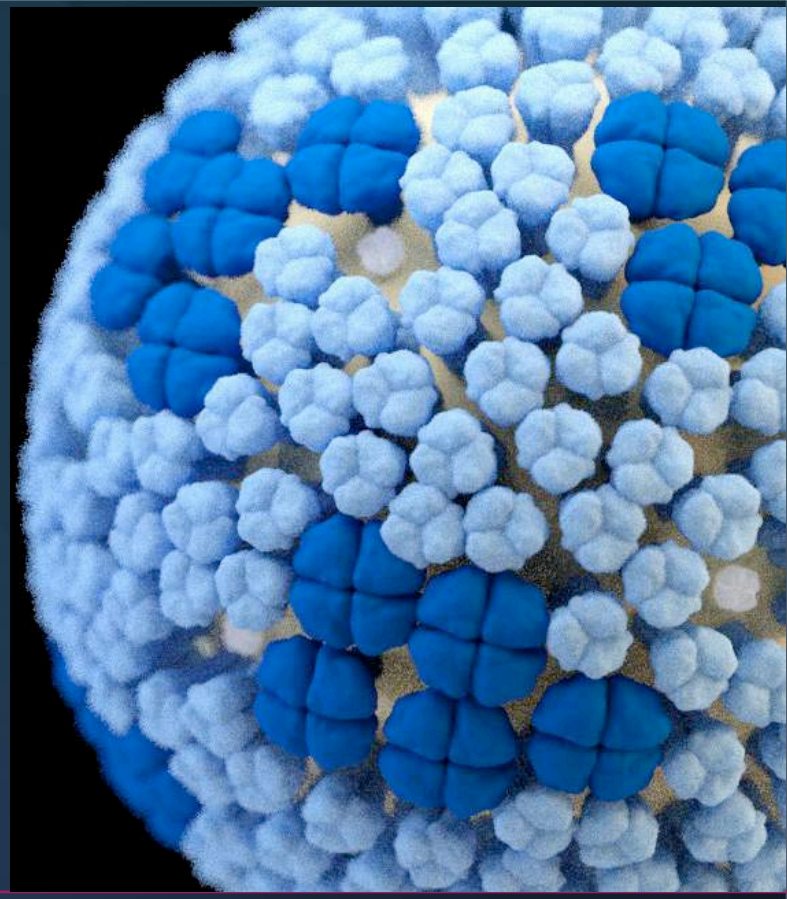
Influenza in the USA, current priorities and initiatives



Dr. Joshua A. Mott,

Technical Advisor for Influenza and Pandemic Preparedness, Department of Epidemic and Pandemic Preparedness and Prevention, World Health Organization, Geneva, Switzerland

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CDC Influenza Division Strategic Priorities 2022 - 2024

Mission

- CDC's Influenza Division (ID) advances global control and prevention of seasonal and novel influenza and improves influenza pandemic preparedness and response
- In collaboration with domestic and global partners, ID:
  - Builds surveillance and response capacity for influenza
  - Monitors and assesses influenza viruses and illness
  - Improves influenza vaccines and other interventions
  - Applies research to provide science-based enhancement of influenza prevention and control policies and programs

About Influenza Division | CDC
https://www.cdc.gov/ncird/flu.html

Surveillance

Opportunities and Challenges

COVID-19 pandemic prompted rapid changes for surveillance

- Unpredictability of influenza seasonality
- Interpretation of syndromic surveillance (ILI)
- Changes in U.S. healthcare-seeking behaviour
- Emergence of avian influenza A(H5)
- Data modernization
  - New and diverse data types
  - Increased speed and accuracy
  - Integration and visualization
- Preparing for severe influenza epidemics and the next pandemic

CDC Influenza

Epidemic Influenza -Global Annual Impact

291,000 – 646,000
(9,243 – 105,690 in <5 yo)

3M to 5M

1.0+ B

Direct Medical Costs (USD): 10.4 B per year
Indirect and Direct Costs (USD): $87.1 B per year

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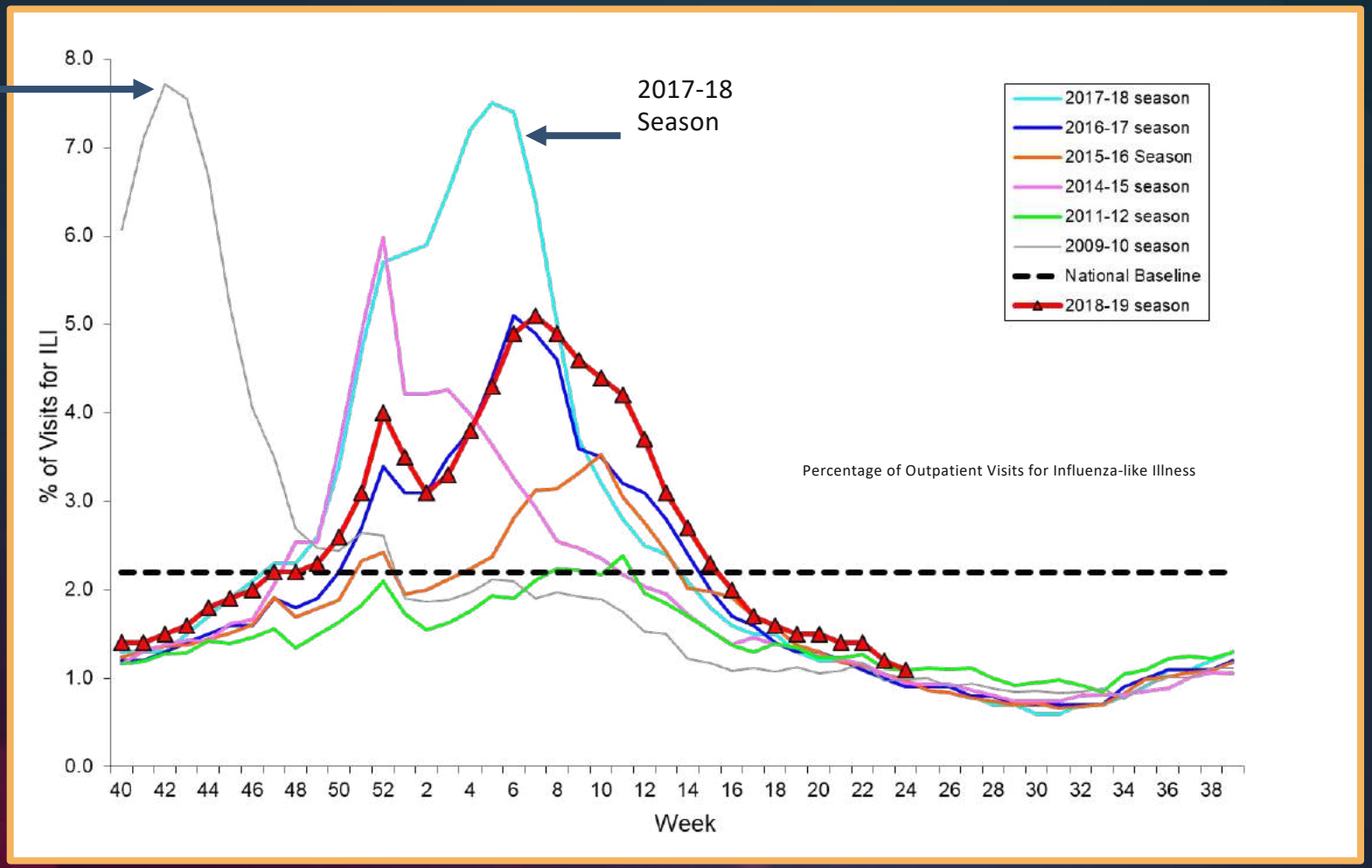
Percent of outpatient ILI cases testing positive for influenza
2018-19 and selected previous seasons

