THE LANCET
Infectious Diseases

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Dong E, Ratcliff J, Goyea TD, et al. The Johns Hopkins University Center for Systems Science and Engineering COVID-19 Dashboard: data collection process, challenges faced, and lessons learned. *Lancet Infect Dis* 2022; published online Aug 31. https://doi.org/10.1016/S1473-3099(22)00434-0.

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Appendix A: Data Sources

This list includes a complete list of all sources ever used in the data set from January 21, 2020 to May 30, 2022. Some sources listed here (e.g. ECDC, US CDC, BNO News) are not currently relied upon as a source of data. There are three main categories: aggregated data sources, US data sources at the state (Admin1) or county/city (Admin2) level, and non-US data sources at the country/region (Admin0) or state/province (Admin1) level. For the most up-to-date list, please refer to the JHU CSSE COVID-19 GitHub Repository (https://github.com/CSSEGISandData/COVID-19/blob/master/README.md).

Location	Source
Aggregated data sources	
World Health Organization	https://www.who.int/
European Centre for Disease Prevention and Control (ECDC):	https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases
DXY.cn. Pneumonia. 2020.	https://ncov.dxy.cn/ncovh5/view/pneumonia?from=dxy&source=&link=&share=
US CDC	https://www.cdc.gov/coronavirus/2019-ncov/index.html
BNO News	https://bnonews.com/index.php/2020/02/the-latest-coronavirus-cases/
WorldoMeters	https://www.worldometers.info/coronavirus/
1Point3Arces	https://coronavirus.1point3acres.com/en
COVID Tracking Project	https://covidtracking.com/data
Los Angeles Times	https://www.latimes.com/projects/california-coronavirus-cases-tracking-outbreak/
The Mercury News	https://www.mercurynews.com/tag/coronavirus/
US data sources at the state (Admin1) or county/city (Admin2) level	
Alabama	https://www.alabamapublichealth.gov/covid19/
Alaska	https://alaska-coronavirus-vaccine-outreach-alaska-dhss.hub.arcgis.com/
Arizona	https://www.azdhs.gov/covid19/data/index.php
Arkansas	https://experience.arcgis.com/experience/633006d0782b4544bd5113a314f6268a/page/page_0/
California	https://www.cdph.ca.gov/covid19
Mariposa County	https://www.mariposacounty.org/1592/COVID-19-Information
Alameda County	https://covid-19.acgov.org/
Fresno County	https://www.co.fresno.ca.us/departments/public-health/covid-19
Humboldt County	https://humboldtgov.org/
Imperial County	http://www.icphd.org/health-information-and-resources/healthy-facts/covid-19/
Los Angeles County	http://publichealth.lacounty.gov/media/coronavirus/
Madera County	https://www.maderacounty.com/government/public-health/corona-virus-covid-19/covid-revised
Marin County	https://coronavirus.marinhhs.org/

Location	Source
Mendocino County	https://www.mendocinocounty.org/community/novel-coronavirus/covid-19-case-data
Orange County	https://occovid19.ochealthinfo.com/coronavirus-in-oc
Placer County	https://www.placer.ca.gov/coronavirus
Riverside County	https://www.rivcoph.org/coronavirus
Sacramento County	https://www.saccounty.net/COVID-19/
San Benito County	https://hhsa.cosb.us/publichealth/communicable-disease/coronavirus/
San Bernardino County	https://sbcovid19.com/
San Diego County	https://www.sandiegocounty.gov/coronavirus.html
San Francisco	https://www.sfdph.org/dph/alerts/coronavirus.asp
San Joaquin County	http://www.sjcphs.org/coronavirus.aspx
San Mateo County	https://www.smchealth.org/coronavirus
Santa Clara County	https://www.sccgov.org/sites/covid19/
Santa Cruz County	http://www.santacruzhealth.org/HSAHome/HSADivisions/PublicHealth/CommunicableDiseaseControl/CoronavirusHome.aspx
Shasta County	https://www.co.shasta.ca.us/covid-19/overview
Solano County	https://www.solanocounty.com/depts/ph/ncov.asp
Sonoma County	https://socoemergency.org/emergency/novel-coronavirus/coronavirus-cases/
Stanislaus County	http://schsa.org/publichealth/pages/corona-virus/
Ventura County	https://www.venturacountyrecovers.org/
Yolo County	https://www.yolocounty.org/health-human-services/adults/communicable-disease-investigation-and-control/novel-coronavirus-2019/
Colorado	https://covid19.colorado.gov/covid-19-data
Connecticut	https://data.ct.gov/stories/s/COVID-19-data/wa3g-tfvc/
Delaware	https://coronavirus.delaware.gov/
District of Columbia	https://coronavirus.dc.gov/page/coronavirus-data
Florida	https://fdoh.maps.arcgis.com/apps/opsdashboard/index.html#/8d0de33f260d444c852a615dc7837c86
	https://protect-public.hhs.gov/datasets/HHSGOV::community-profile-report-counties/about
Georgia	https://dph.georgia.gov/covid-19-daily-status-report
Guam	http://dphss.guam.gov/covid-19/
Hawaii	https://health.hawaii.gov/coronavirusdisease2019/what-you-should-know/current-situation-in-hawaii/
Idaho	https://coronavirus.idaho.gov/
Illinois	https://dph.illinois.gov/covid19
Indiana	https://hub.mph.in.gov/dataset?q=COVID
Iowa	https://coronavirus.iowa.gov/
Kansas	https://www.coronavirus.kdheks.gov/160/COVID-19-in-Kansas
Douglas County	https://coronavirus-response-dgco.hub.arcgis.com/
Finney County	https://finney-county-coronavirus-response-finneycountygis.hub.arcgis.com/

Location	Source
Riley County	https://coronavirus-response-rcitgis.hub.arcgis.com/
Reno County	https://experience.arcgis.com/experience/9a7d44773e4c4a48b3e09e4d8673961b/page/page_18/
Kentucky	https://kygeonet.maps.arcgis.com/apps/opsdashboard/index.html#/543ac64bc40445918cf8bc34dc40e334
Louisiana	http://ldh.la.gov/coronavirus/
Maine	https://www.maine.gov/dhhs/mecdc/infectious-disease/epi/airborne/coronavirus/data.shtml
Maryland	https://coronavirus.maryland.gov/
Massachusetts	https://www.mass.gov/info-details/covid-19-response-reporting
Michigan	https://www.michigan.gov/coronavirus/0,9753,7-406-98163_98173---,00.html
Minnesota	https://www.health.state.mn.us/diseases/coronavirus/situation.html
Mississippi	https://msdh.ms.gov/msdhsite/_static/14,0,420.html
Missouri	https://www.arcgis.com/apps/MapSeries/index.html?appid=8e01a5d8d8bd4b4f85add006f9e14a9d
Nodaway County	https://www.nodawaypublichealth.org/
St. Louis City	https://www.stlouis-mo.gov/covid-19/data/#totalsByDate
St. Louis County	https://stlcorona.com/resources/covid-19-statistics1/
Montana	https://dphhs.mt.gov/publichealth/cdepi/diseases/coronavirusmt
Nebraska	https://datanexus-dhhs.ne.gov/views/Covid/1_CountyStatisticsMap?%3AisGuestRedirectFromVizportal=y&%3Aembed=y
	https://www.cdc.gov/coronavirus/2019-ncov/index.html
Nevada	https://nvhealthresponse.nv.gov/
Reno County	http://reno.maps.arcgis.com/apps/opsdashboard/index.html#/dfaef27aede1414b89abf393b2ccb994
New Hampshire	https://www.nh.gov/covid19/dashboard/summary.htm
	https://www.covid19.nh.gov/news/dhhs-updates
New Jersey	https://covid19.nj.gov/
New Mexico	https://health.data.ny.gov/Health/New-York-State-Statewide-COVID-19-Testing/xdss-u53e/data
New York City	https://www1.nyc.gov/site/doh/covid/covid-19-data.page
	https://www1.nyc.gov/site/doh/covid/covid-19-data.page & Github Repo:https://github.com/nychealth/coronavirus-data
North Carolina	https://covid19.ncdhhs.gov/dashboard
North Dakota	https://www.health.nd.gov/diseases-conditions/coronavirus/north-dakota-coronavirus-cases
Northern Mariana Islands	https://chcc.datadriven.health/ui/99/dashboard/cbaeede2-4f75-11eb-b380-0242ac1d004a
Ohio	https://coronavirus.ohio.gov/wps/portal/gov/covid-19/home
Oklahoma	https://oklahoma.gov/covid19.html
Oregon	https://govstatus.egov.com/OR-OHA-COVID-19
Pennsylvania	https://www.health.pa.gov/topics/disease/coronavirus/Pages/Cases.aspx

Location	Source
Philadelphia	https://www.phila.gov/programs/coronavirus-disease-2019-covid-19/
Lancaster County	https://covid-19-lancastercountypa.hub.arcgis.com/
Chester County	https://chesco.maps.arcgis.com/apps/opsdashboard/index.html#/975082d579454c3ca7877db0a44e61ca
Puerto Rico	https://covid19datos.salud.gov.pr/
Rhode Island	https://ri-department-of-health-covid-19-data-rihealth.hub.arcgis.com/
South Carolina	https://scdhec.gov/infectious-diseases/viruses/coronavirus-disease-2019-covid-19/sc-testing-data-projections-covid-19
South Dakota	https://doh.sd.gov/news/coronavirus.aspx
Tennessee	https://www.tn.gov/health/cedep/ncov.html
Texas	https://dshs.texas.gov/coronavirus/
Amarillo County	https://covid-data-amarillo.hub.arcgis.com/
Brazoria County	https://www.brazoriacountytx.gov/departments/health-department/brazoria-county-coronavirus-map
Brazos County	http://www.brazoshealth.org
Cameron County	https://www.cameroncounty.us/publichealth/index.php/coronavirus/
Collin County	https://www.collincountytx.gov/healthcare_services/Pages/news.aspx
Corpus Christi	https://www.cctexas.com/coronavirus
Denton County	https://gis-covid19-dentoncounty.hub.arcgis.com/pages/covid-19cases
Ector County	http://www.co.ector.tx.us/page/ector.CoronavirusCOVID19
City of El Paso	http://epstrong.org/results.php
Fayette County	https://www.co.fayette.tx.us/
Fort Bend County	https://www.fbchealth.org/ncov/
Galveston County Health District	https://www.gchd.org/about-us/news-and-events/coronavirus-disease-2019-covid-19/galveston-county-confirmed-covid-19-cases
Harris County	https://publichealth.harriscountytx.gov/Resources/2019-Novel-Coronavirus
Hays County	https://hayscountytx.com/covid-19-information-for-hays-county-residents/
Hidalgo County	https://www.hidalgocounty.us/2630/Coronavirus-Updates
Laredo	https://www.cityoflaredo.com/coronavirus/
Midland County	https://www.midlandtexas.gov/955/Coronavirus-COVID-19
Mount Pleasant	https://www.mpcity.net/632/COVID-19-UPDATES
Montgomery County	https://coronavirus-response-moco.hub.arcgis.com/
San Angelo 1	https://www.cosatx.us/departments-services/health-services/coronavirus-covid-19#ad-image-0
San Angelo 2	https://www.gosanangelo.com/
San Antonio	https://covid19.sanantonio.gov/Home
Tarrant County	https://www.tarrantcounty.com/coronavirus
Travis County	https://www.traviscountytx.gov/news/2020/1945-novel-coronavirus-covid-19-information
Williamson County	http://www.wcchd.org/COVID-19/dashboard.php
Utah	https://coronavirus.utah.gov/case-counts/#overview

Location	Source
Vermont	https://www.healthvermont.gov/response/coronavirus-covid-19/current-activity-vermont
Virgin Islands	https://www.covid19usvi.com/
	https://www.covid19usvi.com/covid19-report
Virginia	https://www.vdh.virginia.gov/coronavirus/
Washington	https://www.doh.wa.gov/emergencies/coronavirus
West Virginia	https://dhhr.wv.gov/COVID-19/Pages/default.aspx
Wisconsin	https://www.dhs.wisconsin.gov/covid-19/data.htm
	https://data.dhsgis.wi.gov/datasets/wi-dhs::covid-19-data-by-county-v2/about
Wyoming	https://health.wyo.gov/publichealth/infectious-disease-epidemiology-unit/disease/novel-coronavirus/
Non-US data sources at the country/region (Admin0) or state/province (Admin1) level	
Albania	https://coronavirus.al/statistika/
Argentina	https://www.argentina.gob.ar/salud/coronavirus-COVID-19/sala-situacion
Australia	https://www.health.gov.au/news/coronavirus-update-at-a-glance
	https://www.covidlive.com.au/
Azerbaijan	https://koronavirusinfo.az/az
Belarus	https://stopcovid.belta.by/
Belgium	https://datastudio.google.com/embed/reporting/c14a5cfc-cab7-4812-848c-0369173148ab/page/giyUB
Brazil	https://covid.saude.gov.br/
	https://github.com/wcota/covid19br
	https://doi.org/10.1590/SciELOPreprints.362
Burma (Myanmar)	https://doph.maps.arcgis.com/apps/dashboards/f8fb4ccc3d2d42c7ab0590dbb3fc26b8
Canada	https://www.canada.ca/en/public-health/services/diseases/coronavirus.html
Alberta	https://www.alberta.ca/covid-19-alberta-data.aspx
British Columbia	https://experience.arcgis.com/experience/a6f23959a8b14bfa989e3cda29297ded
Manitoba	https://www.gov.mb.ca/covid19/updates/cases.html
New Brunswick	https://experience.arcgis.com/experience/8eeb9a2052d641c996dba5de8f25a8aa
Northwest Territories	https://www.gov.nt.ca/covid-19/
Ottawa	https://www.ottawapublichealth.ca/en/reports-research-and-statistics/daily-covid19-dashboard.aspx
Toronto	https://www.toronto.ca/home/covid-19/covid-19-latest-city-of-toronto-news/covid-19-status-of-cases-in-toronto/
Peel	https://peelregion.ca/coronavirus/case-status/
Halton	https://www.halton.ca/For-Residents/Immunizations-Preventable-Disease/Diseases-Infections/New-Coronavirus
Prince Edward Island	https://www.princeedwardisland.ca/en/information/health-and-wellness/pei-covid-19-case-data

Location	Source
Quebec	https://www.quebec.ca/en/health/health-issues/a-z/2019-coronavirus/situation-coronavirus-in-quebec/
Yukon	https://yukon.ca/en/case-counts-covid-19
Nunavut	https://www.gov.nu.ca/health/information/covid-19-novel-coronavirus
Chile	https://www.minsal.cl/nuevo-coronavirus-2019-ncov/casos-confirmados-en-chile-covid-19/
	https://www.gob.cl/coronavirus/cifrasoficiales/
China	http://www.nhc.gov.cn/xcs/yqtb/list_gzbd.shtml
	http://weekly.chinacdc.cn/news/TrackingtheEpidemic.htm
Colombia	http://www.ins.gov.co/Noticias/Paginas/Coronavirus.aspx
Czech Republic (Czechia)	https://onemocneni-aktualne.mzcr.cz/covid-19
Denmark	https://experience.arcgis.com/experience/aa41b29149f24e20a4007a0c4e1
Ecuador	https://www.salud.gob.ec/actualizacion-de-casos-de-coronavirus-en-ecuador/
El Salvador	https://covid19.gob.sv/
Finland	https://experience.arcgis.com/experience/92e9bb33fac744c9a084381fc35aa3c7
France	https://dashboard.covid19.data.gouv.fr/
	https://www.data.gouv.fr/fr/datasets/synthese-des-indicateurs-de-suivi-de-lepidemie-covid-19/
	https://github.com/opencovid19-fr
Georgia	https://interaktiv.morgenpost.de/corona-virus-karte-infektionen-deutschland-weltweit/
	https://www.rki.de/EN/Content/infections/epidemiology/outbreaks/COVID-19/COVID19.html
Greece	https://tablerocovid.mspas.gob.gt/
Hong Kong SAR	https://www.chp.gov.hk/en/features/102465.html
	https://chp-dashboard.geodata.gov.hk/covid-19/en.html
Hungary	https://koronavirus.gov.hu/
Iceland	https://www.covid.is/data
India	https://www.mygov.in/covid-19
Indonesia	https://covid19.go.id/peta-sebaran
Ireland	https://covid19ireland-geohive.hub.arcgis.com/
Israel	https://govextra.gov.il/ministry-of-health/corona/corona-virus/
	https://datadashboard.health.gov.il/COVID-19/general
Italy	https://github.com/pcm-dpc/COVID-19/tree/master/
	http://www.salute.gov.it/nuovocoronavirus
Japan	https://www3.nhk.or.jp/news/special/coronavirus/data/
Jordan	https://corona.moh.gov.jo/en
Kazakhstan	https://www.coronavirus2020.kz/
Kosovo	https://corona-ks.info/?lang=en
	https://raw.githubusercontent.com/bgeVam/Kosovo-Coronatracker-Data/master/data.json

