

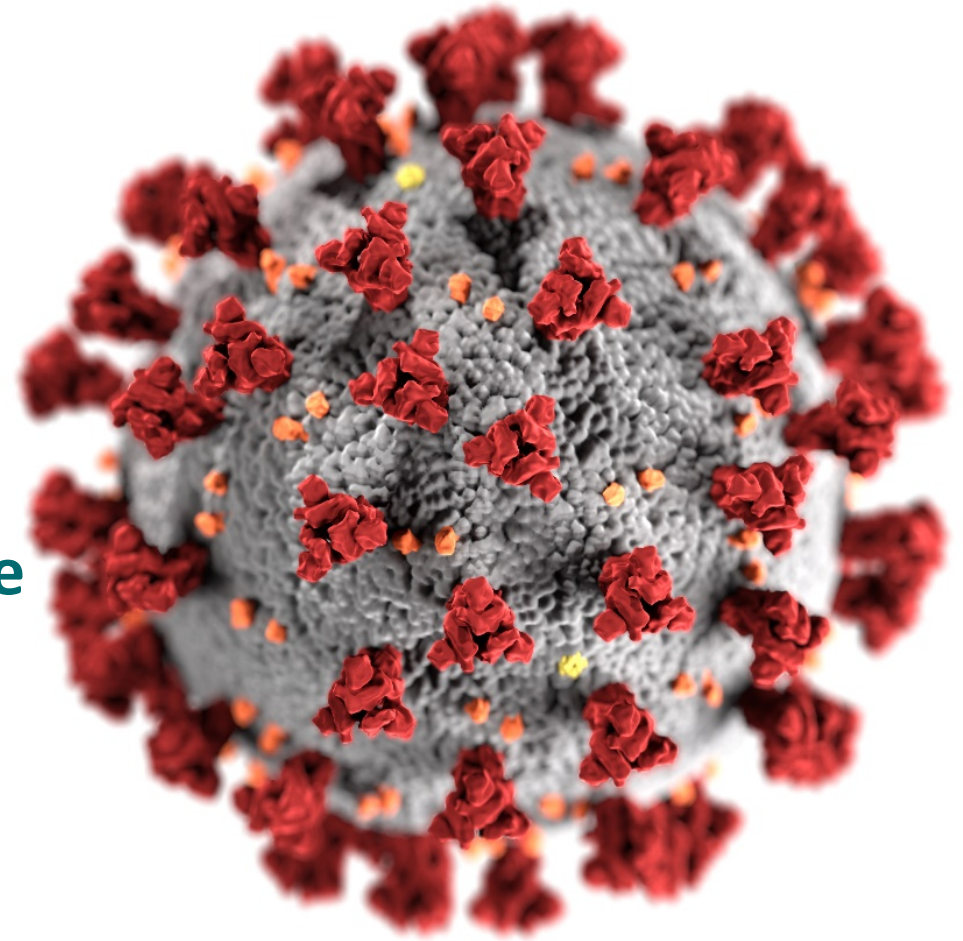
Role of NSSP BioSense Platform in COVID-19 Response

Paula W. Yoon, ScD, MPH

Director

**Division of Health Informatics and Surveillance
Center for Disease Control and Prevention**

November 19, 2020

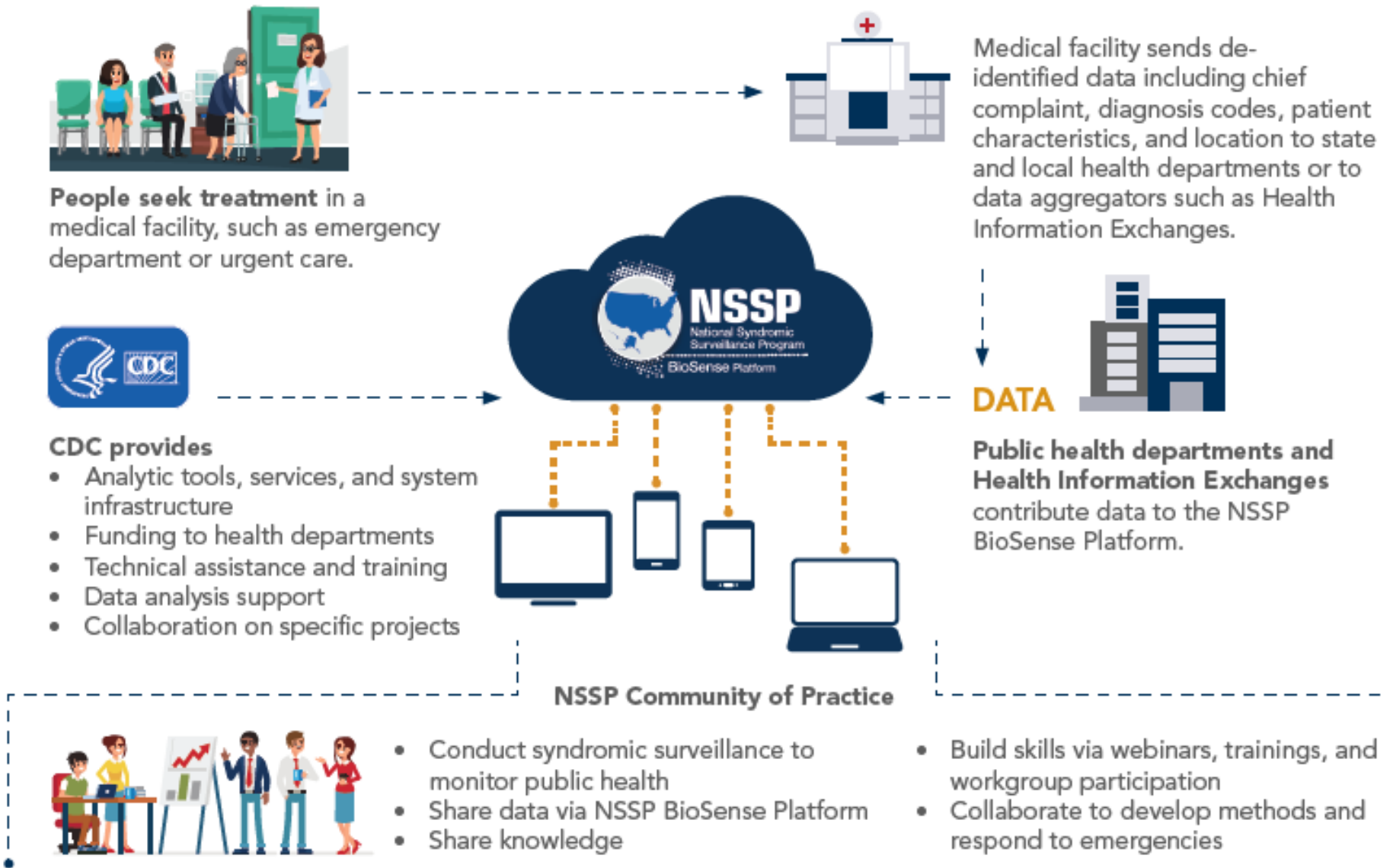


cdc.gov/coronavirus

Bottom Line Up Front (BLUF)

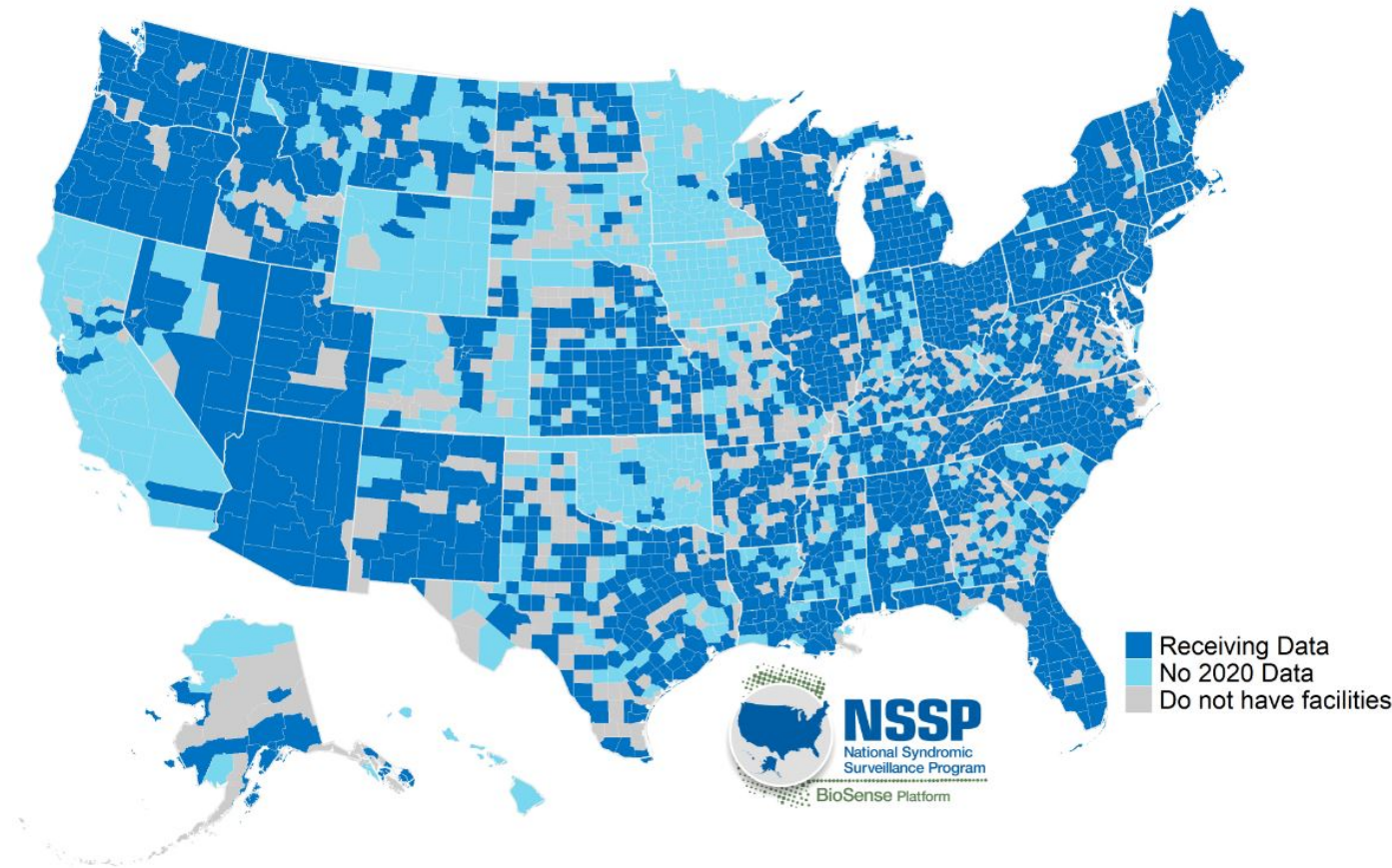
- Data collection systems and tools that function most optimally in an emergency response are those that are used for every day public health practice

HOW WE CONDUCT SYNDROMIC SURVEILLANCE



National Syndromic Surveillance Program

- **48 states** participate
- **73%** of all US Emergency Department visits
- **75%** of data received within **24 hours of the visit**
- **6 million** messages per day
- **>2,000** registered users of the system
- **>6,000** daily queries



NSSP COVID-19 Data Use Timeline: Jan – Nov 2020

- Jan – Community of Practice kicks into high gear to develop and test syndrome definitions
- Jan-Feb – Queries, Dashboards, R Shiny app, and sharing of state experiences
- Feb – NSSP team becomes part of the CDC EOC response
- Feb – Unprecedented need for NSSP data leads to discussions about data sharing with ASTHO, CSTE, CoP and others
- Feb – Order and result data for one laboratory available in ESSENCE
- Mar – Commercial COVID-19 testing ramps up; time trends, maps, percent positivity and line-level data shared through ESSENCE
- Mar–April – Five more large commercial laboratories added

NSSP COVID-19 Data Use Timeline: Jan – Nov 2020

- April – CoP notified that due to the emergency declaration, some NSSP data would be available in HHS Protect and used for federal response efforts
- April – Surge to onboard new facilities to fill in data gaps
- April–May – Emails to alert partners to tests ordered from nursing homes
- April–present – State-reported data phased in through COVID Electronic Lab Reporting (CELR); commercial laboratory data used until CELR feed ready
- Ongoing – Percent positivity and total test volume used to inform response
- Ongoing – Many valuable data products have informed public health actions

Opening Up America Again Guidelines

Proposed State or Regional Gating Criteria

Satisfy Before Proceeding to Phased Comeback

SYMPTOMS

Downward trajectory of influenza-like illnesses (ILI) reported within a 14-day period

AND

Downward trajectory of covid-like syndromic cases reported within a 14-day period

CASES

Downward trajectory of documented cases within a 14-day period

OR

Downward trajectory of positive tests as a percent of total tests within a 14-day period (flat or increasing volume of tests)