2009 Pandemic



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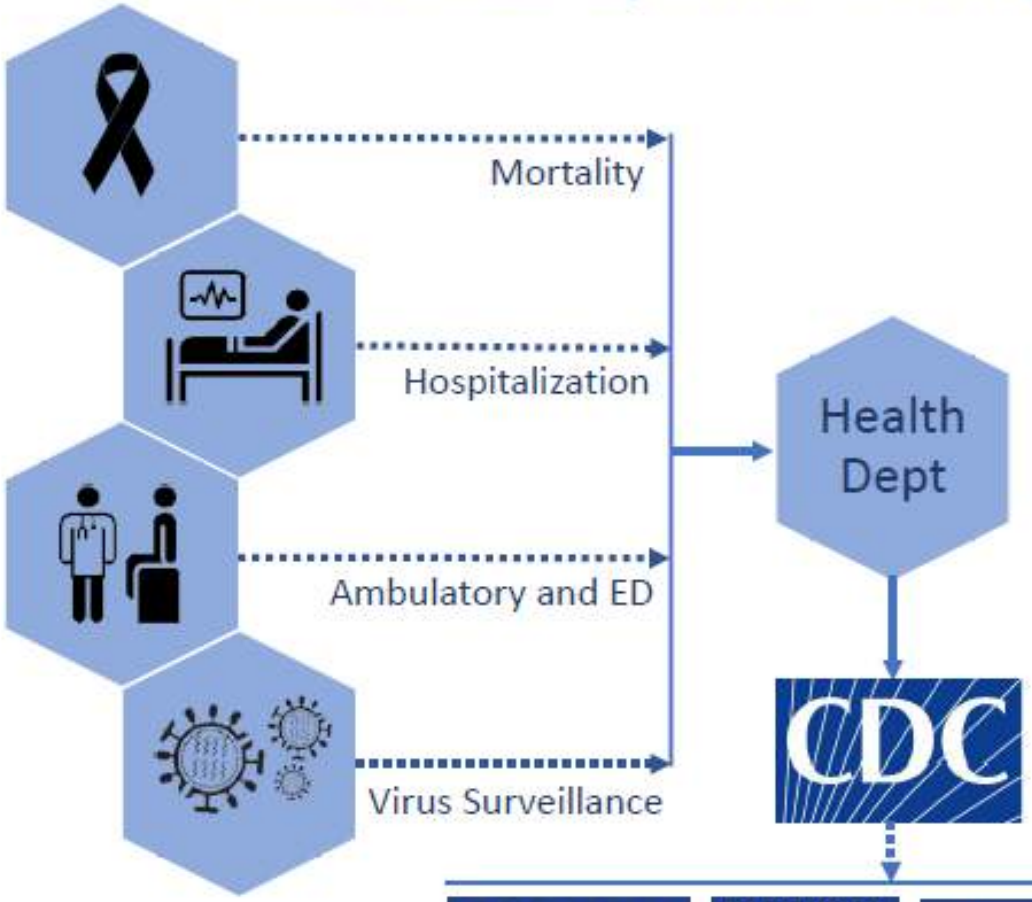
Influenza Epidemiologic Surveillance



- Layered surveillance feeds into weekly public reports and interactive data, burden estimates, and forecasting
- Expansion initiated for the 2020-2021 season
- Systems and models are being used or have been modified for COVID-19

FLUVIEW | FLUVIEW interactive | Burden Estimates | FluSight Forecasting | GISRS vaccine strain selection

