Arizona Infectious Disease Surveillance Overview

Office of Infectious Disease Services

Arizona Department of Health Services

Revised September 20, 2017

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List of acronyms

A.A.C.	Arizona Administrative Code
ADHS	Arizona Department of Health Services
A.R.S.	Arizona Revised Statute
ASPHL	Arizona State Public Health Laboratory
CDC	Centers for Disease Control and Prevention
CDR	Communicable Disease Report
CSTE	Council of State and Territorial Epidemiologists
DSO	Disease-Specific Observation
EDC	Epidemiology and Disease Control
ELR	Electronic Laboratory Reporting
MEDSIS	Medical Electronic Disease Surveillance Intelligence System
ODIS	Office of Disease Integration Services
OIDS	Office of Infectious Disease Services

Purpose and scope of the report

The purpose of this report is to describe Arizona's infectious disease public health surveillance system and provide an overview of changes to that system in recent years. Understanding the infrastructure behind how surveillance data are collected, investigated, managed, and analyzed can be critical to understanding and interpreting reports produced using those data. While this report does not contain any of the statistical output from our infectious disease surveillance system, we hope that it will be used alongside our surveillance reports and complement the information they contain. This document details the system in place, and changes to that system, starting in 2008, although much of the information is also applicable to the system prior to that year.

The ADHS Office of Infectious Disease Services (OIDS) is the state-level entity responsible for surveillance and investigation for a variety of infectious diseases, including influenza; foodborne/waterborne diseases; invasive organisms; vaccine-preventable diseases; and vector-borne and zoonotic diseases. Surveillance for tuberculosis and sexually transmitted diseases (STDs), including HIV, is conducted by the ADHS Office of Disease Integration and Services (ODIS). While there are many similarities in the surveillance system for all of these infectious diseases, we focus only on surveillance for the diseases managed by OIDS. Surveillance and investigations for tuberculosis, STDs, and HIV may vary somewhat from what is described here.

Organization of Arizona infectious disease public health responsibilities

OIDS staff work closely with Arizona's local health departments. Direct public health services, as they relate to surveillance, investigation, and response to infectious diseases of public health importance, are the responsibility of the 15 county health departments and the tribal health departments and/or Indian Health Service Units. Much of the information presented in our surveillance reports has been collected through the joint efforts of local and state health department staff. Local health department staff in Arizona play an essential role not only in collecting communicable disease data, but importantly, as the public health officials working most directly with their populations to control the spread of infection from identified cases.

The authorities and responsibilities of the different public health agencies are granted through the Arizona Revised Statutes (A.R.S.) Title 36 – Public Health and Safety, including Chapter 6 – Public Health Control; and the Arizona Administrative Code (A.A.C.) Title 9 – Health Services, Chapter 6 – Communicable Diseases and Infestations.

ADHS OIDS staff support and supplement the surveillance and investigation efforts of the local public health departments, as needed; compile surveillance and investigations information across counties; provide case-based notifications of communicable disease data to the U.S. Centers for Disease Control and Prevention (CDC); and are responsible for investigations that may cross county or state lines. Additionally, ADHS provides statewide infrastructure to support infectious disease surveillance, including directly receiving communicable disease reports from laboratories; developing and maintaining the communicable disease database (the Medical Electronic Disease Surveillance Intelligence System, or MEDSIS); developing an electronic laboratory reporting (ELR) system that interfaces with MEDSIS; onboarding laboratories to ELR; and providing training, subject matter expertise, and standardization of practices in many subject areas. ADHS is also responsible for updating and maintaining the rules and statutes for communicable disease reporting and control.

OIDS is part of the Bureau of Epidemiology and Disease Control (EDC). In 2014, at the first writing of this report, OIDS was comprised of five programs: Infectious Disease Epidemiology; Public Health Emergency Preparedness Epidemiology; Healthcare Associated Infections; MEDSIS; and Electronic Disease Surveillance (including syndromic surveillance and ELR activities). In 2016, the Electronic Disease Surveillance Program moved to the Bureau of Public Health Statistics but has continued to work closely with OIDS. In 2017, the MEDSIS Program Manager became the EDC Systems Manager and the program moved from the Office to the Bureau level. The organization of OIDS has changed many times in its history, reflecting changes in needs, staffing, funding, and patterns of disease.

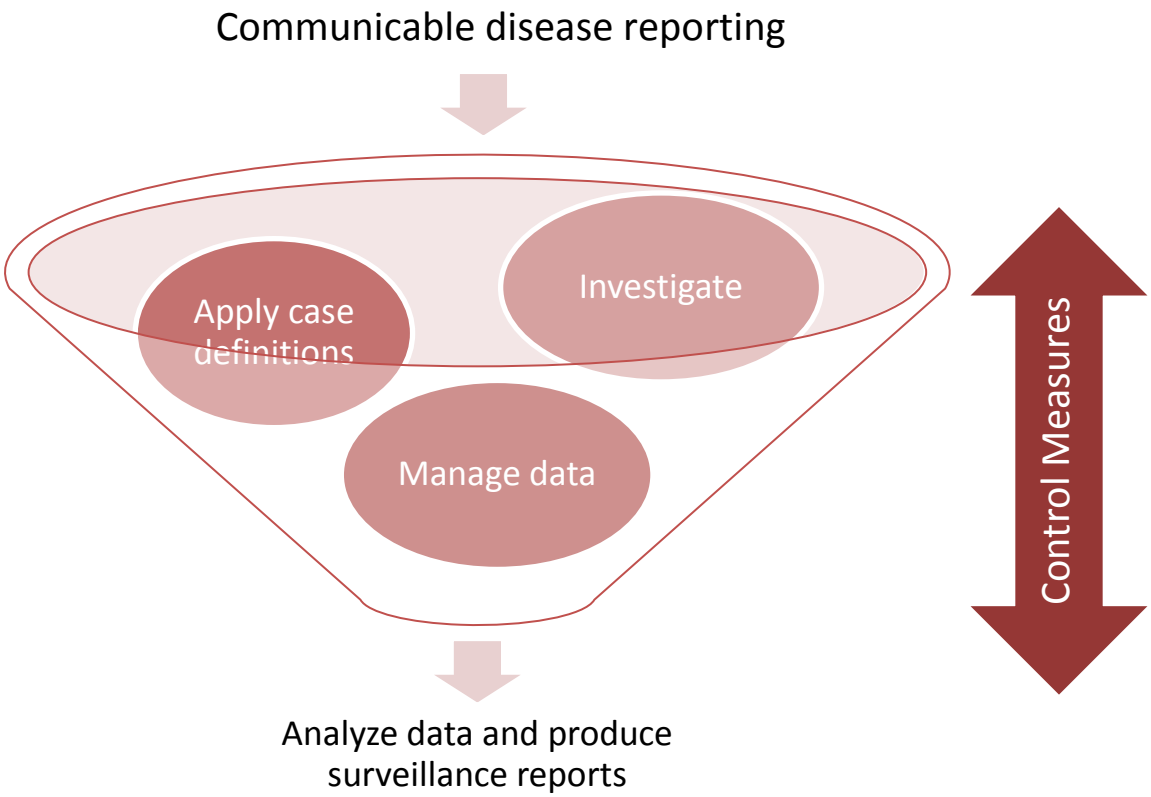
OIDS staff also collaborate with colleagues in other ADHS offices and bureaus including: the Office of Environmental Health and Arizona Immunization Program Office, both also part of EDC; the Arizona State Public Health Laboratory (ASPHL); and the Bureau of Public Health Emergency Preparedness, all within the Division of Public Health Services, and the Office of