HOSPITALS

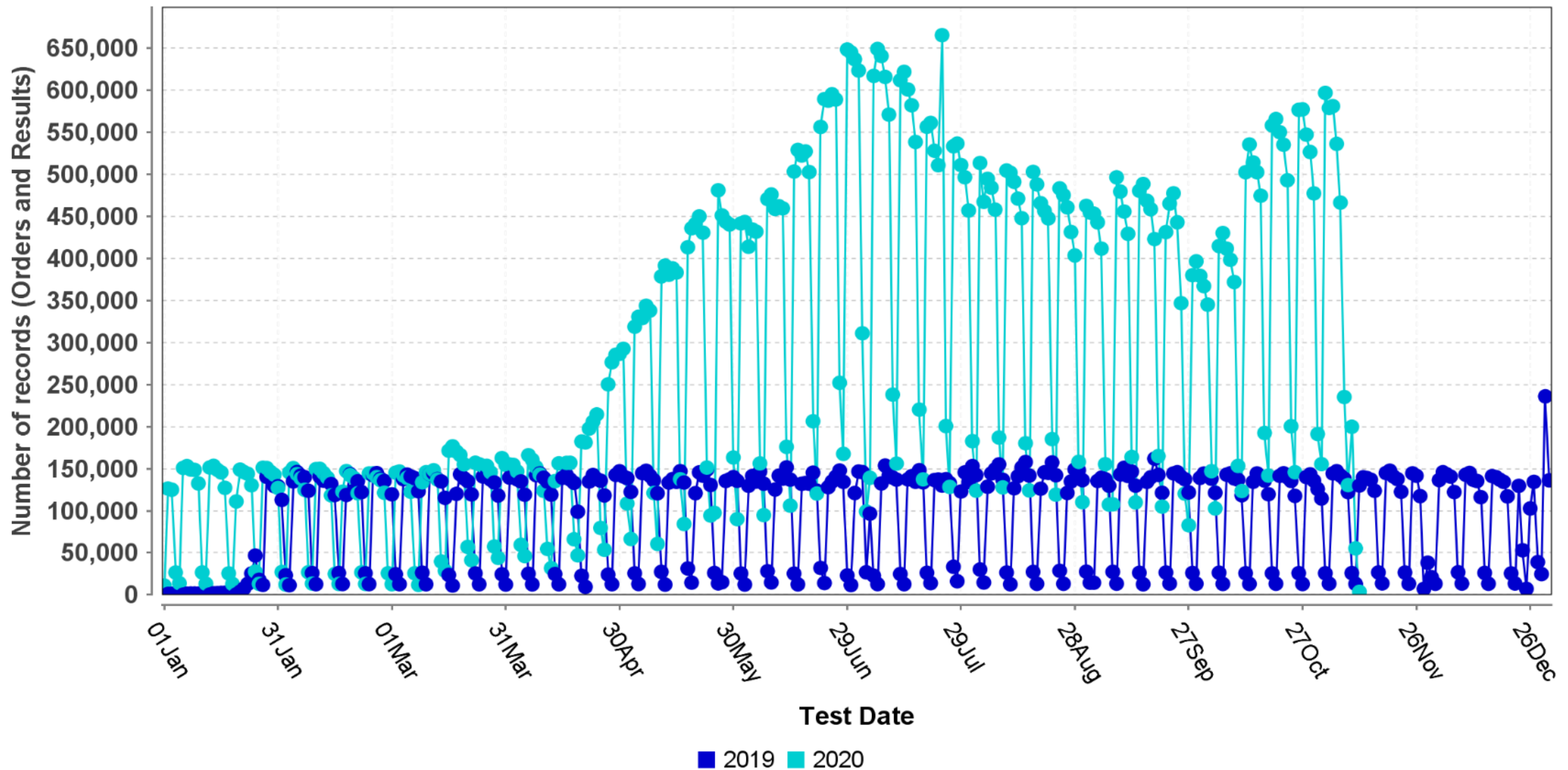
Treat all patients without crisis care

AND

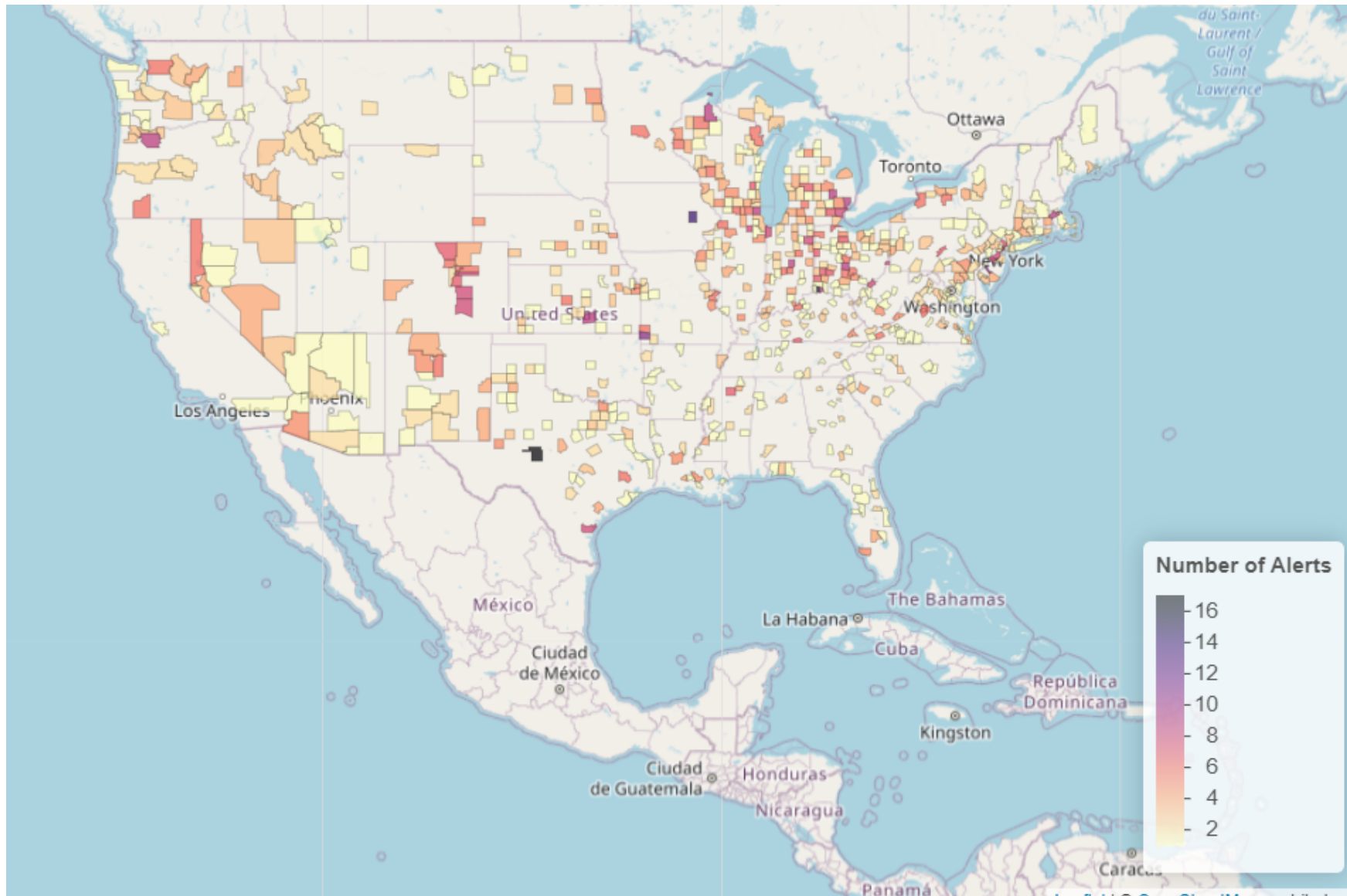
Robust testing program in place for at-risk healthcare workers, including emerging antibody testing

<https://www.whitehouse.gov/openingamerica/>

Commercial Laboratory Records Submitted to NSSP



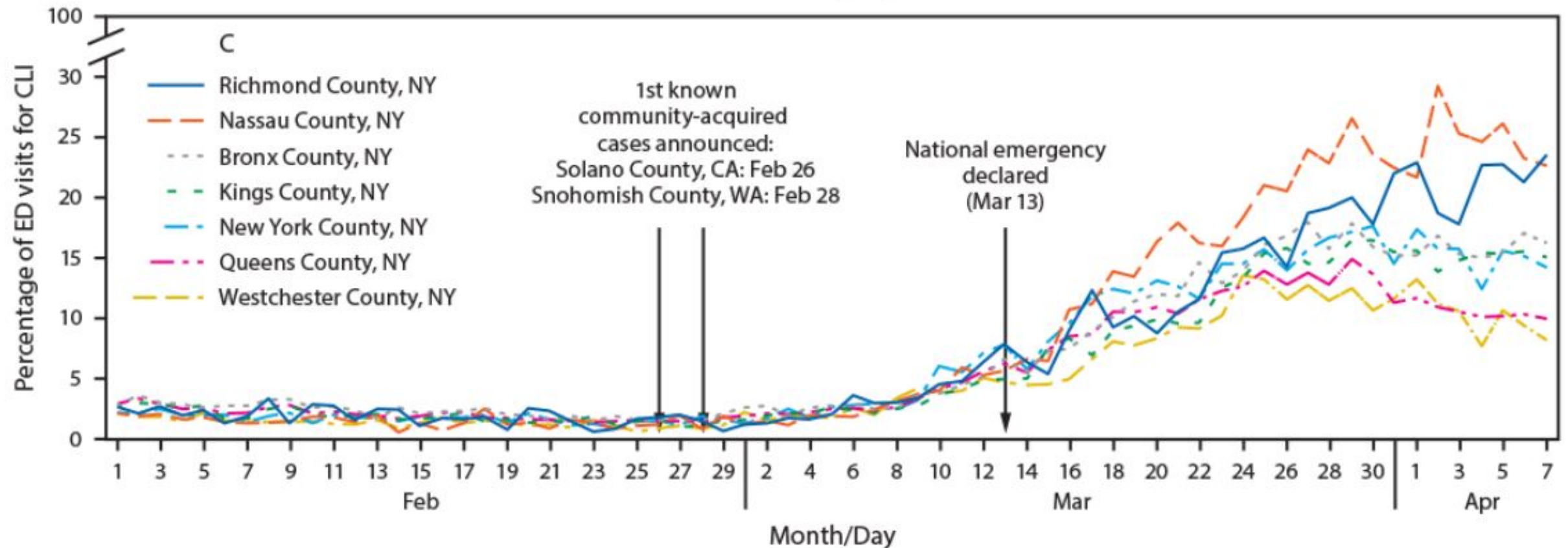
R Shiny Dashboard: ESSENCE alerts, Nov 3–6, 2020



Evidence for Limited Early Spread of COVID-19 Within the United States, January–February 2020

MMWR Weekly / June 5, 2020 / 69(22);680–684

FIGURE. Percentage of emergency department (ED) visits for COVID-19-like illness (CLI) in seven New York counties, February 1–April 7, 2020

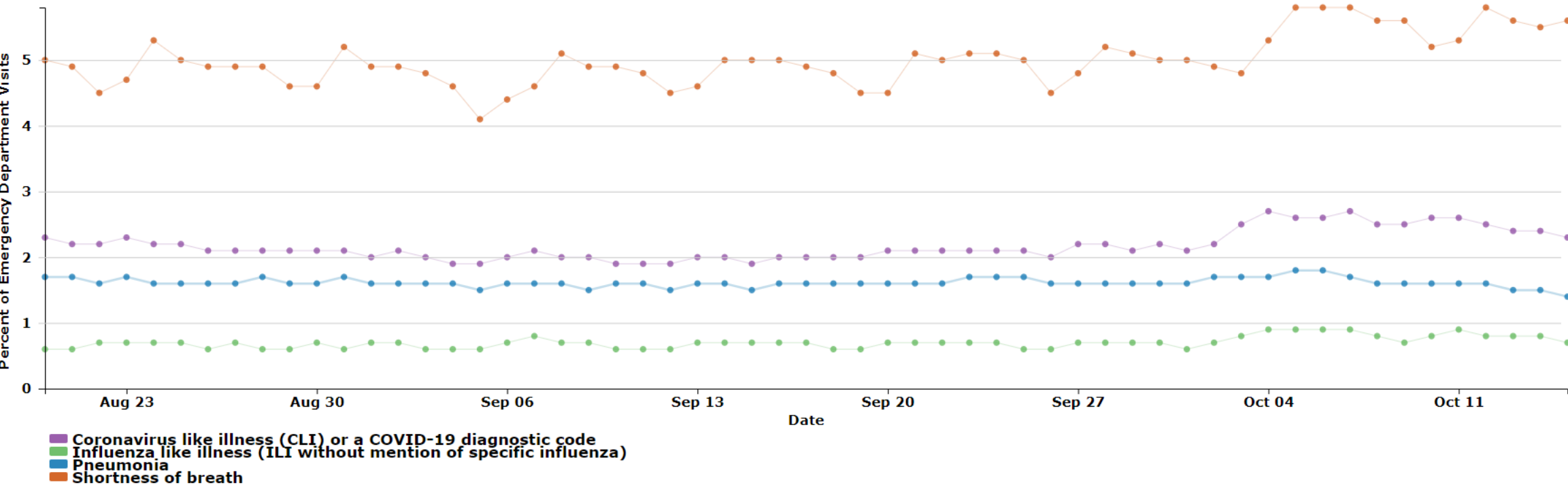


U.S. Trends in Emergency Department Visits

United States

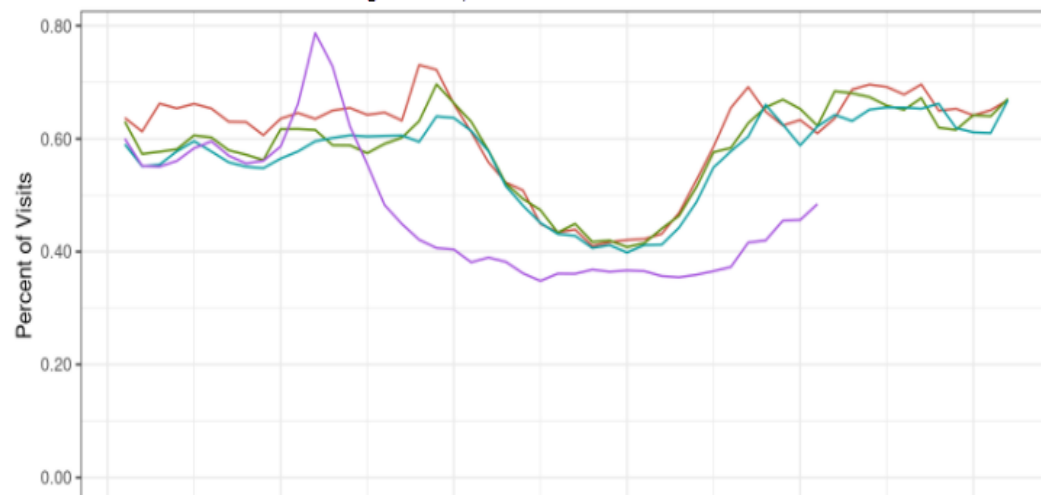


Percentage of ED visits by syndrome in United States: COVID-19-Like Illness, Shortness of Breath, Pneumonia, and Influenza-Like Illness

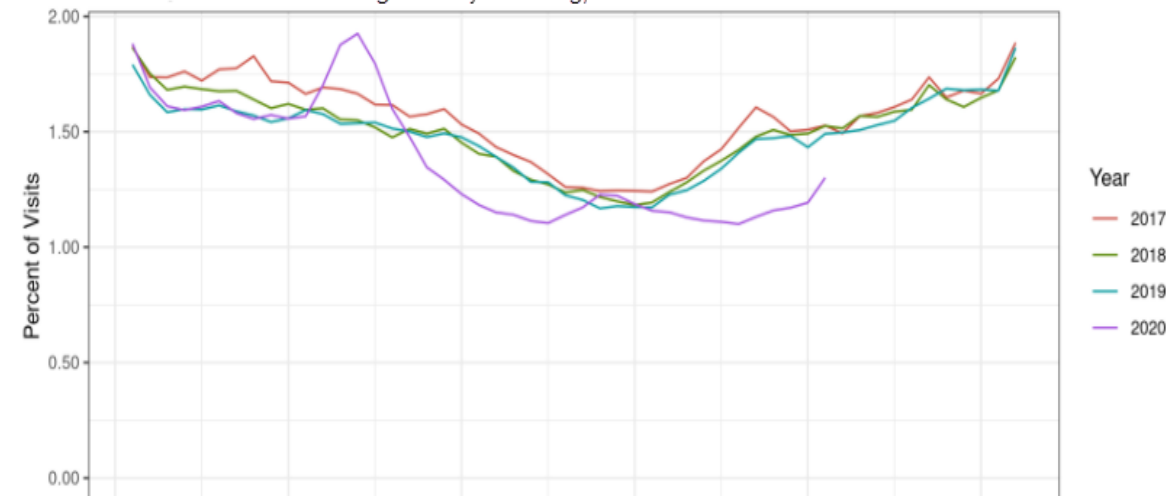


National Year-over-Year Weekly Trends in Percent of ED Visits for Various Respiratory Syndromes, 2017–2020

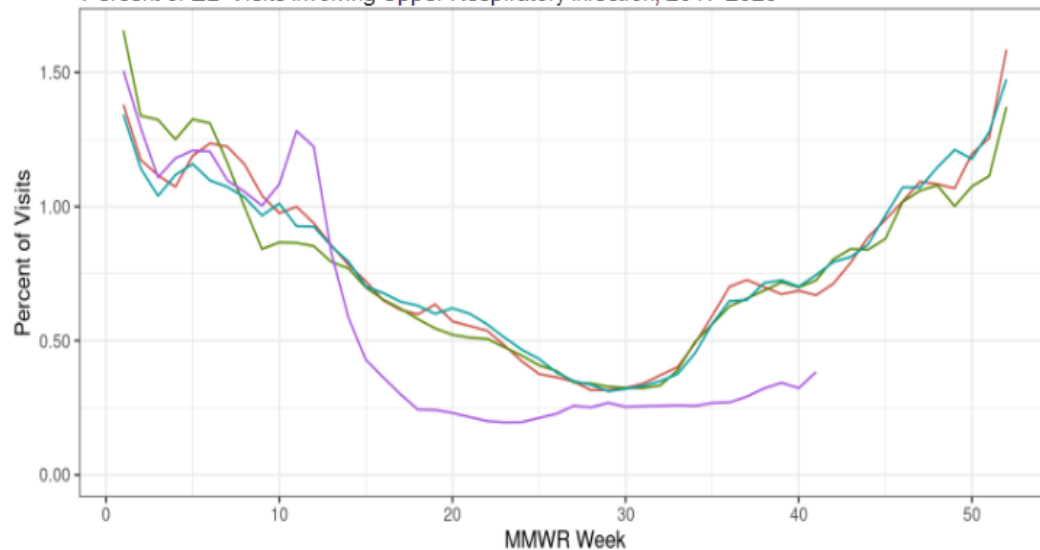
Percent of ED Visits Involving Asthma, 2017-2020



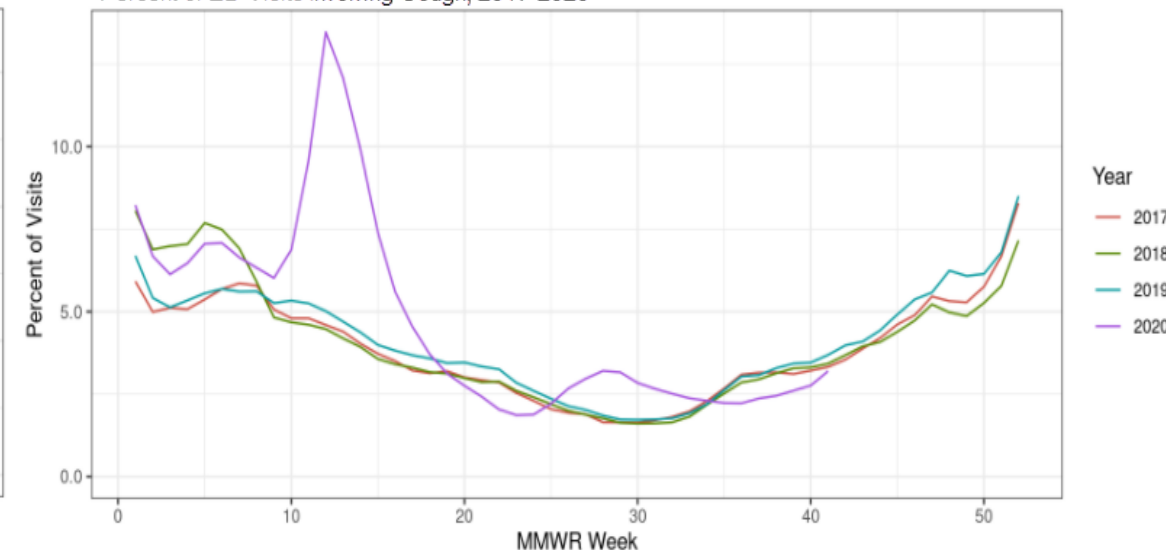
Percent of ED Visits Involving Difficulty Breathing, 2017-2020



