

Centers for Disease Control and Prevention
National Center for Immunization and Respiratory Diseases



Overview of Long COVID: Epidemiology and Public Health Approach

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Objectives

- Provide an update on COVID-19 and other respiratory viruses
- Outline a framework for understanding Post-COVID Conditions or Long COVID
- Estimate the occurrence of Long COVID
- Discuss the role of health officials and health departments

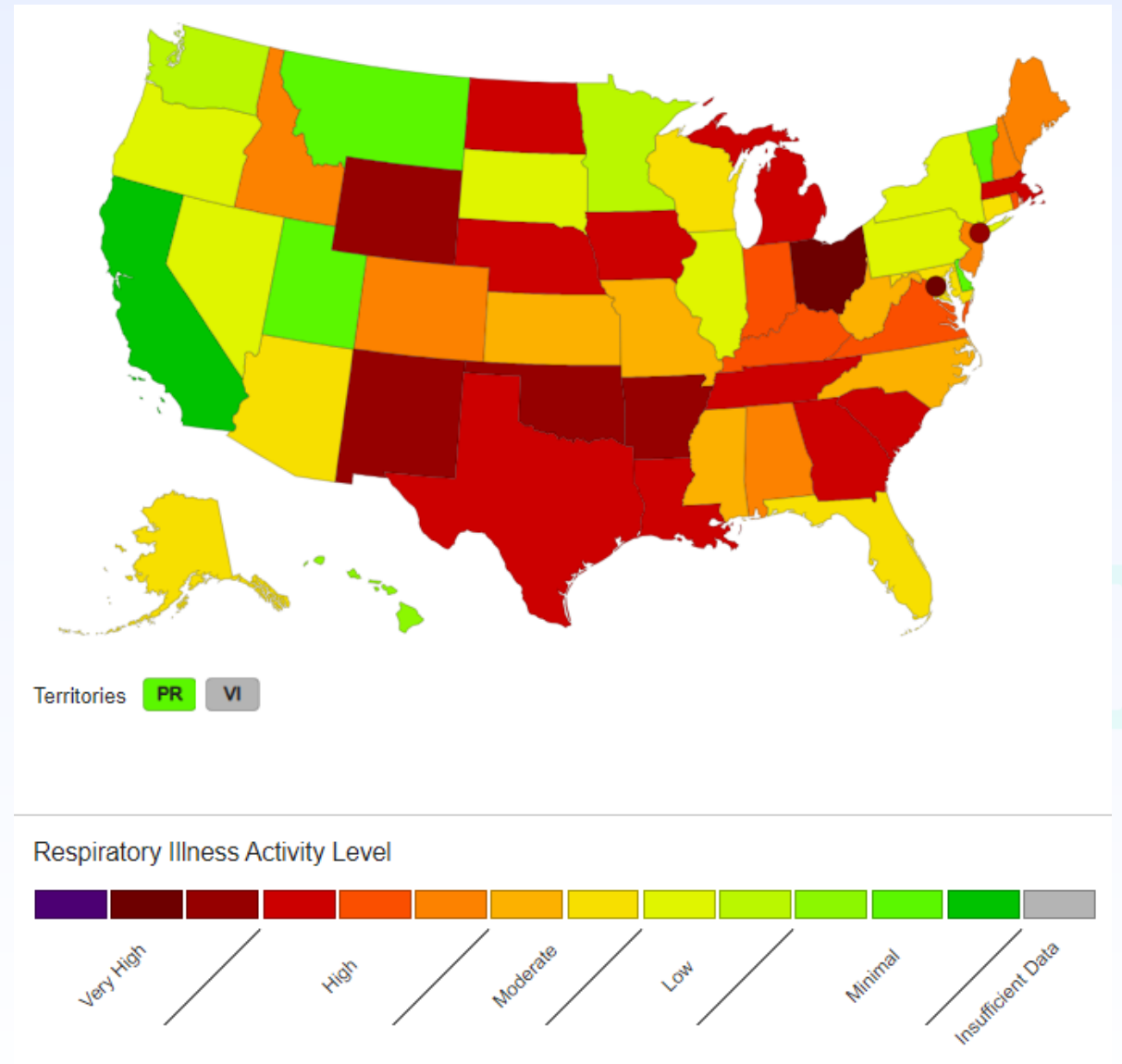


Respiratory Virus Update

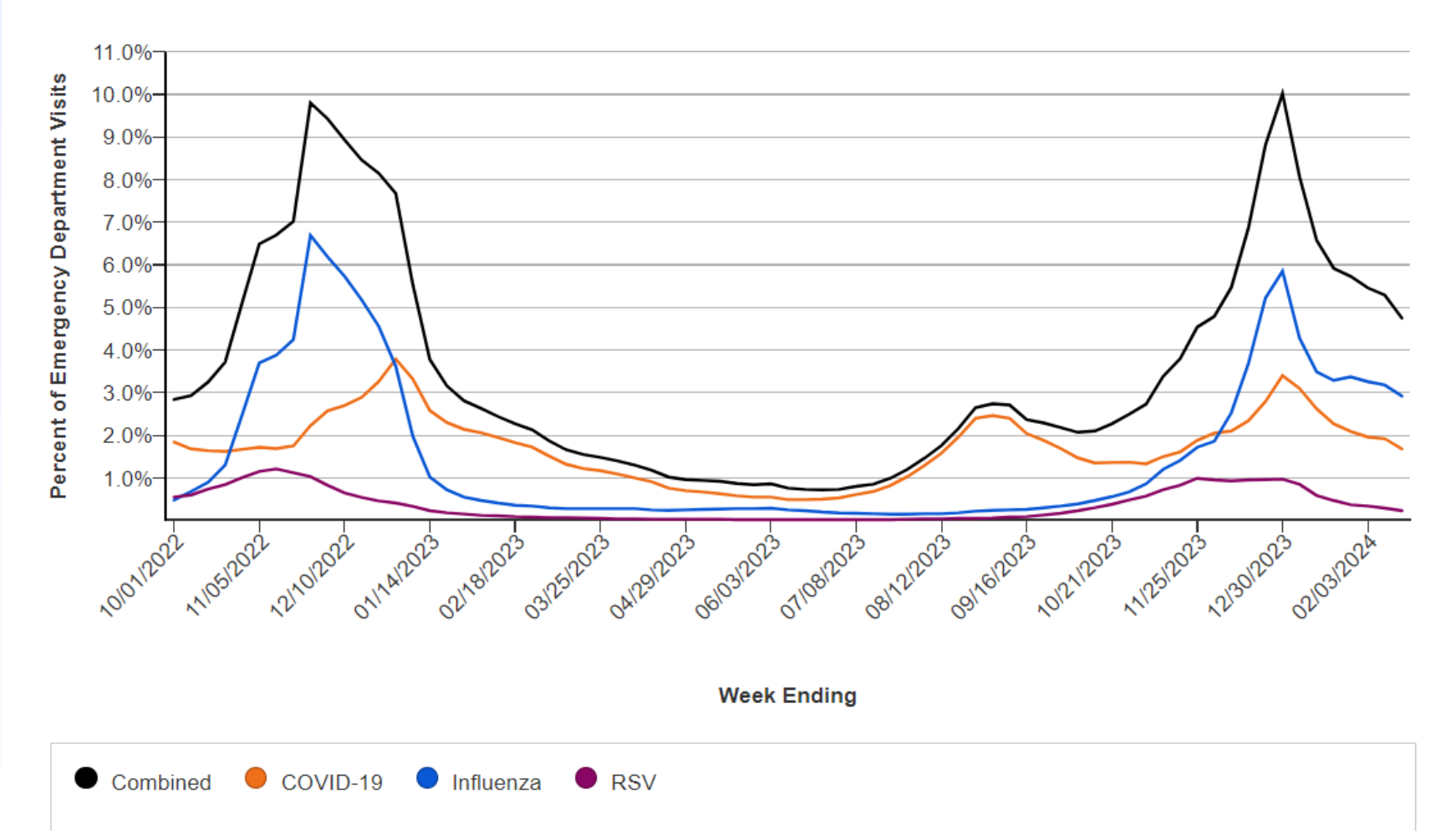
The background of the slide features a pattern of overlapping hexagons. The hexagons are rendered in various shades of blue, from light and translucent to dark and solid, with some appearing as outlines. The overall effect is a textured, geometric design that suggests a molecular or crystalline structure, fitting the theme of a respiratory virus update.

Level of Respiratory Illness Activity

- Amount of respiratory illness (fever plus cough or sore throat) causing people to seek healthcare is elevated across many areas of the country
- For the week of February 19th, 27 jurisdictions experienced high or very high activity
- The number remains stable compared to the previous week



Emergency Department Visits for Viral Respiratory Illness: Weekly percent of total emergency department visits associated with COVID-19, influenza, and Respiratory Syncytial Virus



Data presented through: 02/17/2024; Data as of: 02/21/2024

Long COVID: Framework

The background of the slide features a pattern of overlapping hexagons. The hexagons are rendered in various shades of blue and purple, with some appearing as solid colors and others as outlines. They are scattered across the page, creating a textured, geometric effect.

