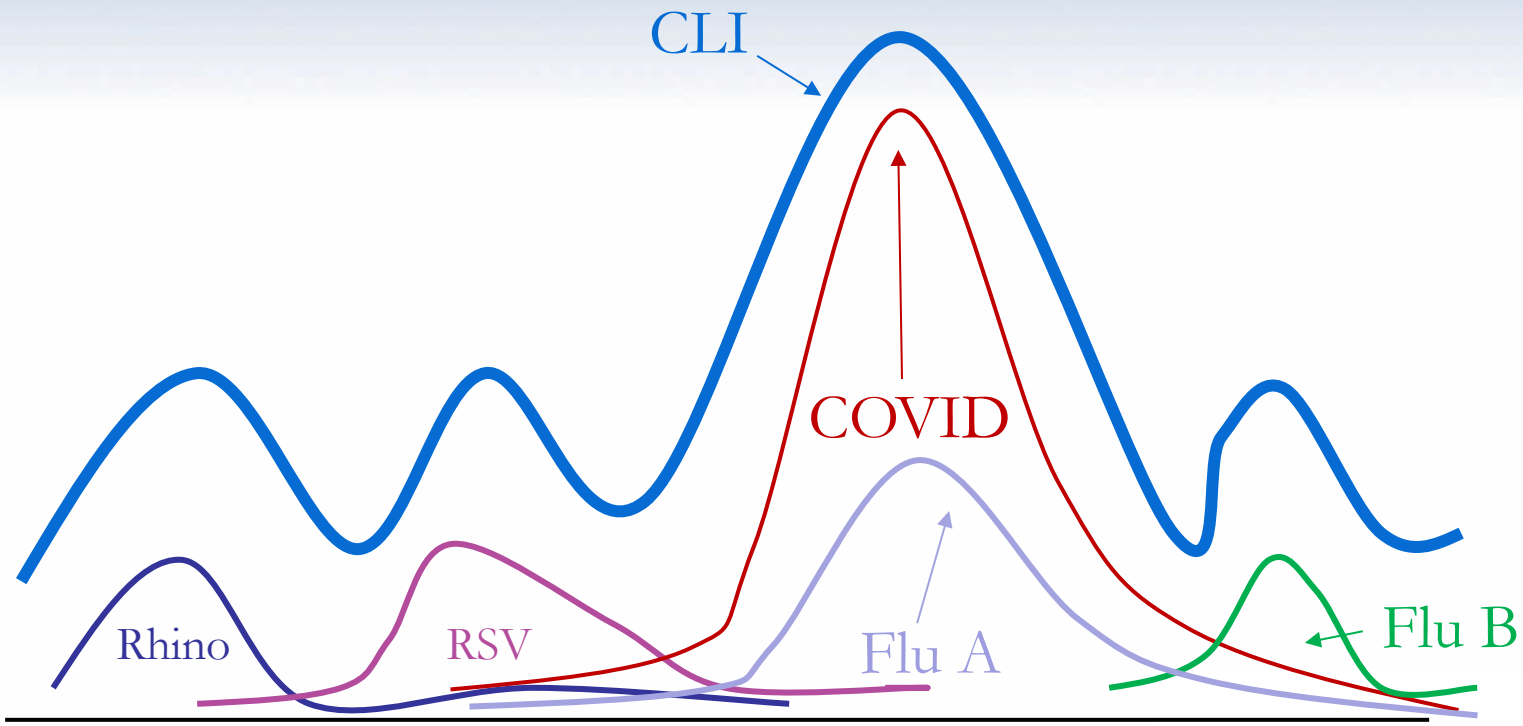
To be continued..

As we move into what could be a season with co-circulation of Influenza and COVID-19, we plan to closely monitor the relationship between laboratory data and syndromic data in relation to respiratory syndromic surveillance



Resources

- **Epi-Center Syndromic Surveillance System, Health Monitoring Systems**
  - COVID-like Illness data
  - Influenza-like Illness data
- **Communicable Disease Surveillance System (CDRSS)**
  - Influenza and COVID-19 Laboratory Data
- **New Jersey Respiratory Illness Surveillance Report** Department of Health | Communicable Disease Service | Influenza and Respiratory Illness Surveillance Reports (nj.gov)
- New Jersey COVID Activity Level Index Report (CALI) Department of Health | Communicable Disease Service | COVID-19 Weekly CALI and Variant Surveillance Reports (nj.gov)
- Spearman's Correlation analysis done with SAS Enterprise Guide 7.1

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New Jersey Department of Health

Questions?

