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MAY 2024

Characterizing and Visualizing COVID-19 Burden: Raising Confidence to Support Evidence-Based Vaccination Recommendations

VDMP-1523-2_May2024

Introductions

Special thanks to Christopher Adams, Ni Zheng, and Isabelle Winer for helping to conduct the underlying analyses presented here.

James Mansi
VP :: Medical Affairs | moderna

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VP :: Real World Evidence | veradigm

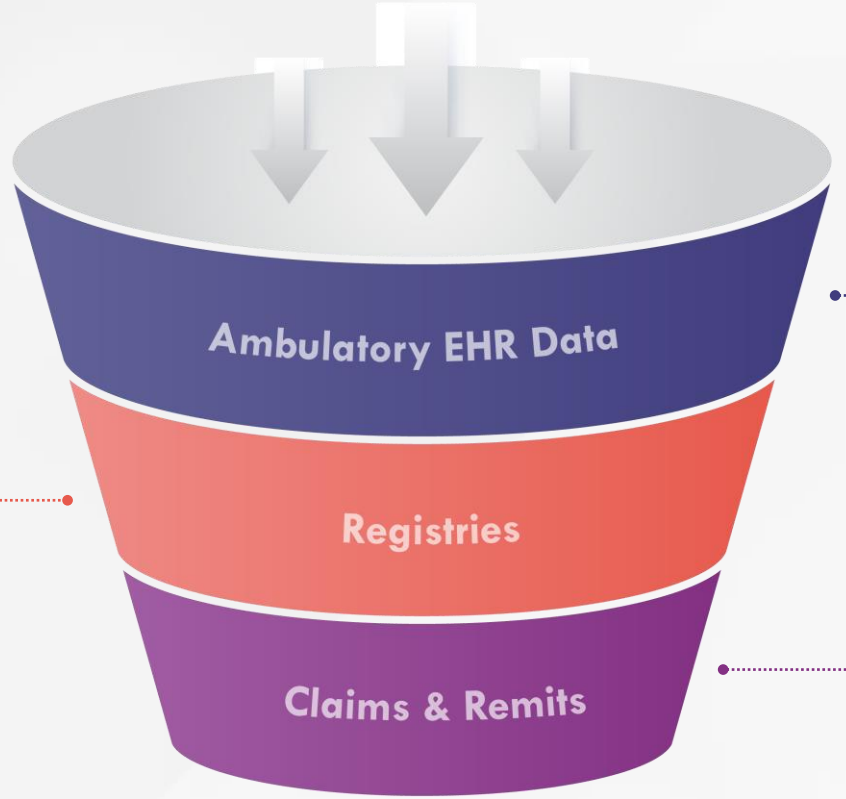
Veradigm's COVID Priorities

Healthcare Practices	Throughout the pandemic, Veradigm's first priority was and remains **supporting our practices and patients** in terms of infrastructure, research queries and general guidance
Public Health Initiatives	Veradigm continues to contribute to **public health efforts,** as well as research efforts to reduce the burden of disease for our patients, including FDA Sentinel analyses and diverse research collaborations
Focused RWD and RWE	Veradigm is developing **distinct data products** and **custom analytics projects** to support deeper COVID-19 analysis and help us move from bench to practice
Prepare for the Future	Veradigm is working with a number of collaborators to prepare for the future, both with chronic phase of COVID-19 and future pandemic preparedness

Background

Veradigm Real World Data Defined

Veradigm Real World Data



Registries
13M+ Patients*

Cardiology
11M+ Patients*

Metabolic
8M+ Patients*

Veradigm Network EHR (VNEHR) Data
174M+ Patients*

Veradigm EHR
TouchWorks
Practice Fusion
NextGen

Linkages to open and closed claims

Claims & Remits
207M/238M Claims**

*5 years of history: Q3 2017-Q2 2022
** Data is only stored at a rolling two-year period closed/open claims via third party vendor : Q3 2020 – Q2 2022

Veradigm Network EHR

Veradigm **Real World Data** is a comprehensive source for electronic health record (EHR) and registry datasets.

185M+ Total unique patients*	**172M+** Total VNEHR unique patients*	**145M+** patients with clinical activity	**133M+** patients with F2F/non-F2F visits
1.98B+ total visits	**241K+** HCP activity	**117M+** patients available for NLP extraction	**10M+** patients with Registry Data**

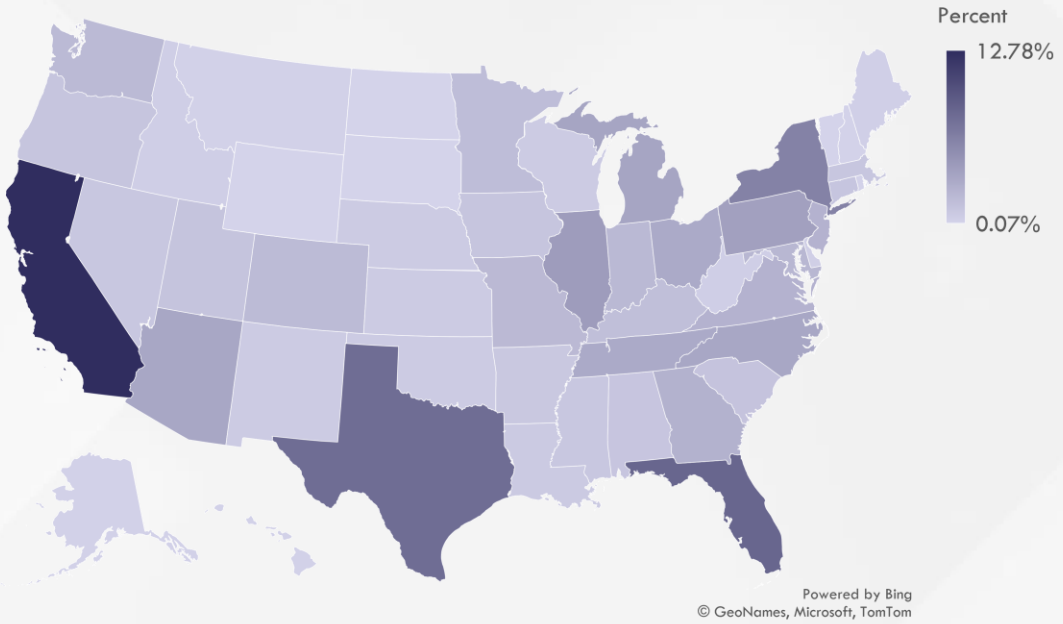
STRUCTURED AND UNSTRUCTURED DATA

NLP extracts evidence available unstructured or semi-structured data for use in custom research projects or feed into the overall research database

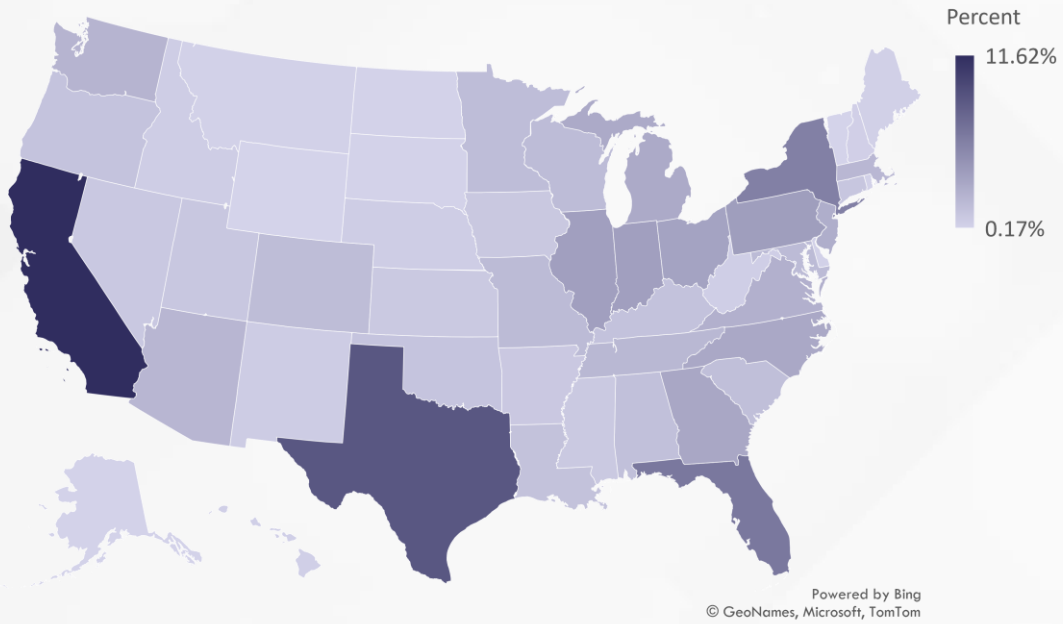
5 Year Time Period: Q3 2018-Q2 2023
*5+ Year Time Period: Jan 2018- Nov 2023
**5 years of history: Q2 2018 – Q1 2023