CDC

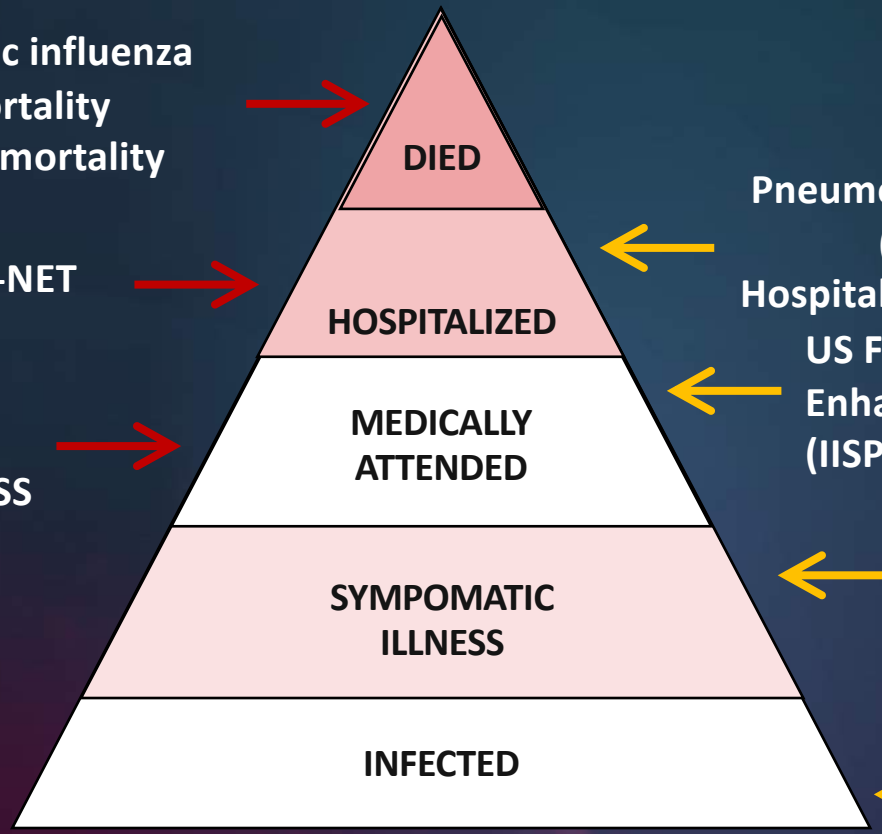
A mosaic of surveillance systems & special studies

SURVEILLANCE PLATFORMS

Pediatric influenza mortality
NCHS mortality

FluSurv-NET

ILInet
WHO/NREVSS



SPECIAL STUDIES

Pneumonia etiology (EPIC)
Hospital VE (HAIVEN)
US Flu VE Network
Enhanced surveillance (IISP/ARIES)

Cohorts (MOSAIC, HIVE)
Phone surveys (BRFSS)

Sero-surveys

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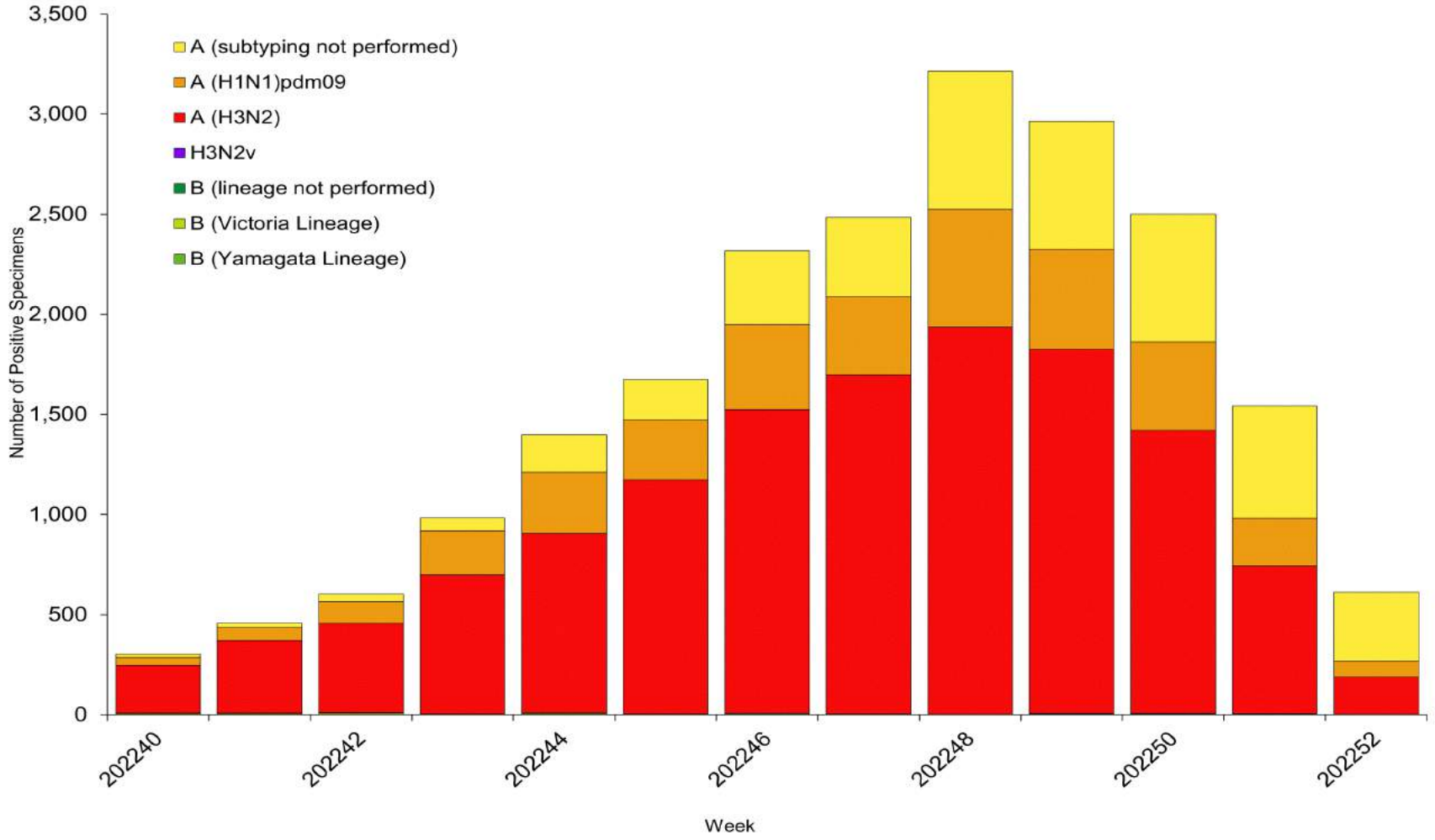
Influenza Positive Tests Reported to CDC by U.S. Public Health Laboratories, National Summary, October 2, 2022 – December 31, 2022