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ILLINOIS DEPARTMENT OF PUBLIC HEALTH

Temporospatial Trends in COVID-Like Illness Emergency Department Visits

Lauren Draftz

Division of Patient Safety & Quality

11/17/21

Introduction

- Since April 2020, Illinois Department of Public Health's Data Intelligence Team has incorporated syndromic surveillance trends for CLI visits into COVID-19 intelligence briefings.

- Geographic stratifications of COVID-19 pandemic trends became an important intel source when making policy decisions.
  - Illinois was stratified into 11 COVID regions

- The IDPH Data Intelligence Team was informed on pandemic trends nationally and at the Health and Human Services (HHS) regional level to put expectations of future surges into context.

- Emergency department visits were a reliable source for trend data, especially during times when testing and case detection capabilities were limited.

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Methods

Using ESSENCE in the BioSense Platform:

- Percentages of weekly Emergency Department (ED) visits for COVID-Like Illness (version 1) were generated from the Patient Location data set.
- National and HHS regional trends were stratified.
- Illinois's trends were overlaid on the HHS regional trends based on geographic proximity to Illinois and similar trends in COVID-19 surges.
- Temporal correlations were performed to identify potential drivers of COVID-19 surges; initially using mobility and weather-related associations.

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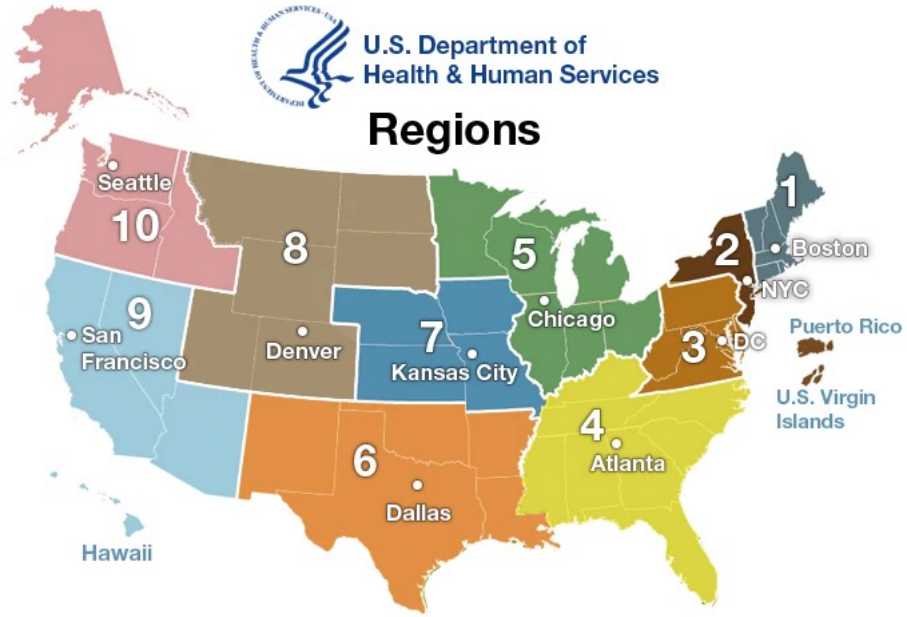
Defining a Surge

- **Baseline for each HHS Region**: average of % CLI ED Visits from 1/5/2019 to 1/25/2020 plus two standard deviations

- **Starting Week Threshold**: ≥ 0.2 percentage points more than the baseline and followed by successive increases

- **Ending Week Threshold**: drops to baseline or plateaus after successive decreases



