OHIO AUDITOR OF STATE
KEITH FABER

Ohio Department of Health COVID-19 Data

Performance Audit

March 23, 2021

OHIO AUDITOR OF STATE
KEITH FABER

88 E. Broad St.
Columbus, Ohio 43215

Phone: (614) 466-4514
Toll Free: (800) 282-0370

www.ohioauditor.gov

Dear fellow Ohioans,

Nearly one year ago, we sent our staff home to work remotely without a date to return to the office. Schools and businesses closed their doors, families stocked up at the grocery store unsure of what to expect, and we said "see you soon" to our loved ones, friends and co-workers. Never could we have imagined the challenges and economic impacts we would experience due to the COVID-19 pandemic.

Billions of federal pandemic relief dollars flowed into Ohio as we worked to create our own pandemic mitigation strategy. Differing views on how to control the pandemic and protect Ohioans sparked many discussions, protests, rumors and questioning of the data being presented to Ohioans.

In July of 2020, my office joined a multi-state effort to develop an audit plan that would study COVID-19 data collection and data management, surveillance and monitoring, and public communications in our respective states. This effort includes the State Auditors' offices from Delaware, Florida, Mississippi, and Pennsylvania, and was developed with assistance from the National State Auditors Association. The intent was to provide a way for states to determine the quality of data used to make policy decisions, where best to invest resources to control the virus spread, and to give the public confidence in the COVID-19 figures being reported.

The Ohio Performance Team (OPT) began an initial audit of the Ohio Department of Health (ODH) in September 2020 and worked cooperatively with the agency throughout the audit. To provide a more complete picture of the response, OPT requested full access to the agency's COVID-19 data. However, due to the agency's interpretation of the Health Insurance Portability and Accountability Act (HIPAA) and other constraints, ODH only provided a portion of the requested data to our auditors. Our analysis of the limited data provided by ODH showed minimal duplicates (0.20%), and minimal misclassifications between confirmed and probable cases (0.12%). Recently, ODH reported a miscalculation of death data and has undertaken efforts to identify the failure and design a better data gathering and reporting process. The death data provided was not sufficient to allow our auditors to identify the death miscount.

While our analysis of the data provided uncovered minimal errors and inefficiencies, opportunities to improve transparency, and methods to collect better data certainly exist. For instance, the "COVID-19 dashboard" created by ODH, while informative, can be confusing and overwhelming for non-medical professionals. This makes drawing conclusions from the data harder for Ohioans and could lead to misinterpretation. To their credit, ODH continues to adapt their public communications to public demands, and the data presented to Ohioans is largely accurate. This adaptation has progressed as ODH leadership has changed hands – from an ODH Director initially focused on being the voice of Ohio's response, to now a third director focused on fixing operational shortcomings.

Bottom line: Were the numbers reported by ODH during this pandemic correct? Generally, yes. I am pleased that ODH is taking steps to improve some operational issues, while also working proactively to implement some of the recommendations made in our audit already.

I hope the Department continues to use this audit and our recommendations to improve its response to COVID-19 and any future pandemics. As the state has emphasized throughout the pandemic, we are all in this together. That remains true today as we hold each other accountable and help government serve Ohioans more effectively and transparently.

Finally, I would like to thank ODH staff, as well as the medical professionals and front-line workers across the Buckeye State who have worked tirelessly to keep us safe over the last year. The light at the end of the tunnel is near.

Sincerely,

Keith Faber
Auditor of State
Columbus, Ohio

March 23, 2021

Ohio Department of Health COVID-19 Data

Performance Audit Digest

WHAT WE LOOKED AT (AUDIT SCOPE AREAS)

This audit is part of a multi-state project to examine data related to COVID-19. This effort was a collaboration among State Auditor offices from Delaware, Florida, Mississippi, Pennsylvania, and Ohio and was developed with assistance from the National State Auditors Association. This performance audit uses the multi-state audit program, with several Ohio-specific objectives included.[1,2] In this audit, we examined aspects of the following areas:

- **Data Collection**, including the types, frequency, technology and processes related to COVID-19 data collection.
- **Internal Reporting,** including guidance disseminated to providers, laboratories and local health departments (LHDs) and the timeliness of internal reporting.
- **Monitoring,** including monitoring COVID-19 coding for cases and sampling the testing and death certificate processes to ensure accuracy, as well as contacting and monitoring COVID-19 positive individuals.
- **External Reporting,** including the types of information and methods by which it was shared with the public; how useful, timely, meaningful, and accurate it was; and why certain data elements were selected for public reporting.

See **Appendix A** for more detail on these scope areas.

WHAT WE FOUND

The anonymized data we were provided by ODH from the Ohio Disease Reporting System (ODRS) appeared mostly accurate (See **Appendix A, On-Site Data Review**) but during the course of the audit, ODH identified over 4,000 death certificates that had not been reconciled to ODRS, thereby making the total Ohio COVID-19 deaths statistic inaccurate from approximately October 2020 to February 2021**.** Auditors were unable to determine the completeness of the data within (ODRS) due to the Department's assertion that the Health Insurance Portability and Accountability Act and other undefined constraints required it to deny AOS full access to test this data, thus limiting the scope of our review. These constraints also prevented us from reconciling data among systems (e.g. Death Certificate Data).

[1] This performance audit report was conducted under Generally Accepted Government Auditing Standards. For more information regarding Purpose, Scope, and Methodology please see **Appendix A**.
[2] This audit did not examine ODH or LHD staffing, state funding, or death certificate reconciliation processes.

ODH lags the majority of other states in the reporting of individual negative test result data as required by the federal government. See R1. Additionally, ODH is unable to report on two of the three means of displaying percent positivity due to incomplete negative test results data. This prevents the Ohio Department of Health from providing a selection of meaningful data points on rates of positivity in the community. See R3.

While ODH has improved the selection of metrics tracked and reported on its dashboard, the department should give a more accurate indication of active cases, hospitalizations, and test positivity rates. Additionally, the terminology used on the dashboard is inconsistent and unclear. The lack of refinement in the dashboard makes it difficult for the general public to make educated decisions. See R3. Further, the frequency of data updates may cause confusion when attempting to interpret information. See R2.

When counting the total number of hospitalizations and deaths, ODH does not differentiate between hospitalizations and deaths **by** COVID-19 and **with** COVID-19. While ODH counts deaths in accordance with CDC guidance, some medical professionals may complete death certificates in a manner that allows for inclusion of some individuals who did not die due to COVID-19 but rather of other causes while also testing positive for COVID-19. Additionally, in the case of deaths, there is conflicting guidance among federal and global public health organizations that should be studied by the Department. The conflicting guidance and definitions raise questions with the public and, as a result, eight other states have chosen to break out deaths into two metrics-deaths due to COVID-19 and deaths with COVID-19. See R5.

The data system and processes in use at the Ohio Department of Health, local health departments, and laboratories, are outdated and have not been able to scale for the volume of cases in the pandemic. Manual data entry, personnel intensive processes, and manual reconciliations all slow the departments of health response to outbreaks. See R6.

As cases spiked, overwhelming local health departments' capabilities to follow up with new positive cases, contact tracing became inconsistent across the state. See R7.

Last, AOS established a hotline for Ohioans to report inaccurate test results and other concerns related to COVID-19. We received 15 completed entries through the hotline. In several cases, these were found to be the result of clerical errors. However, our ability to investigate these complaints was restricted by ODH's assertion that HIPAA prevented us from matching these complaints with data in ODRS.

RECOMMENDATIONS

Recommendation 1: ODH should examine its current framework for data collection for COVID-19 and work to ensure testing data is complete, accurate, and includes all tests administered in Ohio. In particular, the collection of negative test is critical for the accurate calculation of percent positivity, which is a metric that is used by policy makers to make decisions regarding mitigation efforts such as opening schools.

Recommendation 2: Though significant information is available to the public, the usability and clarity of this information could be improved to better guide policy decisions and individual actions. ODH should consider alternatives to daily updates to ensure data completeness and accuracy prior to reporting, as well as leverage trend data to improve public understanding of new case rates.

Recommendation 3: ODH should proactively explain, in a detailed manner, its rationale for the selection of data elements that it elects to share with the public. While the state dashboard was created in haste, subsequent refinements are needed to recalibrate some of its reporting elements, such as active infections versus recovered individuals. ODH should improve its dashboard reporting and terminology to ensure clear, concise communications to the public. Improvements include consistent data definitions, a better indication of active cases, and improved organization and navigation of the Dashboard.

Recommendation 4: ODH should work with LHDs to better align data reporting on daily county-level updates, thereby reducing skepticism generated by differing data. This could include better timing and coordination of data updates to increase consistency among LHDs and ODH, as well as clear explanations of jurisdictional authority.

Recommendation 5: ODH includes all deaths where COVID-19 is present in its total deaths calculation for Ohio. This may lead to confusion for the layperson as to whether an individual died *by* COVID-19 or died *with* COVID-19. To improve this data and enhance clarity in its reporting, ODH should:

- Examine the National Center for Health Statistics (NCHS), Centers for Disease Control (CDC), and World Health Organization (WHO) guidance, seeking clarification where necessary, and determine which of the deaths included in the calculation are deaths directly **caused by** COVID-19 versus those **with** COVID-19,
- Improve and update its guidance to medical professions on how to complete death certificates,
- Review current best practices regarding how to report COVID-19 deaths, and

- Study COVID-19 death reporting methods used in other states that account for the variation between deaths which are deemed to be caused by COVID-19 and those cases where COVID-19 was present, but not a contributing factor to death.

Once this is complete, ODH should update its dashboard accordingly.

Recommendation 6: The Ohio Disease Reporting System (ODRS), the state's 20 year old infectious disease system, collects a significant amount of data on COVID-19 but the age of the system contributes to limitations in and problems with data collection. ODH should proceed with existing plans to replace ODRS, targeting implementation within 24 to 36 months.

Recommendation 7: Current law permits ODH only a coordinating function among the independent LHDs in relation to case investigation, limiting its ability to intervene when staffing constraints make timely contact tracing impossible, Therefore, ODH should pursue options to ensure consistent efforts related to contact tracing and case investigation by LHDs during a pandemic or other widespread infectious event.

LIMITATIONS ON AUDIT WORK PERFORMED

We were unable to conduct major portions of our data analysis based on ODH's interpretation of federal health data privacy laws. For the data we were able to review, our analysis showed that data errors were present in less than 1 percent of the cases.

We found that, generally, the COVID-19 testing data collected by ODH and the LHDs was received in a timely manner, but it was not always acted upon in a timely fashion by LHDs due to backlogs of manual data entry for email and fax test results. Backlogs in laboratory onboarding for electronic reporting still exist and contribute to the manual data entry and some data limitations, and we were unable to ascertain from ODH when this activity would be completed.

Finally, because negative test results were not compiled early in the pandemic and are reliant on electronic laboratory reporting for individual-specific results, ODH is unable to provide reasonable assurance that it's percent positivity figures contain accurate and complete data, nor is it able to internally or externally report other methods of reporting percent positivity.

Note on Audit Report

In December of 2019, the first cases of COVID-19 were identified in China. By March of 2020, the COVID-19 virus was declared a global pandemic by the World Health Organization and the first cases were confirmed in Ohio. In July of 2020, the Ohio Auditor of State's Office joined a multi-state project to examine data related to COVID-19. This effort was undertaken through collaboration among the State Auditors' offices from Delaware, Florida, Mississippi, and Pennsylvania, and was developed with assistance from the National State Auditors Association. This performance audit uses the multi-state audit program, with several Ohio-specific objectives included.[3] This report examines COVID-19 data collection and data management, surveillance and monitoring, and public communications.

In an age where information can be obtained as easily as clicking a button, it is critical that government entities present data in a clear, concise, and unbiased manner. During the COVID-19 pandemic, because of the important public policy decisions being made and the impact on the daily lives of Ohioans, the collection, presentation and impact of this public health data has generated constant scrutiny. As a result, the Ohio Department of Health, at daily briefings held by the governor and through frequent updates to public facing information, as well as the State's response to the COVID-19 pandemic, many issues which may not normally rise to the level of an audit recommendation are discussed in this report.

[3] This performance audit report was conducted under Generally Accepted Government Auditing Standards. For more information regarding Purpose, Scope, and Methodology please see **Appendix A**.

Key Organizations and Terminology

Throughout the report, several agencies are discussed and technical terminology is used. Below is a list of definitions which may be helpful in reading this report:

Antibody Test: An antibody test looks for antibodies that are made by your immune system in response to a threat, such as a virus. Antibodies can take several days or weeks to develop after you have an infection, and may stay in your blood for several weeks after recovery. These tests are not used to diagnose COVID-19, but may show if someone has already had and recovered from the virus.

Antigen Test: A diagnostic test for COVID-19 that detects specific proteins from the virus. These are also often referred to as "rapid tests".

Bureau of Infectious Diseases (BID): A component of ODH, BID seeks to prevent and control the spread of infectious diseases (e.g. foodborne outbreaks, influenza, meningitis, tuberculosis, and vaccine-preventable diseases). BID works closely with Local Health Departments, healthcare providers, and laboratories to ensure that infectious disease reports are identified and investigated timely.

Centers for Disease Control and Prevention (CDC): The CDC is one of the major operating components of the U.S. Department of Health and Human Services. The agency works to protect America from health, safety, and security threats. The CDC is tasked with fighting disease and supporting communities and citizens to do the same.

Centers for Medicare & Medicaid Services (CMS): The Centers for Medicare & Medicaid Services, is a federal agency within the United States Department of Health and Human Services that administers the Medicare program and works in partnership with state governments to administer Medicaid, the Children's Health Insurance Program, and health insurance portability standards. The Centers for Medicare & Medicaid Services Office of Minority Health (CMS OMH) has compiled federal resources on the 2019 Novel Coronavirus (COVID-19) to assist those who work with older adults, those with underlying medical conditions, racial and ethnic minorities, rural communities, and people with disabilities.

Contact Tracing: Contact tracing is used by health departments to prevent the spread of infectious diseases. In general, contact tracing is the process of identification of persons ("contacts") who may have come into contact with an infected person, and subsequent collection of further information about these contacts. By tracing the contacts of infected individuals, testing them for infection, isolating, or treating the infected and tracing their contacts in turn, public health aims to reduce infections in the population.

COVID-19: The new coronavirus SARS-CoV-2 causes COVID-19. SARS-CoV-2 is believed to have originated in animals and spread to humans. SARS-CoV-2 is a betacoronavirus, which means it originated in bats. The initial outbreak occurred in December 2019 among people who

had a link to a large seafood and live animal market in Wuhan, China. While COVID-19 appears to cause mild to moderate illness in most people, in others it has caused life-threatening pneumonia and death.

Electronic Death Registration System (EDRS): The Bureau of Vital Statistics uses EDRS to file and maintain death records in Ohio. A funeral home electronically creates a death record in EDRS and enters the personal demographic information. Certifiers, such as physicians and coroners, have the ability to complete and sign/certify the cause of death for records electronically in EDRS or by manually signing a paper version.

Electronic Laboratory Reporting (ELR): ELR allows facilities (hospitals and laboratories) to report test results for infectious diseases through an automated and secure process. Facilities export data from their laboratory information systems in a standard file format and send it to ODH electronically through a secure interface. ELR will replace paper-based reporting for most reportable infectious diseases.

Infectious Disease: Infectious diseases are disorders caused by organisms such as bacteria, viruses, fungi, or parasites. Some infectious diseases can be passed from person to person.

Local Health Department (LHD): Ohio has 113 local health departments that work with ODH, healthcare providers, and public health stakeholders to promote and protect the health of all Ohioans. The departments maintain independent governance, but often work together, along with the state and federal public health agencies. Funding comes from a variety of sources depending on how the LHD is organized. Collectively, they strive to protect and improve the health of their communities by preventing and controlling the spread of disease and injury. They are governed by regulations in the ORC and the OAC.

Mirth Connect: The Mirth system, which became active in October 2020, was designed and built to accommodate the automated collection of negative COVID-19 laboratory test results. Essentially, Mirth acts as a screening tool to identify the test being performed and the reported result. The system reads inbound ELR messages and applies processing steps and basic logic to filter reportable disease data to appropriate public health reporting channels or systems.

Monitoring: A component of surveillance that is often used to indicate non-data driven (e.g. case investigation and case management) or more longitudinal studies of infectious diseases. Monitoring is intermittent or episodic performance, and analysis of measurements aimed at detecting changes in the health status of populations or in physical or social events.

National Institutes of Health (NIH): A part of the U.S. Department of Health and Human Services, NIH is the U.S.' national level medical research agency.

Ohio Administrative Code (OAC): The OAC contains all of the rules passed by the various state agencies to carry out the intent of legislation passed by the General Assembly. State agencies promulgate rules and regulations (sometimes called administrative law) in the *Register of Ohio*, which are in turn codified in the OAC.

Ohio Contact Tracking System (OCTS): An online form created by ODH as an option to assist local health departments in tracking the contacts of confirmed COVID-19 cases. OCTS allows local health officials to monitor the symptoms of these individuals during their quarantine period and to respond to them if they become symptomatic. The system also allows for two-way text messaging.

Ohio Department of Health (ODH): ODH is a cabinet-level agency, meaning the director reports to the governor and serves as a member of the Executive Branch of Ohio's government. Its mission is advancing the health and well-being of all Ohioans by transforming the state's public health system and implementing data-driven, evidence-based solutions.

Ohio Disease Reporting System (ODRS): ODRS is Ohio's integrated disease surveillance system which tracks reportable conditions across Ohio and its local health jurisdictions. It provides real-time secured access for public health practitioners and medical providers to report infectious diseases. ODRS allows local health departments with jurisdictional responsibility and relevant ODH program staff to have immediate access to infectious disease reports on a 24/7/365 basis for disease control and surveillance purposes.

Ohio Hospital Association (OHA): The OHA leverages data and expertise to influence health policy, drive quality improvement initiatives, and advocate for economic sustainability. Established in 1915, the OHA is the nation's first state-level hospital association. Its mission is to collaborate with member hospitals and health systems to ensure a healthy Ohio.

Ohio Revised Code (ORC): The ORC contains all of the laws that have been passed by the legislature. It can be updated through an act of the General Assembly.

PCR Test (Polymerase Chain Reaction): A molecular diagnostic test for COVID-19 that detects the virus' genetic material. These tests require laboratory processing, unlike antigen tests that can be processed at any location.

Surveillance: Infectious disease surveillance is an important epidemiological tool to monitor disease burden and identify outbreaks and new pathogens. Surveillance is an active form of monitoring where the issue under observation is continuously and actively under radar. Dissemination of surveillance data is a critical step toward public health action. Surveillance is often used to mean data driven or early indicators of infectious disease (e.g. clinical testing).

World Health Organization (WHO): The WHO was formed on April 7, 1948. It is currently comprised of 7,000 people working in 150 country offices, in six regional offices, and at its headquarters in Geneva, Switzerland. Its primary role is to direct and coordinate international health within the United Nations system. Its main areas of work are health systems; non-communicable and communicable diseases.

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Executive Summary

Background

On March 9th, 2020, the State of Ohio declared a state of emergency after three individuals tested positive for COVID-19. By the end of March 2020, the state had issued a stay-at-home order and required non-essential businesses to close their doors to combat the spread of COVID-19. In the months to follow, restrictions would evolve based on the most current understanding of the virus and how it spread. Along the way, the Ohio Department of Health (ODH or the Department) has provided regular updates to the Governor's Office, local health departments, medical professionals and Ohio residents based on data which is reported to the Department by local health departments (LHD), laboratories, hospitals, and other medical providers.

While tracking data and reporting on issues of public health is a standard function of the Department, officials had not experienced a pandemic of this scale and were challenged to change how data tracking and reporting was conducted in order to respond to the information needs of policy-makers and the public. The efforts have been largely undertaken by the Department, particularly within the Bureau of Infectious Diseases (BID), and illustrate the evolving nature of the Governor's and Director of Department of Health's orders and directives. From stay-at-home to mask wearing to social distancing, the Department routinely updated guidance based on its knowledge of techniques to prevent the spread of the virus. Much of this information – data and guidance - is made available on its COVID-19 specific web page and has been highlighted in daily or semi-weekly press conferences held by the Governor's Office.

COVID-19 Timeline

JAN 20, 2020
First US case is reported

JAN 30
WHO declares a global public-health emergency

MAR 9
First Ohio cases reported

MAR 9
Ohio declares State of Emergency

MAR 20
First Ohio death confirmed

JUL 29
Ohio reaches 100k cases

NOV 3
Ohio reaches 250k cases

DEC 2
Ohio reaches 500k cases

DEC 14
First US vaccinations administered

JAN 3, 2021
Ohio reaches 750k cases

Why We Performed this Audit

We performed this audit as part of a multi-state project to examine data related to COVID-19. This effort was conceived through collaboration with State Auditor offices from Delaware, Florida, Mississippi, Pennsylvania, and Ohio (COVID-19 Audit Task Force) and was developed with assistance from the National State Auditors Association. This performance audit uses the multi-state audit program, with several Ohio-specific objectives included.[4]

In this audit, we examined aspects of the following areas:

- **Data Collection**, including the types, frequency, technology and processes related to COVID-19 data collection.
- **Internal Reporting,** including guidance disseminated to providers, laboratories and local health departments (LHDs) and the timeliness of internal reporting.
- **Monitoring,** including monitoring COVID-19 coding for cases and sampling the testing and death certificate processes to ensure accuracy, as well as contacting and monitoring COVID-19 positive individuals.
- **External Reporting,** including the types of information and methods by which it was shared with the public; how useful, timely, meaningful, and accurate it was; and why certain data elements were selected for public reporting.

This audit was limited to examining data collection, management, monitoring and internal and external use. It did not cover other issues such as ODH and LHD staffing and funding or the reconciliation among various ODH systems. The audit objectives were selected based on the volume and nature of questions the participating State Auditors and lawmakers had surrounding state health departments' data reporting and subsequent actions, as well as general knowledge of high risk areas in state government such as internal controls. See **Appendix A** for more detail on the scope areas included in this audit.

Additionally, AOS established a hotline for Ohioans to report inaccurate test results, inaccurate communication from departments of health, and miscoding of hospitalizations and deaths and received 15 complete responses. In many cases, these were found to be the result of clerical errors. Our ability to investigate these complaints was restricted by ODH's assertion that HIPAA prevented us from matching these complaints with data in the Ohio Disease Reporting System (ODRS). ODH provided us explanations for 11 of the 15 hotline reports.

We conducted several analyses related to the audit objectives and obtained a thorough understanding of the Department's operations and data management related to COVID-19. While not all analyses were able to be completed, due to limitations on our data access and certain practices within ODH, some resulted in recommendations for improved operations.

[4] This performance audit report was conducted under Generally Accepted Government Auditing Standards. For more information regarding Purpose, Scope, and Methodology please see **Appendix A**.

What We Found

Accurate data, presented with appropriate context and in an actionable manner, is a critical aspect of a public health response. Responding to a pandemic requires a coordinated effort between state and local governments. Public health officials, at both levels, are responsible for collecting, analyzing, and disseminating COVID-19 testing, tracing, community prevalence and death data. Oftentimes, this data is used to make policy decisions. Further, this information is used to instruct the public and provide guidance on personal actions. When data is incomplete, or presented in an unclear manner, it can lead to confusion and responses which do not effectively address the public health threat.

Overall, we found that the process for collecting, accumulating, managing and disseminating data during the first year of the COVID-19 pandemic did not function at a level to be efficient or effective. Also, in some cases, conclusions rely on incomplete data. The underlying data systems and agency processes were not designed or prepared for a pandemic of this scale. Additionally, because of the separation of data among multiple systems, there is a risk of data integration issues.