Distribution of VNEHR data and US Population by State

VNEHR



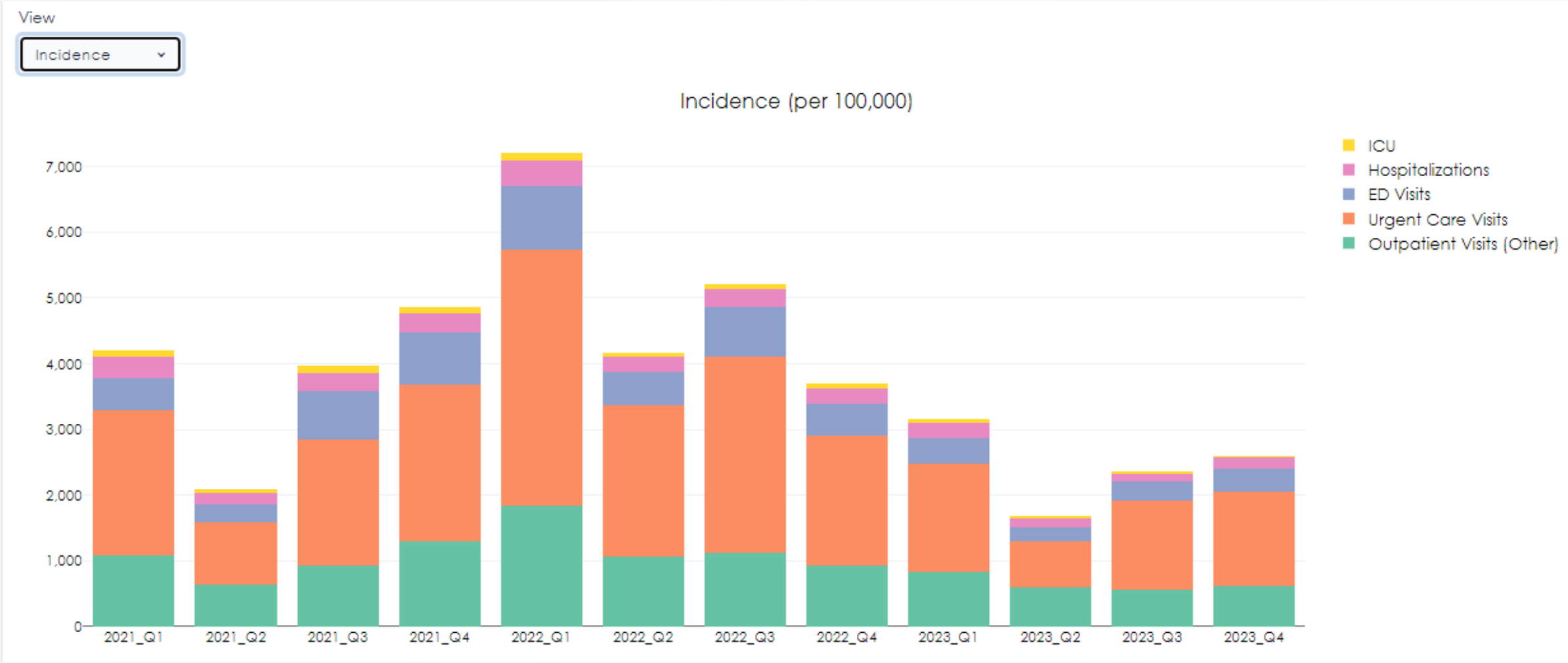
US Census*



5 Year Time Period: Q3 2017 – Q2 2022
*Source: U.S. Census Bureau, Population Division, 2021

COVID-19 Trends to Present

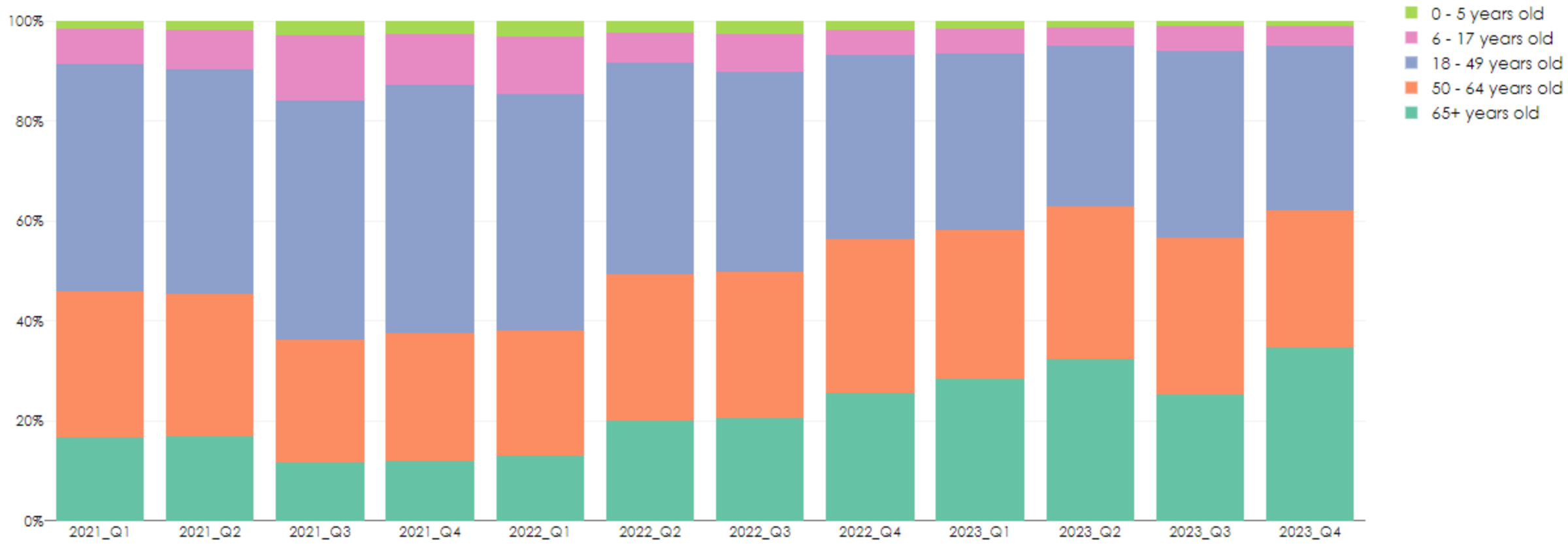
COVID-19 Incidence Over Time



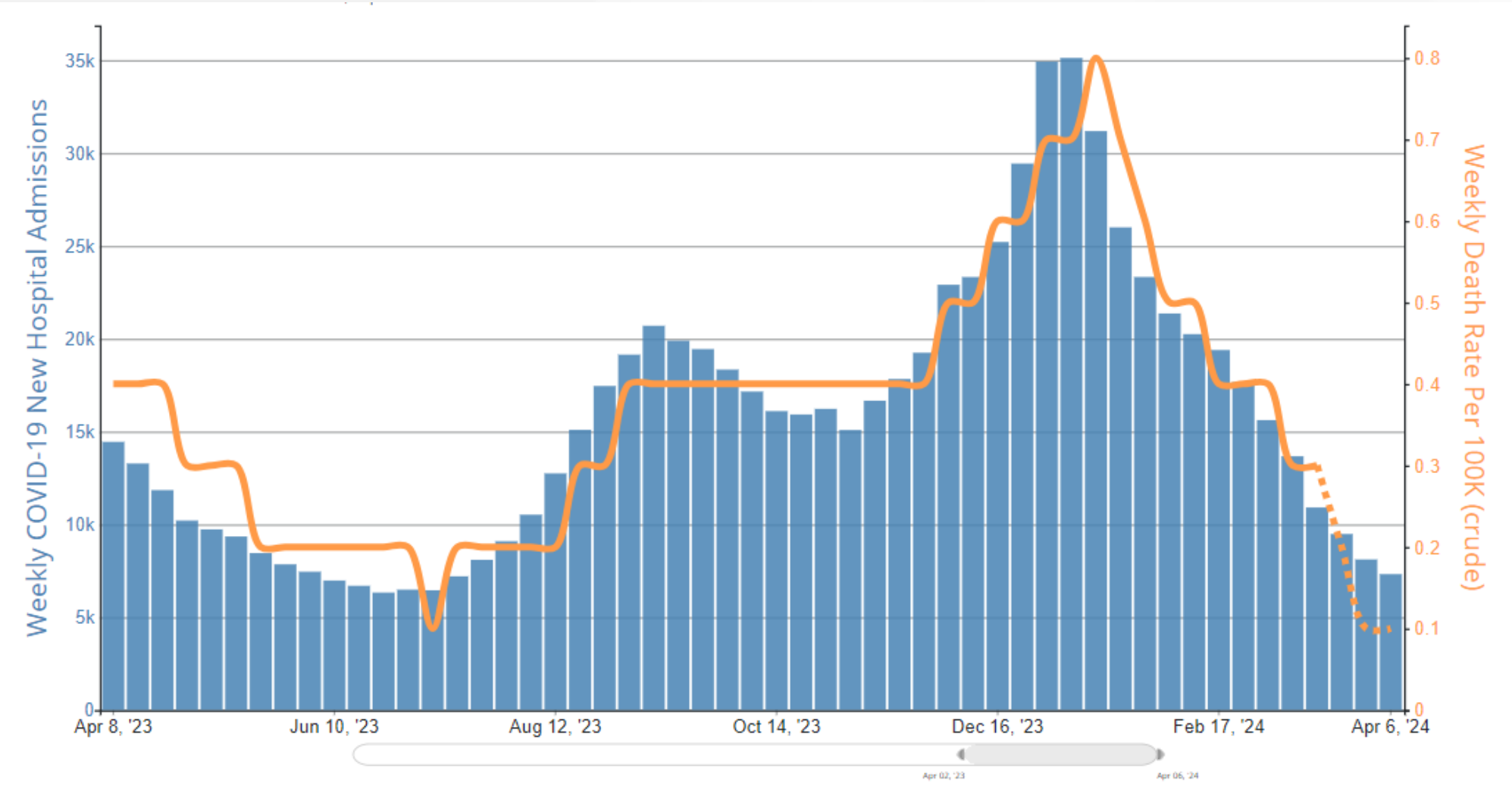
COVID-19 Age Distribution

View: Percentage of cases by age

Outcome: all selected

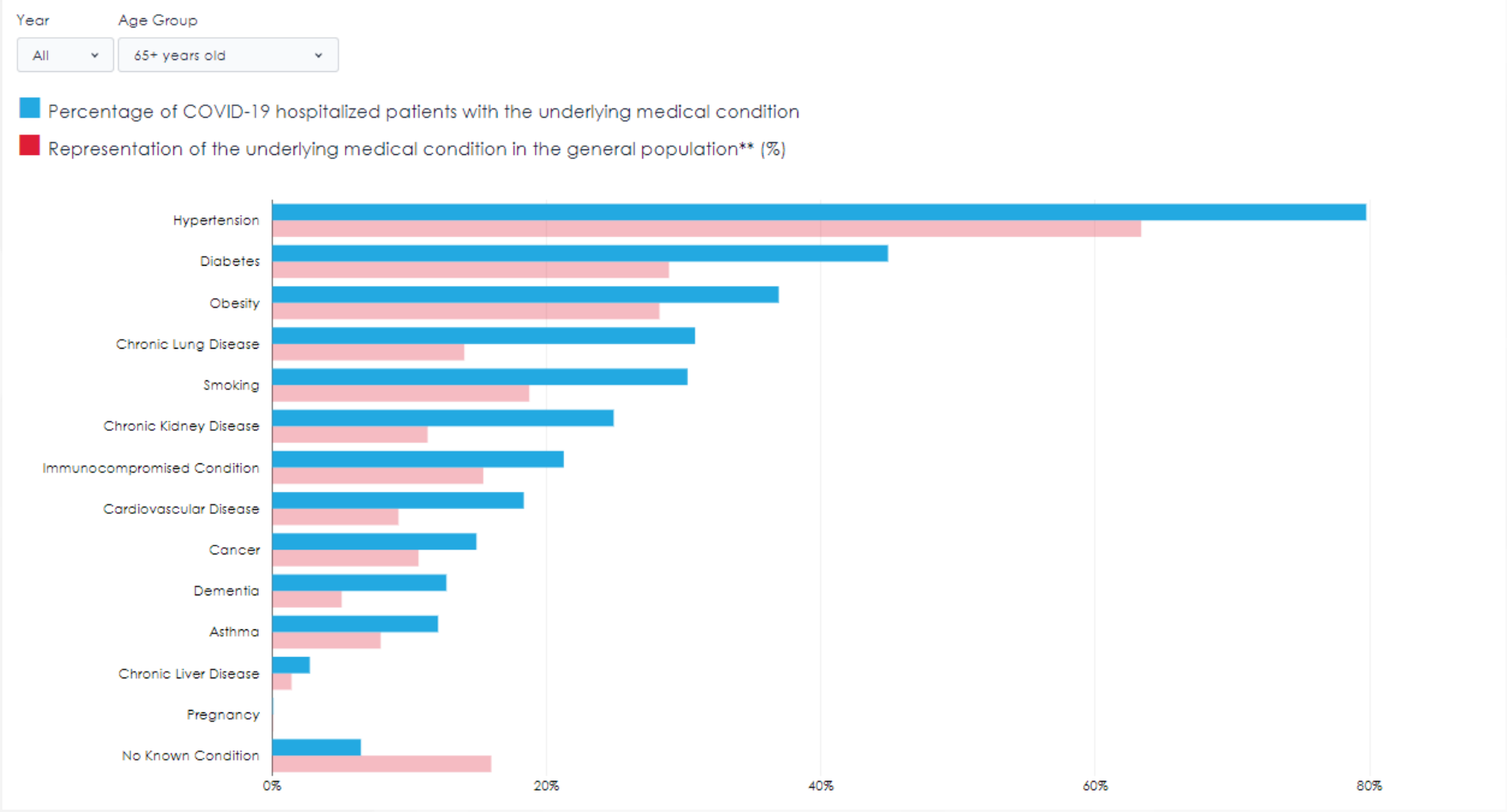