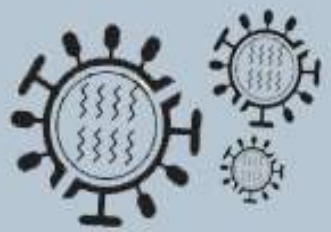
CDC estimates* that, from **October 1, 2022** through **December 31, 2022**, there have been:

22 – 43 million
flu **illnesses**

10 – 21 million
flu **medical visits**

230,000 – 490,000
flu **hospitalizations**

14,000 – 43,000
flu **deaths**



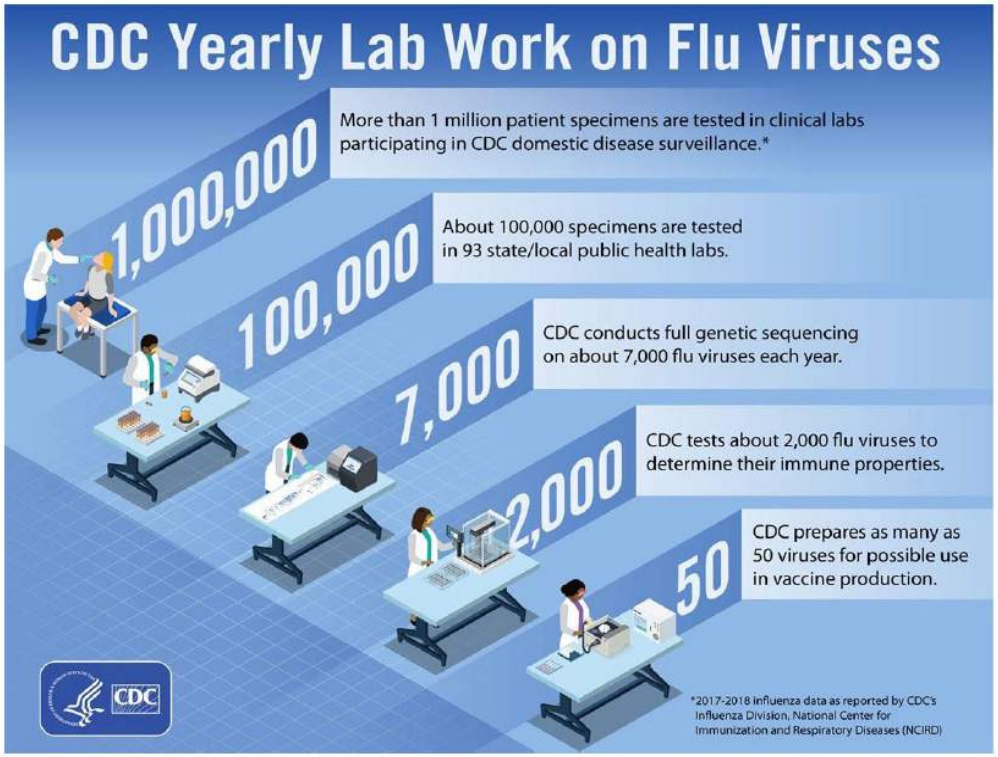
What does the collaborative surveillance in the USA allow us to say?

- Seasonal influenza activity remains high but continues to decline in most areas.
- Of influenza A viruses detected and subtyped during week 52, 70% were influenza A(H3N2) and 30% were influenza A(H1N1).
- CDC estimates that, so far this season, there have been at least 22 million illnesses, 230,000 hospitalizations, and 14,000 deaths from flu.
- The cumulative hospitalization rate in the FluSurv-NET system was 3.5 times higher than the highest cumulative in-season hospitalization rate observed for week 52 during previous seasons going back to 2010-2011.
- However, this in-season rate is still lower than end-of-season hospitalization rates for all but 4 pre-COVID-19-pandemic seasons going back to 2010-2011.
- The majority of influenza viruses tested are in the same genetic subclade as and antigenically similar to the influenza viruses included in this season's influenza vaccine.
- All viruses collected and evaluated this season have been susceptible to the influenza antivirals oseltamivir, peramivir, zanamivir, and baloxavir.

The importance of laboratory networks

Domestic Surveillance

David Wentworth, PhD
Branch Chief



Diagnostic Kits
Develop, manufacture, deploy

Genotypic (NGS)
Sequence First
Fall 2014

Phenotypic
Antigenic
Sensitive/resistant

Candidate Vaccine Viruses
Inactivated
Egg-based
Cell-based
Live Attenuated
A/Leningrad/134/17/57

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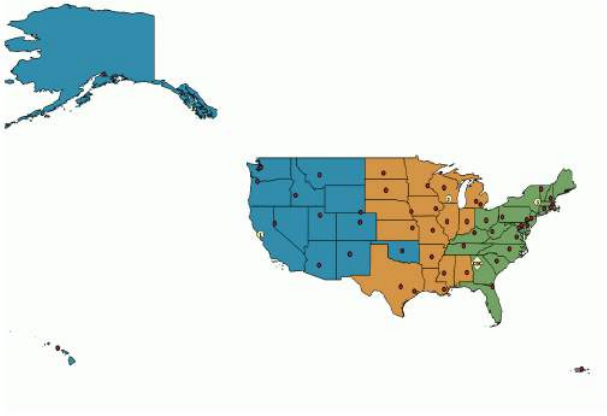
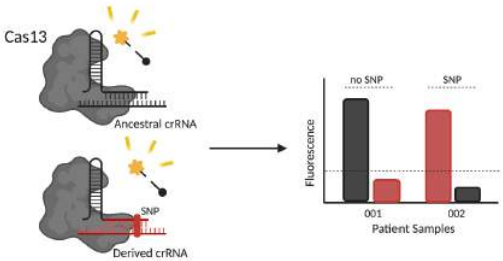
Influenza Laboratory Science

- Flu/SARS-CoV-2 multiplex assay
- Increased national and international sequencing capacity
  - Planned expansion of U.S. National Influenza Reference Centers
  - Potential expansion of international sequencing hubs



- Exploring new, innovative technologies
  - CRISPR-based diagnostics
  - Traveler-based genomic surveillance
  - mRNA vaccine platforms