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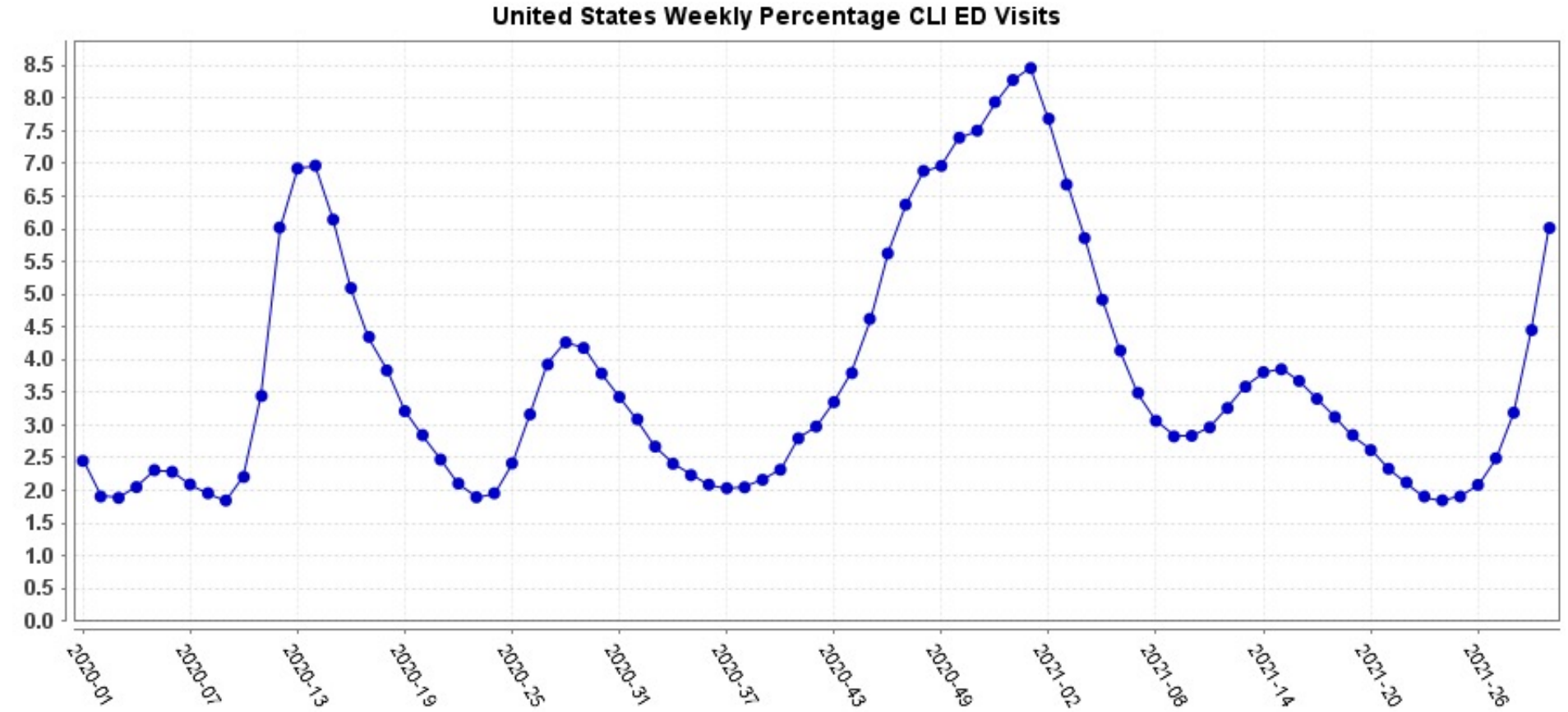
United States



- From January 2020 through July 2021, there were five distinct surges in % CLI ED Visits.
- The largest surge within this date range occurred in Fall/Winter 2020.
- The largest surge to date occurred in Summer 2021 (not pictured).