Data Collection

ODH has processes in place that allow for the collection of data related to infectious diseases. Guidance on these processes, as well as a list of reportable illnesses, is published in the Infectious Disease Control Manual (IDCM). This document is updated as needed based on observed trends and guidance from the CDC. Data is gathered in ODRS which is used to monitor infectious diseases across the state.

COVID-19 was classified as a reportable illness in early 2020. ODH collects a significant amount of data regarding COVID-19[5] including basic demographics such as age, gender, and race. The Department also collects information on symptoms, travel history, illness onset date, and at risk groups such as residents of long-term care facilities. A high-level review indicated that there are more data points collected on COVID-19 compared to other reportable illnesses.

While the Department collects significant amounts of data related to COVID-19, it is of note that it lagged other states in the collection of negative test data, which is used to calculate test positivity rate. The test positivity rate for COVID-19 is one metric that can be used to identify the prevalence of the virus in a community. Negative test results are not typically collected for infectious diseases, but other states identified the value of this information at the onset of the pandemic. However, the Department has worked to provide systems and tools to laboratories and

[5] As a part of the CARES Act Section 18115, data collection fields that were required to be collected at the state level and sent to the Department of Health and Human Services were standardized. Guidance was released on the required data elements and ODH supplied a CSV schema that must be used to transmit COVID-19 laboratory results electronically.

other agencies to report negative testing data, first on an aggregated or total basis and more recently on an individual basis.

We found that ODRS, a 20 year old system, was not able to handle the influx of case data resulting from COVID-19 (see **R6**). Further, during the course of the audit, ODH began to implement a tool which allowed the reporting of negative testing data. While the tool had been implemented, a number of laboratories had not yet been on-boarded to the system at the time of our review so we are unable to speak to the completeness of data collected.

Internal Reporting

ODH relies on information from local partners to conduct public health monitoring. Having data which is both timely and accurate is of critical importance, particularly during a pandemic. Swiftly identifying areas of potential outbreak provides policy makers an opportunity to take actions that may mitigate the risk of spread and apply appropriate public health responses. Conversely, lagging or inaccurate data may result in policy decisions which do not appropriately reflect the severity of an outbreak, either by being insufficient to be impactful or overly restrictive and detrimental. Because of these issues, we reviewed the processes in place for internal reporting.

We found that, generally, the COVID-19 testing data collected by ODH and the LHDs was received in a timely manner, but it was not always acted upon in a timely fashion by LHDs because of backlogs of manual data entry for email and fax test results. This prevented prompt contact tracing and case investigation by LHDs and created backlogs of data and with lags extending from days to weeks.[6] These backlogs were caused by a combination of high volume, manual reporting by laboratories,[7] and the constraints on local operations. Delays often resulted in LHD's not providing timely isolation guidance.

Due to ODH's stated concerns regarding HIPAA protections, we were unable to review the full ODRS database. Instead, ODH provided an anonymized data set to OPT for review at ODH headquarters. We determined that this limited data set was largely accurate (see **Appendix A, On Site Data Review**). Specifically, case data was reviewed to determine how well ODH was able to prevent duplicate entries as a significant number of duplicates would lead to over-counting and potentially skew the public health response. Our analysis determined that data

[6] In the case of COVID-19 test results, ODH obtains data directly from laboratories that use its electronic interface, and LHDs then refine, augment and amend the data. LHDs also obtain paper or facsimile (fax) transmissions from smaller laboratories not yet on the ODH system and perform direct data entry of test results before conducting additional investigations and making corrections to the information.

[7] COVID-19 laboratory test data must be reported to ODH by the close of the following business day that the test results is determined and must contain certain data elements. Laboratories are expected to report this information electronically, however not all laboratories were able to report electronically as they had not completed the process to be officially recognized by ODH in a process called onboarding. At the time of reporting, ODH is still working to onboard laboratories, however, for those tests that were submitted electronically, we found that the data collection process for laboratories was compliant with federal guideline.

errors were present in less than one percent of the cases we were permitted to review and were therefore statistically insignificant and did not have an impact on public policy.

The Department has a data cleaning process internal control that works to ensure the reliability of the data within ODRS. The errors that were observed in the limited data set we were permitted to review had occurred within 60 days prior to the analysis, indicating that it had likely not gone through the cleaning procedures. When instances of double counting were identified by auditors, ODH promptly resolved the data issues. Finally, some internal controls on data reconciliation did not function as designed and led to incomplete and, therefore, inaccurate death data being reported. See **R5**.

External Reporting

During the COVID-19 pandemic, ODH has provided regular updates in order to share critical information with the public.[8] These updates have been issued through a variety of sources including:

- A dedicated public website with data, updated on a daily basis;
- Regular press conferences from the Governor's Office;
- Social media postings; and,
- Public service announcements.

The Department has also provided updates directly to policy makers and other officials, including regular calls with LHDs and other key stakeholders to discuss public health guidance.

We reviewed ODH's efforts in providing information related to the pandemic to the public. This included a review of how information was shared, how data was organized and presented, and how the state decided which data to share.

In many cases, data presentation by ODH and the Governor's Office to the public defaulted to the ODH COVID-19 dashboard. While dashboards can be an important tool to share information with the public, we found that the ODH COVID-19 dashboard lacked clarity and ease of use that would be necessary for public consumption.

ODH's decision to emphasize total cases and total deaths to communicate the perceived severity of the pandemic appeared to lose value as time progressed and external data users developed a better understanding of the pandemic. While this "large number" was intended to drive behavior, we found that it may have raised additional questions from public users of the dashboard. Additionally, due to limitations in the information provided by ODH, we were unable to determine how the state decided which data to share with the public. Although ODH largely provided similar information as other states based on a review of dashboards, there are opportunities to improve this tool.

[8] ODH routinely provides information to the public and other external stakeholders, such as policy makers, on a range of infectious diseases.

Our recommendations note that while ODH has improved the selection of metrics tracked and reported on its dashboard, the Department should give a more accurate indication of active cases, hospitalizations, and test positivity rates. Additionally, the terminology used on the dashboard is inconsistent and unclear. The lack of refinement in the dashboard makes it difficult for the general public to make educated decisions. See **R3**. The audit further identified that the daily updating of some information could result in the reliance on incomplete information, see **R2**. Finally, daily reporting and limited state and local coordination on data reporting can result in inconsistent information being reported between the state and local levels, see **R4**.

Monitoring

Monitoring involves both ensuring the accuracy of testing data[9] as well as the physical monitoring of infected individuals in Ohio.

On the public health response component, the Department has a system of structural monitoring for the identification of unusual medical events. This involves required reporting from LHDs on specific infectious diseases as well as a system which collects information from emergency departments regarding patient symptoms. This helps ODH identify and respond to infectious disease events.

Yet, the processes and primary data system in use at ODH, LHDs and laboratories is outdated and have not been able to scale for the volume of cases in the pandemic. Manual data entry, personnel intensive processes, and manual reconciliations all slow Ohio's response to outbreaks. This is especially reflected in ongoing backlogs of case data at LHDs and the recent "underreporting" of COVID-19 deaths resulting from a manual data reconciliation failure. See **R6**.

Deaths related to COVID-19, another important public health surveillance metric, have been a subject of scrutiny. We reviewed the guidance provided by ODH to medical professionals regarding how to complete death certificates for COVID-19 patients. Much of the guidance on this topic comes from CDC publications. We found conflicting guidance regarding how death certificates containing COVID-19 should be recorded in official death counts based on the placement of information on the certificate, which can lead to confusion as to whether an individual died *from* COVID-19 or died *with* COVID-19 (see **R5**).

ODH has, throughout the pandemic, been in continual contact with LHDs. LHD feedback indicated that the communication, direction and feedback loop with ODH was largely supportive and informative, though some smaller health departments learned of directives and actions they were to take not at internal briefings but through the public press conference process. Generally, ODH has asked for information from LHDs on backlogs and workloads, but it may not have

[9] Laboratories are regulated by the Centers for Medicare & Medicaid Services (CMS). The Clinical Laboratory Improvement Amendments, promulgated by CMS, are a set of standards that are designed to ensure quality laboratory testing. The application of these standards by CMC and monitoring by ODH ensures that laboratories meet the data reporting requirements for data elements and timeliness.

statutory authority to take corrective action to address these issues, due to the decentralized model in use in Ohio.

As cases spiked and backlogs increased in the fall of 2020, overwhelming local health departments' capabilities to follow up with new positive cases, contact tracing became inconsistent across the state. See **R7**. Also, case management - following positive cases through the duration of active infection which is typically performed for other infectious diseases – was not planned to be implemented for COVID-19 and is therefore nonexistent.

Limitations on Data Review

Data related to health is a sensitive topic and the data has broad federal protections embedded mostly within the Health Insurance Portability and Accountability Act, better known as HIPAA.[10] This Act provides privacy protections to the general public regarding personal health information. Because of ODH's interpretation of HIPAA and these protections, and the sensitive information contained in many ODH systems, ODH denied us access to the data systems and full data set. Generally, during the course of an audit we may retrieve large data sets directly from the source systems in order to conduct detailed analyses related to the information. Even in the case of HIPAA protections, health agencies have mechanisms that can allow auditor access to these data sets. However, for purposes of this audit, we were given and reviewed an anonymized data set extracted by ODH from ODRS. We conducted this review on-site at the Department's main office over the period of three days. This review allowed our analysts to draw some conclusions, however in many cases we were unable to complete a full analysis related to our audit objectives or opine on the reliability of the data. Some specific examples of these conclusions or limitations are below:

- Potential duplicate entries were identified within the data we were able to review. All duplicate entries were recent, and likely had not been addressed by the ODH data team due to timing. The internal controls over this process appeared appropriate based on the processes in use by ODH and LHDs and would reasonably guarantee accurate information for the data we were provided.[11] *Total potential duplicates: 1,363 or 0.20% of the total cases at the time of the analysis.*
- We found instances where cases were incorrectly labeled either confirmed or probable based on the type of test administered. These instances were rare but were submitted to ODH for review and correction. *Total potential miscategorizations: 784 or 0.12% of total cases at the time of the analysis.*
- We observed instances where anomalies occurred in the data set (e.g. outlier data), such as a hospitalization date prior to the onset of symptoms. While unable to confirm through

[10] HIPAA is a federal law which, in part, establishes national standards to protect individuals' medical records and other personal health information.
[11] This does not provide assurance over completeness of data in the system, only that the data in the system does not have significant duplicates included in the total number of cases.

data examination due to the anonymized data, BID staff indicated in interviews[12] that the current system, ODRS, was not designed to track multiple events for an individual in a specific disease record. That is, if an individual were to seek treatment for COVID-19 multiple times over the course of a year, exporting data for analysis and comparison purposes becomes difficult and convoluted, often with dates being pulled from multiple treatment events (See **R6** on ODRS for more detail).

- Hotline complaints catalogued by our office were not researched directly by AOS but were compiled for ODH follow up. Some examples provided to ODH were found to be the result of clerical errors at LHDs or, in response to general complaints, were responded to with the associated policy.
- We were unable to get a firm depiction of the laboratories electronically reporting and those waiting to be on-boarded or in process. Therefore, we were unable to determine which laboratories and what proportion of positive and negative test results were reported via ELR.
- Last we were unable to perform some reconciliations, due to the limitations on data access. Specifically we were unable to reconcile EDRS to ODRS (death certificates to recorded COVID-19 deaths) and the total number of tests (positive and negative) to the Dashboard.

This phase of the audit did not examine COVID-19 death reporting for completeness and we were unable to test death certificate data entry into ODRS because of ODH's interpretation of HIPAA restrictions. (See **R1** and **R5**).

Summary of Recommendations:

Recommendation 1: ODH should work to ensure testing data for COVID-19 is complete, accurate, and includes all tests administered for Ohio. In particular, the collection of negative test is critical for the accurate calculation of percent positivity, which is a metric that is used by policy makers to make decisions regarding mitigation efforts such as opening schools.

Test data, positive and negative results of testing, related to COVID-19 has become a critical component to decision making for public officials. If ODH is able to provide a more comprehensive understanding of the number of tests administered in Ohio and the results of those tests, particularly as it relates to individual test data, can provide policy makers and residents a more accurate understanding of the prevalence of the virus in a specific community or the state as a whole.

Recommendation 2: Though significant information is available to the public, the usability and clarity of this information could be improved to better guide policy decisions and individual actions. ODH should consider alternatives to daily updates to ensure data completeness and accuracy prior to reporting, as well as leverage trend data to improve public understanding of

[12] The hospitalization field for COVID-19 reporting is collected by case investigators and does not provide specific guidance as to whether or not COVID-19 was the cause of the hospitalization. As a result, these anomalies could be due to hospitalizations that were not related to the onset of symptoms.

new case rates. Historically, in previous infectious outbreaks, ODH would collect, clean, and analyze data and report out on a weekly basis. Because of public interest in the pandemic, ODH has published information on COVID-19 daily for nearly a year. While this may have been important at the onset of the pandemic, daily data becomes less useful as medium and long-term trends are established.

Recommendation 3: ODH should proactively explain, in a detailed manner, its rationale for the selection of data elements that it elects to share with the public. While the state dashboard was created in haste, subsequent refinements are needed to recalibrate some of its reporting elements, such as active infections versus recovered individuals. ODH should improve its dashboard reporting and terminology to ensure clear, concise communications to the public. Improvements include consistent data definitions, a better indication of active cases, and improved organization and navigation of the Dashboard.

Recommendation 4: ODH should work with LHDs to better align data reporting on daily county-level updates, thereby reducing skepticism generated by differing data. This could include better timing and coordination of data updates to increase consistency among LHDs and ODH as well as clear explanations of jurisdictional authority.

Recommendation 5: ODH includes all deaths where COVID-19 is present in its total deaths calculation for Ohio. This can lead to confusion whether an individual died *from* COVID-19 or died *with* COVID-19. To improve this data and enhance clarity in its reporting, ODH should:

- Examine the National Center for Health Statistics (NCHS), Centers for Disease Control (CDC), and World Health Organization (WHO) guidance, seeking clarification where necessary, and determine which of the deaths included in the calculation are deaths directly caused **by** COVID-19 versus those **with** COVID-19;
- Improve and update its guidance to medical professionals on how to complete death certificates;
- Review current best practices regarding how to report COVID-19 deaths; and,
- Study COVID-19 death reporting methods used in other states that account for the variation between deaths which are deemed to be caused by COVID-19 and those cases where COVID-19 was present, but not a contributing factor to death.

Once this is complete, it should update its dashboard accordingly.

Recommendation 6: The Ohio Disease Reporting System (ODRS), the state's 20-year-old infectious disease system, collects a significant amount of data on COVID-19 but the age of the system contributes to limitations in and problems with data collection. ODH should proceed with existing plans to replace ODRS, targeting implementation within 24 to 36 months. Additionally, it should incorporate lessons learned from the pandemic in its design.

Recommendation 7: Current law permits ODH only a coordinating function among the independent LHDs in relation to case investigation, limiting its ability to intervene when staffing constraints make timely contact tracing impossible. Therefore, ODH should pursue options to

ensure consistent efforts related to contact tracing and case investigation by LHDs during a pandemic or other widespread infectious event. This includes updates to the ORC and OAC as well as improving guidance in the IDCM and providing a robust platform for LHDs to use for reporting data related to contact tracing and case investigation efforts.

For more information on audit objectives that did not result in a recommendation, either because the state was meeting recommended practices or because of unavailability of information or data access limitations, see **Appendix A**.

Agency Updates

During the course of an audit, an audited agency may make updates to processes or procedures which are the subject of a recommendation. Oftentimes this is as a result of information shared with the agency as a part of regular audit meetings. ODH has made several improvements to operations associated with the Department's response to the COVID-19 pandemic. Those which relate to our audit recommendations are listed below.

- The addition of clarifying information regarding terminology on the Dashboard.
- New procedures for the reconciliation and reporting of COVID-19 death data.
- Obtaining a third party vendor to maintain a centralized contact tracing pool.

AOS COVID-19 Hotline Overview

In order to understand how widespread COVID-19 related testing issues were in Ohio, AOS created an online portal (a hotline) where Ohioans could report erroneous COVID-19 test results, inaccurate communications from LHDs, and miscoding of hospitalizations and deaths. The portal was available to the public from August 2020 through January 2021. During that time, 15 completed submissions were received. The most common complaints received were from individuals who received inaccurate correspondence about their test results due to clerical errors made by local health departments and private-testing entities.

The types of complaints that could be registered were as follows:

- I was not tested, but received notice from the State or County Department of Health, or medical provider of a positive COVID-19 test;
- I was not tested, but received notice from the State or County Department of Health, or medical provider of a negative COVID-19 test;
- I was tested only once and initially received a negative result, but later received notice from the State or County Department of Health, or medical provider that I had a positive COVID-19 test;
- I was tested only once and initially received a positive result, but later received notice from the State or County Department of Health, or medical provider that I had a negative COVID-19 test;
- I was hospitalized for a non COVID-19 related medical event, but was coded as a COVID-19 hospitalization;

- I was hospitalized due to COVID-19, but was not coded as a COVID-19 hospitalization;
- I was tested only once and initially received a negative result, but later received notice from the State or County Department of Health, or medical provider that I had a second positive or negative COVID-19 test;
- A member of my household is deceased and COVID-19 was inaccurately recorded as the cause or a contributor to the death; and,
- Other

Responses were not received for all of the types of complaints requested. Further, respondents were asked to include documentation as appropriate. We did not independently investigate these complaints. At the time of reporting, AOS had provided all 15 complaints to ODH in order for the agency to investigate and ODH had provided responses to 11 out of 15 complaints. For those complaints with responses by ODH, the department cited clerical errors as well as policy or statutes.

Ohio Department of Health COVID-19 Performance Audit

Agency Overview

Public Health is the science of protecting and improving the health of people and their communities. Where a doctor or other health care professional may be interested in the health and wellness of an individual, public health officials work to prevent widespread illness or injury. In Ohio, the Ohio Department of Health (ODH or the Department) is a cabinet-level agency that is responsible for monitoring, protecting, and improving public health throughout the State of Ohio.

The Department has several programs and initiatives with dedicated public health professionals. Many of these working areas focus on a subset of the population, such as the Bureau of Maternal, Child, & Family Health which works to improve the health status of women, infants, and families in Ohio. Others are focused on specific health issues, such as diabetes. Generally, much of the work conducted by the Department goes unnoticed by Ohioans, even as it is designed to improve quality of life in the state.

Incident Command System

In 2020, ODH had multiple leadership changes with a total of three different individuals serving as Director of Public Health over the course of the year. With the start of the second leadership in early July, the Director deployed the Incident Command System (ICS).

During critical outbreaks, ODH may use ICS, a standardized structure that allows for a cooperative response by multiple agencies, to provide a common hierarchy for multiple organizations responding to an emergency situation. The ICS is not new to ODH, unique to public health, or unique to Ohio. It was first developed to address issues related to wildfire responses in California and Arizona and is routinely used by the Federal Emergency Management Agency, better known as FEMA. This system was deployed by ODH in July of 2020.

Public health involves a network of agencies at the federal, state, and local levels. The way in which public health agencies work together varies from state to state. Ohio has a decentralized structure in which ODH provides guidance and can set minimum standards for public health agencies, but does not generally have the authority to provide directives regarding daily operations. Essentially, the Department provides directives on action, but local health departments (LHDs) have autonomy to determine how to carry out ODH directives. The LHDs are separate political subdivisions that are independent of the local governments that comprise the LHDs territory, and are able to make public health policy decisions based on the circumstances of the communities they serve. While LHDs operate autonomously, they do so in a partnership with ODH. Each of the 113 LHDs in Ohio is responsible for providing information to ODH regarding public health trends within its jurisdiction, as well as providing surveillance and monitoring activities within the community for any reportable disease.[13] This information is

[13] Reportable infectious diseases are identified in the Infectious Disease Control Manual.

aggregated by ODH and used to direct public health policy and launch initiatives which are designed to improve the overall health of Ohioans.

Bureau of Infectious Diseases

The ODH Bureau of Infectious Diseases (the Bureau or BID) is responsible for the prevention and control of infectious diseases. This is typically done through regular monitoring and surveillance of potential outbreaks throughout Ohio, using electronic databases as well as regular contact with infected individuals.

BID includes epidemiologists, data analysts and other professionals who work closely with LHDs, healthcare providers, and laboratories to ensure that infectious disease cases are reviewed and investigated in a timely manner. In order to provide a uniform set of guidance to partner organizations, ODH publishes the Infectious Disease Control Manual (IDCM). The IDCM contains reporting requirements for select infectious diseases and also guidance on how to monitor infected individuals and attempt to stop the spread of an outbreak through control measures.

In addition to prevention and control of infectious diseases and monitoring outbreaks, BID also provides annual reports on infectious diseases in Ohio. The Bureau receives a significant amount of data over the course of a year, which is reviewed and analyzed in order to provide meaningful trends and information to other public health officials and care givers. At times, when necessary, information is also disseminated to the public in an attempt to prevent the spread of an infectious disease. Regarding potential infectious disease outbreaks, the Bureau relies on information and data from a variety of sources in order to identify public health trends and issue alerts. While prevention efforts are largely based on retrospective trend data, the control efforts are done in real-time through a combination of contact tracing and case management.

Infectious Disease Surveillance

The history of infectious disease surveilling dates back to ancient Egypt. Through the centuries, the concepts and goals of infectious disease surveillance have evolved from historic records in ancient Greece to the beginnings of systematic data analysis in the 17th Century and into the data-driven, technology based systems we work with today.

Public health departments routinely gather data related to infectious diseases that have been identified as a risk to the public, either due to the severity of the infection or the risk of spread within a population. Data collection can be conducted through a variety of sources and for a variety of means. For example, data may be collected initially to serve health-related purposes such as identifying symptoms and potential modes of infection. According to the CDC, surveillance methods are based on the disease under surveillance and different diseases may require a different reporting period depending on the needs of the community.

Surveillance for communicable diseases is typically reliant on reports from health care providers and laboratories. Ohio has many systems in place to aid the reporting of this information to

ODH. These systems are designed with the intent of assisting LHDs and medical professionals in submitting critical information to ODH in an expedient manner. Some of the systems used by ODH include:

- **Ohio Disease Reporting System (ODRS):** The database used for reporting infectious disease data;
- **Electronic Laboratory Reporting (ELR):** a system used by hospitals and laboratories to report testing data directly to ODH through secure messaging;[14]
- **Surgenet:** a web-based software that is used to assist in managing hospital services during a disaster;
- **Syndromic Surveillance:** used to detect potential health events based on data obtained through emergency department visits; and
- **Mirth Connect:** A technology solution implemented during 2020 to automate the collection of negative COVID-19 laboratory test data.[15]

Laboratory Data

ODH has multiple processes in place which allow for the submission and collection of laboratory testing data. Prior to the pandemic, this data was focused on the reporting of confirmed cases of reportable diseases. ODH did not have a system in place to collect negative test results as that information was not needed to conduct epidemiological work.

The CARES Act and subsequent guidance require laboratories that perform or analyze a COVID-19 test to report the result of each test, including negative results, to local and state public health departments, which must submit de-identified data to the CDC. Prior to the CARES Act, ODH was tracking only positive COVID-19 laboratory test data. In response to the cares act and subsequent guidance, ODH implemented Mirth Connect to allow for the collection of negative COVID-19 laboratory test use data.

In addition to these systems, ODH developed the Ohio Contact Tracing System (OCTS) at the onset of the COVID-19 pandemic as an option for LHDs to while conducting contact tracing related to the pandemic. Some health departments elected to use other contact tracing systems already in use by those departments or that better met the needs of the LHD's staff. While not a comprehensive list, the systems described above indicate the level to which ODH and LHDs are dependent on technology solutions in managing the process of monitoring and surveilling infectious diseases within the state.