A general framework for Post-COVID Conditions

Wide range of physical and mental health consequences continue or develop at **least 4 weeks initial SARS-CoV-2 infection**

Post acute sequelae of SARS-CoV-2 infection (PASC)

- System specific pathology (e.g. lung fibrosis, stroke)
- Clinically significant symptoms with unclear pathology (e.g. ME/CFS*-like, dysautonomia)
- On-going symptoms following MIS-C**

General consequences of illness and hospitalization

- Post ICU syndrome
- Other complications of treatment or illness

Conditions frequently overlap
Patients may experience any combination

Long COVID is a commonly used term for Post-COVID Conditions

*ME/CFS: Myalgic Encephalomyelitis/Chronic Fatigue Syndrome

** MIS-C: Multisystem Inflammatory Syndrome in Children

Common Symptoms reported for Post-COVID conditions

General symptoms

- Tiredness or fatigue that interferes with daily life
- Symptoms that get worse after physical or mental effort (also known as “post-exertional malaise”)

Cardiovascular and Respiratory symptoms

- Dyspnea/shortness of breath
- Cough
- Chest pain
- Heart palpitations

Digestive symptoms

- Diarrhea
- Stomach pain

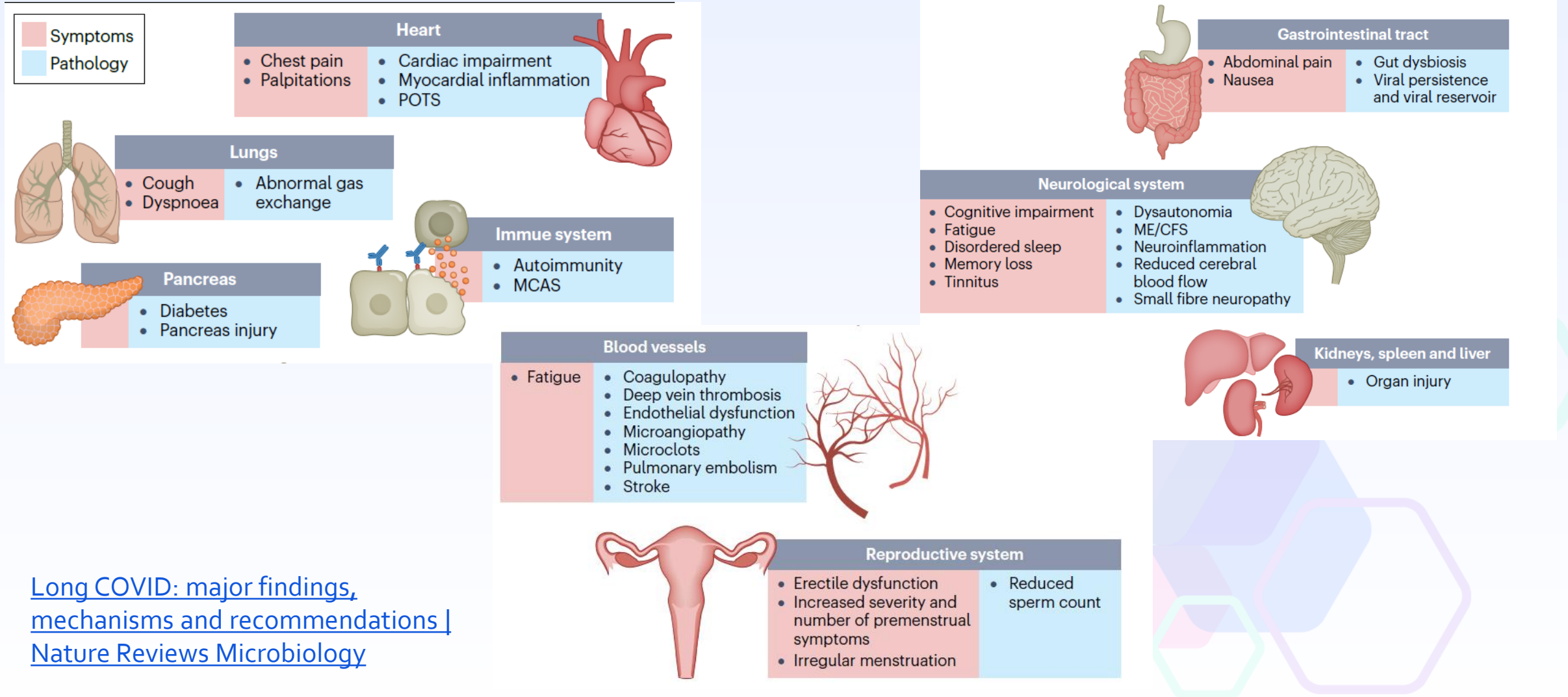
Neurological symptoms

- Difficulty thinking or concentrating (sometimes referred to as “brain fog”)
- Headache
- Sleep problems
- Dizziness when standing up (lightheadedness)
- Pins-and-needles feelings
- Change in smell or taste
- Depression or anxiety

Other symptoms

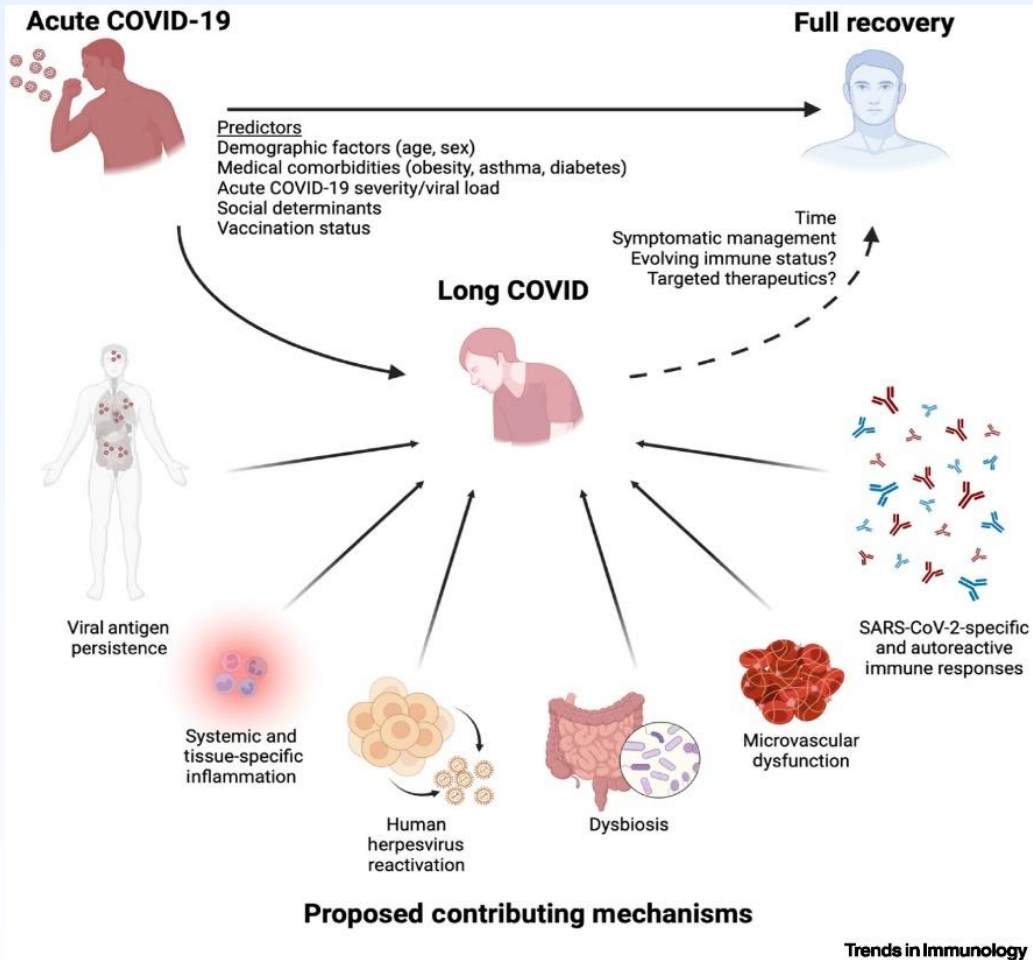
- Joint or muscle pain
- Rash
- Changes in menstrual cycles

Post-COVID Conditions and symptoms impact multiple organ systems with differing pathology



[Long COVID: major findings, mechanisms and recommendations | Nature Reviews Microbiology](#)

Multiple proposed potential mechanisms for Post-COVID conditions



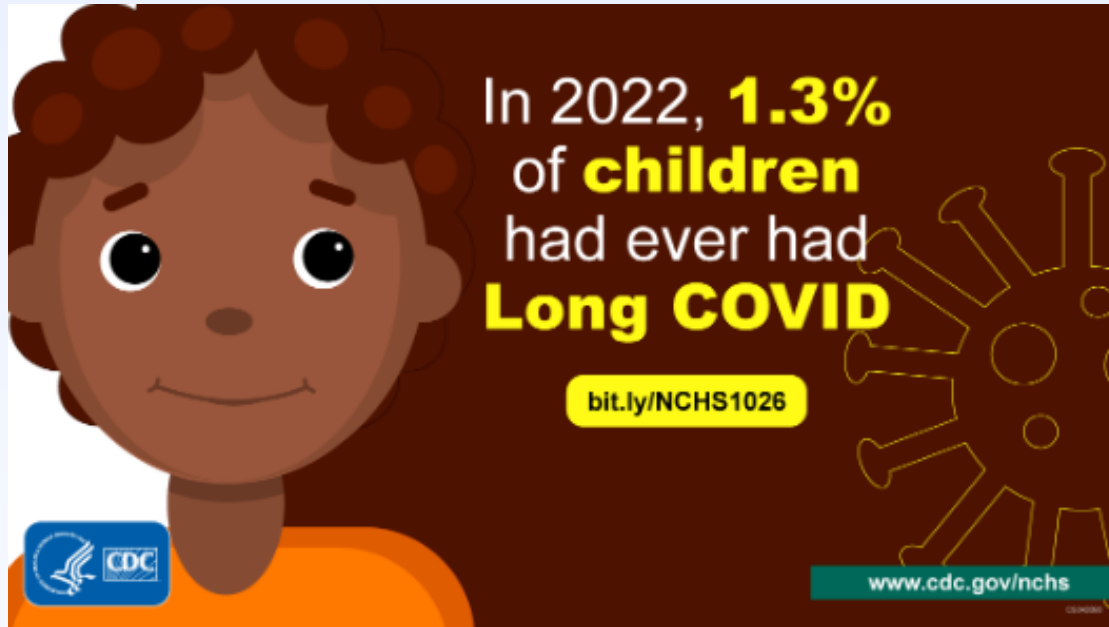
Proposed mechanisms could include

- viral persistence
- systemic and tissue-specific inflammation
- auto immunity
- microvascular dysfunction

