



CDC COVID-19 Mortality Surveillance

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Disclaimer: The findings and conclusions in this presentation are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Objectives

- To describe the systems utilized by the Centers for Disease Control and Prevention (CDC) for tracking COVID-19-associated mortality in the United States using aggregate COVID-19 case and death counts (ACDC), line-level data stream, and National Vital Statistics System (NVSS) during and after expiration of Public Health Emergency (PHE), May 11, 2023.

Background

- Mortality surveillance data are instrumental in monitoring rapidly developing public health events such as the COVID-19 pandemic
- Mortality surveillance involves systematic death data collection for
 - analysis and interpretation
 - providing critical information about the characteristics of and recent trends in death
 - helping track life expectancy
 - helping assess the impact of interventions in place to safeguard the public health

CDC COVID-19 Deaths Data Collection

- Three data sources were utilized by CDC to provide COVID-19 provisional death counts and mortality trends data for decision making and resource allocation.
 - Individual case records
 - Line-level case report data reported through the Nationally Notifiable Diseases Surveillance System and CSV files
 - Aggregate Case and Death Counts (ACDC)
 - Aggregated counts by state, county, and date of report collected via web-scraping, CSV submissions, and application programming interfaces
 - The National Vital Statistics System (NVSS)
 - Death certificate data

Brief history and identification of initial COVID-19 cases and deaths

- On February 29, 2020, the first confirmed COVID-19 death was reported in the United States in Washington State.
- Council of State and Territorial Epidemiologists (CSTE) published their first interim case definition for COVID-19 associated deaths on April 5, 2020, and later revised the guidance definition in January 2022 and additional guidance was provided in November 2022
 - Current definition is: “A person whose death certificate lists COVID-19 disease or SARS-CoV-2 or an equivalent term as an underlying cause of death or a significant condition contributing to death”

Brief history and identification of initial COVID-19 cases and deaths (continued)

- The National Center for Health Statistics (NCHS) provided guidance in March-April 2020 on certifying COVID-19—associated deaths
 - To ensure consistent collection of COVID-19 information on death certificates, facilitate accurate ICD-10 coding, and ascertainment of COVID-19 deaths from death certificate data
 - NCHS later expanded this guidance in February 2023 to include guidance for certifying deaths involving post-acute sequelae of COVID-19 (PASC or 'long COVID')
- COVID-19 was the third leading cause of death in the United States in the years [2020](#) and [2021](#), and the fourth leading cause in [2022](#)

COVID-19 Case Surveillance

- State and jurisdictional health departments voluntarily send case data to CDC via electronic messaging using the [National Notifiable Diseases Surveillance System](#) (NNDSS) or through direct CSV submissions.
- To protect individuals' privacy, COVID-19 case data are sent to CDC without personal identifiers, such as names or home addresses.
- Office of Public Health Data, Surveillance, and Technology (OPHDST), National Center for Immunization and Respiratory Diseases (NCIRD) Surveillance Office, and COVID-19 Response Task Force collaborate with state, tribal, local, and territorial (STLT) health departments
- A national, standardized [case definition](#) is used to define confirmed and probable cases of SARS-CoV-2 infections classifications for cases and deaths.

Aggregate Case and Death Counts (ACDC)

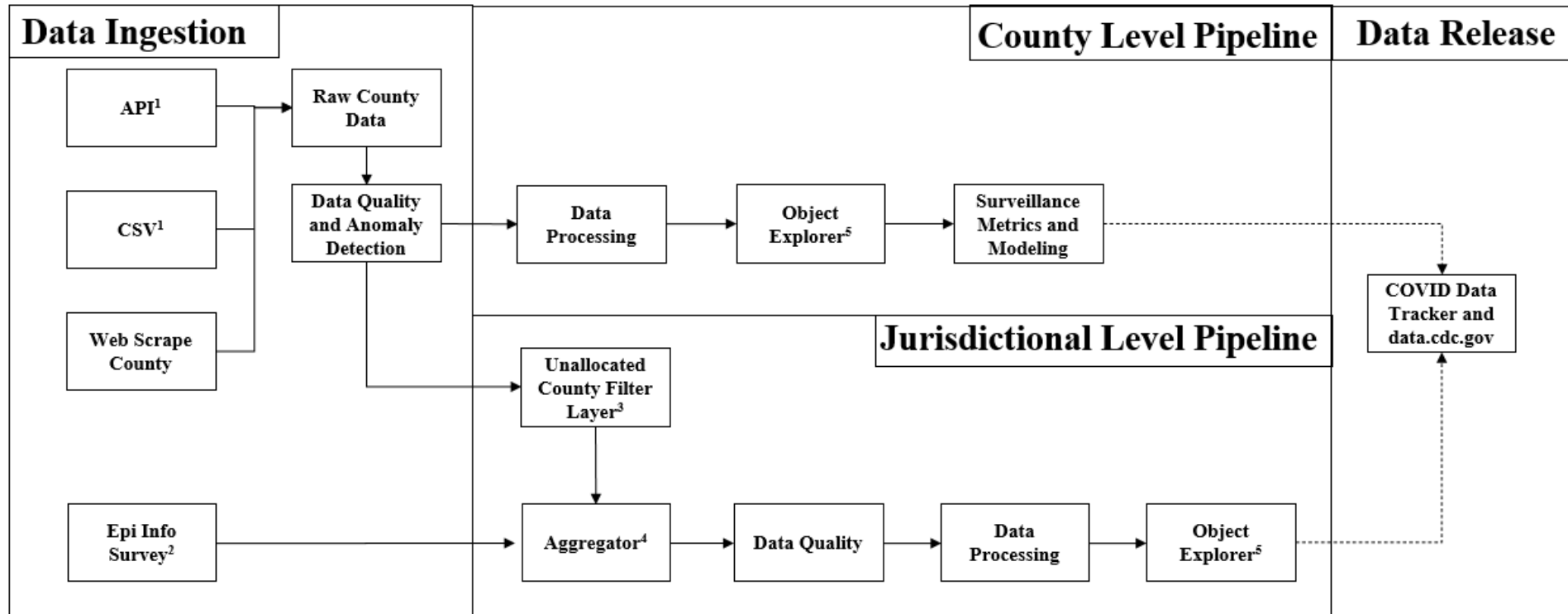


ACDC

- Earlier in the pandemic, aggregate jurisdictional-level counts provided the most up-to-date, validated numbers on cases and deaths
- CDC worked daily with jurisdictions in a multistep process to collect data and confirm COVID-19 case and death numbers
 - CDC collected information from official STLT websites (via web-scraping: automated data extraction), direct CSV submissions, and application programming interfaces.
 - CDC performed data quality checks to identify any irregularities, make historical corrections, and identify jurisdictions that require further follow-up to **align** their counts.
- Collaborative processes within CDC and with jurisdictional stakeholders ensured the accuracy of the COVID-19 case and death numbers, which were published on CDC's website.



COVID-19 Aggregate Case and Death Counts (ACDC) pipelines



¹ API and CSV data transmissions allow for full time series data corrections by Jurisdictions.

² Epi Info Survey allows for states to make weekly corrections to state totals. Additionally, it feeds DC data to the County Pipeline.

³ Filter Layer node handles variabilities in how state use unallocated counties. Each jurisdiction has an unallocated county which is designed to record cases and deaths without county assignments or account for differences between state and county-level reporting.

⁴ Aggregator node rolls up county cases and deaths to the state level

⁵ Object Explorer allows for CDC, on behalf of a Jurisdiction, to make weekly corrections to COVID-19 cases and death totals

Weekly Change in COVID-19 Deaths, United States

January 22, 2020 - May 10, 2023



1,133,774

Total Deaths Reported*

840

New Weekly Deaths*
May 04, 2023 - May 10, 2023

1/22/2020 5/10/2023



120.00

Current 7-Day Average**
May 04, 2023 - May 10, 2023

161.86

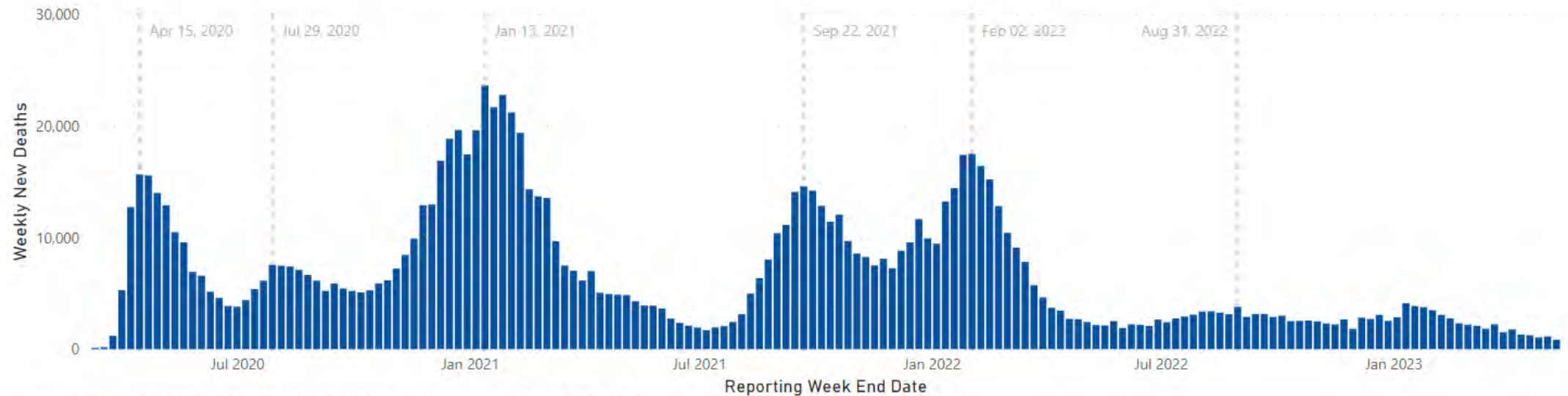
Prior 7-Day Average**
Apr 27, 2023 - May 03, 2023

-25.9%

Change in 7-Day Average

Peaks in Weekly Total and 7-Day Average of Daily Deaths**

Peak	Reporting Week End	Weekly Total - New Deaths	7-Day Daily Average	% Change From Current Average
2020 - Spring	Apr 15, 2020	15,650	2,236	-94.6%
2020 - Summer	Jul 29, 2020	7,541	1,077	-88.9%
2020 - Winter	Jan 13, 2021	23,629	3,376	-96.4%
2021 - Summer	Sep 22, 2021	14,577	2,082	-94.2%
2021 - Winter	Feb 02, 2022	17,480	2,497	-95.2%
2022 - Summer	Aug 31, 2022	3,791	542	-77.8%



* The graph displays data for Mar 05, 2020, to date. The totals include cases reported since Jan 22, 2020.

** The histogram, total of new deaths in the last week, and 7-day averages do not include historical deaths reported retroactively that are not yet attributed to the correct date of report.

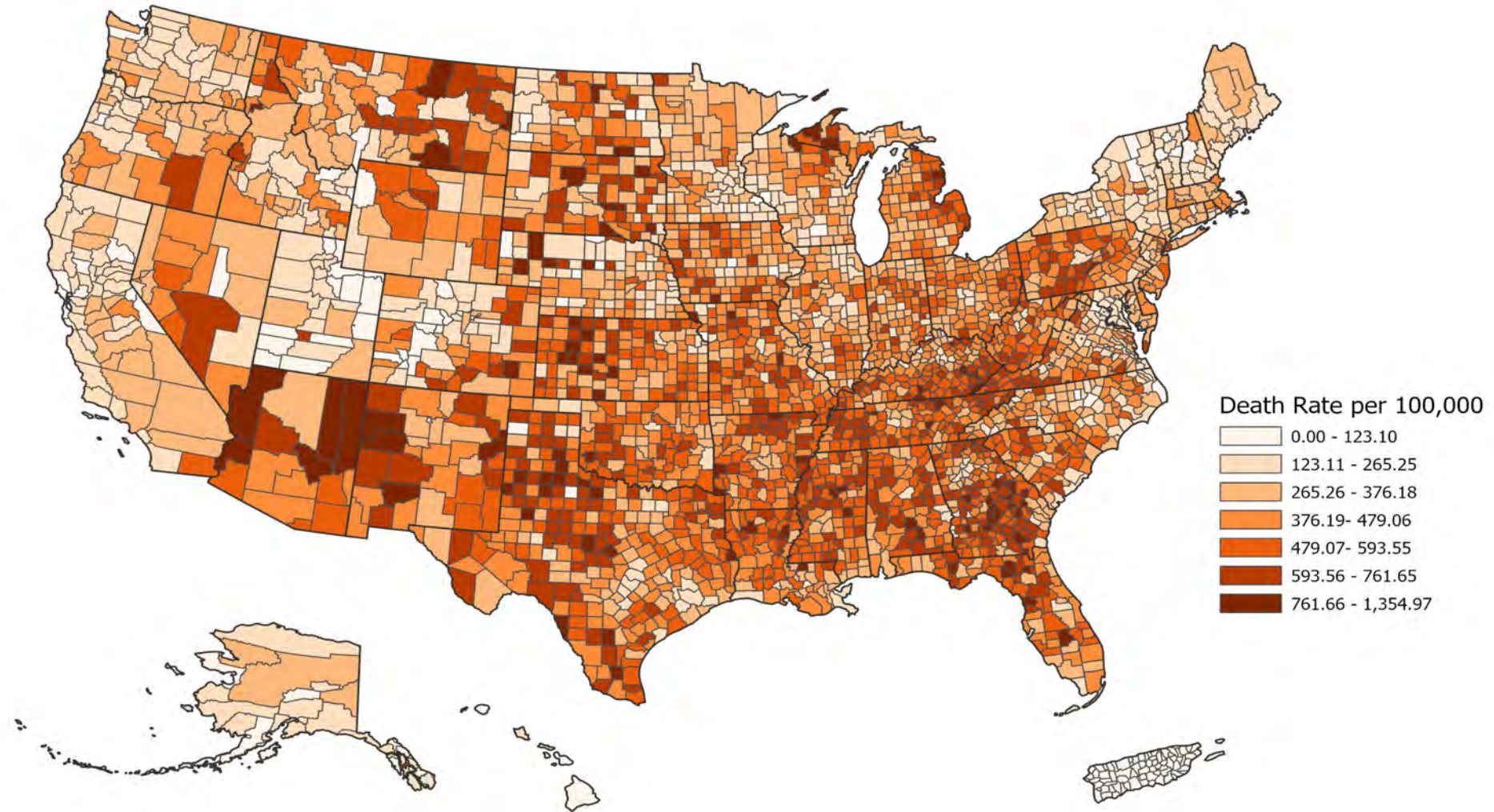
Of 2,824 historical deaths reported retroactively, 1,109 were reported in the current week and none in the prior week.