According to *Modern Epidemiology*,[16] the primary objective of surveillance is to monitor the incidence or prevalence of identified health problems in order to document their effect on

[14] Labs must be credentialed by CLIA and then on-boarded into the ELR which takes weeks, months, or years to complete. During the COVID-19 pandemic, ODH experienced a large influx of new/non-traditional labs reporting COVID-19 data. Labs not yet on-boarded to ELR can submit data through ODH's website.

[15] Reporting a positive test result for classified infectious diseases is a standard requirement in Ohio. However, negative test result data has not been historically collected by ODH. In May 2020, ODH began to require the reporting of all COVID-19 data results including positive, negative, and inconclusive results.

[16] Rothman, K., Greenland, S., & Lash, TL. (2008). *Modern Epidemiology, 3rd Edition*. Lippincott Williams & Wilkins.

defined populations and to identify those at greatest risk. Trends detected through surveillance can also be used to anticipate future events. To be effective, surveillance data must be appropriately communicated to the full spectrum of constituents who can use the data, ranging from health care providers to policy makers.

Infectious Disease Control

Controlling infectious diseases is largely done through two processes: contact tracing[17] and case management. In Ohio, each LHD is responsible for performing both tasks for cases identified within its jurisdiction. The LHD is also responsible for reporting information to ODH so that the Bureau of Infectious Diseases can conduct routine monitoring and data analysis.

While the decentralized nature of Ohio's public health system does not generally give ODH authority to direct all operations of an LHD, ODH can establish contagious or infectious disease reporting requirements for LHDs and health care providers.[18] These reporting requirements are contained in OAC Chapter 3701-3 and further guidance is contained in the Infectious Disease Control Manual (IDCM), a document published by ODH and updated intermittently based on observed trends and guidance from other source such as the CDC.[19]

Responses to Infectious Disease Outbreaks

The current systems and structures are designed to manage fairly consistent caseloads. At times there may be increases in volume due to outbreaks, but these are often localized and over a short period of time. For example, in 2015 there was a foodborne botulism outbreak in Fairfield County which resulted in 29 infections and one death.

ODH is also equipped to surveil sustained outbreaks, for example, the Hepatitis A outbreak began in 2018 and the Department provides regular updates regarding new infections. However, the systems and processes currently in place were not designed with the expectation of a largescale pandemic such as COVID-19.

Infectious Disease Control Manual

This document is designed to be a reference to public health departments, hospitals, laboratories, and physicians in Ohio.[20] The IDCM is updated regularly based on guidance from the CDC and observed events to reflect changes in public health practices and disease prevention and control activities. Reportable diseases are updated on an annual basis based on guidance from the CDC and observed trends and events, and are listed within the IDCM and classified based on the severity of disease and risk of potential epidemic spread into three classes, or disease types. The manual also includes guidance on how LHDs and private healthcare providers can work to limit the spread of infectious disease through efforts such as contact tracing and case management.

[17] Case investigation is an abbreviated form of contact tracing.

[18] ORC § 3701.23 Reporting contagious or infectious diseases, illnesses, health conditions, or unusual infectious agents or biological toxins.

[19] In 2020, the IDCM was updated with new guidance related to COVID-19.

[20] The IDCM is based on Communicable Disease Rules 3703-3-01 through 3701-3-31 of the Ohio Administrative Code.

ODH is currently updating the section of the IDCM that provides guidance relating to contact tracing. This update began prior to the pandemic but the volume of work related to COVID-19 has delayed the update. More information on contact tracing is included in **R7**.

Infectious Disease Data Reporting

In March 2019, COVID-19 was identified as a Class A infectious disease; however, due the volume of cases, ODH issued guidance that COVID-19 should be treated as a Class A infectious disease with Class B reporting requirements.

Disease Classes

Class A diseases, such as measles or smallpox, must be reported immediately upon recognition of a case, suspected case, or positive laboratory result because of the severity of disease or potential risk of epidemic spread.

Class B diseases, such as tetanus or Lyme disease, must be reported by the end of the following business day after the existence of a case, suspected case, or positive laboratory result is known because of the risk of potential epidemic spread. Diseases in this classification are considered to be less severe than Class A diseases.

Class C reporting is reserved for unusual outbreaks of diseases that are not considered Class A or Class B, but indicate a type of spread that is of concern, such as foodborne illness or an outbreak in a localized community. These outbreaks must also be reported by the end of the business day following the recognition of a suspected outbreak.

Generally speaking, Ohio LHDs are responsible for compiling data related to infectious diseases and reporting it to ODH as necessary based on the IDCM. In turn, ODH is responsible for reporting aggregate statewide data to the CDC. At each level, health departments have found it beneficial to report information to the public. Both a micro and macro understanding of the spread and prevalence of infectious diseases can help to inform decisions from public policy to an individual's daily travel plans. This is no less true during a pandemic. In fact, regular dissemination of accurate data can guide public behaviors that would reduce or stop the spread of the virus.

During the COVID-19 pandemic, the CDC has provided national data, while Johns Hopkins University and the WHO have provided international data through a regularly updated dashboard. Additionally, the COVID Tracking Project is an organization which provides aggregate statewide data.[21] While the CDC identifies types of epidemiological information that should be collected about the virus, there is little to no guidance on what information should be displayed on a public facing dashboard. Because of this, each state has developed individual dashboards that may not be useful for cross state comparisons. Further within Ohio there are noticeable differences in data reporting between some LHDs and ODH. The variation within Ohio is largely based on the timing of updates and also the geographic jurisdiction of LHDs.

[21] Both the COVID Tracking Project and Johns Hopkins use publicly available data as reported by the CDC and individual states.

There are industry best practices[22] that provide guidelines regarding data visualization and reporting. While the COVID-19 pandemic has some unique challenges associated with it, key practices have been identified specific to the virus including consistency, showing trends over time, and clearly explained labels and terms. By following these practices related to COVID-19 data reporting, ODH can help to ensure the public is provided enough quality information to make educated decisions that will help slow the spread of the disease. Presenting this data alone is not enough, it must be combined with the necessary context to interpret and understand what the data means. Often one metric alone cannot provide enough information to draw meaningful conclusions. It is only when multiple data points are reviewed together and in the proper context that a complete understanding of the public health risk related to the virus can be understood.

SARS-CoV-19 and COVID-19

The term coronavirus refers to a group of viruses that cause respiratory tract infections which can range from mild to lethal. Many viruses that cause the common cold are in fact coronaviruses. Other forms of coronavirus include SARS, MERS, and most recently SARS-CoV-19, and the related disease COVID-19. While pandemics have occurred periodically throughout history, at the on-set of the COVID-19 pandemic, government agencies from the federal to local levels seemed to be caught unprepared. The intent of this audit was to determine the quality of data used to make policy decisions in Ohio and to allow the public to have confidence in the COVID-19 information being reported by the Government.

Federal Funding Associated with COVID-19

As part of the federal government's attempt to provide support during the COVID-19 pandemic, it passed Coronavirus Aid, Relief, and Economic Security (CARES Act); Paycheck Protection Program and Health Care Enhancement (PPPHCE) Act; and Families First Coronavirus Response Act (FFCRA).

The main source of financial assistance provided directly to healthcare providers was through the CARES Act. One portion of the CARES Act established that hospitals are to be reimbursed a 20 percent add-on to the normal, Medicare reimbursement rate for treatment of patients with a primary or secondary diagnosis of COVID-19. The CARES Act further established a $100 billion Provider Relief Fund (PRF) to be allocated in various ways in order to combat the effects of the pandemic on the healthcare system.

HHS allocated Targeted Distributions of funding to providers that were impacted by a disproportionate COVID-19 case volume, certain rural providers, skilled nursing facilities, and providers requesting reimbursement for the treatment of uninsured Americans. The **COVID-19 High-Impact Distribution**, in particular, was a HHS allocated, $22 billion to hospitals that had a high number of confirmed, COVID-19 positive, inpatient admissions. To be eligible for payment, a hospital must have incurred at least 100 COVID-19 inpatient admissions through April 10, 2020. If this threshold was met, Hospitals received $76,975 for each COVID-19 admission. To be eligible for the second payment, a hospital had to have incurred at least 160 COVID-19 inpatient admissions between January 1, 2020 and June 10, 2020. If this threshold was met, hospitals received $50,000 per COVID-19 admission.

[22] Tableau and Harvard Kennedy School of Government. Tableau Software is an American interactive data visualization software company focused on business intelligence. The State of Ohio contracts with Tableau for its software and the software is used by ODH for its external, public dashboard.

Ohio COVID-19 Dashboard

Beginning in March of 2020, when the virus was first confirmed to be in Ohio, the Governor's office began providing daily updates with the assistance of ODH. Additionally, the Department implemented a tracker, at the request of the Governor's office, which identified the number of confirmed cases, individuals under surveillance, and confirmed deaths. As the virus spread throughout the state, the amount and type of information presented to the public evolved. These updates often came in response to new federal guidelines, at the request of the Governor's office, or based on feedback from organizations interested in particular demographic groups. In addition to regular public briefings by the Governor and Director of Public Health, ODH provided granular data relating to the virus available for public consumption through an online dashboard.[23] The Ohio COVID-19 Dashboard (the Dashboard) is updated daily with data from the Bureau of Infectious Diseases within the Department.

The Dashboard is not the only source of information regarding the virus in Ohio. The CDC, Johns Hopkins, and The COVID Tracking Project all provide national data that can be drilled down to the state, and in some cases, local levels. Additionally, LHDs may opt to publish data relating to their specific jurisdiction as well. As of November of 2020, 57 of Ohio's 88 county health departments provided local information on a regular basis.[24]

The Dashboard was developed in a collaborative effort between ODH and Innovate Ohio, a data sharing and analytical platform managed by the Ohio Department of Administrative Services, Office of Information Technology. Epidemiologists with the Bureau of Infectious Diseases worked with the COVID-19 data team which included representatives from Innovate Ohio, the Ohio State University, and Resolve to Save Lives in order to identify what data to publish on the Dashboard. The first iteration of the Dashboard was completed under a tight schedule and it has been refined and updated as necessary.

Reporting data via a public dashboard is a new method for publishing data related to infectious diseases. This is the first time ODH has used such a method and, in addition to daily data updates, the Dashboard itself is routinely changing to reflect the current needs of the state as well as the Department's understanding of the pandemic.

[23] Downloadable data for the majority of information on the Dashboard are also available through Data Ohio, an initiative to provide access to all publicly available state government data in one location.
[24] County Health Departments were used as a basis of comparison as ODH publishes data at the county level. Counties with multiple health departments were added together unless centrally reported on the main county page as encompassing all health departments.

Multiple additions have been made to the Dashboard and other publicly available information over the course of the pandemic. One major update was the development of a risk map which is published as the Ohio Public Health Advisory System. The Public Health Advisory Alert System is a color-coded system designed to provide local communities a data-driven framework to assess the local spread of the virus and empower individuals, businesses, communities, local governments, and others in their response and actions. For example, an outbreak in Franklin County would not necessarily impact the decisions of local government officials in Ashtabula County. The Ohio advisory system has four levels of alert, each with a different color to indicate the severity of the spread of the virus, along with corresponding criteria for each level.

Public Health Advisory Alert System

Yellow: Level 1 Public Emergency, no more than one indicator met, active exposure and spread;

Orange: Level 2 Public Emergency, two or three indicators met, increased exposure and spread, the public is urged to exercise high degrees of caution;

Red: Level 3 Public Emergency, four or five indicators met, very high exposure and spread, the public is urged to limit activities as much as possible; and,

Purple: Level 4 Public Emergency, six or seven indicators met for two consecutive weeks, severe exposure and spread, the public is urged to leave home only for necessary supplies and services.[25]

There are seven indicators that are used to determine the level of public emergency at the county level. Each of these indicators measure an important aspect of the virus, such as the prevalence within the community or the severity of cases and strain on local health systems. One indicator, "New Cases per Capita" is very useful in explaining prevalence.[26] This indicator identifies the number of cases per 100,000 residents over a two week period. A county will remain at Level 3, or Red, until the incident rate, or cases per 100,000 residents' drops below 100 for a two week period.

[25] Once a county is at Level 4, it remains there until it meets fewer than six indicators for two consecutive weeks.
[26] New cases per capita considers how many new cases have occurred in the previous 14 days compared to the population of a county. More cases mean a greater potential for spread among individuals, the per capita rate is based on CDC guidelines and does not account for incarcerated individuals.

Recommendations

This audit focuses on the collection, analysis, and dissemination of COVID-19 data by ODH. In order to answer a variety of objectives, we conducted a thorough review of operating procedures and detailed analyses where possible. Due to the Department's stated concerns regarding HIPAA, we were limited in our ability to review data. A summary of our on-site analysis can be found in **Appendix A**.[27] However, as previously discussed, several planned analyses could not be completed because we did not have access to the necessary data including the ability to cross reference data from multiple systems for reliability. The following recommendations are based on our completed analyses.

Recommendation 1: Testing Data

ODH should work to ensure testing data for COVID-19 is complete, accurate, and includes all tests administered for Ohio. In particular, the collection of negative test is critical for the accurate calculation of percent positivity, which is a metric that is used by policy makers to make decisions regarding mitigation efforts such as opening schools.

Test data, positive and negative results of testing, related to COVID-19 has become a critical component to decision making for public officials. If ODH is able to provide a more comprehensive understanding of the number of tests administered for Ohio and the results of those tests, particularly as it relates to individual test data (line level data), can provide policy makers and residents a more accurate understanding of the prevalence of the virus in a specific community or the state as a whole.

Background

LHDs, laboratories, and medical providers are required to report certain infectious diseases to ODH. Reporting of this information can be done through a variety of methods including phone calls, fax submissions, or secure electronic portals. These reporting requirements are designed to provide public health officials insight into potentially dangerous infectious diseases in a timely manner so that appropriate actions may be taken to mitigate the spread and impact of a disease. Over the course of 2020, the reporting requirements for COVID-19 testing have evolved:

- **March:** COVID-19 was classified as an infectious disease which required reporting of positive cases within a 24 hour period. At the onset of COVID-19 in Ohio, only positive test data was collected.
- **May**: ODH began to require the reporting of aggregated negative test results.
- **June**: The CDC began to require the reporting of all testing data including positive, negative, and inconclusive results.

[27] Typically auditors would obtain data directly from a source database to conduct analyses. During this audit, ODH instead provided an anonymized extraction specific to testing, for our review, and did not provide access to the system. Therefore, we were unable to test the reliability of the data in the system.

- **August**: The CDC released guidance that a positive antigen test, without symptoms or a direct link to an infected individual, could be counted as a presumed COVID-19 case.
- **October**: ODH implemented a system that would allow onboarded laboratories using ELR to report individual negative test result data.
- **December**: ODH adopted CDC guidance issued in August regarding the categorization of positive antigen tests.

It is of note that negative test data is generally not collected for infectious diseases. Negative test data is not used by epidemiologists in the surveillance or monitoring of an infectious disease. Tracking positive case data and preventing the spread of an illness is considered the priority and tracking negative data does not typically add to that effort. However, during this pandemic, negative test data (as a component of calculations of disease prevalence) has been used to inform policy decisions at the local, state, and federal level.

Methodology

During the course of the audit, we conducted interviews with ODH in order to understand how testing data was being collected. This included several discussions regarding the types of diagnostic tests for COVID-19, as well as the various ways a result could be coded. Once an understanding of this information was obtained, we compared Ohio's practices to those of other states, CDC guidance, and other identified best practices.

Analysis

Within Ohio, there is a well-defined infrastructure for the reporting of laboratory based positive test data for identified infectious diseases. However, during the COVID-19 pandemic, the desire for additional detail relating to negative test data was identified by the federal government in June. Many states, including Ohio, did not have the capability to collect negative test data within existing systems and had to develop solutions to capture this information. Further, while states and the CDC focused on PCR testing early in the pandemic, as antigen testing became more accurate and available, the CDC allowed the inclusion of positive antigen tests in official state counts of COVID-19 cases.[28]

Negative Test Data

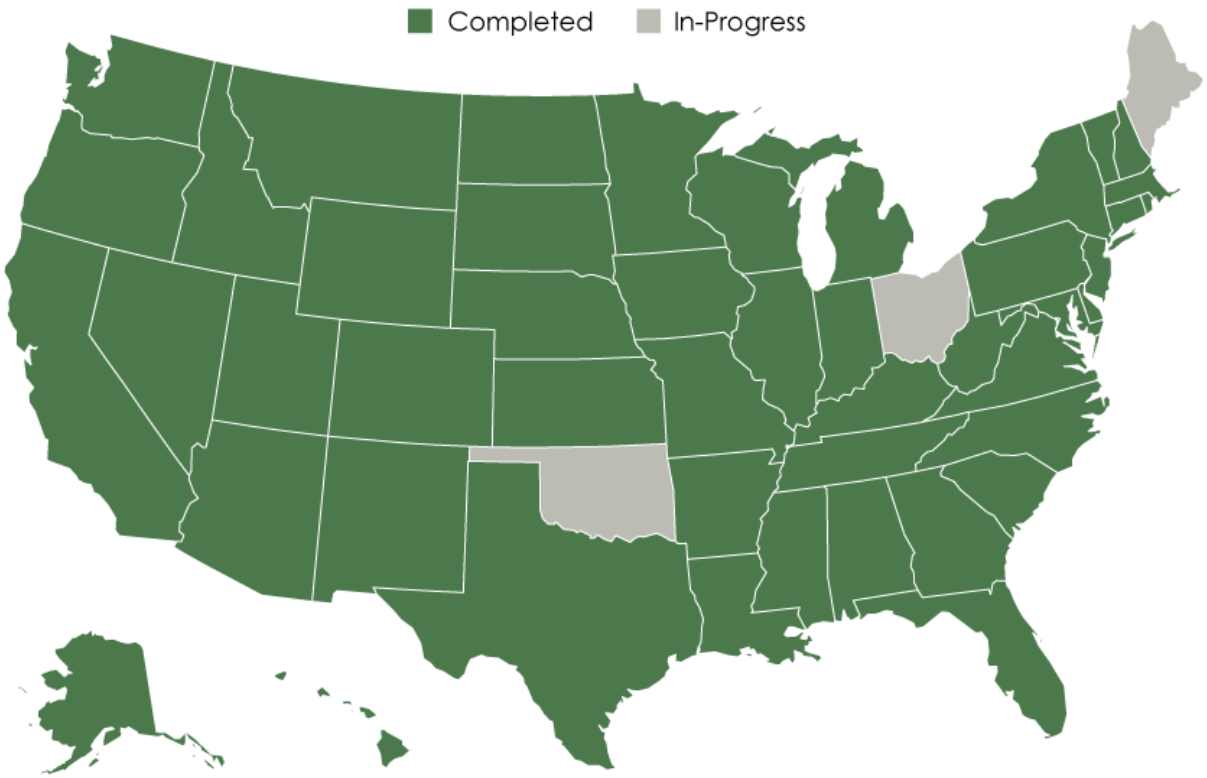
Prior to the pandemic, negative test results for reportable diseases were generally not collected by ODH. This is not a typical process in epidemiology or public health response as, by and large, negative test data does not assist in the control of an infectious disease. ODH began requiring the submission of negative test data in May of 2020. However, due to a variety of issues, the information being reported was only aggregated totals and was not immediately available from all laboratories submitting data to the Department. Negative test data was collected as it allowed states to calculate the percent positivity of tests administered in a given timeframe. While ODH

[28] Prior to this guidance, a positive antigen test needed supporting documentation such as confirmed symptoms or close contact with an infected individual to be counted as a probable COVID-19 case.

began collecting aggregated negative test data prior to the issuance of the June CDC guidance, it lagged other states in obtaining individual negative test information.

ODH implemented an on-line tool which allowed for the reporting of line-level data in October of 2020. Detailed line level data for all test results is dependent on the laboratories being on-boarded to the electronic system. However, Department representatives indicated that not all laboratories had been on-boarded as of January 2021. As the volume related to COVID-19 test data is beyond the normal laboratory reporting conditions, ODH has worked to condense a month long process into a 1 to 4 week onboarding. As of November 17, 2020, close to 2,000 entities performing tests were in the process of being on boarded. Until approved to electronically report to the production database, the entities performing tests have to report positives to the appropriate LHD for entry into ODRS and negatives are reported in the aggregate to ODH and backfilled into ODH records as data is submitted.

COVID-19 Electronic Laboratory Reporting Implementation by State



Source: CDC

The CDC is responsible for gathering information from each state relating to infectious diseases. At the on-set of the COVID-19 pandemic, there was no single federal system to collect information. In order to address the variation in types of data provided by each state and other entities, the COVID-19 Electronic Laboratory Reporting (CELR) program was developed. CELR is designed to combine multiple systems in order to build a single dataset of testing data. The

map on the previous page, from the CDC website, shows the states that have fully implemented CELR as of March 2021.

The federal government requests line-level data from states regarding details of every test conducted. This line-level data includes information such as the type of test, test result, and demographic information of the patient. The federal government prefers line-level data because of the amount of detail it contains. When line-level data is not available, aggregate data is accepted.

According to the COVID Tracking Project there is only one state other than Ohio that does not report line-level data.[29] Because the Department continues to have incomplete line-level negative test data, ODH is unable to provide detailed information regarding viral prevalence within specific communities across the state. While ODH has been working to on-board laboratories in order to obtain line-level data, the Department lags nearly every other state in the country in this regard.

Antigen Testing

At the on-set of the pandemic, antigen tests were considered to be generally unreliable. For individuals experiencing symptoms, there could be up to a 20 percent false negative rate, meaning that 20 percent of the time, an individual with an active infection would not obtain a positive test result. Because of the lack of accuracy in antigen testing, ODH and other public health departments did not publish all data regarding antigen testing.

COVID-19 Electronic Laboratory Reporting

CELR is a combination of multiple systems, new and old, that is pieced together to build a national testing dataset. Tests enter this network of systems through three main inputs:

1. Data from commercial, clinical, and public health labs: Six large commercial labs, hospital labs, and public health laboratories submit testing data directly to the federal government. This data picks up on only a portion of tests administered in a state, since not all labs in each state submit data to the federal government.
2. Aggregate data from state public health departments: The CDC asks states to submit a total count of how many tests they've run each day, indicating test type and result.
3. Line-level data from states: The HHS asks states to submit a line-level feed containing details of every test conducted in a state. Line level data contains details like the test result, the manufacturer and make of test, or demographic information of the recipient.

However, during the course of the pandemic, the accuracy of antigen testing has increased, as has the availability and use of these tests. While a PCR test requires laboratory analysis, antigen tests do not. Many entities, such as long-term care facilities, universities, and businesses, have opted to use antigen testing on a regular basis as a means of monitoring and controlling viral outbreaks within a specific subset of the population. This data, collected in untraditional

[29] There are four states, Maine, Missouri, Oklahoma, and Washington that do not submit testing data directly to the federal government.

environments, may not be as regularly reported to public health departments such as ODH, limiting insight into the total number of tests being processed in an area.

It should be noted that, even in states that report separate counts of antigen tests and where the data and submission parameters are considered well defined, the counts have been suspected of understating the true impact of these tests. This is because antigen tests are commonly used in nursing homes, schools, and other screening circumstances and, as noted above, may not be reported with the same diligence that traditional laboratories make their data submissions. Based on a study by Carnegie Mellon University, the antigen test maker Quidel revealed that between May 26 and October 9, 2020 more than 3 million of its antigen tests were distributed in the United States. However, during that same timeframe, states reported fewer than 500,000 total antigen test results. This indicates there are likely issues with the underreporting of antigen test data across the nation.