Location	Source
	https://datastudio.google.com/embed/reporting/2e546d77-8f7b-4c35-8502-38533aa0e9e8/page/MT0qB
Lebanon	https://corona.ministryinfo.gov.lb/
Lithuania	https://experience.arcgis.com/experience/cab84dcfe0464c2a8050a78f817924ca
Luxembourg	https://data.public.lu/fr/datasets/covid-19-rapports-journaliers/#_
Macau SAR	https://www.ssm.gov.mo/portal/
Malaysia	https://covid-19.moh.gov.my/
	https://github.com/MoH-Malaysia/covid19-public
Mexico	https://datos.covid-19.conacyt.mx/#DOView
Monaco	https://www.gouv.mc/Action-Gouvernementale/Coronavirus-Covid-19/Actualites
Netherlands	https://experience.arcgis.com/experience/ea064047519040469acb8da05c0f100d
New Zealand	https://www.health.govt.nz/our-work/diseases-and-conditions/covid-19-novel-coronavirus/covid-19-data-and-statistics/covid-19-current-cases
	https://covid19.gov.ck/
Palau	http://www.palauhealth.org/2019nCoV_SitRep/MOH-COVID-19%20Situation%20Report.pdf
Paraguay	https://www.mspbs.gov.py/reporte-covid19.html
Pakistan	http://covid.gov.pk/stats/pakistan
Peru	https://covid19.minsa.gob.pe/sala_situacional.asp
	https://www.gob.pe/busquedas?categoria]=6-salud&contenido]=noticias&institucion]=minsa&sheet=1&sort_by=recent&tipo_noticia]=3-comunicado
Philippines	https://doh.gov.ph/covid19tracker
Poland	https://www.gov.pl/web/koronawirus/wykaz-zarazen-koronawirusem-sars-cov-2
Portugal	https://esriportugal.maps.arcgis.com/apps/dashboards/acf023da9a0b4f9dbb2332c13f635829
Romania	https://datelazi.ro/
Russia	https://xn--80aesfpebagmfblc0a.xn--p1ai/information/
Saudi Arabia	https://covid19.moh.gov.sa/
Serbia	https://covid19.rs/homepage-english/
Singapore	https://www.moh.gov.sg/covid-19
Slovakia	https://korona.gov.sk/koronavirus-na-slovensku-v-cislach/#covid-aut-nasledujuci-pondelok
Slovenia	https://covid-19.sledilnik.org/en/stats
South Africa	https://sacoronavirus.co.za/
South Korea	http://ncov.mohw.go.kr/
Spain	https://www.rtve.es/noticias/20200514/mapa-del-coronavirus-espana/2004681.shtml
Sweden	https://experience.arcgis.com/experience/09f821667ce64bf7be6f9f87457ed9aa

Location	Source
Switzerland	https://www.bag.admin.ch/bag/en/home/krankheiten/ausbrueche-epidemien-pandemien/aktuelle-ausbrueche-epidemien/novel-cov/situation-schweiz-und-international.html
	https://github.com/openZH/covid_19
Taiwan*	https://sites.google.com/cdc.gov.tw/2019ncov/taiwan?authuser=0
Thailand	https://ddc.moph.go.th/viralpneumonia/eng/index.php
	https://covid19.ddc.moph.go.th/en
Turkey	https://covid19.saglik.gov.tr/TR-66935/genel-koronavirus-tablosu.html
	https://corona.cbddo.gov.tr/Home/GetLastDayDifference
Ukraine	https://covid19.rnbo.gov.ua/
United Arab Emirates	https://covid19.ncema.gov.ae/en
United Kingdom	https://coronavirus.data.gov.uk/#category=nations&map=rate
	https://www.gov.scot/publications/coronavirus-covid-19-trends-in-daily-data/

* The names of locations included on the Website correspond with the official designations used by the U.S. Department of State. The presentation of material therein does not imply the expression of any opinion whatsoever on the part of JHU concerning the legal status of any country, area, or territory or of its authorities. The depiction and use of boundaries, geographic names and related data shown on maps and included in lists, tables, documents, and databases on this website are not warranted to be error-free nor do they necessarily imply official endorsement or acceptance by JHU.

Appendix B: Extended Discussion of Data Scraping

Data scraping has always been an incredibly difficult process to automate due to the nature of websites and how web technologies are designed to support quick changes in website development. Initial web development began with base technologies that focused on the movement of data known as Hypertext Transfer Protocol (HTTP) and the actual content of a website contained in Hypertext Markup Language (HTML). As web technologies evolved, websites have changed in complexity and incorporated new techniques such as Asynchronous JavaScript and XML (Ajax), Cascading Style Sheets (CSS), JavaScript (JS), and JavaScript Object Notation (JSON). Website developers usually use a combination of all of these techniques in modern web development.

Varying web scraping techniques have evolved as a result of the different web technologies available. The original technique for web scraping is known as HTML parsing which involves the analysis of the website's underlying HTML and performing tree parsing. This is no longer a reliable strategy of scraping as JS and Ajax have introduced an asynchronous nature to websites, and web browsers can dynamically modify the HTML of a webpage based on logic from the JS and CSS components of a website. Scraping data from websites now relies on three overall methodologies: HTML/JS parsing, browser WebDrivers, and Ajax and network request monitoring.

Some websites still embed their data within the HTML or JS files packaged within a website, which allows for effective HTML and JS parsing methods. This is a straightforward solution, but can become extremely brittle and reliant on both the original website developer's data structures as well as the data scraping developer's logic. While quick to develop, these scrapers typically require many fixes over the lifetime of data collection. This method does not work with more modern websites because they usually use JS to fill out data placeholders within the HTML that are empty upon initial HTTP requests.

Browser WebDrivers are a relatively new technology where a browser is launched by software (as opposed to a human user) and is directed to load the website of interest. This allows the browser to load the website and execute all of the JS, CSS, and Ajax logic in order to render the appropriate data, which is extremely effective for modern websites. This method typically comes with its own host of problems such as process management for your browsers, very brittle paths for browser interaction known as Xpaths, and unexpected errors when run from a headless (no display) configuration.

Inspecting Ajax and network requests is one of the final umbrella methods for web scraping. This technique involves monitoring and understanding the Ajax requests a website makes to a data service living elsewhere and mimics those network requests in a separate process. For websites that use external data services (for example, ArcGIS), these are usually easy to observe and recreate from a user perspective. This method is usually reliable and stable, but the quality of data can become an issue over time, especially as new data services are being developed. This introduces issues such as silent failures where the data being scraped may become outdated (e.g., if a source moves active reporting from an external data service to a new one but does not decommission the original service), but may not be immediately obvious to a data scraping developer.

While it may not take a huge amount of effort to scrape targeted data from a single website and convert to a structured format, it becomes a much harder problem when trying to scrape data from a multitude of different websites. At the beginning of the pandemic, every organization began developing their own webpages for communicating data. Because many of these webpages were new and the nature of data and reporting was constantly changing, the structure of these webpages were constantly changing. This meant that automating data scraping was next to impossible or would only run successfully for limited amounts of time due to the maturity of these websites. Maintenance for these web scrapers became a mandatory part of the automation.

Because adjusting data scrapers is unavoidable, we designed an architecture that would allow developers to easily adjust data extraction methods from these websites and apply these changes quickly. The main requirements for the architecture included: flexibility of the data scraping method, standardization of extracted data, explicit failures, and deterministic location behavior. The code for the data scrapers follows an object-oriented structure which allows our team to quickly identify important pieces of code and adjust the scraping methods in a timely manner. The standardization of the extracted data allows our developers to identify data of interest, and guarantee clean aggregation of the data further down our system. Explicit failures are required in our architecture in order to quickly notify our team that a website (or the underlying data) has changed and requires maintenance. Silent failures should be avoided at all costs as they can result in data errors in the future. The final requirement deterministic location behavior guarantees that we correctly correlate data of interest to the specific location in the world it pertains to. This requires careful maintenance as locations in the world can have multiple names, overlapping regions, or may not relate to a specific place (such as states reporting Out of State information).

A couple of other key considerations for data scraping are scheduling and prioritization of raw data collection. Data scraping execution is scheduled at fixed intervals in order to guarantee fast updates and standardized sampling times. This allows us to collect data and analyze it at expected intervals, as well as develop a better understanding of source reporting and the data scrapers we have developed. Scheduling is also important as a form of rate limiting. We do not want to constantly attempt data scraping on such important websites, as we do not want to create unnecessary load on websites (unintentional distributed denial of service (DDoS) attacks) that are providing public services. We also always attempt to complete raw data collection in order to collect as much data as possible which allows us to either compare data across sources, or ensure back up data sources if one goes down.

Modern data scraping is a difficult problem, largely due to the modernization of web technologies as well as the rapidly evolving landscape of websites. As a pandemic evolves, the data changes, and so will the structures of the underlying websites. By applying a mixture of HTML/JS parsing, browser WebDrivers, and Ajax request techniques, we are able to scrape modern websites for important data. In order to ensure successful data scraping, we developed an architecture that highlights flexibility of data scraping methods, structured data results, explicit failure and logging, and deterministic location behavior. Although not key pieces of logic or technologies, we take care in scheduling our scrapers and guaranteeing as much raw data collection as possible. Automating such a huge process requires effective human-machine

teaming, a deep understanding of the reporting from sources, and a flexible approach to web scraping.

The methods used to scrape individual sites are frequently adapted as the sources alter their reporting styles and approaches. Practically all scrappers use some element of natural language processing (NLP) to identify, collect, and store the correct data type. As of June 1, 2022, about 30% of deployed scrappers use HTML text parsing approaches through the re (Regular Expression) or BeautifulSoup python libraries. Only 2% of sources require manual collection.

Appendix C: Extended Case Studies

There are too many stories to share regarding this project than could fit in the main text of this manuscript. Indeed, even with this extended list we only scratch the surface of the challenges faced over more than two years of our efforts, and the lessons learned along the way. This section aims to share a further snippet of the decision-making process underlying the JHU CSSE COVID-19 dashboard. Broadly, the case studies below are categorized into two areas: data source issues and data organization/visualization issues.

DATA SOURCE ISSUES

Probable cases in Social and Medical-Social Facilities (ESMS) in France: Tracking the spread of SARS-CoV-2 in vulnerable populations, such as the elderly, is of the utmost importance. Among other epidemiological data, the French Health Ministry for some time publicly provided confirmed and probable cases in these nursing homes (équipements sociaux et médico-sociaux (ESMS) in French). In the summer of 2020, the probable cases represented individuals who had clinical symptoms of acute respiratory illness and lived in a facility with three or more PCR-confirmed cases.[1] Due to limits on testing capacity, these probable cases did not have follow-on virological testing and thus were effectively ineligible to become confirmed cases. As testing capacity increased in France, the number of probable cases stagnated and began to decrease, presumably as "probable" cases were able to access testing and become either "confirmed" cases or removed from the case total. On or around June 16, the reporting of probable cases was dropped and the 37,129 remaining probable cases disappeared from the national reporting. At this time, the outcomes of these 37,129 cases, and whether any were later confirmed PCR positive, is unclear. While the French approach was understandable given the massive demand for scarce testing resources, the lack of clear communication on the fate of the 37,129 probable cases begets an assumption that the reported case totals in France grossly underestimate the caseload experienced in ESMS in late spring and early summer.

For our dataset, we made the assumption that the probable case category invariably included many cases that would be confirmed if testing had been available, and for that reason, these cases have been included within the total case count since publication. When the 37,129 cases were removed from national reporting without explanation as to their fate, those cases were carried forward as a constant representing the individuals that likely would have tested positive given other circumstances.

Selective removal of cases in prison or jail settings: Numerous prison systems in the United States have suffered significant outbreaks within their facilities. This issue is particularly pronounced in the Texas Department of Criminal Justice (TDCJ), which has thus far seen 65,607 cases among inmates and staff and 239 inmates and 78 staff members die of COVID-19, respectively.[2] These concentrated outbreaks have been a large portion of the number of cases diagnosed in Texas counties that contain multiple prisons. In one of these Texas counties, the local government removed these prison cases from their dashboard and public reports, leading to a discrepancy between the county reported and state reporting totals. Per personal communication, the county officials removed the cases due to inefficient sharing of recoveries from prison officials that resulted in an overestimation of active cases in the county. As active case totals were being used to drive reopening policies, it is understandable that county officials

would want to limit any risk of overestimation. However, obscuring this data masks the scale of the outbreak in the county as there are still movements of staff in and out of the prisons who can readily transmit the virus within their households and communities.

For this county, data has been exclusively sourced from the Texas Department of Health (which does include prison cases) to ensure that the total number of cases in the state of Texas is accurately represented

Disconnect between reporting at different administrative levels: In most instances, case data is collected at the local/municipality level and fed up a hierarchical structure to a central reporting entity, normally at the national level but sometimes at state levels such as in the United States. Along the way, multiple institutions may be responsible for reporting the data to the public. In several instances, notably in the U.S. states of Texas and California, there has at times been a disconnect between the local and state cumulative reported counts, resulting in disparate data being published at the same time across two sources. To ensure that our reporting was as close to real-time as possible, a patchwork approach to collect data from multiple sources reporting for a single location was used. Specifically, the data fusion service mitigates this challenge provided all sources have been identified.

While this challenge is not specific to the U.S., there are alternate practices in place internationally. For example, both France and the United Kingdom consolidate all reporting at the national level. While this approach is effective in eliminating reporting conflict, limiting reporting to a single source greatly increases the risk of stale data in the instance that the source experiences disrupted data flows (e.g., https://github.com/CSSEGISandData/COVID-19/issues/4264).

North Korea COVID-19 cases and deaths: The Democratic People's Republic of Korea (hereafter North Korea) did not report any COVID-19 cases until May 12, 2022.[3] The next day, South Korean news, citing a press release from the North Korean government, reported that 350,000 people were being treated for "unknown fever" and six people had died.[4] As of June 9, 2022, this number of "unknown fever cases" has ballooned to over 4.2 million.[5] However, it has been impossible to confirm the methodology being used to identify COVID-19 cases and evaluate whether this is consistent with the working definition of the U.S. CDC. Further, no cases have as of yet been reported to the WHO. Therefore, we are not, at this time (June 10, 2022), confident in the consistency of including these as cases and have decided to exclude them from our repository.

DATA ORGANIZATION/VISUALIZATION ISSUES

Point level and location: The geometric centroid of a county or region is generally used to represent cases from each location. When the centroid of a location is not within its land mass boundary, we manually adjust its location to the regional capital or a reasonable location inside of its boundary. For instance, we are using the points on the major Australian cities to represent cases in states and territories. When the first COVID-19 case in Spain was reported in the Canary

Islands, the Spain dot was first located on the island itself. As cases in mainland Spain rose, we moved the Spain dot to the Iberian peninsula.

Determination of time cut-offs: The data collected and reported on the dashboard has to follow a regular time interval to be useful for most data analysis. For this, the dashboard produces graphs and products based on 'per-day' cutoffs, so the daily change in data can be easily tabulated. However, producing a single product for all locations across all time zones has presented challenges in selecting the precise moment for the day cutoff for the generation of the time series and daily report files. The cutoff time was initially chosen as 11:59 PM Greenwich Mean Time (UTC or GMT+0). However, this time occasionally resulted in cases on the West Coast of the United States not being captured, which was viewed as inappropriate for a US-centric data effort. The cutoff time was then extended to 4:00 AM UTC, but this happened to fall right around the update time for the Indian Ministry of Health, resulting in cases sometimes being stale between two updates and double-counting on the next day. Now, all daily products are generated at 5:00 AM UTC. When these changes were implemented, historical data was shifted to reflect this time cut-off for all dates. India, Pakistan, and Mexico still occasionally update shortly after product generation, so our system gives these countries an extra two-hour window in which their updates will be applied to the previous day.

Location representation: The design of the dashboard requires the need to assign data to locations with visualized geographic boundaries. This has required decisions to be made on both the names of locations and the assignment of data to specific locations, which has at times led to criticism as it related to geopolitical controversy over disputed territories. To remove ambiguity and assign a standard to location representation, the official designations of the U.S. Department of State were used to standardize inter- and intra-relationships between sovereign nations.[6,7]

There have been instances, particularly in the United States, where two or more organizations have reported identical cases falling under the jurisdiction of both organizations. In the United States, both the Navajo Nation American Indian Territory and county health departments in Arizona, New Mexico, and Utah reported cases occurring in areas overlapping each jurisdiction, leading to an inflation in cases and necessitating alterations to our data collection to avoid duplication. In other instances, the locations of COVID-19 cases and deaths have had to be reassigned to match the location designation of the U.S. Department of State. For example, the Russian Federation source (https://xn--80aesfpebagmfblc0a.xn--p1ai/information/) reports COVID-19 data for Chechnya and Sevastopol, which the U.S. Department of State designates as part of Ukraine. Here, we remove these cases and deaths from our Russia total and assign them to Ukraine.

Cruise ship repatriates: When the United States repatriated individuals traveling on cruise ships that had COVID-19 outbreaks (such as the Diamond Princess or MS Zaandam), the location to where these cases should be assigned was not clear. Initially, the cases were assigned to the geographic centroid of the United States in Kansas. These resulted in public confusion[8] so the cases were moved to "null island". These cases do not have a physical location on the dashboard but do contribute to the overall total for their country of repatriation.

Locations with alternative data resolution: In rare instances, our dataset has had to violate our administrative level designations for US locations when the data is or was not available at the

appropriate resolution. When New York (NYC) reported their first COVID-19 cases, they were published at the city level and not the borough (county) level. Accordingly, our dataset aggregated all cases from the five NYC boroughs/counties into a single total and used the sum of the population of each borough to represent the population of NYC (used to calculate incidence rate). When the data became available at the borough level, the historical data was modified to reflect this resolution. In Utah, reporting for some locations is at the health jurisdiction level rather than the county level. These health jurisdictions are at a lower resolution than county-level and can contain more than one county within their total.

Supplemental References: Appendix C

1 Bernadou A, Bouges S, Catroux M, *et al.* High impact of COVID-19 outbreak in a nursing home in the Nouvelle-Aquitaine region, France, March to April 2020. *BMC Infectious Diseases* 2021; **21**: 198.

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3 Bae G, Regan H. North Korea declares 'major national emergency' as first case of Covid-19 identified, state media reports [internet]. CNN. 2022 May 12 [cited 2022 June 8]. Available from: https://edition.cnn.com/2022/05/11/asia/north-korea-covid-omicron-coronavirus-intl-hnk/index.html

4 Wonju Y. (LEAD) N. Korea reports 6 COVID-19 deaths amid 'explosive' spread of fever [internet]. Yonhap News Agency. 2022 May 13 [cited 2022 June 8]. Available from: https://en.yna.co.kr/view/AEN20220513000851325?section=news.