Percent of ED Visits Involving Upper Respiratory Infection, 2017-2020

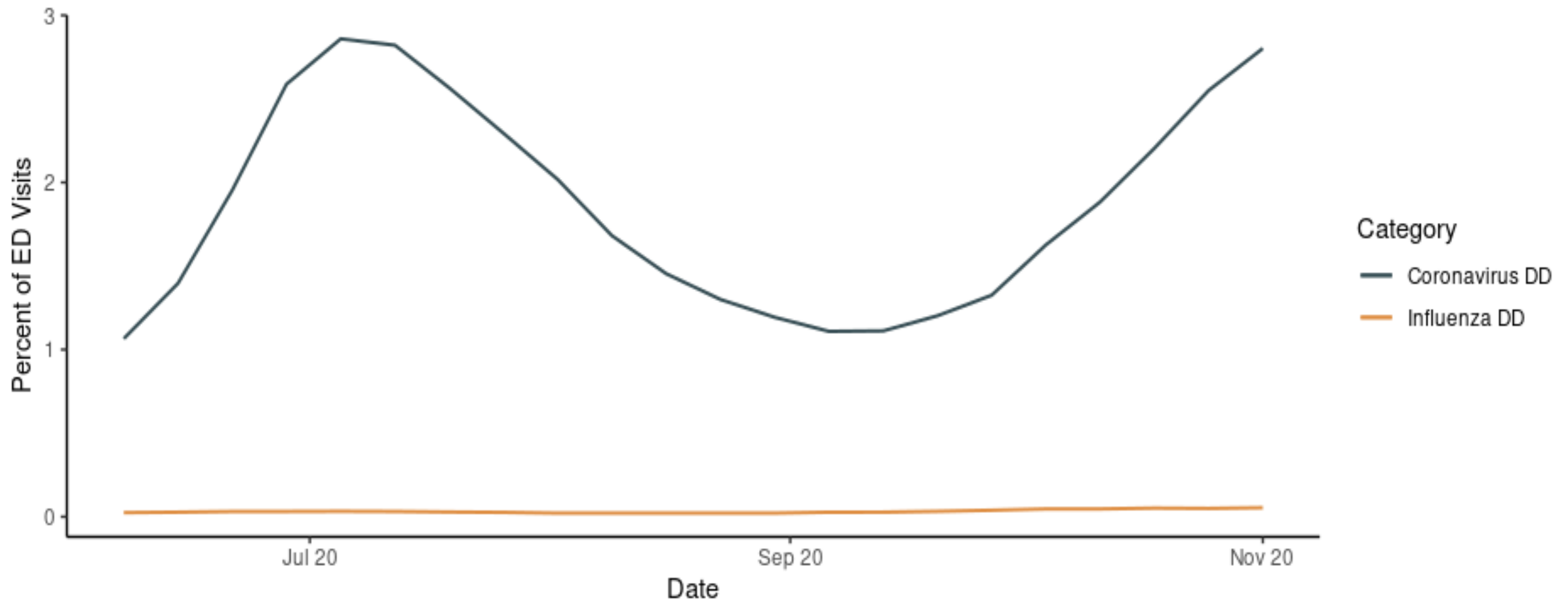


Percent of ED Visits Involving Cough, 2017-2020



Monitoring Discharge Diagnosis for Situational Awareness

Coronavirus and influenza discharge diagnosis as percent of emergency department (ED) visits —
United States, June 7–Nov 7, 2020

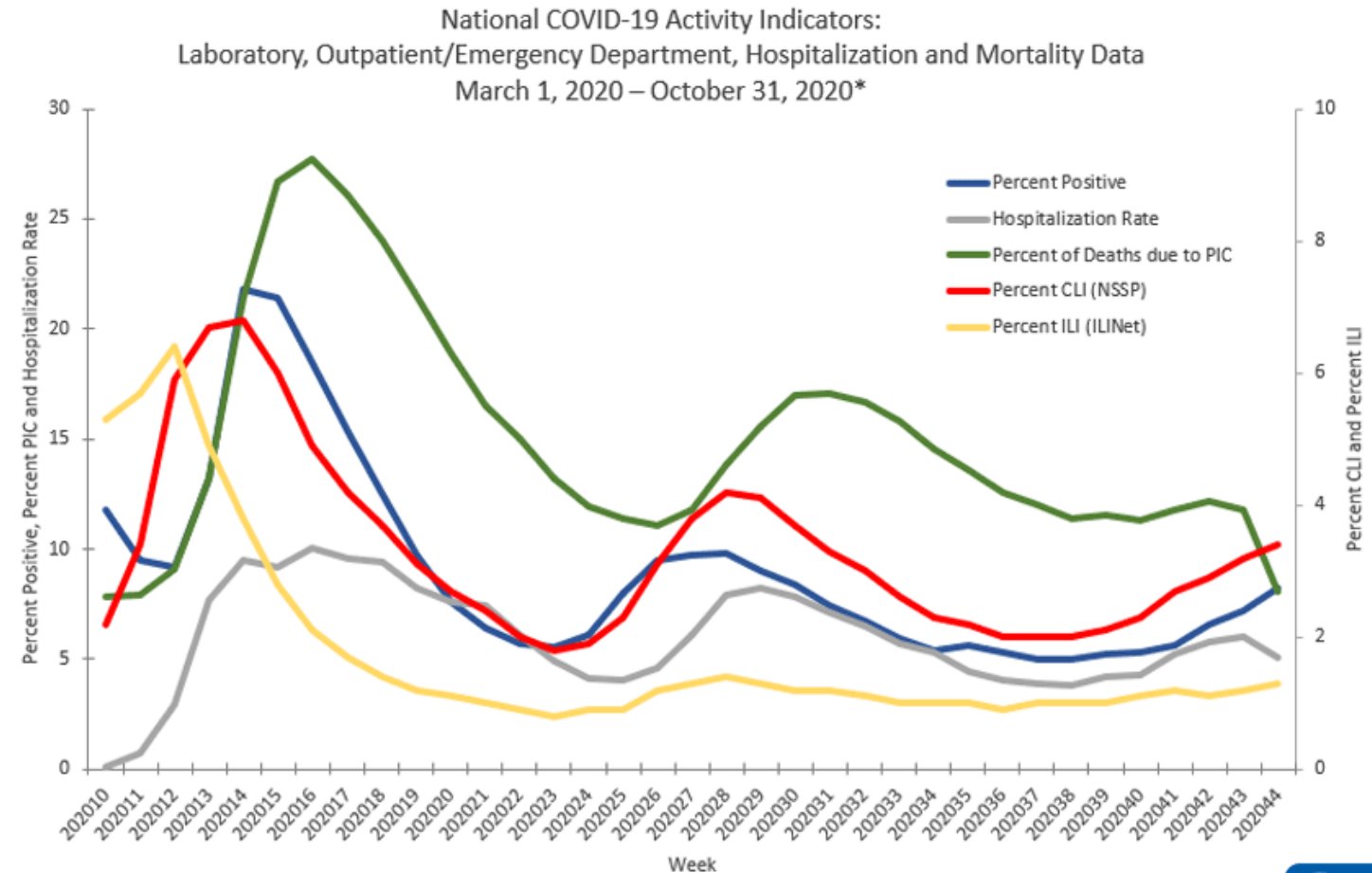


COVIDView

Weekly Surveillance Summary

Key Updates for Week 44, ending October 31, 2020

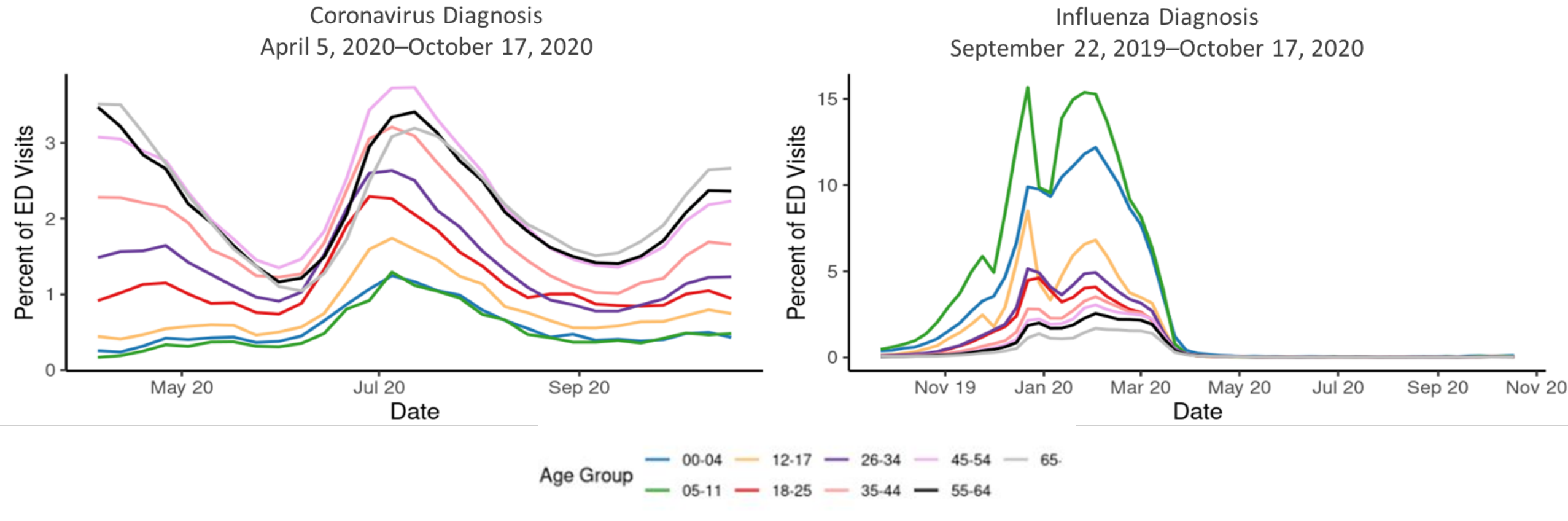
Nationally, surveillance indicators tracking levels of SARS-CoV-2 virus circulation and associated illnesses have been increasing since September. The percentage of deaths due to pneumonia, influenza and COVID-19 (PIC) increased during the first two weeks of October. Both COVID-19 related hospitalizations and PIC mortality for the most recent weeks may increase as more data are received.



*Data are preliminary and may change as more reports are received.



Coronavirus and influenza emergency department (ED) visits as a percentage of all ED visits, by age group — April 5, 2020–October 17, 2020



Data from the National Syndromic Surveillance Program.

Coronavirus diagnosis trends begin in April 2020, when the ICD-10 code U07.1 was introduced for COVID-19.

Changing Age Distribution of the COVID-19 Pandemic – United States, May–August 2020

MMWR Weekly / October 2, 2020 / 69(39);1404–1409

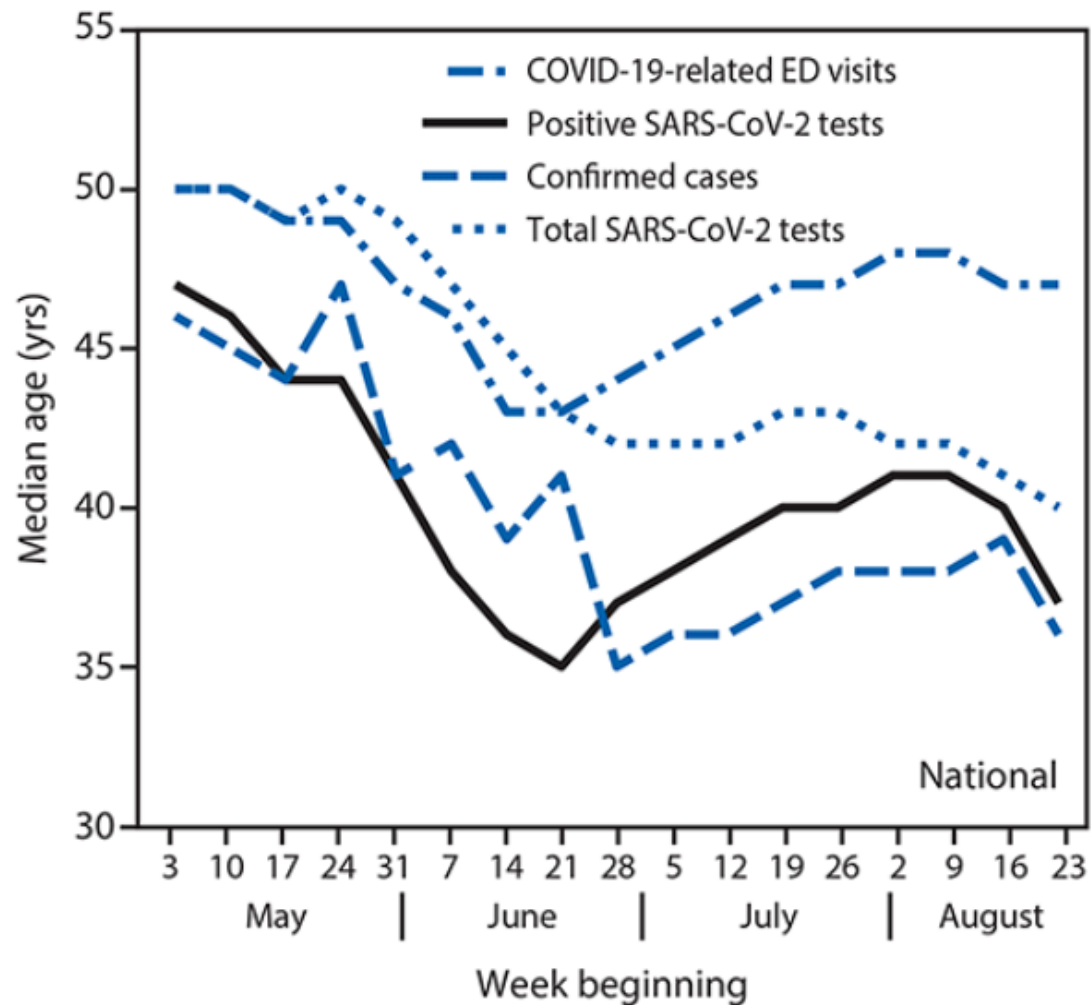
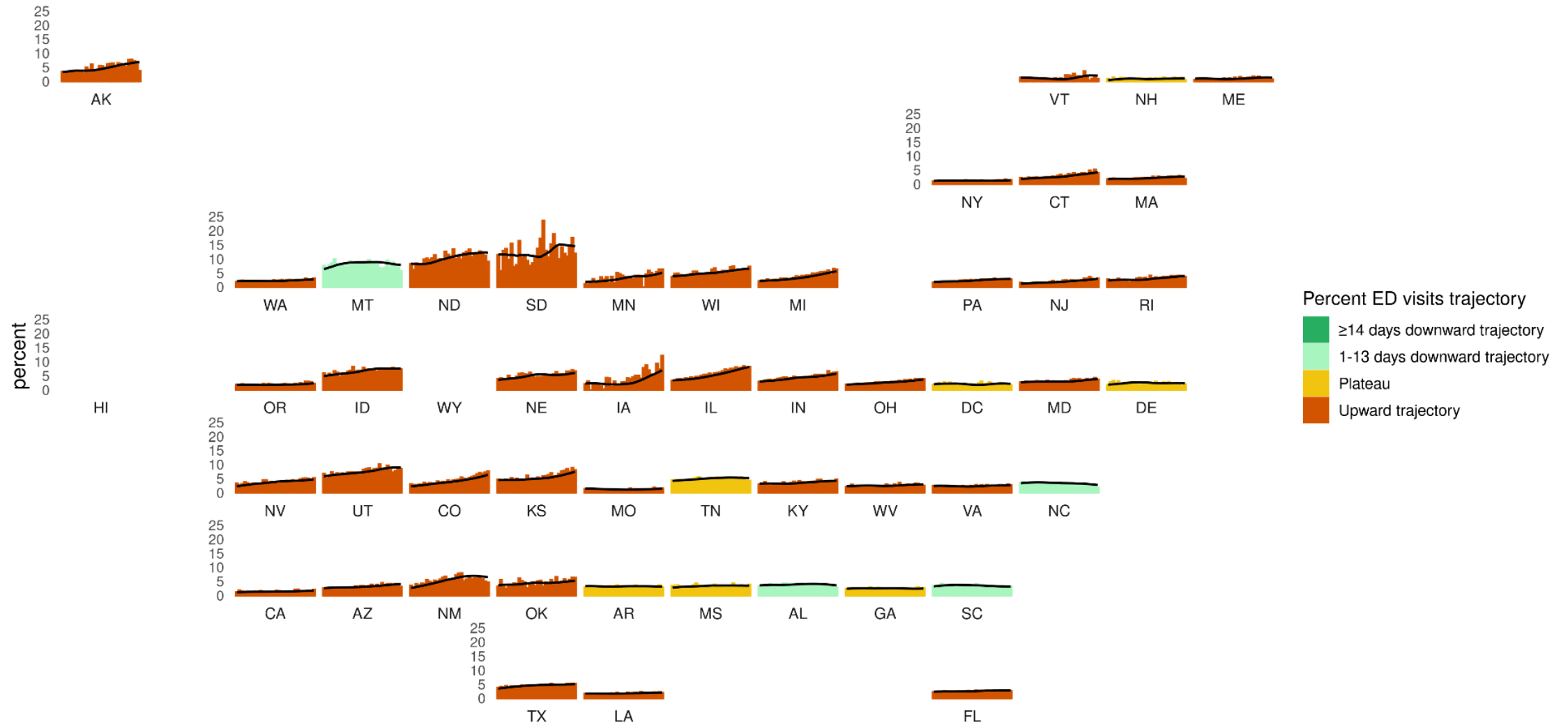


FIGURE. Weekly median age of persons with COVID-19–like illness-related emergency department (ED) visits, positive SARS-CoV-2 reverse transcription-polymerase chain reaction (RT-PCR) test results, and confirmed COVID-19 cases, and of persons for whom all SARS-CoV-2 RT-PCR tests were conducted — United States, May 3–August 29, 2020.