Data Reliability

According to Government Accountability Office, government organizations and auditors must consider several factors related to data and whether it is sufficiently reliable. These include the expected importance of the data, the presence of corroborating evidence, the risk of using the data, and the results of assessment work performed. Corroborating evidence can strengthen whether data is determined to be reliable, whereas errors and incompleteness may diminish the reliability of the data. Overall, the objective in examining data reliability is to ensure that the user does not reach the wrong conclusions when basing their decisions on the data or lead to an incorrect or unintended message.

Because we did not have access to the systems where test data is maintained, we could not conduct any analyses to determine the completeness or accuracy of information provided by ODH as it relates to test results within Ohio. Further, due to the inconsistent reporting of line-level data by laboratories and other reporting entities, ODH cannot reconcile individual negative test results to the aggregate data. This prevents the Department from ensuring the completeness of the total case data presented on the Dashboard. Additionally, the Department is unable to confirm the accuracy of percent positivity rates reported on the Dashboard as test data may be missing. Because of the abovementioned limitations, particularly regarding completeness of positive test data, we were unable to determine the reliability of the COVID-19 test data.

Conclusion

ODH continues to lag other states in the collection and dissemination of line-level negative test data. This limits the ability of the Department to provide detailed test positivity calculations that can be used for public policy decisions.

There are documented concerns nationwide regarding incomplete reporting of antigen tests. The information with ODH currently collects prevents the Department from determining if it in fact has obtained all relevant test data. While testing data is required by law to be submitted to the Department, ODH cannot determine if these laws are being followed by the multitude of organizations administering antigen tests within the state.

The data provided by ODH to lawmakers and policy makers appears accurate in its broad conclusions based on the information we were able to review. However, it is important to ensure the integrity and completeness of the data so that issues do not arise that may undermine ODH's efforts to control the pandemic across the state.

Recommendation 2: Consistency and Frequency of Data Updates

ODH should consider alternatives to daily updates to ensure data completeness and accuracy prior to reporting, as well as leverage trend data to improve public understanding of new case rates. Historically, in previous infectious outbreaks, ODH would collect, clean, and analyze data and report out on a weekly basis. Because of public interest in the pandemic, ODH has published information on COVID-19 daily for nearly a year. While this may have been important at the onset of the pandemic, daily data becomes less useful as medium and long-term trends are established.

The ODH Dashboard may be more useful to the public if updates to the Dashboard are completed with data that has undergone an internal review process in-line with past practices.

Background

ODH receives data from a variety of partners and in a variety of methods. Generally the Bureau of Infectious Diseases within ODH has a standard process for issuing annual reports relating to diseases that are tracked by the Bureau. This includes reviewing data to identify duplicate entries or outliers and analyzing the information in order to provide context for the infection. When serious outbreaks occur, such as the Hepatitis A outbreak currently present in Ohio, ODH changes the annual reporting process to a weekly report. While this does not allow for the full data review and narrative crafting process to take place, it does allow for variances due to daily reporting oddities to be resolved.

Both the volume of data that is received relating to COVID-19 and the frequency with which it has been reported leads to variations in data which could appear as inaccuracies in what is reported and may result in lower levels of public trust. Lowered public confidence in public health information could further lead to individuals ignoring the advice of officials.

Methodology

We reviewed National Institute of Health (NIH) best practices for data reporting as it relates to public health to identify a baseline of how processes should work without the influence of a global pandemic. We also interviewed ODH epidemiologists to better understand both the standard operations for reporting on infectious diseases and what changes have been brought on due to COVID-19.

Also as a part of our analysis, we reviewed publicly available death data in order to understand the difference between the two methods of accounting for COVID-19 deaths and compared the daily COVID-19 deaths reported by ODH to the number of COVID-19 deaths that occurred daily based on publicly available data death count by day from a later date using the ODH generated CSV file. This analysis was done for each date during the period between March 1, 2020 and

December 31, 2020.[30] The analysis confirmed significant lags can occur in filing death certificates for a variety of reasons such as determining cause of death. As a result of the extensive process to file death certificates, COVID-19 death reporting lags as well.

Analysis

Data cleaning is a term that can bring up questionable motives, however it is a normal process of data analysis. Prior to conducting any sort of analysis on public health data, epidemiologists will clean data by removing or modifying data that is incorrect, incomplete, irrelevant, duplicated, or improperly formatted. These types of data errors can occur through the process of data entry into systems that are used to track information. By undergoing data cleaning, the raw data becomes more useful for purposes of analysis, allowing epidemiologists to draw better conclusions.

Data Cleaning

Data cleaning refers to preparing data for analysis by removing or modifying data that is incomplete, irrelevant, duplicated, or improperly formatted.

Administratively incorrect, inconsistent data can lead to false conclusions and misdirect investments both public and private scales. For instance, the government may want to analyze population census figures to decide which regions require further spending and investment on infrastructure and services. In this case, it will be important to have access to reliable data to avoid erroneous fiscal decisions.

Most data collection systems in public health are meant to review data over an extended period of time, such as monthly, quarterly, or annually. Rather than reporting out on the cases in a single day, epidemiologists typically report on data that is collected during a specified time period. Reporting on public health data on a daily basis is akin to a company reporting daily profits and losses, as opposed to a quarterly statement.

Additionally, the NIH recommends that "by making health-related data available in useful form soon after the data are collected, near-real-time surveillance systems could enhance public health emergency preparedness in many ways." The NIH notes that while timely recommendations to [the] population at risk should be prioritized, public health should also reduce panic and overreaction. Despite the public's desire for instant access to information, daily data reporting may not be the best method. When identifying trends, a single point of data can be misleading and lead to inaccurate conclusions.

While the Department has processes in place to ensure the accuracy of data reported on the dashboard, the scale of COVID-19 makes it very difficult to ensure data is properly cleaned within a 24-hour period. The data ODH provided to us in January 2021 contained some errors related to recent entries that reflect the Department's minor lag in reviewing the data and

[30] This data was extracted on January 21, 2021 to ensure inclusion of any delayed submission. It is important to note that LHD's could add COVID-19 deaths in ODRS prior to ODH pulling in death certificate data to the system, so a 1:1 match of COVID-19 related death certificates to the ODRS COVID-19 death count generally did not exist. This process was changed at the beginning of March 2021. Similarly, a comparison of EDRS to the Ohio COVID-19 Dashboard deaths would not yield a 1:1 match because of the entries made by LHDs.

performing its internal data cleansing processes on a day to day basis. For context, while the Hepatitis A outbreak may result in a handful cases in a week which must be reviewed (the total from the outbreak from June 2018 to time of reporting is 3,713), during the week of January 24, 2021 ODH reviewed approximately 33,000 cases related to COVID-19.

Further, epidemiologists caution that daily data reporting can be misinterpreted. A single day decline may provide a false sense of security that the virus is slowing or trending in a more favorable direction, when alternatively this could have resulted from a delay associated with laboratory capacity or processing. Similarly, a day where there are a significant number of cases reported may induce undue fear or concern, when this influx of reporting could have been due to laboratories working through a previous backlog. Both are possible anomalies when reporting daily numbers. One area where the issue of lags in data availability is easily seen is the daily reporting of death data (see **R5**).

While the Department does have trend data available on the dashboard over longer time horizons such as a 7-day or 21- day average, this is not the first information presented on the Dashboard. According to a study by the Nielsen Norman Group[31], the majority of individuals look at the top left corner of a website first, and for the most amount of time. If trend data is considered of vital importance, it should be displayed prominently. As ODH often does not have the opportunity to verbally provide context to the data and has little control over how data is reported through the media, it is possible that those potentially and unintentionally misleading single day data points can be widely reported and misinterpreted.

Additionally, ODH updates the Dashboard daily with new daily death totals. However, the number posted by ODH does not indicate the number of individuals who have died in the preceding 24 hours. Instead, it is the number of death certificates that have been certified and processed by the Department in the previous 24 hours.[32] Because medical professionals have five working days to file a death certificate[33] and because the Bureau of Vital Statistics within ODH must process all death certificates, including inputting data from paper documents, significant lags may occur between the date of death and the date a death certificate becomes publicly available. (See also **R3**).

In the following chart, the green line represents the deaths announced daily by ODH. It shows routine spikes and valleys, with the valleys occurring on weekends as a result of limited data entry and spikes showing increased processing of data in those backlogs. The yellow line represents the count of deaths by the date on which they occurred, as reported by ODRS.

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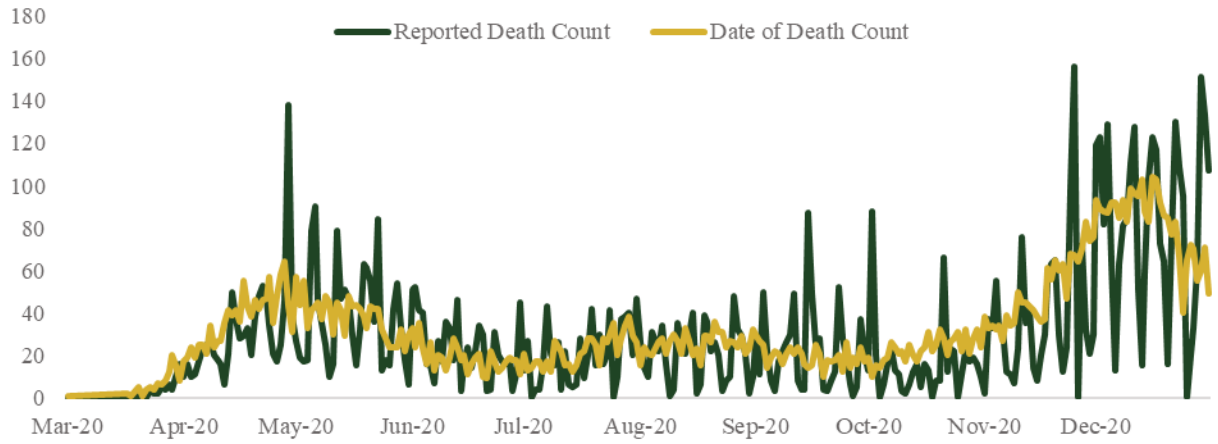
[31] Pernice, Kara, "F-shaped Pattern of Reading on the Web: Misunderstood, But Still Relevant (Even on Mobile)," Nielsen Norman Group, https://www.nngroup.com/articles/f-shaped-pattern-reading-web-content.

[32] During the course of the audit, ODH fell behind in updating Death Certificates data to ODRS and the dashboard from October 2020 to February 2021. In February 2021, ODH began adding these additional records into the dashboard COVID-19 death counts.

[33] ORC § 3705.16 Statement of facts in certificates - death certificate and OAC 3701-5-08(B)

The chart shows multiple instances where reported deaths (the green line) spiked over 100 on a single day while the yellow line follows a much more consistent path.[34] The inconsistency in death reporting is due, in part, to the timing of when information becomes available to ODH (upon receipt) and its decision to add the reported deaths (regardless of when they occurred) on the date they certified. There is presently no requirement or mechanism for the immediate reporting of death data and this may not be feasible due to instances where investigations may be required to determine a cause of death.



Source: ODH Publicly Available Data as of January 21, 2021

A subsequent analysis was performed to further quantify the backlog of COVID-19 death reporting. This analysis examined how many deaths that were reported, during a two week period of time, actually had a date of death within that same period of time using the publicly available dataset from ODH website. This data set was downloaded on two separate occasions[35] to show:

- The proportion of deaths announced during that two week period that were documented to have occurred during that same two week period; and
- The variation, between the first data download and second data download, in count among those dates outside of the two week window (March 1, 2020 through November 15, 2020).

Lastly, a dataset from The COVID Tracking Project was downloaded which documented the daily count of announced deaths during that two week time period.

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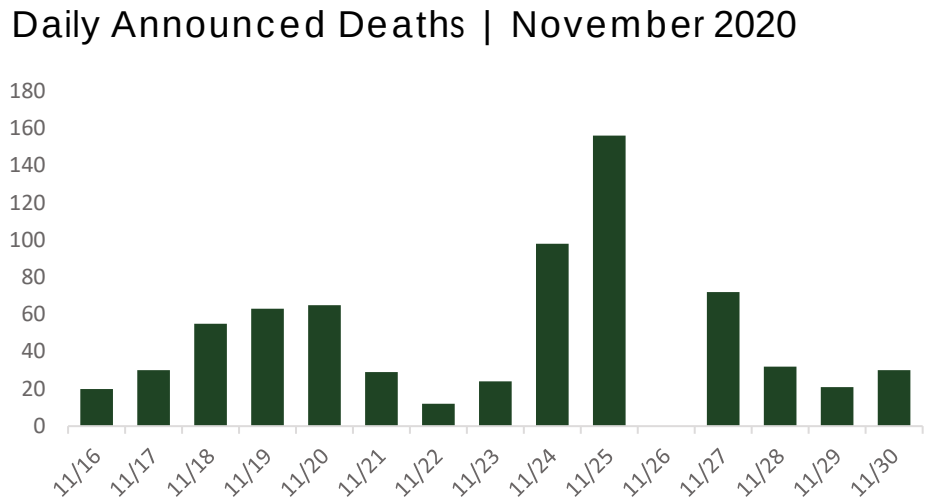
[34] Between March 1st and December 31st of 2020, ODH reported a daily death number in excess of 100 on 15 occasions. Actual deaths exceeded 100 on three occasions during that time period.

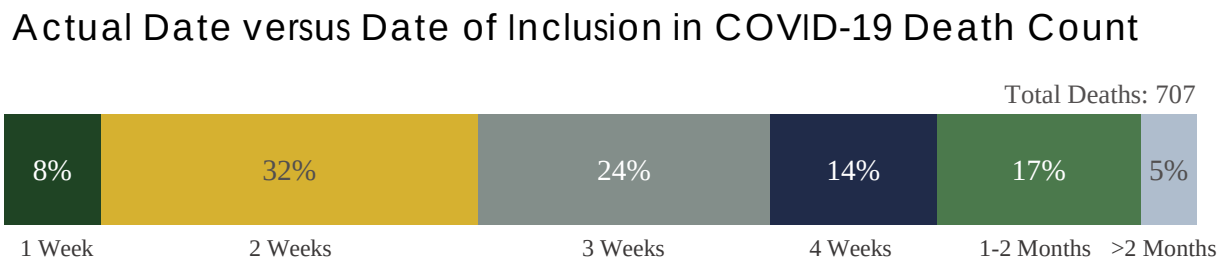
[35] The original data set was downloaded on November 15, 2020 to document a count of all deaths, by date on which they died, from March 1, 2020 through November 15, 2020. A second version of the same dataset was downloaded on December 1, 2020 for two additional comparisons.

The chart below is a representation of this count of announced deaths (the green line in the chart above) broken down by day. It includes 707 deaths recorded in Ohio from COVID-19.



Source: The COVID Tracking Project

As referenced in **Appendix E**, the ODH publicly available dataset of deaths by date on which they occurred exhibits a total difference of 707 deaths between the two download dates. The cart below summarizes the data from **Appendix E** and calculates the proportionality of the deaths by the date on which they occurred to the total number of deaths announced by ODH in the same period. In doing so, it shows that that just under 40 percent of the deaths announced during this two week period had a date of death within the same time-span. This means that, due to the aforementioned lag in death reporting, around 60 percent of the announced deaths during this time period took place three weeks or more from the time in which they occurred.



Source: The COVID Tracking Project; ODH

Conclusion

ODH currently provides daily updates to the Dashboard. While daily updates may be preferred by the media and public, it does not allow for the regular and necessary process of ensuring the reliability of data. The Department should consider instituting an internal review period which allows for routine data cleaning to improve accuracy prior to posting new information on the

Dashboard. This would likely result in less frequent updates to the Dashboard but increase the confidence in the data reported. ODH should evaluate if daily reporting is necessary and if the desire for immediate access to raw data is more important than providing data which has been appropriately cleaned and verified. If the daily updates continue to be a priority, a disclaimer should be considered as an addition to the data element.

Recommendation 3: Quality and Usefulness of Data

ODH should proactively explain, in a detailed manner, its rationale for the selection of data elements that it elects to share with the public. While the state dashboard was created in haste, subsequent refinements are needed to recalibrate some of its reporting elements, such as active infections versus recovered individuals. ODH should improve its dashboard reporting and terminology to ensure clear, concise communications to the public. Recommended improvements include:

- Improved data definitions so that technical terminology and precise language can be understood by the general public;
- Improved data metrics including a more accurate indication of active cases, hospitalizations, and test positivity rates; and,
- Improved organization and navigation of the Dashboard geared toward ease of use for the general public.

Background

The ODH Dashboard has evolved from a single page with basic information regarding confirmed cases, individuals under surveillance, and deaths to a website with many pages outlining a variety of data and associated trends and measurements. The Dashboard is updated daily with preliminary data reported to ODH regarding cases, hospitalizations, and deaths. There is additional information available regarding subsets of the population, such as school children or nursing home facilities, as well as other key data trends such as the number and positivity of tests in a given time frame.[36]

Because of the nature of the work conducted by epidemiologists and public health officials, highly technical language is used on the Dashboard. Similarly, every day terms may be used on the Dashboard in a very specific manner. Without proper context and definitions for the citizen viewing the information, the information on the Dashboard could be misconstrued by an individual who is not familiar with the language used by epidemiologists.

The method in which information is currently displayed can make it difficult to draw conclusions regarding the prevalence of the virus in Ohio. The end goal of a dashboard is to provide information that can be easily understood by the end user so that appropriate actions are taken. When data is presented with appropriate context and explanation, individuals may struggle to understand what the important takeaway points are. When language choices add further confusion or difficulty in understanding the information, the Dashboard may become an ineffective tool. It is important that ODH works to provide sufficient and appropriate data through the Dashboard and does so in a manner which complies with best practices.

[36] This information is constrained by the availability of tests and accessibility of testing sites.

Methodology

During the course of our audit, we reviewed how ODH conducts external reporting, or how they provide information on public health issues to the public. In particular, while we focused on the actions related to the COVID-19 pandemic, we also used information related to standard operations in order to understand regular best practices. Because COVID-19 has created challenges for public health departments, we also reviewed how other states are reporting data. Each state has a dashboard for COVID-19 data, these dashboards were analyzed in order to determine any trends or best practices across all states.

Lastly, we looked at best practices from Tableau and the Harvard Kennedy School of Government about general data reporting in order to identify any areas of improvement in ODH's external reporting efforts.

Analysis

Over the course of the pandemic, ODH has collected a vast amount of data related to the virus within Ohio. Our review of the Dashboard, which is the primary tool used for external data reporting, identified multiple areas where ODH could improve public facing reporting in order to develop a better experience for the end user and provide better data to the public.

Data Definitions and Terminology

Lean Six Sigma[37] principles call for definitions to be detailed in such a way that everyone using the same metric is calculating it in the same manner. Because there is a significant amount of raw data available on the Dashboard, it is important that it be clearly defined so that it is not misinterpreted. We found that the Dashboard has multiple documents which contain definitions, as well as definitions that are not consistent across the platform. Both of these issues can result in difficulty interpreting the information and data which is presented through the dashboard.

On the first page of the Dashboard, there is a document with data definitions. This document provides definitions for nine terms related to COVID-19 data. A second data definition sheet can be found on the Ohio Public Health Advisory System page. This document provides a series of definitions related to the advisory system in order to provide additional detail regarding each of the indicators and how levels are developed. Beyond these two documents, a variety of definitions are presented on pages as necessary for understanding the data. Providing a single comprehensive list of definitions could reduce confusion when reviewing data on the dashboard. This information should also be provided in context alongside the data with links to the primary definition list when necessary.

[37] Lean Six Sigma is a process improvement methodology designed to eliminate problems, remove waste and inefficiency, and improve working conditions to provide a better response to internal and external customers' needs.

Over the course of the pandemic, other states have improved their public reporting efforts across a range of factors. Some notable examples are listed below:

- Texas provides a page with definitions separated by topic to assist individuals in understanding the data provided by the state. Often these definitions include the criteria for the data, sources, and a description of definitions over time.
- Wisconsin provides a detailed description of data charts with information on how to interpret the data and how information is calculated. It uses headings such as "Understanding our data: What does this chart mean?" and "About our data: How do we measure this?" Including this information increases transparency and clarity for the public.
- The information on the Wisconsin site is explained in a manner which avoids complicated medical terms.
- North Dakota and South Dakota show active cases with clear definitions.
- Colorado has developed an "outbreak" map that helps residents identify areas of concern or "hot spots". The map includes outbreak locations like bars/restaurants/entertainment, gathering spaces, inpatient and outpatient healthcare, and offices/indoor workplaces.
- Connecticut has a downloadable PDF in addition to the dashboard containing a wealth of information to supplement and reinforce items on the dashboard.
- New Hampshire has developed an easy to navigate, tabbed dashboard with a wide variety of statistics and data points that can be selected by the user. It also has included a school district specific dashboard showing the learning model in use at the number of cases per district.

These states have taken steps to make sure that the information being presented is done so in a manner which limits misinterpretations. See **Appendix D** for examples.

Data Metrics: Hospitalizations

The Dashboard has hospitalization data on its main page and several subordinate pages. The total number of hospitalizations published on the main page includes all individuals that have had COVID-19 and have been hospitalized over the course of the pandemic. Based on this definition, there may be individuals who are hospitalized for reasons other than receiving treatment for the virus, but who are counted in the total number of hospitalizations. However, the Public Health Advisory System displays the "number of new hospitalizations due to COVID-19." While the language "hospitalizations due to COVID-19" suggests these individuals were hospitalized as a result of COVID-19 related illness, we found ODH does not maintain data on the reason for the hospitalization. Therefore, this metric, includes those individuals who may be hospitalized for reasons other than COVID-19 but have tested positive for the virus. While any hospitalization where COVID-19 is present will require scarce personal protective equipment resources, it is important to clearly define what is meant by COVID-19 hospitalizations.[38]

[38] Even asymptomatic and mildly symptomatic cases can be contagious in a hospital setting and medical personnel would need to isolate the individual and use appropriate personal protective equipment while treating them

Data Metrics: Active Cases

The ODH Dashboard currently provides total cases, total hospitalizations, total deaths, and presumed recoveries on the Overview page. While this provides a high level overview of the total impact of the virus over the course of the pandemic, it does not provide users insight into the current prevalence of the virus in Ohio. The Current Trends page provides statewide 21 day averages for reported information as well as the most recent 24 hours update, but this information does little to inform the public on the current prevalence of the virus.

There are two key aspects to current COVID-19 cases that are of use and of interest to the public. The first is the number of people who have cases and where they are receiving treatment. The strain on the healthcare system due to COVID-19 is important to monitor and understand, as that strain may result in capacity issues. The second aspect, which has significant implications for public behavior is the number of infectious persons in the community. In this case, infectious persons would be individuals who have recently contracted COVID-19 and are currently a risk of virus spread.

The Dashboard presently does not provide easily accessible information regarding estimated active, or infectious cases. While an individual could extrapolate estimated active cases by taking the total case count and subtracting presumed recovered and death totals, this is not easily done by simply looking at the Dashboard.

While the CDC has not provided a definition for active cases, as of November 2020, approximately 20 percent of other states had begun to provide this metric on dashboards. Because there is no authoritative definition, there is variation in how states are reporting their respective data. However, comprehensive case management or case investigation could allow LHDs to identify actual recoveries and report that data to ODH. While this may not be possible at times due to the volume of cases, it would provide the most accurate depiction of active and recovered cases. Alternatively, other states[39] have attempted to use existing data to estimate current active cases through the duration of the pandemic. For example, Alaska considers individuals who are in isolation as active cases whereas Texas takes the confirmed total case count and subtracts known fatalities and estimated recoveries.