[Peluso and Deeks. Early clues regarding the pathogenesis of long-COVID: Trends in Immunology \(cell.com\) 2022](#)

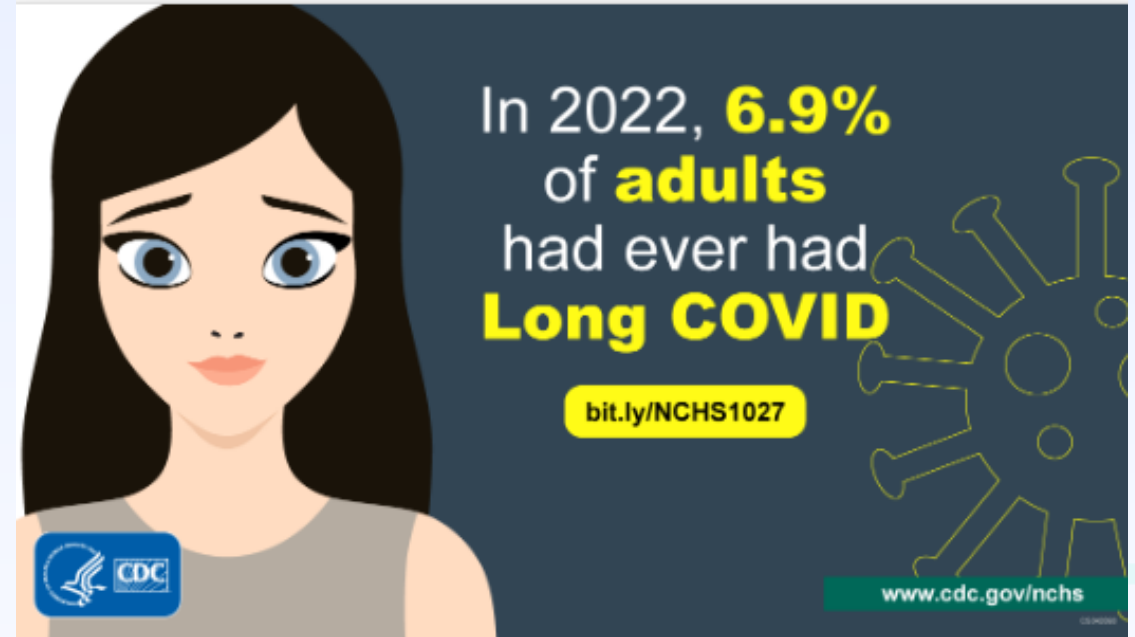
Long COVID: Epidemiology

The background of the slide features a pattern of overlapping hexagons in various shades of blue and purple, creating a geometric, crystalline effect. The hexagons vary in opacity and color, with some appearing as solid shapes and others as outlines. The overall aesthetic is clean and modern, typical of a scientific or medical presentation.



Analysis of National Health Interview Survey Long COVID data for children
Read the report.

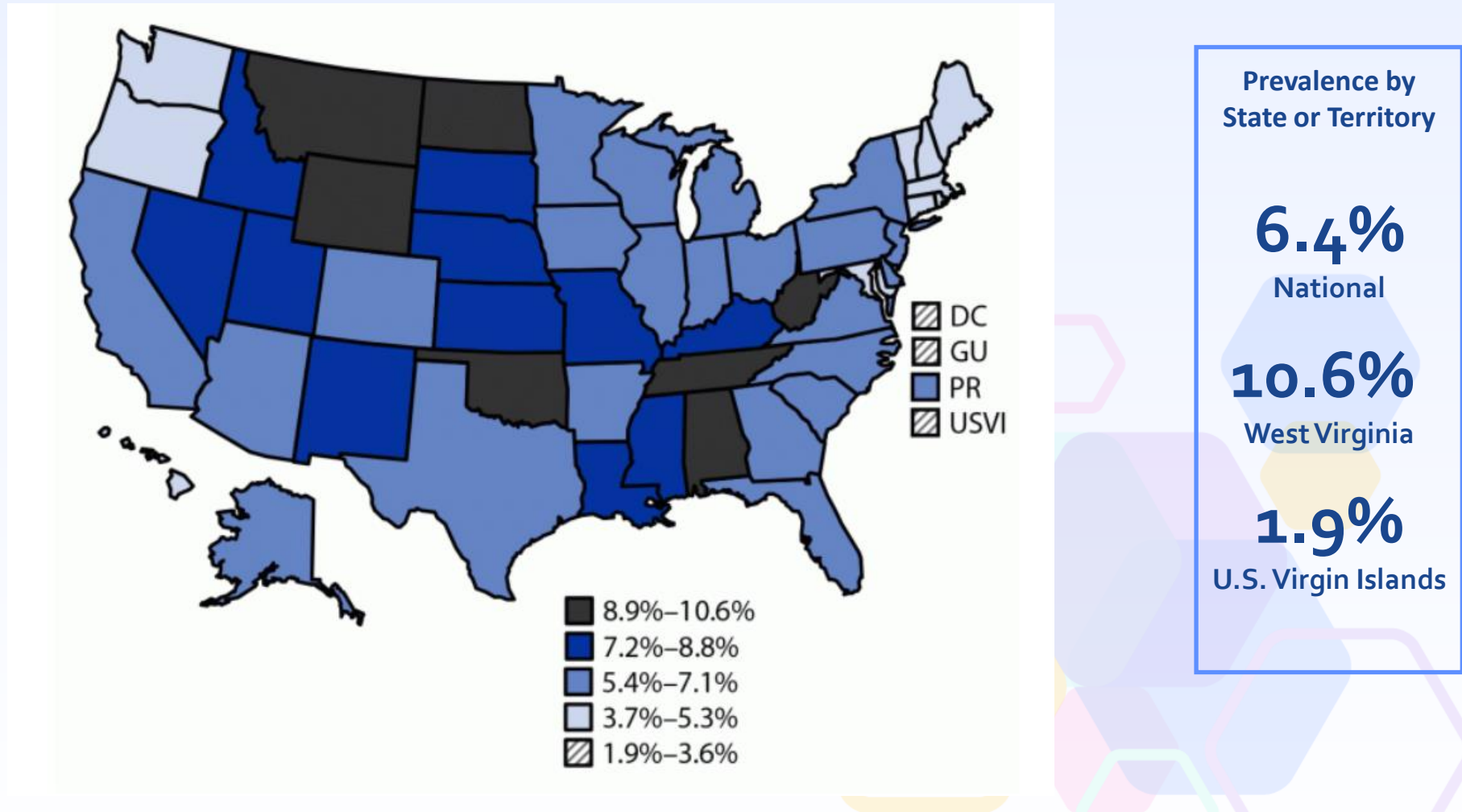
[Long COVID in Children, United States 2022](https://www.cdc.gov/nchs/longcovid/children)



Analysis of National Health Interview Survey Long COVID data for adults
Read the report.