COVID-19-like Illness Trajectory: Oct 9 – Nov 7, 2020



Please note: Hawaii and Wyoming do not currently report data to the NSSP; Additionally, a number of states, or parts of states, do participate but have lower coverage, including California, Colorado, Iowa, Minnesota, New Hampshire, Oklahoma, Pennsylvania, South Carolina, South Dakota, and Texas. Missouri's discharge diagnosis data are less complete than other states.

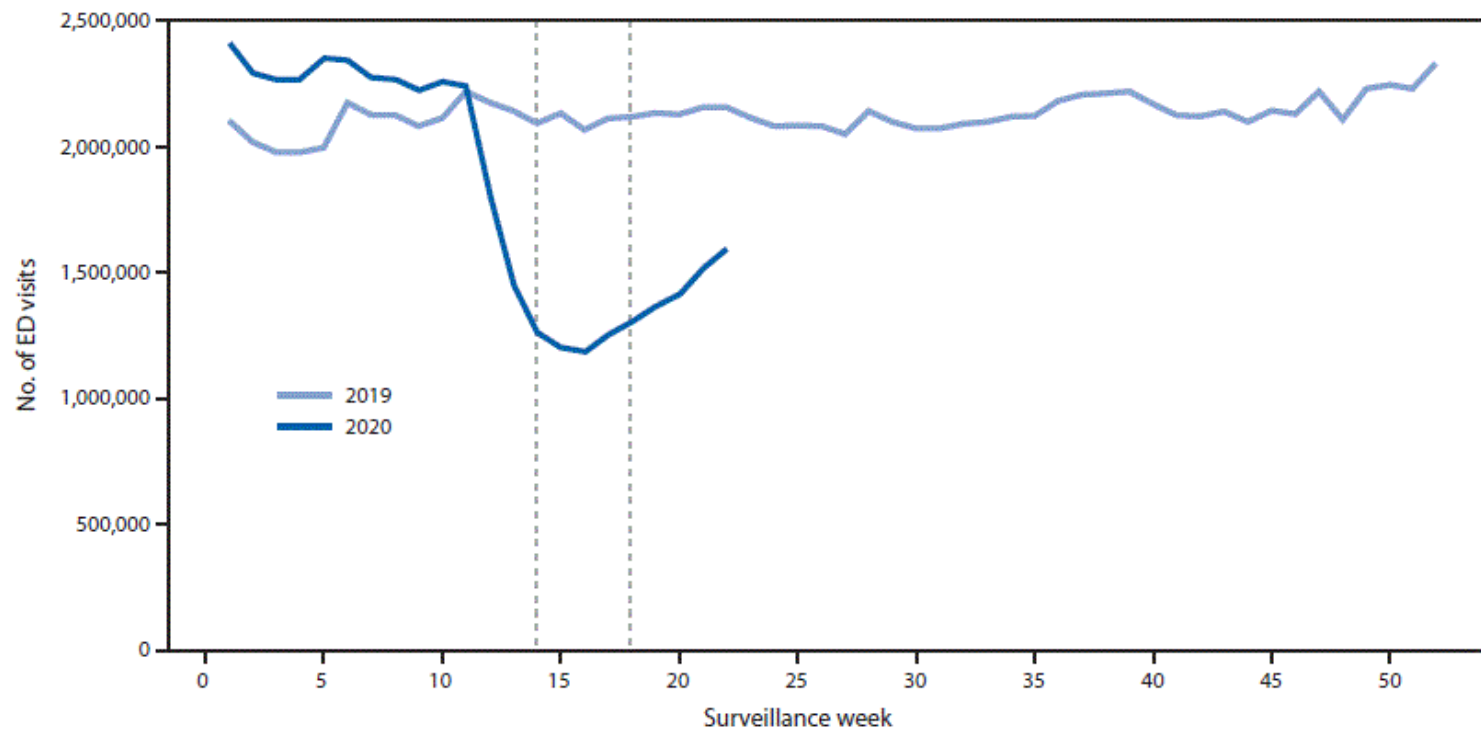
Surveillance for Other Indirect Effects

- Acute Life-Threatening Conditions
- Volume of HIV tests from commercial laboratory data
- Violence and self-harm
- Children's mental health
- Child abuse and neglect
- Drug overdose
- Other respiratory conditions
- Vaccine adverse events

Impact of the COVID-19 Pandemic on Emergency Department Visits — United States, January 1, 2019–May 30, 2020

MMWR Weekly / June 12, 2020 / 69(23);699–704

FIGURE 1. Weekly number of emergency department (ED) visits — National Syndromic Surveillance Program, United States,* January 1, 2019– May 30, 2020†

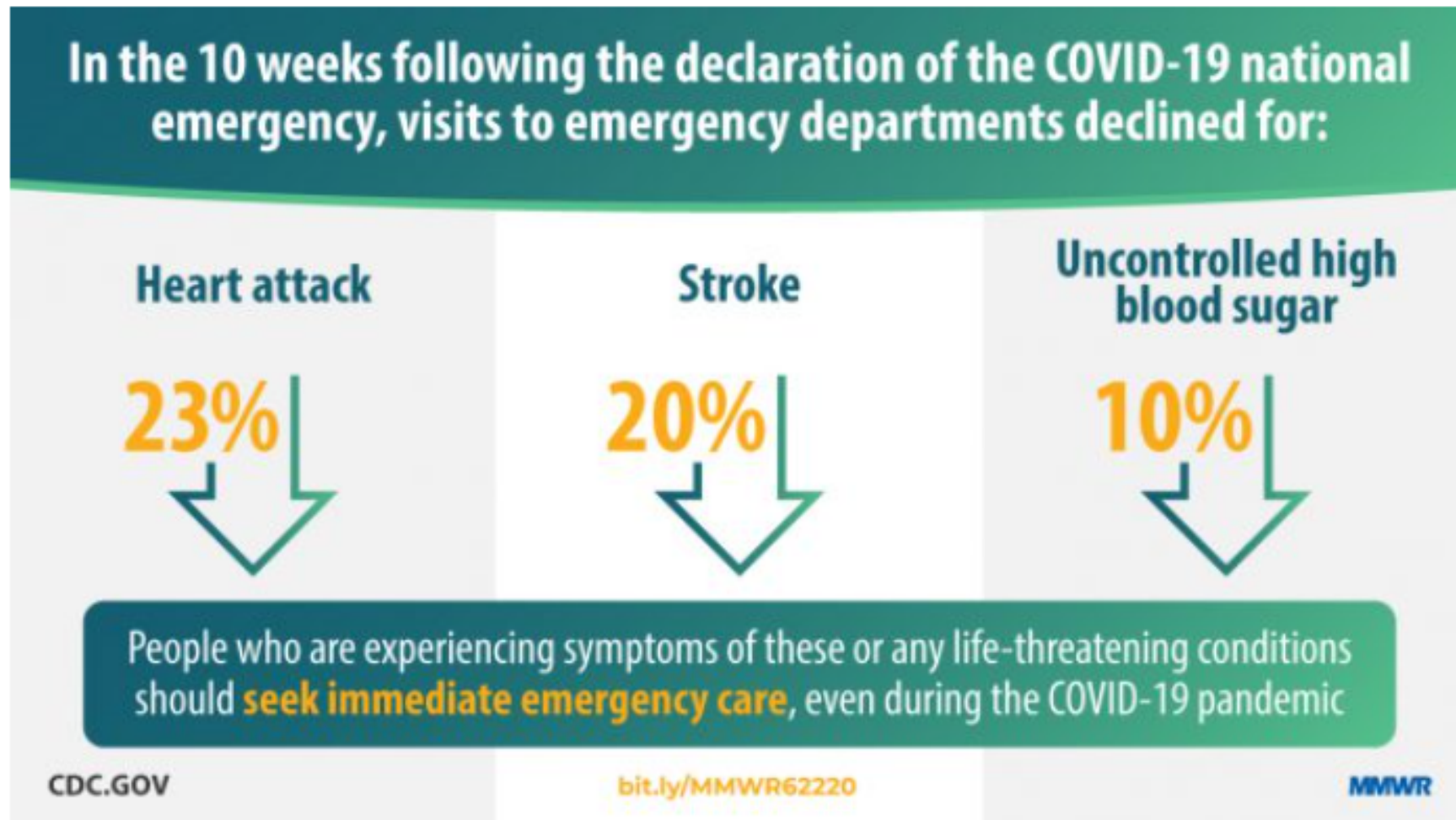


* Hawaii, South Dakota, and Wyoming are not included.

† Vertical lines indicate the beginning and end of the 4-week coronavirus disease 2019 (COVID-19) early pandemic period (March 29–April 25, 2020) and the comparison period (March 31–April 27, 2019).

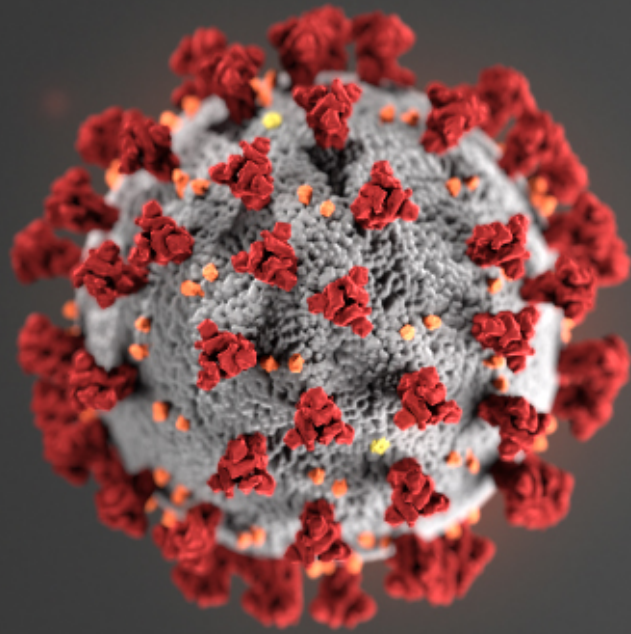
Potential Indirect Effects of the COVID-19 Pandemic on Use of Emergency Departments for Acute Life-Threatening Conditions — United States, January–May, 2020

MMWR Weekly / June 26, 2020 / 69(25);795–800



Lessons Learned

- Establish data sharing practices for national emergencies before the emergency
- Coverage gaps result in skepticism about some estimates and findings
- Incomplete data feeds (e.g., disposition) limit ability to characterize ED visits
- Layering trends in ED visits, laboratory testing, case incidence, and mortality provides insight into the spread of infection
- ED visits provide timely information about health seeking behaviors during a pandemic
- Race and ethnicity data can be improved by combining text and codes
- NSSP provides unique mechanism for tracking CLI and ILI trends



For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



COVID Response: State and Local Experiences



COVID: State and Local Experiences



Natasha Close

**Washington Department of
Health**

Surveillance Epidemiologist



Scott Hutton

Idaho Division of Public Health

Epidemiology Section Manager



Stacey Hoferka Jensen

Illinois Department of Health

Epidemiologist



Rob Mathes

**NYC Dept of Health and Mental
Hygiene**

Director, Syndromic Surveillance





CHASING COVID-19

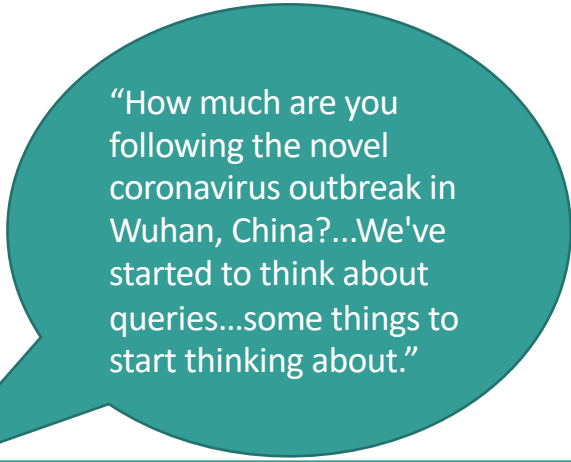
Natasha Close

In the beginning

January 16

- Msg from National Syndromic Surveillance Program (NSSP) that they are thinking about potential queries

In the beginning

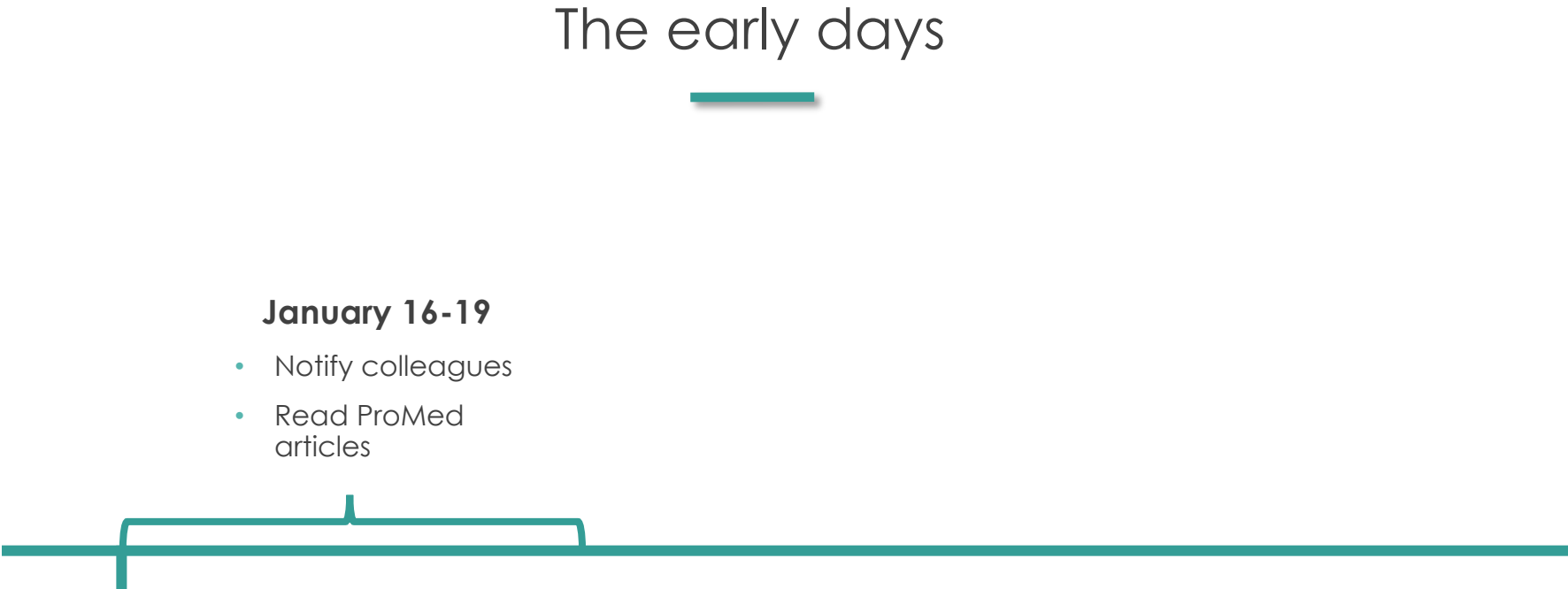


“How much are you following the novel coronavirus outbreak in Wuhan, China?...We've started to think about queries...some things to start thinking about.”