ODH should determine how best to define an active case based on the available information. The Department should identify a clear definition for active cases in Ohio and report that information on the Dashboard. In doing so, ODH should clearly define what is meant by active case so that the public can better understand the known prevalence of the virus in the community. Because an individual may continue to be symptomatic past the point of being contagious, or, conversely, be asymptomatic but contiguous, ODH should work to ensure appropriate context is provided when

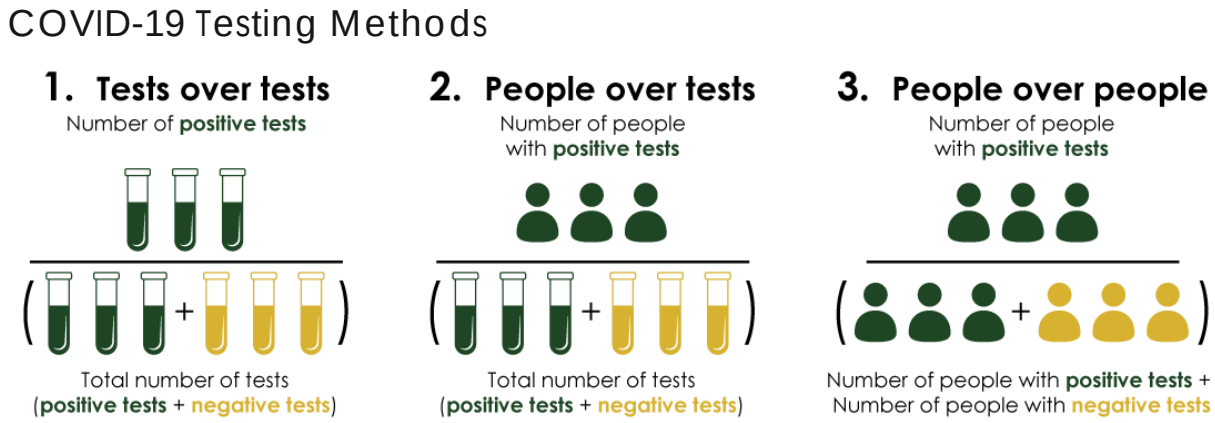
[39] At the time of the analysis (November, 2020), Alaska, Arkansas, Montana, New Hampshire, North Dakota, Oklahoma, South Dakota, Texas, West Virginia, and Wisconsin each were reporting a metric indicating active case on their dashboard.

identifying what the Department means in regards active cases. In doing so, ODH should review current guidance from the CDC and WHO regarding infectious periods for the virus.

Data Metrics: Test Positivity Rate

Test positivity is a metric that is talked about frequently in the news. Some public officials have tied various restrictions or guidance to the test positivity rate in an area. Within Ohio, a travel advisory was declared for states where the test positivity rate was over 15 percent.[40] In New York City, public schools remained closed until the test positivity rate fell below 3 percent.[41]

We reviewed the CDC guidance regarding the calculation of test positivity rate and compared it to ODH's procedures. The CDC indicates that state and local officials may consider any combination of the following three methods when calculating percent positivity, while each method provides a different view of the outbreak:



Source: The COVID Tracking Project

The CDC's own percent positivity uses method number one, taking the number of positive tests divided by the total number of tests[42] reported during a given timeframe. This is referred to as "Tests over Tests." This method provides a calculation of what percentage of tests resulted in positive results. Because all tests are considered singular events in this method, both the number of positive tests and the number of total tests may be higher than the population of people who tested positive or were tested overall due to individuals being tested multiple times.

[40] Percent positivity for purposes of the Ohio travel advisory is based on data obtained through The COVID Tracking Project.
[41] 3 percent positivity rate was based on City of New York calculations as opposed to State of New York, which uses a different calculation for positivity rate.
[42] While the CDC only uses tests that have either a confirmed positive or negative result in their calculation, states may choose to include those tests that are inconclusive. Ohio currently uses Tests over Tests and includes positive, negative, and inconclusive test data in order to calculate test positivity rate.

The second testing method that is described by the CDC is people over tests. This method takes into account the potential for one individual to have multiple positive tests. Positive test results are tied to an individual in this metric rather than using the total number of positive tests. The number of people who test positive are then divided by the total number of tests reported in a given time frame. Because individuals may have multiple positive tests, this method could result in a lower positivity rate when compared to the tests over tests method. The advantage of this method is that it accounts for all retests (denominator) while only counting a positive test once in the numerator. In other words, a positive person is only counted once.

The third method takes into account the fact that individuals may have multiple positive or multiple negative tests in a given time frame. People over people takes the total number of people who have tested positive divided by the total number of people who have been tested. Since both the denominator and numerator in this metric excludes/controls for retests, it is then helpful in validating case count growth/declines in an area.

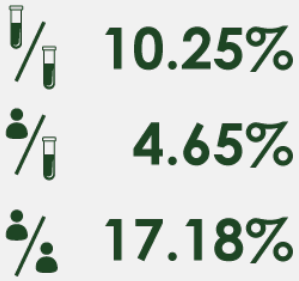
Under any of these methods for determining test positivity, a high positivity rate can indicate one of three things:

- Widespread infections in the community tested;
- Only a subset of the community that is at greater risk is being tested; and,
- Reporting processes that skew results, such as an emphasis on reporting positive test results.

Test Positivity Rates

The COVID Tracking Project was able to convert existing data in order to calculate a percent positivity for Missouri using all three methods. As shown, the three methods result in significantly different positivity rates.

Missouri Testing Data



Source: The COVID Tracking Project

Note: Reported between dates of September 25, 2020 and October 1, 2020

Because there is no standard for which method is used by public health systems, it is not recommended to use positivity rate as a comparison between jurisdictions.

In particular, with respect to COVID-19, one factor to consider is the availability of testing to the general public. If only individuals who are at risk for contracting the virus seek out testing, the positivity rate may be skewed based on a self-selection bias. It is important to note that while test positivity is dependent on viral prevalence, this metric alone cannot be used to determine the prevalence of the virus in a community.

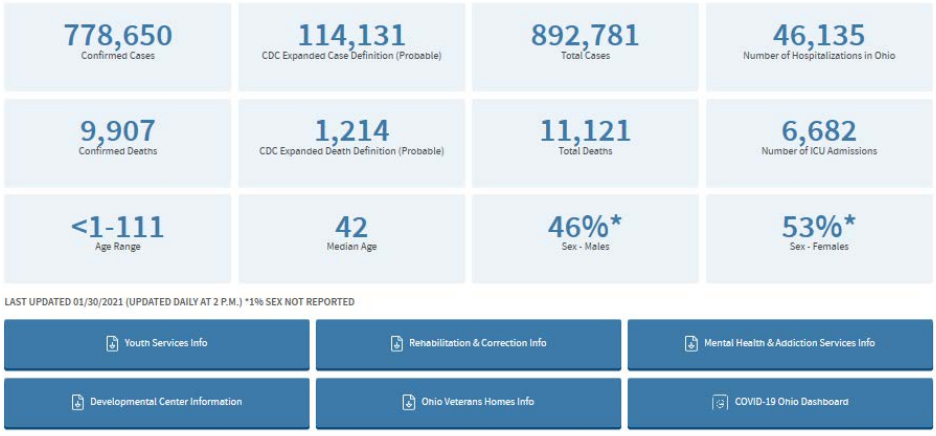
Because test positivity can signify many different issues in relation to an infectious disease, epidemiologists must look at other metrics in tandem with positivity rate. Test positivity can help to assess disease spread, but it is influenced by a variety of factors, such as the availability of testing or the individuals opting to be tested, which limit the usefulness of the metric (see more information in the sidebar.)

As illustrated in the case study from the COVID Tracking Project on the previous page, during the same time frame, Missouri's positivity rates varied substantially based on the calculation method used. ODH reports positivity rates based on the tests over tests method. This was partially due to the CDC using this same methodology, but also it was the only method of calculation that ODH had access to all of the data necessary to complete.

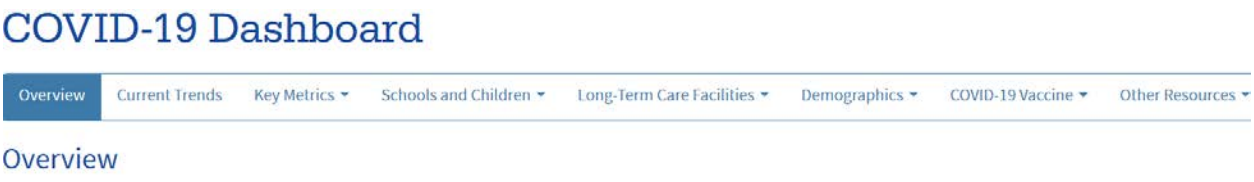
At minimum, ODH should clearly define the percent positivity metric used on its dashboard, to ensure appropriate comparisons can be made to other state or from county to county.

Dashboard Organization

There has been a concerted effort to drive the public to the official website for information regarding COVID-19 in Ohio. The main page, coronavirus.ohio.gov provides many sources of information including YouTube videos, fact sheets, public health orders, and a Twitter feed. In addition to all of the clickable links, the main page also provides static data that is available without further navigation. The information provided on the page is updated regularly with new data and links. The data displayed on the main page, as seen in the screenshot provides total numbers for cases, deaths, hospitalizations, and ICU admissions. It also provides basic demographic information including age and gender.



The dashboard itself is linked from this main page underneath the basic data. Once the dashboard is accessed, additional high level data is available on the "Overview" page. The overview page also provides county level data via a drop down menu.



The Dashboard has a ribbon with additional headings for further information. Each heading, some of which have drop down menus, lead to additional data pages. Overall, there are 24 pages

with data on the dashboard that are updated at differing intervals. While most are updated daily, there is one page with a forecast model that has not been updated since April of 2020.[43]

In general, according to the Nielsen Norman Group, data and information should be displayed in an "F" shaped pattern. Individuals look at the top left corner of a website first and scan left to right and up and down. Unless drawn to the lower right corner by something specific, such as a large red box, most people do not look in that area for information.

Conclusion

While the Ohio Dashboard provides a significant amount of data, ODH can and should improve how the information is provided to the public. This should be done through a variety of means including clear definitions relating to terminology, updated data metrics to provide better insights as to the current prevalence of the virus in communities, and aiding in the ease of navigation across the dashboard. By providing these updates, the Department will improve the user experience and help both the general public and policy makers in making decisions based in fact.

[43] As of February 2021, the ODH Dashboard had 24 pages. Pages are updated on a regular basis, so this number may increase or decrease in the future.

Recommendation 4: Consistency of Data Updates

ODH should work with LHDs to better align data reporting on daily county-level updates, thereby reducing skepticism generated by differing data. This could include better timing and coordination of data updates to increase consistency among LHDs and ODH as well as clear explanations of jurisdictional authority.

Background

Ohio has a decentralized system of public health. This means that local jurisdictions, such as a county or city health department, have control over a designated area and are not directly supervised by ODH[44]. Currently, there are 113 Local Health Departments (LHDs) which may act individually without ODH directing their actions. While this is an acceptable and common form of local public health governance during a pandemic, it may lead to a disjointed response due to multiple entities speaking as the authoritative voice on public health issues.

LHDs have chosen to report on the pandemic in a variety of ways.[45] Several have dashboards with information that is unique to their jurisdiction. Some, such as Summit County, provide a great deal of data with the ability to look at specific areas, such as zip codes. Others, such as Delaware County, mirror the ODH Dashboard, but provide additional information such as individuals currently in isolation or quarantine and active cases.[46]

Methodology

We reviewed the websites for County Health Departments in order to determine if information regarding COVID-19 was being published. While there are 113 LHDs in Ohio, County Health Departments were used as a basis of comparison as ODH publishes data at the county level. If multiple health departments coexist within a county, these were added together unless centrally reported on the main county page as encompassing all health departments.

Once agencies with high levels of variance were determined, we conducted further analysis including interviews in order to identify reasons for any such variance.

Analysis

Current Ohio laws provide LHDs with a great deal of autonomy[47] regarding public health in the community. ODH may not have the authority to determine what data is communicated by LHDs, but the Department can provide guidance on how and when information is shared.

Within Ohio, the LHDs do not always adhere to preexisting borders and jurisdictional boundaries. For example, the City of Reynoldsburg (located in Fairfield, Franklin and Licking

[44] ORC § 3701.13 Department of health - powers
[45] See **Appendix C** for LHD dashboard examples.
[46] Information regarding Delaware County was current as of November 2020.
[47] ORC Chapter 3709: HEALTH DISTRICTS

Counties) has opted to be a part of the Franklin County Health District. Further, the City of Columbus (located in Franklin County) has its own Department of Public Health and is not a part of the Franklin County Health District. All of this makes it difficult to provide a consistent basis of comparison between LHDs and ODH, particularly as it relates to data.

We found that 57 of the 88 County Health Departments were reporting COVID-19 data on a regular basis.[48] Of those which reported data, we found that 14 departments had a variance in data of more than 5 percent. We interviewed representatives from three of those departments which has large variances in order to identify potential causes. The primary cause of variation was due to the differences between county lines and the jurisdiction of County Health Departments. Particularly when a city is in multiple counties, some of the data reported for a county by ODH will be missed by the County Health Department. Further, we found one instance where a county chose not to include the population from a state prison in their data, while ODH does.

The misalignment of LHD jurisdictions compared to existing county borders results in significant variation in some reported numbers. Lower levels of variation that were observed are likely caused by differences in the timing of reporting. Both LHDs and ODH pull data from the Ohio Disease Reporting System (ODRS, discussed in **R6**), this system is updated regularly as new data is imputed by users. Because of this, data pulled at different times on the same day will likely result in slightly different case information.

Conclusion

Statistics have been posted on local dashboards which seem to conflict with the information provided by ODH. This is due to the timing of updates and the differences in LHD jurisdictional areas. To reduce public confusion and better align data reporting, ODH should work with LHDs to align communications. The Department may need to work with the General Assembly for additional statutory authority or adjust Administrative rules in order to accomplish this goal. While variation in data between LHDs and ODH does not mean that data is inaccurate, without clear information identifying the causes of data variation, public confidence in the information may be diminished and individuals may be less trusting of information that is presented by LHDs or ODH, perceiving it as conflicting, and in turn, be less likely to take actions to minimize the spread of the virus.

[48] Information was compared at the County level due to how ODH presents information on the Dashboard. The remaining 25 (of 113) health departments are city health departments and may cross county boundaries, like the City of Reynoldsburg, or be entirely contained in a single county, like the City of Columbus in Franklin County.

Recommendation 5: COVID-19 Death Data

ODH includes all deaths where COVID-19 is present on the death certificate in its total deaths calculation for Ohio. This can lead to confusion whether an individual died *by* COVID-19 or died *with* COVID-19. To improve this data and enhance clarity in its reporting, ODH should:

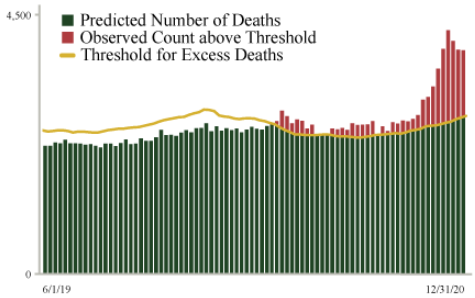
1. Examine the National Center for Health Statistics (NCHS), Centers for Disease Control (CDC), and World Health Organization (WHO) guidance, seeking clarification where necessary, and determine which of the deaths included in the calculation are deaths directly caused **by** COVID-19 versus those **with** COVID-19;
2. Improve and update its guidance to medical professions on how to complete death certificates;
3. Review current best practices regarding how to report COVID-19 deaths; and
4. Study COVID-19 death reporting methods used in other states that account for the variation between deaths which are deemed to be caused by COVID-19 and those cases where COVID-19 was present, but not a contributing factor to death.

Once this is complete, it should update its dashboard accordingly.

Background

The COVID-19 virus has resulted in a deadly pandemic that has been associated with more than two million deaths worldwide. In Ohio, ODH reported nearly 10,000 deaths related to COVID-19 in 2020. As death is an important metric in understanding the potential severity of the disease, it is important that the information associated with deaths is appropriately defined and reported.

Ohio Excess Deaths



Source: CDC

During the course of our analysis we reviewed death information for 2020 and found some instances where it was unclear if an individual died due to COVID-19 or died of other causes while also being infected with COVID-19. These questions were raised as a result of the way cause of death is reported on death certificates. A death certificate has multiple sections that are filled out by a medical examiner.

Methodology

We used information from ODH, the NIHS, CDC and WHO to compare instructions for completing COVID-19 death certificates. Additionally, we reviewed a selection of death certificates in EDRS. We compared the EDRS death certificates to the NIHS, CDC and WHO guidelines on death certificate preparation and classification. Last, we sent a survey to LHDs to determine their role in providing guidance to medical practitioners in completing death certificates for COVID-19 related deaths. Fifty two percent of LHDs responded to the survey.

Analysis

On a Death Certificate, Part I is used to identify the immediate cause of death and any conditions which directly led to the immediate cause of death. Part II is filled out with other significant conditions that contribute to death but do not result in the underlying condition. We found that COVID-19 was listed most often in Part I, but we also observed that in approximately 1 out of 10 COVID-19 related deaths, the Death Certificate had the virus listed in Part II.

In looking at the CDC and, separately the National Institute of Health Statistics (NCHS),[49] as well as the WHO, we found conflicting guidance regarding how to fill out a death certificate if COVID-19 is present.[50] This guidance is summarized below:

1. **National Institute for Health Statistics:**[51] If COVID-19 is determined to be a cause of death, it should be reported on the death certificate. When reporting COVID-19 as a cause of death, use standard WHO terminology, such as "Coronavirus Disease 2019" or "COVID-19." Report pre-existing conditions that contributed to the death in Part II of the death certificate.
2. **CDC FAQ Guidance:** COVID-19 should only be listed on a death certificate if the virus was a contributing factor to the death and that when the virus should be included, COVID-19 should be listed in Part 1 of the death certificate; *however, if COVID-19 is listed in Part II of a death certificate, departments of health should count the death as a death related to the virus.*
3. **WHO Guidance:** If COVID-19 is determined to be a cause of death, it should be reported in Part I of the death certificate. *If COVID-19 is listed in Part II, the death should not be labeled as a death due to the virus.*

The conflicting guidance has resulted in some states separately categorizing Part 2 deaths, or not counting them at all. Ohio, along with 41 other states, uses Part 2 deaths in its total COVID-19 death count, in line with CDC guidance.

Death Count Accuracy

On February 10, 2021, ODH issued a press release stating that approximately 4,000 deaths, most of which occurred in November and December, had been inadvertently omitted from its COVID-19 reporting numbers. At the time of the audit, AOS did not have the ability to review this data or confirm the completeness of several aspects of reporting due to ODH's interpretation of HIPAA protections and other undisclosed constraints.

[49] The National Center for Health Statistics is a division of the CDC.
[50] Screenshots of the guidance found on the subject can be found in the **Appendix B.**
[51] NCHS death reporting guidance is detailed at https://www.cdc.gov/nchs/covid19/coding-and-reporting.htm

In discussing preparation of death certificates with ODH, Department representatives indicated that LHDs often provide feedback and consultation to medical practitioners. In our survey of the LHDs, respondents indicated the following:

- 76 percent referenced using death certificates as the only means to categorize a COVID-19 related death, or it was used in conjunction with investigations of other sources.
- 53 percent stated they verify the death was COVID-19 related using the death certificate.
- 32 percent stated they perform an investigation into the death using hospital, long term care facility, vital statistics confirmation, or death certificates.
- 20 percent stated they used guidance from the CDC, the IDCM, or an unnamed source in classifying a death as COVID-19.
- 12 percent stated that they have not classified a death or that the health department does not classify deaths.
- 12 percent referenced the decedent having a positive COVID-19 test result prior to death
- 24 percent referenced ODRS entry in their responses, whether as a means to enter the data or as a resource.
    - 12 state that they enter information into ODRS
    - 1 stated they use ODRS to assist in classifying
    - 1 did not specify the use of ODRS[52]

Based on the responses of LHDs, it appears that they their involvement in COVID-19 death certificate consultation may vary.

Conclusion

ODH should review the guidance from NIHS, CDC and WHO, as well as the death reporting methods of the eight states[53] mentioned above and determine what, if any, changes should be made to the method currently used to count COVID-19 deaths and display them on the Dashboard. Any changes determined to be appropriate to more accurately and clearly reflect COVID-19 related deaths should be applied to the Dashboard as soon as possible.

[52] There are two places in ODRS to mark a death. These may appear in the "person demographic" section which allows a LHD to mark that the person as deceased and the date of death or on the disease page which has a check box for "did the person die as a result of this illness?"

[53] According to each state's dashboard, Tennessee, Texas, and Utah only count death certificates appearing on Part 1 of the death certificate. Iowa, Mississippi, North Dakota, South Dakota, and Washington report Part 1 and Part 2 deaths separately.

Recommendation 6: Ohio Disease Reporting System

ODH should expedite plans to replace the Ohio Disease Reporting System (ODRS), a 20 year old platform currently used to collect infectious disease data. The Department should proceed with existing plans to replace ODRS within 24-36 months and work to incorporate lessons learned from the current pandemic (in Ohio and other states using the already selected software) in the new platform.

Implementation of a new tracking system is a serious undertaking that should involve a formalized process with minimal customizations and defined timelines. To ensure stable system operations and expedite implementation, ODH should reduce customizations through process change as much as possible. Also, due to the continuous need to track infectious diseases, the Department should consider a plan which involves running both ODRS and the new platform concurrently for a short period to allow for appropriate training and resolution of any technical issues on the new system.

Background

Monitoring, tracking, and surveilling infectious diseases is a critical component to public health. This information is typically reviewed at regular intervals on a historic basis in order to understand what has happened and what can be done moving forward to prevent or mitigate new outbreaks. ODH began to design ODRS in 2001 and the system was first implemented in 2006 by the Department in order to track infectious diseases.

ODRS provides a secure access point to report infectious diseases. The system itself is accessed via a web browser. Both LHDs and ODH have access to the data contained in ODRS at all times for surveillance purposes, which helps to ensure cases of significant public health importance receive prompt attention and response from public health officials. In addition to LHDs and ODH, laboratories, hospitals, and healthcare providers may also have access to the system in order to submit data. Presently there are approximately 4,000 individuals with access to ODRS and more than 75 percent of those users work for LHDs.

The Department issued a request for proposal in 2017 for a new infectious disease reporting software and a vendor was chosen in September of 2018. ODH planned for a two year system build, however several factors have led to delays in the process. The Department had a significant number of customization requests which needed to be built into the system. Further, because the CDC is also in the process of modernizing reporting processes, ODH has attempted to preemptively address issues with how data is transmitted. Lastly, the Department noted that the vendor has undergone significant personnel changes which also resulted in additional work. At this point, ODH is still in the process of replacing ODRS, however those plans have been put on hold during the pandemic as key personnel within ODH are not available due to their COVID-19 responsibilities.

Methodology

ODRS has two primary functions, allowing the timely and secure reporting of data and allowing the timely and secure extraction of data. Both are critical functions for public health officials. The timely sharing of sensitive medical information allows for appropriate action to be taken when issues of public health concern are identified.

In order to understand the effectiveness of ODRS, we issued a survey to LHDs regarding the system. LHDs were chosen because they represent more than 75 percent of all ODRS users. Additionally, LHD users are most likely to encompass individuals responsible for submitting data as well as extracting data. These survey responses were used to understand what issues existed within the reporting system.

Analysis

The CDC's field Epidemiology Manual contains a section which provides guidance regarding using technology for data collection and management. According to the guide, there are two guiding principles for selecting and using technology during a field response:

- Technologies for data collection and management should streamline and directly support the workflow of field investigations rather than disrupt or divert resources and staff away from epidemiologic investigations and related laboratory testing activities; and,
- Technologies should facilitate more time for epidemiologists to be epidemiologists – to find better data, acquire them, clean them, and use data to better characterize the event, monitor its progress, or monitor the implementation or effectiveness of control measures – and more time for laboratorians to perform testing.[54]

As ODRS is a 20 year old reporting system, ODH had already identified the need for replacement because of the constraints of the aging technology. However, during the course of the COVID-19 pandemic, serious issues in the system were highlighted. In a survey conducted by AOS during the audit of more than 60 percent of all local health departments, nearly 96 percent reported some degree of issue with ODRS during the pandemic.