Last Updated: May 11, 2023, 12:34

Data Source: CDC Case Surveillance, state-level aggregated COVID-19 Cases, HHS Protect; Visualization: CDC CPR DEO Situational Awareness Public Health Science Team



Cumulative COVID-19 Death Rates per 100,000 population by County, January 22, 2020 – May 10, 2023*



*Cumulative COVID-19 deaths reported to CDC by county between January 22, 2020 – May 10, 2023. Data pulled May 12, 2023.



COVID-19 Situational Awareness during PHE

Aggregate Case and Death Counts (ACDC) were available through a common operating platform (HHS Protect) and provided essential COVID-19 data used to:

- describe trends and geographic patterns in COVID-19 [cases and deaths](#);
- estimate COVID-19 community levels and disease severity;
- identify geographically localized hotspots; and
- guide national and local mitigation efforts, such as face mask wearing, screening and testing, and staying up-to-date with vaccinations and boosters



Line-level data source



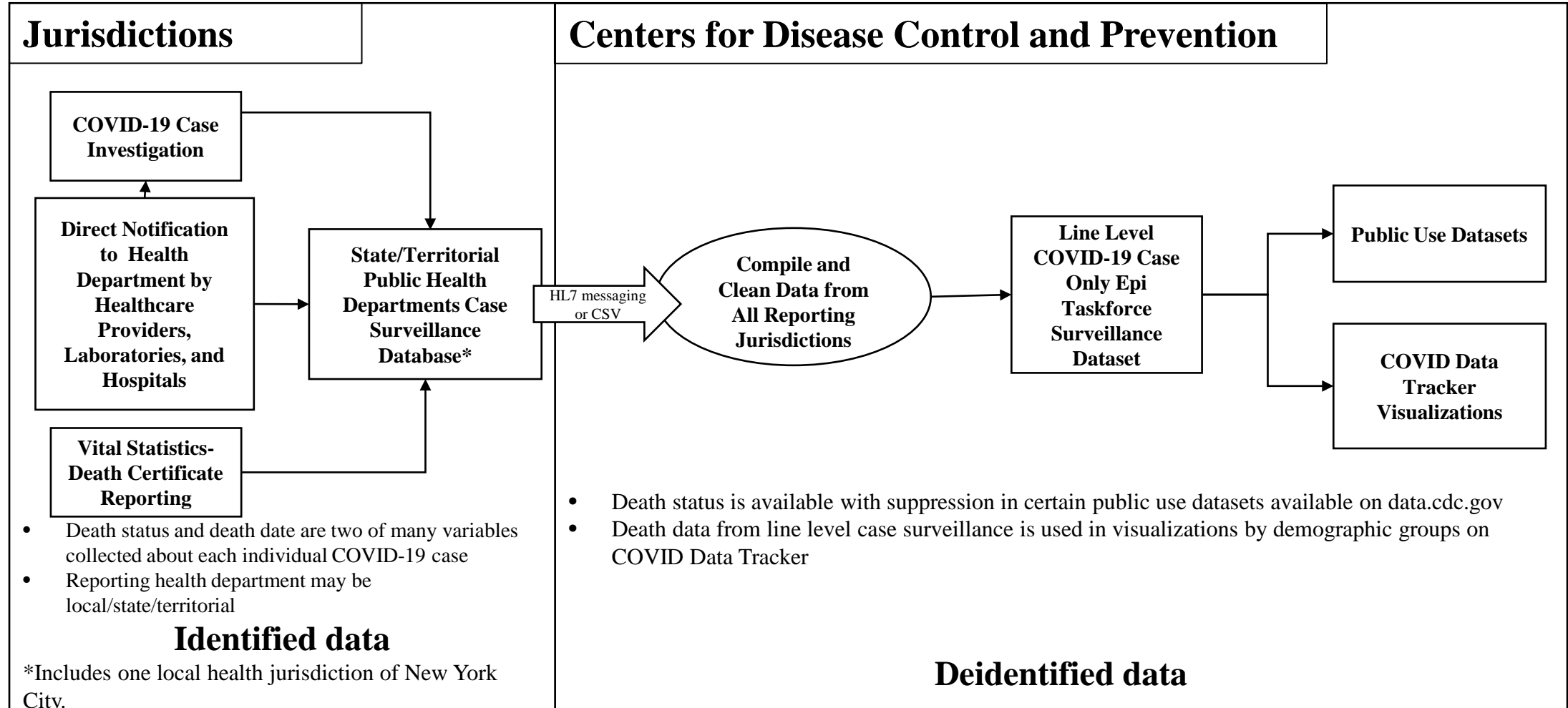
Line-level data

- Provides detailed clinical, epidemiological, and demographic data for more granular analyses and informs emerging scientific questions
- Include patient demographics and information:
 - Age
 - Race and ethnicity
 - Signs and symptoms of illness
 - Underlying health conditions
 - Hospitalization status
 - Laboratory results
 - Vaccination history
 - Possible routes of exposure
 - Death status and date of death

How line-level data are collected

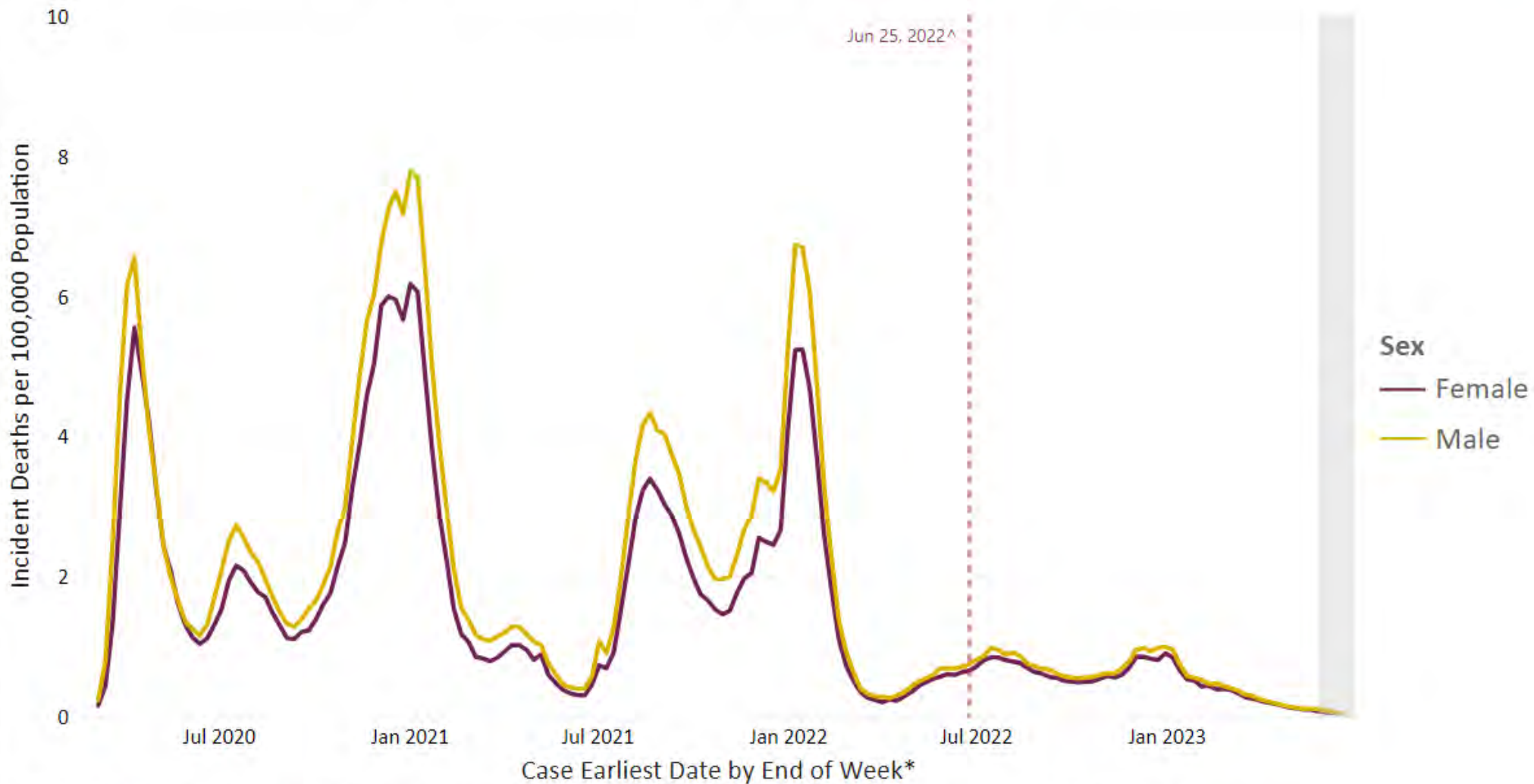
- COVID-19 is a nationally notifiable disease
- Jurisdictional health departments voluntarily transmit individual, de-identified patient case reports to CDC
 - Electronic messaging to the Nationally Notifiable Diseases Surveillance System (NNDSS)
 - CSV files submissions into HHS Protect/DCIPHER

COVID-19 Line-Level Death Counts pipeline



COVID-19 Weekly Deaths per 100,000 Population by Sex, United States

March 01, 2020 - June 17, 2023*



US: Includes data up to the week ending on Jul 01, 2023. Percentage of deaths among reported cases - 0.99%. Percentage of deaths reporting sex by date - 99.64%.
 US territories are included in case and death counts but not in population counts. Potential six-week delay in case reporting to CDC denoted by gray bars. Weekly data with five or fewer deaths have been suppressed. *Case Earliest Date is the earliest of the clinical date (related to illness or specimen collection and chosen by a defined hierarchy) and the Date Received by CDC. The date for the current week extends through Saturday. ^The death rate for Texas during the week ending Jun 25, 2022, are reflective of a data reporting artifact.

Jurisdiction
 US

3/7/2020 6/17/2023

Cases

- Sex
- Age - All Groups
- Age by Race/Ethnicity
- Pediatric Case Proportions
- Race/Ethnicity
- Race/Ethnicity by Age

Deaths

- Sex
- Age - All Groups
- Age by Race/Ethnicity
- Race/Ethnicity
- Race/Ethnicity by Age

COVID-19 Weekly Deaths per 100,000 Population by Age Group and Race/Ethnicity, United States