Border Health. OIDS would like to acknowledge and thank external and internal partners for their contributions to this system.

Overview of Arizona's communicable disease surveillance system

The communicable disease surveillance system starts with the reporting of a case of illness to public health officials. Public health officials evaluate and investigate the case, apply case definitions, and ensure information is entered appropriately into the data management system. Many of these steps may be performed concurrently or repeated several times for a single case. Aggregated data are analyzed and used to produce surveillance reports. Importantly, control measures can be implemented at any point in this process, when identified as necessary to reduce or prevent additional cases of disease.

Figure 1. Public health communicable disease



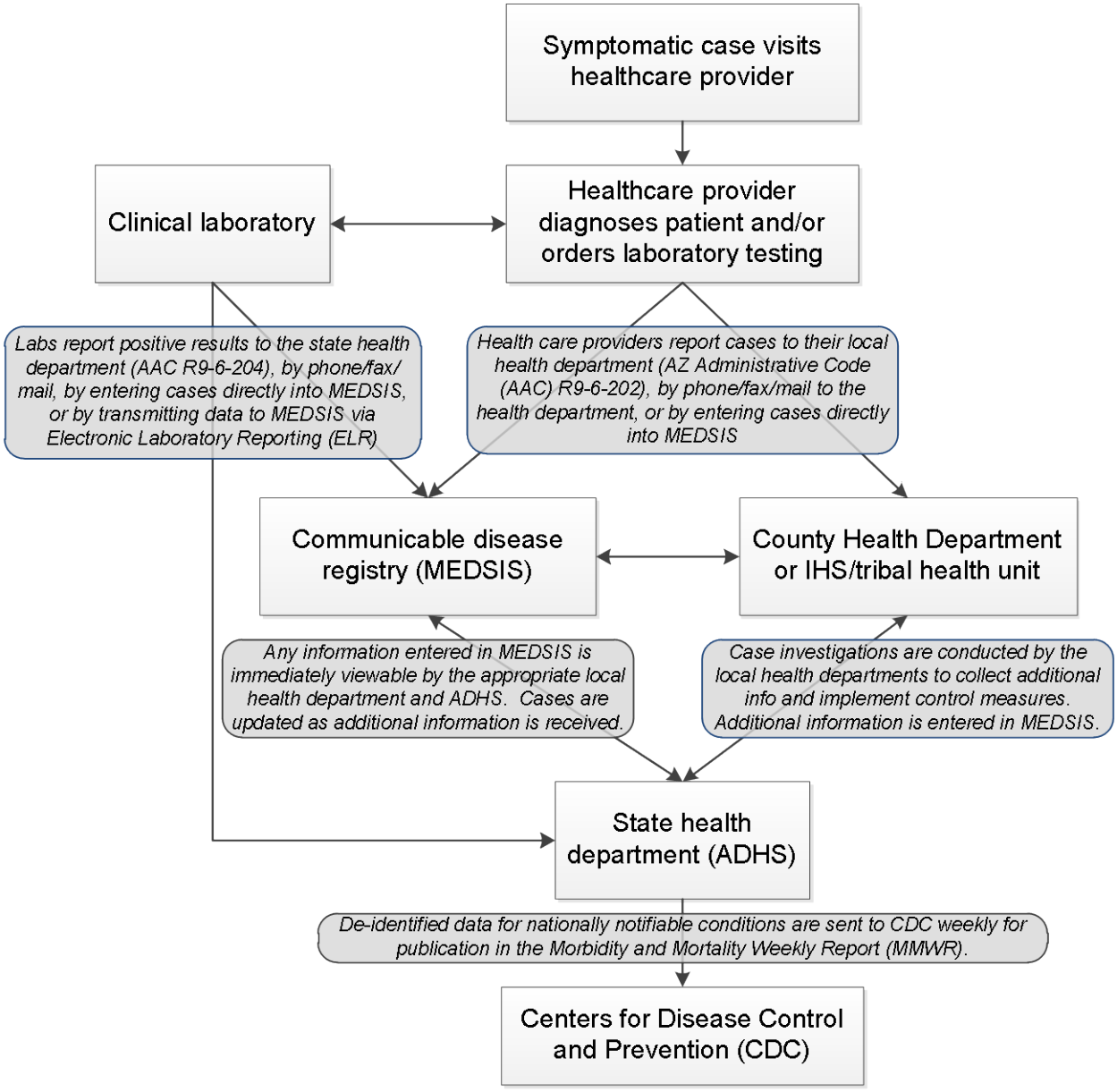
Additional information about each of these steps, as relevant for interpreting surveillance data, follows.

COMMUNICABLE DISEASE REPORTING

A.A.C. R9-6-202, 203, 204, and 205 describe the morbidities, test results, and prescriptions required to be reported by healthcare providers, administrators of healthcare facilities, clinical laboratory directors, institutions, schools, pharmacists, and others. The list of reportable conditions is based upon the list of Nationally Notifiable Infectious Diseases jointly developed and maintained by the Council of State and Territorial Epidemiologists (CSTE) and CDC. Additional conditions are included that are considered important for Arizona because of differences in the epidemiology of the disease in the state or for other public health reasons. The list is revised periodically to add newly emerging pathogens or remove conditions that are no longer a public health priority. Information is collected to assess and monitor the burden of disease, characterize affected populations, assess trends in disease occurrence, guide control efforts, and evaluate prevention initiatives.