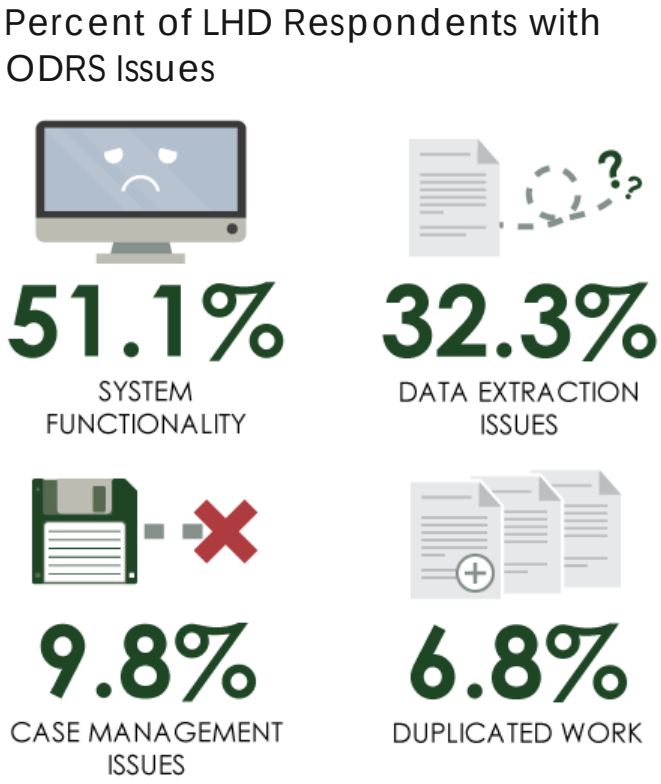
Based on the survey responses, we identified four key areas where there were common issues or problems experienced by users: system functionality, case investigation, data extraction, and duplicated work.

- System functionality issues include general issues surrounding the performance of tasks by ODRS. Among other things, functionality issues could include system outages or slow processing times.
- Data extraction issues primarily relate to the ability to pull information from ODRS for case investigation or analysis. This includes issues related to pulling specific fields such as phone numbers or limits on the quantity of cases extracted at one time.

[54] https://www.cdc.gov/eis/field-epi-manual/chapters/data-collection-management.html

- Case investigation issues include problems related to workflow and data collection. For example, updating information can cause a case to be classified as new even though the case investigation is already in progress.
- The existing system does not allow for automation of processes which results in extra time being spent on basic data entry. This results in a situation where efforts are duplicated because the workflow is not streamlined.

Several of these issues are a result of the system being overwhelmed. The system cannot handle the volume of web traffic during peak hours because of the high number of entries, which results in further delays in processing and limits functionality.



Source: Local Health Department Survey

While staffing resources are limited because of the pandemic, replacing the ODRS system cannot be further delayed. ODH should seek to immediately pivot to system implementation efforts as disease reporting becomes less onerous. While still in the development phase of a new system, the Department should also work to incorporate lessons learned from the COVID-19 pandemic, both in Ohio with the current system, and in other states based on their experiences with the product already selected by ODH. This would include identified issues relating to systems sharing information. For example, the Ohio Contact Tracking System was not designed to share information with ODRS which causes duplication of work. Also, there is limited functionality regarding contact tracing and case investigations within ODRS. A new system should seek to address these issues. Ultimately, the new system or systems must address modern data needs and user expectations, and ensure that it poises ODH for addressing COVID-19 variants and emerging infectious diseases in the future.

Additionally, as ODH has selected a system reportedly in use in multiple states, it should work with those states to aggregate requests for system changes related to the pandemic experience. This will help the vendor shorten development time for these changes. Last, it should reduce the number of customizations as much as possible. This may require changes to rule, law or operating model but would reduce the potential for coding issues (which can cause operating problems within the new system) and also shorten development and implementation time.

Generally, an organization with more than 1,000 employees should plan a two to three year time frame for software implementation. It is important to maintain continuity of data reporting in order to continuously monitor infectious diseases. Because of this, ODH should develop a plan which allows for appropriate training on the new system while allowing for continued data entry in the new system. This may require the use of temporary staff to perform the routine data entry functions while tenured staff are trained on the new system during the implementation process.

Conclusion

The existing system used by ODH to track and monitor infectious diseases is outdated. The COVID-19 pandemic has highlighted systemic issues that prevent timely reporting of data during a widespread event. While these types of events may not occur regularly, it is precisely during these times of extreme need that reliable functionality is necessary. ODH must prioritize the implementation of a new system and allocate appropriate resources to complete this critical project. Because of amount of time required to ensure a new system is fully functional, the Department should begin the development process as soon as possible based on new case volume, ideally no later than July 1, 2021.

Note on Reporting Systems

During the course of the audit, ODH officials discussed issues and problems that were experienced by other state departments of health which use software provided by the vendor building the ODRS replacement system. The Department felt that Ohio was able to respond to the rapid influx of data in a more expedient manner compared to peer states. While ODH completes the development of the new system, it should work with other states in order to incorporate lessons learned from the pandemic, as well as survey Ohio LHDs about potential functionality that would be beneficial to them.

Recommendation 7: Contact Tracing, Case Investigation and Case Management

The Department should seek to formalize standard procedures for contact tracing conducted by LHDs during a pandemic or other widespread infectious event. ODH should determine if this would be outside current statutory authority, and, if so, consider seeking that authority as soon as possible. A formal policy with procedures relating to contact tracing and other disease control efforts during a pandemic should be developed by the end of 2021. This policy should include information regarding how to determine when LHDs should switch efforts from contact tracing to more general case investigation efforts as surges in caseload are experienced, as well as when and how case management should be applied.

Additionally, the Department should work to ensure that the replacement disease reporting system allows LHDs to record important data regarding monitoring and surveillance efforts (See **R6**). ODH should work with LHDs to identify key functions that are desired by those individuals completing the task.

Background

The goal of contact tracing is to break the chain of transmission of an infectious disease through the identification, testing, and isolation or treatment of close contacts of an infected individual. In general, public health officials will contact an infected individual in order to obtain information regarding close contacts and identify potential infections. Those close contacts are then contacted and provided information regarding testing and monitoring of symptoms. Infected individuals are monitored and provided support during any period of isolation which may be necessary.

Some diseases that are subject to contact tracing can only be contracted through close, personal encounters such as syphilis or HIV. With these sorts of infections, with the cooperation of an infected individual, it is possible to conduct a thorough and methodical contact tracing procedure. However, with a disease where transmission is airborne and highly contagious, such as COVID-19, contact tracing must be able to pivot to a rapid identification of individuals who may need to isolate or be tested for the virus. COVID-19, as a new virus, provides an additional level of difficulty as anyone who is exposed is at risk for infection, whereas other highly

Contact Tracing

Backward (or reverse or retrospective) tracing seeks to establish the source of an infection, by looking for contacts before infection.

Forward tracing is the process of looking for contacts after infection, so as to prevent further disease spread.

In October 2020, ODH and the LHDs adopted backward tracing in addition to focusing on future contact to prevent spread (quarantining).

contagious diseases like the flu or measles have a vaccine which provides some amount of protection against illness.[55]

Within the IDCM, ODH has identified protocols for contact tracing which local health districts adhere to. However, these protocols are general in nature and do not identify any information as to how efforts should be scaled in the event of a pandemic or other large-scale infectious event. The COVID-19 pandemic exposed the weaknesses in contact tracing procedures. In particular, the efforts put forth by LHDs become less effective as the number of infected individuals grows. Further compounding the problems associated with contact tracing was the public's limited access to testing for COVID-19 and the lag time associated with laboratory processing. It is possible that individuals who are deemed infectious may not be contacted until nearly the end of an isolation period. Generally, changes in funding from federal sources has, to some degree, impacted public health across the nation and limited the capacity of local health departments.[56] While ODH has created a central pool of contact tracers to supplement the LHDs, this elective was not available until May of 2020.

Isolation vs Quarantine

Isolation: The separation and restriction of movement or activities of **infected** persons who have a contagious disease.

Quarantine: The separation and restriction of activities of **well** persons, who are believed to be exposed to a case of a communicable disease.

Methodology

We reviewed the IDCM in order to determine what guidance is given to LHDs in regards to limiting the spread of an infectious disease. In September and October 2020, we directly interviewed about two dozen LHDs to learn about their processes and obtain feedback on challenges they were experiencing. Further, we sent surveys to all LHDs in Ohio in order to understand the efforts of contact tracing during the COVID-19 pandemic at the local level. The survey also identified resources that LHDs thought would be useful in improving the existing processes.

[55] Adding urgency to the need to effectively trace and investigate/manage cases, recent scientific discoveries in Boston, Massachusetts, the UK and South Africa have identified viral mutations associated with infected individuals who may have active infections for long periods of time. An additional CDC study also reinforces that not all cases resolve within the presumed recovery period. Without strong contact tracing, subsequent case management and local health departments' having capacity to absorb this workload, these longer duration cases may not be adequately recognized.

[56] One hurdle, noted by health departments across the US in addressing contact tracing, has been the availability of resources, both financial and personnel. A literature review, including studies from Kaiser Family Foundation and the National Institutes of Health raised issues of chronic underfunding in the public health sector. In October 2020, Forbes noted that from 1960 to 2010, the federal share of public health funding dropped from 45 percent to 15 percent, requiring local and state governments to make up the balance of the funding gap.

Standard contact tracing practices were identified and analyzed to develop a basis for comparison of ODH and LHD practices. Where issues were identified within ODH or LHDs, we conducted further review in an attempt to determine the cause of contact tracing breakdowns.

Finally, we conducted research into how public health departments conduct COVID-19 contact tracing. This was significant for our understanding of public messaging and to determine if there were any best practices which could be adopted by Ohio in order to encourage compliance with LHD efforts.

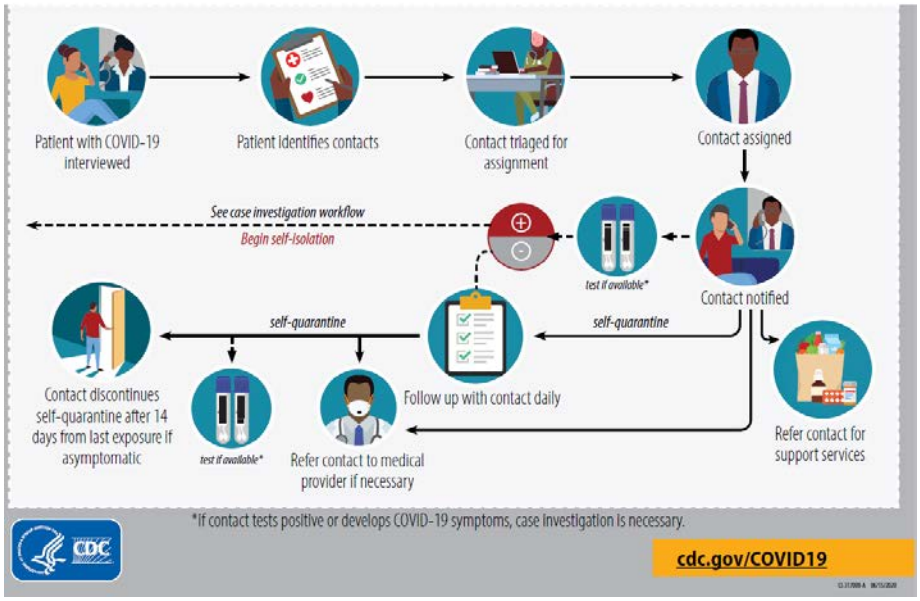
Analysis

Section 5 of the IDCM identifies policies and procedures related to the control of infectious diseases. This section was most recently updated in 2011 and was in the process of being updated but this update was halted during the pandemic.

While the IDCM does not identify step by step instructions for contact tracing, throughout the section it provides a set of guidance which should be followed when attempting to control infectious diseases. The general process includes several steps which an LHD should undertake. The process is described as follows:

- Once a positive test is received, the LHD should contact the infected individual. This initial contact is used to provide information to the patient regarding isolation procedures and also to identify any close contacts who may be at risk of infection.
- Close contacts of an infected individual are considered probable cases and are contacted. This contact is to provide information regarding testing and possible symptoms the individual may be experiencing. Close contacts are usually counseled to enter into a period of quarantine to prevent further spread.

By comparison, the CDC has issued guidance for a multi-step contact tracing process specific to COVID-19 as seen in the infographic below. There are some states that have implemented this process as a part of their public health response to the pandemic.



In addition to contact tracing, LHDs are guided to provide

support to individuals with infectious diseases which require isolation. For example, this may include providing groceries or other sorts of assistance. During COVID-19, these sorts of support efforts were largely halted due to the number of cases being managed by LHDs.

The IDCM indicates that, during a pandemic, contact tracing, contact monitoring, and quarantine of close contacts may be effective only during the earliest stages. As caseload increases, the time dedicated to contact tracing can become overwhelming for the LHDs and, as a result, less effective as a method of controlling an infectious disease and a tiered approach to managing case investigations and contact tracing may be necessary. However, effective contact tracing remains a critical component of long-term control of the disease and efforts should be focused on high priority individuals or groups.[57] The manual itself does not include information regarding how contact tracing efforts should be scaled in the event of a large-scale pandemic. The lack of foresight into this area may have resulted in delays that impacted the Department's ability to appropriately respond to the pandemic. In November 2020, ODH issued updated guidance with recommendations for the prioritization of case investigations and contact tracing. This guidance was developed in partnership with LHDs to develop a tiered case investigation and contact tracing strategy that is adaptable to changing conditions in each community. ODH should include this type of formal guidance in the IDCM for use during future outbreaks.

Public Participation

Contact tracing is only effective when infected individuals are willing to provide information and comply with isolation orders. During our audit, LHDs commented that at times there has been a struggle in obtaining sufficient information in order to conduct robust contact tracing necessary to slow the spread of the virus.

According to CDC guidance, when a jurisdiction does not have the capacity to investigate a majority of new cases, it should consider scaling down contact tracing activities and instituting strict mitigation measures such as stay at home orders and business closures until transmissions begin to decline. Generally, when a LHD is unable to complete full contact tracing efforts, it conducts only a case investigation. This process includes contacting an individual who has received a positive test result and provide them with information regarding isolation or quarantine, as necessary based on infectious disease. As a part of case investigation, LHD employees will also instruct infected individuals to reach out to contacts who are at risk for contracting the disease.

Contact Tracing Systems

As discussed in **R6**, technology should be used to streamline data collection and management. This includes the use of online databases and reporting systems. Currently, when LHDs conduct contact tracing efforts and case investigations, there is no requirement to use a specific contact tracing system. The COVID-19 pandemic highlighted the need for a system which would assist in contact tracing efforts, and ODH developed the Ohio Contact Tracking System (OCTS) as a

[57] In November 2020, ODH issued guidance regarding the implementation of tiered case investigation and contact tracing.

tool that could be used by LHDs. Our review found that LHDs have not universally opted to use OCTS, as some choose to use third party systems and some choose to use no data system to assist with contact tracing.

While ODH has issued guidance which should assist LHDs in managing resources to best control the spread of an infectious disease during a pandemic, that guidance is only useful when properly implemented. If ODH cannot centrally see all data related to contact tracing, the Department cannot determine where lapses in data collection are occurring. Incorporating contact tracing data into the disease reporting system under development would allow ODH to assess the success of efforts in real-time and provide guidance on when an LHD should prioritize contact tracing.

Centralized Contact Tracer Staffing

Contact tracing is an effort which requires specialized training. While LHDs maintained capacity to conduct routine contact tracing efforts, the pandemic strained the system at all levels causing these efforts to be scaled back. In order to address this issue, ODH issued an RFP for contact tracers in December of 2020. The vendor who has been chosen will take over the management of the 250 contact tracers who are available to LHDs in the event of a widespread event or other strain on the system. Implementing a centralized system as discussed above would allow ODH to optimize the use of these individuals by better understanding where there is the greatest amount of need for additional support and streamlining data collection procedures.

Conclusion

Contact tracing procedures should be documented and formalized so that in the event of a pandemic or other widespread infection, decisions relating to the scaling of contact tracing can be made with appropriate epidemiological data. ODH should ensure it is prepared to collect significant contact tracing data within a single system for future pandemics to support decision making, such as the staffing levels needed for contact tracing, this should be selected in conjunction with local partners and ODH should have it in place and operational within 24-36 months of the release of this audit as timelines in this area is critical. ODH may need to work with the General Assembly in order to obtain the appropriate oversight and authority in order to implement these changes.

Client Response Letter

Audit standards and AOS policy allow clients to provide a written response to an audit. The letter on the following pages is the Department's official statement in regards to this performance audit. Throughout the audit process, staff met with Department officials to ensure substantial agreement on the factual information presented in the report. When the Department disagreed with information contained in the report, and provided supporting documentation, revisions were made to the audit report.

Ohio | Department of Health

Mike DeWine, Governor
Jon Husted, Lt.Governor

Stephanie McCloud, Director

March 16, 2021

The Honorable Keith Faber
Auditor of State
88 East Broad Street, 5th Floor
Columbus OH 43215

Auditor Faber:

The Ohio Department of Health (ODH) is truly appreciative of the efforts of your Ohio Performance (Audit) Team in completing a review of COVID-19 data. A year ago, ODH, like every other state health department, rapidly transitioned to a pandemic response unseen in modern times. ODH employees swiftly moved into action: operating a massive call center, performing critical laboratory analysis and case investigation, enhancing safety precautions around the state, providing constant guidance, literature, and communications, procuring essential supplies and services, and providing effective resources to local partners facing the monumental challenge before them. The department informed the effort for essential businesses to stay open during the Spring of 2020 and the Responsible Restart protocols last summer.

This effort also required the ODH team to collect, analyze, and publish data for public consumption and understanding, oftentimes from antiquated technology and systems that were not designed for a pandemic or at the scale or speed at which they were needed. Indeed, COVID-19 shone a bright light on the impact of inadequate funding for state and local health departments, particularly in the areas of technology and informatics.

As I hope has been evidenced by the participation and cooperation from the ODH team, ODH is singularly dedicated to fulfilling its mission to advance the health and well-being of all Ohioans and doing so in a transparent manner. I am deeply grateful to the ODH team for their tireless work, and I am grateful to you for our continued partnership in serving Ohioans together.

Recommendation 1: Testing Data Collection

Integration of point-of-care testing within non-laboratory settings has been a critical aspect of making testing more broadly available in Ohio. However, we know that in Ohio and throughout the country, the reporting requirements associated with testing have presented a challenge in these settings. We are pleased to report that we have worked with the federal government and with other states to identify solutions. We are working closely with the U.S. Digital Service on a solution which we believe will significantly reduce reporting as an obstacle to testing.

ODH can provide electronic laboratory reporting (ELR) status of COVID-19 test results for any entity, upon request, and will continue to provide technical assistance to onboard laboratories that are identified as being non-compliant in federal or state reporting laws and attempt to collect any unreported backlog of test results since October 20, 2020.

Finally, it is worth noting that while the AOS team noted that ODH included indeterminate test results in the denominator for calculating test-based percent positivity while the Centers for Disease Control and Prevention (CDC) only included the sum of positive and negative tests, the reported difference in the two calculations over the entire pandemic yielded a 0.02% ***lower*** positivity rate using ODH's methodology (8.30% vs 8.32%).

Recommendations 2, 3, and 4: Data Reporting and Alignment

As each of these recommendations deal generally with data reporting and alignment between dashboards, ODH will respond to these comprehensively. At the outset of the pandemic, the COVID-19 dashboards were developed with input from ODH employees, hospitals, universities, and non-profit partners. ODH has shared voluminous amounts of data for COVID-19. Notably, the dashboards received the Government Experience Award from the Center for Digital Government in September of 2020.

Currently, there are approximately twenty-five (25) public facing dashboards that describe all aspects of the disease. Many of these dashboards allow users to download data so that additional analysis can occur by individuals and organizations outside of state government. Much of that additional analysis has been beneficial in helping ODH respond to the pandemic.

ODH appreciates the ideas put forth in the audit to improve the dashboards and other communications strategies and will continue its work on implementing improvements and many of these recommendations. ODH has already clarified some of the terminology used on the dashboard in line with your recommendations. And, with respect to the recommendations regarding daily reporting, ODH acknowledges and understands that certain data points vary daily while some data points are better measured against longer periods of time, particularly as long-term trends emerge.

Recommendation 5: Death Data Reporting

As you know, ODH has remedied the issues with death data reporting and is in alignment with the recommendations listed, including but especially the recommendation regarding implementing best practices in reporting COVID-19 deaths.

In February, ODH's Bureau of Infectious Diseases initially learned that as many as 4,000 deaths may have been underreported through the state's reporting system. The issue related to the unreconciled COVID-19 deaths was identified by ODH during a routine employee training. In accordance with the Centers for Disease Control and Prevention's (CDC) national reporting guidelines, the department instituted a reconciliation process of deaths between the Bureau of Infectious Diseases and the Bureau of Vital Statistics. The undercounted deaths relate to death certificates which included COVID-19 as a cause or contributing factor to death and were assigned a COVID-19 ICD-10 code by the National Center for Health Statistics. Assignment of this code used the same processes and principles that have been used for decades to assign codes for all other causes of death.

Although these deaths had been certified by the physician, medical examiner, other medical professional, or coroner as being related to COVID-19, the deaths were not included in previous counts released by ODH. Reconciling deaths between the case surveillance system and vital statistics system requires manual review and entry of data, which unfortunately did not happen as expected during the height of the surge.

As a result of this unacceptable set of circumstances, ODH initiated an administrative review and has corrected death data inconsistencies by using a more reliable and accurate system to count COVID-19 related deaths. Consistent monitoring and process improvements in this area continue.

Recommendation 6: Ohio Disease Reporting System/Technology Enhancements

Your recommendations regarding the replacement of the Ohio Disease Reporting System (ODRS) specifically and technology enhancements generally align with current plans and activities and our long-term strategic goals. In recent months, ODH established a stronger partnership with the Ohio Department of Administrative Services, Office of Information Technology to work with the InnovateOhio Platform to ensure data sources are complete and consistently monitored for accuracy and improvement. As that partnership has evolved, we are seeing enhancements in our data quality and reporting.

Long term, Governor DeWine's executive budget includes a request for a $25 million investment, appropriated to DAS, for enterprise informatics and data systems upgrades. With this investment, ODH will use data and technology to advance the health of every Ohioan. In line with your overall recommendations, ODH will embed data-driven decision making into public health and elevate public health by improving the return on investment of technology.

Recommendation 7: Contact Tracing and Local Health Departments

We appreciate your recognition that current law limits ODH to a coordinating function among local health departments, particularly in relation to case management. We concur that a consistent effort related to contact tracing and case management is ideal during pandemic response efforts. Here, too, we are pleased to report that your recommendations regarding streamlining processes for contact tracing are underway. At one time during the pandemic, ODH employed more than 250 staff members to conduct contact tracing work on behalf of local partners, which is in addition to staff employed directly by the local partners. Many of these local partners applied unique and varied practices and processes in case investigation. Recently, ODH transitioned its role in staffing contact tracing administration and services to an experienced vendor to maintain a centralized, sustained response. ODH communicated to local health departments the importance of maximizing the use of this service for the sake of both statewide consistency and in focusing efforts on vaccine administration.

Response to Data Access Limitations Statements:

With respect to the comments regarding data access and limitation, ODH must respectfully disagree in several material respects.