[Long COVID in Adults, United States 2022](https://www.cdc.gov/nchs/longcovid/adults)

Prevalence of report of experiencing Long COVID among adults ≥ 18 years by jurisdiction- 2022



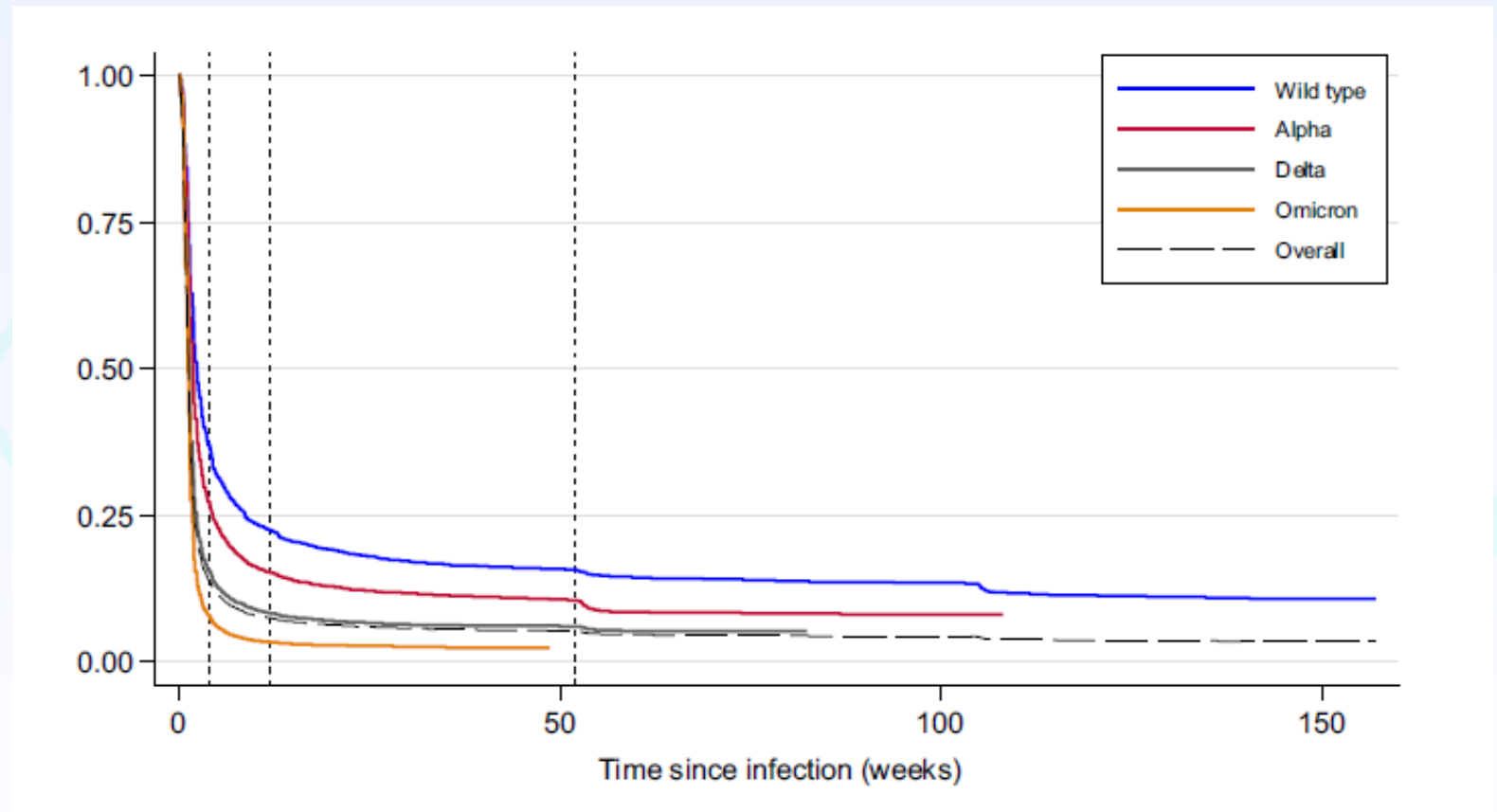
Adults with Long COVID report significant activity limitations

Almost 1 in 4 adults with Long COVID report significant activity limitations



Time to symptom end date among those who tested positive for SARS-CoV-2 by variant period, REACT study

- 133,526 adults reporting SARS-CoV-2 infection
- Mean duration of COVID related symptoms 1 to 3 weeks
- 7.5% reporting symptoms at 12 weeks
- 5.4% reporting symptoms at 52 weeks



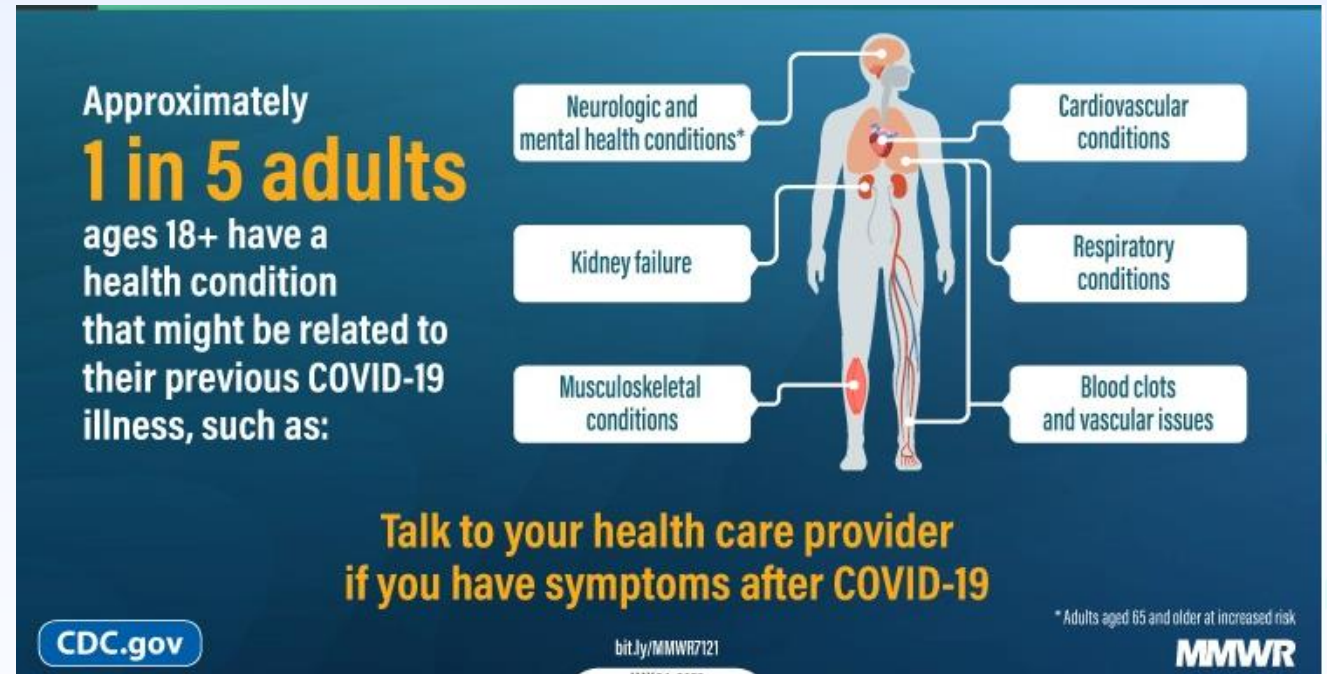
Persistent symptoms of Long COVID among children

- Difficulties in assessing Long COVID in young children include:
 - Inability of younger children to verbalize symptoms
 - Inconsistent manifestation of symptoms
 - Assessments of conditions may be dependent on expected developmental milestones
- Among children identified in emergency departments:
 - Absolute risk of ongoing symptoms was low, but greater among those who were SARS-CoV-2 positive (0.42% at 6 months and 0.51% at 12 months) and the most common symptoms were respiratory
 - Quality of life reported by participants at 6 and 12 months did not differ by SARS-CoV-2 positivity
- Prevalence difference for persistent symptoms among sero-positive children compared to sero-negative children is 4.1%

[A population-based serological study of post-COVID syndrome prevalence and risk factors in children and adolescents | Nature Communications](#)
[A Systematic Review of Persistent Clinical Features After SARS-CoV-2 in the Pediatric Population | Pediatrics | American Academy of Pediatrics \(aap.org\)](#)
[Post-COVID-19 Condition in Children 6 and 12 Months After Infection | Pediatrics | JAMA Network Open | JAMA Network](#)

Post-COVID Conditions Among Adult COVID-19 Survivors Aged 18–64 and ≥65 Years

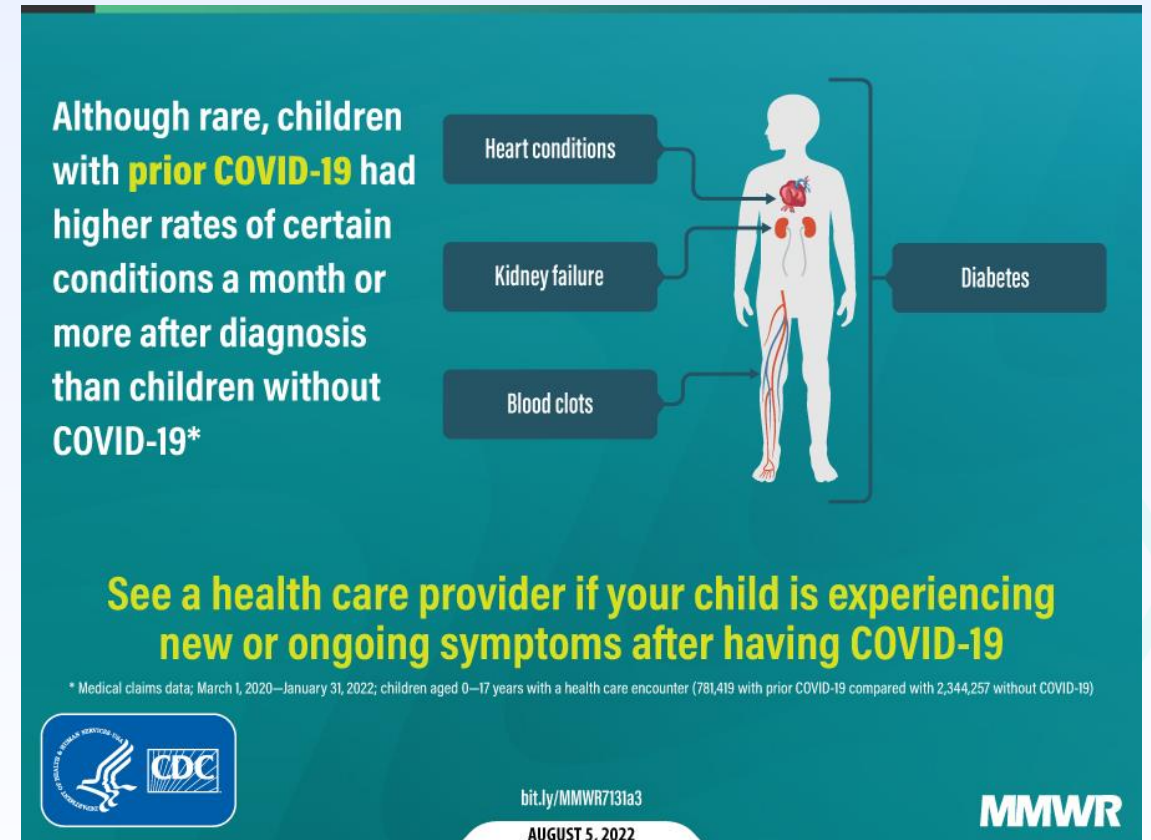
- Analysis of occurrence of 26 clinical conditions in EHRs during Mar 2020 – Nov 2021 (~63 million unique adult records)
- Patients followed for 30 – 365 days after their initial acute COVID index encounter
- 38% of case-patients and 16% controls experienced at least one incident condition