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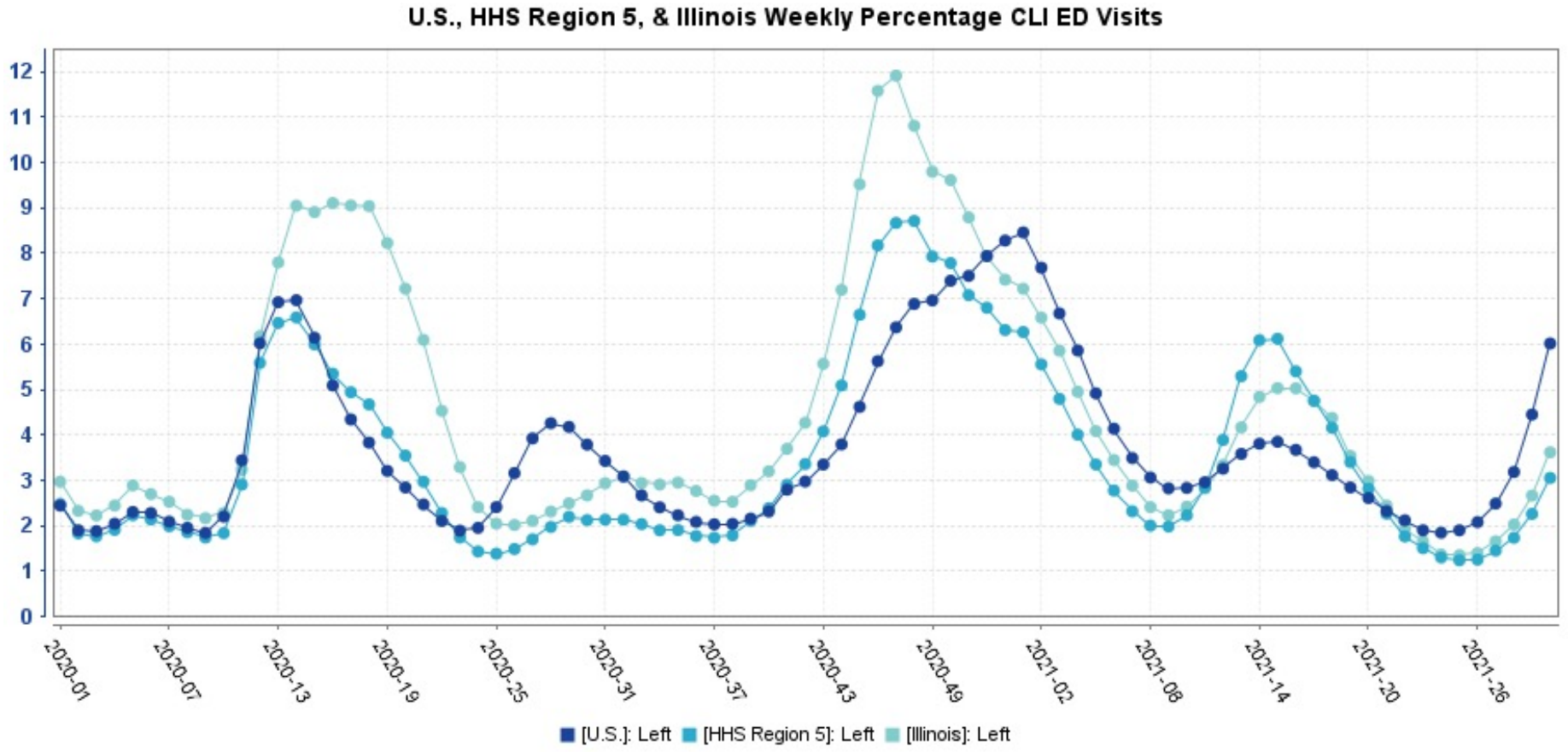
United States, HHS Region 5, & Illinois



- Region 5 and the U.S. trended similarly during Spring 2020
- The U.S. had a Summer 2020 surge while IL and the rest of Region 5 did not experience a surge
- Region 5 and Illinois have a higher peak and more clearly defined Spring 2021 surge compared to the U.S.