March 01, 2020 - June 17, 2023*



All Races/Ethnicities

Single Race/Ethnicity

Jurisdiction

US

3/7/2020 6/17/2023



Cases

Sex

Age - All Groups

Age by Race/Ethnicity

Pediatric Case Proportions

Race/Ethnicity

Race/Ethnicity by Age

Deaths

Sex

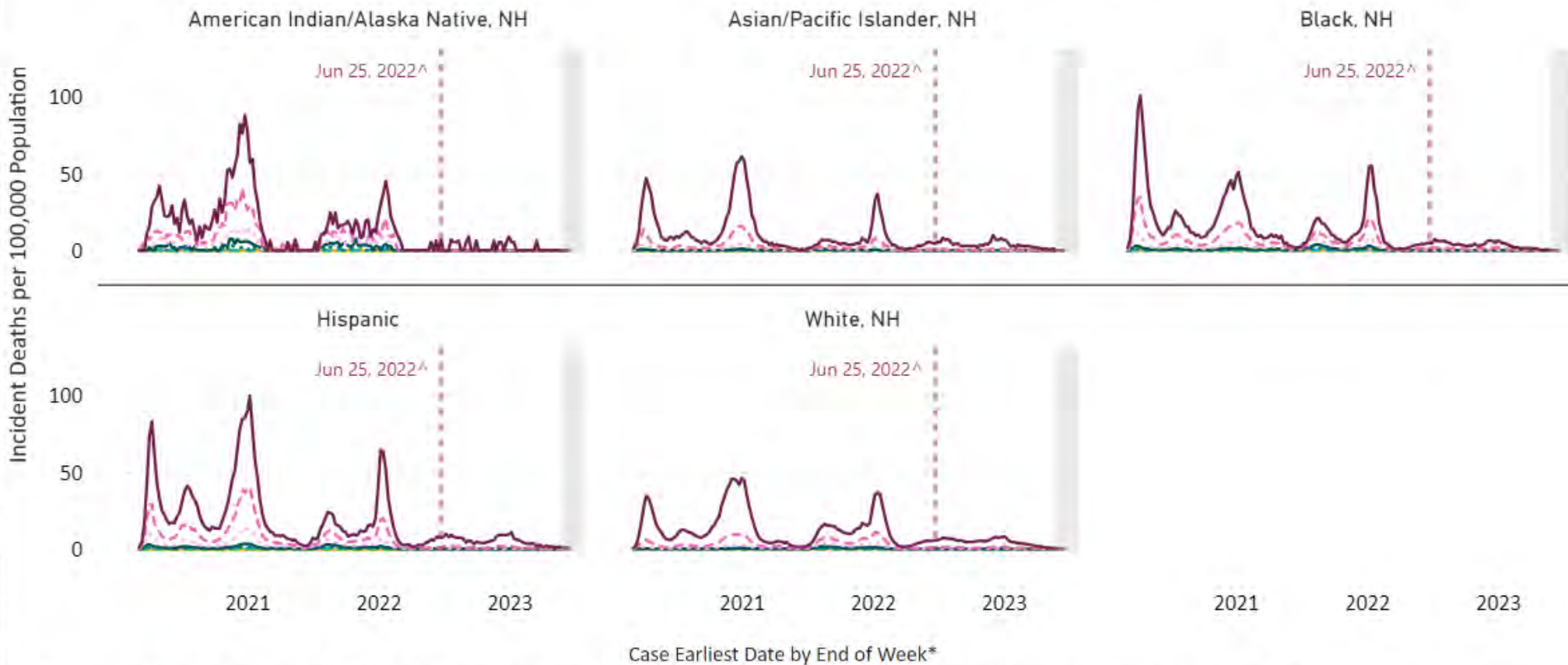
Age - All Groups

Age by Race/Ethnicity

Race/Ethnicity

Race/Ethnicity by Age

Age Group 0 - 4 5 - 11 12 - 15 16 - 17 18 - 29 30 - 39 40 - 49 50 - 64 65 - 74 75+



US: Includes data up to the week ending on Jul 01, 2023. Percentage of deaths among reported cases - 0.99%. Percentage of deaths reporting race and age by date - 83.68%.

US territories are included in case and death counts but not in population counts. Potential six-week delay in case reporting to CDC denoted by gray bars. Weekly data with five or fewer deaths have been suppressed. *Case Earliest Date is the earliest of the clinical date (related to illness or specimen collection and chosen by a defined hierarchy) and the Date Received by CDC. The date for the current week extends through Saturday. ^The death rate for Texas during the week ending Jun 25, 2022, are reflective of a data reporting artifact.

COVID-19 Weekly Deaths per 100,000 Population by Race/Ethnicity, United States



March 01, 2020 - June 17, 2023*



Jurisdiction
US

3/7/2020 6/17/2023

Cases

Sex

Age - All Groups

Age by Race/Ethnicity

Pediatric Case Proportions

Race/Ethnicity

Race/Ethnicity by Age

Deaths

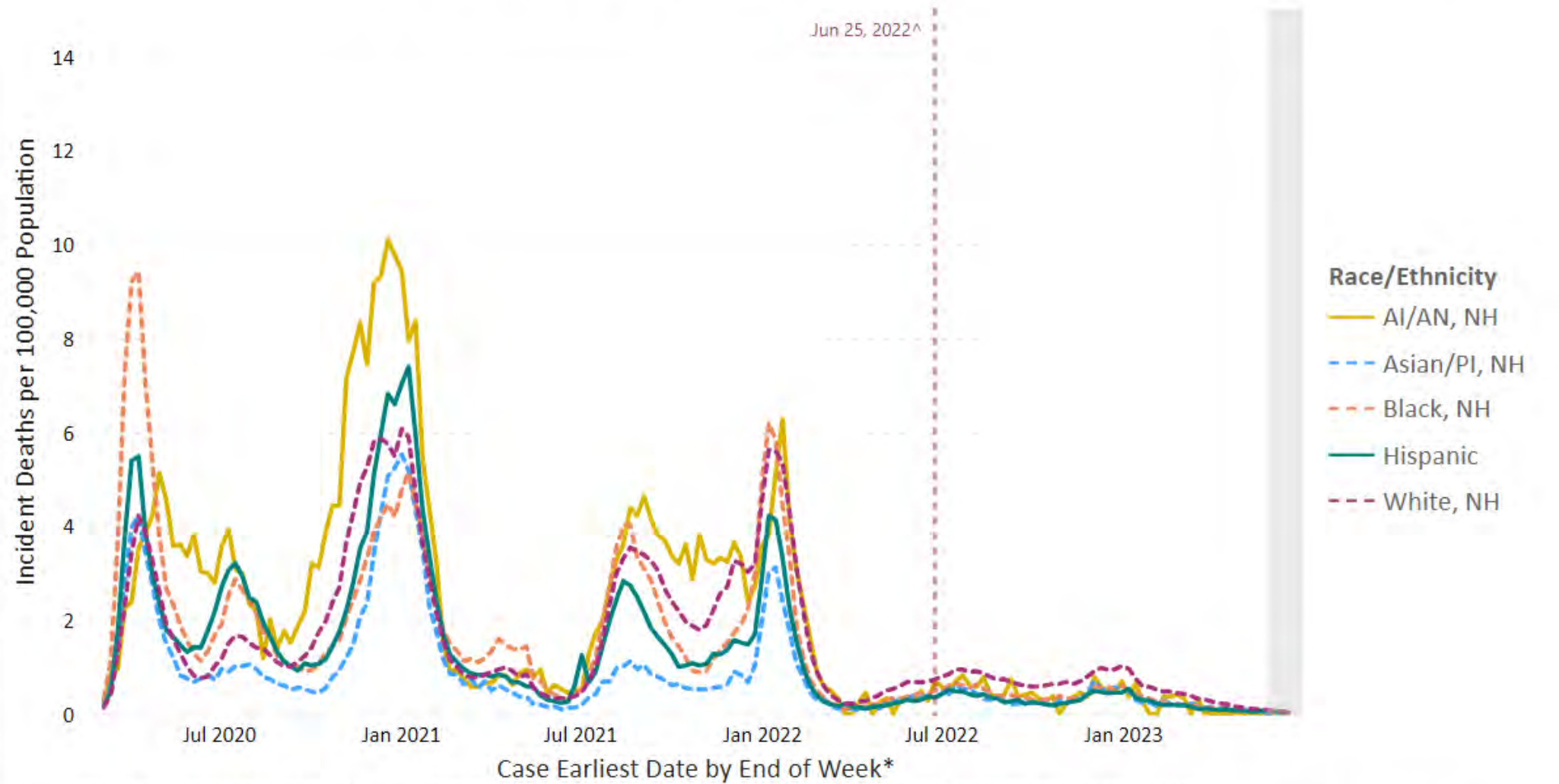
Sex

Age - All Groups

Age by Race/Ethnicity

Race/Ethnicity

Race/Ethnicity by Age



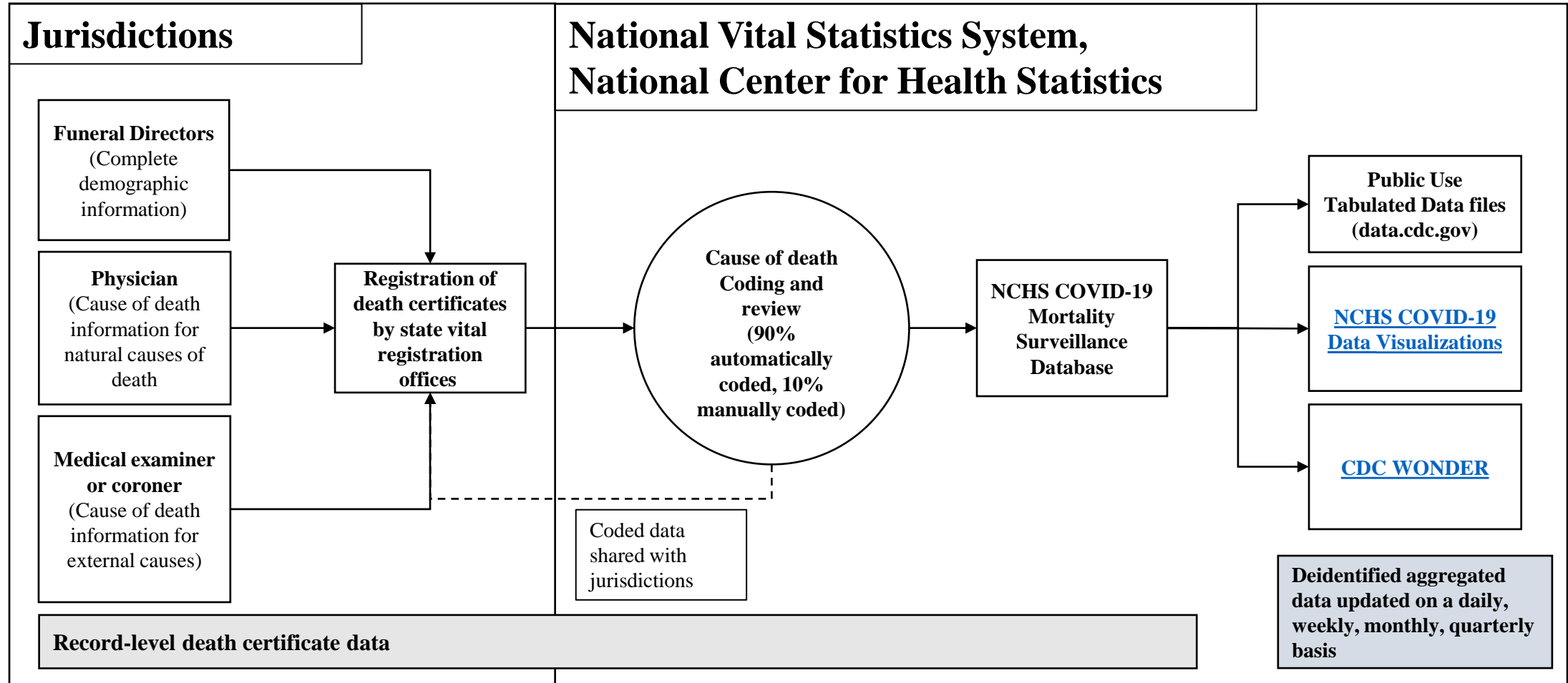
US: Includes data up to the week ending on Jul 01, 2023. Percentage of deaths among reported cases - 0.99%. Percentage of deaths reporting race by date - 83.72%. US territories are included in case and death counts but not in population counts. Potential six-week delay in case reporting to CDC denoted by gray bars. Weekly data with five or fewer deaths have been suppressed. AI = American Indian, AN = Alaska Native, NH = Non-Hispanic, PI = Pacific Islander. Excludes cases with unknown or multiple races. *Case Earliest Date is the earliest of the clinical date (related to illness or specimen collection and chosen by a defined hierarchy) and the Date Received by CDC. The date for the current week extends through Saturday. ^The death rate for Texas during the week ending Jun 25, 2022, are reflective of a data reporting artifact.

National Vital Statistics System (NVSS)

National Vital Statistics System

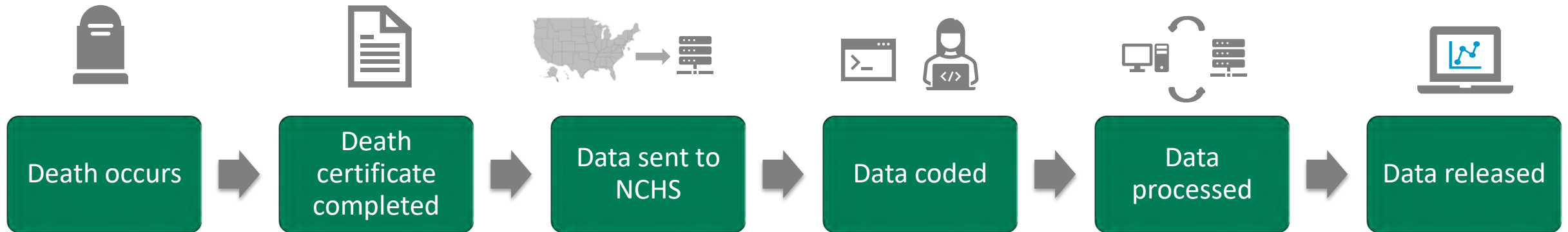
- The NVSS is the mechanism by which NCHS collects and disseminates the Nation's official vital statistics on births, deaths, and fetal deaths.
 - Collects, processes, and reviews death certificate data to provide the most complete information on causes of death
- Data are provided through contracts between NCHS and the 57 vital registration jurisdictions (50 States, the District of Columbia, New York City, and 5 territories)

COVID-19 National Vital Statistics System (NVSS)





Death certificate data



Death certificate completed by:

- Funeral director (demographic information)
- Physician (cause of death info for natural causes)
- Medical examiner/coroner (cause of death info for injuries, deaths outside of a medical facility)
 - After investigation (days to months)

Jurisdictions submit data electronically, and ICD-10 codes are assigned to cause-of-death information