[Bull-Otterson et al. Post-COVID Conditions Among Adult COVID-19 Survivors Aged 18–64 and ≥65 Years – United States, March 2020–November 2021. MMWR May 27, 2022.](#)

Post-COVID-19 Symptoms and Conditions among Children and Adolescents

- Analysis of large medical claims database of children with and without COVID-19 of 46 symptoms and conditions
- During March 1, 2020–January 31, 2022, increased risk of four symptoms and eight conditions 31–365 days following COVID-19 among children aged 0–17 years

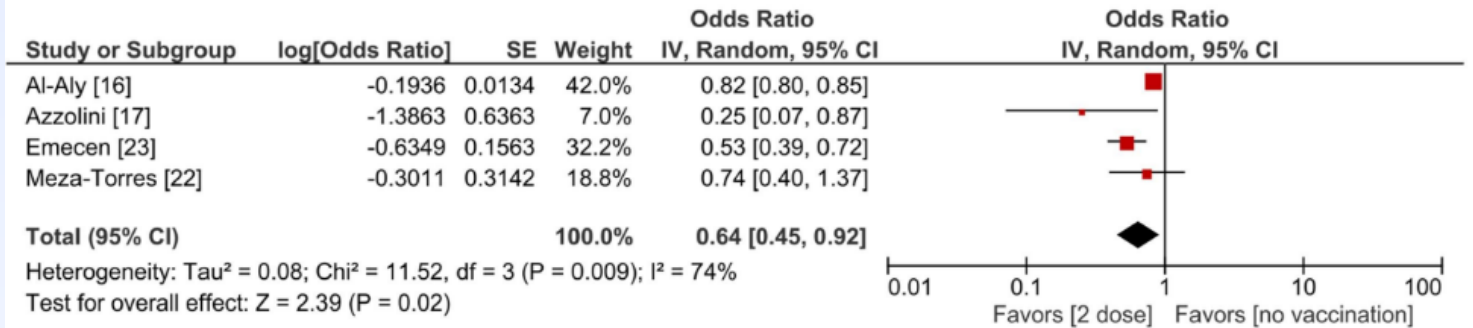


[Post-COVID-19 Symptoms and Conditions Among Children and Adolescents — United States, March 1, 2020–January 31, 2022 | MMWR \(cdc.gov\)](https://www.cdc.gov/mmwr/2022/august5/20220805a1.htm)

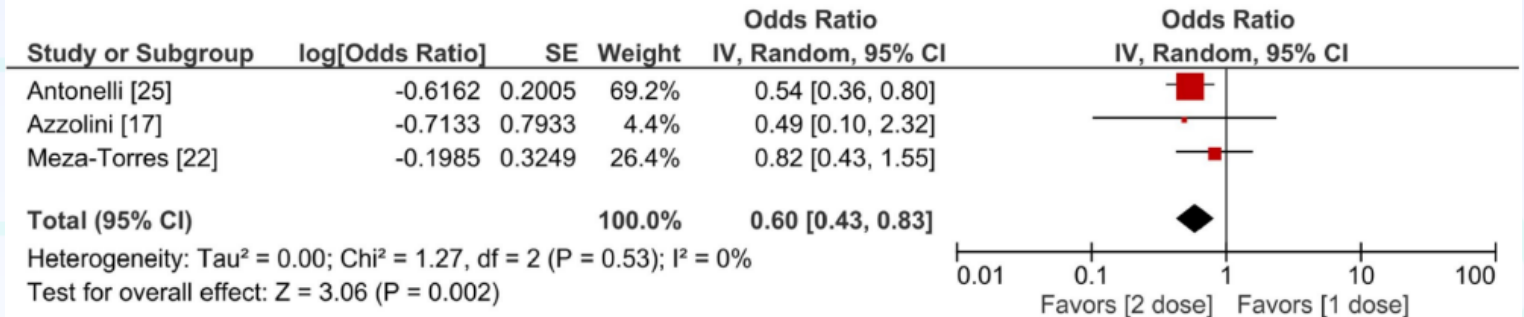
COVID-19 vaccination (1 or 2 doses) reduces Post-COVID Conditions compared to no vaccination among those with SARS-CoV-2 infection

[Protective effect of COVID-19 vaccination against long COVID syndrome: A systematic review and meta-analysis - ScienceDirect](#)

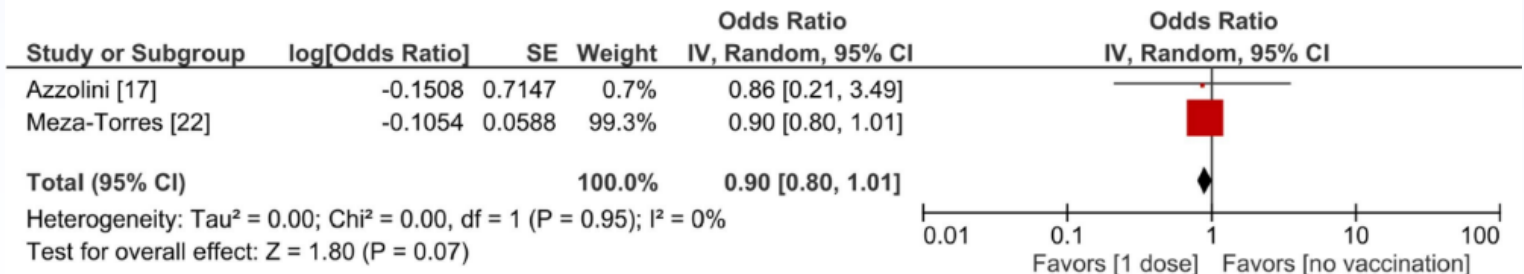
a) two-dose vaccination vs. no vaccination



b) two-dose vaccination vs. one-dose vaccination



c) one-dose vaccination vs. no vaccination



Groups associated with a higher likelihood of developing Long COVID

- Females
- Older age (sometimes)
 - Adolescents compared to younger children
 - Middle-aged adults compared to younger and older adults for symptoms
 - Older adults compared to younger adults for incident conditions
- Severity of COVID-19 illness
- Underlying health conditions prior to COVID-19
 - Asthma, autoimmune diseases
- Lower socio-economic status
- Did not get COVID-19 vaccine

[Maglietta G et al. Prognostic Factors for Post-COVID-19 Syndrome: A Systematic Review and Meta-Analysis. JCM 2022](#)

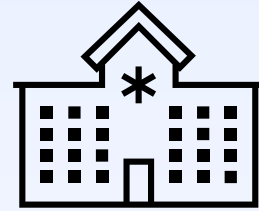
[Socioeconomic inequalities of Long COVID-UK. Shabnam et al. 2023 \(sagepub.com\)](#)

[Hastie. et al. Outcomes among confirmed cases and matched comparison group in the Long COVID in Scotland Study. Nature 2022](#)

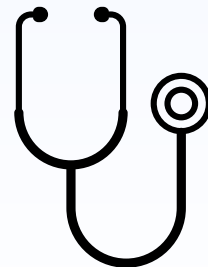
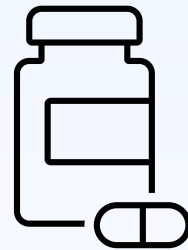
[Epidemiology of Long Coronavirus Disease in US Adults | Clinical Infectious Diseases | Oxford Academic \(oup.com\)](#)

[Frontiers | Hospital admission and vaccination as predictive factors of long COVID-19 symptoms \(frontiersin.org\)](#)

Excess direct medical costs were higher among COVID-19 cases compared to non-COVID controls



Direct medical costs for children **1.75x** higher among cases compared to controls



Direct medical costs for adults **1.56x** higher among cases compared to controls



US Government Response to Long COVID and Public Health Approach



The Federal Government Response

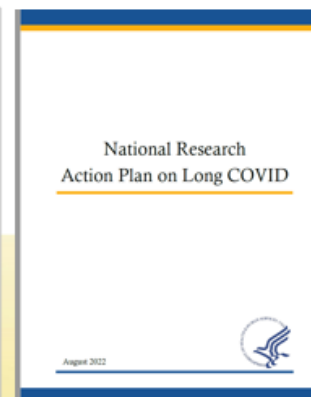
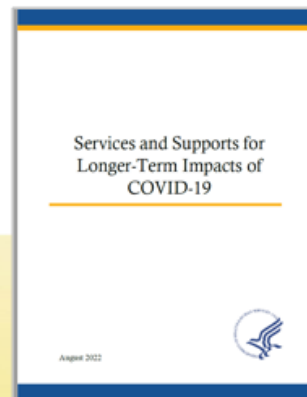
2022