Arizona requires reporting by both healthcare providers and clinical laboratories as a dual surveillance measure to increase the sensitivity of the surveillance system and improve the completeness of reporting. Since local health departments are the primary response agency, healthcare providers report notifiable conditions to the local health departments for immediate investigation and initiation of control measures, as appropriate. Laboratories report to ADHS. ADHS reports case information without personal identifiers to CDC on a weekly basis for the purposes of compiling national statistics. Figure 2 outlines the reporting structure and flow of information in Arizona.

Figure 2. Arizona communicable disease reporting flow of information



FORMATS FOR SUBMITTING COMMUNICABLE DISEASE REPORTS

The information that should be included with each report is specified in A.A.C. R9-6-202, 203, 204, and 205.

Reports from healthcare providers can be submitted using the communicable disease report (CDR) to collect basic information about the case and the disease event, or using another format containing the same information.

Reports from laboratories can be submitted using the laboratory report form to collect basic information about the case and the test results, or using another format containing the same information. Laboratories commonly submit a print-out of the test results from their own laboratory information system.

The reports can be submitted in several ways:

- Telephone, secure fax, or mail
- Direct entry into MEDSIS by enrolled infection preventionists, providers, or laboratory staff (available since 2006), or
- ELR – electronic transmission of test information from a laboratory's information system via HL7 messaging to ADHS (available since 2009).

For some diseases, the reporting entity must notify the health department immediately (within 24 hours) or within one working day. For these more urgent reports, the reporting entity should select a method that allows for notification within that time frame.

REPORTING LIMITATIONS

Incomplete reporting is inherent to any passive surveillance system. Knowledge and awareness of current reporting rules, willingness to comply, available diagnostic tests, or mechanisms of reporting, may influence the likelihood of a case being reported as required. Additionally, many factors may affect whether a person seeks healthcare for the condition, and whether a diagnosis or laboratory test is considered. These may include severity of the disease, age of the patient, confidentiality issues or sensitivity of the disease, general patterns of health-seeking behavior, and access to or availability of healthcare services. Within the public health system, changes in case definitions over time, changes in administrative rules, changes in personnel and funding, changing in investigation practices, and other factors may also contribute to some variation over time or place.

CASE DEFINITIONS

Case definitions for public health surveillance are used to classify reported cases, increasing the specificity of reporting, and allowing comparability of diseases nationwide or over time. Unless otherwise specified, cases meeting the confirmed or probable case classifications for these standardized surveillance case definitions are generally included in ADHS surveillance reports. Criteria for surveillance case definitions may differ from those used by providers to diagnose and treat diseases.

The current Arizona case definitions are posted on the ADHS website. Many of these case definitions are based upon those voted on and approved by CSTE. Those national case definitions are used in CDC's National Notifiable Diseases Surveillance System, the system to which ADHS provides weekly updates on cases reported and counted for the state.

INVESTIGATION OF REPORTED CASES

State and local public health officials rely on healthcare providers, laboratories, hospitals, schools, and other facilities to report notifiable diseases or conditions. Once a report is received, public health staff, particularly at the local level, conduct investigations of many morbidities. During this time, they may also implement control measures and provide education to the case about ways to prevent further transmission, as appropriate.

During the investigation, additional information may be obtained about basic case descriptors, symptoms, risk factors, travel or vaccination history, contacts, and other pertinent facts. Local health jurisdictions and ADHS add the information collected through public health reporting and/or investigation to case records in the communicable disease registry.

Investigators usually use a standardized investigation form for each morbidity to direct the investigation and collect additional information.

DATA MANAGEMENT

Both ADHS and local health departments enter reported information into the secure, web-based MEDSIS. Reports may also be entered directly by healthcare providers or laboratories. Information in MEDSIS can be jointly viewed by both ADHS and the appropriate local health department. Information obtained during case investigations is added to MEDSIS to supplement the initial case reporting. Within MEDSIS, information from any of the sources about a single case is combined; one case may include data from the laboratory report, the healthcare provider report, and the public health investigation. Data can be extracted from MEDSIS for analysis and the production of statistical reports.

Many morbidities in MEDSIS contain a section of specialized fields, called disease-specific observations (DSO), with investigation questions relevant to the particular disease. While some information collected during the case investigation is entered into MEDSIS as notes or attached files, for many questions the information collected can be entered into the MEDSIS DSO and used for later review and data analysis. Notes and attachments are useful to document the case investigation but are not extractable and thus cannot be analyzed (with few exceptions).

DISEASE REPORTING BY TRIBAL HEALTH DEPARTMENTS, INDIAN HEALTH SERVICES, OR OTHER FEDERAL ENTITIES

Arizona has a large population of American Indians, and is home to 22 federally-recognized tribes. Health services are provided for these populations through numerous health centers run by the tribes or by the U.S. Indian Health Services. Several other federal health facilities, including those run by the Veterans' Administration or Department of Defense, are also located in the state. While these entities are not technically required to comply with state reporting rules, they serve Arizona residents who are included in our state's census and population counts. Under A.A.C. R9-6-207 ("Federal or Tribal Entity Reporting"), these facilities are requested to report communicable diseases and laboratory results in the same manner as non-tribal or non-federal providers, laboratories or schools; this code also provides the same privacy and confidentiality protections for these records as for reports from other entities. Reports for Arizona residents from these facilities are thus included in MEDSIS along with reports from any other entity, and statistical reports include the populations served at these health facilities, unless otherwise specified.

Other data considerations

FINAL AND PROVISIONAL DATA

Data shared with public health partners, the public, and CDC throughout the year are considered provisional until approximately the following April or May. Statistics and tables produced with these data are subject to change. Although data cleaning and review occurs routinely to ensure data accuracy and quality, data for the previous reporting year are finalized only after additional data cleaning and review each spring. Many of the more detailed surveillance reports are produced only after finalized data are available.