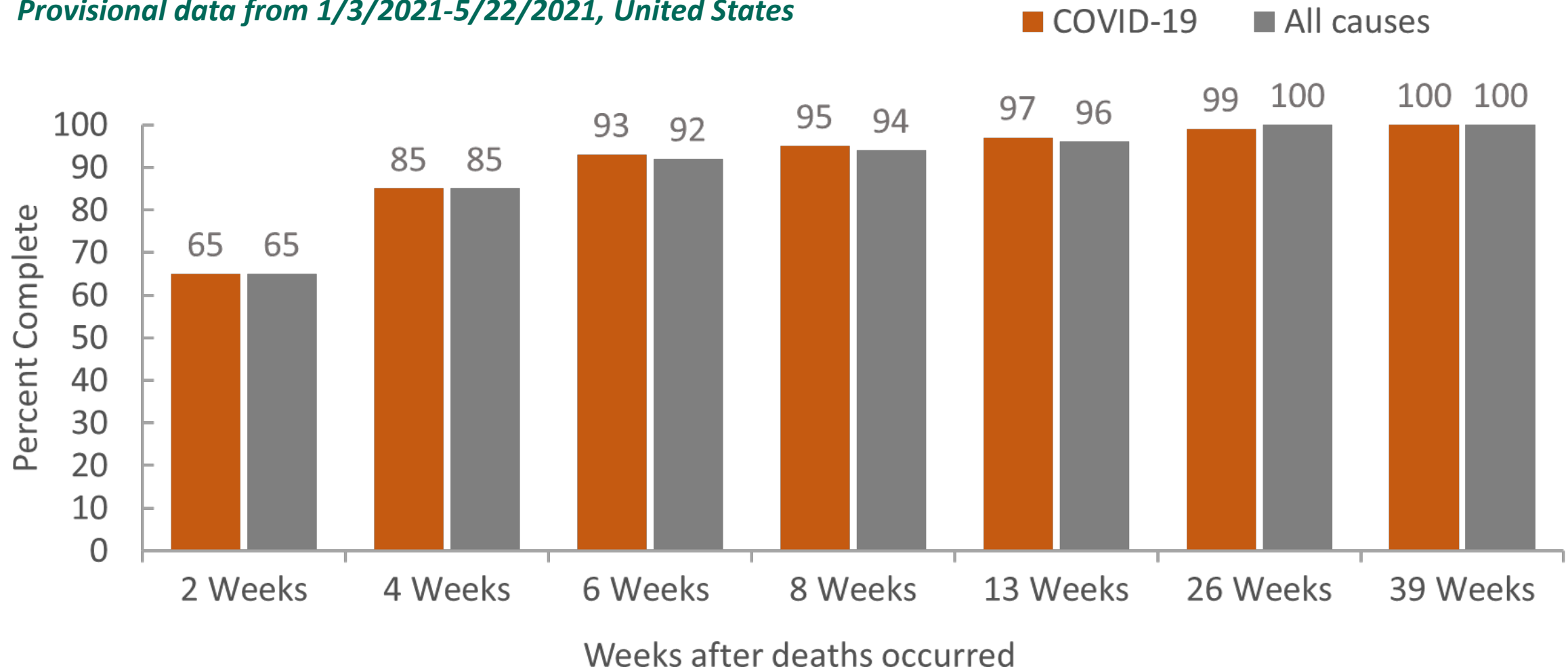
- ‘Fact of death’ or demographic data often available first
- Coding is done by automated software and trained DVS staff (‘manual coding’)
 - Manual coding can take several days
 - ~ 12 days currently

Data processed into several SQL databases, updated multiple times per day

- Weekly tab-delimited files created and archived
- Excel ‘cubes’
- Various programs to create data files released on the web
 - Daily, weekly, monthly, quarterly

How long does it take for COVID-19 death certificate data to be complete?

Provisional data from 1/3/2021-5/22/2021, United States



NOTE: Mean percentage refers to the sum of the percentages of available death records (i.e., all causes or cause-specific death records in a given week over all cause or cause-specific death records at 52 weeks) across the 20 reference-week units divided by the total number of reference-week units. A reference-week unit is defined as the week a set of deaths occurred. These data includes deaths that occurred in the United States and may include residents of U.S. territories and foreign countries.

DATA SOURCE: NCHS, National Vital Statistics System, January 3, 2021 – May 22, 2021.

NVSS Provisional COVID-19 Death Counts: Demographic and Geographic Detail

Causes of Death

- COVID-19
- Pneumonia and Influenza (with and without COVID-19)
- Other Selected Causes of Death (with and without COVID-19)

Demographic Detail

- Sex
- Age
- Race/Hispanic origin
- Place of death

Time Detail

- Cumulative for pandemic
- Monthly
- Weekly

Geographic Detail

- National
- HHS Region
- Jurisdiction/state
- County
- Urban/rural

Counts 1-9
suppressed

COVID-19 Situational Awareness with NVSS at the end of PHE, May 11, 2023

[Silk BJ, Scobie HM, Duck WM, et al. MMWR, 2023](#)

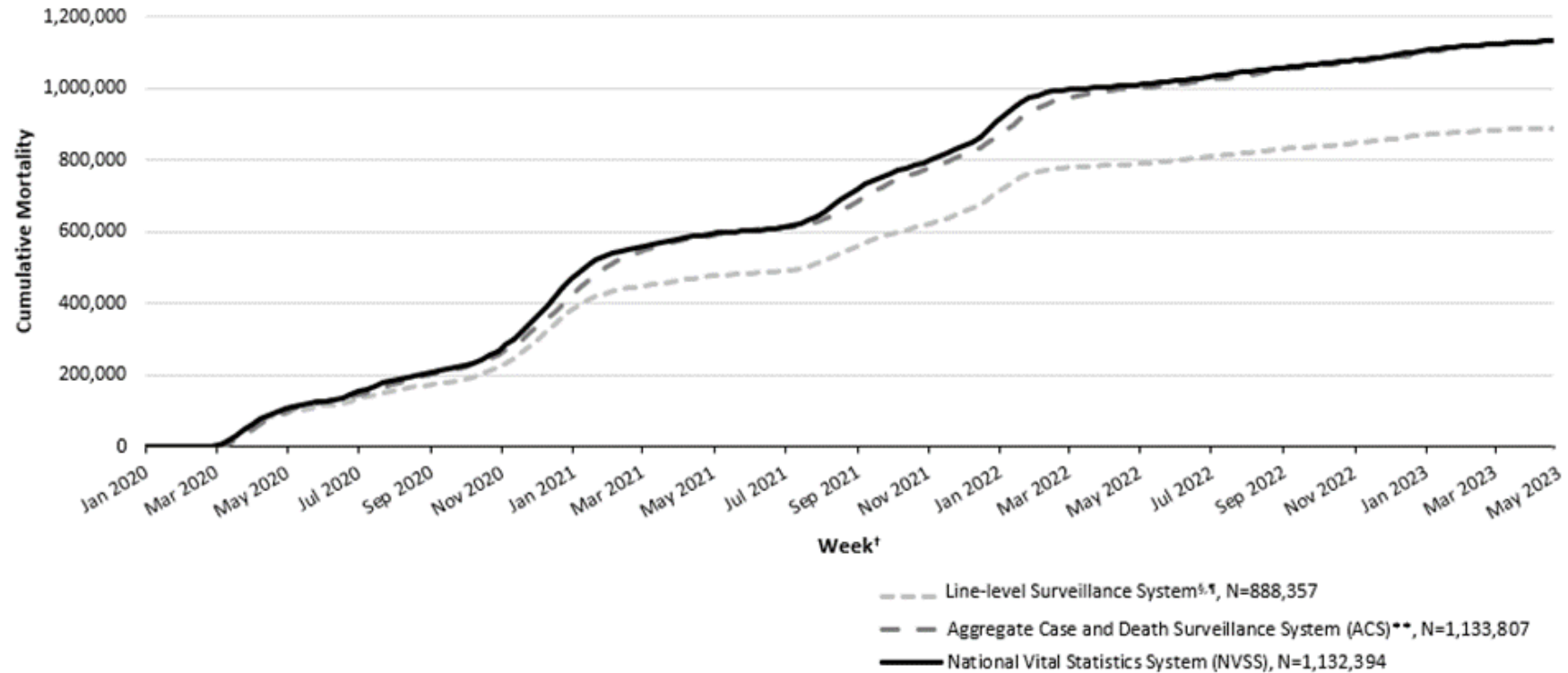


NVSS: the primary leading indicator for disease severity

- Post-PHE, provisional mortality data from NVSS is the primary data source on COVID-19 deaths based on date of death instead of report date
 - [Scobie HM, Panaggio M, Binder AM, et al.](#)
 - Observed NVSS death trends were 13 days earlier than for ACDC during Apr 1, 2022–Mar 22, 2023
- Percentage of COVID-19 deaths is a timely disease severity indicator because reporting lags for COVID-19 and all-causes are similar
 - While COVID-19 death counts from NVSS might be incomplete, the % of total deaths due to COVID-19 should be relatively unbiased
 - Similar reporting lags in both the numerator and denominator
- [CDC COVID Data Tracker: https://covid.cdc.gov/covid-data-tracker/#datatracker-home](https://covid.cdc.gov/covid-data-tracker/#datatracker-home)



Weekly National COVID-19 Deaths, January 20th, 2020, to May 13th, 2023*: Line-level, Aggregate Case and Death Counts and National Vital Statistics System.



*Data accessed on June 1, 2023. Line-level and NVSS are organized by MMWR week and are presented up to week ending date May 13, 2023. Due to data update cadences, ACS defined a week as the previous Wednesday to the current Thursday and data are presented up to May 11, 2023.

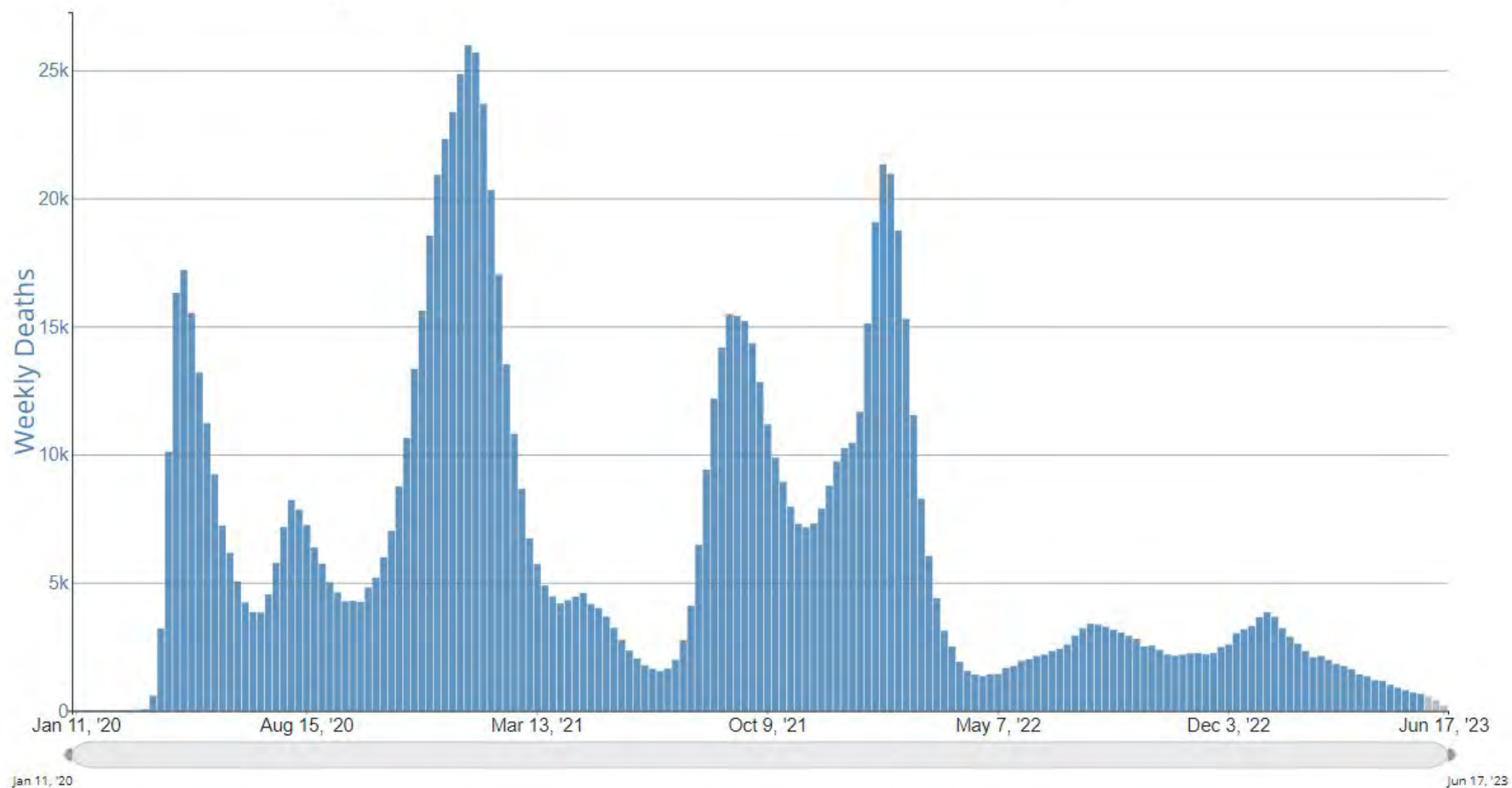
†ACS data based on date reported to CDC; Line-level and NVSS are based on the date the death occurred.

‡Death date was unknown for 8.6% of deaths from the Line-level Surveillance System.