April

President's memo organized government-wide response to address Long COVID and the longer-term impacts of COVID-19

14 agencies collaborated to identify existing federal services available and outline a national research agenda



August

Released two reports

1. Services and Supports for Longer-Term Impacts of COVID-19
2. National Research Action Plan on Long COVID

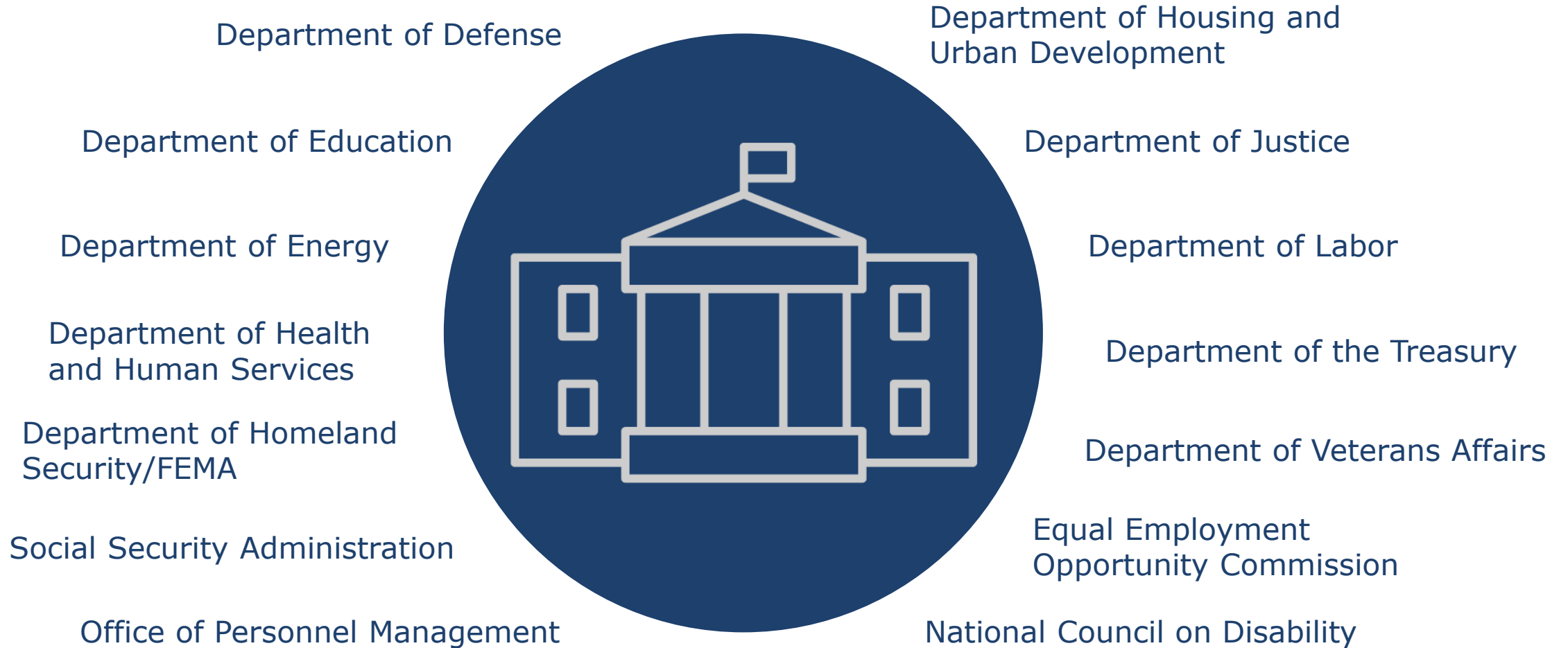




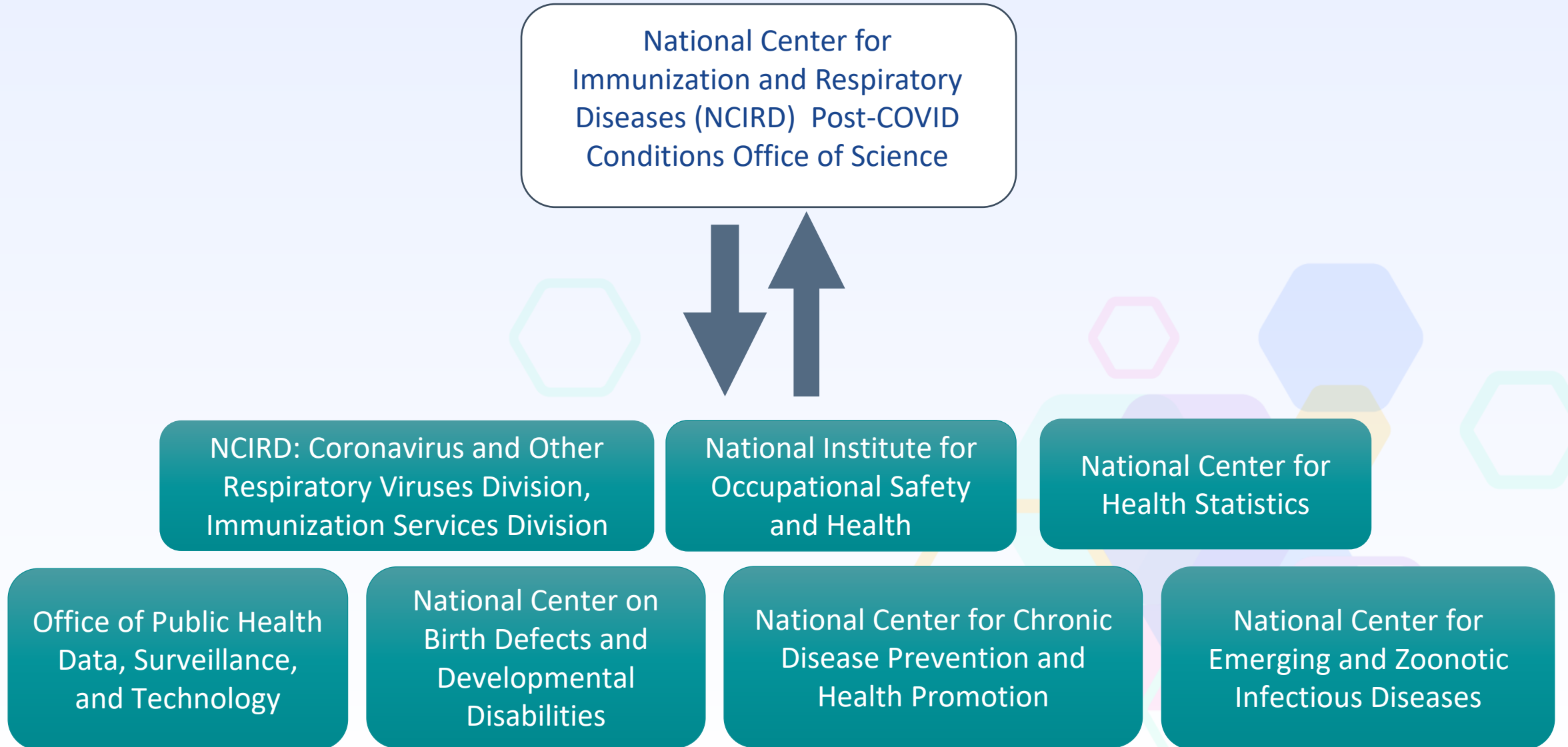
There are
seven research
priorities

1. Characterize the full clinical spectrum of Long COVID and diagnostic strategies
2. Understand the pathophysiology of Long COVID
3. Engage in surveillance and epidemiology to understand burden and risk factors
4. Understand impacts on well-being, quality of life
5. Develop safe and effective treatments, and other interventions
6. Evaluate and improve support services
7. Conduct health services and health economics research

Agencies Involved in Long COVID Response Efforts



CDC Organizational Entities Involved in Long COVID



Open access

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American Journal of
Preventive Medicine

CURRENT ISSUES

The Role of U.S. Public Health Agencies in Addressing Long COVID

Priti R. Patel, MD, MPH,^{1,2} Jay R. Desai, PhD, MPH,³ Marcus Plescia, MD, MPH,⁴
Jessica Baggett, MPH,⁴ Peter Briss, MD, MPH⁵

Long COVID (or post-COVID conditions) refers to symptoms or health conditions that persist or occur ≥ 4 weeks after severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection.¹ Symptoms such as brain fog, fatigue, pain, dyspnea, depression, and a wide range of other manifestations can occur and may be debilitating. The mechanism(s) of these outcomes are poorly understood, creating challenges to prevention and treatment. The study of Long COVID is rapidly evolving, and approaches to describe its burden vary. However, prevalence estimates of activ-

associated with Long COVID. In April 2023, an online survey was sent to all 59 state and territorial health officials. The survey included multiple-choice and open-ended questions to determine areas in which jurisdictions were already working, barriers to progress, and priorities for further initiatives. In total, 43 of 59 jurisdictions—including 4 U.S. territories and freely associated states—participated in the survey, resulting in a 73% response rate. Jurisdictions were queried about their current activities and funding and asked to rank their most immediate needs related to Long COVID.