January 16

- Msg from National Syndromic Surveillance Program (NSSP) that they are thinking about potential queries

The early days



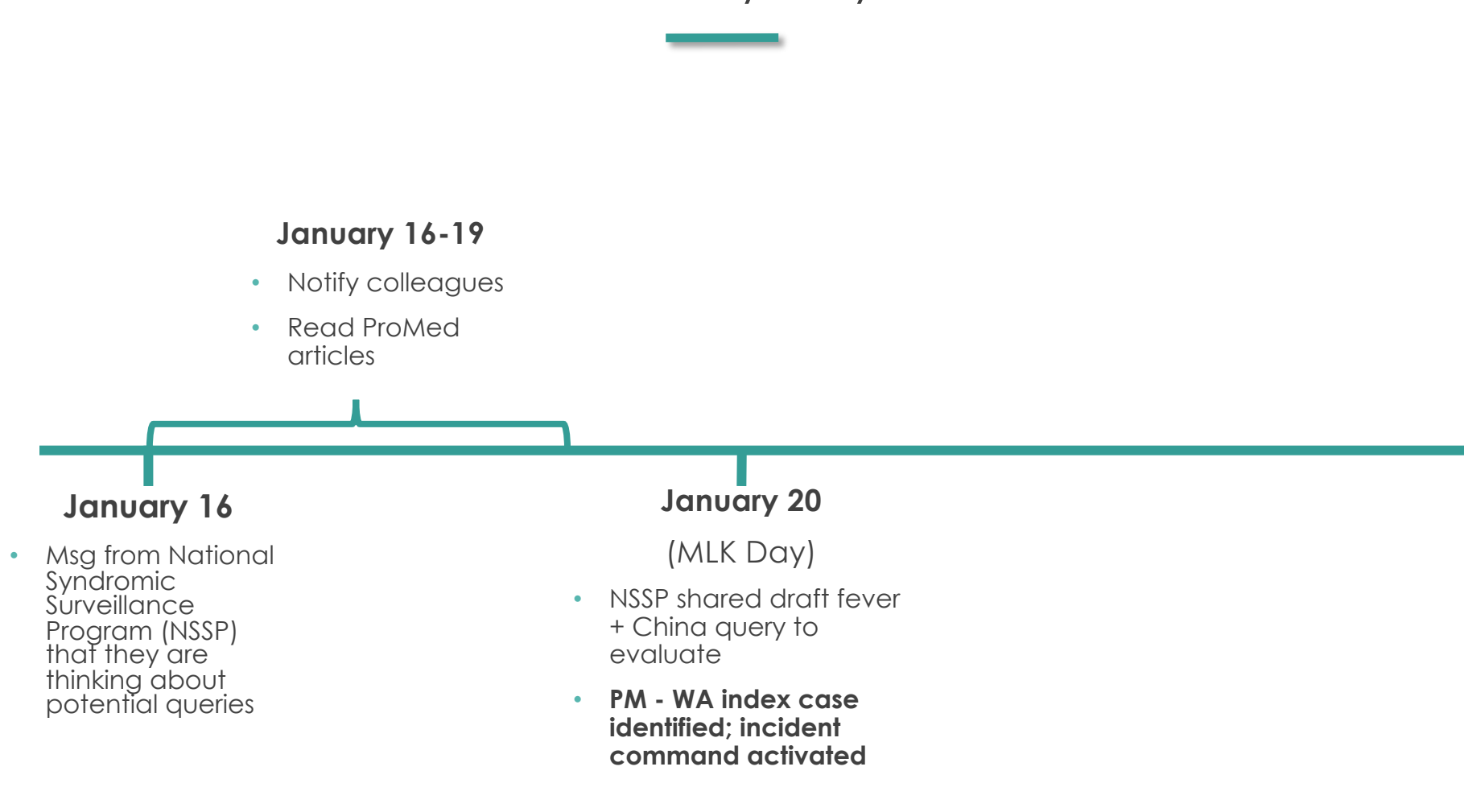
January 16-19

- Notify colleagues
- Read ProMed articles

January 16

- Msg from National Syndromic Surveillance Program (NSSP) that they are thinking about potential queries

The early days



January 16-19

- Notify colleagues
- Read ProMed articles

January 16

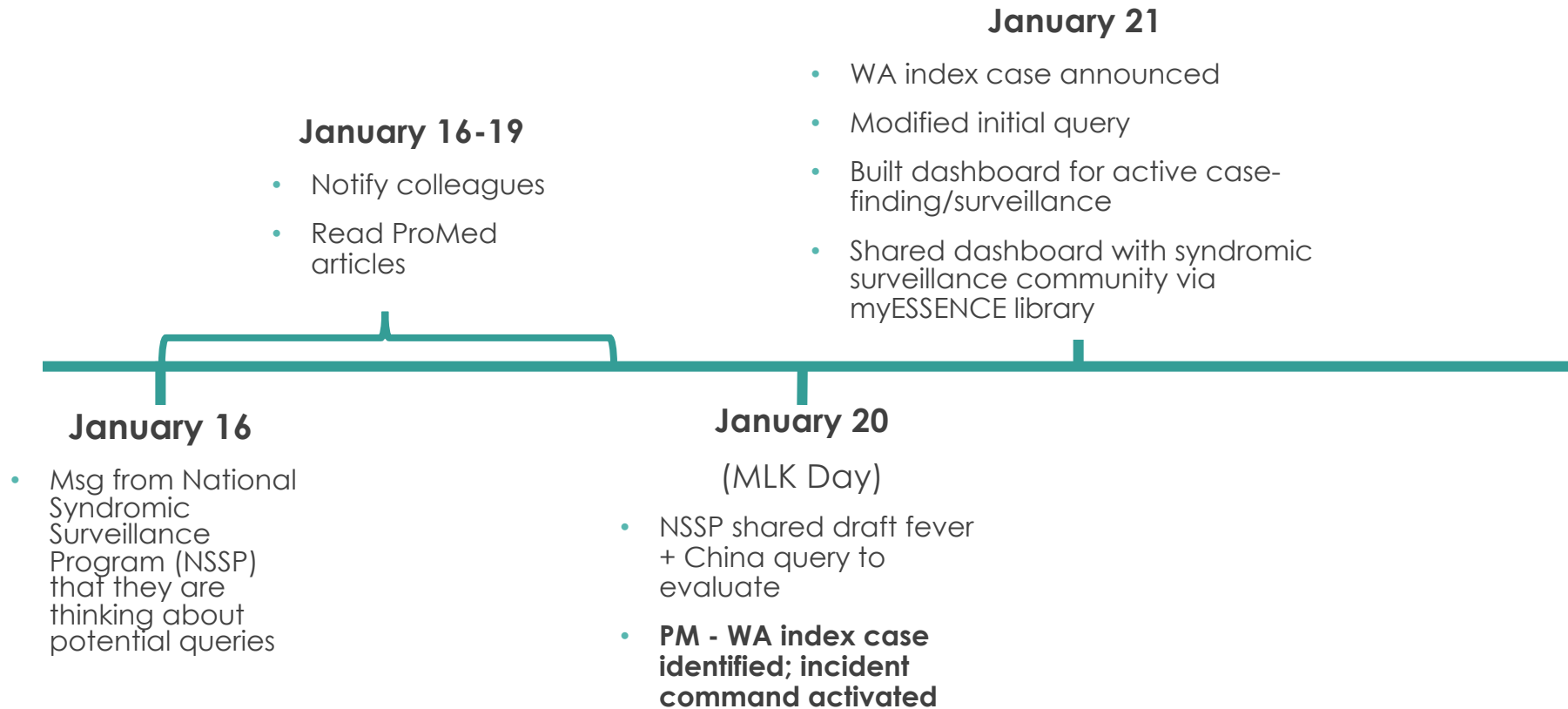
- Msg from National Syndromic Surveillance Program (NSSP) that they are thinking about potential queries

January 20

(MLK Day)

- NSSP shared draft fever + China query to evaluate
- **PM - WA index case identified; incident command activated**

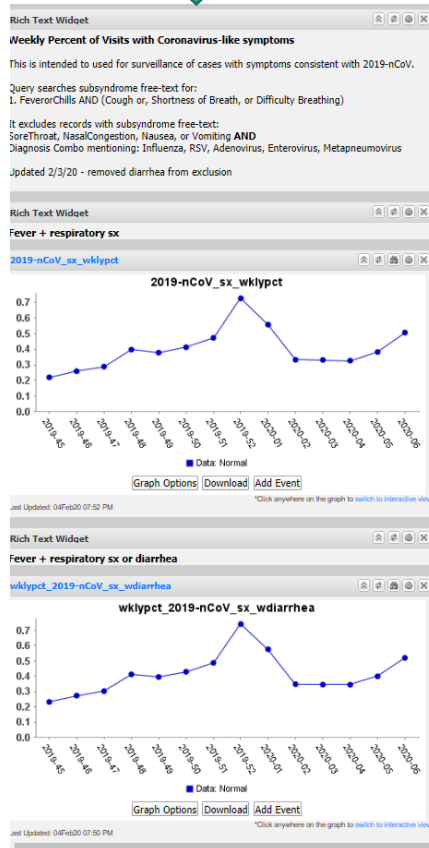
The early days



Early ESSENCE Dashboard

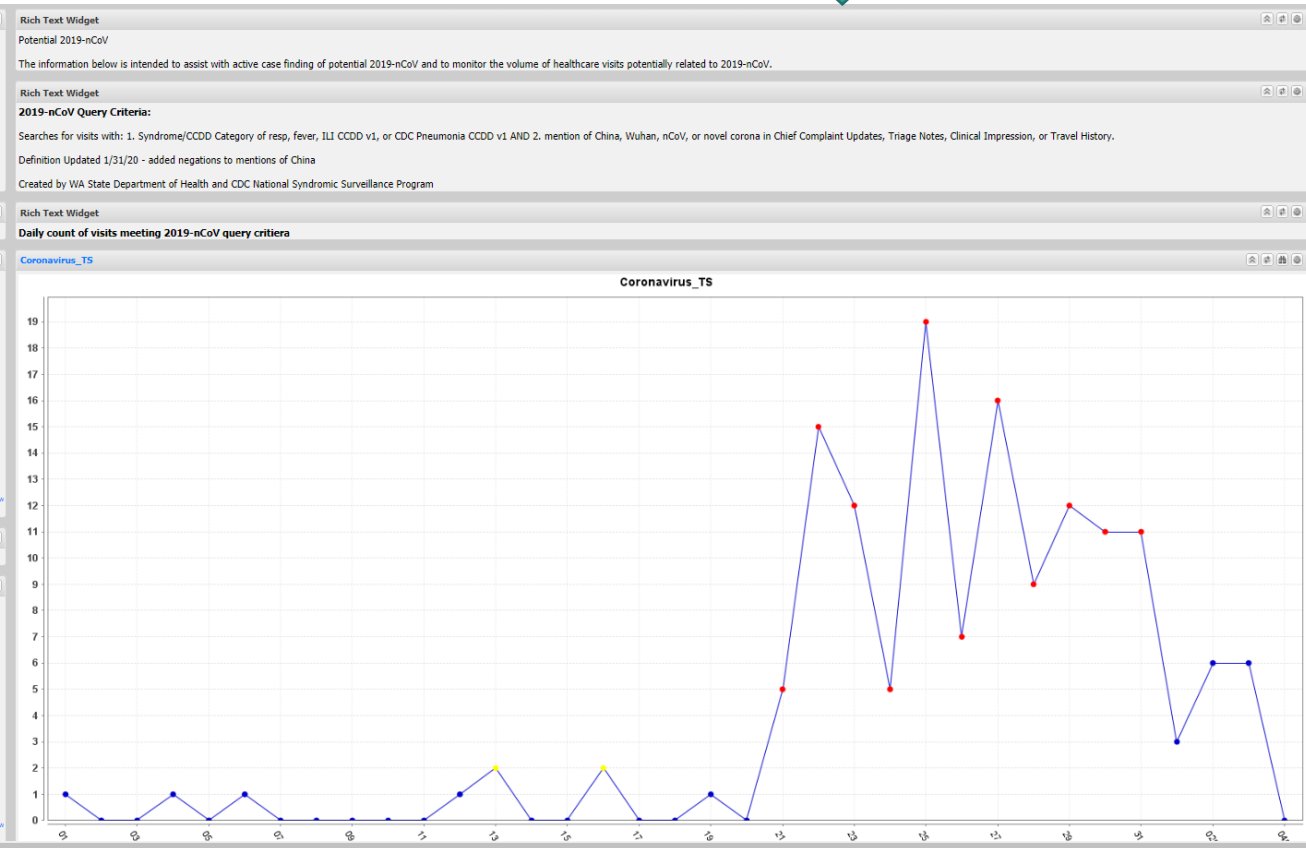
Community Surveillance:

- Symptoms
- Pneumonia
- Coronavirus diagnosis

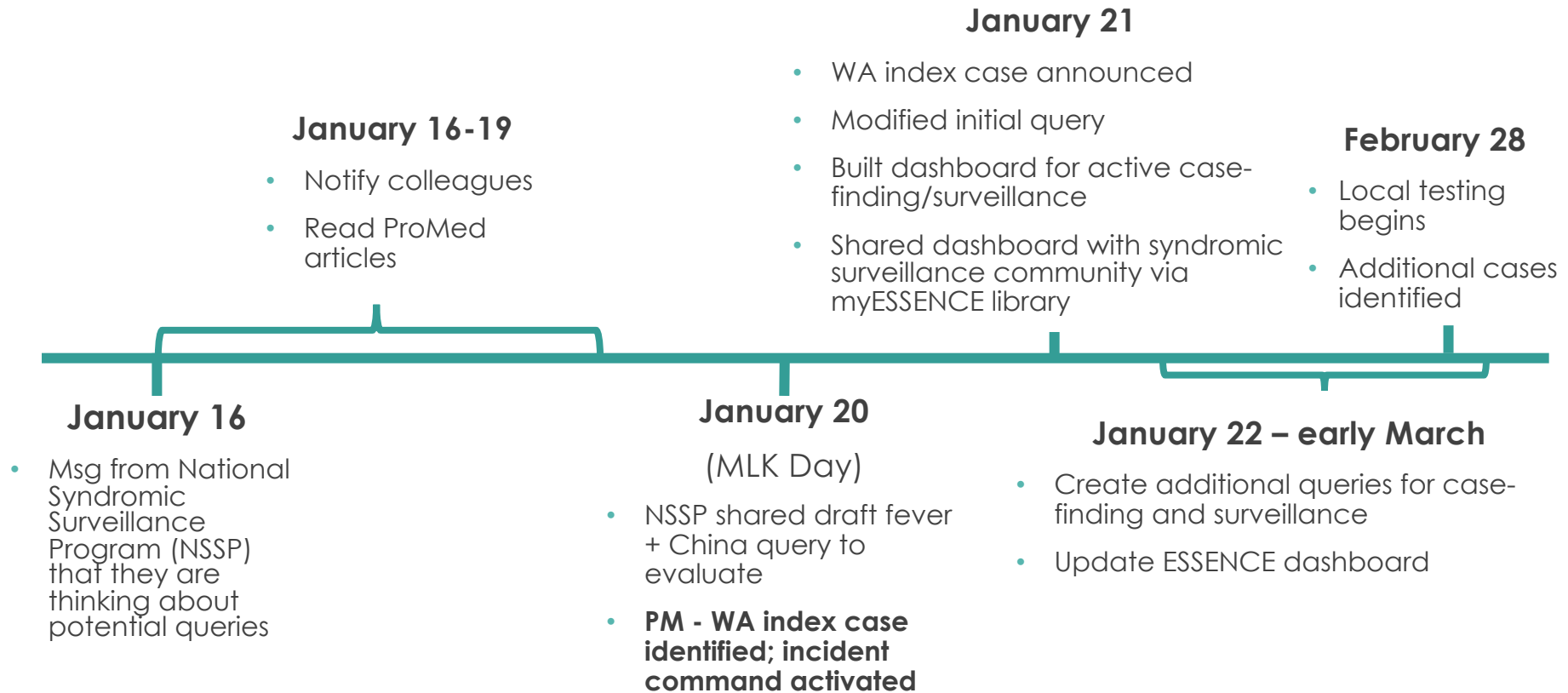


Active Case-Finding:

- Symptoms + Travel
- Mention of coronavirus



The early days



What should we monitor?

Pneumonia
Shortness of Breath
Fever
Mention of coronavirus

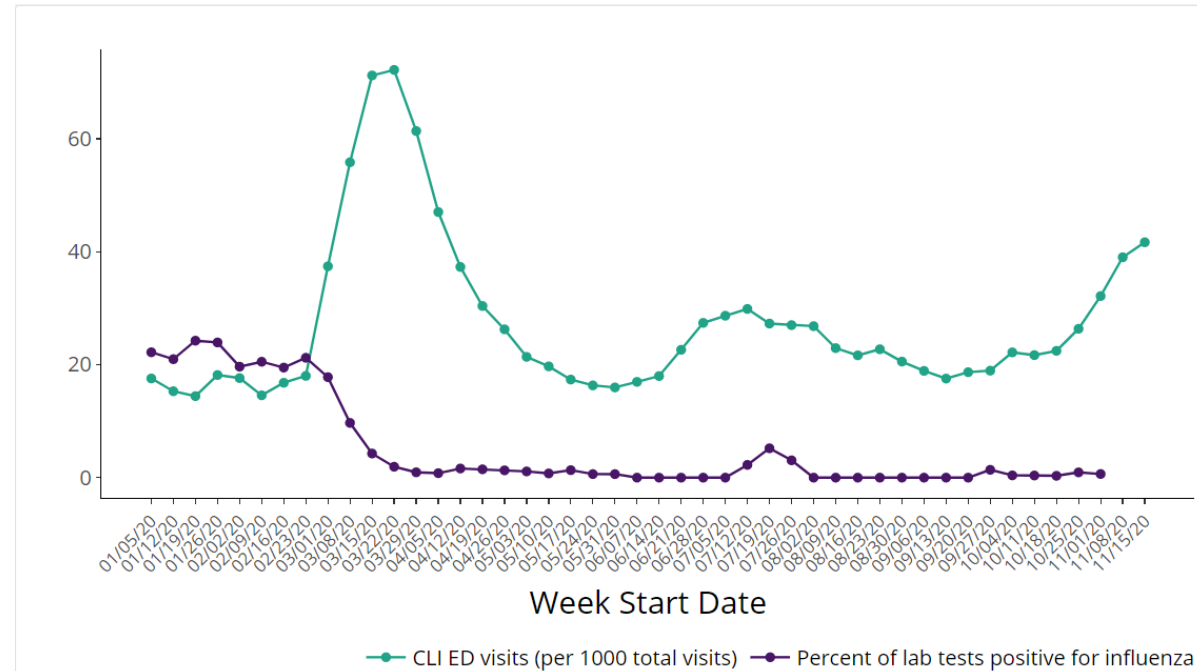
Coronavirus Dx
Severe Acute Respiratory
Infection (SARI)
Cough

Influenza Dx
Non-specific pneumonia
Influenza-like Illness (ILI)

How did we choose?