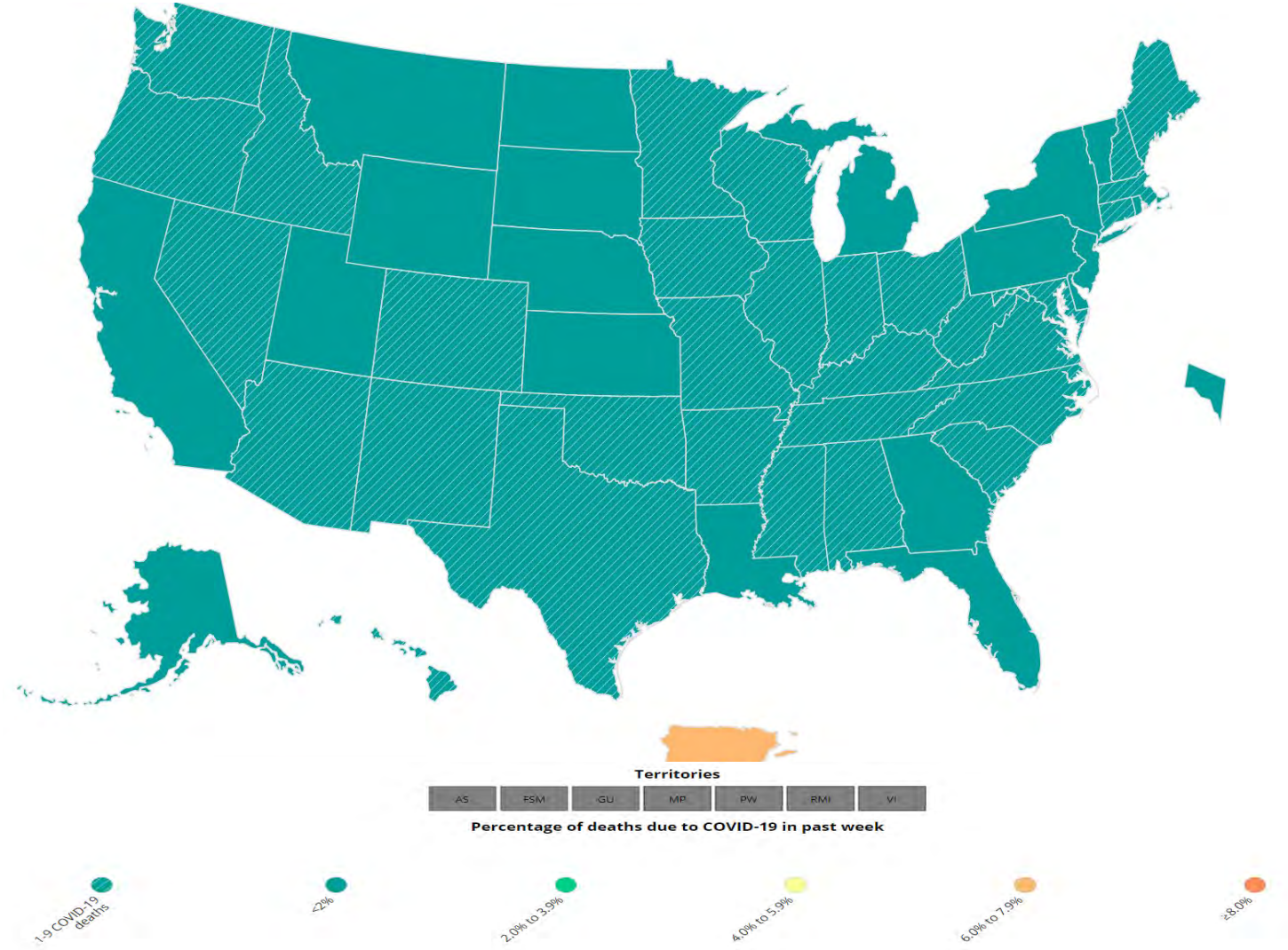
§As of 3/15/22, CDC changed its method for cleaning Line-level death information to remove an outdated piece of cleaning code to better reflect the data jurisdictions share and to improve alignment with other the data sources. This removal resulted in a decrease of 72,277 deaths in the dataset, as well as 270 health care worker deaths. Decreases were observed in 18 jurisdictions' data.

**A total of 2,807 historical deaths were reported to ACS as of May 11, 2023. Historical deaths are not reflected in new weekly death counts.

Weekly Trends in Provisional COVID-19 Deaths (NVSS) in the US Reported to CDC, Week of June 17, 2023



U.S. Percentage of Provisional Deaths Due to COVID-19 in the Past Week, by State/Territory



Summary

- Earlier in the pandemic, ACDC provided the fastest accounting of COVID-19 mortality burden amongst the three systems at the national, state and county levels
- Due to advancements in vital registration systems over the course of COVID-19 pandemic, timeliness for the NVSS and ACDC systems have become more similar with NVSS COVID-19 death counts at times surpassing that of line-level and ACDC systems
- In line-level data, key variables are incomplete (i.e. ethnicity & race combined, deaths (underreported), healthcare worker, pregnancy status)
- NVSS provides the most accurate and complete information on COVID-19 mortality
- NVSS suppresses counts of deaths between 1-9; data may be largely obscured at lower geographic levels

Summary

- Line level data contains epidemiological information about the course of infection and possible exposure
- Can be leveraged to guide individual, clinical, and community health actions
- With wide range of sociodemographic variables, NVSS mortality data are widely used to compare mortality across geographies, sex, race/ethnicities, and age groups
- As the timeliness of NVSS continues to improve, supplemental aggregate and line-level systems will be less necessary
- Mortality data continue to be collected, processed, verified, and made public via COVID Data Tracker, NCHS data visualization webpages and data.cdc.gov

Conclusion

- Utilizing details from multiple surveillance systems has helped CDC to assess accurate, complete, and timely information on COVID-19—associated deaths which is used to subsequently develop appropriate guidance to inform and safeguard the nation's health.

Questions?

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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.



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- Scobie HM, Panaggio M, Binder AM, et al. Correlations and Timeliness of COVID-19 Surveillance Data Sources and Indicators — United States, October 1, 2020–March 22, 2023. MMWR Morb Mortal Wkly Rep. ePub: 5 May 2023. DOI: <http://dx.doi.org/10.15585/mmwr.mm7219e2>.

References

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Appendix



Number of reporting jurisdictions : ACDC

- Jurisdictional level: 50 states, 5 territories (Guam, Puerto Rico, the United States Virgin Islands, the Commonwealth of the Northern Mariana Islands, and American Samoa), 3 freely associated states (FAS), New York City, and the District of Columbia.
- County-level: > 3,200 counties



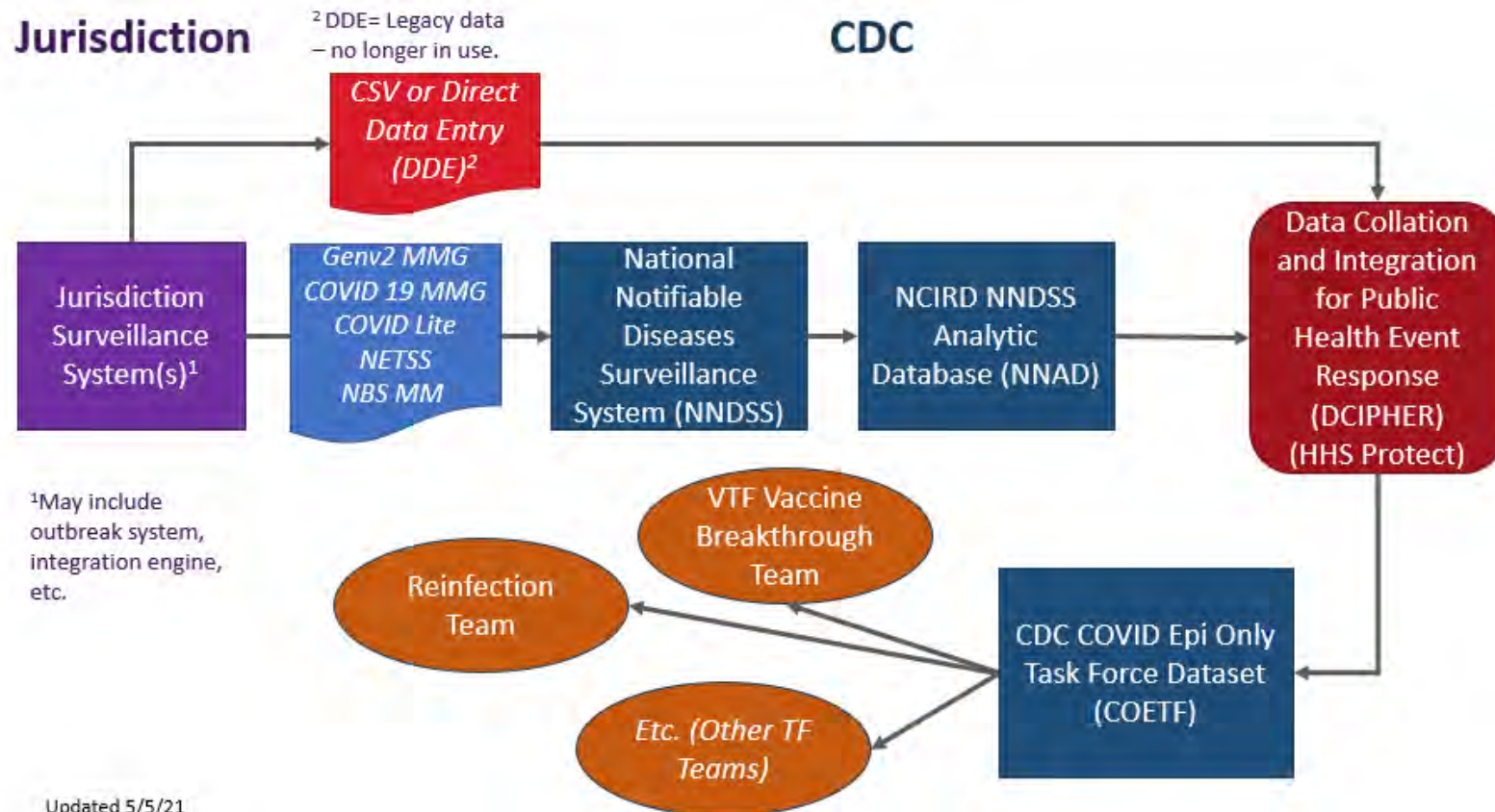
Number of reporting jurisdictions : Line-Level

- 57 jurisdictions: 50 States, the District of Columbia, New York City, and 5 US territories (Guam, Puerto Rico, the United States Virgin Islands, the Commonwealth of the Northern Mariana Islands, and American Samoa)



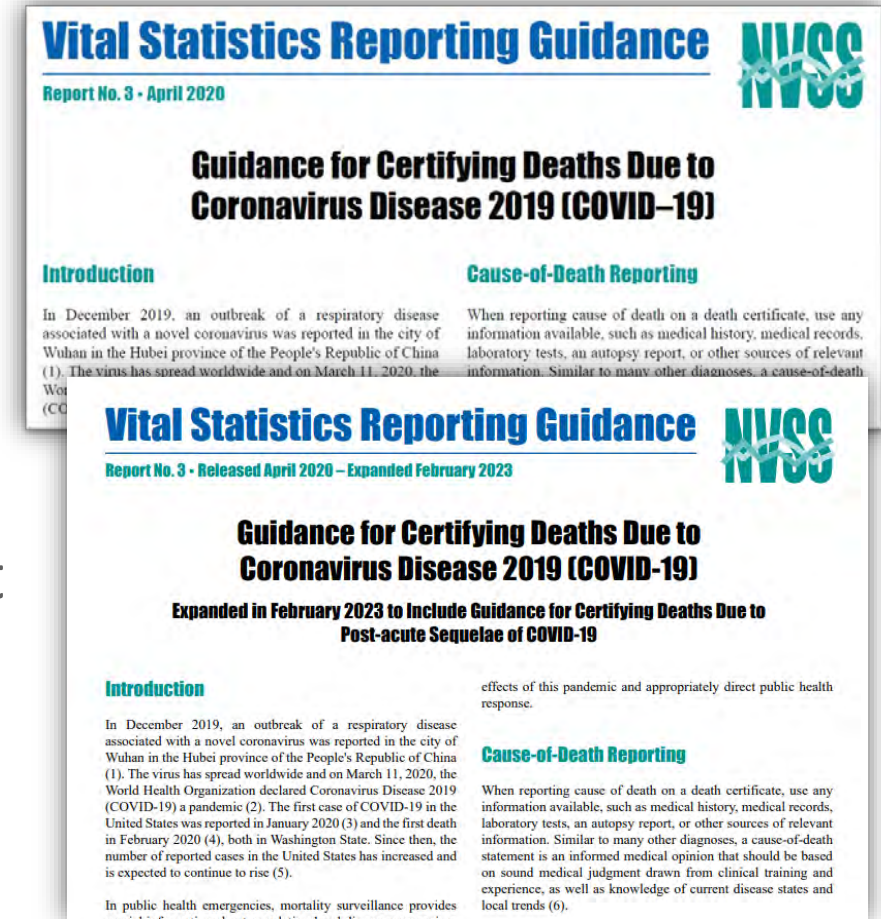
Line-level COVID-19 data collection

Case Notification Process



Guidance for Certifying COVID-19 Deaths: Key Points

- If COVID–19 played a role in the death it should be mentioned on the death certificate
- It is acceptable to report COVID–19 on a death certificate as “probable” or “presumed” – certifiers should use their best clinical judgement in determining if a COVID–19 infection was likely and if the infection contributed to death
- Include pre-existing conditions that complicated death in Part 2 of the death certificate