COVID-19 Related Hospitalizations and Deaths*



*Source: https://covid.cdc.gov/covid-data-tracker/#trends_weeklyhospitaladmissions_weeklydeathratecrude_00

COVID-19 Related Risk for Sequelae in Older Adults ≥ 65 Years*



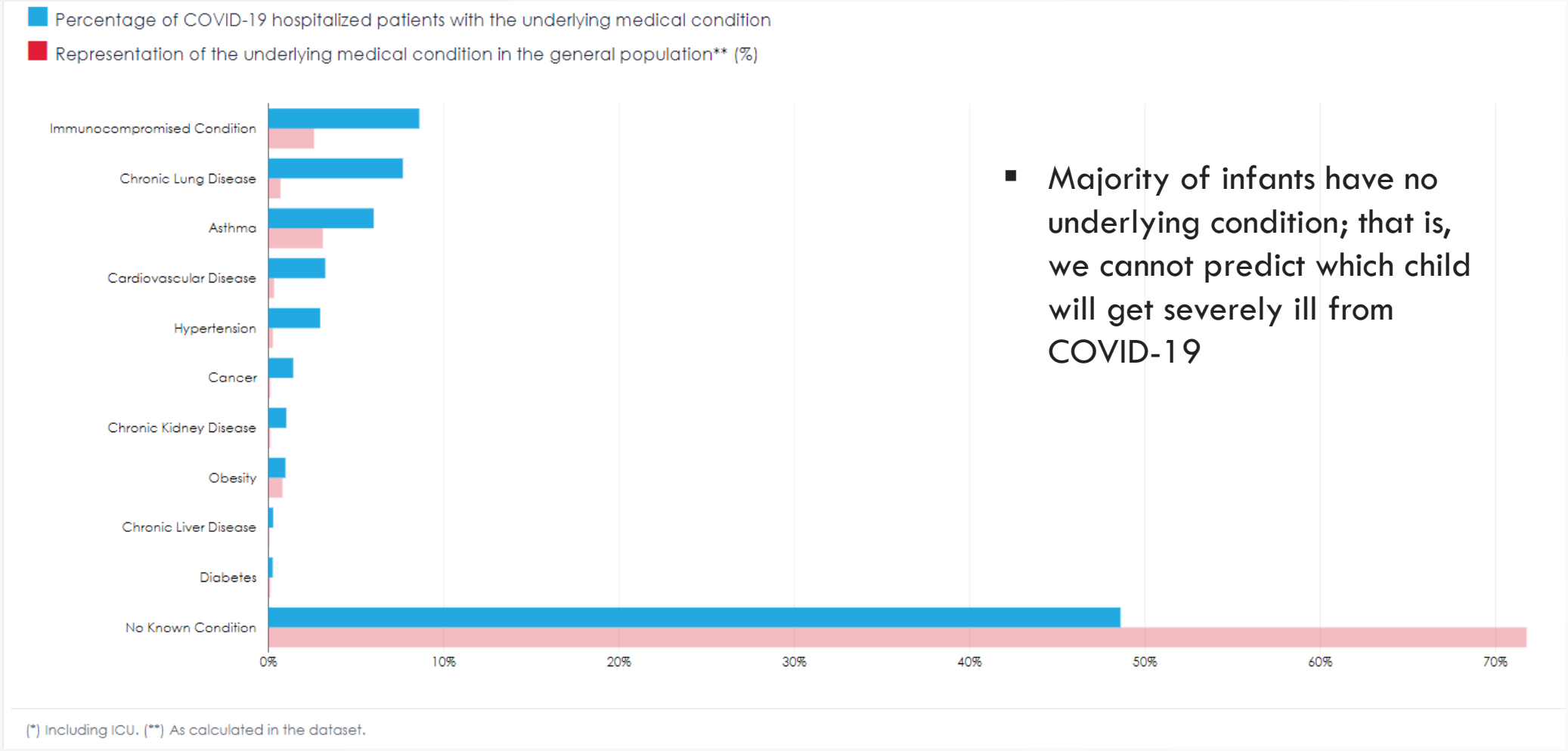
*Source: Kopel, H et al. Comparison of COVID-19 and Influenza-Related Outcomes in the United States during Fall–Winter 2022–2023: A Cross-Sectional Retrospective Study. Diseases 2024, 12, 16. https://doi.org/10.3390/diseases12010016