RESEARCH AND GUIDELINES



PREVENTION
AND MITIGATION



COMBATING
STIGMA



COMMUNICATION AND
PUBLIC EDUCATION



CLINICAL CAPACITY
BUILDING



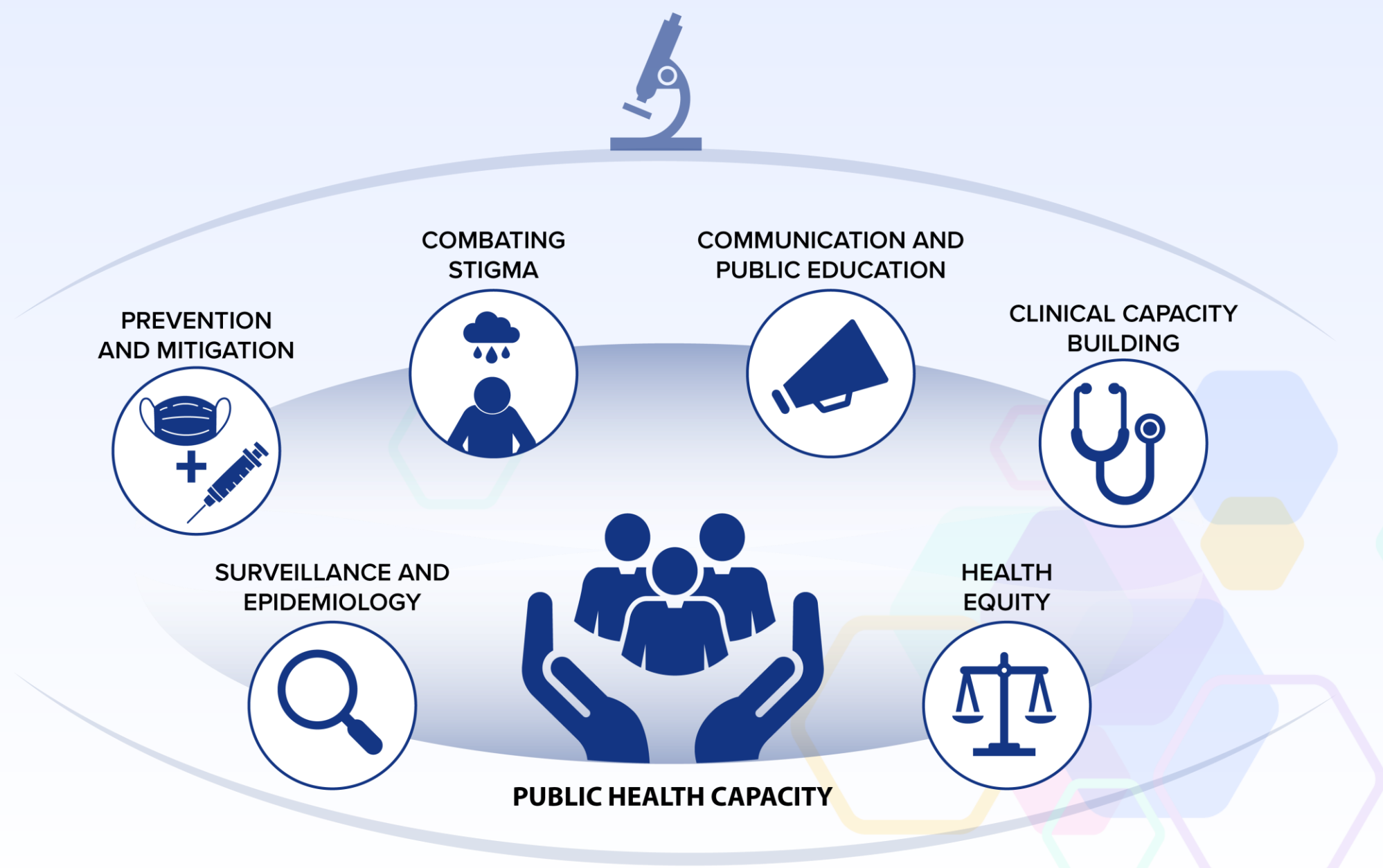
SURVEILLANCE AND
EPIDEMIOLOGY



HEALTH
EQUITY



PUBLIC HEALTH CAPACITY



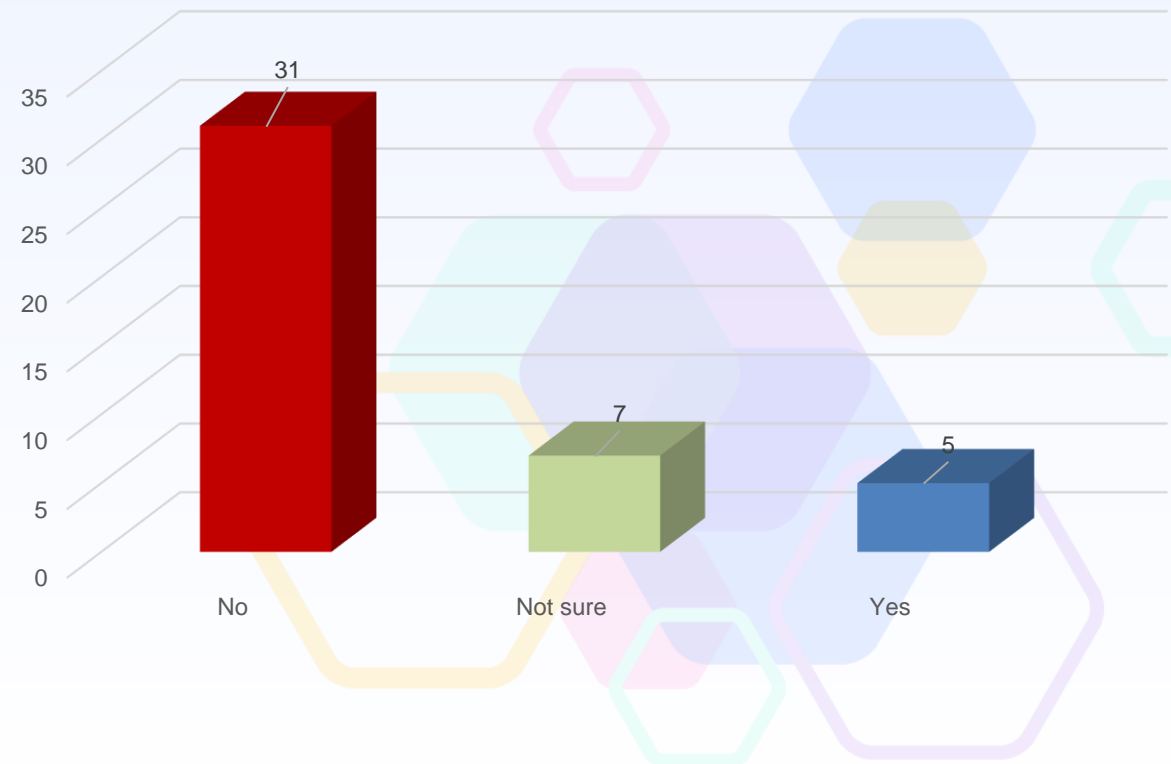
Jurisdictional Needs to Address Long COVID (N=43)

Most immediate needs in rank order:

- (1) The need for a standard definition
- (2) Surveillance efforts and best practices
- (3) Prevention and mitigation
- (4) Access to multidisciplinary care/Long COVID clinics
- (5) Provider engagement and education
- (6) Health system capacity building
- (7) Public communications
- (8) Addressing the mental health impacts of Long COVID
- (9) Policy development

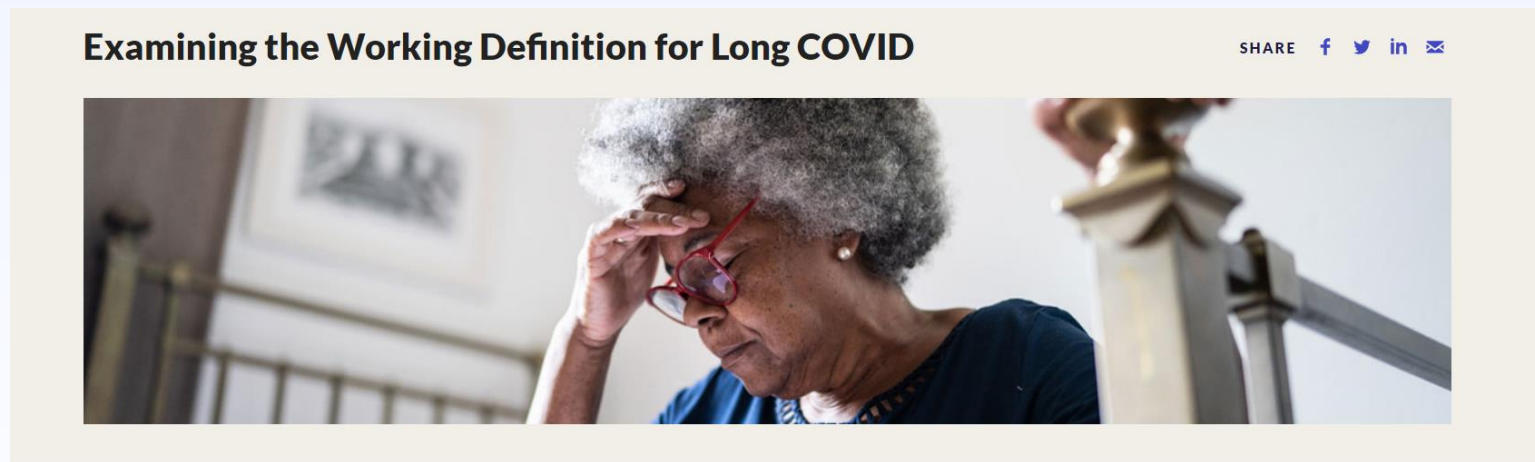
Only 12% of jurisdictions have Long COVID funding