CDC Influenza

Welch et al. medRxiv. 2021. 12.14.21265689; doi: https://doi.org/10.1101/2021.12.14.21267689

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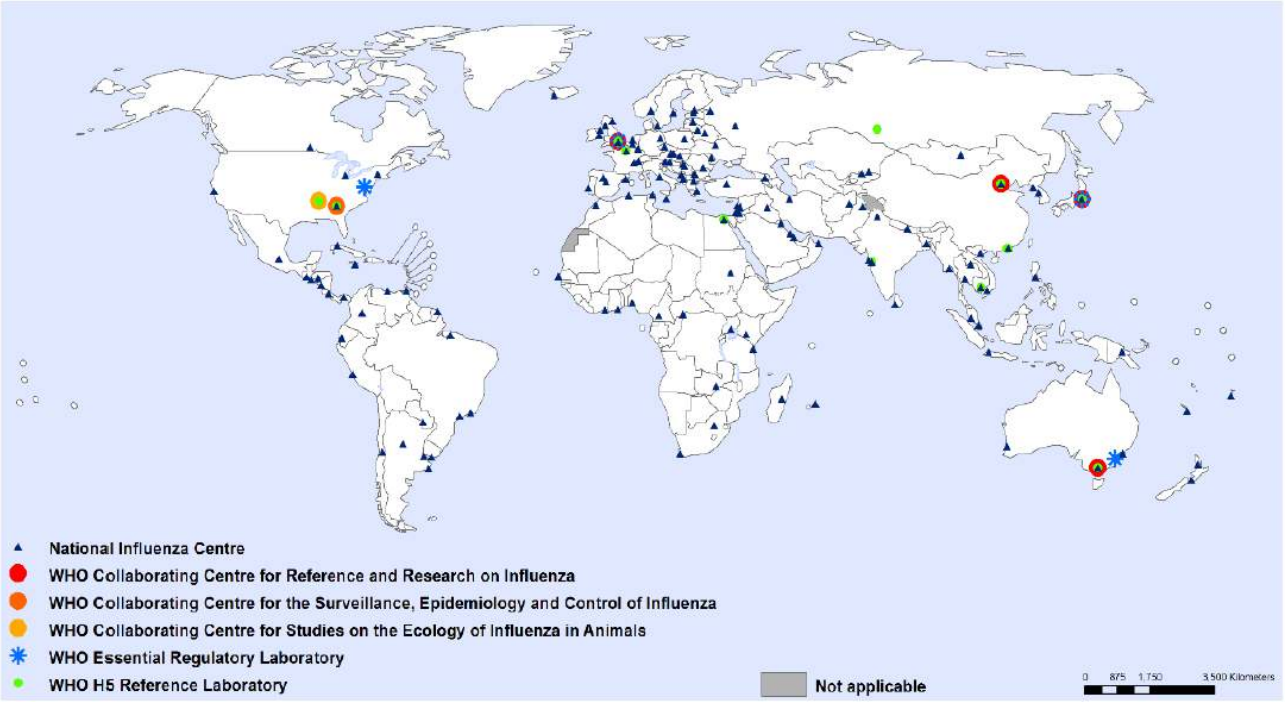
CDC Contributes to WHO Global Influenza Surveillance and Response System (GISRS)



- 147 WHO National Influenza Centers in 123 Member States (CDC Atlanta Influenza Laboratory is one)
- 7 WHO Collaborating Centers for Influenza (CDC is one)
- 12 WHO H5 Reference Laboratories

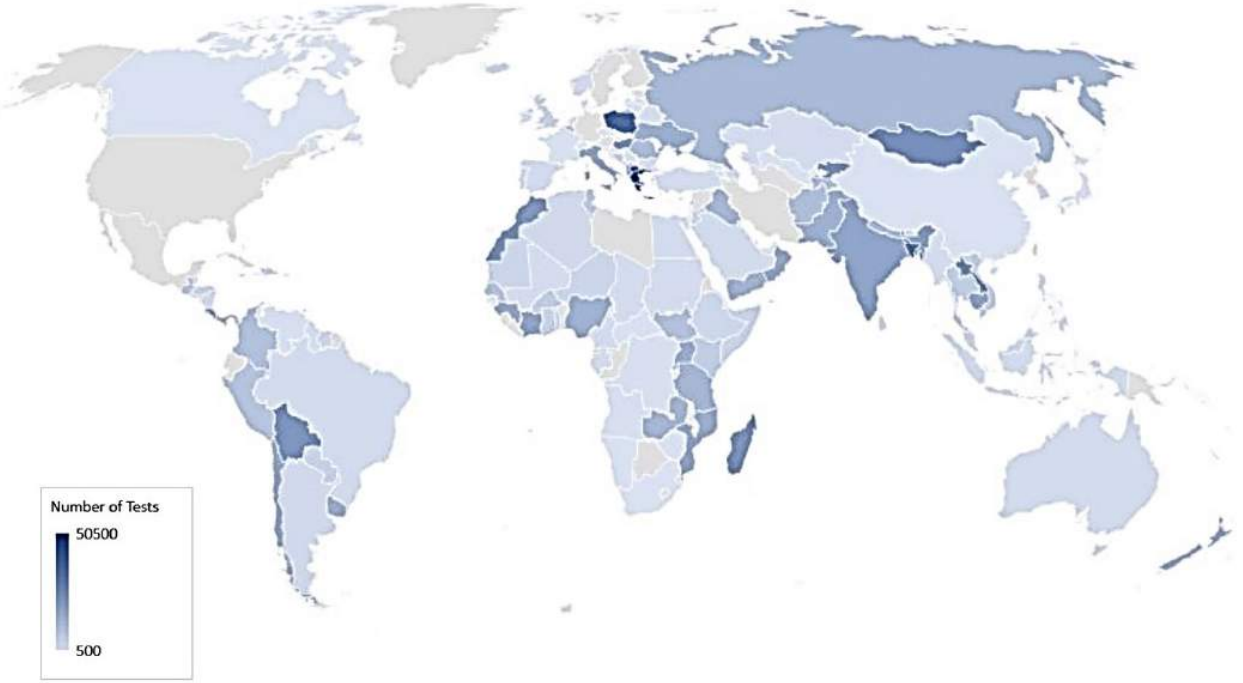
- Characterize human and zoonotic influenza viruses
- Contribute data for biannual vaccine composition
- ID uses data to generate and evaluate CVVs for distribution to vaccine manufacturers
- Leverage surveillance systems and laboratories for COVID-19
- Field staff
  - Assist with surveillance and laboratory assessments
  - Support timely virus sharing for vaccine consultation
  - Support data reporting to FluNet
  - Liaise with WHO