5 Epidemic Spread and Treatment Results in DPRK [internet]. KCNA Watch. 2022 June 9 [cited 2022 June 9]. Available from: https://kcnawatch.org/newstream/1654758572-833903755/epidemic-spread-and-treatment-results-in-dprk/.

6 Independent States in the World [internet]. United States Department of State. [cited 2022 Feb 6]. https://www.state.gov/independent-states-in-the-world/

7 Dependencies and Areas of Special Sovereignty [internet]. United States Department of State. [cited 2022 Feb 6]. https://www.state.gov/dependencies-and-areas-of-special-sovereignty/

8 Local Coronavirus Confusion Cleared Up By Johns Hopkins [internet]. KJRH. 2020 Feb 25 [updated 2020 Feb 26; cited 2022 Feb 6]. Available from: https://www.kjrh.com/news/local-news/coronavirus-confusion-cleared-up-by-johns-hopkins

Appendix D: Data README

Data modification records

This section will contain any modifications to our datasets as well as the reason for the change. If the error results from an issue on our collection of the data, the error will be listed in the errata.csv in the csse_covid19_time_series folder. If the error results due to a change from the source, the change and reasoning will be listed below.

Generalized Format:
Date: Location | Change | Files affected | Reason/Other notes | Source

- February 14, 2020: Hubei Province, China | Reduction of 108 deaths | Time_series_covid19_confirmed_global.csv | N/A | N/A
- February 13, 2020: Hubei Province, China | Inclusion of probable cases (clinical symptoms) from source | Time_series_covid19_confirmed_global.csv | For lab-confirmed cases only (Before Feb 17), please refer to [who_covid_19_situation_reports](https://github.com/CSSEGISandData/COVID-19/tree/master/who_covid_19_situation_reports) | N/A
- February 27, 2020: Italy | Source limits testing to at-risk people showing symptoms of COVID-19 | N/A | N/A | (Data Source: https://apnews.com/6c7e40fbec09858a3b4dbd65fe0f14f5)
- March 1, 2020: Diamond Princess| All cases of COVID-19 in repatriated US citizens from the Diamond Princess are grouped together, and their location is currently designated at the ship's port location off the coast of Japan. These individuals have been assigned to various quarantine locations (in military bases and hospitals) around the US. This grouping is consistent with the CDC. | N/A | N/A| N/A
- April 13, 2020: Hainan Province, China | We responded to the error from 3/24 to 4/1 we had incorrect data for Hainan Province. We had -6 active cases (168 6 168 -6). We applied the correction (168 6 162 0) that was applied on 4/2 for this period (3/24 to 4/1). | daily reports | N/A | N/A
- April 16, 2020: France | After communicating with solidarites-sante.gouv.fr, we decided to make these adjustments based on public available information. From April 4 to April 11, only "cas confirmés" are counted as confirmed cases in our dashboard. Starting from April 12, 2020, both "cas confirmés" and "cas possibles en ESMS" (probable cases from ESMS) are counted into confirmed cases in our dashboard. ([More details](https://github.com/CSSEGISandData/COVID-19/issues/2094)) | time_series_covid19_confirmed_global.csv | N/A
- April 17, 2020: Wuhan Province, China | Increase in death toll from 2579 to 3869 | time_series_deaths_global.csv | N/A | ([Source1](http://www.china.org.cn/china/Off_the_Wire/2020-04/17/content_75943843.htm), [Source2](http://www.nhc.gov.cn/yjb/s7860/202004/51706a79b1af4349b99264420f2cee54.shtml))
- April 21-22, 2020: Benton and Franklin, WA | Data were adjusted/added to match the WA DOH report. See [errata](https://github.com/CSSEGISandData/COVID-19/blob/master/csse_covid_19_data/csse_covid_19_time_series/Errata.csv) for details.

- April 22, 2020: Navajo Nation, US | Cases within the Navajo Nation had been tracked as an independent data source which resulted in double counting of the cases and deaths within Arizona, New Mexico, and Nevada. The US time series files for confirmed from 4/1 and 4/8 and the US time series files for deaths from 3/31 to 4/17 were corrected to remove the double counting. Adjustments were also made for Navajo County, AZ; Coconino County, AZ; Apache County, AZ; San Juan County, NM; McKinley County, NM; Cibola County, NM; Socorro County, NM; and San Juan County, UT. See errata file for specific details.
- April 24, 2020, New York City, NY | Back distribution of probable deaths, removal of probable deaths as probable cases | time_series_covid19_confirmed_us.csv, time_series_covid19_deaths_us.csv | This change is in line with CDC reporting guidelines. | N/A
- April 26, 2020: Australia | Revision of recovered data from 4/20 to 4/26 | time_series_covid19_recovered_global.csv | N/A | N/A
- April 28, 2020: Other | for consistency, we no longer report the hospitalization data as the max of "current - hospitalized" and "cumulative - hospitalized", and instead only report 'cumulative - hospitalized' from [Covid Tracking Project](https://covidtracking.com/). For states that do not provide cumulative hospital counts no hospital data will be shown.
- April 28, 2020: Lithuania | Adjustment in reporting standards for confirmed cases. Prior to April 28, confirmed cases = the number of positive laboratory test results rather than the number of positive individuals. | N/A | ((Data Source: https://lietuva.lt/wp-content/uploads/2020/04/UPDATE-April-28.pdf)).
- April 30, 2020: United Kingdom | Release of deaths in care homes (prior reporting was hospitalized deaths only). All deaths back distributed and all values changed | time_series_cvoid19_deaths.csv | N/A | ((Data Source: coronavirus.data.gov.uk))
- May 1, 2020: Kosovo and Serbia | Revision of all data for from 4/19-4/30 adjusted due to stale data source | time_series_covid19_confirmed_global.csv, time_series_covid19_deaths_global.csv, time_series_covid19_recovered_global.csv | N/A | N/A
- May 20, 2020: United Kingdom | Large reduction in cases | time_series_covid19_confirmed_global.csv | "This is due to historical data revisions across all pillars." | ((Data Source: https://www.gov.uk/guidance/coronavirus-covid-19-information-for-the-public), [DHSCgovuk Twitter](https://twitter.com/DHSCgovuk/status/1263159710892638208)).
- May 27, 2020: Netherlands | Official source ceases reporting recovered data | time_series_covid19_recovered_global.csv | For consistency, we have nullified the previous recorded recoveries | N/A
- June 2, 2020: France | Reduction in confirmed cases due to a change in calculation method. Since June 2, patients who test positive are only counted once. (Baisse des cas confirmés due à un changement de méthode de calcul. Depuis le 2 juin, les patients testés positifs ne sont plus comptés qu'une seule fois.) ((Data Source: https://dashboard.covid19.data.gouv.fr/vue-d-ensemble?location=FRA))
- June 5, 2020: Chile | On June 2nd, Chile's Ministerio de Salud began reporting national "total active cases" where in the past they had reported national "total recoveries". To accommodate this change and to stay consistent with the ministry's reporting of active cases, from June 2nd forward we are computing recoveries based on the formula "Active Cases =

Total Case – Deaths – Recoveries". Based on this, the data for Chile will reflects a jump in recoveries on June 2nd. ((Data Source: https://www.minsal.cl/nuevo-coronavirus-2019-ncov/casos-confirmados-en-chile-covid-19/))

- June 5, 2020: Sweden | In an internal audit of the data for Sweden, it has become clear to our team that our reported total of recoveries conflates regional reporting of the number of patients being released from hospitals with country wide recovery data. As this regional reporting is not universally available and represents only a subset of recoveries, our prior reporting did not accurately represent nationwide recoveries. To ensure the accuracy of our data, we have chosen to nullify the number of recovered cases in Sweden until the data is released by the national health ministry. We will also be removing recovery data from our historical time series due to this assessment. | time_series_covid19_recovered_global.csv | N/A | N/A
- June 5, 2020: Russia/Ukraine | As noted in the disclaimer for the dashboard, the geographic designations in this data have been designed to be consistent with public guidance from the US State Department. This does not imply the expression of any opinion whatsoever on the part of JHU concerning the legal status of any country, area or territory or of its authorities. In implementing subnational data for the Russian Federation and the Ukraine, data for the Crimean Peninsula has been apportioned in line with this guidance. This adjustment explains a difference in national totals for both the Russian Federation and Ukraine relative to alternate reporting. | All files | N/A | N/A
- June 10, 2020: Pakistan | Our previous reporting for Pakistan had a single day delay. A recent update corrected this issue but resulted in data for June 7th being lost. We have corrected this issue by adding June 7th manually and pulling all of the Pakistan data back by a single day. | time_series_covid19_confirmed_global.csv, time_series_covid19_deaths_global.csv, time_series_covid19_recovered_global.csv | N/A | N/A
- June 12, 2020: St. Louis City, MO | Data for confirmed cases and deaths from March 16 to June 11 were updated to match up with the updated official report at the [City of St. Louis dashboard](https://www.stlouis-mo.gov/covid-19/data/index.cfm). Date of the first case was updated to March 16, and date of the first deaths was updated to March 23.
- June 12, 2020, St. Louis County, MO | data for confirmed cases and deaths from March 9 to June 11 were updated to match up with the updated official report at [St. Louis County government site](https://stlcorona.com/resources/covid-19-statistics1/). Date of the first case was remained on March 8, and date of the first deaths was updated to March 20.
- June 12, 2020: Massachusetts | Cases from April 15 to June 11 were updated to match official updateded statistics from the [Massachusetts government raw data - County.csv](https://www.mass.gov/info-details/covid-19-response-reporting). This change arose due to to release of historical probable cases by the state. The alteration distributes probable cases and updates some confirmed case counts that were revised by the state. Dukes and Nantucket are still reported together, though County.csv lists them separately.
- June 16, 2020: Oregon | Delay in reporting from Oregon Health Authority resulted in time series for confirmed and deaths not updating for June 14th - updated via official source. | time_series_covid19_confirmed_global.csv, time_series_covid19_deaths_global.csv | Recovered data was not available for this date. | (Data Source: https://www.oregon.gov/oha/ERD/Pages/Oregon-reports-101-new-confirmed-presumptive-COVID-19-cases-2-new-deaths.aspx).

- June 19, 2020: Belarus | Case data for April 18th and 19th | time_series_covid19_confirmed_global.csv | Initial error was due to a [delay](https://news.tut.by/society/681391.html) in reporting by the Belarusian health authorities that wasn't properly distributed. | See prior line for source
- June 25, 2020: New Jersey | NJ began reporting probable deaths today and the record for the 25th reflects these 1854 deaths not previously reported. | N/A | Additional information can be found in the [transcript](https://nj.gov/governor/news/news/562020/approved/20200625a.shtml) of the state's June 25th coronavirus briefing.
- June 27, 2020: France | Internal audit identified issue with calculation of probable cases in nursing homes for France. The French Health Ministry ended public reporting of this number on June 1st - we have since carried that number of probable cases forward.
- June 30, 2020: New York | Increase in deaths in New York by 692 | ([NYC gov](https://www1.nyc.gov/site/doh/covid/covid-19-data.page)) We distributed these data back to the time series tables according to [nychealth GitHub](https://github.com/nychealth/coronavirus-data/blob/master/deaths/probable-confirmed-dod.csv).
- July 3rd, 2020: United Kingdom | On July 2nd, the United Kingdom revised their case count due to double counting of cases in England that had been tested in multiple facilities. In doing so, they revised their historical time series data for England (available [here](https://coronavirus.data.gov.uk/)). This change resulted in the need to revise our time series for the United Kingdom. As our time series data represents collective cases in England, Scotland, Northern Ireland, and Wales and the change only affected England, we gathered historical from each respective country's national dashboard (available [here](https://public.tableau.com/profile/public.health.wales.health.protection#!/vizhome/RapidCOVID-19virology-Public/Headlinesummary), [here](https://www.arcgis.com/apps/opsdashboard/index.html#/658feae0ab1d432f9fdb53aa082e4130), and [here](https://app.powerbi.com/view?r=eyJrIjoiZGYxNjYzNmUtOTlmZS00ODAxLWE1YTEtMjA0NjZhMzlmN2JmIiwidCI6IjljOWEzMGRlLWQ4ZDctNGFhNC05NjAwLTRiZTc2MjVmZjZjNSIsImMiOjh9)) to completely rewrite the time series data for cases in the United Kingdom.
- July 9, 2020: Japan | Update of confirmed cases from Feb 5 to May 27 and deaths from Feb 13 to May 27 | time_series_covid19_confirmed_global.csv, time_series_covid19_deaths_global.csv | N/A | Updated according to the [Japan COVID-19 Coronavirus Tracker](https://covid19japan.com/)
- July 14, 2020: United Kingdom | United Kingdom has made frequent revisions to their death data | time_series_covid19_deaths_global.csv | N/A | Death data was downloaded from [this link](https://coronavirus.data.gov.uk/downloads/csv/coronavirus-deaths_latest.csv) and the death totals for the UK from 3/25 to 6/22 in time_series_covid19_deaths_global.csv were updated to match the data in the official report.
- July 18, 2020: Puerto Rico | We are now providing the confirmed cases for Puerto Rico at the municipality (Admin1) level. The historic Admin1 data ranging from 5/6 to 7/17 are from [nytimes dataset](https://github.com/nytimes/covid-19-data). Confirmed cases before 5/6 are categorized into Unassigned, Puerto Rico in `time_series_covid19_confirmed_US.csv`.

Meanwhile, deaths are all grouped into Unassigned, Puerto Rico in `time_series_covid19_deaths_US.csv`. Daily cases are from [Puerto Rico Departamento de Salud](http://www.salud.gov.pr/Pages/coronavirus.aspx).

- July 20, 2020: Uganda | Recovered data includes Ugandans, non Ugandans and refugees while confirmed data contains Ugandans only. This discrepancy results in negative cases being reported in the daily reports | Daily reports | (Data Source: https://twitter.com/gbkatatumba/status/1285150623692926976)
- July 22, 2020: Liechtenstein | Update to all cases and recovered | time_series_covid19_confirmed_global.csv, time_series_covid19_recovered_global.csv | N/A | Updated in line with historical data provided on this [government website](https://www.llv.li/inhalt/118863/amtsstellen/situationsbericht) and within this [pdf](https://www.llv.li/files/ag/aktuelle-fallzahlen.pdf)
- July 22, 2020: Iceland | From June 15 to July 20, the government reported antibody cases. We have removed these cases from our time series file | time_series_covid19_confirmed_global.csv | N/A | (Data Source: https://www.covid.is/data)
- July 28, 2020: Kosovo | Overwriting Kosovo data due to stale source. Data was updated from 3/14 to 7/26. | time_series_covid19_confirmed_global.csv, time_series_covid19_deaths_global.csv, time_series_covid19_recovered_global.csv | N/A | Data revised based on reporting from the [Kosovo National Institute of Public Health](https://www.facebook.com/IKSHPK), the [Kosovo Corona Tracker](https://corona-ks.info/?lang=en), and coincident reporting from local news sources: [Koha Ditore](https://www.koha.net/) and [Telegrafi](https://telegrafi.com/).
- August 17, 2020: United Kingdom | Government changes definition of death to those occuring within 28 days of a positive test. We have revised the historical death data to match this reporting. | time_series_covid19_deaths_global.csv | The change in definition results in a loss of around 5000 deaths from the official tally. | Data accessed from the [official webpage](https://coronavirus.data.gov.uk/deaths) on August 17 was used to recreate the time series file.
- August 17, 2020: Texas | A backlog of laborartory reporting has been identified in the state of Texas which is causing spikes in reporting at the county level (for reference, see the [Aug 16 press release from Dallas County](https://www.dallascounty.org/Assets/uploads/docs/covid-19/press-releases/august/081620-PressRelease-DallasCountyReports5361AdditionalPositiveCOVID-19Cases.pdf) and local reporting (e.g. [KENS5's reporting in San Antonio](https://www.kens5.com/article/news/local/the-texas-department-of-state-health-services-told-3news-that-walgreens-pharmacy-reported-experiencing-a-coding-error-which-they-have-now-corrected/503-ff7a0eb5-9ce9-4127-82a6-8120175a0d67)). Data is not currently available that would allow for these positive cases to be appropriately back distributed.
- August 25, 2020: US Virgin Islands, US | Improper accession of data resulted in stale cases and deaths for August 22 and 23. These were corrected using the data available [here](https://www.covid19usvi.com/covid19-report).
- August 25, 2020: Collin County, Texas | Case data reset to state level data for August 21-25. The source from the Collin County health department has been removed from the public eye. These adaptations are to align with our new source.