RATE CALCULATIONS AND POPULATION ESTIMATES

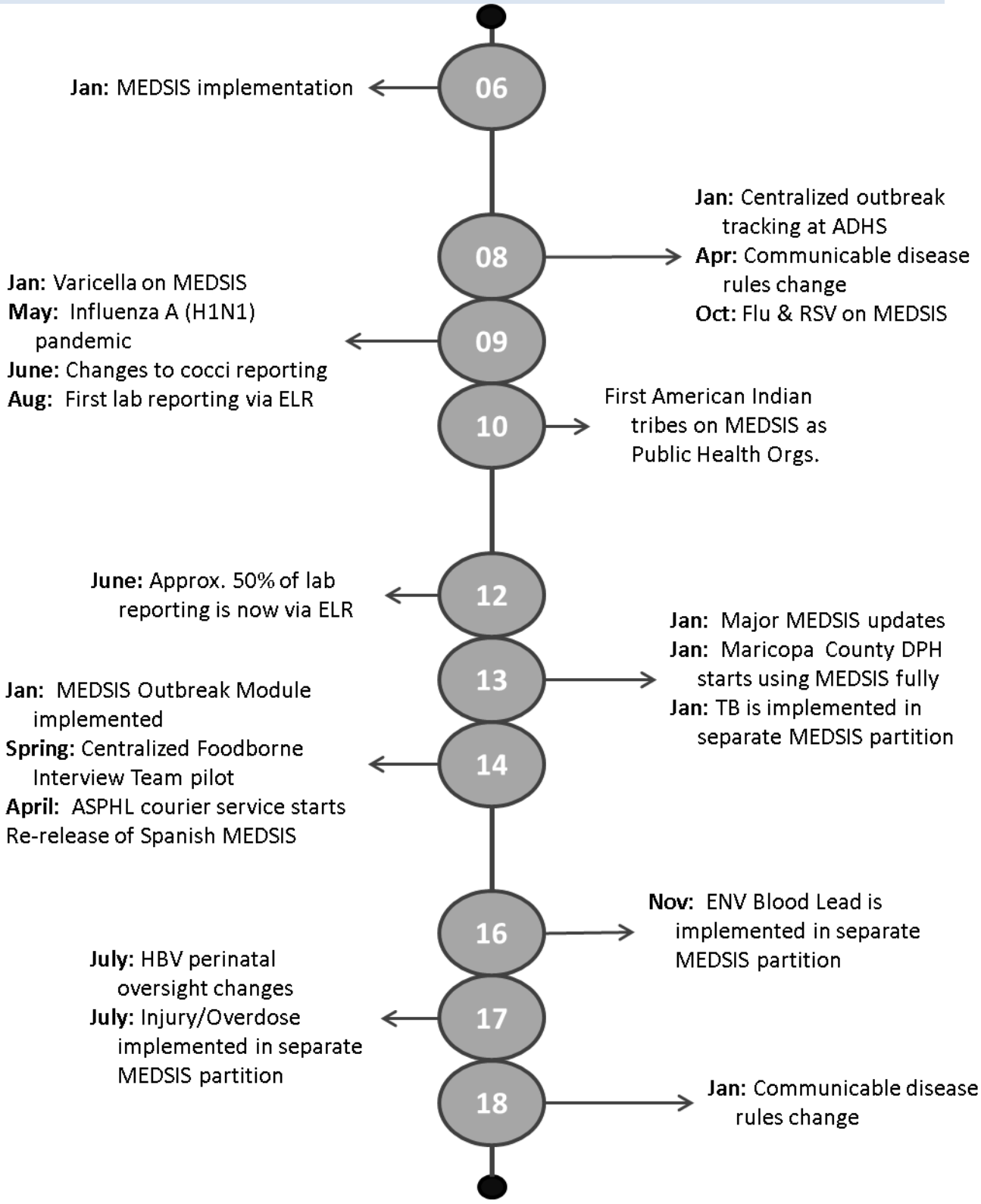
The annual population estimates from the ADHS Bureau of Public Health Statistics are used for rate calculations in reports produced by OIDS, unless otherwise stated. Disease rates are usually calculated per 100,000 population and are not age-adjusted, unless otherwise specified. Rate calculations based on a small number of reported cases or for counties with populations less than 100,000 are not considered reliable since they can be dramatically influenced by small changes in the number of reported cases.

Changes to the surveillance system

The communicable disease surveillance system, as well as investigation procedures and forms, change over time. Changes within the Arizona system may be a result of national-level changes to case definitions or the notifiable conditions list; information system enhancements; technological changes within public health or healthcare; changes in policies or procedures at state or local levels; variations in public health priorities or resource levels; the changing epidemiology of certain morbidities; or changes in what we know about particular diseases, among other factors. Changes may be intended to improve the information available to public health officials or the public, or may be a consequence of the changing context in which public health departments operate. Many of these changes may also have an effect on surveillance data and the comparability of those data year-to-year, to greater or lesser extents. These changes should therefore be considered when interpreting trends over time.

A timeline of major surveillance changes is shown on the next page; these changes are described in more detail afterwards.

TIMELINES OF MAJOR SURVEILLANCE CHANGES, 2006 – 2018



CHANGES IN SURVEILLANCE AND INVESTIGATION TOOLS AND RESOURCES

A.A.C. ("RULES")

Information about the current rules can be found on the Arizona Secretary of State's website at and on the OIDS website. Rule-making (including modifying current rules) is a formal process, and is described on the ADHS Office of Administrative Counsel & Rules website. All rules must also be reviewed at least every five years, pursuant to A.R.S. § 41-1056, to determine whether any rules should be amended or repealed; this review includes analysis of whether the rule is effective at achieving its objectives and is consistent with other rules and statutes.

2008–2017

The rules (A.A.C. R9-6, Articles 1, 2 and 3) in place throughout this period became effective April 1, 2008. Changes that year included making Chagas disease and influenza-associated pediatric mortality reportable by providers, removing vancomycin-resistant enterococcus (VRE) from the reporting rules, requiring specimen submission to the state laboratory for positive tests for several additional organisms (including measles and rubella), and clarifying time frames and responsibilities.

A state-wide moratorium on rule-making was in effect for a long period since then, although the following changes are noted:

- April 30, 2013: Several sections requiring investigation of specific morbidities expired, although this did not change the reporting requirements.
- March 9, 2016: A guidance document was issued, suspending isolate submission of two organisms to ASPHL.

These changes are described in more detail in Appendix A.

2018

In mid-2016, the Department was given permission to open the rule-making process for communicable diseases. In September 2017, revisions to the rules were approved, effective January 1, 2018. These changes will be described in detail in a subsequent revision of this report.

> *Possible surveillance impact*: The additional or removal of a condition on the reporting list affects whether public health officials are informed of cases, and whether disease statistics or trends can be examined. Investigations generally affect how much is known about each case. Investigations may lead to more complete or accurate information about symptoms, risk factors, timing of illness, or demographic data; for some morbidities, this information

may also affect the case classification and whether a case is counted in the disease statistics. Isolate submission, followed by additional testing at ASPHL, may help to confirm laboratory testing performed at other laboratories or provide serotype information, depending on the organism and the testing protocols.

CASE DEFINITIONS

The current Arizona case definitions are posted on the ADHS website. Annual case definitions from 2005 through the past year are posted on this site as well, for archival purposes. A few case definitions change or are added each year, in response to national or local needs to modify existing definitions, or to standardize the counting of new diseases under surveillance.