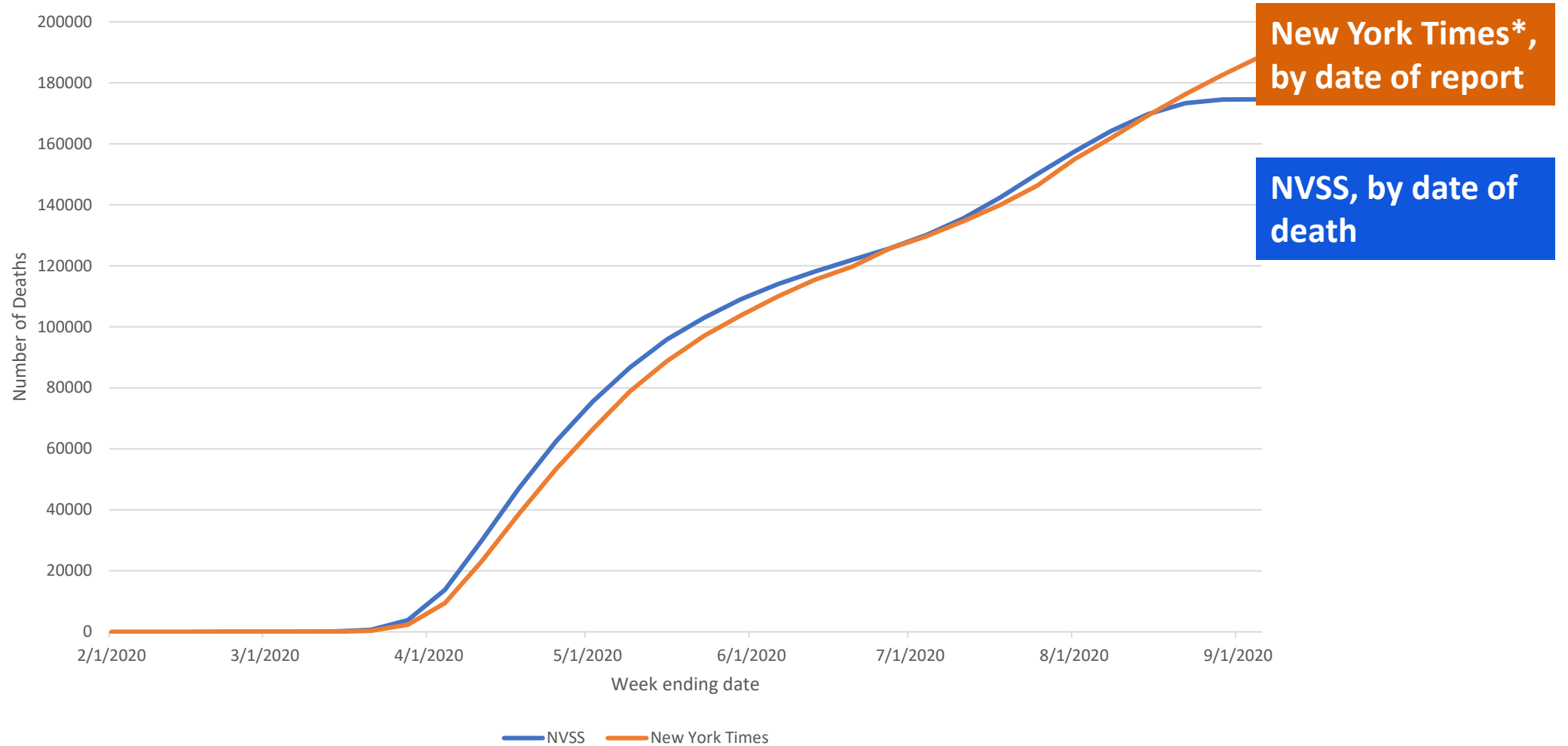
National Vital Statistics System

- Final Data
 - Annual Final Micro-data (record-level) files
 - Analytic Reports
 - Leading causes of death, life expectancy, trends, and disparities in mortality
 - Final data available on [CDC WONDER](#)
- Provisional Data
 - Tabulated counts and estimate based on incomplete data
 - Quarterly Provisional Estimates
 - Weekly Surveillance of Flu and Pneumonia Deaths
 - Monthly Provisional Counts of Drug Overdose Deaths
 - Provisional data available on [CDC WONDER](#), updated monthly

COVID-19 Cause of Death Coding: Coding Process

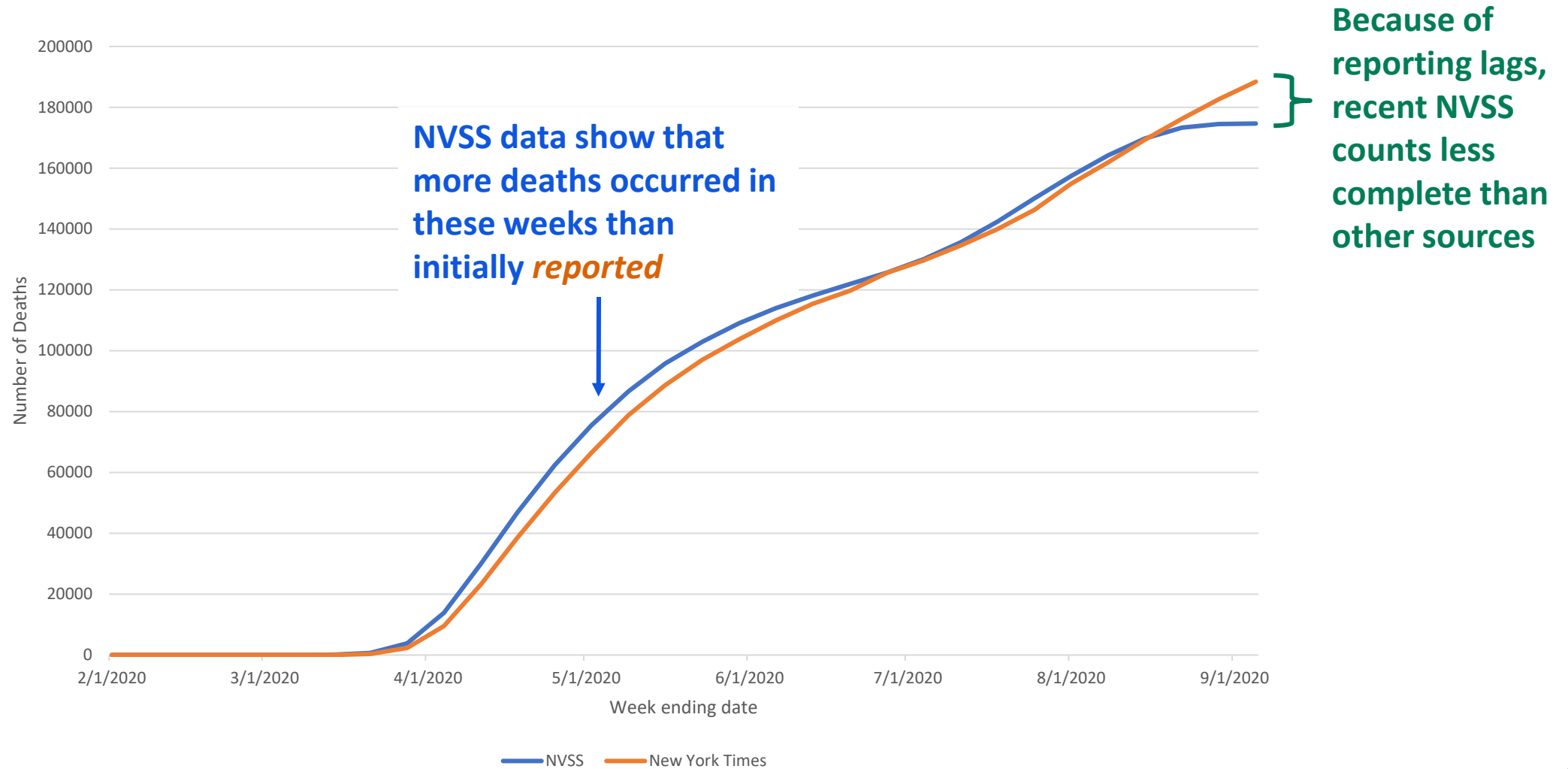
- Coding systems not initially set up to code COVID-19 or to accept ICD-10 code U07.1
- Establish coding rules
- Initially **all** COVID-19 records had to be manually coded
- Managing manual coding
 - Prioritization
 - Increase manual coding capacity
- Systems modified to automatically code some COVID-19 deaths
- Adjust coding rules
 - Eventually added post-acute sequelae of COVID-19
- 80-90% COVID-19 deaths automatically coded

Initial comparisons of Cumulative COVID-19 Death Counts by Data Source (as of 9/8/2020)



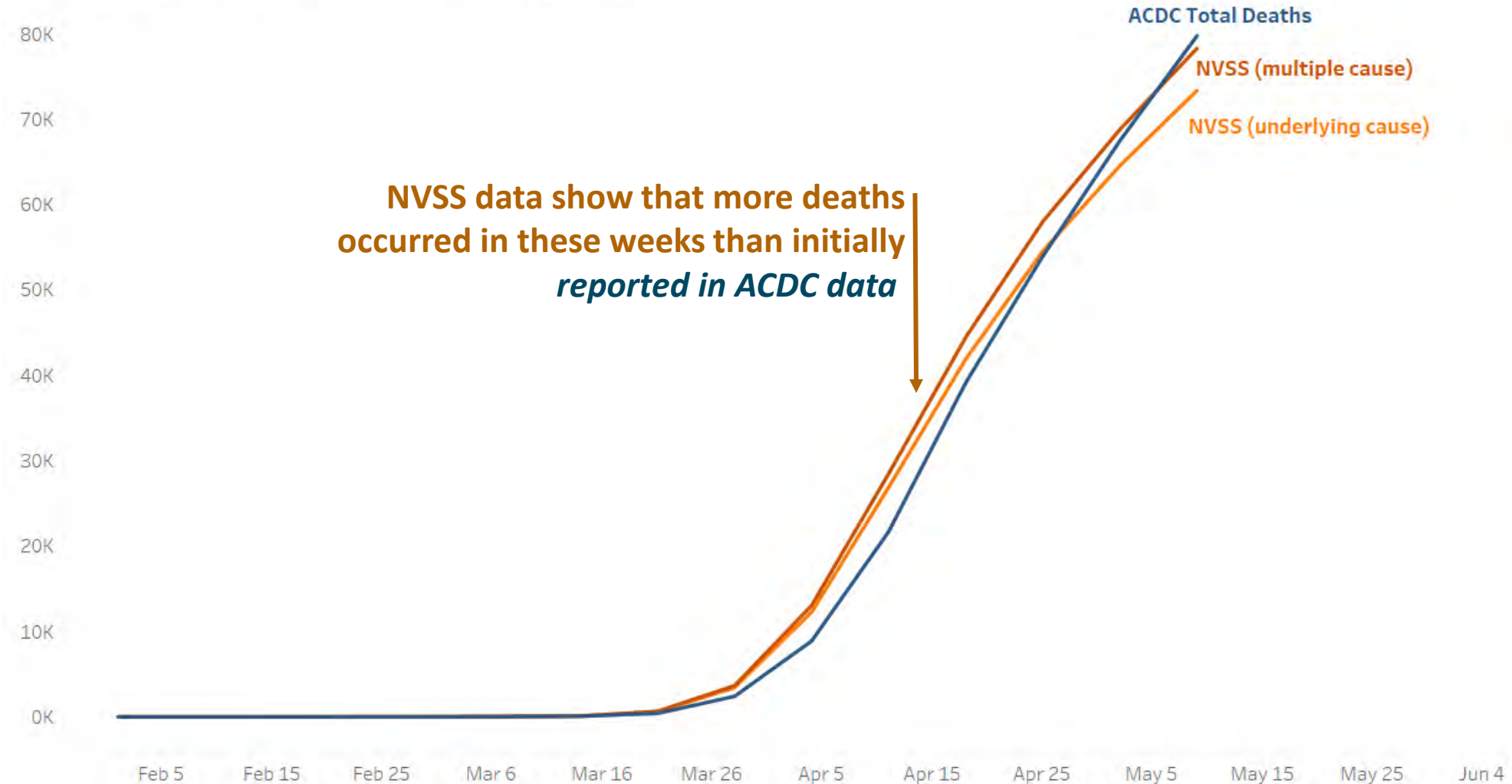
*New York Times case and death data from <https://github.com/nytimes/covid-19-data/blob/master/us-counties.csv>, September 2020

Initial comparisons of Cumulative COVID-19 Death Counts by Data Source (as of 9/8/2020)