- August 27, 2020: Sweden | Government's Public Health Agency published an [official release](https://www.folkhalsomyndigheten.se/smittskydd-beredskap/utbrott/aktuella-utbrott/covid-19/allman-information-om-testning/felaktiga-provsvar-i-ca-3-700-covid-19-tester) indicating that approximately 3700 of their cases had been improperly identified with a faulty kit that gave false positive results. The agency cleaned the data on [their dashboard](https://experience.arcgis.com/experience/09f821667ce64bf7be6f9f87457ed9aa/page/page_0/) was corrected to remove these cases over time (with slight changes to deaths as well). We have accessed this data and used it to recreate our cases and deaths time series files.
- August 31, 2020: New York City, New York | Borough level data for New York City added to the dashboard. Historical cases and deaths backfilled into the time series files. For description of the approach, please see issue #3084.
- September 2, 2020: Luxembourg | Government removes non-resident data from official reports. Recovered time series file adjusted to match official reporting, case data is maintained with previous numbers
- September 10: Walker County, Texas | 453 cases removed from case totals | N/A | County has removed cases associated with the Texas Department of Criminal Justice. A historical correction is not available. | N/A
- September 13, 2020: Colorado, Texas | Texas Department of Health notifies that Colorado, Texas was subject to data entry error on September 12 that resulted in 545 cases being reported rather than 454. Time series adjusted to correct this mistake. | time_series_covid19_confirmed_US.csv | N/A | N/A
- September 16, 2020: Pennsylvania | Pennsylvania released county level data for September 13 after generation of daily reports. We have used [this report](https://www.health.pa.gov/topics/Documents/Diseases%20and%20Conditions/COVID-19%20County%20Data/County%20Case%20Counts_9-13-2020.pdf) to assign county level data. Of note, the cases for Philadelphia appear to be anomalous in the official report (significant drop of cases) so we have chosen to maintain our previously reported number for this location.
- October 5, 2020: Missouri | We have noted irregularities with the reporting for Missouri from September 29-October 1 due to changes in reporting by the Missouri Department of Health. We are working to correct our time series data.
- October 13, 2020: Rhode Island, US | in collaboration with the Rhode Island Department of Health, we have been able to recreate the county level death time series for Rhode Island. Moving forward, we will be reporting deaths at the county level | time_series_deaths_us.csv & time_series_deaths_global.csv. Rhode Island will be publishing county level cases and deaths once per week. Please see issue #3229 for more details.
- October 15, 2020: Luxembourg | Update for stale data October 8 through 14 | All time series files and daily reports | Updated via [daily report pdfs](https://data.public.lu/fr/datasets/covid-19-rapports-journaliers/#_) from national source
- October 27, 2020: Alaska | Add non-resident cases from March 12 to October 26 | Confirmed cases - time series tables for the US and global | NA | [Cases by date reported](https://coronavirus-response-alaska-dhss.hub.arcgis.com/datasets/geographic-distribution-of-all-cases-by-date-reported)

- October 30, 2020: Franklin County, VA | Rewrite time series 8/22 to 10/28 with appropriate data | All time series files and us daily reports for 8/22 through 10/28 | Internal mapping error had led to cases in Franklin City, VA replacing values for Franklin County, VA as well as the source for Franklin City going stale
- October 31, 2020: Greece | Edit recoveries August 4 to present | time_series_covid19_recovered_global.csv | Update recovery data using government press releases | (Data Source: https://eody.gov.gr/category/deltia-typoy/)
- Unassigned, Colorado | Addition of historical "international" entry to unassigned category | time_series_covid19_confirmed_us.csv, time_series_covid19_confirmed_global.csv | Addition of missing cases from an international entry - cases moving forward will include these cases in unassigned | Data used from the csv file hosted [here](https://data-cdphe.opendata.arcgis.com/datasets/222c9d85e93540dba523939cfb718d76_0)
- November 9, 2020: Puerto Rico, US | Revision of historical data in line with clarification from the Puerto Rican health department regarding suspected versus probable cases | time_series_covid19_cases_US.csv, time_series_covid19_cases_global.csv | Prior to November 7, Puerto Rico suspected cases were serology test results, which are incongruent with our working definition of probable cases. The breakdown is now indicated and we have used historical reporting to alter our previous reported totals. This change brings reporting for the territory in line with national reporting for the rest of the US. (Data Source: http://www.salud.gov.pr/Estadisticas-Registros-y-Publicaciones/Pages/COVID-19.aspx)
- November 9, 2020: Georgia, US | Revision of data from November 3-8 in line with newly published antigen data, taken from coincident reporting with the state dashboard | All time series files and daily reports | (Data Source: https://dph.georgia.gov/covid-19-daily-status-report)
- November 9, 2020: Kansas, US | Revision of data from September 20 to November 8 to deconflict differences in reporting between state and county sources. Max of source used as ground truth. | All time files and daily reports | [State source](https://www.coronavirus.kdheks.gov/160/COVID-19-in-Kansas), [County source](https://experience.arcgis.com/experience/9a7d44773e4c4a48b3e09e4d8673961b/page/page_18/)
- November 9, 2020: Wisconsin, US | Revision of data beginning October 19th to include probable cases *and deaths*. | All time files and daily reports
- November 18, 2020: Alabama, US | In collaboration with the Alabama Department of Health, we have received a file with a proper back distribution of all cumulative and probable cases at the county level from January 22 to November 10. These cases are being used to back-distribute the September 15 case spike and are also overwriting all data in the time series and daily reports for consistencies sake | time_series_covid19_confirmed_us.csv, time_series_covid19_global_us.csv, all daily reports
- November 18, 2020: Guyana | Revision of confirmed cases data on November 16 from 4894 to 4874 due to a type on the national dashboard | time_series_covid19_confirmed_global.csv, 11-16-2020.csv | [Ministry source](https://www.facebook.com/mohguyana/posts/2485156248454573)
- November 23, 2020: Nunavut, Canada | Add Nunavut cases from November 6-22 | All time files and daily reports | [Government of Nunavut News](https://www.gov.nu.ca/news/345?page=1)

- November 24, 2020: Kansas, US | Revision of deaths for Kansas from April 4 to November 23 | All time files and daily reports | [Kansas State Dashboard](https://www.coronavirus.kdheks.gov/DocumentCenter/View/1529/Nov-23-case-summary?bidId=)
- November 24, 2020: Texas, US | Revision of cases for Titus, Texas from May 22 to November 23 | All time files and daily reports | [Texas State Dashboard](https://txdshs.maps.arcgis.com/apps/opsdashboard/index.html#/ed483ecd702b4298ab01e8b9cafc8b83)
- December 2, 2020: Afghanistan | Revision of cases for Afghanistan from March 1 to November 30 | All time files and daily reports | [Afghanistan Ministry of Public Health](http://covid.moph-dw.org)
- December 4, 2020: Israel | Revision of cases for Israel from February 27 to December 3 | All time files and daily reports | [Ministry of Health of Israel](https://datadashboard.health.gov.il/COVID-19/general)
- December 7, 2020: Samoa | Addition of cases, deaths, and recovered for Samoa | All time files and daily reports | [Ministry of Samoa](https://www.facebook.com/samoagovt)
- December 8, 2020: New Hampshire, US | Correction of cases and deaths from November 29 to December 6 | All time files and daily reports | [New Hampshire DHHS](https://www.nh.gov/covid19/news/updates.htm)
- December 15, 2020: New York, US | Correction of cases and deaths from November 2 to December 14 for Orange and Rockland counties | All time files and daily reports | [Orange County Dashboard](https://ocnygis.maps.arcgis.com/apps/opsdashboard/index.html#/21de1fb5ce0c480f95dc0cf2b8b83b71) [Rockland County Dashboard](https://rockland-covid-19-portal-rockland.hub.arcgis.com/)
- December 15, 2020: France | Correction of cases and deaths from March 3 to December 14 for in accordance with the Ministry of Solidarity and Health | All time files and daily reports | [Ministry of Solidarity and Health](https://www.data.gouv.fr/en/datasets/donnees-relatives-a-lepidemie-de-covid-19-en-france-vue-densemble/#_)
- December 15, 2020: French Overseas Territories | Correction of cases and deaths from December 6 to December 14 for Guadeloupe, French Guiana, Martinique, Mayotte, and Reunion in accordance to WHO | All time files and daily reports | [WHO](https://covid19.who.int/WHO-COVID-19-global-table-data.csv)
- December 17, 2020: Washington, US | Correction of deaths from April 1 to December 15 and inclusion of probable cases from June 1 to December 15 for Washington in accordance to Washington Department of Health | All time files and daily reports | [Washington Department of Health](https://www.doh.wa.gov/Emergencies/COVID19/DataDashboard)
- December 29, 2020: New York, US | Correction of probable cases from August 31 to December 28 for New York City in accordance to NYC Health | All time files and daily reports | [NYC Health](https://www1.nyc.gov/site/doh/covid/covid-19-data-totals.page)
- January 7, 2021: Texas, US | Correction of probable cases from April 1, 2020 to January 5, 2021 for Tarrant County in accordance to Tarrant County Public Health | All time files and daily reports | [Tarrant County Public Health](https://www.tarrantcounty.com/en/public-health/disease-control---prevention/COVID-19.html)

- January 10, 2021: New Jersey, US | Correction of probable cases from May 1, 2020 to January 9, 2021 for all counties in accordance with NJ Health COVID-19 Dashboard | All time files and daily reports | [NJ Department of Health](https://www.nj.gov/health/cd/topics/covid2019_dashboard.shtml)
- January 14, 2021: Yemen | Overwriting of time series using data from Yemeni Ministry of Health | (Data Source: https://twitter.com/YSNECCOVID19) | **Note**: Source may be blocked in the United States
- January 15, 2021: Kansas, US | Adjustment of time series to use data from Kansas Department of Health and Environment | All time files and daily reports | [Kansas DHE](https://www.coronavirus.kdheks.gov/160/COVID-19-in-Kansas)
- January 15, 2021: Kansas, US | Adjustment of time series to use data from Douglas County Coronavirus Response and Recovery Hub | All time files and daily reports | [Douglas Dashboard](https://coronavirus-response-dgco.hub.arcgis.com/)
- January 15, 2021: Kansas, US | Adjustment of time series to use data from Finney County COVID-19 Resource Hub | All time files and daily reports | [Finney Dashboard](https://finney-county-coronavirus-response-finneycountygis.hub.arcgis.com/)
- January 15, 2021: Kansas, US | Adjustment of time series to use data from Riley County Corona Virus Response | All time files and daily reports | [Riley Dashboard](https://coronavirus-response-rcitgis.hub.arcgis.com/)
- January 19, 2021: California, US | Adjustment of time series to shift data for later sampling time from California State Government | All time files and daily reports | [California State Government](https://covid19.ca.gov/state-dashboard/)
- January 19, 2021: California, US | Adjustment of time series to shift data for later sampling time from California State Government | All time files and daily reports | [California State Government](https://covid19.ca.gov/state-dashboard/)
- January 19, 2021: Douglas, Nebraska, US | The original death data on 1/07 (617) was due to a data entry error from the county health department, which was corrected on 1/08. However, the state health department has been unable to provide a proper death total for this day. To remove the artificial spike, we have held the death total from 1/06 stale (525). | time_series_covid19_deaths_US.csv, time_series_covid19_deaths_global.csv, 01-07-2021.csv | No source needed
- January 21, 2021: Sweden | See issue #3594, the deaths have been altered to be consistently "deaths by date of report" | time_series_covid19_deaths_global.csv | (Data Source: https://www.svt.se/special/articledata/2322/fohm_timeline.json)
- January 25, 2021: Haiti | Adjustment of time series to use data from Haiti Ministry of Health | All time series files and daily reports | (Data Source: https://www.mspp.gouv.ht/)
- January 25, 2021: California, US | Revision of cases for Orange County, CA to include probable cases from 2020-04-01 to 2021-01-24 | All-time series files and daily reports | (Data Source: https://ochca.maps.arcgis.com/apps/opsdashboard/index.html#/cc4859c8c522496b9f21c451de2fedae)
- January 25, 2021: California, US | Revision of cases for Stanislaus County, CA to include probable cases from 2020-04-17 to 2021-01-24 | All-time series files and daily reports | (Data Source: https://experience.arcgis.com/experience/c29aa0c6a84844ceab6601da4b124c0b)

- January 26, 2021: Sudan | Adjustment of cases for Sudan to World Health Organization data from 2020-3-13 to 2021-01-25 | All time series files and daily reports | (Data Source: https://covid19.who.int/WHO-COVID-19-global-table-data.csv)
- January 27, 2021: Missouri, US | Adjustment of St. Louis City, MO cases and deaths from 2020-03-03 to 2021-01-26 | All time series files and daily reports | (Data Source: https://www.stlouis-mo.gov/covid-19/data/)
- January 28, 2021: Quebec, Canada | Adjustment of Quebec deaths from 2020-03-17 to 2021-01-27 | All time series files and daily reports | (Data Source: https://www.quebec.ca/en/health/health-issues/a-z/2019-coronavirus/situation-coronavirus-in-quebec/)
- February 01, 2021: Illinois, US | Adjustment of Illinois probable deaths from 2020-11-07 to 2021-01-31 | All time series files and daily reports | (Data Source: https://www.dph.illinois.gov/covid19)
- February 02, 2021: Lithuania | Adjustment of Lithuania cases, deaths, and recovered from 2020-02-28 to 2021-02-01 based on Lithuania dashboard | All time series files and daily reports | [Dashboard](https://osp.maps.arcgis.com/apps/MapSeries/index.html?appid=c6bc9659a00449239eb3bde062d23caa)
- February 09, 2021: Indiana, US | Redistribution of previously identified historical deaths to unassigned category. State total reported from Department of Health was compared to time_series_covid19_deaths_us.csv and the difference was distributed to Unassigned, Indiana. | All time series files and daily reports | [Indiana source](https://www.coronavirus.in.gov/2393.htm) | We hope to receive a county level distribution from the state health department but we have not yet received a response
- February 11, 2021: Delaware, US | As referenced in [Issue #3666](https://github.com/CSSEGISandData/COVID-19/issues), this modification is a back distribution of all Delaware deaths at the county level | All time series files and daily reports | [Delaware source](https://myhealthycommunity.dhss.delaware.gov/locations/state#deaths-trends)
- February 15, 2021: Lithuania | Adjustment of Lithuania recovered from 2020-03-19 to 2021-02-13 for updated numbers, and patched cases and deaths from 2021-02-11 to 2021-02-14 due to stale data. | All time series files and daily reports | [Dashboard](https://osp.maps.arcgis.com/apps/MapSeries/index.html?appid=c6bc9659a00449239eb3bde062d23caa)
- February 16, 2021 | Ohio, US | Back distribution of deaths at the county level to correct for large release of backlogged deaths. | All time series and daily reports | [Press release](https://odh.ohio.gov/wps/portal/gov/odh/media-center/odh-news-releases/odh-news-release-02-10-20), [Data source - csv link](https://coronavirus.ohio.gov/static/dashboards/COVIDSummaryData.csv) | There are 78 deaths with an Unknown Date of Death but known county residence. For these, the data of hospital admission was used, or the date of symptom onset if hospital admission was also unknown. This avoids all 78 being placed in one day.
- February 19, 2021 | New South Wales, Australia | Adjustment of recovered to 0 to reflect #3694 | All time series and daily reports | [NSW Health](https://www.health.nsw.gov.au/news/Pages/20200730_00.aspx)

- February 20, 2021: Texas, US | Correction to Tom Green, Texas cases due to source reporting for 2021-02-13 to 2021-02-18 | (Data Source: https://www.cosatx.us/Home/ShowDocument?id=33418)
- February 22, 2021 | Israel | Adjustment of data for 1/25 and 1/26 to match media reports due to source issue | time_series_confirmed_global.csv and 1/25/2021 and 1/26/2021 daily reports | [Source 1](https://www.israelhayom.com/2021/01/25/health-ministry-180-people-infected-by-single-passenger-returning-from-dubai/), [Source 2](https://www.israelhayom.com/2021/01/26/health-minister-relentless-covid-morbidity-requires-extending-lockdown/)
- March 3, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv) | This correction nullifies the Ohio correction on February 16
- March 3, 2021 | Iowa, US | Fix case time series to replace "total positive tests" values with "positive tests by individual". Stale county level data on February 20 is due to lack of data access on that day | All case time series and daily reports | (Data Source: https://coronavirus.iowa.gov/)
- March 6, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- March 7, 2021 | Iowa, US | Adjust time series to represent more standardized sampling times for Iowa data | All case time series and daily reports | (Data Source: https://coronavirus.iowa.gov/)
- March 8, 2021 | Pennsylvania, US | Adjust US daily reports to reflect correct testing data | All US daily reports | (Data Source: https://www.health.pa.gov/topics/disease/coronavirus/Pages/Cases.aspx)
- March 10, 2021 | Spain | Released an updated daily report that included a downgrade of the number of cases in Catalonia | March 10 daily report and time_series_covid19_confirmed_global.csv | (Data Source: https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov/documentos/Actualizacion_329_COVID-19.pdf)
- March 11, 2021 | Missouri, US | Reallocate Missouri probables into Unassigned for the inclusion of new probable cases | All daily reports and time series | (Data Source: https://results.mo.gov/t/COVID19/views/COVID-19DataforDownload/MetricsbyReportDate.csv)
- March 11, 2021 | Missouri, US | Correct stale data for St. Louis City, Missouri and apply back distribution for cases and deaths | All daily reports and time series | (Data Source: https://www.stlouis-mo.gov/government/departments/health/communicable-disease/covid-19/data/index.cfm)

- March 12, 2021 | Missouri, US | Account for St. Louis county and St. Louis City probables within the Missouri time series | All daily reports and time series | (Data Source: https://showmestrong.mo.gov/data/public-health/)
- March 14, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- March 21, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- March 28, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- March 30, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- April 2, 2021 | Alaska, US | In response to the state's separation of Valdez-Cordova, AK into Copper River, AK and Chugach, AK, we have recreated the time series including these two locations using the official data from the Alaska dashboard | (Data Source: https://alaska-coronavirus-vaccine-outreach-alaska-dhss.hub.arcgis.com/app/6a5932d709ef4ab1b868188a4c757b4f)
- April 5, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- April 7, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- April 12, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- April 13, 2021| Kern, California, US | Replacement of historical data with that of the LA Times aggregator due to source change and stale data. | All time series files and daily reports

for which there was a difference between historical data and new source | (Data Source: https://github.com/datadesk/california-coronavirus-data/blob/master/latimes-county-totals.csv)