The list, by year, of the definitions that changed is included as Appendix B, with brief notes about those changes. Appendix C lists the morbidities for which the national and Arizona case definitions differ. National and state numbers for Arizona may not match exactly, if Arizona definitions include additional classifications beyond those available nationally.

Possible surveillance impact: Changes to the confirmed and probable case definitions and to the clinical and laboratory criteria might result in an increased or decreased number of cases reported to ADHS and/or classified as confirmed or probable. Therefore, it is important to interpret the changes in incidence for a disease in the context of the modifications made to the case definition for that morbidity. Changes to the suspect case definition do not impact the numbers present in most of the ADHS reports, as only confirmed and probable cases are shown, unless otherwise stated, but may impact disease investigation.

REPORTING AND INVESTIGATION FORMS

The CDR, the basic form for provider-reporting, is available as a form-fillable PDF file on the ADHS website. Other than the change to a fillable form, it has remained unchanged since at least 2008.

Investigation forms designed for specific morbidities change over time. These changes may be motivated by modifications in forms or variables for national data collection, or may be locally-driven. Sometimes the changes represent updates to a single variable; other times the changes may be a major revision. The forms that have changed since 2008 are listed in Appendix D.

Possible surveillance impact: Many of the fields commonly used throughout the surveillance reports – age, county of residence, sex – are not subject to change. Trends in risk factors or other fields present in the investigation forms might be discontinuous through the years,

depending on the extent of the changes.

CHANGES TO MEDSIS AND OTHER ELECTRONIC SYSTEMS

After its initial implementation in January 2006, MEDSIS has undergone several versions and iterations in order to align with changes to national standards as well as the needs of the system's users. Many of these enhancements and added modules have increased Arizona's capacity to manage cases of communicable disease as well as improved the state's ability to quickly respond to outbreak situations and implement control measures.

MEDSIS is currently used by over 500 provider/healthcare facility users. Since MEDSIS is the only system that allows providers direct entry of disease reports, the MEDSIS and Electronic Disease Surveillance Programs have worked with other offices at ADHS to integrate the reporting process for all communicable diseases, so that providers would not need to report different diseases through different systems or methods. Reports entered for communicable diseases tracked by other ADHS offices are automatically extracted and sent to the appropriate program.

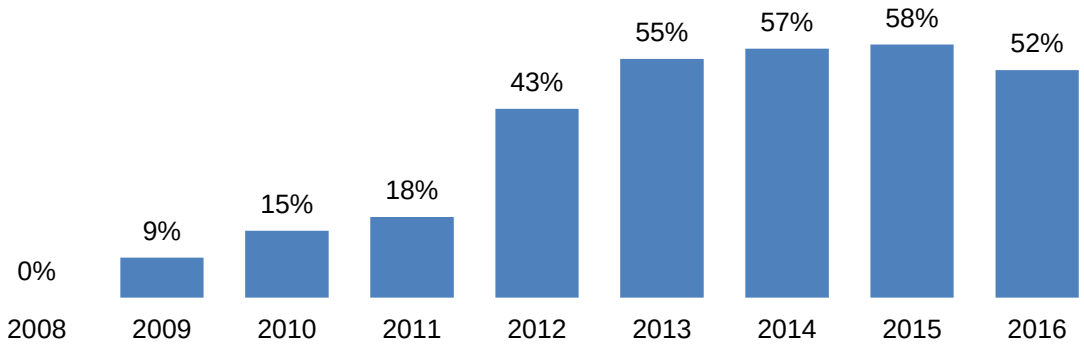
ELR IMPLEMENTED

ELR allows laboratories to transmit data from their information system directly to ADHS, replacing reporting via fax or mail. Received information can then be triaged by the ADHS electronic database; laboratory reports for diseases included in MEDSIS are used to create new MEDSIS cases or add information to existing cases. Data from the electronic laboratory report are auto-populated into the appropriate fields in the MEDSIS case. Once implemented for a given laboratory, ELR reduces the time needed by ADHS staff to enter cases, reduces the likelihood of data transcription errors, and should also reduce the amount of time that laboratory staff spend on public health reporting. Importantly, timeliness of reporting of all diseases is also improved.

- In 2009, two commercial laboratories started reporting via ELR (reporting burden: approximately 10–15% of reported cases)
- In June 2012, an additional commercial laboratory started reporting via ELR. Together, these three laboratories account for a large proportion of the reports received by ADHS (approximately 50%).
- In December 2012, the first hospital system started reporting via ELR.
- Additional hospital laboratories were added in September 2014, May 2015, and May 2016.

Possible surveillance impact: Data accuracy should be improved through the elimination of manual data entry, and possibly the elimination of transcription errors by the laboratory. Other jurisdictions have found that the implementation of ELR is often accompanied by increases in case reports through more complete reporting of cases that may have been missed by manual processes.

First implemented in 2009, ELR accounts for more than half of laboratory reports received each year, since 2013.



JURISDICTIONAL USE OF MEDSIS EXPANDS

Tribal public health organizations start using MEDSIS

Tribal health organizations have a unique role in the surveillance and investigation of cases residing on tribal lands. Through creation of a specialized role in MEDSIS that allows sharing of case information between the tribal organizations, the county health department for the county in which the case is counted, and ADHS, increased cooperative efforts concerning communicable disease surveillance for this population are enhanced. Three tribal public health organizations started using MEDSIS since 2010.

> *Possible surveillance impact*: More comprehensive and accurate information about cases occurring on tribal lands in Arizona.

Maricopa County Department of Public Health uses MEDSIS as their primary communicable disease surveillance database

In January 2013, with the release of major MEDSIS enhancements, MCDPH joined MEDSIS fully. Previously, county health department staff had maintained a separate surveillance database while ADHS staff entered and updated Maricopa County data on MEDSIS.

> *Possible surveillance impact:* The MCDPH transition to MEDSIS meant greater accuracy in Maricopa County MEDSIS data, and more comprehensive investigation data in MEDSIS. Although ADHS and MCDPH data were reconciled periodically before this point, the utilization of the same database ensures much better agreement and a reduction of information missed during reconciliation. It also resulted in staff time saved, with the elimination of the duplicate case entry into both systems.

INITIATION OF MEDSIS USE FOR ADDITIONAL MORBIDITIES

Morbidities transitioned to MEDSIS

Although surveillance for most communicable diseases tracked by OIDS moved to MEDSIS in January 2006, separate databases were maintained for several morbidities, with the idea that data entry for these morbidities might be easier in a smaller database with fewer fields. With time, however, the value of tracking all diseases in the same system became clear, in particular because of the possibility of entry by external laboratory and healthcare provider users, and shared access between local and state public health users.