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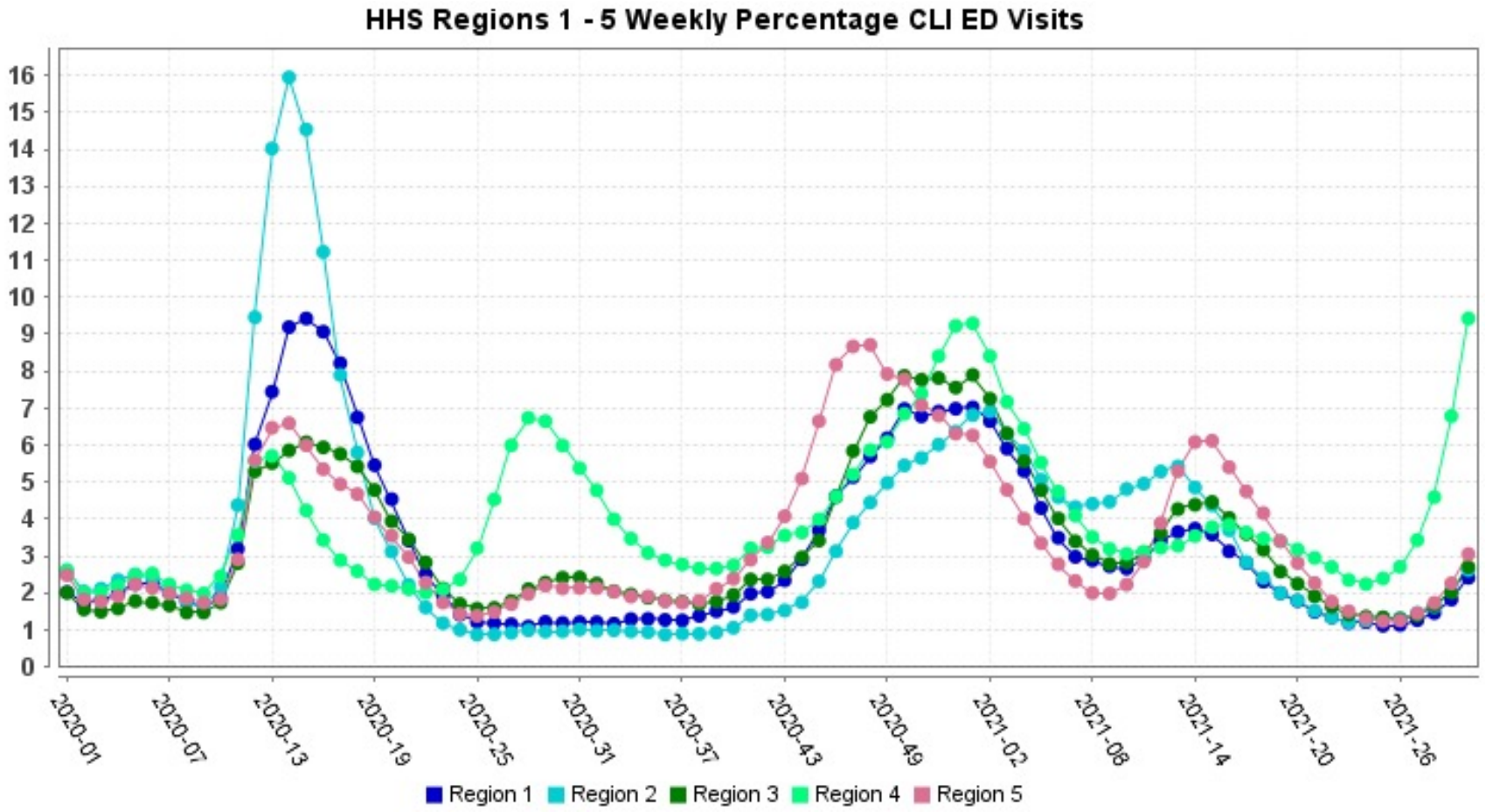
Health and Human Services Regions 1-5



- Regions 1-5 trended similarly during Spring 2020.
- Region 4 experienced large Summer 2020 and Summer 2021 surges compared to Regions 1-3 & 5.
- Region 5's Fall/Winter 2020 surge began several weeks earlier than Regions 1-4.