CDC Influenza

GISRS

CDC's International Reagent Resource

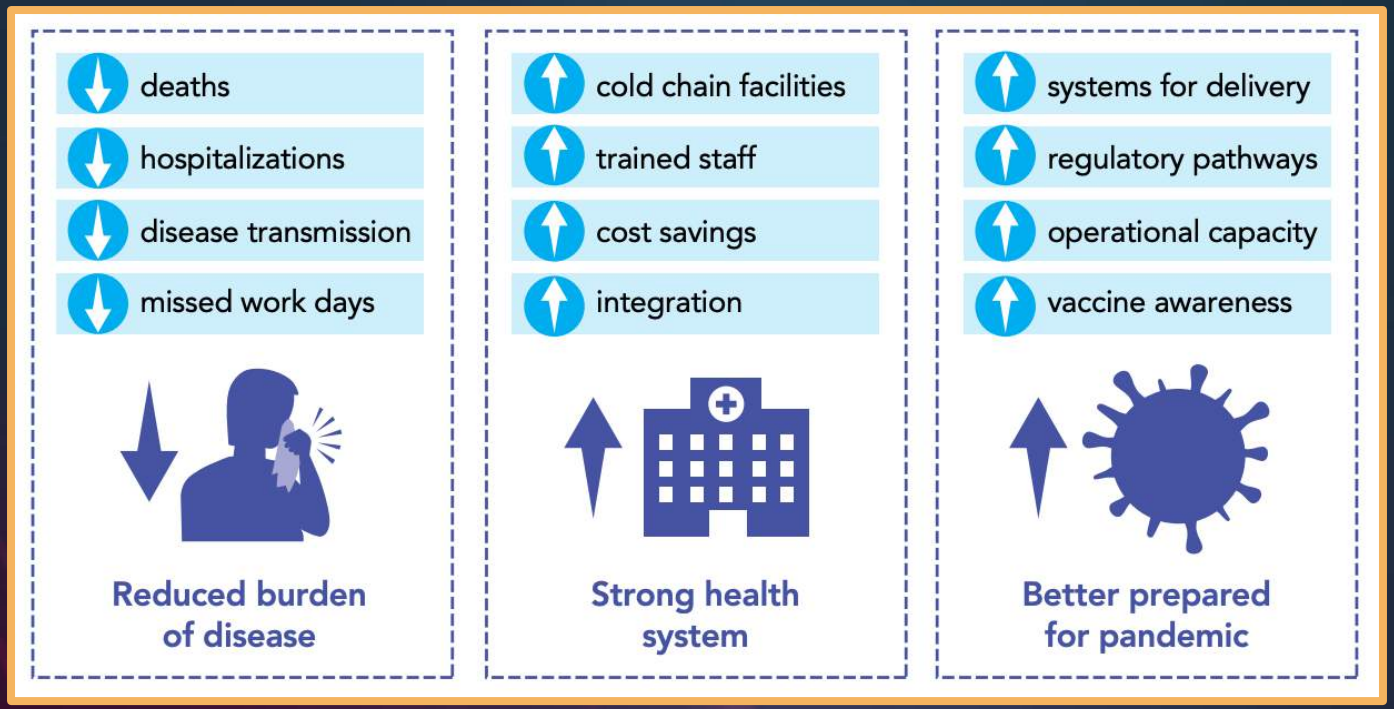
- 2021: IRR provided $2M PCR assays to international laboratories supporting viral and bacterial surveillance
- 2,563 Flu-SC2 multiplex PCR assay kits provided to 138 countries
  - >1.28M PCR reactions