At the time of the exit conference, ODH provided responses to the AOS for all types of complaints for which it was able to retrieve or receive a response, resulting in addressing at least 11 of the 15 complaints. ODH notes that while every complaint of this type was and should be taken seriously, the overall number of complaints received with supporting documentation is quite small.

Respectfully, ODH does not concur with the representations or statements that the AOS Performance Team was prevented by ODH from conducting an independent investigation in any way. ODH provided full access to the ODRS database in the form of a CSV file that was downloaded to ODH computers prior to the AOS onsite visit. ODH acknowledges that the data set was anonymized based upon articulated concerns raised by ODH staff regarding protected health information and/or information protected by HIPAA, but an anonymized data set was provided following indications that this method would be acceptable after discussions between each agency.[1] Additionally, following the onsite visit, ODH senior leadership sought to confirm that the AOS Performance Team had been provided everything it needed to complete the audit, in an effort to confirm that your team was not restricted in its ability to conduct a

[1] Specifically, on December 15, 2021, the AOS Performance Team indicated their request for data from the ODRS system as "a full data set as available from the system – which may be downloaded to CSV prior to [their] access time."

thorough review. Based upon the representations of the AOS Performance Team, it reasonably appeared to ODH senior leadership that your team was pleased with the cooperation and access they were given at the staff level to review all data elements requested and in a format agreed to by the parties.[2] Finally, despite perceived limitations on data access, your team identified very few ***potential*** duplicate entries (.2%) and ***potential*** misclassifications of confirmed or probable cases (.12%) in the data set.

Request for Additional Review:

ODH leadership seeks to be transparent in its collection, analysis, and reporting of all data elements. We operate under a philosophy of continuous improvement in service to Ohio's taxpayers. As your team has been highly responsive and engaged in this audit, we believe ongoing or additional review would benefit ODH and help the public at large understand the complexity of the work that ODH undertakes on a continuous basis. For its part, ODH will address any remaining concerns regarding limitations on data access through appropriate mechanisms agreed to by the parties.

Once again, we appreciate the work of the AOS Performance Team. Thank you for your continued partnership.

Sincerely,

Stephanie McCloud

Stephanie B. McCloud
Director
Ohio Department of Health

[2] AOS Performance Team confirmed in an email dated January 22, 2021 that they had, "very good cooperation in completing the data analysis component of the audit." Following this email exchange, no contrary concern was raised by the AOS Performance Team to ODH leadership on data access.

Appendix A: Purpose, Scope, Objectives, and Methodology

Performance Audit Overview and Audit Objectives

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. Audit work was conducted from August 2020 to January 2021. OPT worked with ODH to obtain access to data and conduct interviews to establish current operating conditions. The audit report also contains the specific criteria used for comparisons and detailed methodology.

The performance audit process involved sharing preliminary information with the client, which included status meetings with the client. Input from the agency was considered and taken into account, as appropriate.

Although assessment of internal controls was not specifically an objective of this performance audit, internal controls were considered and evaluated when applicable to scope areas and objectives. We relied upon standards for internal controls obtained from Standards for Internal Control in the Federal Government (2014), the U.S. Government Accountability Office, report GAO-14-704G.

This audit report contains the following objectives:

Data Collection

Q	**What COVID-19 case data did the state collect and how does this compare to recommended practices?**
A	Data collected by ODH was consistent with existing public health standards including CDC COVID-19 case reporting requirements.
Q	**What COVID-19 treatment data did the state collect and how does this compare to national guidelines and recommended practices?**
A	Treatment data in regards to ventilator and hospital bed capacity appear to be collected in line with other states. Ohio and most other states do not publish additional specific treatment data on a regular basis.
Q	**How frequently did the state collect data for each variable?**

A Data is collected continually. Each day, data sent from laboratories are collected and analyzed.

Q **Were appropriate technology and processes in place to ensure timely receipt of the data by the state's Public Health Director?**

A Outdated technology systems contributed to problems in data collection, see **R6**. Additionally, the aging ODRS system and its underlying configuration caused problems in collecting the data. The volume of COVID-19 cases delayed the input of data into ODRS.

Internal Reporting

Q **Did the State identify entities performing testing and what guidance did the state provide in comparison to national standards and recommended practices?**

A The state continues to work to onboard facilities completing tests, allowing for the use of electronic laboratory reporting (ELR). This reduces data entry backlogs as faxes or other means of communication of laboratory results have been replaced with direct electronic reporting. ODH did not provide us with a calendar of the backlog in laboratory onboarding, information on why some laboratories took longer than others to onboard (although laboratories must undergo CLIA certification), or when the onboarding would be complete and therefore our audit was unable to determine when this would be completed. Ohio is one of three states that has not completed onboarding to its ELR.

ODH could not provide reasonable assurance regarding completeness of its data for inclusion in the Percent Positivity calculations. See **R1** and **R3**. Clarification regarding the calculation used for Percent Positivity was included in External Dashboard reporting. See **R3**. The internal control failures related to data collection and management are described in these recommendations.

Q **Was the data collected and reported adequate for monitoring purposes and was the data reported timely?**

A In two of the three months examined, laboratories reported to ODH within 2 days for 80 percent or more of cases collected during the given month. Most data was reported timely to ODH in line with recommended practices. The data points collected were in line with other states.

The dataset which was provided to our office included 37 data fields, we reviewed 35 of these columns for completeness of data. We found that six of the categories had no data missing, six of the categories had some data missing (between 0 and 20 percent), and 23 had significant data missing (more than 20 percent). Of those categories with significant data missing, the majority related to symptoms experienced by an infected individual.

Monitoring

Q **Did the state monitor how COVID-19 testing results were coded to determine whether the cases were coded and reported in accordance with established guidelines? Did the state adequately monitor or sample COVID-19 testing processes (test administration) and resulting data (result verification) to ensure accuracy?**

A Cases were coded and reported in accordance with established guidelines. Minimal examples of variation were identified. For more information, see observations in **Limitations of Data Review** section. Further, ODH had minimal insight into the state's test administration and laboratory result verification process due to the widespread involvement and significant role of healthcare providers during the pandemic.

Q **Did the state provide sufficient guidance to entities providing care to COVID-19 patients related to determining the cause of death, including when co-morbidity conditions existed?**

A ODH provided guidance to physicians on determining the cause of death, including when co-morbidity conditions exist and how these should be recorded, through the guidance devolved to the states from the CDC; however some states and the WHO differ in their handling of certain death certificate deaths. ODH did not issue separate guidance or clarifying guidance. See **R5**.

Q **Did the state have adequate processes in place to contact and monitor COVID-19 positive individuals?**

A Variation in contact tracing occurred due to COVID-19 demand outpacing health department contact tracing capacity. See **R7**.

External Reporting

Q **How did the state disseminate information to the public? How does this compare to recommended practices?**

A ODH disseminated information to the public but this was sometimes inconsistent from the data disseminated by some local health departments. See **R4**.

Q **How was the data organized and presented to provide data that was useful, comparable, and informative for the public and for policy makers? Was it timely, accurate, meaningful, and consistent? Who ensured the accuracy?**

A Data was organized without clear and consistent terminology. See **R3**. Further, ODH has released its data daily for nearly a year, often causing confusion due to insignificant spikes or changes numbers related to the review process which occurs post release. See **R2**.

Q **How did the state decide which data to share? Why isn't data updated with recovered numbers?**

A ODH was unable to explain how particular data elements were selected, although certain elements were at the request of the Governor's office. Additionally ODH provides presumed recovered numbers based on an estimated duration of the virus of 21 days per person. Specific recoveries are not available, as that data is not being collected through case investigation and therefore we were unable to complete this objective. See R3.

On-Site Data Review

ODH provided us a data set related to COVID-19 cases extracted from ODRS. The dataset did not include all fields collected by ODH and was anonymized so we were unable to correlate records to a secondary source. We used the data set provided for a series of limited reviews on selected topics. The anonymized dataset that ODH provided to us and that we reviewed had nearly 850,000 rows of data, which ODH stated included relevant case data necessary to ensure the accuracy of reported cases published on the Dashboard. This information matched the confirmed and probable case data presented on the COVID-19 Dashboard which is also predominantly extracted from the ODRS system.

We conducted analyses using both Excel and RStudio[58] to determine potential data errors relating to duplication or miscoding of test data in the provided data set. These analyses were designed to identify instances where an individual had two unique cases associated with them, suggesting a double counting of cases. They were also designed to identify instances where a probable case was counted as a confirmed case, and vice versa. This was attributed to miscategorization of certain tests and test results which could be reflected as in either an under or over reporting of this data in the confirmed versus probable case count on the public dashboard.

The review of the anonymized data allowed our analysts to draw some limited conclusions regarding COVID-19 case data. ODH provides daily updates on the number of confirmed and probable COVID-19 cases in Ohio though the Dashboard. We analyzed the provided data to ensure that the number of cases listed on the Dashboard accurately reflected the data from ODRS. While we confirmed the information provided to us accurately reflected the information on the Dashboard, we could not verify that the dataset provided to us represents the totality of all test data contained in ODRS or contained all positive tests administered in Ohio.

Using Excel and RStudio we identified approximately 1,300 potential cases that were duplications. We provided 11 examples to ODH for review and found that of those examples, 10

[58] RStudio is an open source data analysis tool.

were in fact duplicates, although the Department had already identified and corrected the information within ODRS. The last potential duplicate required additional review from the LHD in order to determine if action was required. Based on our limited analysis, the internal controls relating to data cleaning appear to be effective in identifying and correcting duplications within the dataset.

We conducted a similar analysis in order to determine instances where a positive PCR test was categorized as "probable" or where a positive antigen test was categorized as "confirmed" we found 784 instances where cases were potentially labeled incorrectly. These cases represented 0.12 percent of cases at the time of analysis and were referred to ODH for review.

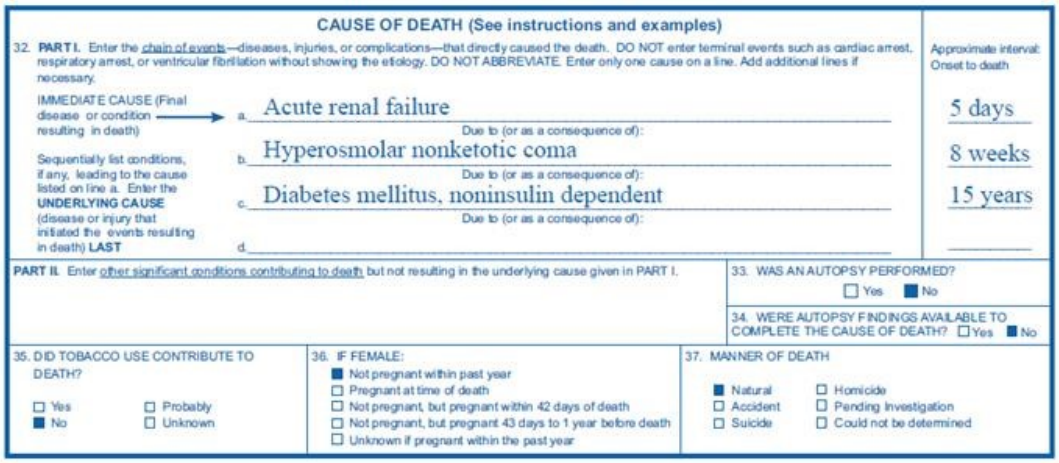
One anomaly was identified within publicly available data that were observed during the course of our audit: Hospitalization dates that occurred prior to the onset of COVID-19 symptoms. During interviews with BID staff, this was attributed to case investigation processes and lack of clarity on how to complete the hospitalization field within ODRS. We were unable to analyze this fully during our on-site review due to the anonymized data set.

Appendix B: Death Certificate Imagery

The CDC provides guidance for reporting deaths on a death certificate. The first image below from the CDC shows Part I (the four primary causes of death) and also part II (other significant conditions). This guidance applies to all death certificates, regardless of the COVID-19 pandemic. However, the CDC recommends that states classify all death certificates where COVID-19 is present as a death related to the virus. While this information may be appropriate for monitoring the on-going pandemic, it may present marginally inflated death data to the general public. (See **R5**).

The WHO provides guidance on completing a death certificate for COVID-19 as well as guidance for what is not a COVID-19 death. The second and third images from the WHO shows both of these examples, respectively. The third image shows that deaths with COVID-19 as an "other significant condition" is not a COVID-19 death.

CDC Death Certificate



CAUSE OF DEATH (See instructions and examples)

32. **PART I.** Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.

Approximate interval: Onset to death

IMMEDIATE CAUSE (Final disease or condition resulting in death) → a.	Acute renal failure	5 days
Due to (or as a consequence of):		
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the **UNDERLYING CAUSE** (disease or injury that initiated the events resulting in death) **LAST** b.	Hyperosmolar nonketotic coma	8 weeks
Due to (or as a consequence of):		
c.	Diabetes mellitus, noninsulin dependent	15 years
Due to (or as a consequence of):		
d.		

PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.

33. WAS AN AUTOPSY PERFORMED? ☐ Yes ■ No

34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? ☐ Yes ■ No

35. DID TOBACCO USE CONTRIBUTE TO DEATH? ☐ Yes ■ No ☐ Probably ☐ Unknown

36. IF FEMALE: ■ Not pregnant within past year ☐ Pregnant at time of death ☐ Not pregnant, but pregnant within 42 days of death ☐ Not pregnant, but pregnant 43 days to 1 year before death ☐ Unknown if pregnant within the past year

37. MANNER OF DEATH ■ Natural ☐ Accident ☐ Suicide ☐ Homicide ☐ Pending Investigation ☐ Could not be determined

ITEM 32 - CAUSE OF DEATH

Take care to make the entry legible. Use a computer printer with high resolution, typewriter with good black ribbon and clean keys, or print legibly using permanent **black** ink in completing the cause-of-death section. **Do not abbreviate** conditions entered in section.

Part I (Chain of events leading directly to death)

- Only **one** cause should be entered on each line. Line a **MUST ALWAYS** have an entry. **DO NOT** leave blank. Additional lines may be added if necessary.
- If the condition on Line a resulted from an underlying condition, put the underlying condition on Line b, and so on, until the full sequence is reported. **ALWAYS** enter the **underlying cause of death** on the lowest used line in Part I.
- For each cause indicate the best estimate of the interval between the presumed onset and the date of death. The terms "unknown" or "approximately" may be used. General terms, such as minutes, hours, or days, are acceptable, if necessary. **DO NOT** leave blank.

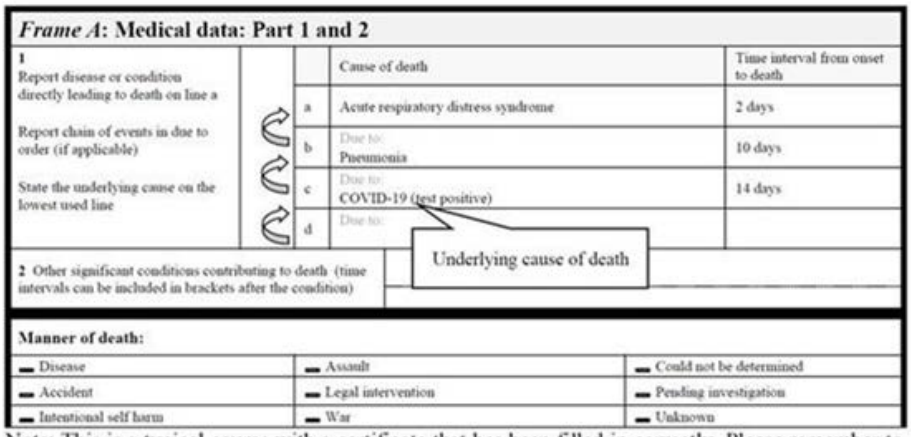
- The terminal event (e.g., cardiac arrest or respiratory arrest) should not be used. If a mechanism of death seems most appropriate to you for Line a, then you must always list its cause(s) on the line(s) below it (e.g., cardiac arrest **due** to coronary artery atherosclerosis *or* cardiac arrest **due** to blunt impact to chest).
- If an organ system failure such as congestive heart failure, hepatic failure, renal failure, or respiratory failure is listed as a cause of death, always report its etiology on the line(s) beneath it (e.g., renal failure **due** to Type I diabetes mellitus).
- When indicating neoplasms as a cause of death, include the following: 1) primary site *or* that the primary site is unknown, 2) benign or malignant, 3) cell type *or* that the cell type is unknown, 4) grade of neoplasm, and 5) part or lobe of organ affected. Example: a primary well-differentiated squamous cell carcinoma, lung, left upper lobe.

Part II (Other significant conditions)

- Enter all diseases or conditions contributing to death that were not reported in the chain of events in Part I and that did not result in the **underlying cause of death**. See examples.
- If two or more possible sequences resulted in death, or if two conditions seem to have added together, report in Part I the one that, in your opinion, most directly caused death. Report in Part II the other conditions or diseases.

Source: CDC

WHO Death Certificates



***Frame A*: Medical data: Part 1 and 2**

1 Report disease or condition directly leading to death on line a / Report chain of events in due to order (if applicable) / State the underlying cause on the lowest used line		Cause of death	Time interval from onset to death
	a	Acute respiratory distress syndrome	2 days
	b	Due to: Pneumonia	10 days
	c	Due to: COVID-19 (test positive)	14 days
	d	Due to:	

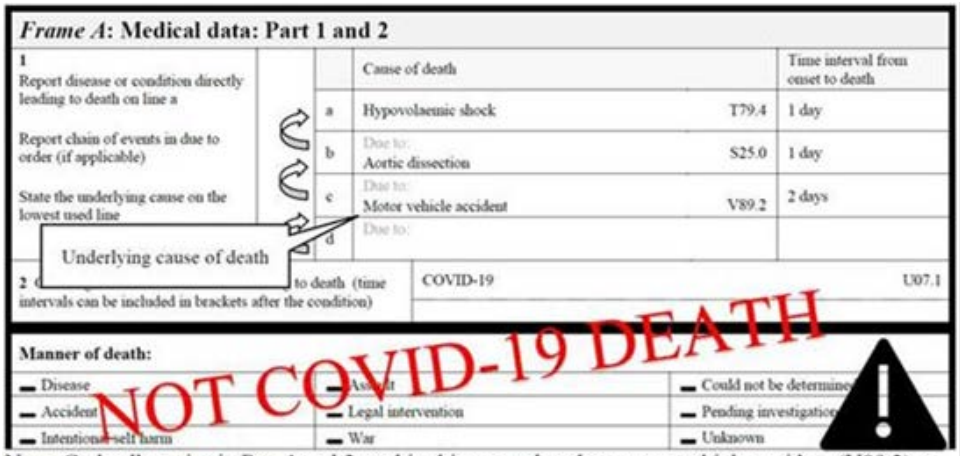
Underlying cause of death

2 Other significant conditions contributing to death (time intervals can be included in brackets after the condition)

Manner of death:

▬ Disease	▬ Assault	▬ Could not be determined
▬ Accident	▬ Legal intervention	▬ Pending investigation
▬ Intentional self harm	▬ War	▬ Unknown

Note: This is a typical course with a certificate that has been filled in correctly. Please remember to indicate whether the virus causing COVID-19 had been identified in the defunct.



***Frame A*: Medical data: Part 1 and 2**

1 Report disease or condition directly leading to death on line a / Report chain of events in due to order (if applicable) / State the underlying cause on the lowest used line		Cause of death		Time interval from onset to death
	a	Hypovolaemic shock	T79.4	1 day
	b	Due to: Aortic dissection	S25.0	1 day
	c	Due to: Motor vehicle accident	V89.2	2 days
	d	Due to:		

Underlying cause of death

2 … to death (time intervals can be included in brackets after the condition) — COVID-19 — U07.1

NOT COVID-19 DEATH

Manner of death:

▬ Disease	▬ Assault	▬ Could not be determine
▬ Accident	▬ Legal intervention	▬ Pending investigation
▬ Intentional self harm	▬ War	▬ Unknown

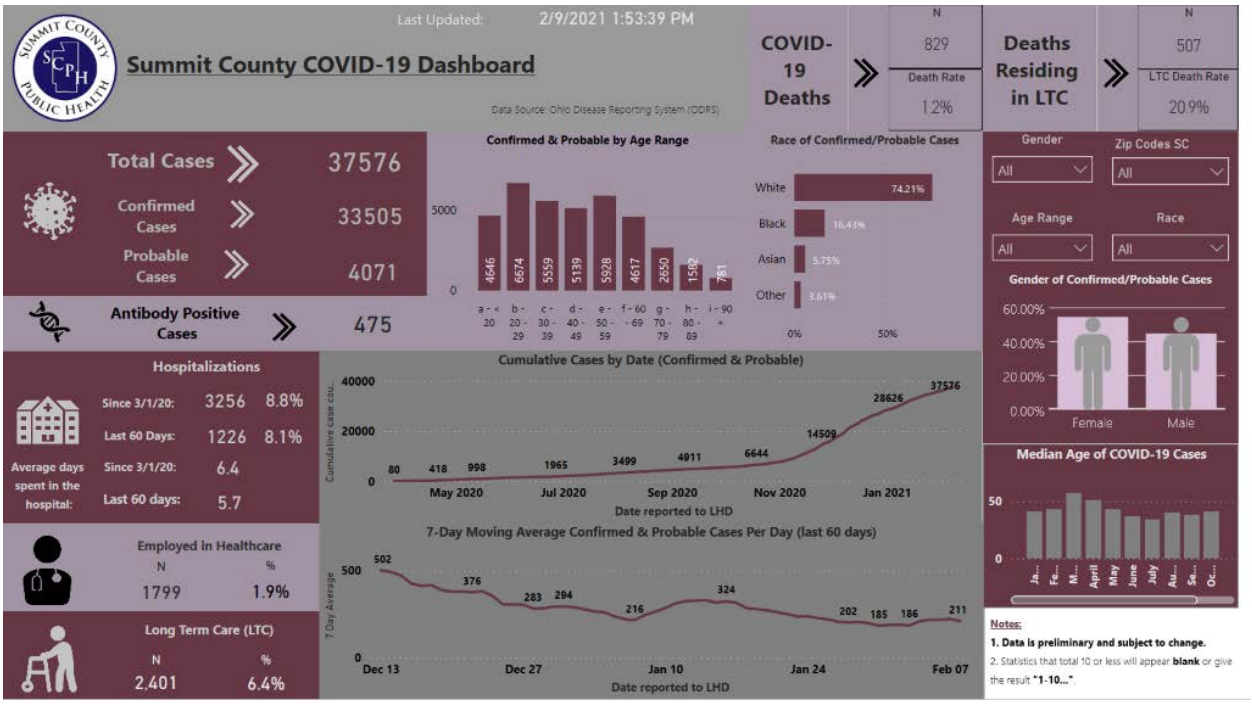
Note: Code all entries in Part 1 and 2, and in this example select motor vehicle accident (V89.2) as underlying cause of death. Step SP3 applies as causes have been reported on more than one line in Part 1 and the condition reported first on the lowest used line, motor vehicle accident (V89.2), can cause all the conditions, traumatic aortic dissection (S25.0) and traumatic hypovolemic shock (T79.4), mentioned on the lines above. [See ICD-10 2016 and later, Volume 2, Section 4.2.1].