- Influenza and respiratory syncytial virus (RSV) surveillance transitioned to MEDSIS in October 2008 (for the 2008-2009 influenza season).
- Varicella case surveillance transitioned from a local database to MEDSIS in 2009. Before the complete adoption of MEDSIS for varicella surveillance, cases entered in MEDSIS by local health department users were identified and also entered into the separate database.

Possible surveillance impact: The transition to MEDSIS allowed county and state health department users to access and review the same data, reducing the potential errors inherent to reconciling different systems, whether through transcription errors or by not identifying all cases from one system that needed to be entered in the other. When assessing trends for these morbidities across years that used different data systems, it is possible that data entered outside of MEDSIS are less comprehensive because of fewer partners contributing reports to those systems; the older systems may have also had different variables than MEDSIS.

New morbidities tracked

Additionally, new diseases emerged or gained attention, requiring addition to the morbidity list in MEDSIS. Some of these may have been captured earlier under Emerging or Exotic Disease.

- Chikungunya and Ebola virus: December 2014
- Acute Flaccid Myelitis: December 2015
- Zika: February 2016
- Unspecified flavivirus group 1: December 2016
- Spotted Fever Group Rickettsiosis and Unspecified flavivirus group 2: March 2017

Possible surveillance impact: These morbidities would not have been entered in MEDSIS under these morbidity names for earlier suspect cases, though some cases entered initially as Emerging or Exotic Disease may have been transferred to the new morbidity.

New MEDSIS subject areas

Starting in January 2013, MEDSIS functionality was added that allowed for separate "partitions" of MEDSIS within a jurisdiction, requiring separate user permissions. This functionality was first used for tuberculosis surveillance; staff at one jurisdiction might be able to access tuberculosis cases, or "non-tuberculosis" (general communicable disease) cases, or both, depending on their user permissions. Additional partitioned areas of MEDSIS were added later.

- Tuberculosis: January 2013
- Environmental (Blood Lead): November 2016
- Injury/Overdose: July 2017

Possible surveillance impact: Although these morbidities are not tracked by the Office of Infectious Disease Services, use of the MEDSIS infrastructure to create surveillance systems for these morbidities takes advantage of a system with shared access across many jurisdictions, that is already used for healthcare provider reporting, and that is connected to the ELR infrastructure.

OUTBREAK TRACKING

Centralized outbreak tracking

ADHS created a centralized database to track outbreaks across the state, starting in 2008, with expansions after that time. Although local health departments generally conduct the outbreak investigations, the centralized outbreak database allowed public health officials to better understand the number, size, location, and types of outbreaks reported and investigated throughout the state. The ADHS database was later replaced in 2014 by the implementation of the MEDSIS Outbreak Module.

Possible surveillance impact: Possibly minimal impact for case-based surveillance, although centralized tracking may encourage more comprehensive inclusion in MEDSIS of outbreak-associated cases.

MEDSIS Outbreak Module

In 2014, the MEDSIS Outbreak Module was implemented to track outbreaks and outbreak-associated cases, with significant functionality between the Outbreak Module and case-based parts of MEDSIS. Over the next few years, outbreak module bugs were corrected, enhancements were identified and implemented, and standard practices were developed for

use of the system.

Possible surveillance impact: Outbreak information available to ADHS improved significantly, as local health departments were able to use the same system as ADHS to collect and store outbreak tracking information in a standardized, shared manner. This improvement mirrored the improvement of case data that occurred several years earlier with the original implementation of MEDSIS across jurisdictions. Improvements in outbreak data collection are reflected in the outbreak summary reports posted online.

DISEASE-SPECIFIC OBSERVATION (DSO) CHANGES IN MEDSIS

The DSO sections in MEDSIS are distinct to each morbidity (or group of similar morbidities). Investigation data or other disease-specific details of a case can be entered and extracted from these sections. While information can also be entered into free-text notes or comments, or saved as an attachment to a case, DSO fields allow for data to be more easily retrieved and analyzed.

Like investigation forms, the DSOs may need to change over time, though the process for updating a DSO does not always happen at the same time as the change in an investigation form. See Appendix E for a list of DSOs that have been modified.

Possible surveillance impact: Some DSO fields may change over time, whether an addition or removal, a change in question format (for example, check-box to drop-down), a change in drop-down response options, or a restructuring of the question order or format. This can impact the data available for analysis across years.

OTHER MAJOR MEDSIS ENHANCEMENTS

2013 system update, including case management and case and contact linking

A major system update was released in January 2013. This release included brand new case management functionality; case and contact linking; an overhaul of the user interface; the inclusion of tuberculosis surveillance resources for the first time; the ability for state and local users to assign different classifications to a case; and the ability to capture time in many of the date fields. In preparation for the release, ADHS developed numerous user materials, including a comprehensive user guide, updated policies and procedures, and data dictionaries to accompany the new system. User materials were distributed at state-wide in-person trainings to all MEDSIS county and tribal health department liaisons.

Possible surveillance impact: Case management details could not be tracked well

previously (other than in comments or notes). Contacts could be linked to the appropriate cases within the system for the first time. Time in hours could be calculated, as needed. Updated materials may have contributed to a better understanding of the system and its features.

Binational surveillance and translation of MEDSIS into Spanish

Translation of MEDSIS into Spanish to continue the binational partnership with public health counterparts in Sonora, Mexico, was released in 2014. Binational MEDSIS had been available previously, but staff turnover (especially in Sonora) and changes in MEDSIS made more work necessary. Subsequent trainings have been held for Sonoran officials, including in Hermosillo, Sonora.

The binational field expanded in November 2014 to include Canada, as well as Mexico. Cases that are marked as binational with either country are reviewed by the ADHS Office of Border Health, and communicated to the Sonora public health officials or CDC, as appropriate.

Possible surveillance impact: Potentially better information on cases with Mexico or Canada connections, and better communication with partners about those cases.

OTHER EVENTS AND CHANGES AFFECTING SURVEILLANCE

Beyond to the changes to MEDSIS itself and the use of MEDSIS, additional events or changes in practice may have an impact on surveillance data; some are listed below.

ADHS CENTRALIZED FOODBORNE INVESTIGATION TEAM

Beginning in 2014, ADHS organized a centralized foodborne investigation team, with trained staff who were able to assist county health departments complete enteric disease investigations in a timely manner. These staff were very familiar with the foodborne disease investigation process, were available to quickly attempt an interview after cases were reported, and could relieve county health department staff to attend to other priorities. Some county health departments delegated investigations of all cases of certain diseases to this team; others continued to conduct their own investigations or called on the team only as needed.