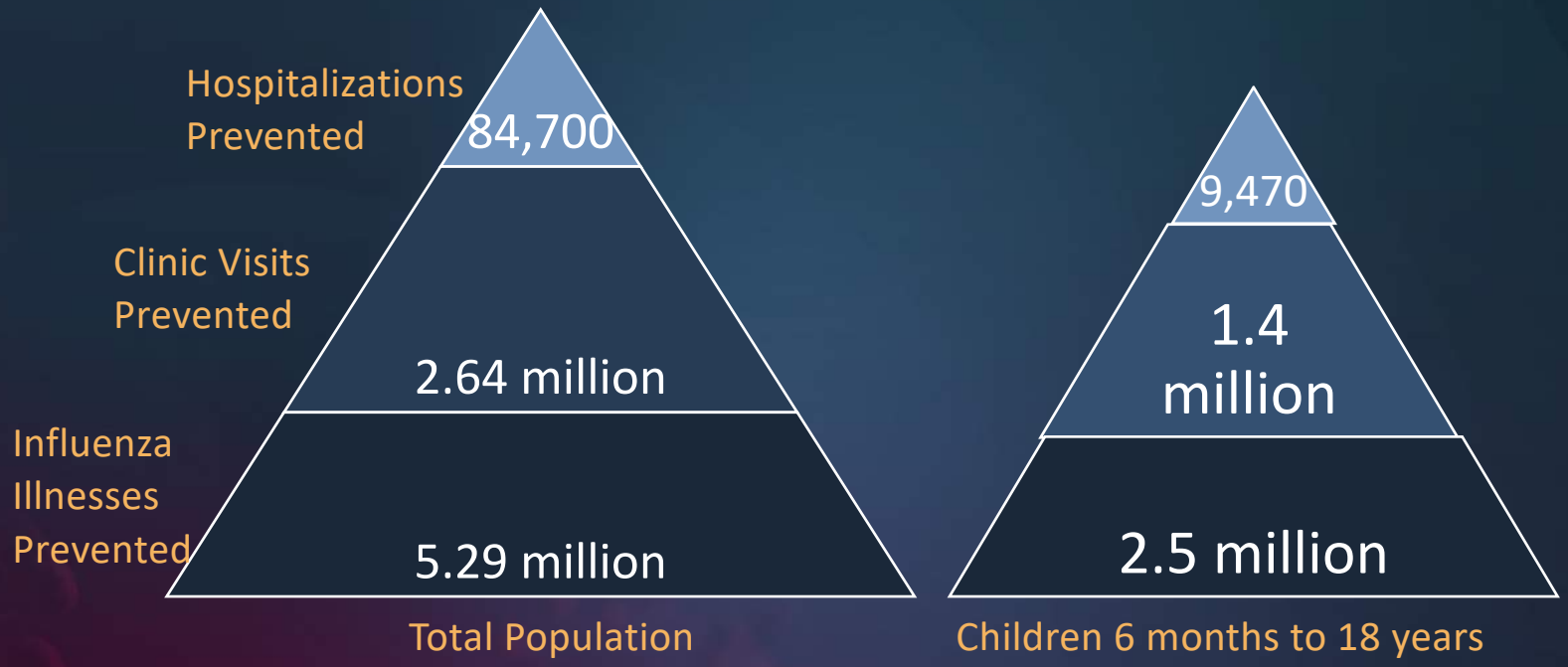
CDC Influenza

Benefits of seasonal influenza vaccination

Influenza vaccination is a critical part of influenza prevention and control strategies, which also include therapeutics and non-pharmaceutical public health and social measures



Influenza Vaccine Reduces the Burden of Illnesses in the U.S., 2016-17



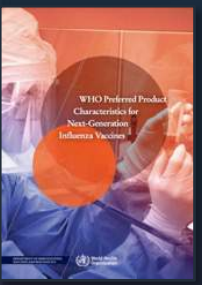
www.cdc.gov/flu/about/disease/2016-17.htm; Vaccine Coverage 40% and Vaccine Effectiveness 40%

Advancing progress on global next generation influenza vaccine R&D

Member States + WHO Expert Groups

IVR Steering Committee

24 strategic goals
113 milestones: 37 high-priority



Strategy → Roadmap → Implementation

10-year plan for prioritizing and coordinating global influenza vaccine R&D

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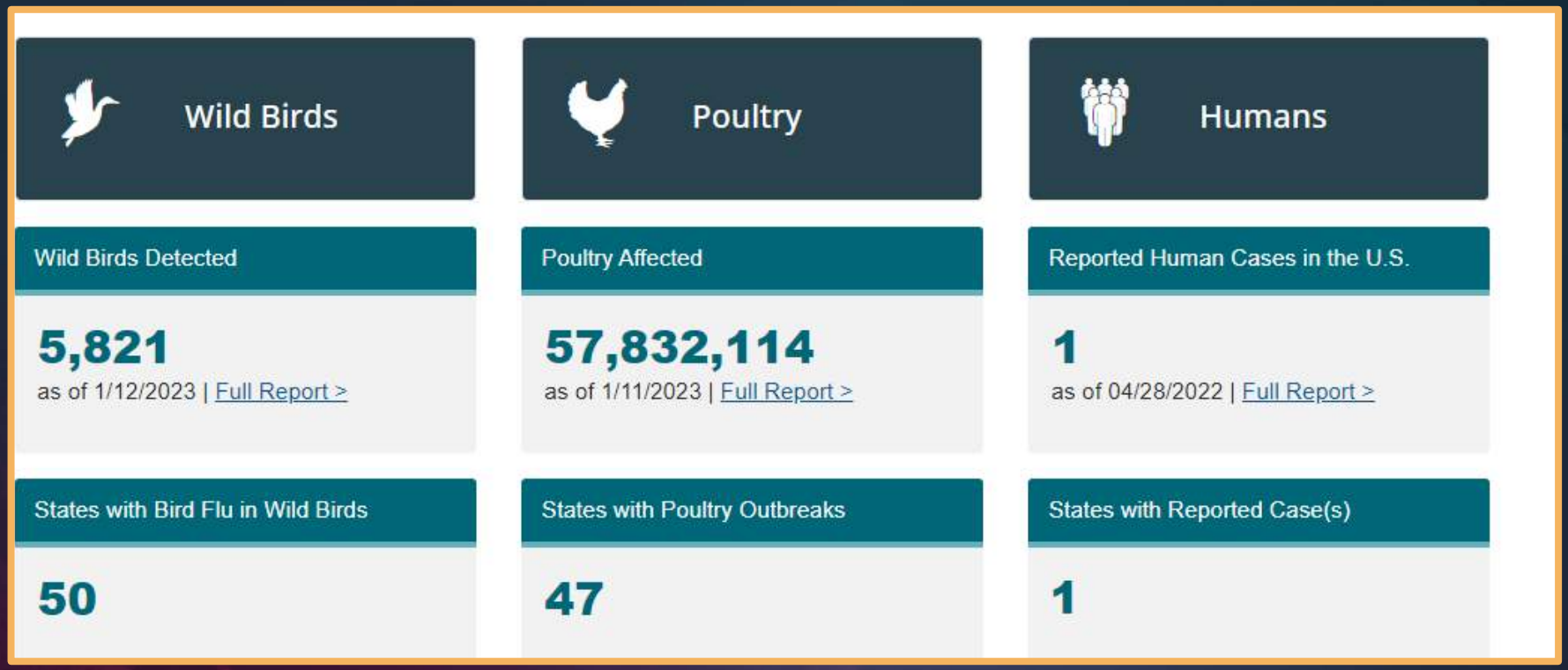
Novel Influenza

The world is increasingly

- Crowded
- Connected
- Converging

Jernigan, Strausbaugh. Emerging Infections, Textbook of Infectious Diseases, 2004
Institute of Medicine, Emerging Infections, 1992
Jernigan, Cox. Textbook of Influenza. 2013