COVID-19 Related Risk for Sequelae in Adults 50-64 years with Underlying Medical Conditions*

- Nearly all adults hospitalized with COVID-19 had at least one underlying medical condition associated with increased risk for severe outcomes.
- Some of the conditions that were most strongly associated with severe COVID-19-related hospitalizations, such as hypertension, diabetes, and obesity, are highly prevalent in the US adult population.

*Source: Kopel, H et al. Comparison of COVID-19 and Influenza-Related Outcomes in the United States during Fall–Winter 2022–2023: A Cross-Sectional Retrospective Study. Diseases 2024, 12, 16. https://doi.org/10.3390/diseases12010016

COVID-19 related risk for sequelae in young infants*

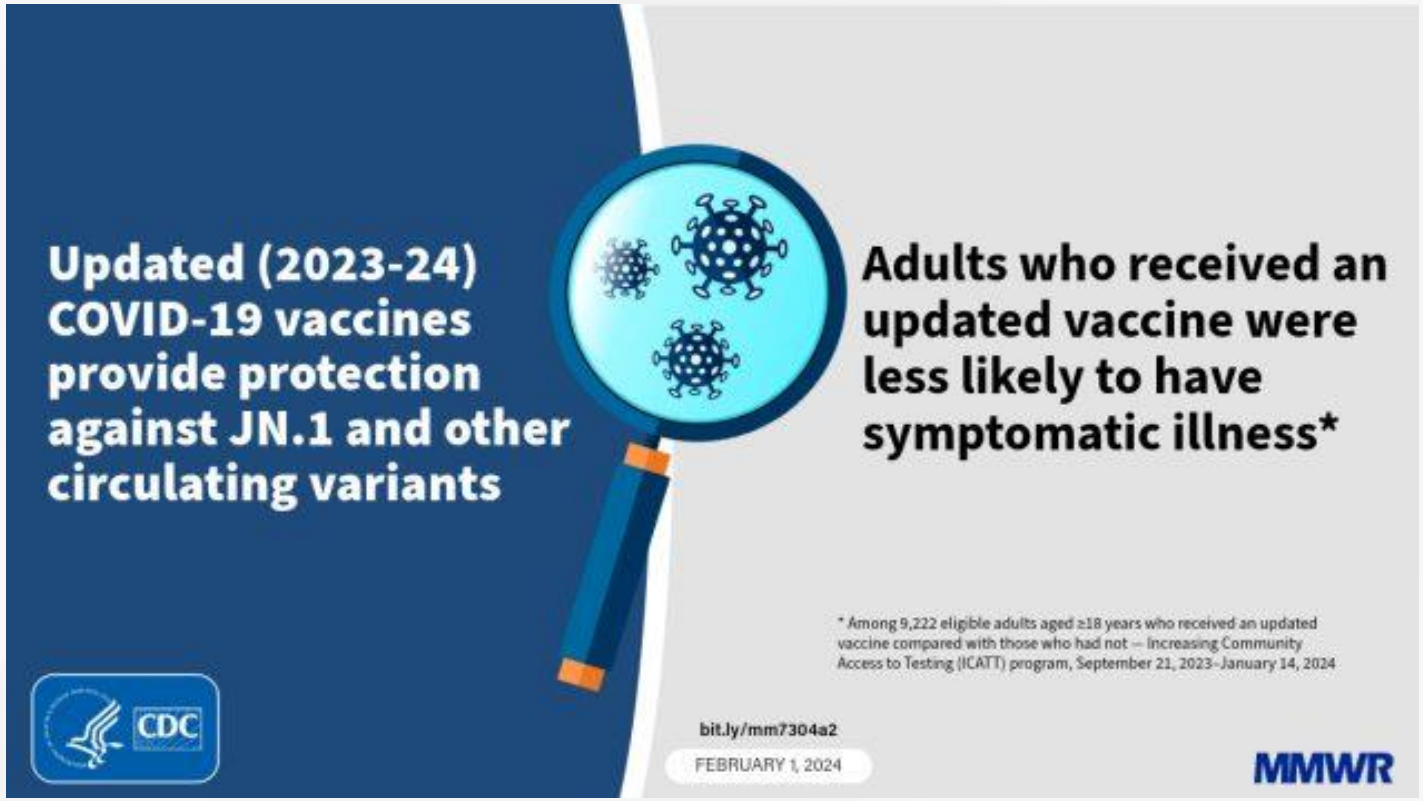


- Majority of infants have no underlying condition; that is, we cannot predict which child will get severely ill from COVID-19

*Source: Kopel, H et al. Comparison of COVID-19 and Influenza-Related Outcomes in the United States during Fall–Winter 2022–2023: A Cross-Sectional Retrospective Study. Diseases 2024, 12, 16. https://doi.org/10.3390/diseases12010016