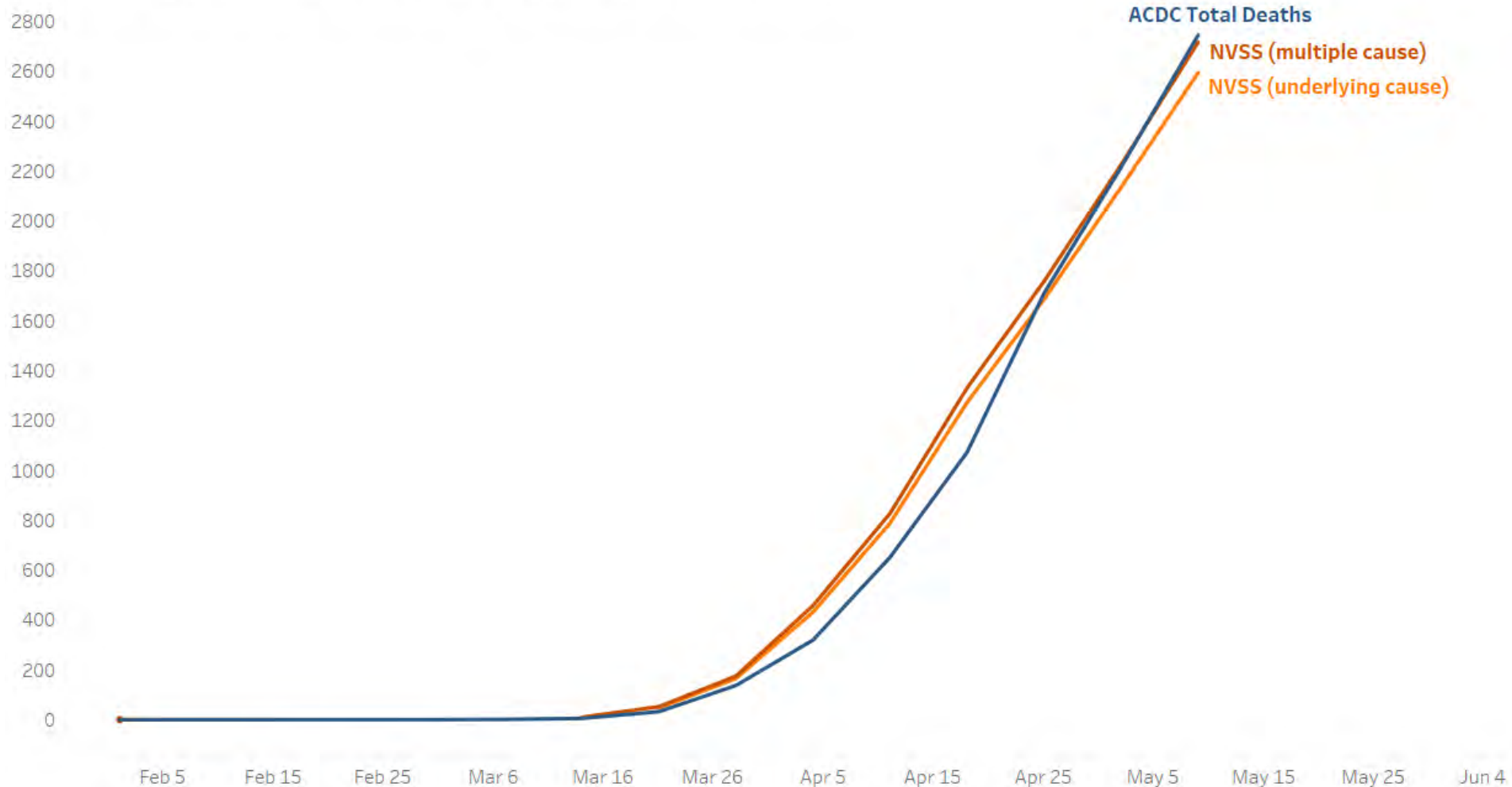
Initial comparisons between NVSS and ACDC: Cumulative COVID-19 Death Counts in early 2020, United States

Case report data show the cumulative counts reported as of the specified date. NVSS data show the cumulative count occurring as of the specified date (based on the date of death). Where the blue lines fall below the orange lines, it suggests underreporting of COVID-19 deaths in the initial case reports. Where the orange lines fall below the blue lines, it suggests reporting delays in NVSS.



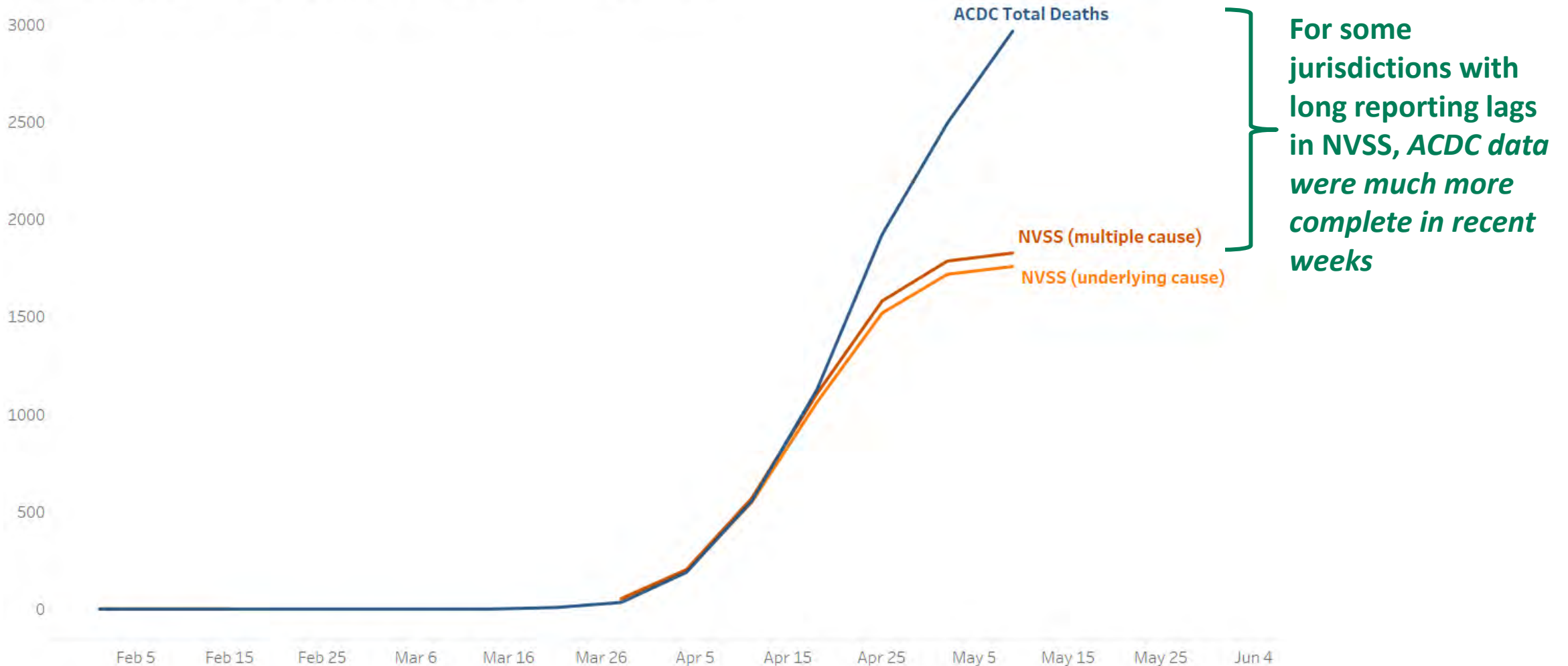
Initial comparisons between NVSS and ACDC: Cumulative COVID-19 Death Counts in early 2020, California

Case report data show the cumulative counts reported as of the specified date. NVSS data show the cumulative count occurring as of the specified date (based on the date of death). Where the blue lines fall below the orange lines, it suggests underreporting of COVID-19 deaths in the initial case reports. Where the orange lines fall below the blue lines, it suggests reporting delays in NVSS.



Initial comparisons between NVSS and ACDC: Cumulative COVID-19 Death Counts in early 2020, Connecticut

Case report data show the cumulative counts reported as of the specified date. NVSS data show the cumulative count occurring as of the specified date (based on the date of death). Where the blue lines fall below the orange lines, it suggests underreporting of COVID-19 deaths in the initial case reports. Where the orange lines fall below the blue lines, it suggests reporting delays in NVSS.



Provisional NVSS COVID-19 Death Counts: Where to Find Them

NCHS webpages

- Coronavirus Disease (COVID-19) Death Data and Reporting Guidance
<https://www.cdc.gov/nchs/nvss/covid-19.htm>
 - Daily Updates of Totals by Week and State
 - Weekly Updates by Select Demographic and Geographic Characteristics
 - Health Disparities: Race and Hispanic Origin
 - Excess Deaths Associated with COVID-19

Download and API Access

- All data is simultaneously posted on data.cdc.gov
 - Export in a variety of formats
 - API Access - provides programmatic access to this dataset including the ability to filter, query, and aggregate data
- Monthly updates on [CDC WONDER](#)

Index of available NVSS data files

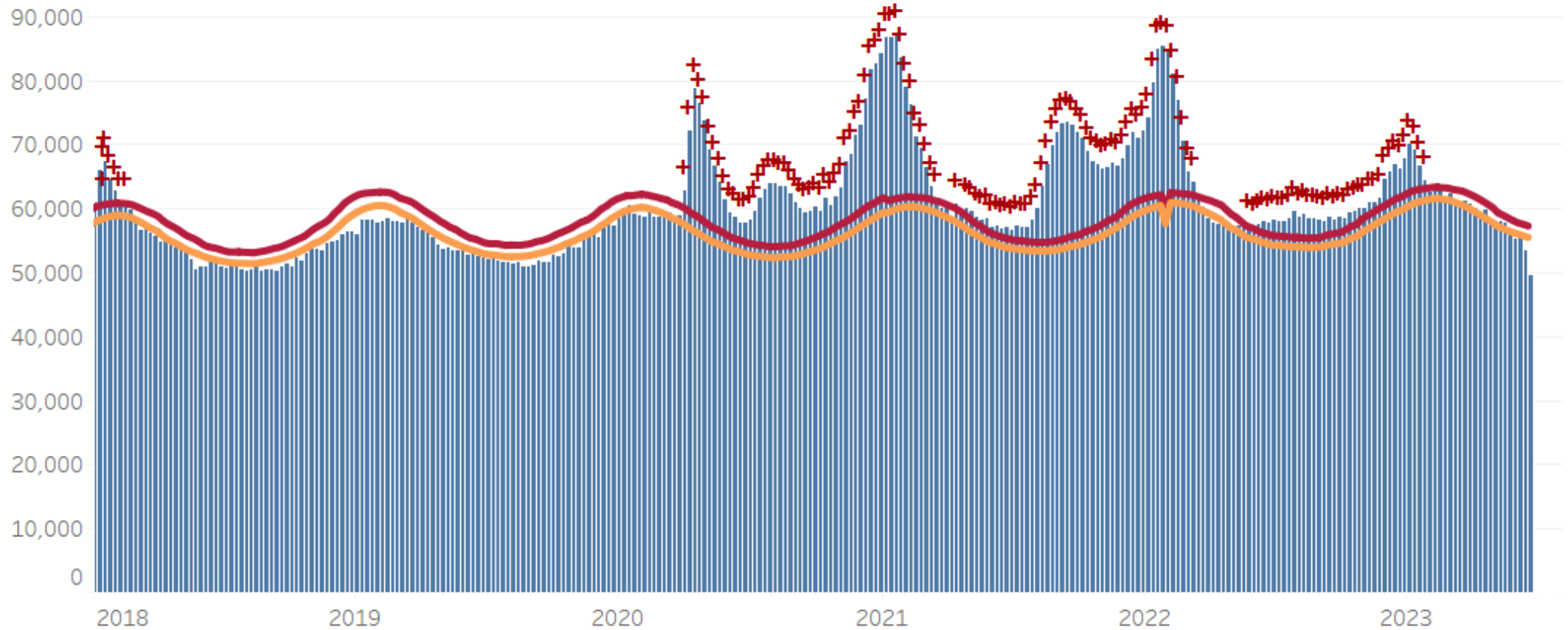
- <https://www.cdc.gov/nchs/covid19/covid-19-mortality-data-files.htm>

NCHS NVSS COVID-19 Surveillance Datasets						
Keyword Filter					59 Datasets	
All						
NCHS NVSS COVID-19 Surveillance Datasets						
Name	Description	Update Frequency	Last Updated	Geographic Area	Time Period	
Excess Deaths Associated with COVID-19	<p>Effective June 28, 2023, this dataset will be updated monthly on the 4th Wednesday of the month.</p> <p>Estimates of excess deaths can provide information about the burden of mortality potentially related to COVID-19, beyond the number of deaths that are directly attributed to COVID-19. Excess deaths are typically defined as the difference between observed numbers of deaths and expected numbers. This visualization provides weekly data on excess deaths by jurisdiction of occurrence. Counts of deaths in...</p>	Weekly	6/28/2023	Puerto Rico, State	Weekly	
Provisional COVID-19 death counts and rates, by jurisdiction of residence and demographic characteristics	<p>This file contains COVID-19 death counts and rates by jurisdiction of residence (U.S., HHS Region) and demographic characteristics (sex, age, race and Hispanic origin, and age/race and Hispanic origin). United States death counts and rates include the 50 states, plus the District of Columbia.</p> <p>Deaths with confirmed or presumed COVID-19, coded to ICD-10 code U07.1. Number of deaths reported in this file are the total number of COVID-19 deaths received and coded as of the</p>	Weekly	7/12/2023	HHS Region, United States	Weekly	