Source: WHO

Appendix C: Local Dashboards

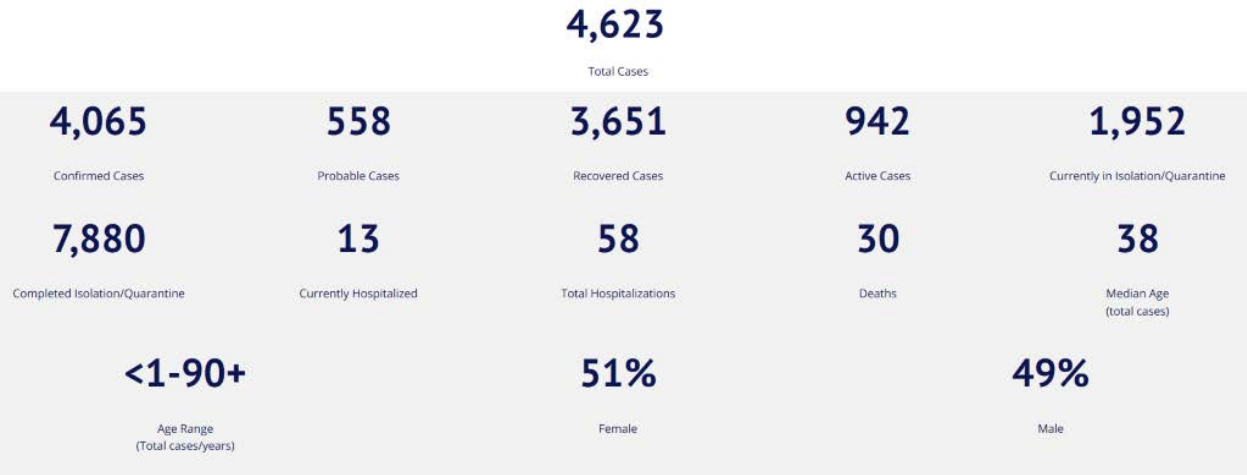
Local health departments have chosen to report on the pandemic in a variety of ways. Many have dashboards with information about the prevalence and severity of COVID-19 specific to their jurisdiction. The image below shows how Summit County Public Health Department shared very detailed information with the ability to drill down into the data further. The image on the following page shows how the Delaware Public Health District utilized a similar dashboard organization to the ODH overview page, but chose to include additional categories such as active cases.

Summit County Dashboard



Source: Summit County Public Health |

Delaware County Dashboard

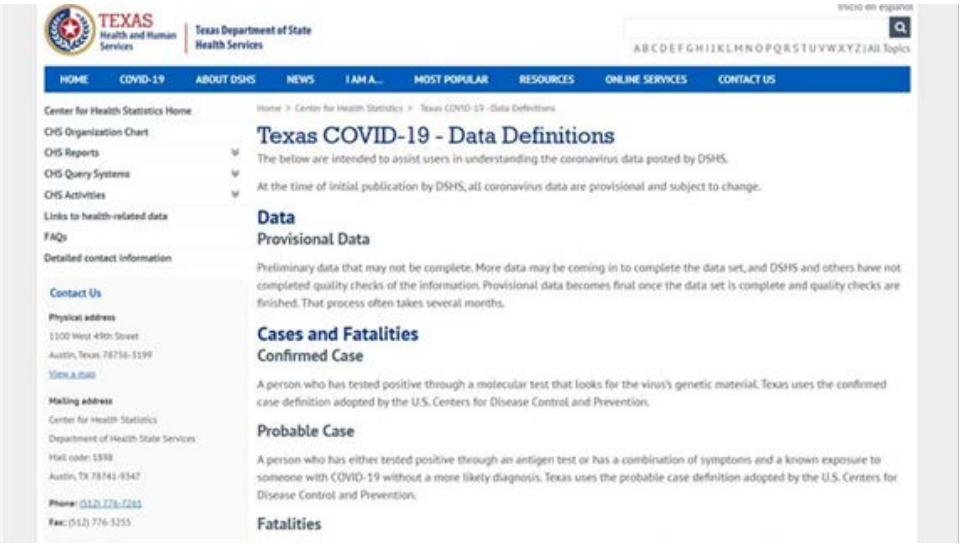


Source: Delaware Public Health District |

Appendix D: Other State Dashboards

To better understand Ohio's Public Health Advisory System and COVID-19 dashboard, we looked at the other states' websites. All 50 states had a dashboard of some kind and we found examples from other states which Ohio could leverage in future outbreaks of this scale. The following images show examples of how other states provided public information in a way that was meaningful and easily understood:

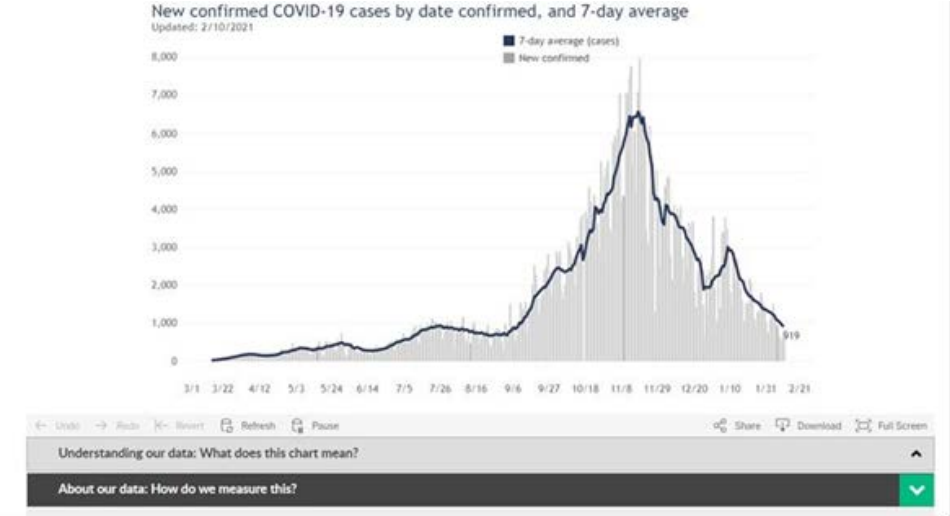
Texas DSHS Definitions



Source: Texas DSHS |

As shown in the image above, the Texas Department of State Health Services (Texas DSHS) has a single-stop website for data definitions used in its dashboard. The website includes clear and precise definitions for the data presented, often with the criteria included. For example, Texas defines ‘confirmed cases’ as, “A person who has tested positive through a molecular test that looks for the virus’s genetic material.” Texas uses the confirmed case definition adopted by the U.S. Centers for Disease Control and Prevention. Additionally, Texas defines ‘fatalities’ as, “Deaths for which COVID-19 is listed as a direct cause of death on the death certificate.” A medical certifier, usually a doctor, determines the cause(s) of death. DSHS does not include deaths of people who had COVID-19 but died of an unrelated cause. Fatalities are reported by the location where the person lived, as listed on the death certificate.

Wisconsin DHS Definitions



Data source: Wisconsin Electronic Disease Surveillance System (WEDSS).

Read our Frequently Asked Questions for more information on how cases of COVID-19 are reported to WEDSS.

Every morning by 9 a.m., we extract the data from WEDSS that will be reported on the DHS website at 2 p.m. These numbers are the official DHS numbers. Counties may report their own case and death counts on their own websites. Because WEDSS is a live system that constantly accepts data, case and death counts on county websites will differ from the DHS counts if the county extracted data from WEDSS at a different time of day. Please consult the county websites to determine what time of day they pull data from WEDSS. Combining the DHS and local totals will result in inaccurate totals.

Confirmed cases of COVID-19: Unless otherwise specified, the data described here are confirmed cases of COVID-19 reported to WEDSS. Cases are classified using the national case definition established by the CDC. Confirmed cases are those that have positive results from diagnostic, confirmatory polymerase chain reaction (PCR) tests or nucleic acid amplification tests (NAT) that detect genetic material of SARS-CoV-2, the virus that causes COVID-19. Illnesses with only positive antigen or positive antibody test results do not meet the definition of confirmed and are not included in the number of confirmed cases.

COVID-19 Deaths: Unless otherwise specified, COVID-19 deaths reported on the DHS website are deaths among confirmed cases of COVID-19 that meet the vital records criteria set forth by the CDC and Council of State and Territorial Epidemiologists (CSTE) case definition. Those are deaths that have a death certificate that lists COVID-19 disease or SARS-CoV-2 as an underlying cause of death or a significant condition contributing to death. Deaths associated with COVID-19 must be reported by health care providers or medical examiners/coroners, and recorded in WEDSS by local health departments in order to be counted as a COVID-19 death. Deaths among people with COVID-19 that were the result of non-COVID reasons (e.g., accident, overdose, etc.) are not included as a COVID-19 death. For more information see the FAQ page.

Probable cases of COVID-19 and deaths among probable cases. Some visualizations include the option of including information on probable cases of COVID-19 and deaths among probable cases of COVID-19. Cases are classified using the national case definition established by the CDC and the CSTE [https://www.cdc.gov/nndss/conditions/coronavirus-disease-2019-covid-19/...]. A person is counted as a probable* case of COVID-19 if they are not positive by a confirmatory laboratory test method (for example, a PCR, or NAT test), but have met one of the following:

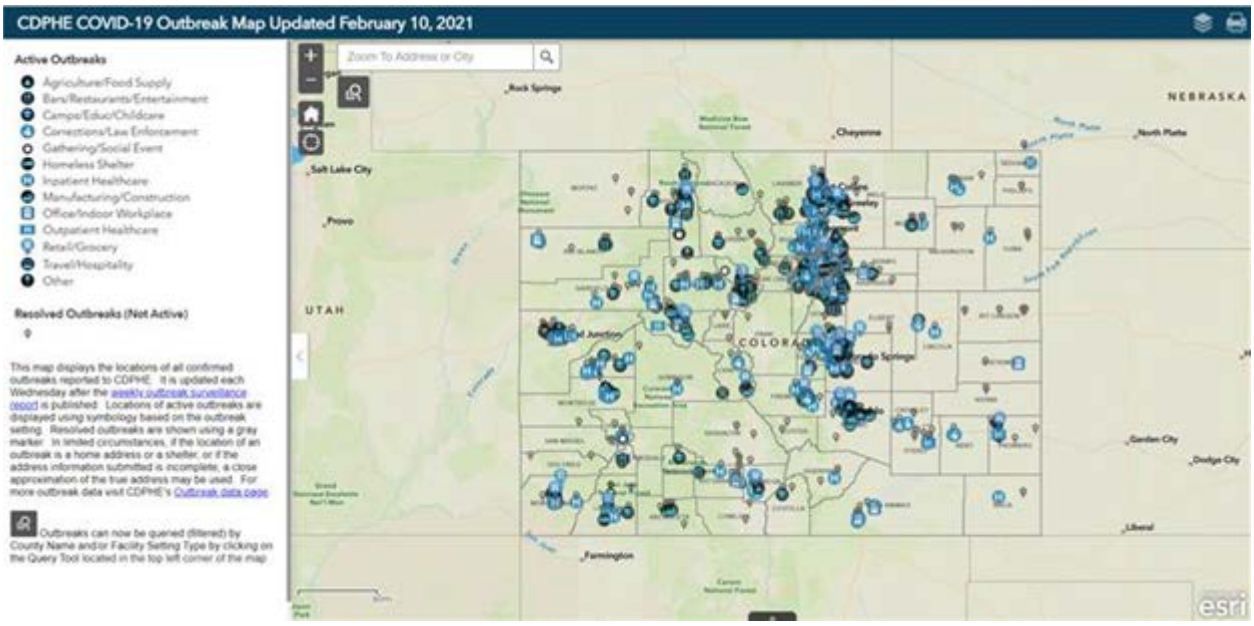
1. Test positive using an antigen test method.
2. Have symptoms of COVID-19 AND known exposure to COVID-19 (for example, being a close contact of someone who was diagnosed with COVID-19).
3. COVID-19 or SARS-CoV-2 is listed on the death certificate.

*This definition was updated as of August 19, 2020. Previously, probable cases also included those that had a positive antibody test which detects COVID-19 antibodies in the blood. For more details on this transition, see the CDC's statement.

Source: Wisconsin DHS |

The Wisconsin Department of Health Services (Wisconsin DHS) provides information below their visuals in sections called “Understanding our data: What does this chart mean?” and “About our data: How do we measure this?” Including this information increases transparency and clarity for the public.

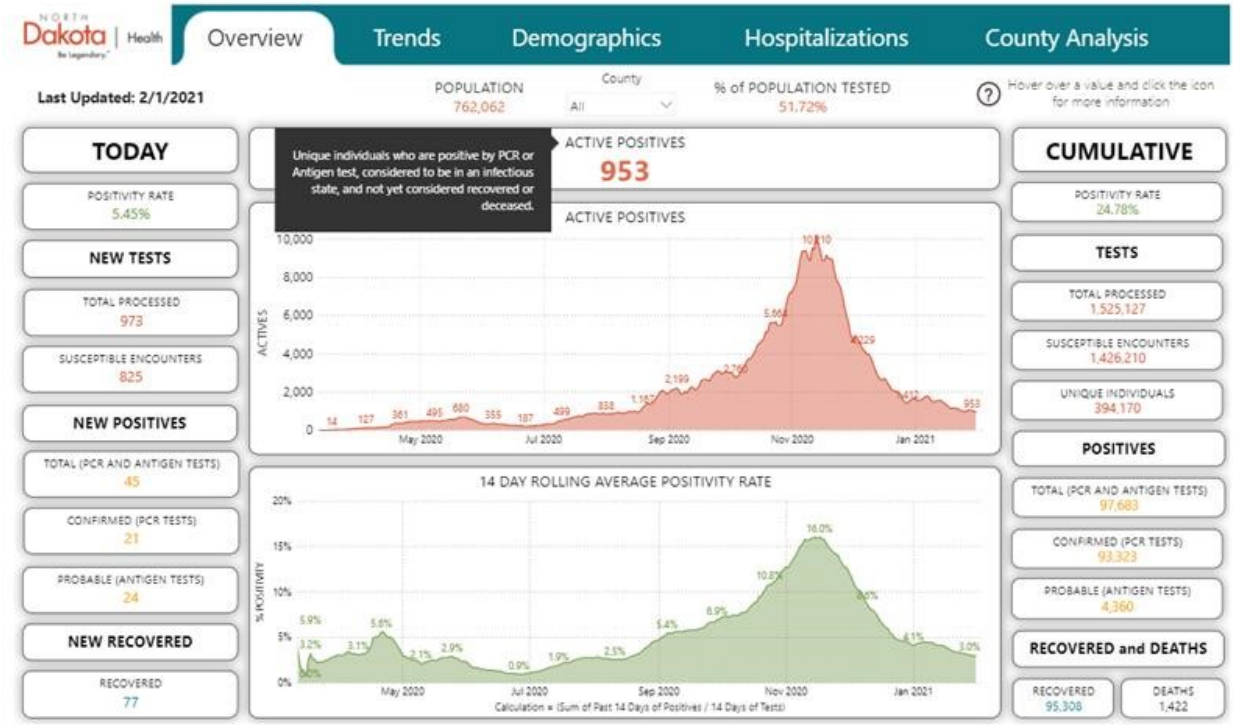
Colorado Outbreak Map



Source: Colorado DPHE |

The Colorado Department of Public Health and Environment (Colorado DPHE) updates an outbreak map weekly, shown above. This outbreak map displays the location of all confirmed outbreaks reported to the Colorado DPHE. Outbreak locations on the map include: bars/restaurants/entertainment, offices, gathering spaces, inpatient and outpatient healthcare, offices/indoor workplaces, and more. As Ohio develops its use of location data, the state can leverage this technology for outbreak maps. This helps residents weigh the risks involved with certain activities.

North Dakota Dashboard



Source: North Dakota Department of Health |

The North Dakota Department of Health (North Dakota DH) displays active positives. The definition is clearly listed on the visual.

Appendix E: Full ODH Data Downloads for Death Certification Lag Analysis

2020 Dates	December 1 Download	November 15 Download	Daily Difference
Unknown	19	19	0
1-Mar	1	1	0
17-Mar	2	2	0
18-Mar	1	1	0
20-Mar	5	5	0
21-Mar	1	1	0
22-Mar	4	4	0
23-Mar	5	5	0
24-Mar	4	4	0
25-Mar	7	7	0
26-Mar	6	6	0
27-Mar	8	8	0
28-Mar	12	12	0
29-Mar	20	20	0
30-Mar	15	15	0
31-Mar	8	8	0
1-Apr	17	17	0
2-Apr	19	19	0
3-Apr	24	24	0
4-Apr	19	19	0
5-Apr	26	26	0
6-Apr	25	25	0
7-Apr	21	21	0
8-Apr	34	34	0
9-Apr	24	24	0
10-Apr	27	27	0
11-Apr	27	27	0
12-Apr	35	35	0
13-Apr	41	41	0
14-Apr	39	39	0
15-Apr	41	41	0
16-Apr	36	36	0
17-Apr	55	55	0

2020 Dates	December 1 Download	November 15 Download	Daily Difference
18-Apr	43	43	0
19-Apr	38	37	1
20-Apr	47	47	0
21-Apr	42	42	0
22-Apr	46	46	0
23-Apr	47	47	0
24-Apr	58	58	0
25-Apr	35	35	0
26-Apr	48	48	0
27-Apr	58	58	0
28-Apr	64	64	0
29-Apr	43	43	0
30-Apr	32	32	0
1-May	57	57	0
2-May	44	44	0
3-May	55	55	0
4-May	33	33	0
5-May	41	41	0
6-May	43	43	0
7-May	47	47	0
8-May	37	37	0
9-May	48	48	0
10-May	45	45	0
11-May	30	30	0
12-May	46	46	0
13-May	41	41	0
14-May	30	31	-1
15-May	49	49	0
16-May	43	43	0
17-May	44	44	0
18-May	43	43	0
19-May	38	38	0
20-May	33	33	0
21-May	43	43	0
22-May	42	42	0
23-May	42	42	0
24-May	32	32	0
25-May	28	28	0
26-May	24	24	0

2020 Dates	December 1 Download	November 15 Download	Daily Difference
27-May	24	24	0
28-May	25	25	0
29-May	32	32	0
30-May	23	23	0
31-May	32	32	0
1-Jun	33	33	0
2-Jun	24	24	0
3-Jun	35	35	0
4-Jun	25	25	0
5-Jun	17	17	0
6-Jun	27	26	1
7-Jun	13	14	-1
8-Jun	20	20	0
9-Jun	19	19	0
10-Jun	13	13	0
11-Jun	19	19	0
12-Jun	28	28	0
13-Jun	24	24	0
14-Jun	18	18	0
15-Jun	20	20	0
16-Jun	11	11	0
17-Jun	16	16	0
18-Jun	20	20	0
19-Jun	22	22	0
20-Jun	11	11	0
21-Jun	9	9	0
22-Jun	23	23	0
23-Jun	17	17	0
24-Jun	12	12	0
25-Jun	14	14	0
26-Jun	17	17	0
27-Jun	19	19	0
28-Jun	19	19	0
29-Jun	18	18	0
30-Jun	12	12	0
1-Jul	21	21	0
2-Jul	13	13	0
3-Jul	14	14	0
4-Jul	17	17	0

2020 Dates	December 1 Download	November 15 Download	Daily Difference
5-Jul	17	17	0
6-Jul	12	12	0
7-Jul	18	18	0
8-Jul	12	12	0
9-Jul	28	28	0
10-Jul	24	23	1
11-Jul	23	23	0
12-Jul	15	15	0
13-Jul	16	16	0
14-Jul	12	12	0
15-Jul	15	15	0
16-Jul	21	21	0
17-Jul	22	22	0
18-Jul	28	28	0
19-Jul	29	29	0
20-Jul	25	25	0
21-Jul	15	15	0
22-Jul	28	28	0
23-Jul	26	26	0
24-Jul	30	30	0
25-Jul	35	34	1
26-Jul	20	20	0
27-Jul	28	27	1
28-Jul	34	34	0
29-Jul	38	38	0
30-Jul	29	29	0
31-Jul	27	27	0
1-Aug	15	15	0
2-Aug	24	24	0
3-Aug	21	20	1
4-Aug	20	20	0
5-Aug	24	24	0
6-Aug	25	25	0
7-Aug	28	28	0
8-Aug	21	21	0
9-Aug	27	27	0
10-Aug	30	30	0
11-Aug	27	27	0
12-Aug	21	21	0

2020 Dates	December 1 Download	November 15 Download	Daily Difference
13-Aug	33	33	0
14-Aug	27	27	0
15-Aug	20	20	0
16-Aug	23	23	0
17-Aug	15	15	0
18-Aug	29	28	1
19-Aug	29	29	0
20-Aug	26	26	0
21-Aug	36	35	1
22-Aug	31	31	0
23-Aug	31	31	0
24-Aug	24	24	0
25-Aug	27	27	0
26-Aug	26	26	0
27-Aug	24	24	0
28-Aug	29	29	0
29-Aug	20	20	0
30-Aug	22	21	1
31-Aug	32	32	0
1-Sep	30	30	0
2-Sep	27	27	0
3-Sep	25	25	0
4-Sep	14	14	0
5-Sep	19	18	1
6-Sep	22	21	1
7-Sep	19	19	0
8-Sep	15	14	1
9-Sep	20	20	0
10-Sep	24	22	2
11-Sep	21	21	0
12-Sep	24	24	0
13-Sep	21	20	1
14-Sep	16	16	0
15-Sep	14	14	0
16-Sep	14	14	0
17-Sep	25	25	0
18-Sep	20	19	1
19-Sep	10	10	0
20-Sep	18	18	0

2020 Dates	December 1 Download	November 15 Download	Daily Difference
21-Sep	14	14	0
22-Sep	15	15	0
23-Sep	18	16	2
24-Sep	12	11	1
25-Sep	24	21	3
26-Sep	13	13	0
27-Sep	17	16	1
28-Sep	15	15	0
29-Sep	22	21	1
30-Sep	13	13	0
1-Oct	17	15	2
2-Oct	8	7	1
3-Oct	14	11	3
4-Oct	13	12	1
5-Oct	17	13	4
6-Oct	16	13	3
7-Oct	23	18	5
8-Oct	21	18	3
9-Oct	16	13	3
10-Oct	22	18	4
11-Oct	14	11	3
12-Oct	20	18	2
13-Oct	20	18	2
14-Oct	17	17	0
15-Oct	18	12	6
16-Oct	21	15	6
17-Oct	28	21	7
18-Oct	22	16	6
19-Oct	23	21	2
20-Oct	25	21	4
21-Oct	26	20	6
22-Oct	20	16	4
23-Oct	23	20	3
24-Oct	26	19	7
25-Oct	29	25	4
26-Oct	19	18	1
27-Oct	25	18	7
28-Oct	21	18	3
29-Oct	22	17	5

2020 Dates	December 1 Download	November 15 Download	Daily Difference
30-Oct	26	20	6
31-Oct	21	17	4
1-Nov	34	31	3
2-Nov	30	18	12
3-Nov	30	21	9
4-Nov	30	20	10
5-Nov	27	15	12
6-Nov	22	14	8
7-Nov	36	11	25
8-Nov	25	8	17
9-Nov	28	10	18
10-Nov	39	16	23
11-Nov	35	14	21
12-Nov	30	6	24
13-Nov	32	5	27
14-Nov	27	1	26
15-Nov	30		30
16-Nov	22		22
17-Nov	26		26
18-Nov	37		37
19-Nov	39		39
20-Nov	38		38
21-Nov	29		29
22-Nov	36		36
23-Nov	19		19
24-Nov	16		16
25-Nov	16		16
26-Nov	9		9
27-Nov	5		5
28-Nov	4		4
29-Nov	6		6
30-Nov	1		1
Total	**6,429**	**5,722**	**707**

OHIO AUDITOR OF STATE
KEITH FABER

OHIO DEPARTMENT OF HEALTH

FRANKLIN COUNTY

AUDITOR OF STATE OF OHIO CERTIFICATION

This is a true and correct copy of the report, which is required to be filed pursuant to Section 117.26, Revised Code, and which is filed in the Office of the Ohio Auditor of State in Columbus, Ohio.

Certified for Release 3/23/2021

88 East Broad Street, Columbus, Ohio 43215
Phone: 614-466-4514 or 800-282-0370