> *Possible surveillance impact*: The centralized team likely improved the timeliness of interviews. For the type of questions asked during a foodborne investigation, such as food history, timeliness can contribute to more complete and accurate information, and potentially faster outbreak identification and response. Centralization of interviews could also lead to more standardization of processes and information across counties.

STATE LABORATORY COURIER SERVICE

In April 2014, ASPHL implemented a statewide courier service. The service is intended as a convenient way for external laboratories to have their diagnostic and reference microbiological samples picked up and delivered to ASPHL, free of charge, and on a routine schedule.

> *Possible surveillance impact*: In theory, the availability of the courier service may be associated with better submission of specimens and isolates of public health interest. By reducing the costs and logistical challenges to other laboratories for submitting specimens, the service could potentially increase the number of samples submitted, including those required under rule, and improve the timeliness of submission. Both of these aspects could improve the timeliness and quality of data available for a public health response.
>
> Additionally, although providers and laboratories should report detection or suspicion of certain organisms or diseases regardless of whether they submit an isolate or specimen for additional testing, sometimes the submission is the first and/or only notification that public health receives about a suspect case. Facilitating and speeding the submission process can thus lead to more timely identification of suspect cases, and to faster public health control actions, if warranted.

INFLUENZA H1N1 PANDEMIC

During the 2009 influenza A (H1N1) outbreak, many public health resources were devoted to pandemic response.

> *Possible surveillance impact*: In addition to the clear impact of the pandemic on influenza surveillance and investigations, the pandemic response also involved many of the same human resources normally devoted to other aspects of communicable disease surveillance and investigations. Laboratories and healthcare providers were likely affected in similar ways. Investigations of cases of other morbidities, comprehensive data accuracy checks, and timeliness of public health activities may have been affected, particularly during May 2009 and September–October 2009: the first wave, then second wave and period of vaccine distribution.

UNIVERSITY OF ARIZONA COLLEGE OF PUBLIC HEALTH FIELD EPIDEMIOLOGY RESPONSE TEAM (SAFER)

Since 2005, the Mel and Enid Zuckerman College of Public Health at the University of Arizona has organized the Student Aid for Field Epidemiology Response (SAFER) team. The objectives are to provide trained surge capacity and back-up to public health departments in the case of an outbreak or other public health incident, and allow public health graduate students to gain real-world experience in a health department, outside of an internship or thesis project. Students have worked with several health departments to conduct investigations during outbreaks or for routine surveillance, and have supported emergency preparedness efforts for several major events, including the Super Bowl. ADHS and two county health departments provide training periodically for new team members. All health departments are welcome to call on the team for assistance.

> *Possible surveillance impact*: SAFER members add resources, allowing for completion of investigations that may not otherwise happen. Investigation data may not all be entered into MEDSIS DSOs, however, as some SAFER interviews are recorded in a separate database.

MORBIDITY-SPECIFIC CHANGES

Significant changes are noted here for three morbidities.

Coccidioidomycosis

In June 2009, a major commercial laboratory changed its reporting practices for

coccidioidomycosis, resulting in a large increase in reported positive tests that were classified as confirmed coccidioidomycosis cases. In December 2012, a change in testing methods occurred at this laboratory, accounting at least in part for a subsequent decline in reports.

> *Possible surveillance impact:* The changes in reporting and testing practices align closely with an increase in coccidioidomycosis cases in Arizona in 2009, followed by a decrease starting in December 2012. The effect on the numbers of reported cases due to changes in practices cannot be disentangled from changes in the incidence or diagnosis of coccidioidomycosis in the community in this period. It is also unclear to what extent coccidioidomycosis is underreported in the state, and whether that varied during the changes to reporting and testing.

Hepatitis B, perinatal

Surveillance for persons potentially at risk for perinatal hepatitis B involves identifying pregnant women who are infected with hepatitis B virus. It is important to identify these women before the baby is born in order to ensure that the baby receives appropriate vaccination and prophylaxis immediately upon birth, decreasing the risk of the child developing chronic hepatitis B. Pregnancy information is often not available from laboratory testing, so surveillance involves identifying infection in women of child-bearing age and then identifying pregnancies within that group. State and county health departments work closely to ensure follow-up of the women through the remainder of the pregnancy.

In December 2014, processes changed so that all new laboratory reports were scanned for women of child-bearing age, rather than only those for newly reported persons. This could mean, for example, that records for a pregnant woman who was already known to have hepatitis B infection and was reported in a previous year would now be sent to the perinatal hepatitis B program upon receipt of a new laboratory report, triggering follow-up for this pregnancy.

In July 2017, the management of the perinatal hepatitis B program moved from the Arizona Immunization Program Office to OIDS. The personnel involved in the program changed, and many processes were re-evaluated and modified.

> *Possible surveillance impact:* The change in laboratory report processing could have hypothetically resulted in better identification of at-risk babies. The change in program management within ADHS will likely result in increased tracking of perinatal HBV cases within MEDSIS, though the full impact is unclear at this time.

Influenza

During the 2009 influenza pandemic, MEDSIS, OIDS, and Information Technology staff worked together to implement a mechanism by which influenza data from ASPHL could be added to MEDSIS via the upload of a case line list that was then processed to appear in MEDSIS with the functionality of an ELR report. Until 2012, the system also auto-populated parts of the MEDSIS influenza DSO and classified cases based on the test results.

> *Possible surveillance impact:* The entry of influenza data from ASPHL may not be as consistent before this process was implemented. Algorithms for automatic classification and DSO completion should reduce the potential for user error.

Appendices

A. CHANGES TO THE ARIZONA ADMINISTRATIVE CODE (A.A.C.)

Changes effective January 1, 2018, will be described in later versions of this report.

On March 9, 2016, "GD-113-PHS-EDC: Guidelines for Submission of Isolates for *Shigella* spp. and *Streptococcus pneumoniae*" was issued, advising clinical laboratories and the public that the isolate-submission requirements in A.A.C. R9-6-204 and Table 3 would not be enforced for *Shigella* spp. and *Streptococcus pneumoniae*. Submission of isolates would only be required upon the request of the Department, rather than for routine isolates.

On April 30, 2013, four sections of A.A.C. R9-6 Article 3 expired, removing the requirements for local health agencies to conduct an epidemiological investigation for enterotoxigenic *E. coli*, Kawasaki disease, Reye syndrome, and unexplained death with a history of fever.