- Necessary qualities:

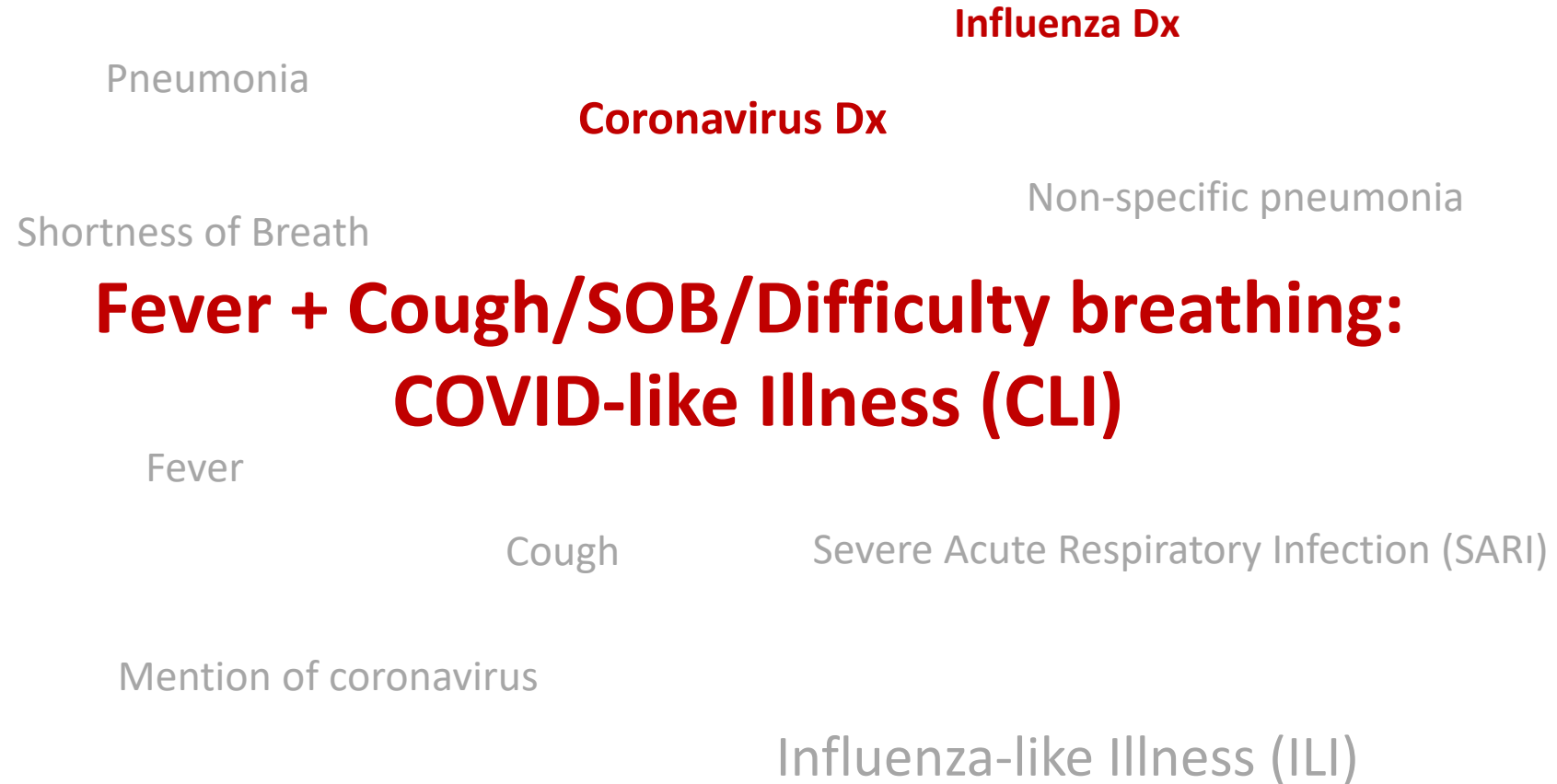
- Timely
- Performs in absence of testing
- Sufficient volume to be robust
- Indicative of illness



- Compare to:

- Trends in influenza laboratory test positivity
- Trends in confirmed cases
- Demographic profile of confirmed cases

The winners



Refinement of CLI

Subsyndromes of fever AND cough, difficulty breathing, or shortness of breath

-

Influenza diagnoses

+

Symptoms recorded in discharge diagnoses

+

Coronavirus diagnoses (both seasonal and novel)

-

Remove negations

Challenges

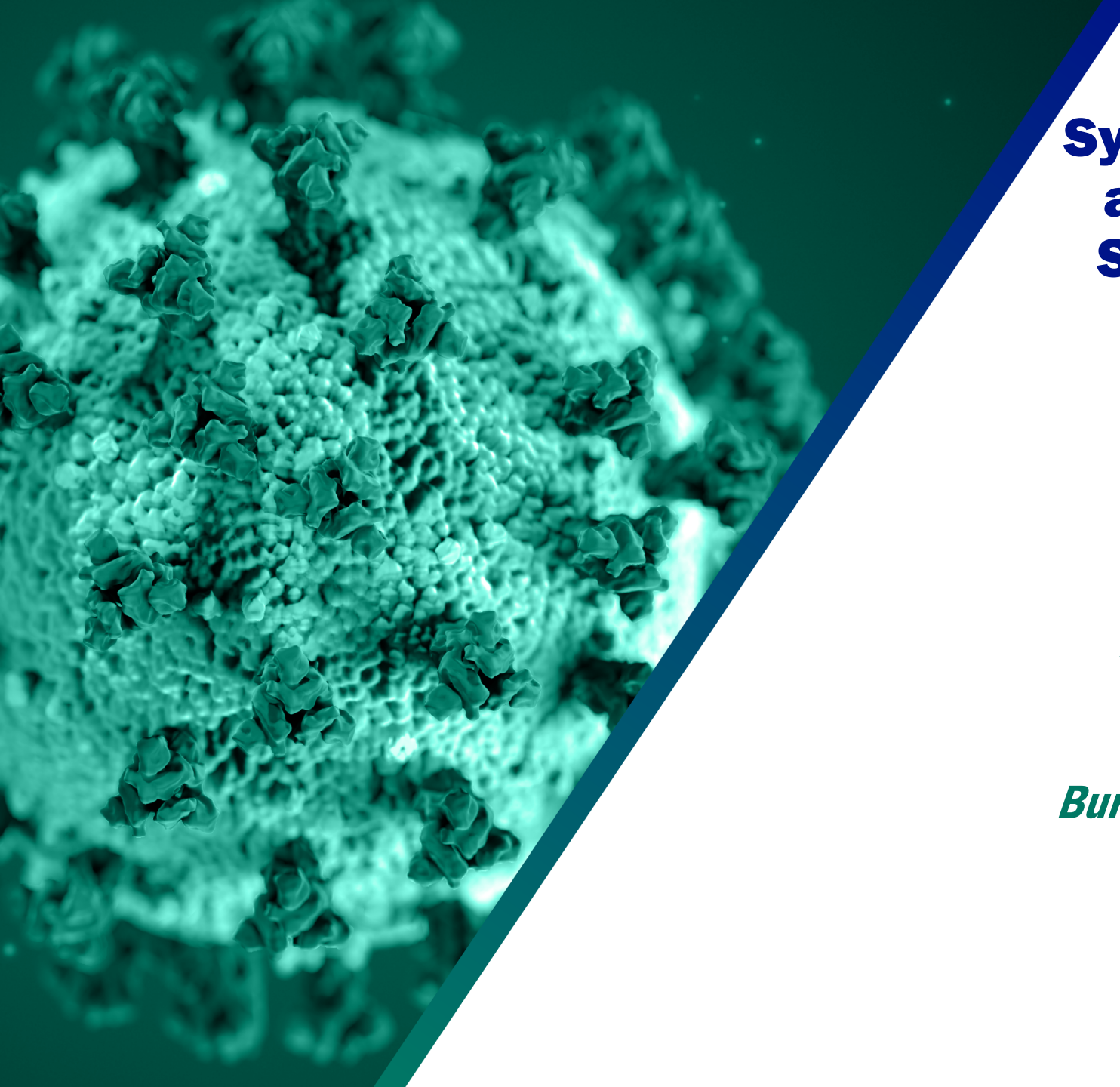
- Novel pathogen
- Overlap of respiratory illnesses with similar symptoms (e.g., influenza)
- Non-specific diagnosis code (before April 1, 2020)
- Changes in healthcare seeking behaviors
- Fast-paced, high-pressure
- Competing priorities with limited resources
- Constantly changing landscape and objectives
- Coordination of efforts
- Technical limitations

Lessons Learned

- Don't try to reinvent the wheel if you don't have to
- Simple may be sufficient
- Having *something* may be more important than perfection
 - Refinement can come later
- Monitor multiple syndromes simultaneously and narrow
- >1 syndrome may be needed



To request this document in another format, call 1-800-525-0127. Deaf or hard of hearing customers, please call 711 (Washington Relay) or email civil.rights@doh.wa.gov.



**Syndromic Surveillance during
a National Emergency – the
State and Local Experience:**

**Using Syndromic
Surveillance for
Policy Decisions**

Scott Hutton, PhD MPH

Epidemiology Section Manager

Bureau of Communicable Disease Prevention

Idaho Division of Public Health



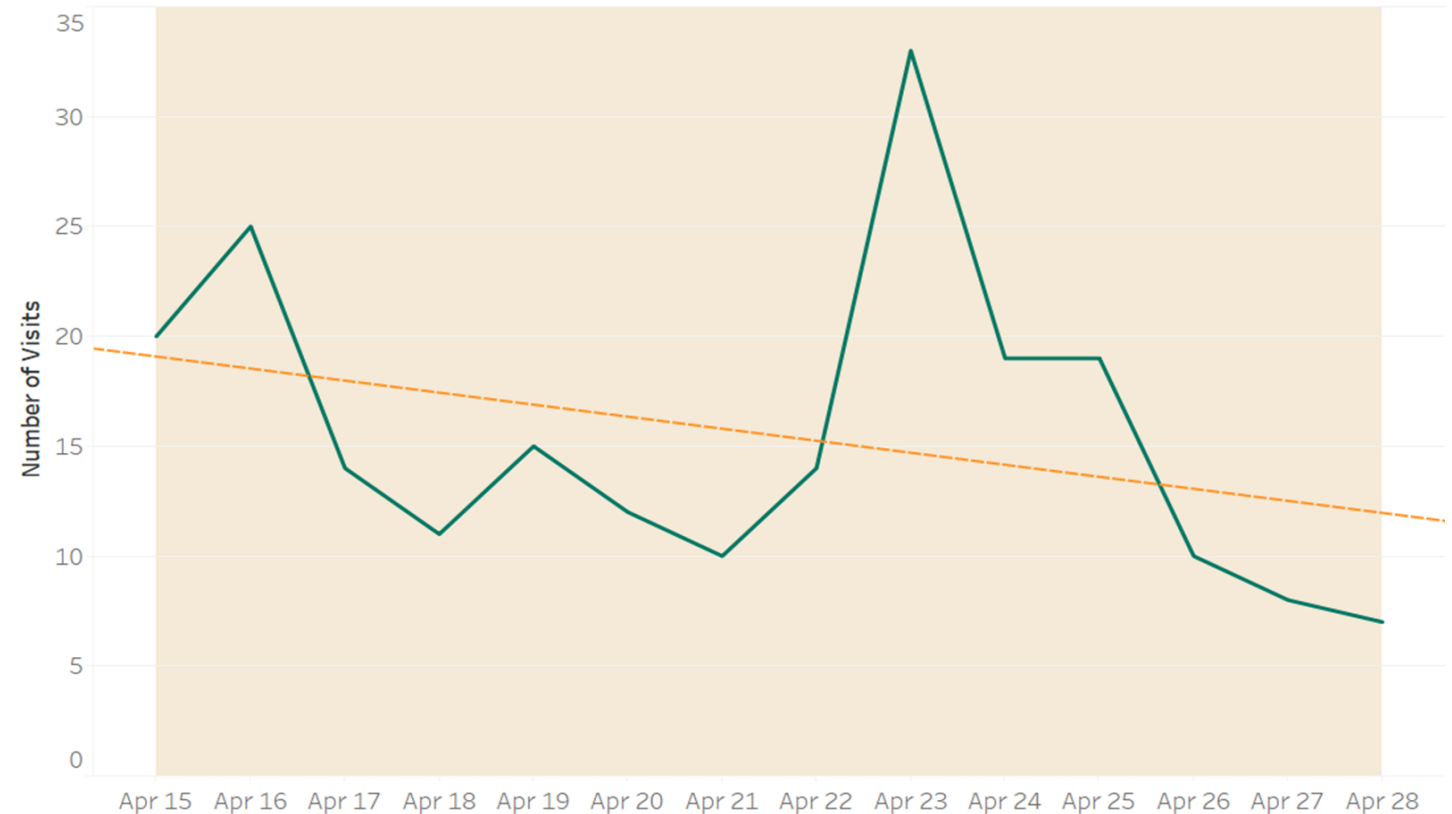
IDAHO DEPARTMENT OF
HEALTH & WELFARE



Downward trend or low numbers of COVID-19-like illness patient visits as tracked by Emergency Departments within a 14-day period. **Metric:** Downward trend over most recent reported 14-day period, OR less than 20 visits/day on average over the same 14-day period.

The number of **ED visits** for COVID-19-like illness during April 15 – April 28 trended **downward**.

Number of Emergency Department (ED) Visits for COVID-like illness



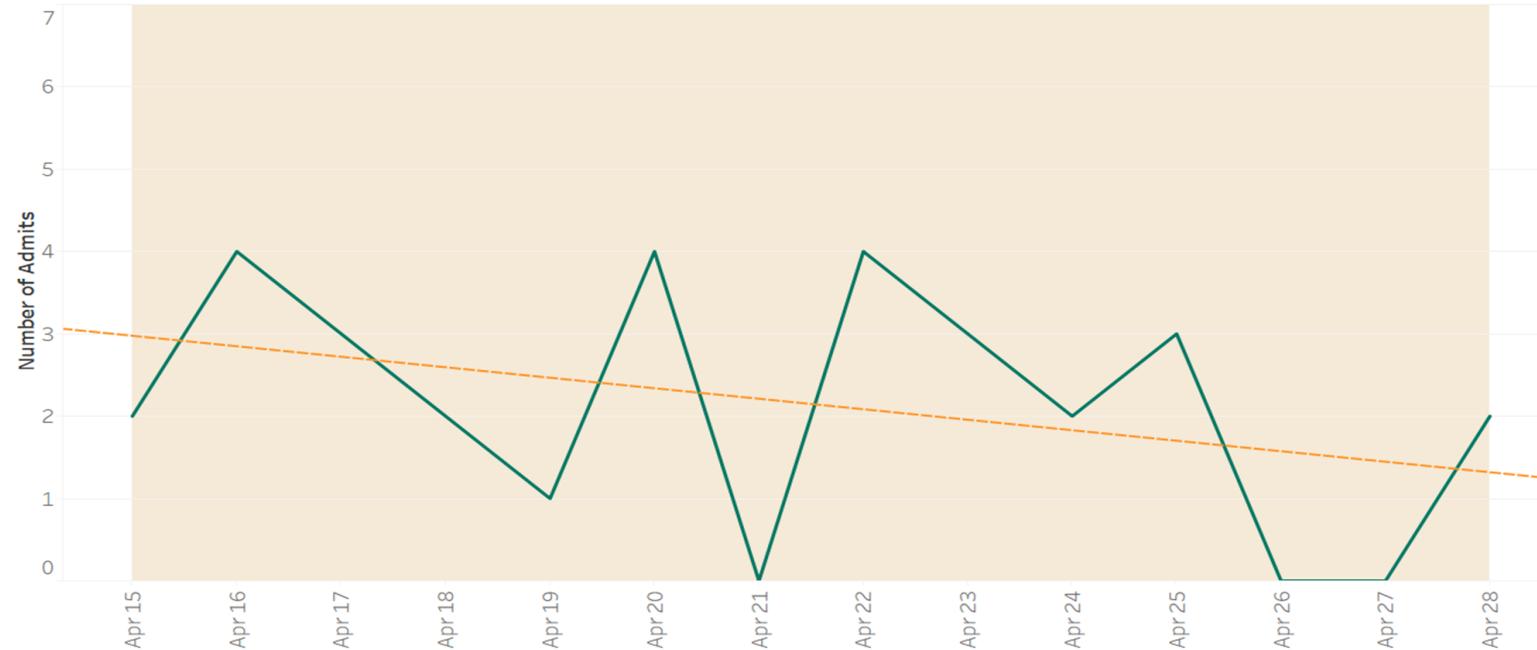


AND

Downward trend or very low numbers of patients with COVID-19-like illness admitted from Emergency Departments within a 14-day period. **Metric:** Downward trend over most recent reported 14-day period, OR less than 2 patients/day on average admitted from the Emergency Department over the same 14-day period.