- April 13, 2021 | Oklahoma, US | Further to issue #3936, we have back distributed the backlogged 1,414 cases to their appropriate date with the assistance of the Oklahoma State Health Department. All cases have been distributed to the unassigned category. See #3936 for further details. | Time series files and daily reports | Personal correspondence, see #3936 for further details.
- April 14, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- April 19, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- April 22, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- April 26, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- April 28, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- May 3, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- May 4, 2021 | Kansas, US | Update Labette, Kansas deaths based on correct data from state dashboard | [KS Dashboard](https://www.coronavirus.kdheks.gov/160/COVID-19-in-Kansas)
- May 10, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice

per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)

- May 17, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- May 24, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- June 01, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- June 07, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- June 07, 2021 | Peru | Back distribution of deaths to account for release of backlogged deaths from Peru's Ministry of Health | (Data Source: https://www.datosabiertos.gob.pe/dataset/fallecidos-por-covid-19-ministerio-de-salud-minsa)
- June 11, 2021 | California, US | Back correction of Alameda, California's deaths due to adjustment of death counts to agree with the state definition. | (Data Source: https://covid19.ca.gov/state-dashboard/#location-alameda)
- June 13, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- June 14, 2021 | Singapore | Data for June 12 updated to match news source | (Data Source: https://www.straitstimes.com/singapore/nine-new-community-cases-cleaner-at-ion-orchard-among-5-unlinked-covid-19-cases)
- June 21, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- June 28, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice

per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)

- June 28, 2021 | Illinois, US | Adjust Illinois case count to properly match their historical records for state level data. | (Data Source: https://www.dph.illinois.gov/covid19/data-portal)
- July 01, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- July 05, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- July 07, 2021 | California, US | Adjust Santa Clara, California to match the state dashboard's reported date time series | (Data Source: https://covid19.ca.gov/state-dashboard/#location-santa_clara)
- July 12, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- July 19, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- July 25, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- July 27, 2021 | New York, US | Back correction of Rockland, NY deaths to match the New York State COVID-19 Fatalities by County dataset | (Data Source: https://health.data.ny.gov/Health/New-York-State-Statewide-COVID-19-Fatalities-by-Co/xymy-pny5)
- August 02, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- August 09, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice

per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)

- August 16, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- August 23, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- September 07, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- September 12, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- September 13, 2021 | Florida, US | Use historic CDC data to distribute Florida's state level data | (Data Source: https://covid.cdc.gov/covid-data-tracker/)
- September 13, 2021 | Iowa, US | Use historic CDC data to distribute Iowa's state level data | (Data Source: https://covid.cdc.gov/covid-data-tracker/)
- September 16, 2021 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- September 19, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- September 26, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- September 26, 2021 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- September 30, 2021 | California, US | Adjust Modoc, CA and Sierra, CA data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- October 04, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated

with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)

- October 12, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- October 16, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- October 19, 2021 | California, US | Adjust California's death data based on historic data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- October 25, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- November 1, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- November 5, 2021 | Japan | To match Japan NHK reporting standards, the Japan time series (cases and deaths) is being overwritten with NHK data, and the entire time series will be updated with each time NHK updates their data. | (Data Source: https://www3.nhk.or.jp/news/special/coronavirus/data/)
- November 12, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately twice per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- November 12, 2021 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- November 15, 2021 | Pennsylvania, US | Adjust Pennsylvania's data based on historic case data provided by Open Data Pennsylvania. This is due to the introduction of reinfections to their data, which caused a spike in our data.| (Data Source: https://data.pa.gov/Covid-19/COVID-19-Aggregate-Cases-Current-Daily-County-Heal/j72v-r42c)
- November 16, 2021 | Indiana, US | Adjust Indiana's data based on historic case data provided by Indiana Department of Health. This is due to the introduction of reinfections to their data.| (Data Source: https://hub.mph.in.gov/dataset/covid-19-county-wide-test-case-and-death-trends)

- November 18, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- November 18, 2021 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- November 28, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- November 28, 2021 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- December 02, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- December 02, 2021 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- December 09, 2021 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- December 19, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- December 23, 2021 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- December 23, 2021 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- January 3, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- January 3, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- January 6, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once

per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)

- January 6, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- January 13, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- January 13, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- January 18, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- January 20, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- January 21, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- January 25, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- January 25, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- January 28, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- January 28, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- February 02, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- February 02, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)

- February 04, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- February 04, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- February 10, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- February 10, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- February 12, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- February 12, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- February 15, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- February 15, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- February 16, 2022 | Channel Islands, United Kingdom | Channel Islands will now be split into its individual islands Jersey and Guernsey | (Data Source: https://covid19.who.int/)
- February 18, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- February 18, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- February 22, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- February 22, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)

- March 01, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- March 01, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- March 08, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- March 08, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- March 08, 2022 | Mauritius | Update cases and deaths from 2022-01-25 to 2022-03-06 | (Data Source: https://besafemoris.mu/communiques/)
- March 10, 2022 | Tennessee, US | Corrected from 2020-03-12 to 2022-02-26 | (Data Source: https://www.tn.gov/content/dam/tn/health/documents/cedep/novel-coronavirus/datasets/Public-Dataset-County-New.XLSX)
- March 16, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- March 16, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- March 16, 2022 | Tennessee, US | Corrected from 2020-03-12 to 2022-03-05 | (Data Source: https://www.tn.gov/content/dam/tn/health/documents/cedep/novel-coronavirus/datasets/Public-Dataset-County-New.XLSX)
- March 18, 2022 | Hong Kong, China | Correct Hong Kong case data | (Data Source: https://chp-dashboard.geodata.gov.hk/covid-19/en.html)
- March 28, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- March 28, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- March 28, 2022 | Tennessee, US | Corrected from 2020-03-12 to 2022-03-19 | (Data Source: https://www.tn.gov/content/dam/tn/health/documents/cedep/novel-coronavirus/datasets/Public-Dataset-County-New.XLSX)
- March 30, 2022 | China | Inclusion of asymptomatic cases reported from the National Health Commission of the People's Republic of China | (Data Source: http://www.nhc.gov.cn/xcs/yqtb/list_gzbd.shtml)

- March 31, 2022 | China | Adjusting of asymptomatic cases reported from the National Health Commission of the People's Republic of China | (Data Source: http://www.nhc.gov.cn/xcs/yqtb/list_gzbd.shtml)
- April 01, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- April 01, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- April 01, 2022 | Tennessee, US | Corrected from 2020-04-02 to 2022-03-26 | (Data Source: https://www.tn.gov/content/dam/tn/health/documents/cedep/novel-coronavirus/datasets/Public-Dataset-County-New.XLSX)
- April 05, 2022 | North Dakota, US | Corrected from 2020-03-09 to 2022-03-31 | (Data Source: https://www.health.nd.gov/sites/www/files/documents/Files/MSS/coronavirus/charts-data/PublicUseData.csv)
- April 07, 2022 | Massachusetts, US | Corrected from 2020-08-19 to 2022-03-14 to align with state reporting
- April 08, 2022 | Massachusetts, US | Corrected from 2020-08-23 to 2022-03-13 to align with state reporting
- April 11, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- April 11, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- April 11, 2022 | Tennessee, US | Corrected from 2020-04-02 to 2022-04-02 | (Data Source: https://www.tn.gov/content/dam/tn/health/documents/cedep/novel-coronavirus/datasets/Public-Dataset-County-New.XLSX)
- April 11, 2022 | North Dakota, US | Corrected from 2020-03-09 to 2022-04-07 | (Data Source: https://www.health.nd.gov/sites/www/files/documents/Files/MSS/coronavirus/charts-data/PublicUseData.csv)
- April 18, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- April 18, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- April 18, 2022 | Tennessee, US | Corrected from 2020-04-02 to 2022-04-09 | (Data Source: https://www.tn.gov/content/dam/tn/health/documents/cedep/novel-coronavirus/datasets/Public-Dataset-County-New.XLSX)

- April 18, 2022 | North Dakota, US | Corrected from 2020-03-09 to 2022-04-14 | (Data Source: https://www.health.nd.gov/sites/www/files/documents/Files/MSS/coronavirus/charts-data/PublicUseData.csv)
- April 25, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- April 25, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- April 25, 2022 | Tennessee, US | Corrected from 2020-04-02 to 2022-04-16 | (Data Source: https://www.tn.gov/content/dam/tn/health/documents/cedep/novel-coronavirus/datasets/Public-Dataset-County-New.XLSX)
- April 25, 2022 | North Dakota, US | Corrected from 2020-03-09 to 2022-04-21 | (Data Source: https://www.health.nd.gov/sites/www/files/documents/Files/MSS/coronavirus/charts-data/PublicUseData.csv)
- May 02, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- May 02, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- May 02, 2022 | Tennessee, US | Corrected from 2020-03-12 to 2022-04-23 | (Data Source: https://www.tn.gov/content/dam/tn/health/documents/cedep/novel-coronavirus/datasets/Public-Dataset-County-New.XLSX)
- May 02, 2022 | North Dakota, US | Corrected from 2020-03-09 to 2022-04-28 | (Data Source: https://www.health.nd.gov/sites/www/files/documents/Files/MSS/coronavirus/charts-data/PublicUseData.csv)
- May 09, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- May 09, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- May 09, 2022 | Tennessee, US | Corrected from 2020-03-12 to 2022-04-30 | (Data Source: https://www.tn.gov/content/dam/tn/health/documents/cedep/novel-coronavirus/datasets/Public-Dataset-County-New.XLSX)
- May 09, 2022 | North Dakota, US | Corrected from 2020-03-09 to 2022-05-05 | (Data Source: https://www.health.nd.gov/sites/www/files/documents/Files/MSS/coronavirus/charts-data/PublicUseData.csv)

- May 16, 2022 | Austria | Corrected from 2020-01-03 to 2022-05-11 | (Data Source: https://info.gesundheitsministerium.gv.at/data/timeline-faelle-bundeslaender.csv)
- May 17, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- May 17, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- May 17, 2022 | Tennessee, US | Corrected from 2020-03-12 to 2022-05-07 | (Data Source: https://www.tn.gov/content/dam/tn/health/documents/cedep/novel-coronavirus/datasets/Public-Dataset-County-New.XLSX)
- May 18, 2022 | North Dakota, US | Corrected from 2020-03-09 to 2022-05-12 | (Data Source: https://www.health.nd.gov/sites/www/files/documents/Files/MSS/coronavirus/charts-data/PublicUseData.csv)
- May 24, 2022 | California, US | Adjust California's data based on historic probable case data provided by CDPH | (Data Source: https://covid19.ca.gov/data-and-tools/)
- May 24, 2022 | Ohio, US | To match Ohio's new reporting standards, the Ohio death time series is being overwritten with date of death data, and the entire time series will be updated with each time Ohio updates their death data. This is expected to occur approximately once per week. | (Data Source: https://coronavirus.ohio.gov/static/dashboards/COVIDDeathData_CountyOfResidence.csv)
- May 24, 2022 | Tennessee, US | Corrected from 2020-03-12 to 2022-05-14 | (Data Source: https://www.tn.gov/content/dam/tn/health/documents/cedep/novel-coronavirus/datasets/Public-Dataset-County-New.XLSX)
- May 24, 2022 | North Dakota, US | Corrected from 2020-03-09 to 2022-05-19 | (Data Source: https://www.health.nd.gov/sites/www/files/documents/Files/MSS/coronavirus/charts-data/PublicUseData.csv)

Retrospective reporting of (probable) cases and deaths

This section reports instances where large numbers of historical cases or deaths have been reported on a single day. These reports cause anomalous spikes in our time series curves. When available, we liaise with the appropriate health department and distribute the cases or deaths back over the time series. If these are successful, they will be reported in the below section titled "Large Scale Back Distributions". A large proportion of these spikes are due to the release of probable cases or deaths.

Generalized Format:
Date: Location | Change | Reason/Other notes | Source

- April 12, 2020: France | Spike in cases | Inclusion of "cas possibles en ESMS" (probable cases from ESMS)| ([More details](https://github.com/CSSEGISandData/COVID-19/issues/2094))
- April 21, 2020: Finland | Increase in deaths from 98 to 141 | Finnish National Institute for Health and Welfare included deaths in nursing homes in the Helsinki Metropolitan area for the first time. | (Data Source: https://www.foreigner.fi/articulo/coronavirus/finland-reports-44-increase-in-number-of-coronavirus-deaths/20200421174642005414.html)
- April 23, 2020: New York City, New York, US | Reporting of probable deaths | N/A |(Data Source: https://www.nbcnews.com/health/health-news/live-blog/2020-04-23-coronavirus-news-n1190201/ncrd1190406#blogHeader) | **Back Distributed**
- April 24, 2020: Colorado, US | Spike of 121 deaths | Inclusion of probable deaths for first time | (Data Source: https://www.denverpost.com/2020/04/24/covid-coronavirus-colorado-new-cases-deaths-april-24/)
- April 24, 2020: Republic of Ireland | Spike of 189 deaths | Source begins including probable deaths (those with COVID-19 listed as cause of death but no molecular test) | (Data Source: https://www.irishnews.com/news/republicofirelandnews/2020/04/24/news/republic-s-covid-19-death-toll-passes-1-000-1915278/)
- April 29, 2020: United Kingdom | Death counts updated to reflect deaths outside of hospitals | (Data Source: https://metro.co.uk/2020/04/29/uk-death-toll-rises-26097-care-homes-included-12628454/) | **Back Distributed**
- May 6, 2020: Belgium | 339 new deaths, 229 of which had occured over recent weeks | (Data Source: http://www.xinhuanet.com/english/2020-05/06/c_139035611.htm)
- May 20, 2020: Spain | Reduction in cases and deaths for some autonomous communities due to data validation effort | (Data Source: https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov/documentos/Actualizacion_116_COVID-19.pdf)
- June 5, 2020: Michigan, US | Release of probable cases and deaths | See [Issue #2704](https://github.com/CSSEGISandData/COVID-19/issues/2704) | **Back Distributed**
- June 8, 2020: Chile | Spike of 653 deaths | Historical deaths | (Data Source: https://www.emol.com/noticias/Nacional/2020/06/07/988430/minsal-muertos-covid19.html)
- June 11, 2020: Michigan, US | Michigan started to report probable cases and probable deaths on June 5. ((Data Source: https://www.michigan.gov/coronavirus/0,9753,7-406-98158-531156--,00.html)) We combined the probable cases into the confirmed cases, and the

probable deaths into the deaths. As a consequence, a spike with 5.5k+ cases is shown in our daily cases bar chart.

- June 12, 2020: Massachusetts, US | Probable cases released | **Back Distributed**
- June 16, 2020: Spain | Revision of historical death count resulting in spike of 1179 cases| [source 1](https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Actualizacion_140_COVID-19.pdf) & [source 2](https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov-China/documentos/Actualizacion_141_COVID-19.pdf)
- June 16, 2020: India | 1672 backlogged deaths from Delhi and Maharashtra | (Data Source: https://www.hindustantimes.com/india-news/india-s-death-toll-soars-past-10k-backlog-deaths-raise-count-by-437-in-delhi-1-409-in-maharashtra/story-9GNbe7iMBKLsiHtByjRKCJ.html).
- June 17, 2020: Chile | Release of 31k unreported cases | See [Issue #2722](https://github.com/CSSEGISandData/COVID-19/issues/2722) | **Back distributed**
- June 23, 2020: Delaware, US | Release of some probable deaths and historical cases | See [Issue #2789](https://github.com/CSSEGISandData/COVID-19/issues/2789)
- June 25: New Jersey, US | Release of probable deaths | See [Issue #2763](https://github.com/CSSEGISandData/COVID-19/issues/2763) | **Back distributed**
- July 1, 2020: New York City, New York, US | Increase of 682 deaths | (Data Source: https://www1.nyc.gov/site/doh/covid/covid-19-data.page)
- July 7, 2020: Illinois | Incorporation of probable cases and deaths that are being released by the Illinois Department of Health once per week, starting July 3rd. We anticipate weekly spikes in both of these numbers.
- July 12, 2020: Phillippines | 141 historical deaths reported | (Data Source: https://rappler.com/nation/coronavirus-cases-philippines-july-12-2020)
- July 18, 2020: Kyrgyzstan | Alteration of probable deaths to include those diagnosed with pneumonia that have not been tested for COVID-19 | (Data Source: https://www.hrw.org/news/2020/07/21/kyrgyzstan/kazakhstan-new-rules-tallying-covid-19-data)
- July 22, 2020: Peru | Addition of 3688 deaths from analyzing historical death records. It is unclear if these are probable deaths or retroactively diagnosed. | (Data Source: https://www.gob.pe/institucion/minsa/noticias/214828-minsa-casos-confirmados-por-coronavirus-covid-19-ascienden-a-366-550-en-el-peru-comunicado-n-180)
- July 27, 2020: Texas, US | Department of State Health Services changed their reporting methodology for COVID-19 deaths, resulting in a roughly 13% increase in reported fatalities from the 26th to the 27th | Details can be found in the press release from the state [here](https://www.dshs.texas.gov/news/releases/2020/20200727.aspx). | **Back distributed for Harris County**
- July 29, 2020: Connecticut | Inclusion of 384 historical cases from lab tests "performed during April-June (which) were newly reported to DPH in connection with a transition to electronic reporting by an out of state regional laboratory and for surveillance purposes have been added to the total case and test counts" | (Data Source: https://portal.ct.gov/-/media/Coronavirus/CTDPHCOVID19summary7292020.pdf)). The 463 spike is consistent with the ct.gov data ((Data Source: https://data.ct.gov/Health-and-Human-Services/COVID-19-Tests-Cases-Hospitalizations-and-Deaths-S/rf3k-f8fg/data).