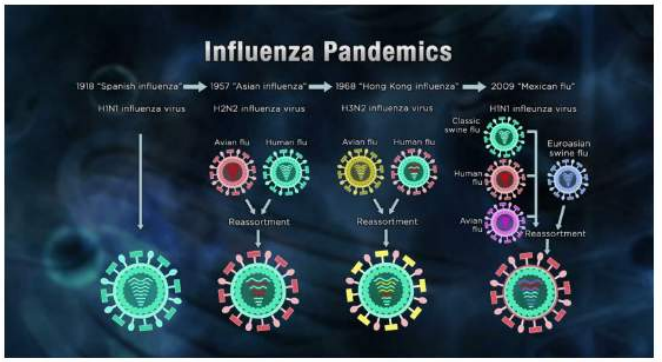
United States A(H5) Current Situation



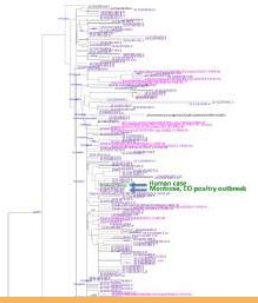
Candidate vaccine virus, genetic, and antiviral analyses of US A(H5)

A(H5) Clade 2.3.4.4b Candidate Vaccine Virus and Genetic Analyses

- Pre-pandemic Vaccines
  - CDC has produced many A(H5NX) candidate vaccine viruses (CVV) over the years
  - IDCDC-RG71A CVV for this A(H5) virus
    - HA is nearly genetically identical to the 2022 H5 HA viruses in North American wild birds and poultry and the individual who tested positive for H5N1 in Colorado.
    - CVV has been shared with vaccine manufacturers



- Continuous analysis of newly available sequence data
  - No concerning mutations or genetic markers identified based on previous association with greater disease, transmissibility to people

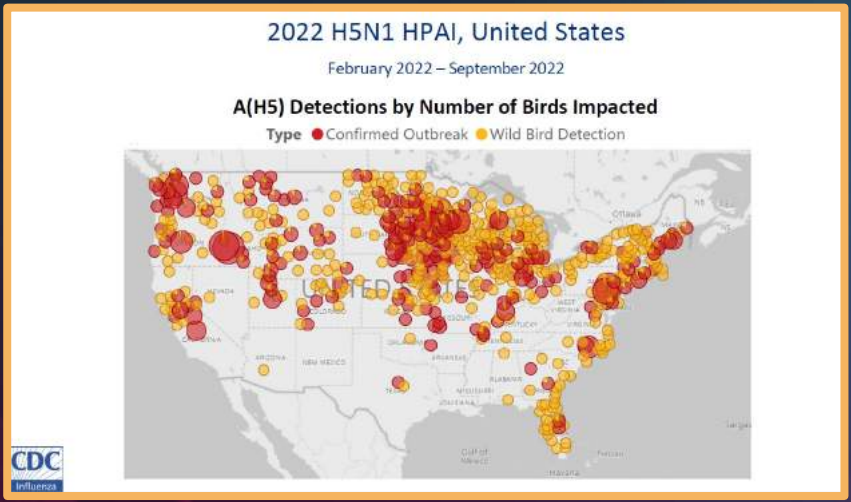


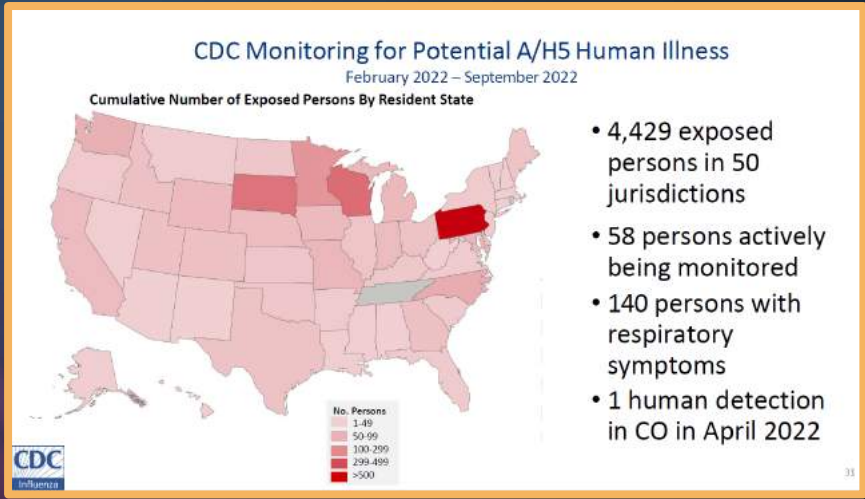
Antiviral Analysis of U.S. A(H5) viruses

Preliminary sequence analyses indicate that currently approved influenza antiviral treatments in the U.S. would be effective against more than 99% of A(H5) viruses

Novel Influenza – Data Modernization Opportunity

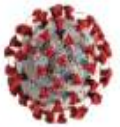
- A(H5): developed data systems to more easily share, synthesize and view U.S. human monitoring and avian outbreak data
  - Systems can be replicated and scaled for future outbreaks and responses
  - A standard form for state reporting of the number of persons being monitored following exposure to A(H5) virus-infected birds
  - An internal dashboard to display avian outbreak data and human monitoring data

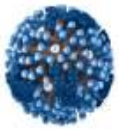




Leveraging Influenza Investments for COVID-19

- CDC's influenza epidemiologic networks and laboratory capabilities provided the underpinning for CDC's COVID-19 response
  - Played a critical role in providing initial infrastructure and expertise, domestically and globally, to respond to COVID-19, including expanding existing epidemic and pandemic preparedness
- Epidemiology
  - Surveillance systems, VE, modeling and forecasting, training
- Laboratory Science
  - Multiplex assay development, reagent distribution, informatics, training
- International
  - WHO GISRS and NICs, networks, capacity, PIVI





CDC Influenza

Conclusions

- Epidemic influenza has returned and exacts an important burden of disease every year
- Pandemic influenza remains as important a threat globally as has it ever been

- *Capacities that support the monitoring, prevention, and control of seasonal and novel influenza enhance pandemic respiratory disease preparedness and response capacities as well*

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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.

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