Jurisdiction allocated dedicated funding support to Long COVID efforts
[N=43]



National Academies of Sciences, Engineering, and Medicine and Federal Advisory Committee

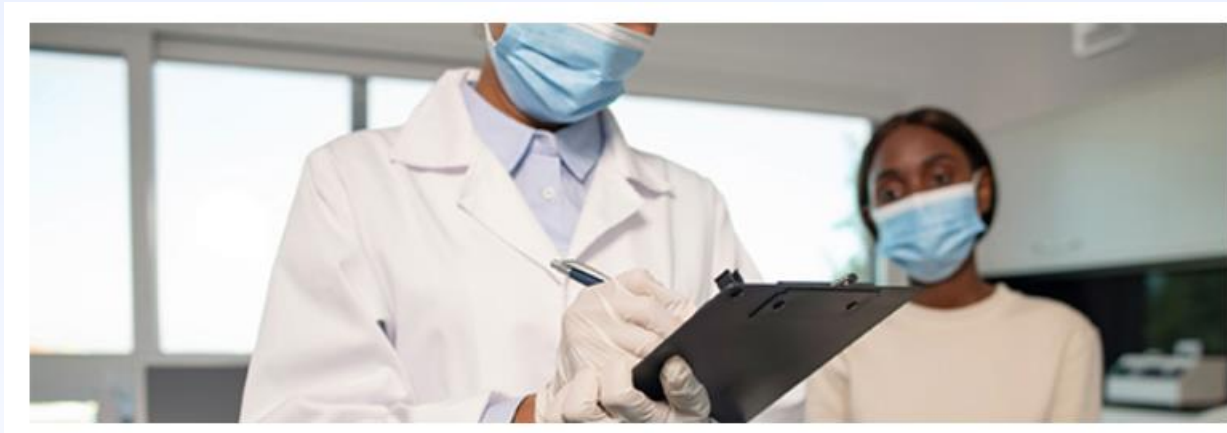
- Committee to examine current working definitions for Long COVID
 - Report expected in June 2024



- Federal Advisory Committee on Long COVID

<https://www.nationalacademies.org/our-work/examining-the-working-definition-for-long-covid>

Agency for Healthcare Research and Quality (AHRQ) Long COVID Care Network



Kennedy Krieger Institute, Baltimore, MD

University of Pittsburgh, Pittsburgh, PA

University of Texas Health Science Center, San Antonio, TX

University of Washington, Seattle, WA

Icahn School of Medicine at Mount Sinai, New York, NY

Emory University, Atlanta, GA

University of Colorado, Denver, CO

Stanford University, Stanford, CA

Washington University in St. Louis, St. Louis, MO

<https://www.ahrq.gov/coronavirus/long-covid/care-network.html>

Resources and Education Outreach

Building Clinical Capacity Through the Long COVID and Fatiguing Illness Recovery Program



**FAMILY HEALTH CENTERS
OF SAN DIEGO**



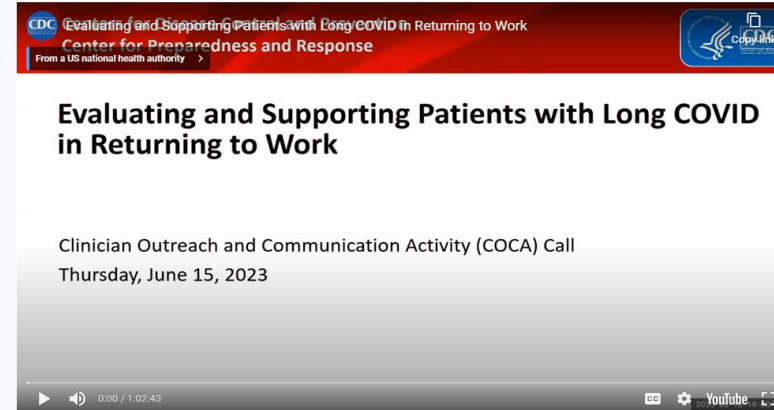
University of Colorado

UW Medicine

Anschutz Medical Campus

[Public Program | iECHO](#)

Clinician Outreach and Communication Activity (COCA)



[Evaluating and Supporting Patients with Long COVID in Returning to Work \(cdc.gov\)](#)

Global Long Covid ECHO Webinar Series: Exploring Clinical Practice and Research



WHO Collaborating Centre for Digital
Learning in Health Emergencies

[Global Long Covid ECHO Webinar Series: Exploring Clinical Practice and Research | iECHO](#)

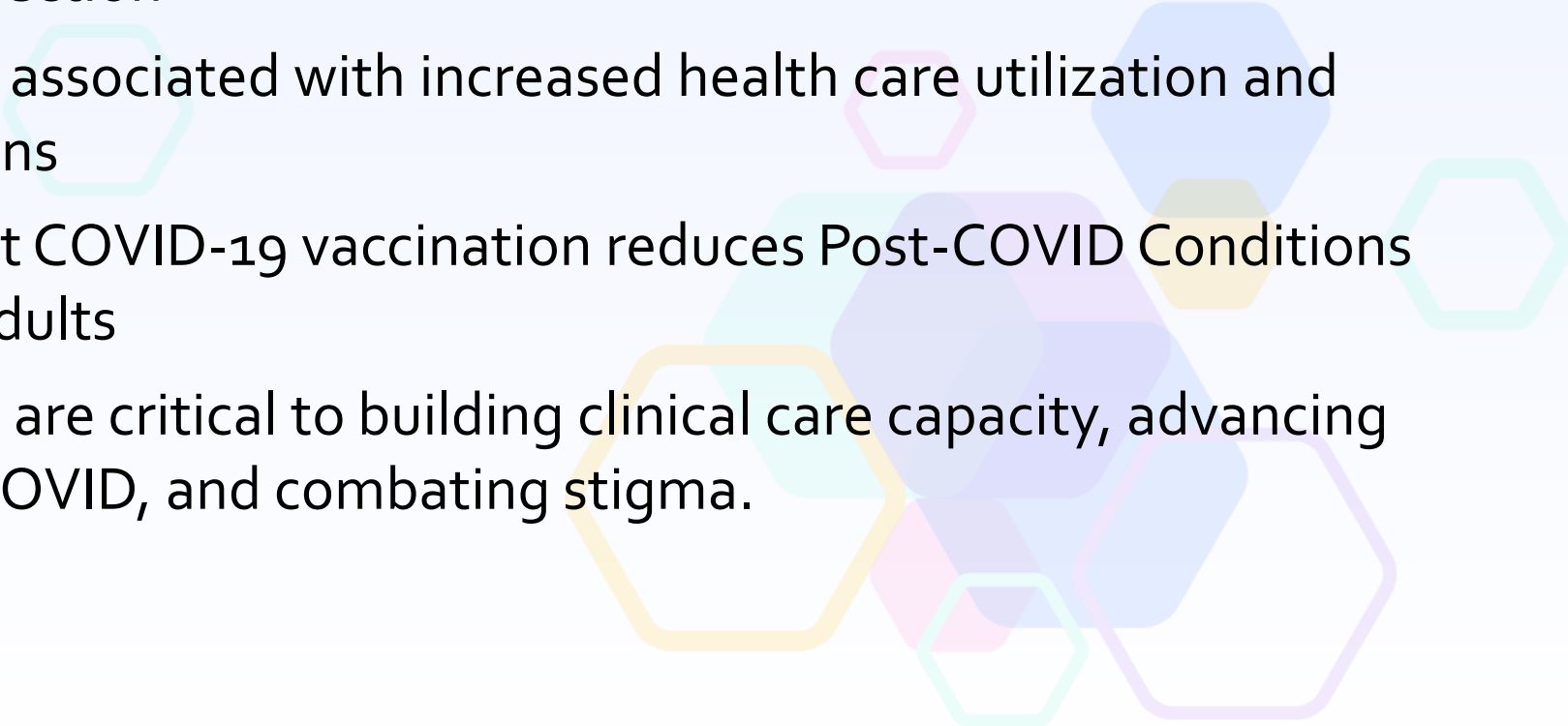
Long-COVID ECHO



**Arizona State
University**

[Long-COVID ECHO | College of Health Solutions \(asu.edu\)](#)

Key takeaways

- Post-COVID Conditions are common following SARS-CoV-2 infection, decrease with time since infection, and have decreased since the start of the pandemic
 - Symptoms and conditions associated with Post-COVID Conditions are not unique to having had SARS-CoV-2 infection
 - Post-COVID Conditions are associated with increased health care utilization and significant activity limitations
 - Accumulating evidence that COVID-19 vaccination reduces Post-COVID Conditions among both children and adults
 - Public health organizations are critical to building clinical care capacity, advancing public awareness of Long COVID, and combating stigma.
- 

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

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