Excess deaths associated with COVID-19

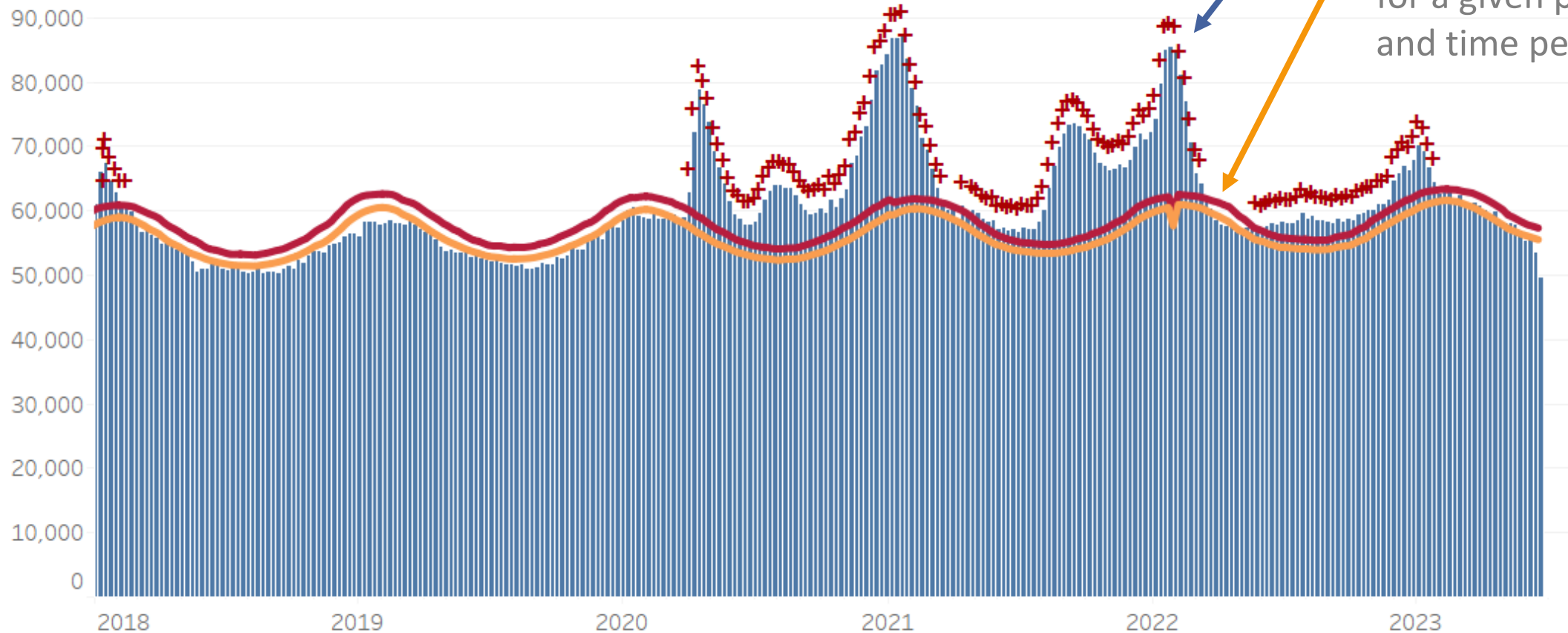
Weekly number of deaths (from all causes)

- + indicates observed count above threshold
- Predicted number of deaths from all causes
- average expected number of deaths
- upper bound threshold for excess deaths

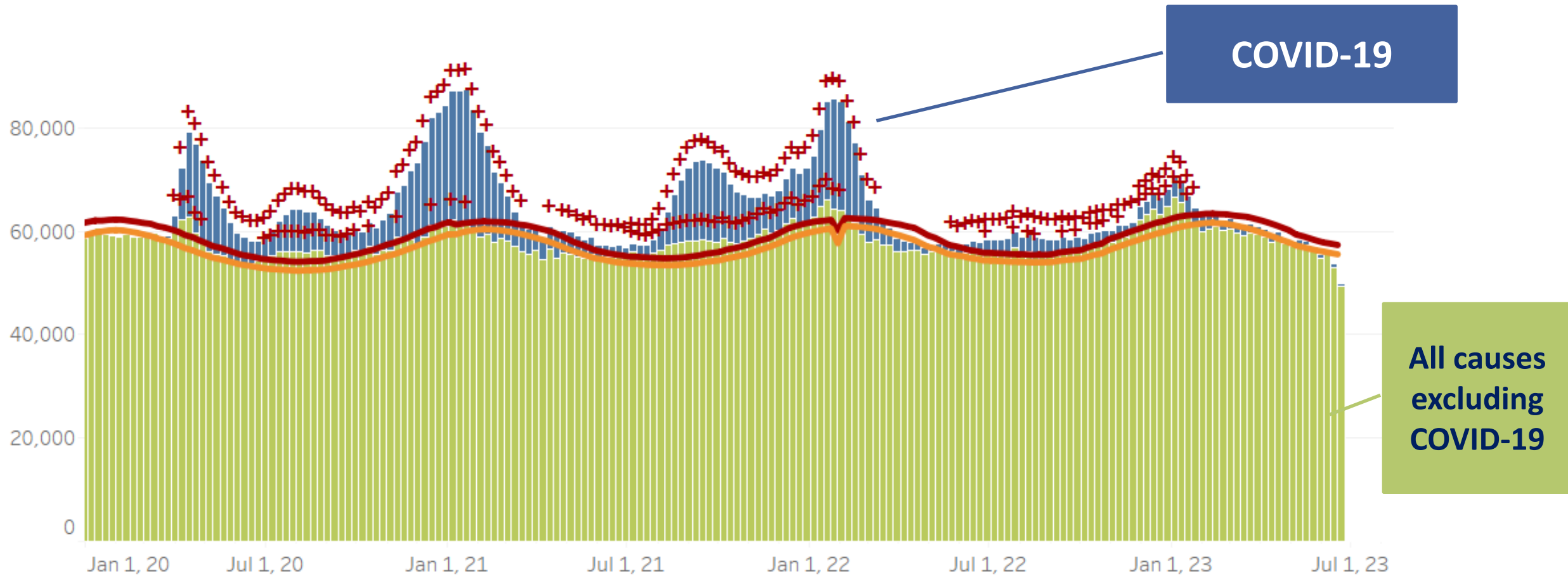


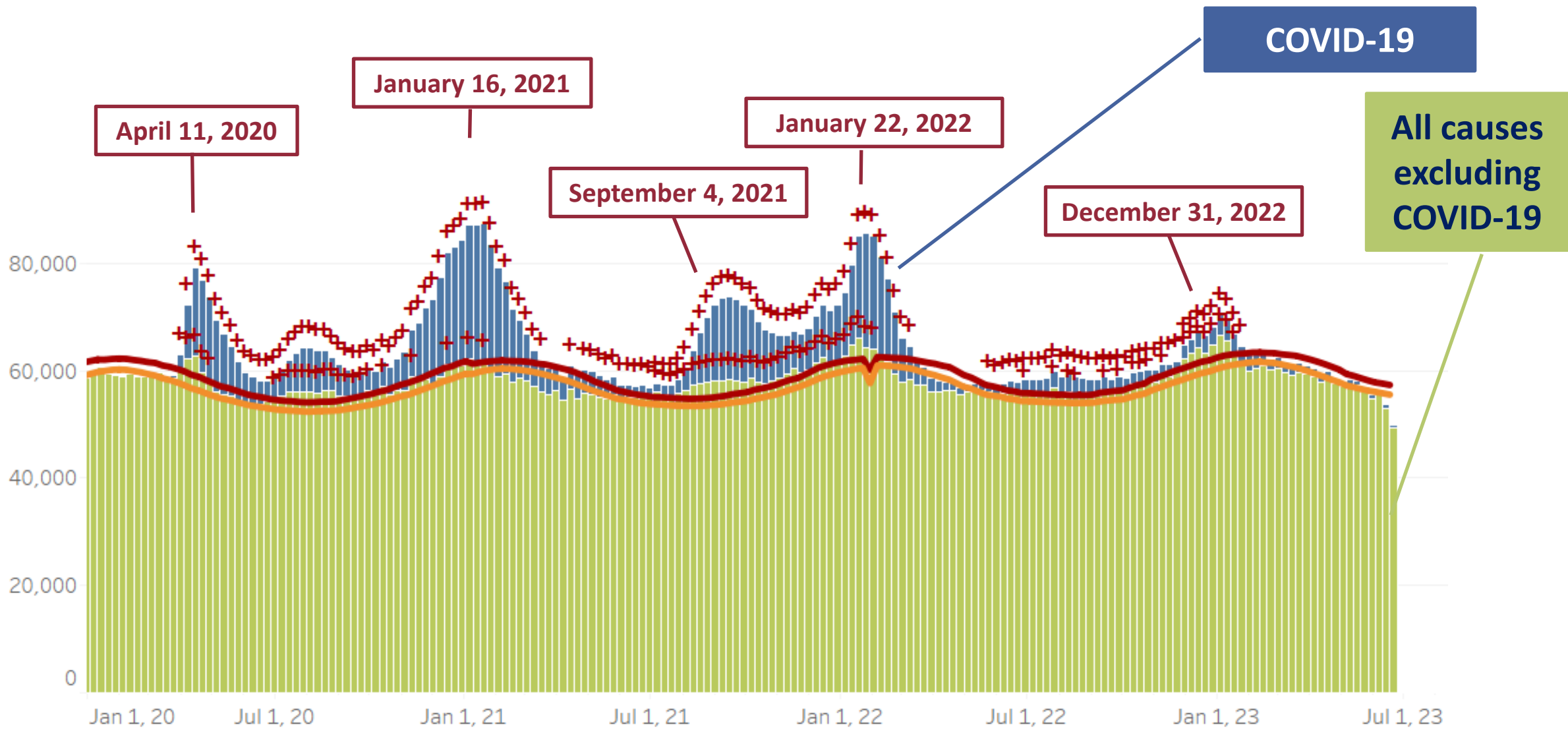
What is excess mortality?

The number of deaths above the expected number, for a given place and time period



Excess Deaths Directly Due to COVID-19

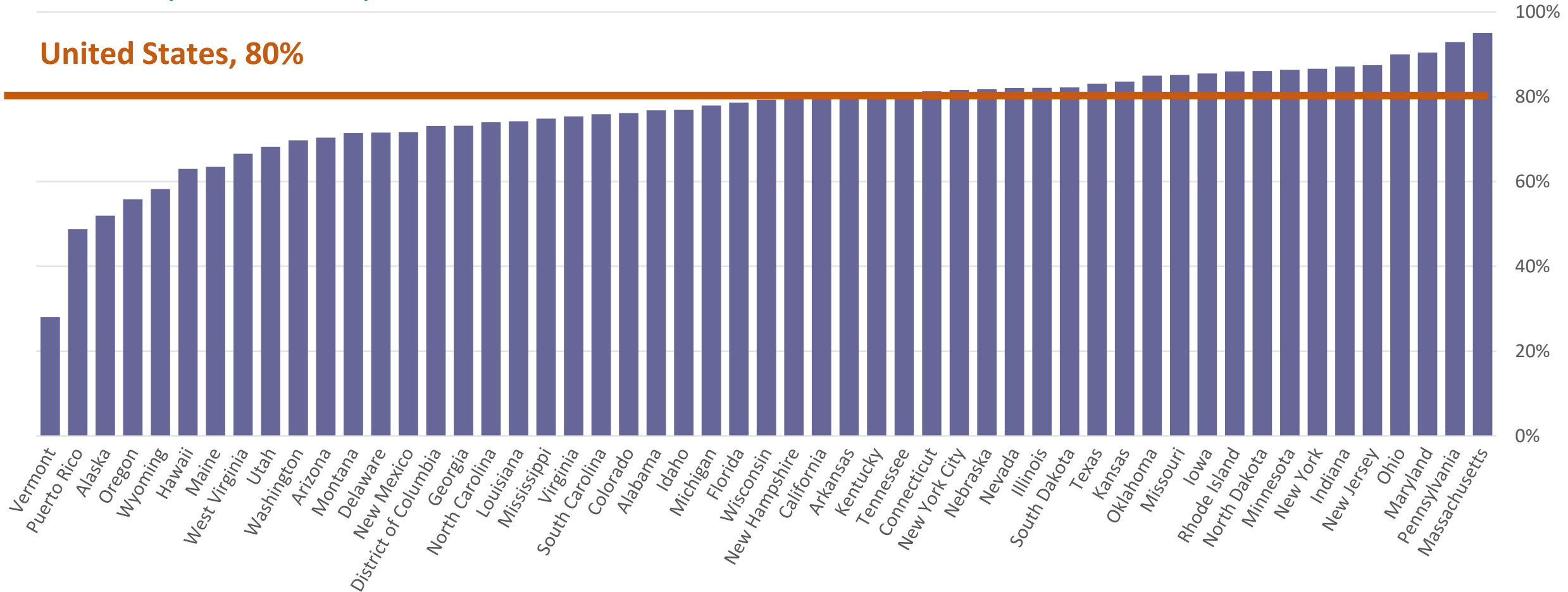




Percent of excess deaths due to COVID-19, by jurisdiction

February 1, 2020 – May 14, 2022

United States, 80%



Provisional COVID-19 Death Counts: Understanding the Numbers

Things to know about the data

- Provisional counts are not final and are subject to change
- Provisional data are not yet complete
- Death counts should not be compared across jurisdictions

Why these numbers are different

- Death certificates take time to be completed
- States report at different rates
- It takes extra time to code COVID-19 deaths
- Other reporting systems use different definitions or methods for counting deaths

<https://www.cdc.gov/nchs/data/nvss/coronavirus/Understanding-COVID-19-Provisional-Death-Counts.pdf>

Timeliness of death certificate data has been improving

Percentage of death records received within 10 days of death from 2013 to 2022