The number of **ED patients** with COVID-19-like illness **admitted** to the hospital during April 15 – April 28 trended **downward**.

Number of ED Patients with COVID-like illness Admitted to the Hospital



IDAHO **SYNDROMIC CRITERIA - **STATUS: MET****

The original CLI definition mirrored Idaho's first "wave"...



"Wave" 1

Comparison: ~37 confirmed cases/day on average

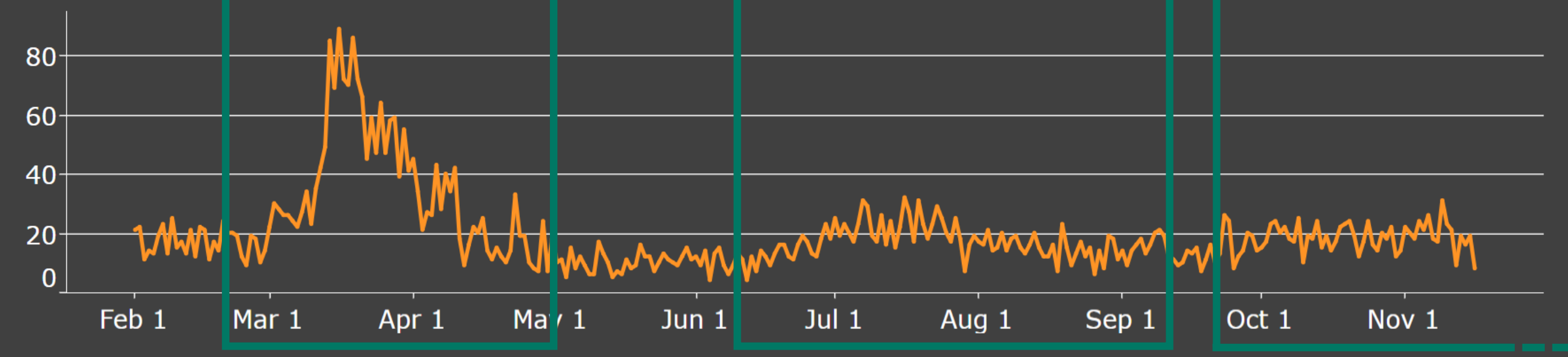
"Wave" 2

Comparison: ~321 confirmed cases/day on average

"Wave" 3...

Comparison: ~720 confirmed cases/day on average

Number of Emergency Department Visits for COVID-Like Illness



The revised CLI definition is now better mirroring current trends over the original...

54



“Wave” 1

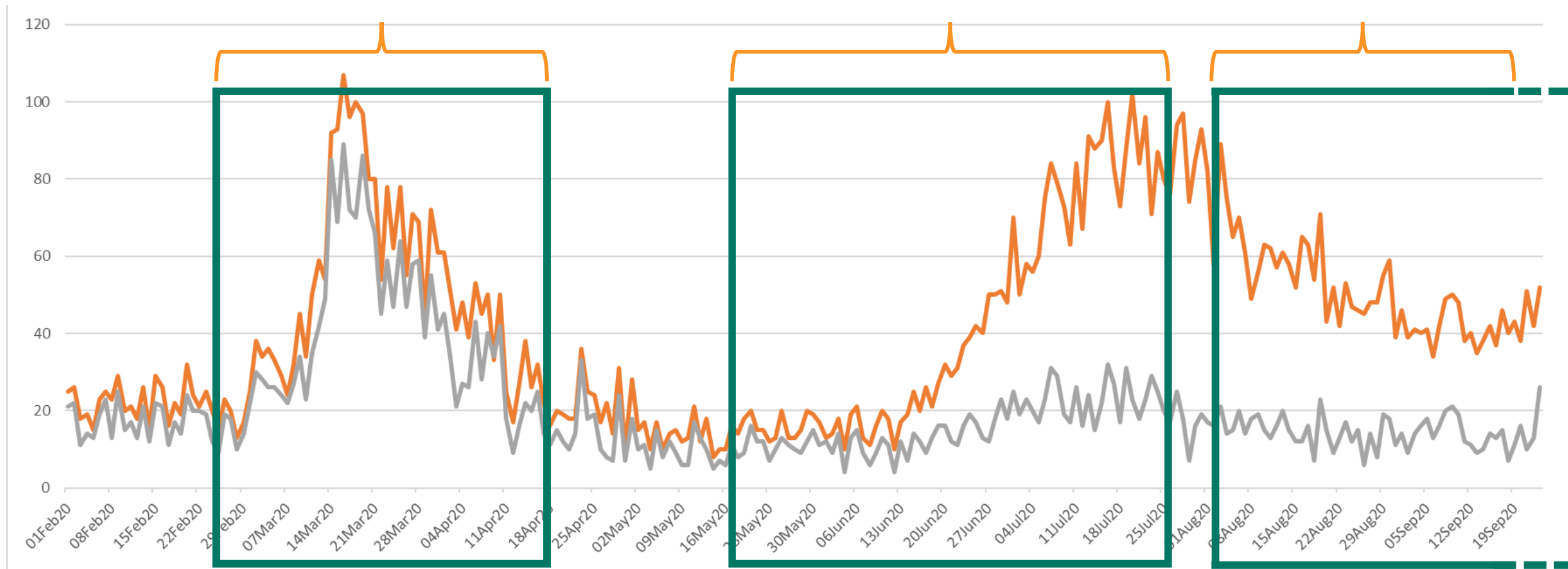
Comparison: ~37 confirmed cases/day on average

“Wave” 2

Comparison: ~321 confirmed cases/day on average

“Wave” 3...

Comparison: ~720 confirmed cases/day on average



Illinois use of Syndromic Surveillance for COVID-19 Response

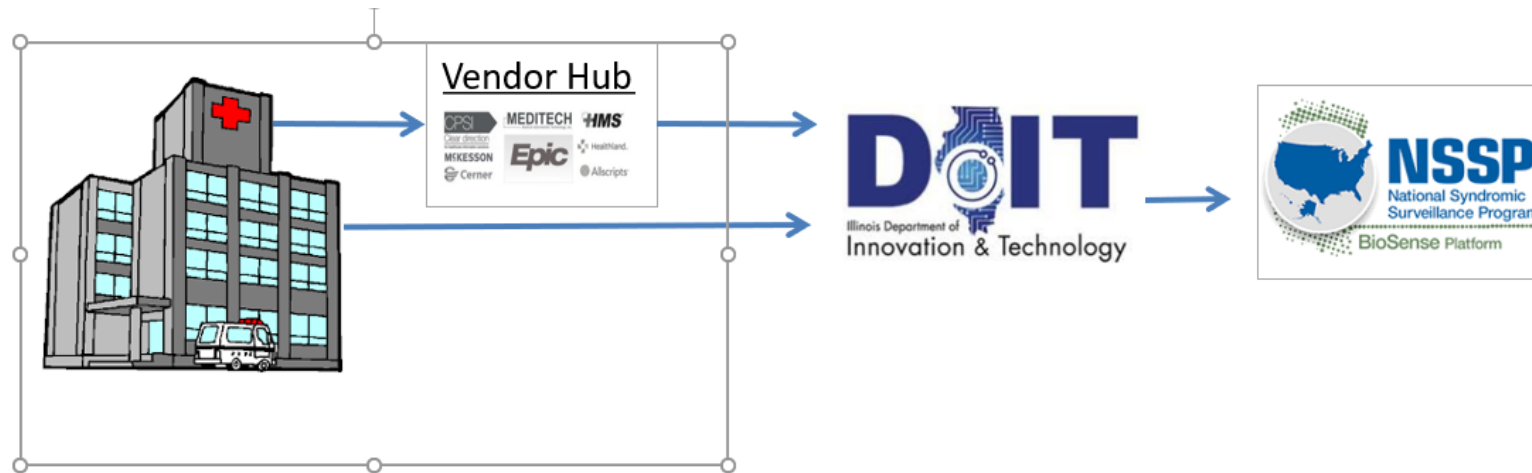
Stacey Hoferka, MPH, MSIS

Illinois Department of Public Health

November 19, 2020

Illinois Syndromic Surveillance

- Syndromic Surveillance in Illinois is...
 - Emergency Department visits (100%)
 - Inpatient visits (93% of sites)
 - 185 acute care EDs are sending data to IDPH + 3 free standing EDs
 - About 16,000 Emergency visits/day
 - Feeds every 15 minutes-many sites near real-time
 - Some sites have a lag in visits-most are received within 48 hours
 - *** near real time is not immediate. Processing can delay activity for a day typically
 - Other Early, non-diagnostic data include EMS, Poison Control...



COVID-like Illness Weekly ED and Inpatient trends through Nov. 7th

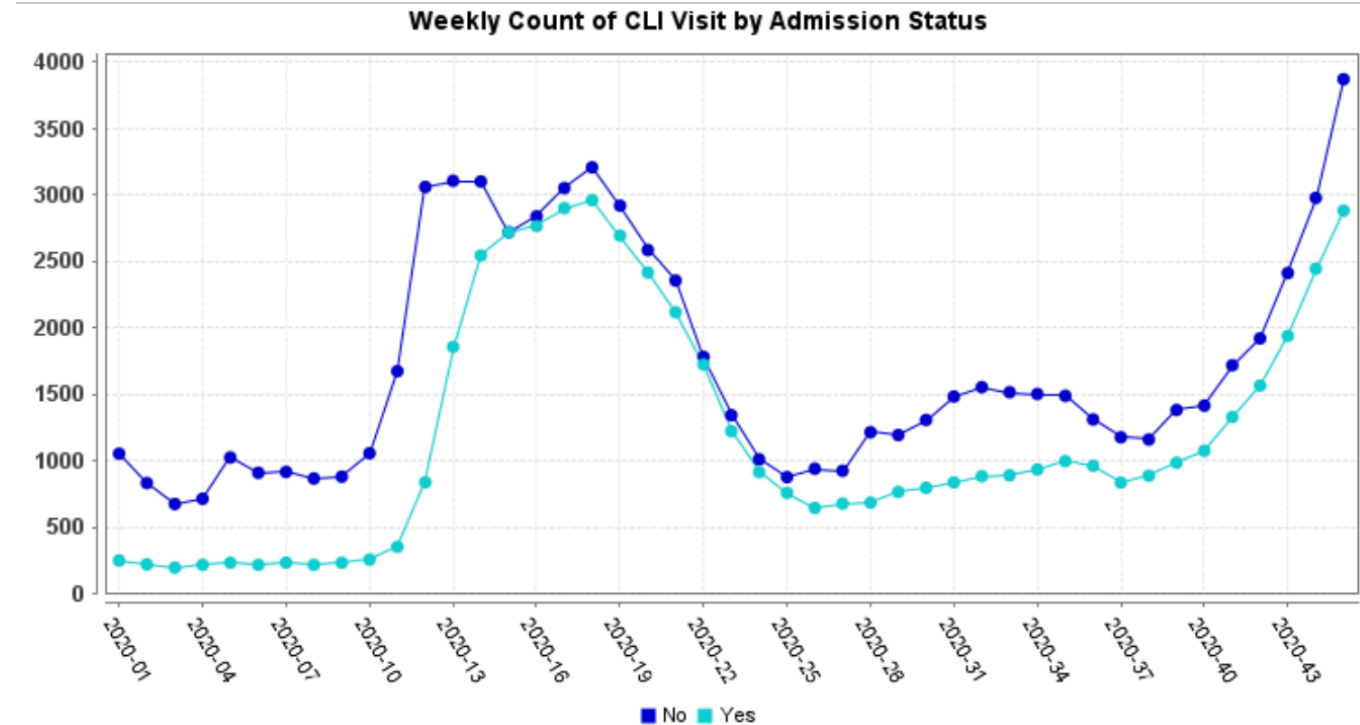
Illinois has emphasized the Inpatient visits in syndromic surveillance for

Inpatient data is submitted by the majority of hospitals (93%)

Analyzed by resident of the Patient

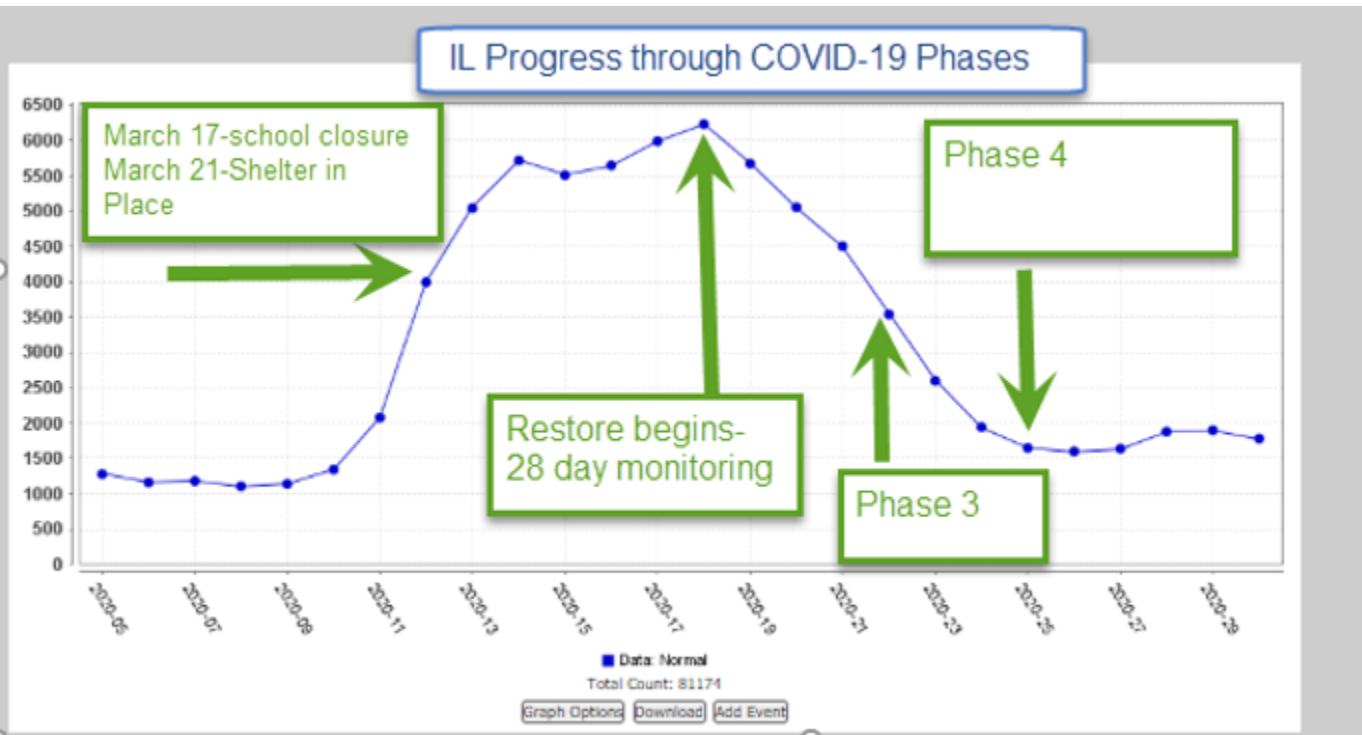
Served as a bridge metric to detect burden increases in severe illness (removing detection bias in case data and age distribution of younger cases),

Capacity issues (to assess stress on hospitals) to pair with EM resources/hospital bed capacity reporting



Progress of COVID-19 Epidemic in Illinois

Initial wave of COVID-19 in IL



Recent COVID-19 in IL

Timeline	CLI trend	Regional
July-Sept	CLI was stable/not increasing. Test positivity	Low density population
Oct	Increase identified as early indicator	Urban/high density populations

County metrics

Weekly County Metrics

Updated Weekly (MMWR)