- July 29, 2020: Kazakhstan | Alteration of probable deaths to include those diagnosed with pneumonia that have not been tested for COVID-19 | (Data Source: https://www.hrw.org/news/2020/07/21/kyrgyzstan/kazakhstan-new-rules-tallying-covid-19-data)
- August 8, 2020: Virginia | Spikes in cases are associated with the release of a backlog of testing | (Data Source: https://wtop.com/virginia/2020/08/recent-surge-in-virginia-covid-19-numbers-due-to-data-backlog)
- August 11, 2020: California | Cases are likely to be erratic for the next several days/weeks as a systematic issue with underreporting is being addressed. See the disclaimer posted [here](https://covid19.ca.gov/data-and-tools/): "Note: Due to issues with the state's electronic laboratory reporting system, these data represent an underreporting of actual positive cases in one single day."
- August 12, 2020: Massachusetts | Department of Public Health changed their reporting methodology. The state is no longer reporting county level total cases and deaths daily. Massachusetts is now reporting state level confirmed cases and deaths daily, and are updating state level probable cases and county level confirmed cases weekly. In light of this change by the state, new cases and deaths are being aggregated in "Unassigned, Massachusetts".
- August 14, 2020: Peru | Release of 3,658 historical deaths | (Data Source: https://www.gob.pe/institucion/minsa/noticias/292693-ministerio-de-salud-presento-nueva-actualizacion-de-cifra-de-fallecidos-por-covid-19).
- August 18, 2020: Israel | 53 newly idenified nursing home fatalities that occured within July and August | (Data Source: https://t.me/s/MOHreport/5697)
- August 20, 2020: Massachusetts | As previously noted, the Massachusetts Department of Public Health changed their reporting methodology on August 12th (see #3026), dropping their reporting of daily cumulative confirmed + probable cases and deaths at the county level. Beginning on August 19th, the state resumed reporting of daily county level data, however the new structure contains confirmed cases, and confirmed + probable deaths. To accommodate, beginning on August 20th the data we are reporting at the county level will line up with Massachusetts' new reporting (i.e. confirmed cases, confirmed and probable deaths). Statewide probable cases will be aggregated in the entry for "Unassigned, Massachusetts". This will unfortunately introduce a drop in total cases at the county level on August 20th as the county level probable cases are shifted to a statewide aggregate. If and when historical data becomes available we will revise the prior reporting in line with this new definition.
- August 26, 2020: Belgium: 352 new deaths and 473 deaths that had either been double counted or misattributed to COVID-19 | [Source 1](https://covid-19.sciensano.be/sites/default/files/Covid19/MORTALITE%20COVID-19%20%E2%80%93%20MISE%20%C3%80%20JOUR%20DES%20DONNEES%20%E2%80%93%2026%20AO%C3%9BT%202020.pdf), [Source 2](https://www.lecho.be/dossiers/coronavirus/le-covid-19-a-fait-moins-de-morts-qu-annonce-en-belgique/10247337.html)
- September 3, 2020: Massachusetts | The Massachusetts state government has altered their definition of probable cases ([see source](https://www.mass.gov/doc/covid-19-dashboard-september-2-2020/download)). Prior to September 2, the criteria for probable cases was: if they have a positive antigen test AND have symptoms OR were exposed to someone with

COVID; if they have a positive antibody test AND have symptoms OR were exposed to someone with COVID; if they have COVID symptoms AND were exposed to someone with COVID; or if they died and their death certificate lists COVID as a cause of death. Starting September 2, the criteria for probable cases became: if they have a positive antigen test; if they have COVID symptoms AND were exposed to someone with COVID; or if they died and their death certificate lists COVID as a cause of death. The change in definition (and no longer including antibody tests) has resulted in the loss of 8051 cases located in the Unassigned, Massachusetts entry. **Back Distributed**

- September 4, 2020: Illinois | Spike of 5,368 cases | Test backlog | (Data Source: https://www.nbcchicago.com/news/coronavirus/illinois-reports-5368-new-coronavirus-cases-after-test-backlog-29-additional-deaths/2334290/).
- September 6, 2020: Ecuador | Drop of 7953 cases | Definition of confirmed cases from PCR+rapid tests to only PCR tests | (Data Source: https://www.salud.gob.ec/msp-presenta-actualizacion-de-indicadores-en-infografia-nacional-covid-19/).
- September 7, 2020: Ecuador | Inclusion of 3758 probable deaths | The first date where the probable cases are delineated is [September 8](https://twitter.com/Salud_Ec/status/1303463345056616450/photo/1)
- September 15, 2020: Alabama | Distributino of probable cases to the county level (previously aggregated at the state level, in unassigned, AL). This resulted in significant increase in cases in nearly all counties. We are working to get the historical distribution of these probable cases from the State, and will update the timeseries accordingly when we do. | **Back Distributed**
- September 15, 2020: Arkansas | Addition of 139 probable deaths | [News source](https://katv.com/news/local/arkansas-gov-asa-hutchinson-to-give-covid-19-briefing-09-15-2020).
- September 15-21, 2020: Virginia | Progressive inclusion of backlogged deaths into the state total throughout the week | [News source](https://www.wtkr.com/news/coronavirus/local-area-reports-zero-covid-19-deaths-from-sunday-virginia-continues-to-see-steady-decrease-in-test-percent-positivity)
- September 21, 2020: Texas, US | Release of large swath of historical cases affecting 25 counties. Please see pinned issue #3143 for full statement from Texas dashboard.
- September 25, 2020: North Carolina | Spike of 6000 cases due to inclusion of positive antigen tests as probable cases | **Back Distributed**
- September 29, 2020: Alabama | Releases statement that: "Due to technical issues, laboratory errors, and backlogs from onboarding new laboratories, the following dates: 06/02, 06/28, 08/11, 08/25, 09/24, and 09/29 saw an inflation in total number of daily cases" | (Data Source: https://alpublichealth.maps.arcgis.com/apps/opsdashboard/index.html#/6d2771faa9da4a2786a509d82c8cf0f7) - See Tab 6
- October 1, 2020: Argentia | Release of 3050 previously unidentified deaths in the Buenos Aires province | [Official report](https://www.argentina.gob.ar/sites/default/files/01-10-20-reporte-vespertino-covid-19.pdf)
- October 2, 2020: New Hampshire | 139 probable cases (positive via antigen test) dating back to July | [Official press release](https://www.nh.gov/covid19/news/documents/covid-19-update-10022020.pdf)

- October 3-4, 2020: United Kingdom | Notice on United Kingdom's dashboard states "Due to a technical issue, which has now been resolved, there has been a delay in publishing a number of COVID-19 cases to the dashboard in England. This means the total reported over the coming days will include some additional cases from the period between 24 September and 1 October, increasing the number of cases reported." We anticipate this will lead to significantly higher case numbers being reported. ((Data Source: https://coronavirus.data.gov.uk/)). On October 4, the United Kingdom released the following statement on their dashboard: "The cases by publish date for 3 and 4 October include 15,841 additional cases with specimen dates between 25 September and 2 October — they are therefore artificially high for England and the UK."
- October 5, 2020: Mexico | Alteration of case definition to include those epidemiologically linked and symptomatic but lacking test confirmation. The result of this change is an increase of 24,698 historical cases and 2609 historical deaths, both going back to the beginning of the pandemic | [News source with official press conference embedded](https://www.eluniversal.com.mx/nacion/coronavirus-5-de-octubre-mexico-suma-789-mil-casos-de-covid-y-81-mil-muertes)
- October 7, 2020: Fayette County, Kentucky | Release of 1472 historical cases stretching over the previous month and a half. These are a portion of 1900 backlogged cases for the county, and it is likely this will be included in the proceeding days | [County source](https://www.facebook.com/LFCHD/posts/10159412744354739), [News source with Governor's press conference](https://www.wkyt.com/2020/10/07/watch-live-gov-beshear-gives-update-on-covid-19/)
- October 12, 2020: Missouri } spike in cases is due to a database error. We are monitoring the dashboard and will redistribute if the error is fixed | [News report](https://www.stltoday.com/lifestyles/health-med-fit/health/missouri-health-department-says-5-000-case-increase-was-reporting-error/article_0021cc3b-21a4-5c6f-8887-48aa6e2087bd.html)
- October 18, 2020: Navajo County, Arizona | Reduction of -52 cases | Reconciliation of database entry errors | (Data Source: https://twitter.com/NavajoCountyAZ/status/1317506622281850881)
- October 23, 2020: Alabama, US | Inclusion of 2565 backlogged antigen positives in Mobile and 1182 backlogged antigen and PCR tests from around the state | (Data Source: https://alpublichealth.maps.arcgis.com/apps/opsdashboard/index.html#/6d2771faa9da4a2786a509d82c8cf0f7) "The Alabama Department of Public Health processed a backlog of 2565 positive antigen results from a facility in Mobile on October 22. These will be classified as “probable” COVID-19 cases reported on 10/22/20 even though the tests were performed during June through October 18, 2020. The Alabama Department of Public Health processed a backlog of 1182 positive results from a variety of facilities all over Alabama. A majority of these will be classified as “probable” COVID-19 cases reported on 10/23/20 even though the tests were performed during April through September."
- October 23, 2020: Los Angeles County, California, US | Estimated 2000 backlogged cases included in daily report | (Data Source: https://github.com/CSSEGISandData/COVID-19/issues/3267)
- November 4, 2020: Spain | Inclusion of 5,105 cases and 1,326 deaths that occurred prior to May 11 | (Data Source:

https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov/documentos/Actualizacion_243_COVID-19.pdf)

- November 3, 2020: Georgia, US | Inclusion of 29,937 antigen tests distributed over unknown period of days. This includes 450 probable deaths. | We have contacted the state health department to obtain a back distribution [Media source](https://www.wrbl.com/news/georgia-news/update-georgia-reports-364589-confirmed-covid-19-cases-statewide-with-6440-in-columbus/)
- November 10, 2020: Louisiana, US | Inclusion of probable cases from August 26 through November 9 and ongoing inclusion of probable cases. Probables are aggregated in the Unassigned, Louisiana entry
- November 16, 2020: Louisiana, US | Disbursement of probable cases from Unassigned, Louisiana to the county level. Probables will be at the county level moving forward.
- December 2, 2020: Kazakhstan | Back-distrubution of probable cases, deaths, and recoveries from official sources and coincident reporting including the Ministry of Health of the Repulbic of Kazakhstan, the European Commission Joint Research Center, the European Centre for Disease Prevention and Control, and Tengrinews
- December 2, 2020: Alabama, US | Addition of backlog of 706 PCR results from November 23 to 29 | (Data Source: https://alpublichealth.maps.arcgis.com/apps/opsdashboard/index.html#/6d2771faa9da4a2786a509d82c8cf0f7)
- December 4, 2020: Massachusetts, US | Addition of historical cases from December 1 | "Today's case numbers include 680 positive cases tested by one Massachusetts-based laboratory prior to December 1. The delay in reporting was caused by a technical issue with the software used by that laboratory's reporting vendor." | [Massachusetts dashboard](https://www.mass.gov/info-details/covid-19-response-reporting).
- December 7, 2020: Iowa, US | Alteration of death definition to include COVID-19 probable deaths without positive PCR or antigen tests | This change resulted in an increase of 469 deaths on December 11 | [Government source, including methodology definitions](https://idph.iowa.gov/News/ArtMID/646/ArticleID/158384)
- December 9, 2020: Ohio, US | Addition of nearly 13000 backlogged antigen tests | [News source](https://www.cleveland.com/open/2020/12/ohio-reports-25721-new-coronavirus-cases-an-expected-one-day-record-due-to-clearing-backlog-tuesday-update.html)
- December 9, 2020: Alabama, US | Addition of backlog of 1038 PCR and 473 probable cases from November 30 - December 5 | (Data Source: https://alpublichealth.maps.arcgis.com/apps/opsdashboard/index.html#/6d2771faa9da4a2786a509d82c8cf0f7)
- December 10, 2020: Turkey | Addition of 792,801 cases asymptomatic cases | (Data Source: https://covid19.saglik.gov.tr/) | We note that this heavily distorst all of our products and we are attempting to find an official back distribution of this data
- December 13, 2020: Alabama, US | Inclusion of 298 backlogged antigen tests from July 7 through December 9 | (Data Source: https://alpublichealth.maps.arcgis.com/apps/opsdashboard/index.html#/6d2771faa9da4a2786a509d82c8cf0f7)

- December 16, 2020: Washington, US | Inclusion of 7,671 probable cases from June to present | (Data Source: https://www.doh.wa.gov/Emergencies/COVID19/DataDashboard) | We are working a back distribution
- December 16, 2020: California, US | California dashboard included 15,337 historical cases in their December 16 update | We pull from several sources including the California State Daashboard so it is unclear how these historical cases are distributed within our data | (Data Source: https://covid19.ca.gov/state-dashboard/)
- December 17, 2020: Hidalgo, Texas, US | Reduction in cases due to double counting probable and confirmed cases | [Source 1](https://www.hidalgocounty.us/DocumentCenter/View/43316/12162020---Eight-deaths-related-to-COVID-19-reported-in-Hidalgo-County-along-with-377-positive-cases), [Source 2](https://www.hidalgocounty.us/DocumentCenter/View/43374/12172020---Four-deaths-related-to-COVID-19-reported-in-Hidalgo-County-along-with-522-positive-cases)
- January 5, 2021: Alabama, US | Backlog of cases from the holiday period resulted in daily record of cases | Quote from source: "Case counts reported on today's update are high. Today's increase represents a delay in testing and reporting to the Alabama Department of Public Health (ADPH) due to the holiday weekends." | (Data Source: https://alpublichealth.maps.arcgis.com/apps/opsdashboard/index.html#/6d2771faa9da4a2786a509d82c8cf0f7)
- January 25, 2021: Hawaii, US | Identification of unreported COVID-19 deaths results in a statewide spike of 60 deaths | (Data Source: https://www.kitv.com/story/43230995/60-covid19-related-deaths-went-unreported-doh-finds)
- February 1, 2021: South Carolina, US | 210 newly reported deaths include backlog extending back to October | [News source](https://www.wistv.com/2021/02/01/dhec-new-covid-cases-reported-monday-deaths-announced-after-system-issue/#:~:text=COLUMBIA%2C%20S.C.%20(WIS)%20%2D,30.)
- February 5, 2021: Indiana, US | "Today's total deaths includes 1,507 historical deaths identified through an audit of 2020 and 2021 COVID death records and test results." | (Data Source: https://www.coronavirus.in.gov/2393.htm) | **See Data Mod records**
- February 10, 2021: Ohio, US | "Ohio to add approximately 4,000 COVID-19 deaths to death total" over the next several days | (Data Source: https://odh.ohio.gov/wps/portal/gov/odh/media-center/odh-news-releases/odh-news-release-02-10-20) | **Back distributed, see Data Mod records**
- February 18, 2021: New Hampshire, US | Inclusion of 421 backlogged cases from November to January | (Data Source: https://www.nh.gov/covid19/news/documents/covid-19-update-02172021.pdf)
- February 20, 2021: Delaware, US | Inclusion of 24 backlogged deaths from December and January | (Data Source: https://baytobaynews.com/stories/delawares-covid-related-death-toll-rises-by-24-to-1245,38744?)
- February 20, 2021: Ohio, US | Continual updates to "Ohio to add approximately 4,000 COVID-19 deaths to death total" over the next several days | (Data Source: https://odh.ohio.gov/wps/portal/gov/odh/media-center/odh-news-releases/odh-news-release-02-10-20) | **Back distributed, see Data Mod records**

- February 22, 2021: Rhode Island, US | Inclusion of 81 historical deaths in today's report | (Data Source: https://eu.providencejournal.com/story/news/healthcare/2021/02/22/ri-covid-numbers-9-deaths-835-additional-cases-over-last-3-days/4539308001/)
- February 24, 2021: LA, California, US | Inclusion of 806 historical deaths that primarily occurred between December 3, 2020 and February 3, 2021 | (Data Source: http://publichealth.lacounty.gov/phcommon/public/media/mediapubhpdetail.cfm?prid=2983)
- February 25, 2021: Jefferson, Wisconsin, US | 30 deaths reported in a single day due to data not previously being transferred to the state health department correctly | [News source](https://wkow.com/2021/02/25/52-more-dead-from-covid-19-in-wisconsin-7-1-percent-fully-vaccinated/)
- February 28, 2021: Rhode Island, US | Distribute the inclusion of 81 historical deaths between March 27, 2020 to February 26, 2021 | (Data Source: https://www.providencejournal.com/story/news/healthcare/2021/02/22/ri-covid-numbers-9-deaths-835-additional-cases-over-last-3-days/4539308001/)
- March 2, 2021: Spain | Removal of duplicated reports in the region of Catalonia. This has resulted in a drop in cases of ~80k for the region, and a daily drop of ~70k for the country | (Data Source: https://www.mscbs.gob.es/profesionales/saludPublica/ccayes/alertasActual/nCov/documentos/Actualizacion_323_COVID-19.pdf)
- March 3, 2021: United Kingdom | Addition of 172 historical deaths by Public Health Scotland | (Data Source: https://coronavirus.data.gov.uk/details/whats-new#172_deaths_within_28_days_of_a_positive_test_added_to_scotland_and_uk_totals)
- March 10, 2021: Minnesota, US | Inclusion of 891 backlogged cases and 138 backlogged deaths in daily report | [Source 1](https://kttc.com/2021/03/09/minnesota-reports-backlog-of-covid-19-cases-deaths-from-past-year/), [Source 2](https://www.mprnews.org/story/2021/03/09/whats-behind-spikes-in-covid-case-death-numbers-in-minnesotas-latest-data-release)
- March 11, 2021: Texas, US | Daily report included 548 backlogged confirmed cases and 154 backlogged probable cases | (Data Source: https://txdshs.maps.arcgis.com/apps/opsdashboard/index.html#/ed483ecd702b4298ab01e8b9cafc8b83)
- March 16, 2021: Alabama, US | Inclusion of 4007 historical probable and confirmed cases on March 15. Tests were performed on or during October 1, 2020 through January 1, 2021. | (Data Source: https://alpublichealth.maps.arcgis.com/apps/opsdashboard/index.html#/6d2771faa9da4a2786a509d82c8cf0f7)
- March 18, 2021: Maricopa, Arizona, US | Removal of 467 cases that had inadvertently been attributed to Maricopa County | (Data Source: https://www.maricopa.gov/5460/Coronavirus-Disease-2019)
- March 18, 2021: Kentucky, US | Identification of 601 historical deaths. 417 were added on March 18; the remaining 187 will be added "in the coming days" | (Data Source: https://www.kentucky.com/news/coronavirus/article250035379.html)
- March 19, 2021: Kentucky, US | Inclusion of 166 of the above-referenced historical deaths | (Data Source: https://chfs.ky.gov/cvdaily/COVID19DailyReport031921.pdf)