Vaccine Effectiveness

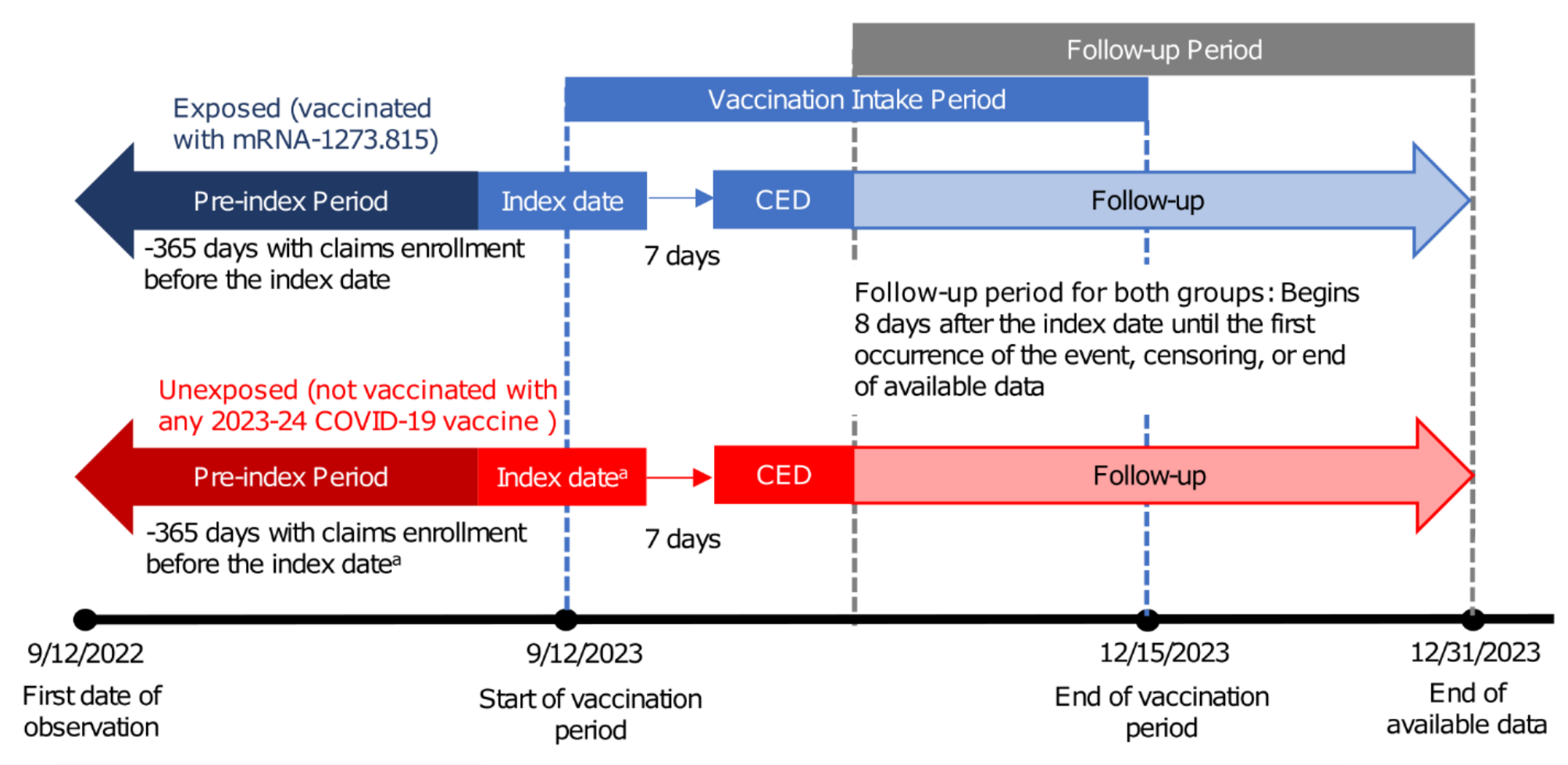
Early Estimates of Updated 2023–2024 (Monovalent XBB.1.5) COVID-19 Vaccine Effectiveness Against Symptomatic SARS-CoV-2 Infection



- Receipt of updated COVID-19 vaccine provided approximately 54% increased protection against symptomatic SARS-CoV-2 infection compared with no receipt of updated vaccine.
- Vaccination provides protection against JN.1 and other circulating lineages.
- Key takeaway- vaccine effectiveness can be estimated using RWD

*Source: Link-Gelles R, Ciesla AA, Mak J, et al. Early Estimates of Updated 2023–2024 (Monovalent XBB.1.5) COVID-19 Vaccine Effectiveness Against Symptomatic SARS-CoV-2 Infection Attributable to Co-Circulating Omicron Variants Among Immunocompetent Adults — Increasing Community Access to Testing Program, United States, September 2023–January 2024. MMWR Morb Mortal Wkly Rep 2024;73:77–83. DOI: http://dx.doi.org/10.15585/mmwr.mm7304a2

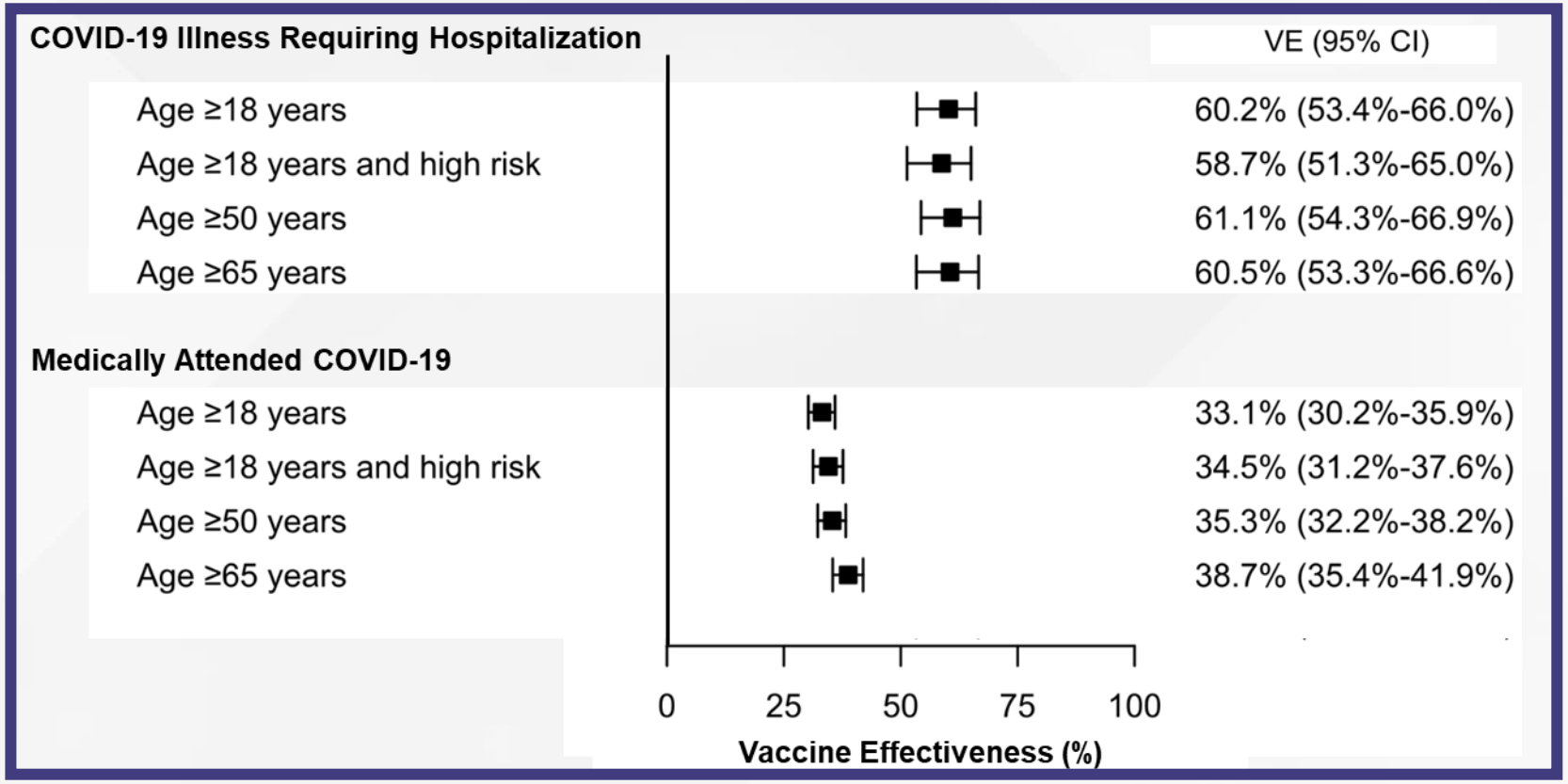
Effectiveness of mRNA-1273.815 among adults aged ≥ 18 years: Study Design



CED, cohort entry date. The index date for unexposed individuals was assigned based on their 1:1 match in the exposed cohort

Effectiveness of mRNA-1273.815 among adults aged ≥ 18 years*

Vaccine Effectiveness (VE) Estimates of the mRNA-1273.815 (12SEP2023– 31DEC2023)