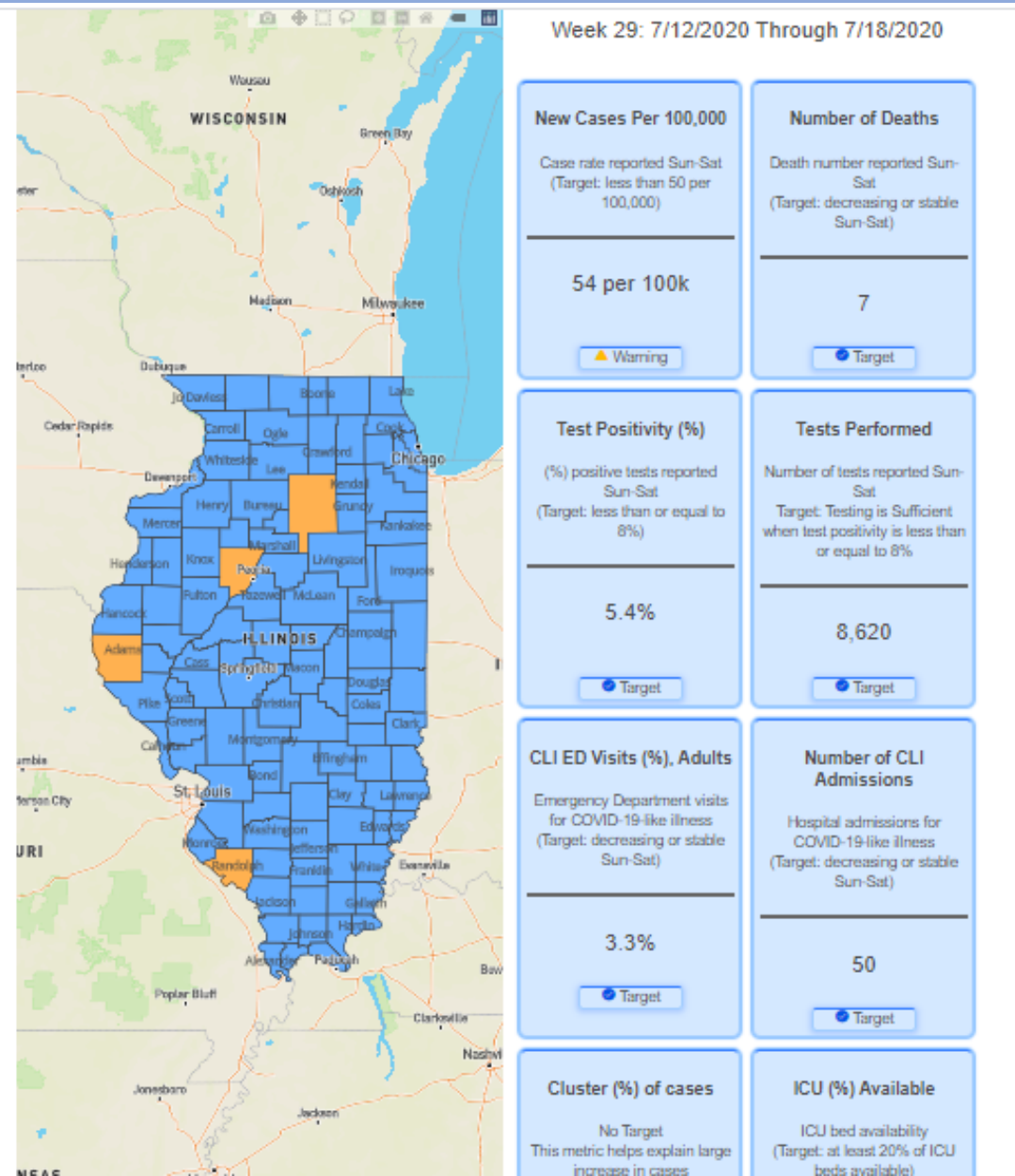
Includes ED percent in Adults

Includes CLI admissions

Both must increase 2+ consecutive weeks, by 20% each week

Suppression rules in place

Guidance not enforcement



Incorporating CLI in Response to trends

Restore

- Established May 1
- 28 day progress monitoring
- Included CLI admissions stability
- Trends – overall decrease (regression)

Resurgences

Implemented July

Monitoring 11 regions in IL through Phase 4

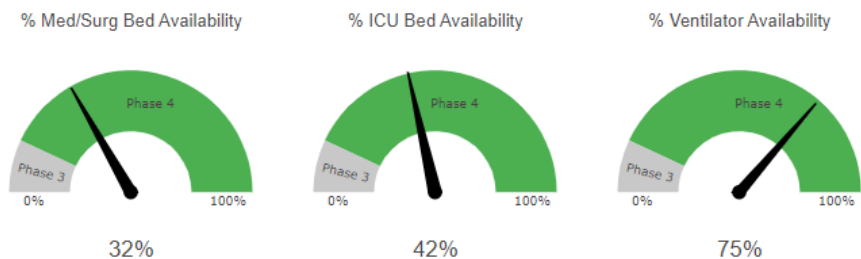
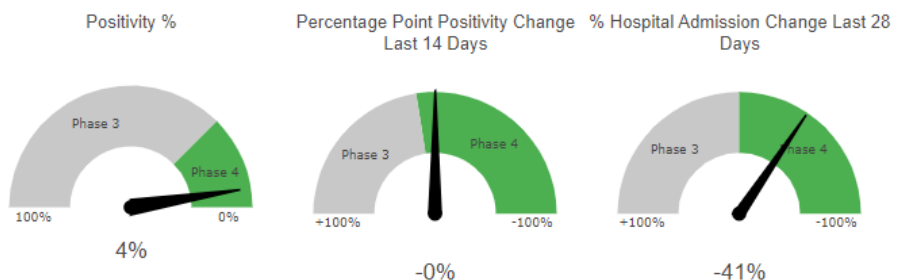
Includes CLI admissions

Increases 7 of 10 days (+ regression)

Paired with other metrics

Enforcement Tiers

Northeast Region (EMS Regions 7-11)



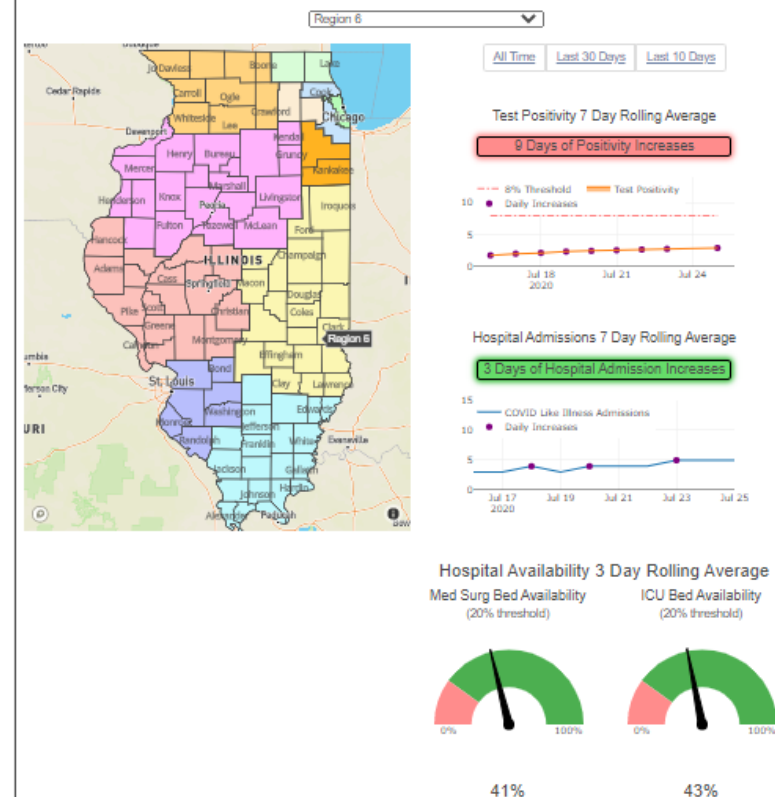
% Med/Surg & % ICU Bed Availability: Time-Series



Percent positive tests (daily & 7-day rolling average)



Region 6 Details



Other uses

- Total visit / Non – COVID trends
- Disposition vs. Discharge Date /Time
 - Disposition
 - 60% complete
 - 20% still admitted
 - 20% incomplete
 - Discharge date/time – 90% complete
- Length of Stay
- Hospitalizations
 - Race/ethnicity
- Matching
 - Confirmed cases to Inpatient and ED
 - ED alerts of contract – in March/April
 - Complete case information for hospitalization, race/ethnicity, ICU

Considerations

- Health seeking behavior impact on ED Visits
- Establish a constant threshold vs. trend (preferred)
- Age stratification
- Freezing vs. updating
- Lagging data
- Influenza season's effect on Covid-like Illness
 - Coronavirus Diagnosis 93% of CLI (past 30 days)

Using syndromic data to inform ventilator allocation in NYC

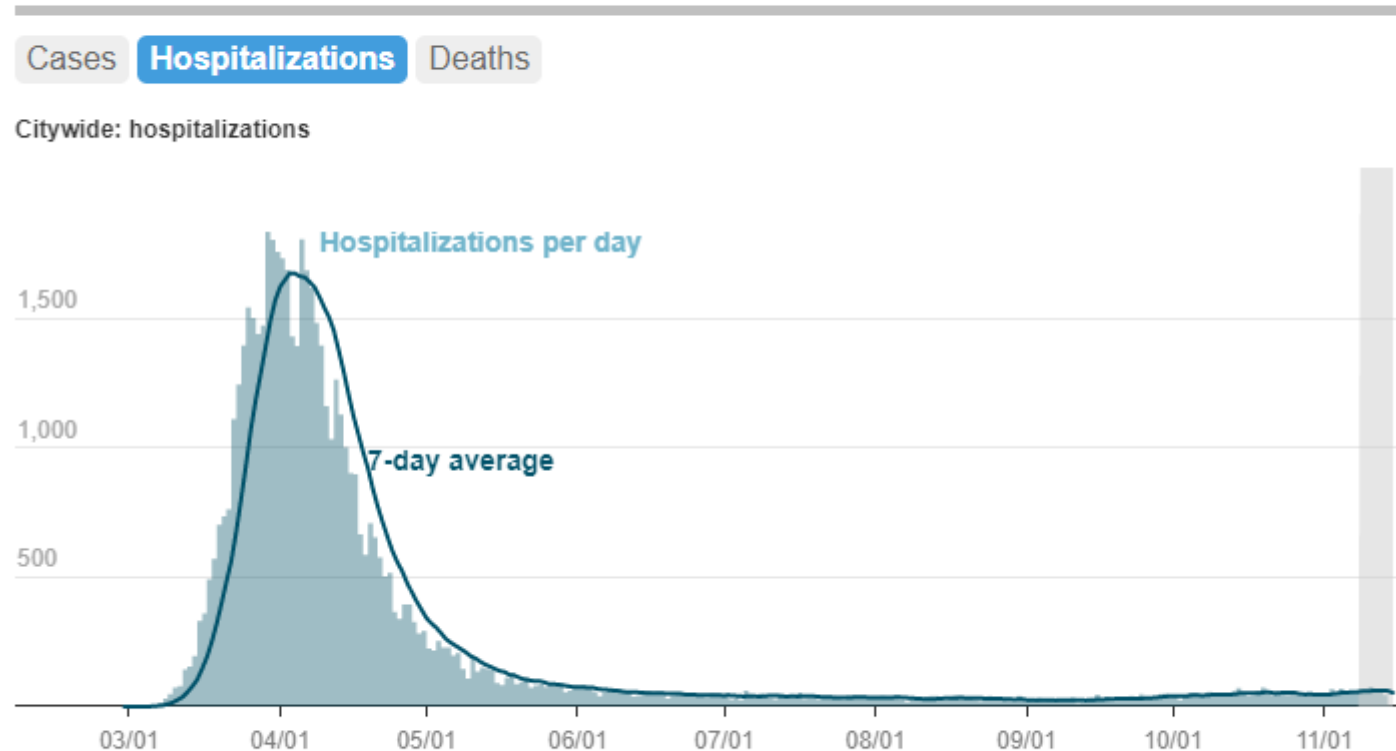


*Robert Mathes
Syndromic Surveillance Unit
New York City Dept of Health and Mental Hygiene*

The initial case surge in NYC was one of the most severe in the US

Cases, Hospitalizations and Deaths

These charts show the daily number of confirmed COVID-19 cases by diagnosis date, hospitalizations by admission date and deaths by date of death. Due to delays in reporting, which can take as long as a week, recent data are incomplete.



Seven-day average is the average of the date noted and the six prior days.
Gray bar indicates data from most recent days are incomplete.

[Get the data](#) • Created with [Datawrapper](#)

Hospitalizations increased dramatically in mid-March, especially those with severe symptoms

The New York Times

Coronavirus Outbreak >

LIVE

Latest Updates

Maps and Cases

State Restrictions vs. Case Counts

Vaccine Trials

Coronavirus in N.Y.: 'Deluge' of Cases Begins Hitting Hospitals

There are already critical shortages: A Bronx hospital is running out of ventilators. In Brooklyn, doctors are reusing masks.

* NY Times, March 20, 2020

A critical concern was distribution of ventilators

- The city had ventilators but how to distribute equitably?
- The information we had:

Hospital size

ICU census

ED CLI admissions

Each data source has limitations:

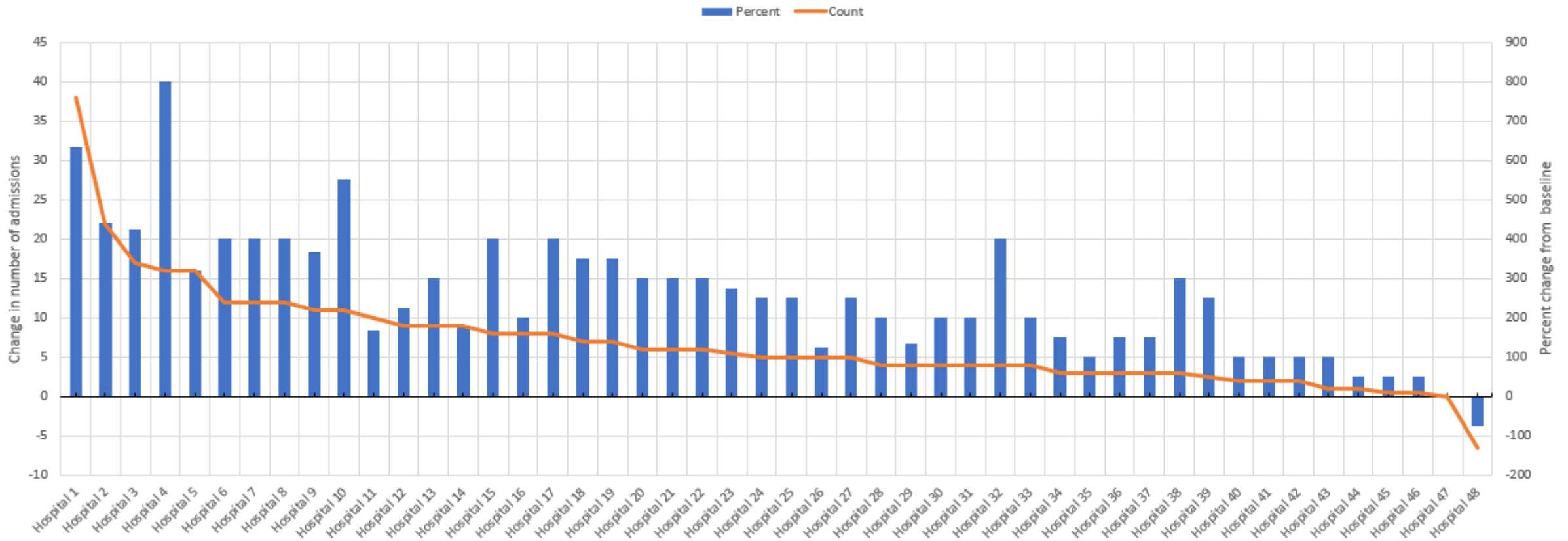
- E.g., ICU census is avg of most recent 7 days and may have missing information

Change in CLI admissions from baseline

Where are we seeing the greatest surge in CLI admissions:

- Change in number of admissions
- Percent change from baseline

ED ILI+PNE change in median admissions Mar 18-24, 2020 compared to median admissions from October 1, 2019-February 29, 2020



Developing the final distribution algorithm

Developed by modelers, hospital systems experts, and city emergency preparedness staff

Hospital Vent Allocation Model_3.26.20					Allocation Model						
Network	Hospital	ENTER ALLOTMENT	Equal Distribution	% NYC Beds	% NYC Beds	% NYC Covid patients	% NYC ICU Beds	% NYC ICU Beds on Vents	Slamm-ness		
		400			35%	25%	15%	10%	15%		
		Total One-Time Distribution Allotment	Clean Allocation (equal)	Simple Allocation (% of NYC Beds)	Standard	Covid Modifier	ICU Modifier	ICU on Vents Modifier	Slamm-ness	Allocation	
N/A	Hospital 1	400	8	4	35%	25%	15%	10%	15%	4	
N/A	Hospital 2	400	8	7	35%	25%	15%	10%	15%	4	
N/A	Hospital 3	400	8	5	35%	25%	15%	10%	15%	4	

Final model:

1. $(\% \text{ beds} * 0.35 * 400) +$
2. $(\% \text{ COVID patients} * 0.25 * 400) +$
3. $(\% \text{ ICU beds} * 0.15 * 400) +$
4. $(\% \text{ ICU beds on vents} * 0.10 * 400) +$
5. $(\text{Change in ED admissions} * 0.15 * 400)$