- March 19, 2021: North Carolina, US | Removal of 99 deaths that did not fit the most recent version of the state definition of a COVID-19 death | See [Issue #3839](https://github.com/CSSEGISandData/COVID-19/issues/3839)
- March 22, 2021: Italy | Inclusion of 10,665 historical cases in the region of Bolzana | (Data Source: https://opendatadpc.maps.arcgis.com/apps/opsdashboard/index.html#/b0c68bce2cce478eaac82fe38d4138b1)
- March 27, 2021: United Kingdom | Removal of 850 historical cases that had been processed incorrectly. "This affected specimen dates between 23 and 25 March in local authorities primarily in the North East and Yorkshire." | (Data Source: https://coronavirus.data.gov.uk/details/whats-new#removal_of_cases_incorrectly_reported_by_laboratory)
- April 3, 2021: Iowa, US | State reports large unspecified number of backlogged deaths identified through death certificate review | Private communication with Iowa State Health Department
- April 7, 2021: Oklahoma, US | Addition of ~1300 backlogged cases and ~1700 backlogged deaths. Cases were due to a data transfer error from a private laboratory and include cases from December to February; deaths are due to addition of a process to automate a portion of the state's death certificate review | (Data Source: https://www.oklahoman.com/story/news/2021/04/07/oklahoma-add-hundreds-covid-cases-went-unreported-due-tech-error/7105281002/)
- April 9, 2021: Montana, US | Addition of 72 backlogged cases and 26 backlogged deaths | [Source 1](https://nbcmontana.com/news/local/data-reconciliation-leads-to-jump-in-recorded-covid-19-deaths-cases), [Source 2](https://billingsgazette.com/news/state-and-regional/montana-adds-229-covid-19-cases-27-more-deaths/article_071eec55-2419-53e9-9138-196ae0f65d11.html)
- April 9, 2021: England, United Kingdom | Reduction of 8,010 cases that were deemed lateral flow test false positives due to negative confirmatory PCR | (Data Source: https://coronavirus.data.gov.uk/details/whats-new)
- April 13, 2021: Alabama, US | Addition of 1150 backlogged cases from October 22, 2020 to April 7, 2021 | (Data Source: https://alpublichealth.maps.arcgis.com/apps/MapSeries/index.html?appid=d84846411471404c83313bfe7ab2a367)
- April 15, 2021: Alaska, US | Addition of 20 deaths identified through a death certificate review process | (Data Source: https://www.adn.com/alaska-news/2021/04/15/tracking-covid-19-in-alaska-194-cases-and-20-deaths-reported-thursday-after-death-certificate-review/)
- April 15, 2021: Nebraksa, US | Removal of 21 duplicated deaths | (Data Source: https://siouxlandnews.com/news/coronavirus/covid-19-in-nebraska-04-15-2021)
- April 17, 2021: Missouri, US | Removal of 11,454 double counted cases | [Source 1](https://www.kmbc.com/article/covid-19-live-updates-coronavirus-in-kansas-city-missouri-kansas-coronavirus-04162021/36144667#), [Source 2](https://showmestrong.mo.gov/data/public-health/statewide/)
- April 20, 2021: Alabama, US | Inclusion of 1110 backlogged cases from October 23, 2020 to April 6, 2021. 1058 are in residents of Mobile County | (Data Source: https://alpublichealth.maps.arcgis.com/apps/MapSeries/index.html?appid=d84846411471404

c83313bfe7ab2a367) and see [issue #3984](https://github.com/CSSEGISandData/COVID-19/issues/3984)

- April 20, 2021: Knox County, Texas, US | Negative cases due to cleaning of historical data | See [Announcement](https://github.com/CSSEGISandData/COVID-19/issues/4056)
- April 26, 2021: Alaska, US | Inclusion of 12 deaths over the past several months identified through death certificate review | (Data Source: https://alaska-native-news.com/covid-19-daily-summary-april-26-2021/55402/)
- April 26, 2021: New Jersey, US | Removal of ~10,400 duplicated confirmed and probable cases from the state total | Communication with state health department and [news source](https://www.nj.com/coronavirus/2021/04/nj-covid-updates-outdoor-capacities-to-increase-indoor-proms-can-have-dancing-heres-the-latest-april-27-2021.html)
- April 27, 2021: West Virginia, US | Removal of 162 deaths found to not be due to COVID-19 | [Source 1](https://www.wvnews.com/news/wvnews/west-virginia-health-officer-162-deaths-found-not-to-be-covid-related-to-be-removed/article_3bb21c72-638b-5e07-a041-e343239aa340.html), [Source 2](https://www.wvnews.com/news/wvnews/west-virginia-dhhr-reports-3-new-covid-19-related-deaths-removes-162-previously-reported/article_c4bbd8b8-61f5-5423-aeef-97599f6c5f2e.html)
- May 5, 2021: Bergen County, Nnew Jersey, US | Addition of over 1100 backlogged antigen cases | See [Announcement](https://github.com/CSSEGISandData/COVID-19/issues/4055)
- May 7, 2021: Ravali County, Montana, US | Publication of 12 backlogged deaths | (Data Source: https://billingsgazette.com/news/state-and-regional/montana-reports-149-new-covid-19-cases-12-more-deaths-confirmed/article_b3dec548-4789-599d-9414-e5b56d9ec273.html)
- May 13, 2021: Alabama, US | Inclusion of 306 backlogged cases | See [announcement](https://github.com/CSSEGISandData/COVID-19/issues/4087)
- May 14, 2021: Alabama, US | Inclusion of 4,877 backlogged cases | See [announcement](https://github.com/CSSEGISandData/COVID-19/issues/4087)
- May 15, 2021: Alabama, US | Inclusion of 1,235 backlogged cases | See [announcement](https://github.com/CSSEGISandData/COVID-19/issues/4087)
- May 17, 2021: Alaska, US | 10 of 11 daily deaths identified through death certificate review | (Data Source: https://alaska-native-news.com/covid-19-daily-summary-may-17-2021/55811/)
- May 18, 2021: United Kingdom | Reduction of 4,776 false positive lateral flow tests | (Data Source: https://coronavirus.data.gov.uk/details/whats-new) (Note for May 18)
- May 18, 2021: Missouri, US | Weekly death certificate review resulted in a large spike in deaths, particularly in rural counties | See [announcement](https://github.com/CSSEGISandData/COVID-19/issues/4099)
- May 19, 2021: New Castle County, Delaware, US | Large spike in cases due to reporting delays with multiple laboratories | See [announcement](https://github.com/CSSEGISandData/COVID-19/issues/4121)
- May 20, 2021: Laramie County, Wyoming, US | 100+ case backlog due to data transfer issues with a health provider | See [announcement](https://github.com/CSSEGISandData/COVID-19/issues/4136)
- May 20, 2021: France | Reduction of 350,000 duplicate cases without correcting historical data | See [press release](https://www.santepubliquefrance.fr/les-actualites/2021/des-indicateurs-plus-precis-pour-le-suivi-des-cas-confirmes-de-covid-19)

- May 24, 2021: New Mexico, US | Inclusion of approximately 100 deaths identified through death certificate review | (Data Source: https://www.kob.com/new-mexico-news/new-mexico-to-add-approximately-100-more-covid-19-deaths-to-states-total/6117386/)
- May 24, 2021: Brazos County, Texas, US | Inclusion of 628 backlogged cases in daily report | See [announcement](https://github.com/CSSEGISandData/COVID-19/issues/4132)
- May 26, 2021: Oklahoma, US | An unspecified number of backlogged deaths have resulted in 373 deaths reported | (Data Source: https://oklahoma.gov/covid19/newsroom/2021/may/situation-update--covid-19-05-26-2021.html)
- May 27, 2021: Los Angeles, California, US | Addition of 3,857 backlogged cases | See [discourse](https://github.com/CSSEGISandData/COVID-19/issues/4147) including a statement from the LA Times
- May 27, 2021: Maryland, US | Addition of 538 previously unpublished COVID-19 deaths | (Data Source: https://southernmarylandchronicle.com/2021/05/27/maryland-department-of-health-vital-statistics-administration-issues-revision-of-covid-19-death-data/)
- June 1, 2021: Kentucky, US | Addition of 260 backlogged deaths identified from a death certificate audit | (Data Source: https://www.kentucky.com/news/coronavirus/article251818393.html)
- June 3, 2021: Indiana, US | Addition of 765 backlogged cases | (Data Source: https://www.wthr.com/article/news/health/coronavirus/coronavirus-numbers/indiana-coronavirus-updates-for-thursday-june-3-2021/531-a05e1e2f-019d-42e7-8a54-fb923fe14383)
- June 6, 2021: San Mateo, California, US | Addition of 85 backlogged deaths | (Data Source: https://covid19.ca.gov/state-dashboard/#location-san_mateo) - "Today's case count includes 186 deaths from San Mateo County from prior months that were not previously reported." Importantly, our data for San Mateo had not previously come from the state dashboard, explaining why our daily deaths is <186.
- June 9, 2021: West Virginia, US | Inclusion of 18 deaths from death certificate review | (Data Source: https://wvmetronews.com/2021/06/09/dhhr-adds-24-additional-covid-19-deaths-to-state-numbers/)
- June 11, 2021: Alaska, US | Inclusion of four deaths identified through death certificate review | (Data Source: https://www.adn.com/alaska-news/2021/06/11/tracking-covid-19-in-alaska-49-cases-reported-over-2-days-and-4-deaths-identified-in-certificate-review/)
- June 29, 2021: California, US | Removal of 6,372 duplicated cases from the state dashboard (along with inclusion of 2,013 new cases). County-level distribution not available. | (Data Source: https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Immunization/ncov2019.aspx)
- July 14, 2021: Arizona, US | Large spike in cases due to technical issue resulting in some cases having not been published in the previous two days | See (Data Source: https://www.usnews.com/news/best-states/arizona/articles/2021-07-14/arizona-reports-covid-19-case-bulge-cites-reporting-issue)
- July 30, 2021: Delaware, US | 128 backlogged deaths from mid-May to June 2021 reported after death certificate review | (Data Source: https://news.delaware.gov/2021/07/30/positive-case-numbers-continue-to-rise-and-delta-variant-continues-to-dominate/)

- August 6, 2021: Cameron County, Texas, US | 7,634 older probable cases added | (Data Source: https://txdshs.maps.arcgis.com/apps/dashboards/ed483ecd702b4298ab01e8b9cafc8b83)
- October 23, 2021: Namibia | 343 antigen positive cases added that were missed from the reports from May 2021 to beginning of October 2021 | (Data Source: https://www.facebook.com/photo/?fbid=173659591625049&set=pcb.173659671625041)
- October 30, 2021: Japan | 4,065 backlogged cases in the Tokyo Prefecture | (Data Source: https://www3.nhk.or.jp/news/special/coronavirus/data-all/) | See Issue #4854 for translation of announcement
- December 2, 2021: Missouri, US | Addition of ~2800 probable deaths | See [GitHub issue](https://github.com/CSSEGISandData/COVID-19/issues/4982)

Large-scale back distributions

This section will serve to notify developers when we are able to successfully backdistribute any of the large instances of retrospective reporting.

Generalized format:
Date: Location | File | Change | Data source for change

- April 24, 2020: New York City, New York, US (April 23) | Distribution of probable deaths from March 12 to April 24 (See errata.csv line 104) |
- April 29, 2020: United Kingdom (April 29) | time_series_covid19_deaths_global.csv | Distribution of deaths outside of hospital | Official government website
- June 12, 2020: Massachusetts, US (June 12) | Probable cases back distributed | Source is [here](https://www.mass.gov/info-details/covid-19-response-reporting).
- June 13, 2020: Michigan | Through data provided by the Michigan Department of Health and Human Service's (MDHHS) Communicable Disease Division, we were able to appropriately distribute the probable cases MDHHS began reporting on June 5th.
- July 1, 2020: New York City, New York (July 1) | time_series_covid19_deaths_us.csv | Probable deaths back distributed via tables on [nychealth GitHub](https://github.com/nychealth/coronavirus-data/blob/master/deaths/probable-confirmed-dod.csv).
- July 26, 2020: Chile (June 17) | Back distribution of probable and previously non-notified cases (all prior to June 17) | time_series_covid19_confirmed_global.csv | Data from [this repository] (https://github.com/MinCiencia/Datos-COVID19) managed by the Ministry of Science was used for the correction. Specifically, data from [product 45] CasosConfirmadosPorComunaHistorico_std.csv and CasosNoNotificadosPorComunaHistorico_std.csv was accessed on July 26 and the most current version of the documents at that time were used for the correction. For CasosConfirmadosPorComunaHistorico_std.csv, this was July 22nd. Cases were added to the day at the end of their respective epidemiological week.
- August 2, 2020: New Jersey, US (June 25) | time_series_covid19_deaths_US.csv | Redistribution of probable deaths into Unassigned, New Jersey
- August 6, 2020: Harris County, Texas (Texas July 27) | In line with alteration to reporting standards, time series for coronavirus deaths in Harris County has been updated from 3/7 to 8/5/2020 | Details can be found in the press release from the state [here](https://www.dshs.texas.gov/news/releases/2020/20200727.aspx).
- September 22, 2020: Massachusetts (September 3) | Reconciliation of changes to probable cases | Detailed [here](https://github.com/CSSEGISandData/COVID-19/issues/3146)
- October 1, 2020: North Carolina, US | Back distribution of probable cases | See [Issue #3183](https://github.com/CSSEGISandData/COVID-19/issues/3183#ref-commit-663bcf9)
- November 9, 2020: Wisconsin, US | Back distribution of probable cases and deaths through October 19
- November 10, 2020: Louisiana, US | Back distribution of probable cases from August 26 to November 9
- November 13, 2020: Georgia, US | Probable deaths back distributed to November 3

- November 18, 2020: Alabama, US | Back distribution of probable case spike on September 15
- November 22, 2020: Texas,US | Introduction of probable cases for Brazos, Denton, and Dallas counties | Data was back distributed based on historical reporting from local government sources
- December 2, 2020: Kazakhstan | Reporting in Kazahkstan has been modified to include probable cases, deaths, and recoveries.
- December 4, 2020: Guam, US | Back-distribution of probable cases and deaths from official sources | | [Guam Dashboard](https://dphss.guam.gov/covid-19/)
- December 14, 2020: Texas, US | Back-distribution of county level probable cases as provided by the Texas Department of State Health Services | (Data Source: https://dshs.texas.gov/coronavirus/AdditionalData.aspx)
- December 17, 2020: Washington, US | Back-distribution of 7,671 probable cases from present to June | Back distribution used the [Washington COVID-19 dashboard]
- February 09, 2021: Indiana, US | Redistribution of previously identified historical deaths to unassigned category. State total reported from Department of Health was compared to time_series_covid19_deaths_us.csv and the difference was distributed to Unassigned, Indiana. | [Indiana source](https://www.coronavirus.in.gov/2393.htm) | We hope to receive a county level distribution from the state health department but we have not yet received a response
- February 16, 2021: Ohio, US | Back distribution of deaths at the county level to correct for large release of backlogged deaths. | [Data source - csv link](https://coronavirus.ohio.gov/static/dashboards/COVIDSummaryData.csv)
- February 19, 2021: New Hampshire, US | Redistribution of recently identified historical cases from November to January to unassigned category. From November 1, state total reported from Department of Health was compared to time_series_covid19_deaths_us.csv and the difference was distributed to Unassigned, New Hampshire | (Data Source: https://www.nh.gov/covid19/dashboard/trends.htm#dash)
- March 24, 2021: Indiana, US | The deaths back distributed on February 9 have been distributed to their respective counties and removed from the unassigned category. Our appreciation to the Indiana Department of Health for their help with this issue.
- April 2, 2021: Alaska, US | In response to the state's separation of Valdez-Cordova, AK into Copper River, AK and Chugach, AK, we have recreated the time series including these two locations using the official data from the Alaska dashboard | (Data Source: https://alaska-coronavirus-vaccine-outreach-alaska-dhss.hub.arcgis.com/app/6a5932d709ef4ab1b868188a4c757b4f)
- June 2, 2021: Pennsylvania, US | Deaths for Chester county, PA were determined to be greater at the state level of reporting than the direct reporting from Chester county. The data has been redistributed based on the state level histroical deaths and moving forward Chester county data will be collected from the maximum value between the state and county source. | [State Source](https://www.health.pa.gov/topics/disease/coronavirus/Pages/Cases.aspx) | [County Source](https://chesco.maps.arcgis.com/apps/opsdashboard/index.html#/975082d579454c3ca7877db0a44e61ca)