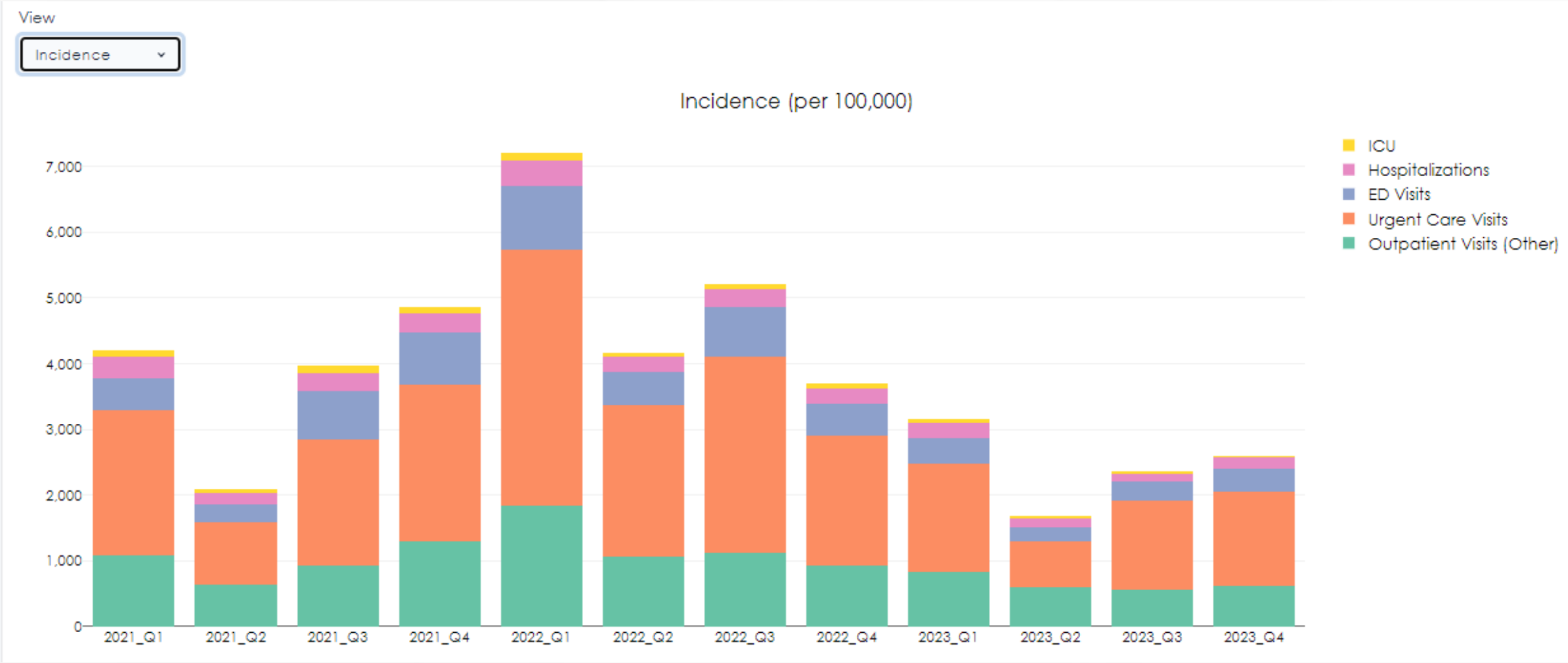
- mRNA1273.815 provided increased protection against COVID-19-associated hospitalizations and medically attended outcomes compared to patients with no updated vaccine dose

Data Source: Veradigm EHR dataset with integrated medical and pharmacy claims

*Source: High risk - adults with at least one underlying medical condition associated with increased risk for severe COVID-19, as defined by the Centers for Disease Control and Prevention: https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/underlyingconditions.html

The Next Challenge

COVID-19 Incidence Over Time, re-visited



2023/4 Respiratory Vaccination Season

	COVID-19 Vaccination Rate	Influenza Vaccination Rate
Age 18+	14.8%	30.4%
Age 50-64	14.1%	30.6%
Age 65+	29.3%	52.3%

Comparative Burden of COVID-19 and Influenza (October 2022 - March 2023) *

Age Group	COVID-19 N = 93,888 N	Influenza N = 20,561 N	Count Ratio of COVID-19 vs. Influenza
Pediatrics			
0–5	706 *	564	1.3
6–17	1529 *	1260	1.2
Adults			
18–49	26,242 *	4693	5.6
50–64	22,947 *	5529	4.2
Older Adults			
65+	42,464 *	8515	5

[a] Inclusive of intensive care unit admission. * *p*-value < 0.001, COVID-19 versus influenza.

- Hospitalizations with COVID-19 were more common than hospitalizations with influenza in **all** age groups
- Take away- clear need to address the vaccination gap

*Source: Kopel, H et al. Comparison of COVID-19 and Influenza-Related Outcomes in the United States during Fall–Winter 2022–2023: A Cross-Sectional Retrospective Study. Diseases 2024, 12, 16. https://doi.org/10.3390/diseases12010016

Vaccination Gaps

Upon EUA, COVID-19 vaccinations started appearing in the EHR

EHRs include the opportunity to capture vaccines received outside of traditional HCP settings but there was no complete source early in the pandemic; this has recently improved considerably

Rich patient data found in the EHR could be used to highlight vaccination gaps by patient profiled, in terms of:

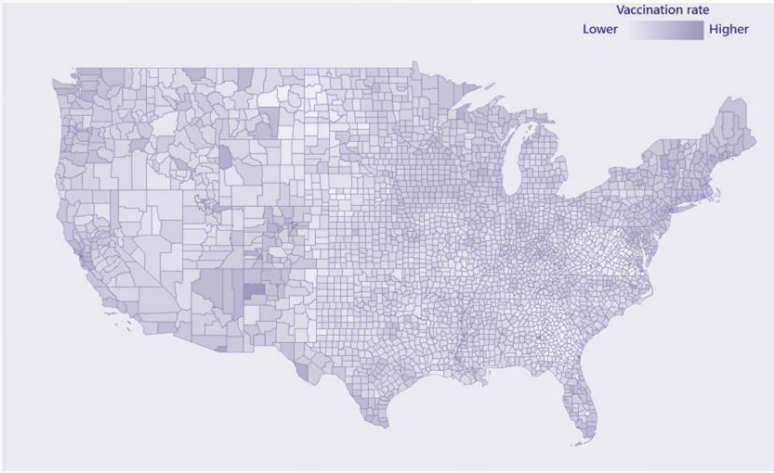
- Age
- Gender
- Race/ethnicity

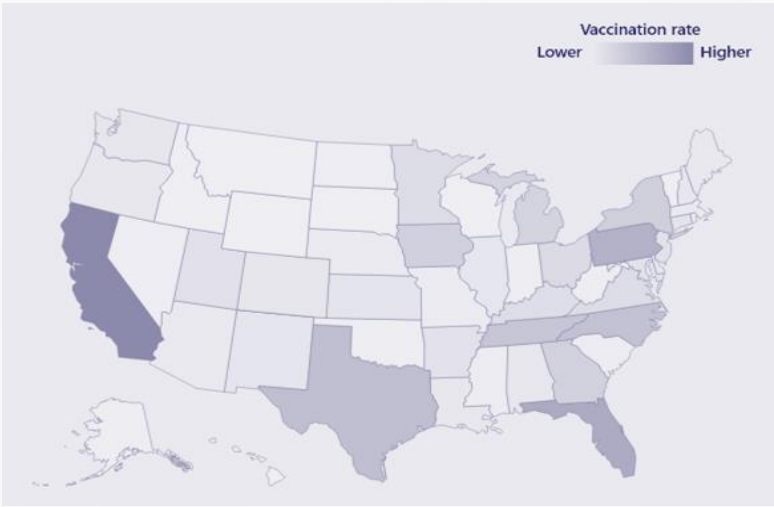
Clinical profile: Immunocompromised; Presence of chronic conditions
(e.g., diabetes, cardiovascular disease, respiratory disease, etc.)

Geographic detail allowed helped focus public health outreach

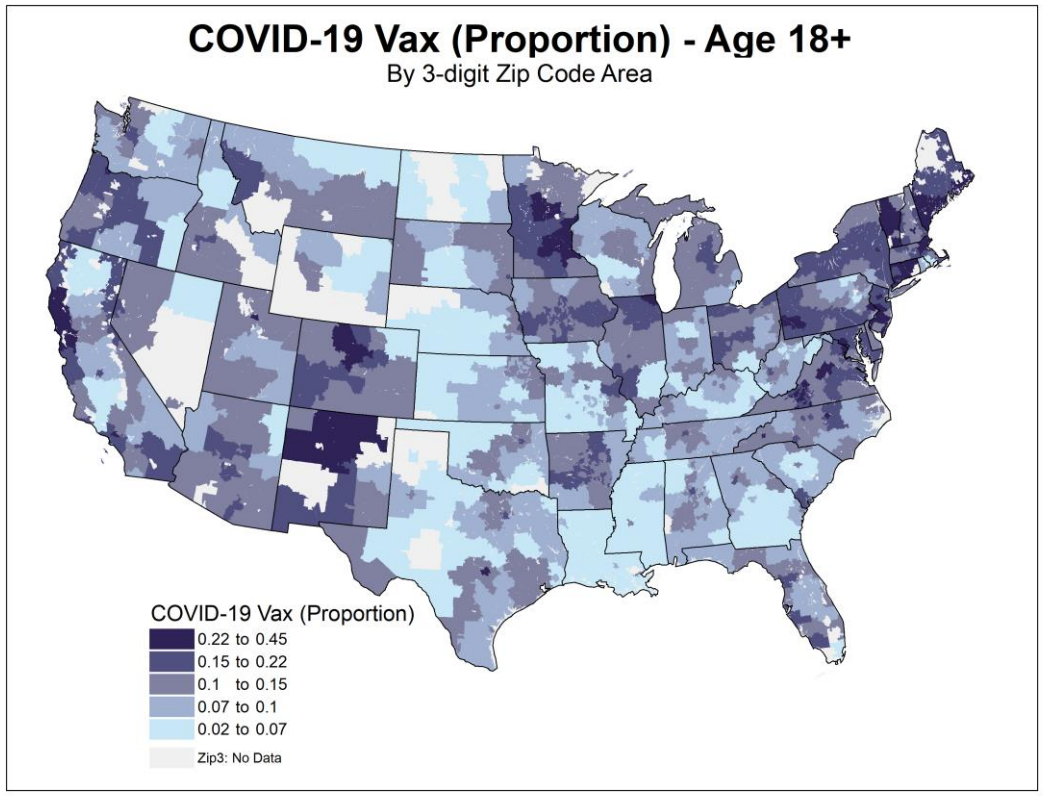
Fosters localized insights:

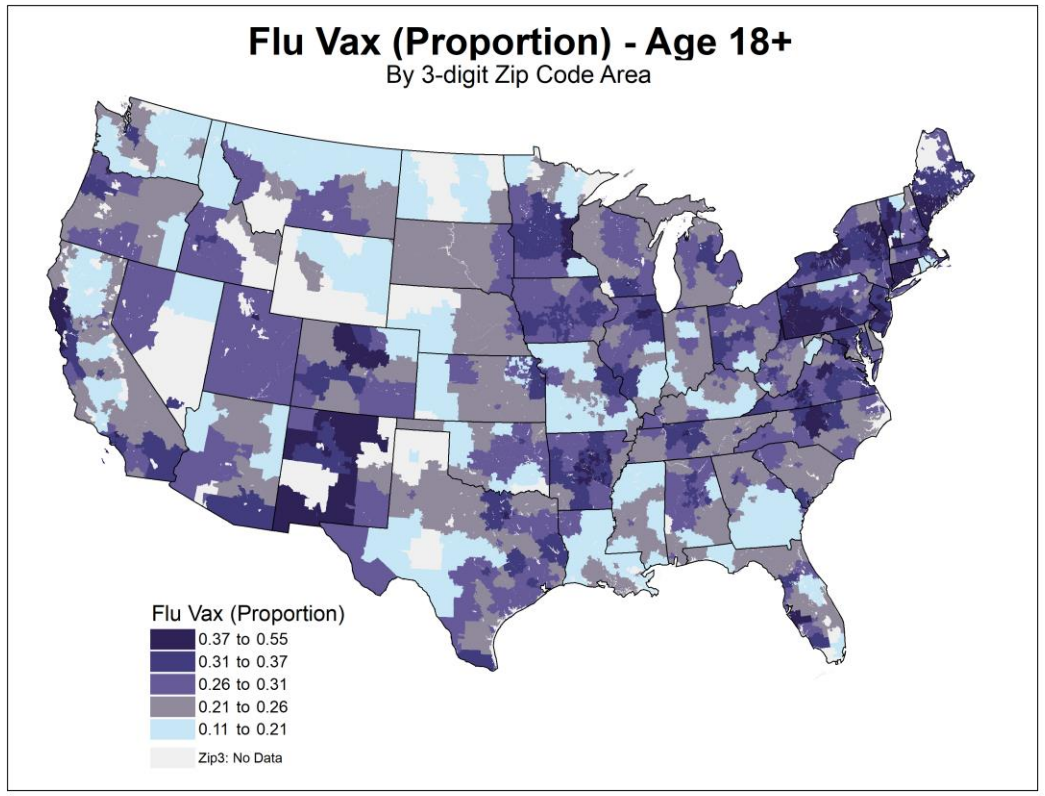
- Within a zip code, what patient group is least likely to be fully vaccinated?
- Can we use this to plan focused outreach and education?