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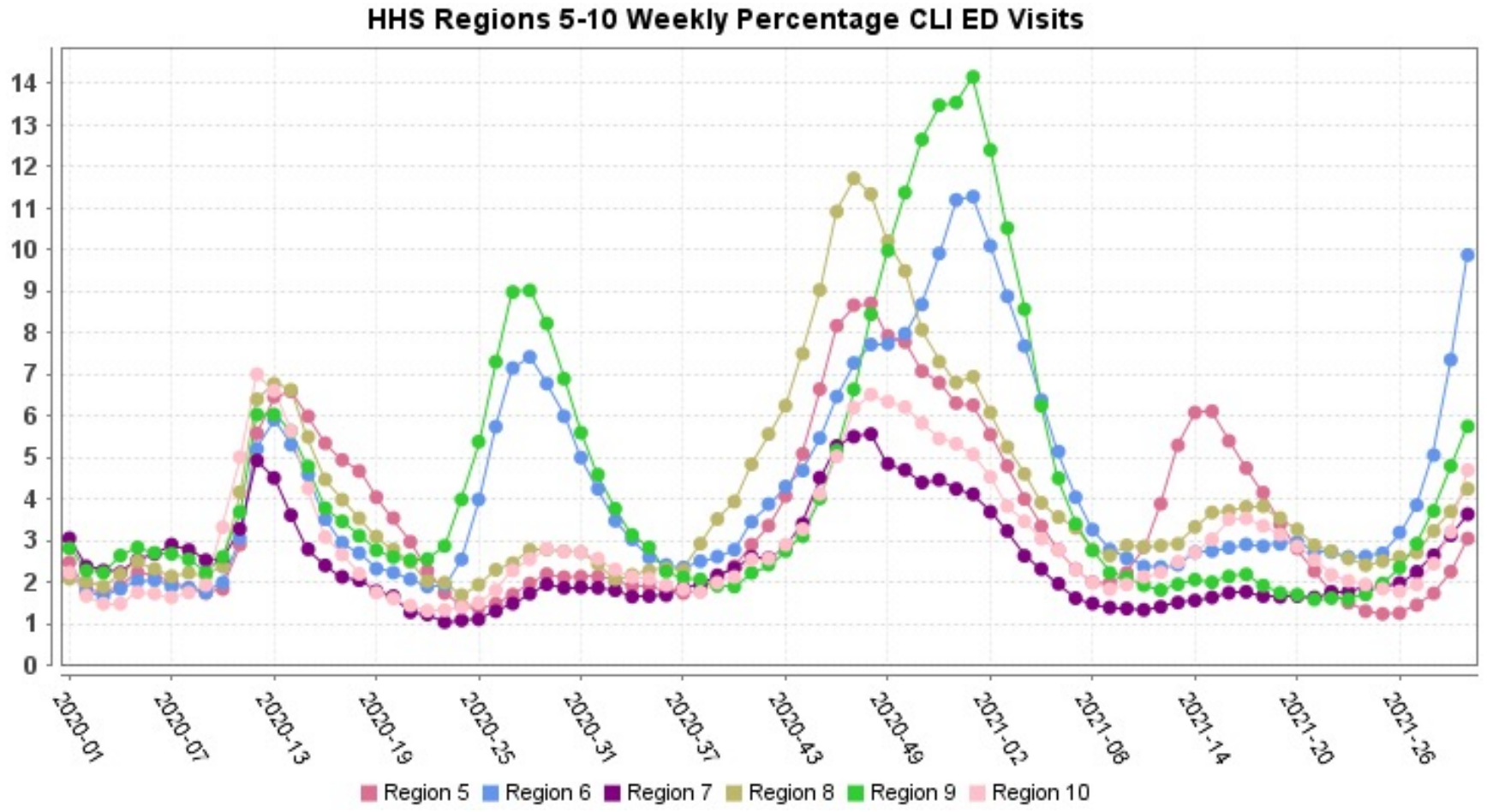
Health and Human Services Regions 5-10



- Region 6 experienced large Summer 2020 and Summer 2021 surges compared to Regions 5 &7-10.
- Region 5 had the most distinct surge in Spring 2020 compared to Regions 6-10.