- November 18, 2021: Slovakia | Reporting in Slovakia has been modified to include probable cases. A back-distribution of probable cases from official sources has been issued| | [Slovakia Dashboard](https://korona.gov.sk/koronavirus-na-slovensku-v-cislach/)
- December 23, 2021: Brazil | Reporting in Brazil has been corrected to align with the Federal University of Vicosa Github Repository. This action was in response to the cyber attack on the Brazil Ministry of Health source.| [Federal University of Viçosa Github Repository](https://github.com/wcota/covid19br/blob/master/cases-brazil-states.csv)
- December 24, 2021: Kentucky, US | Reporting in Kentucky, US has been corrected to align with the Kentucky Cabinet For Health and Family Services. | [Kentucky Cabinet For Health and Family Services](https://chfs.ky.gov/Pages/cvdaily.aspx?View=Dec.%202021%20Daily%20Summaries&Title=Table%20Viewer%20Webpart)
- January 5, 2022: Nova Scotia, Canada | Reporting in Nova Scotia, Canada has been corrected to align with the Government of Canada. | [Canada Government](https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection.html)
- January 10, 2022: Kansas, US | Reporting in Kansas, US has been corrected to align with the state.
- January 11, 2022: Thailand | Reporting in Thailand has been corrected from 07-22-2020 to 01-05-2022
- January 21, 2022: Texas, US | Reporting in Texas has been corrected from 04-12-2020 to 01-20-2022. This correction is to align our data with the state reporting.
- January 22, 2022: Texas, US | Reporting in Texas has been corrected from 04-01-2020 to 01-16-2022. This correction is to align our data with the state reporting.
- January 27, 2022: Finland | Reporting in Finland has been corrected from 02-11-2022 to 01-26-2022. This correction is to align our data with the World Health Reporting.
- January 27, 2022: Ontario, Canada | Reporting in Ontario, Canada has been corrected from 03-24-2020 to 01-26-2022. This correction is to align our data with the [Ontario Government](https://data.ontario.ca/dataset/status-of-covid-19-cases-in-ontario/resource/ed270bb8-340b-41f9-a7c6-e8ef587e6d11).
- February 8, 2022: Mongolia | Reporting in Mongolia has been corrected from 03-17-2020 to 02-07-2022. This correction is to align our data with the [World Health Organization](https://covid19.who.int/region/wpro/country/mn).
- February 9, 2022: Ecuador | Reporting in Ecuador has been corrected from 06-26-2021 to 02-08-2022. This correction is to align our data with the [The Government of Ecuador](https://www.salud.gob.ec/informes-de-situacion-sitrep-e-infografias-covid-19-desde-26-07-2021/).
- February 21, 2022: Maryland, US | Reporting in Maryland has been corrected from 12-05-2021 to 02-15-2022. This correction is to align our data with the [State of Maryland](https://coronavirus.maryland.gov/datasets/mdcovid19-casesbycounty/explore)
- February 24, 2022: Saskatchewan, Canada | Reporting in Saskatchewan has been corrected from 03-25-2020 to 02-23-2022. This correction is to align our data with the [The Government of Canada](https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection.html).

- February 28, 2022: Netherlands | Reporting in the Netherlands has been corrected from 07-17-2020 to 02-27-2022. This correction is to align our data with the [The Government of Netherlands](https://coronadashboard.government.nl/verantwoording#confirmed-cases).
- March 03, 2022: Ontario, Canada | Reporting in Ontario, Canada has been updated to include Toronto Public Health, Ottawa Public Health, Region of Peel, and Region of Halton.
- March 17, 2022: Lassen County, California, US | Corrected from 2020-02-01 to 2022-03-16 to report cases and deaths from state source
- May 09, 2022: Stanislaus County, California, US | Corrected from 2020-02-01 to 2022-05-04 to report cases and deaths from state source

Irregular Update Schedules

As the pandemic has progressed, several locations have altered their reporting schedules to no longer provide daily updates. As these locations are identified, we will list them in this section of the README. We anticipate that these irregular updates will cause cyclical spikes in the data and smoothing algorithms should be applied if the data is to be used for modeling.

United States

- Alabama: Providing data Monday-Friday (as of March 4, 2022). ~~Providing data seven days a week (as of September 17, 2021).~~ ~~Providing data Monday-Friday.~~ ~~Providing data Monday, Wednesday, and Friday~~
- Alaska: Providing data once per week (Wednesdays) (as of April 4, 2022). ~~Providing data Monday, Wednesday, and Friday (as of December 7, 2021).~~ ~~Providing data Monday-Friday (as of 8/2/2021).~~ ~~Providing data Monday, Wednesday, and Friday, excluding holidays.~~
- Arizona: Providing data once per week (as of March 2, 2022)
- Arkansas: Providing data Monday-Friday. Resuming weekend reporting July 24, 2021.
- California: Providing data Tuesdays and Fridays (as of April 4, 2022). ~~Providing data Monday-Friday.~~
- Colorado: Providing data Monday-Friday.
- Conneticut: Providing data Monday-Friday.
- Delaware: Providing data Monday-Friday.
- District of Columbia: Providing data once per week (Thursdays) as of March 4, 2022. ~~Providing data Monday-Friday.~~
- Florida: Providing data once every two weeks (Fridays) (as of March 11, 2022). ~~Providing data once per week (Fridays).~~
- Georgia: Providing data once per week (Wednesdays) (as of April 20, 2022).~~Providing data Monday-Friday.~~
- Guam: Providing data Monday-Friday.
- Hawaii: Providing data once per week (Wednesdays) (as of March 9, 2022).
- Idaho: Porviding data Monday, Wednesday, and Friday (as of April 20, 2022). ~~Providing data Monday-Friday. Providing data Monday-Saturday (as of November 6, 2021).Providing data daily (as of 9/11/2021).Providing data Monday-Friday.~~
- Illinois: Providing data Monday-Friday.
- Indiana: Providing data Mondays, Wednesdays, and Fridays (as of March 29, 2022).~~Providing data Monday-Friday.~~
- Iowa: Providing data once weekly (day of the week TBC).
- Kansas: Providing data once per week (Wednesdays).~~Providing data once per week (Fridays) (as of April 1, 2022).~~ ~~Providing data Monday, Wednesdays, and Fridays.~~ No data for the weekend of August 22-23.
- Kentucky: Providing data once per week on Mondays (as of March 7, 2022). ~~Providing data Monday-Friday.~~
- Louisiana: Providing data Monday-Friday.
- Maine: Providing data Tuesday-Saturday.
- Maryland: Providing data Monday-Friday (as of April 3, 2022).

- Massachusetts: Providing data Monday-Friday.
- Michigan: Providing data once per week (Wednesdays) (as of April 4, 2022). ~~Providing data Mondays, Wednesdays, and Fridays (as of August 9, 2021).~~ ~~Providing data Tuesdays and Fridays (as of 07/07/2021)~~. No case data provided for August 21.
- Minnesota: Providing data Monday-Friday.
- Mississippi: Providing state level data Monday-Friday. County level data updated once per week (as of March 10, 2022).
- Missouri: Providing data once weekly (Fridays) (as of April 1, 2022). ~~Providing data Monday-Friday (as of Feb 22, 2022).~~
- Montana: Providing data once weekly (Fridays) (as of May 6, 2022). ~~Providing data Monday-Friday.~~
- Nebraska: Providing state level data only Monday-Friday (in composite with CDC reporting).~~Providing data Monday-Friday (as of 9/25/2021).~~ ~~Providing data Wednesdays only (as of 8/11/2021)~~
- Nevada: Providing data once per week (Wednesdays) (as of March 16, 2022). ~~Providing data Monday-Friday.~~
- New Hampshire: Providing data once weekly (Thursdays) as of May 16, 2022. ~~Providing data Monday-Friday.~~
- New Mexico: Providing data Monday-Friday.
- New York City: ~~Providing data Monday-Friday.~~ Providing data seven days a week (as of January 4, 2022).
- North Carolina: Providing data weekly (Wednesdays) (as of April 6, 2022). ~~Providing data Monday-Friday.~~
- Northern Mariana Islands: Providing data once weekly (Mondays).
- Ohio: Providing all data once per week (Thursdays) (as of March 14, 2022). ~~Providing death data twice per week (normally Tuesdays and Sundays).~~
- Oklahoma: Providing data once per week on Thursdays (as of March 7, 2022). ~~Only updating deaths and county-level case data on Tuesdays. State level case data updated Monday-Friday.~~
- Oregon: Providing data Monday-Friday (as of July 10, 2021).
- Republic of Palau: Providing data Tuesdays and Fridays.
- Rhode Island: Providing state level data Monday-Friday. County level cases and death data is released once per week.
- Pennsylvania: Providing data once per week (Wednesdays) (as of May 6, 2022).
- South Carlina: Providing data weekly (Tuesdays) (as of March 15, 2022). ~~Providing data Monday-Friday.~~
- South Dakota: Providing data weekly (as of April 12, 2022). ~~Providing data Monday-Friday (as of August 16, 2021). Providing data Wednesdays only.Saturday and Sunday data will be reported on Tuesdays.~~
- Tennessee: Providing data weekly. ~~Providing data Monday-Friday.~~
- Utah: Providing data once weekly (Thursdays) (as of March 31, 2022). ~~Providing data Monday-Friday.~~
- Vermont: Providing data once per week (Wednesdays) (as of May 19, 2022). ~~Providing data daily (as of August 21, 2021).~~ ~~Providing data Monday-Friday.~~

- Virginia: Providing data Monday-Friday.
- Washington: Did not update October 10-12 due to data entry issue. ~~As of December 20, only updating Monday-Saturday. As of August 1, only updating Monday-Friday.~~ As of Janaury 25, 2022, only updating Monday, Wednesday, and Friday.
- West Virginia: Providing data Monday-Friday (as of March 14th, 2022). ~~Providing data daily.~~ ~~Providing data Monday-Friday.~~
- Wisconsin: Providing data Monday-Friday.
- Wyoming: Providing data once per week (Tuesdays). ~~Providing data twice a week (Tuesdays and Fridays) (as of March 11, 2022).~~ ~~Providing data Monday-Friday.~~

International

- Belgium: Providing data Tuesdays and Fridays. ~~Providing data Tuesday-Saturday.~~
- Bosnia and Herezegovina: Not updating data on the weekends.
- Alberta, Canada: Providing data Monday-Friday.
- British Columba, Canada: Providing data Monday-Friday.
- Manitoba, Canada: Providing data Monday-Friday.
- New Brunswick, Canada: Providing data Monday-Friday.
- Newfoundland and Labrador, Canada: Providing data Monday, Wednesday, and Friday.
- Northwest Territories, Canada: Providing data Monday-Friday.
- Saskatechewan, Canada: Providing data weekly (Thursdays).
- Yukon, Canada: Providing data Monday-Friday.
- Colombia: Weekly on Thursdays
- Costa Rica: Updating data on Wednesdays and Saturdays only.
- Denmark: Not updating case, death, or recovered data on the weekends.
- France: No longer releasing case, hospitalization, or death data on the weekends. Please see [Tableau dashboard](https://dashboard.covid19.data.gouv.fr/vue-d-ensemble?location=FRA). No update to deaths or recoveries for the weekend of August 8 and 9.
- Honduras: Providing data Monday-Friday.
- Ireland: Providing death data once weekly.
- Luxembourg: Not providing actionable data on weekends.
- Mexico: Providing data once weekly. Beginning November 10, recoveries are available at the national level only and will be grouped in the "Unassigned, Mexico" entry.
- Nicaragua: Releasing case, death, and recovered data once per week.
- NSW, Australia: NSW Health has suspended its survey of the recovery status of patients with COVID-19 to focus on the recent increase in community transmission on July 31, 2020. Therefore, recovery statistics are no longer presented. ([Source](https://www.nsw.gov.au/covid-19/find-facts-about-covid-19), [Issue #3694](https://github.com/CSSEGISandData/COVID-19/issues/3694))
- Spain: Providing data twice a week (Tuesdays and Fridays) (as of March 15, 2022). ~~Not updating case or death data on the weekends (and is not currently providing recoveries at any time)~~
- Sweden: Updating once per week (Thursdays) (as of March 24, 2022). ~~Not updating case, death, or recovered data Saturday-Monday. Updates expected Tuesdays through Fridays.~~
- Switzerland: Providing data once per week (Tuesdays).

- UK: Providing data Monday-Friday (as of Feb 26, 2022). Daily death toll paused on July 18. ([GOV.UK](https://www.gov.uk/guidance/coronavirus-covid-19-information-for-the-public#number-of-cases) and [Reuters](https://www.reuters.com/article/us-health-coronavirus-britain-casualties-idUSKCN24J0GC)). Technical difficulties with the national dashboard are resulting in no update for August 11. [Source](https://twitter.com/phe_uk/status/1293245784599781376?s=21). Corrected on August 12.
- Wales, UK: Providing data Monday-Saturday

UID Lookup Table Logic

URL:https://github.com/CSSEGISandData/COVID-19/blob/master/csse_covid_19_data/UID_ISO_FIPS_LookUp_Table.csv

1. All countries without dependencies (entries with only Admin0).
    - None cruise ship Admin0: UID = code3. (e.g., Afghanistan, UID = code3 = 4)
    - Cruise ships in Admin0: Diamond Princess UID = 9999, MS Zaandam UID = 8888.
2. All countries with only state-level dependencies (entries with Admin0 and Admin1).
    - Demark, France, Netherlands: mother countries and their dependencies have different code3, therefore UID = code 3. (e.g., Faroe Islands, Denmark, UID = code3 = 234; Denmark UID = 208)
    - United Kingdom: the mother country and dependencies have different code3s, therefore UID = code 3. One exception: Channel Islands is using the same code3 as the mother country (826), and its artificial UID = 8261.
    - Australia: alphabetically ordered all states, and their UIDs are from 3601 to 3608. Australia itself is 36.
    - Canada: alphabetically ordered all provinces (including cruise ships and recovered entry), and their UIDs are from 12401 to 12415. Canada itself is 124.
    - China: alphabetically ordered all provinces, and their UIDs are from 15601 to 15631. China itself is 156. Hong Kong, Macau and Taiwan have their own code3.
    - Germany: alphabetically ordered all admin1 regions (including Unknown), and their UIDs are from 27601 to 27617. Germany itself is 276.
    - Italy: UIDs are combined country code (380) with `codice_regione`, which is from [Dati COVID-19 Italia](https://github.com/pcm-dpc/COVID-19). Exceptions: P.A. Bolzano is 38041 and P.A. Trento is 38042.
3. The US (most entries with Admin0, Admin1 and Admin2).
    - US by itself is 840 (UID = code3).
    - US dependencies, American Samoa, Guam, Northern Mariana Islands, Virgin Islands and Puerto Rico, UID = code3. Their Admin0 FIPS codes are different from code3.
    - US states: UID = 840 (country code3) + 000XX (state FIPS code). Ranging from 8400001 to 84000056.
    - Out of [State], US: UID = 840 (country code3) + 800XX (state FIPS code). Ranging from 8408001 to 84080056.
    - Unassigned, US: UID = 840 (country code3) + 900XX (state FIPS code). Ranging from 8409001 to 84090056.
    - US counties: UID = 840 (country code3) + XXXXX (5-digit FIPS code).

- Exception type 1, such as recovered and Kansas City, ranging from 8407001 to 8407999.
- Exception type 2, Bristol Bay plus Lake Peninsula replaces Bristol Bay and its FIPS code. Population is 836 (Bristol Bay) + 1,592 (Lake and Peninsula) = 2,428 (Bristol Bay plus Lake Peninsula). 2148 (Hoonah-Angoon) + 579 (Yakutat) = 2727 (Yakutat plus Hoonah-Angoon). UID is 84002282, the same as Yakutat. ~~New York City replaces New York County and its FIPS code. New York City population is calculated as Bronx (1,418,207) + Kings (2,559,903) + New York (1,628,706) + Queens (2,253,858) + Richmond (476,143) = NYC (8,336,817). (updated on Aug 31)~~
- Exception type 3, Diamond Princess, US: 84088888; Grand Princess, US: 84099999.
- Exception type 4, municipalities in Puerto Rico are regarded as counties with FIPS codes. The FIPS code for the unassigned category is defined as 72999.

4. Population data sources.
   - United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Prospects 2019, Online Edition. Rev. 1. https://population.un.org/wpp/Download/Standard/Population/
   - eurostat: https://ec.europa.eu/eurostat/web/products-datasets/product?code=tgs00096
   - The U.S. Census Bureau: https://www.census.gov/data/datasets/time-series/demo/popest/2010s-counties-total.html
   - Mexico population 2020 projection: [Proyecciones de población](http://sniiv.conavi.gob.mx/(X(1)S(kqitzysod5qf1g00jwueeklj))/demanda/poblacion_proyecciones.aspx?AspxAutoDetectCookieSupport=1)
   - Brazil 2019 projection: ftp://ftp.ibge.gov.br/Estimativas_de_Populacao/Estimativas_2019/
   - Peru 2020 projection: https://www.citypopulation.de/en/peru/cities/
   - India 2019 population: http://statisticstimes.com/demographics/population-of-indian-states.php
   - Belgium (Population on 1st January 2020): https://statbel.fgov.be/en/themes/population/structure-population
   - Canada (Q3 2021): https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901
   - China (mainland) (May 11, 2021): http://www.stats.gov.cn/english/PressRelease/202105/t20210510_1817188.html
   - Denmark (mainland) (2021Q3): https://www.dst.dk/en/Statistik/emner/borgere/befolkning
   - France (European) (January 1st 2021): https://www.ined.fr/en/everything_about_population/data/france/population-structure/regions_departments/
   - Germany (as of 31.12.2020): https://www.destatis.de/EN/Themes/Society-Environment/Population/Current-Population/Tables/population-by-laender.html
   - The Admin0 level population could be different from the sum of Admin1 level population since they may be from different sources.