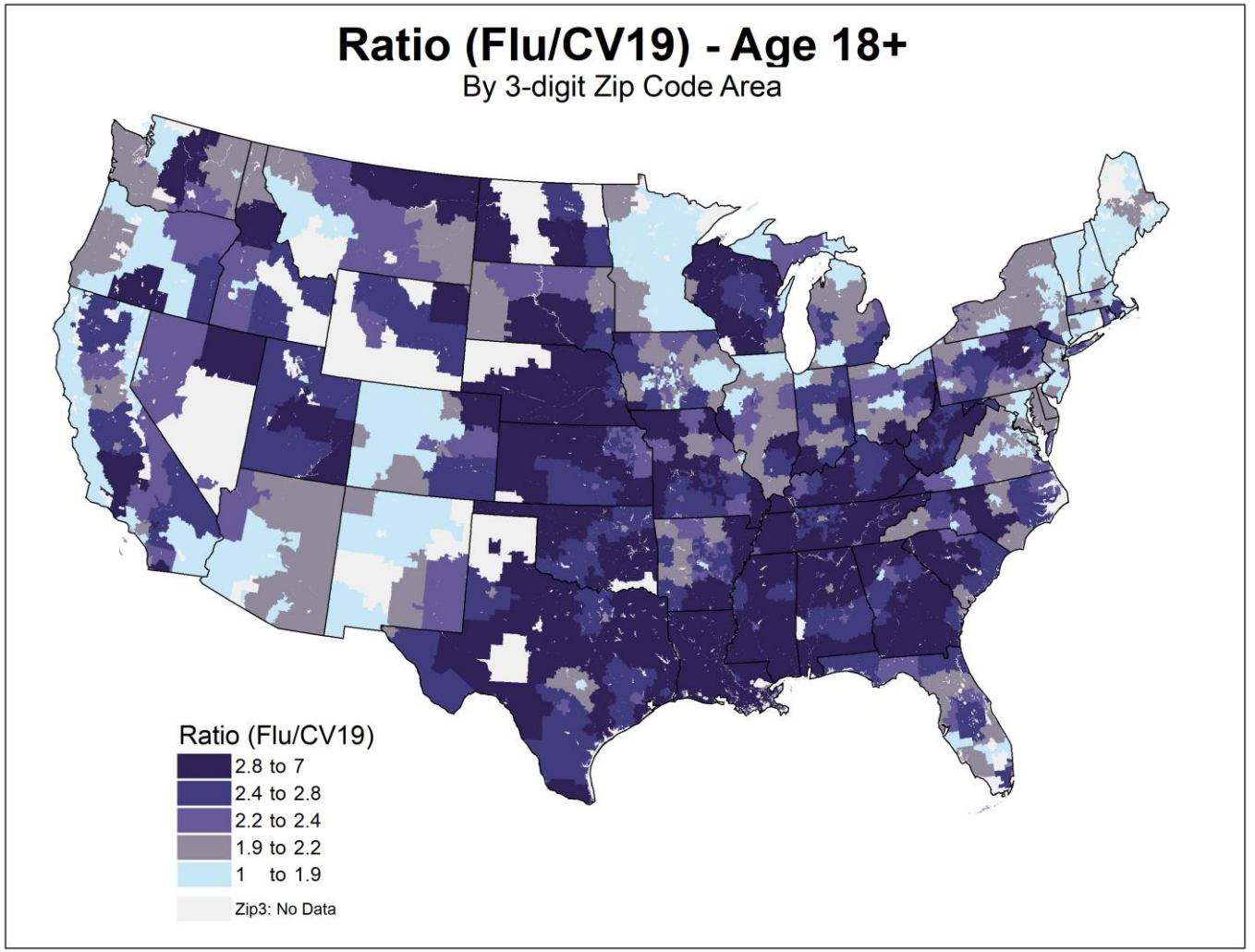


COVID-19 and Influenza Vaccination Rates: 2023/4





Influenza:COVID-19 Vaccination Ratio



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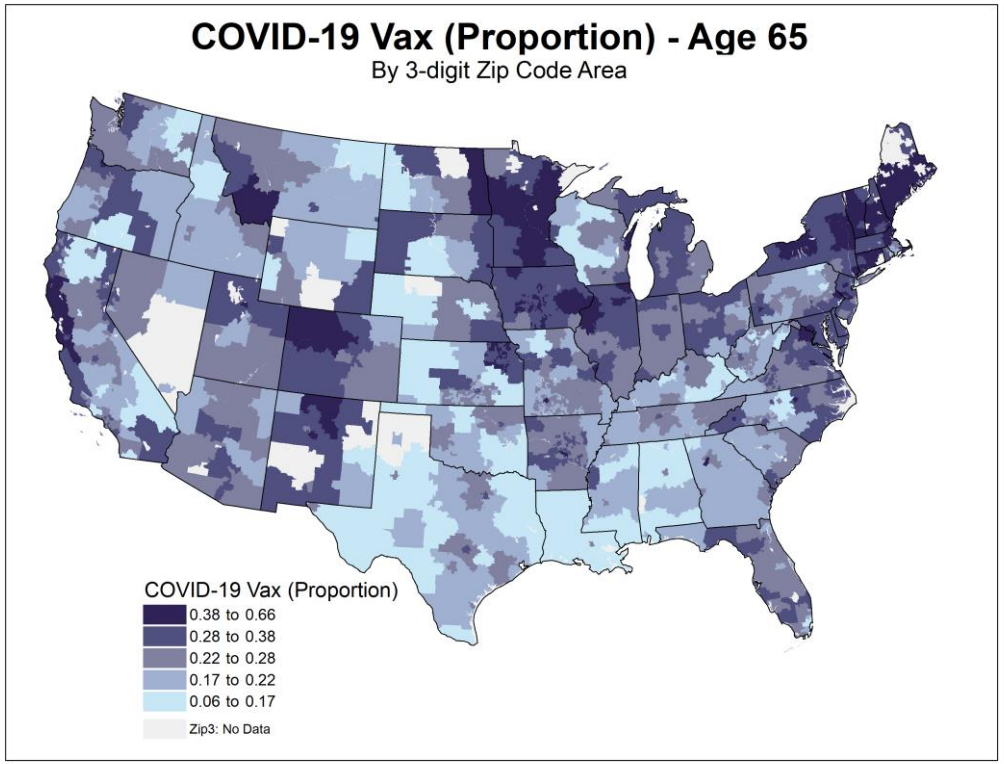

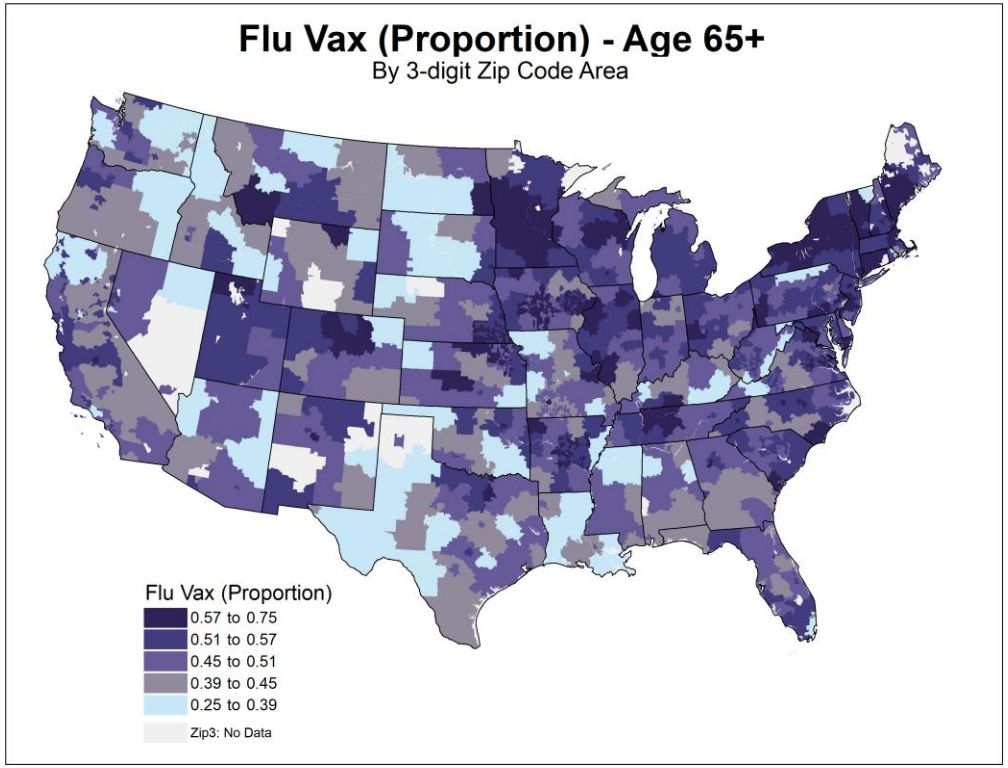

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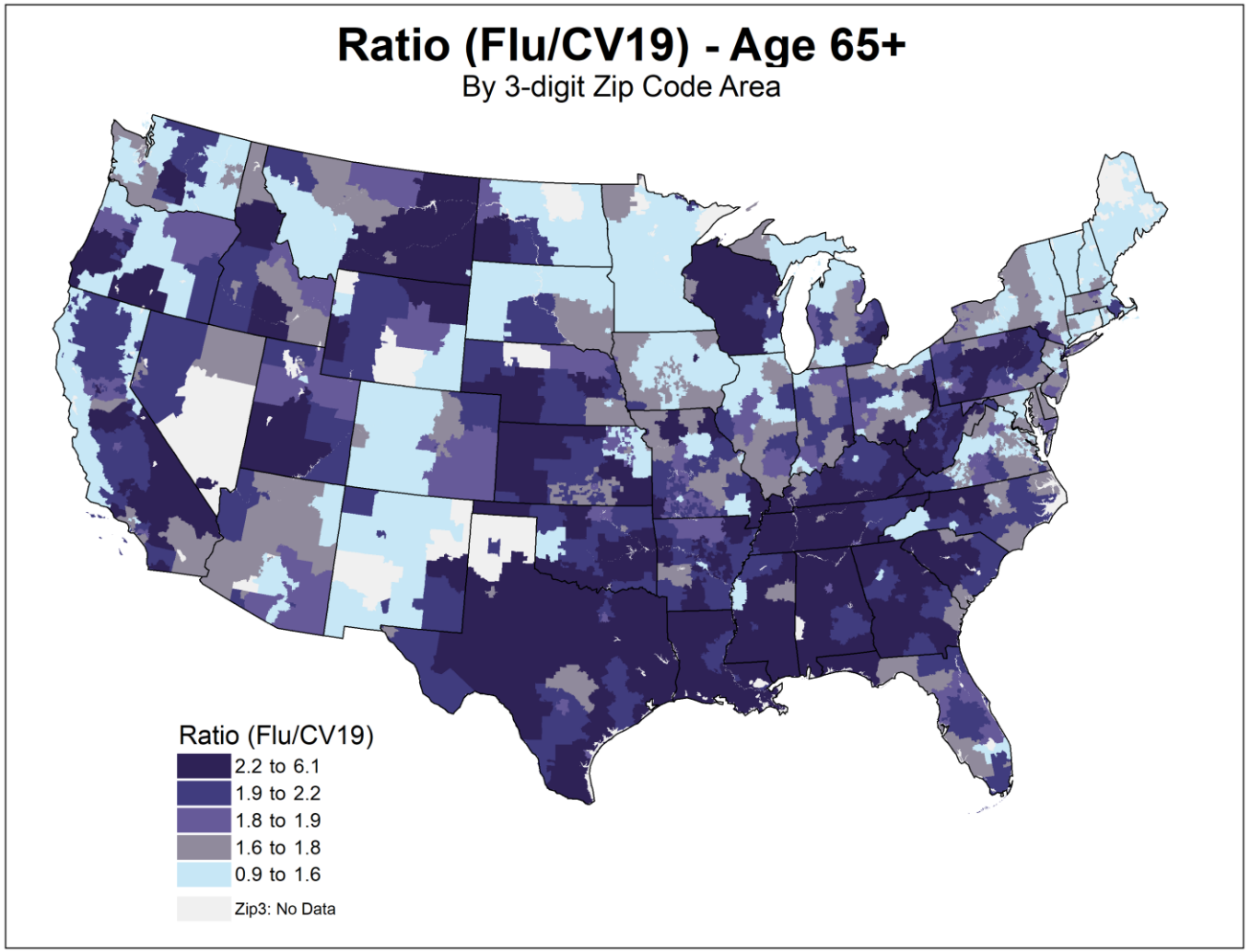

Questions for the Future

Learn and adapt

- How do we build off what we've done?
- What can we do now to be ready later?
- What system changes are needed to answer tomorrow's research questions?

Proactive Focused Inquiry

Where are we doing well? Where can we do better? Can we…

- Find vaccination gaps in near real time?
- Communicate successful approaches faster?
- Uncover reasons for vaccine hesitancy and fatigue?

Real-World Evidence Mandate

- Shorten the cycle from knowledge gap to insight generation to dissemination

Questions