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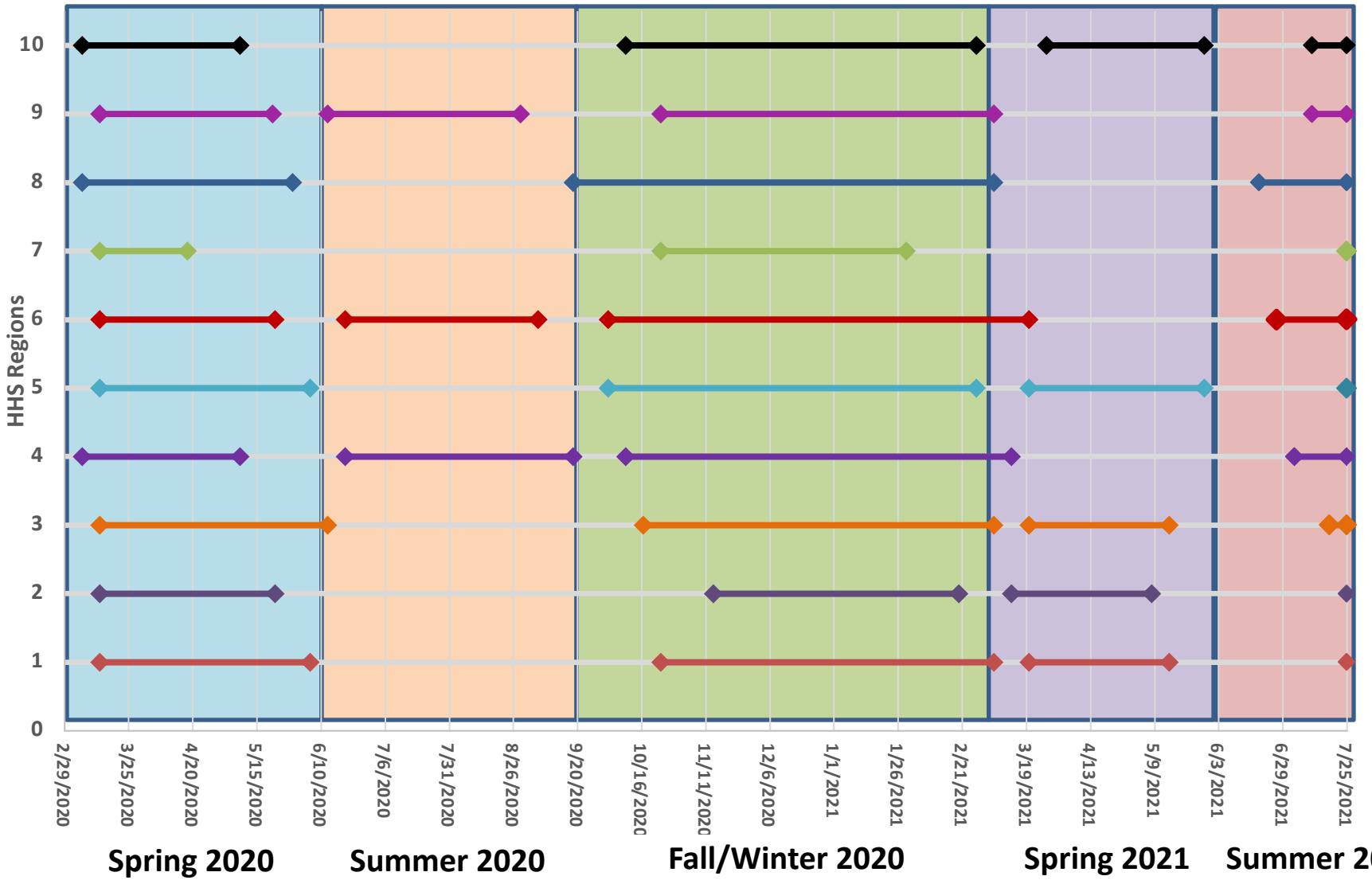
Duration of Pandemic Surges by HHS Region (12/29/20 – 07/31/21)



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Association between Weather, Mobility, and Percent CLI ED Visits

Weather

- Weather data sourced from NSSP ESSENCE
- Within Illinois, minimum temperature showed a weak negative correlation ($r<0.3$, $p<0.01$) with rising CLI ED visits

Mobility

- Mobility data sourced from U.S. Bureau of Transportation Statistics
- Percent of the population staying at home in Illinois had a strong positive correlation with percent CLI ED visits ($r>0.7$, $p<0.01$)
- Most HHS regions showed a strong positive correlation between percent of the population staying at home and percent CLI ED visits

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Summary

- Measuring pandemic surges though ED visits, avoided the bias associated with testing availability or screening.

- Surges in CLI ED Visits differ in timing by region. National sharing of syndromic surveillance data allowed for greater insight into state-level trends.

- Among HHS Regions, strong positive correlations between CLI ED visits and mobility suggest potential behavior modifications during CLI surges.

- Correlation between CLI ED visits and temperature was weak but warrants further exploration.

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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

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