As mentioned above, changes that became effective April 1, 2008, included making Chagas disease and influenza-associated pediatric mortality reportable by providers, removing vancomycin-resistant enterococcus (VRE) from the reporting rules, requiring specimen submission to the state laboratory for positive tests for several additional organisms (including measles and rubella), and clarifying time frames and responsibilities.

B. CHANGES TO CASE DEFINITIONS, BY YEAR

Year	Morbidity	Changes
2017	Arboviral diseases	Zika virus was removed from the list of arboviruses for this case definition, because a separate Zika virus case definition was created.
	Campylobacteriosis	Added criteria for distinguishing new from existing case (30 day window).
	Chagas disease	Case definition added to the surveillance manual.
	Carbapenem-resistant Enterobacteriaceae (CRE)	Adopted 2015 CSTE case definition using modified expanded definition of CRE.
	Encephalitis, parasitic	Split into four separate case definitions: Granulomatous Amebic Encephalitis (GAE) *Acanthamoeba* Disease excluding Keratitis, Granulomatous Amebic Encephalitis (GAE) *Balamuthia mandrillaris* Disease, Primary Amebic Meningoencephalitis (PAM) *Naegleria fowleri* Disease, and *Acanthamoeba* keratitis (moved to non-reportable diseases).
	Hepatitis B, perinatal	Laboratory criteria updated to include HBeAg and HBV DNA. Probable definition added for classification of children for whom the mother's hepatitis B status is unknown.
	Lyme disease	Exposure (epidemiological) criteria were revised to include a definition of a high-incidence state. Laboratory evidence now includes more information to help interpret results. Classification modified to use new epidemiological criteria. Added criteria that a report should not be counted as a new case if previously counted.
	Malaria	Added criteria for distinguishing new from existing case (different species).
	Methicillin-resistant *Staphylococcus aureus* (MRSA)	Minimum inhibitory concentration (MIC) values updated and table added.
	Salmonellosis	Supportive laboratory evidence modified to allow for tests other than culture. Supportive laboratory evidence used for a new probable definition. Suspect definition removed. Added criteria for distinguishing new from existing case (365 day window or different serotypes).
	Shigellosis	Supportive laboratory evidence modified to allow for tests other than culture. Supportive laboratory evidence used for a new probable definition. Suspect definition removed. Added criteria for distinguishing new from existing case (90 day window or different serotypes).
	Streptococcus pneumoniae, invasive disease	Supportive laboratory evidence added, to allow for tests other than culture. Supportive laboratory evidence used for a new probable definition. Suspect definition removed. Added criteria for distinguishing new from existing case (30 day window).
	Tularemia	PCR included as supportive laboratory evidence. Changes to wording of oropharyngeal clinical form. Added criteria for distinguishing new from existing case.

	Vibrio infection	Supportive laboratory evidence modified to allow for tests other than culture. Supportive laboratory evidence used for a new probable definition. Added criteria for distinguishing new from existing case (30 day window).
	Yersiniosis	Added supportive laboratory criteria and suspect case definition.
	Zika virus disease	Zika virus was removed from the list of arboviruses and a separate Zika virus case definition created.
2016	Acute flaccid myelitis	Standardized national case definition added, although acute flaccid myelitis is not nationally notifiable and is not explicitly reportable in Arizona at this time.
	Arboviral diseases	Suspect case definition and note on additional laboratory guidance added. Zika virus added to the list of arboviruses.
	Carbapenem-resistant Enterobacteriaceae (CRE)	Standardized national case definition added, although CRE is not nationally notifiable and is not explicitly reportable in Arizona at this time.
	Hepatitis B, acute and chronic	Clarification added about confirmatory HBsAg test results from the same specimen.
	Hepatitis C, acute and chronic	Changes to laboratory criteria. "Hepatitis C, chronic" renamed from "Hepatitis C, past or present". Added criteria for distinguishing new from existing case.
	Legionellosis	Epidemiological Classification section added to clarify and define healthcare- and travel-associated cases.
	Middle East respiratory syndrome (MERS) coronavirus	Case definition added.
2015	Arboviral diseases	Chikungunya virus added to the list of arboviruses, and list of clinically compatible symptoms expanded.
	Campylobacteriosis	Probable case definition modified to include illnesses with positive culture-independent diagnostic tests. The previously suspect cases now count as probable and the suspect case classification has been eliminated.
	Cryptococcus	Standardized national case definition added, although cryptococcus is not explicitly reportable in Arizona at this time.
	Dengue virus infections	Name changed from Dengue Fever to Dengue Virus Infections. Classifications changed from dengue fever, dengue hemorrhagic fever and dengue shock syndrome to dengue-like illness, dengue, or severe dengue. Modification of the laboratory criteria for confirmatory, probable and suspect testing.
	Haemophilus influenzae, invasive disease	Added detection by PCR to confirmed case definition; probable case definition modified to specify meningitis instead of clinically compatible.
	Hantavirus	Non-pulmonary syndrome hantaviral infections added as a subcategory of hantavirus infections. The clinical case definition adjusted so that all febrile, laboratory-confirmed hantaviral infections are counted as cases, regardless of the presence or absence of pulmonary symptoms.
	Meningococcal invasive disease	PCR of normally sterile sites specimen moved from a presumptive to confirmatory test.
	Norovirus	Deleted "approved" from "approved reference laboratory" in the laboratory criteria.

	Toxic shock syndrome (TSS)	Streptococcal and non-Streptococcal TSS split into separate definitions (format change only).
2014	Arboviral diseases	Clinical criteria revised to accept subjective fever or chills in place of measured temperature; modification of laboratory criteria.
	Enterohemorrhagic *Escherichia coli (*Shiga toxin-producing *E. coli* (STEC))	Modifications to the supportive laboratory results.
	Hepatitis E	Confirmatory and supportive laboratory criteria were modified; probable case definition added; modifications capture cases for which no clinical specimen is available for testing at CDC, but risk factors and clinical symptoms are compatible with acute HEV infection.
	Malaria	Modifications to the laboratory criteria to include the determination of the parasite species and the quantification of the parasitemia; confirmed case definition changed to include detection of unspeciated parasite.
	Norovirus	Addition of suspect case definition to capture epi-linked/outbreak cases without laboratory testing available.
	Pertussis	Apnea added to list of case-defining clinical signs and symptoms for infants; probable classification modified to allow PCR positive or epi-linked cases occurring among infants with cough of any duration and at least one other clinical symptom.
	Streptococcal Group A, invasive disease	Removed “clinically compatible” from confirmed definition.
	Streptococcus pneumoniae, invasive disease	Suspect case definition added; slight rewording of confirmed case definition.
	Trichinellosis (Trichinosis)	Laboratory criteria modified to include identification of the parasite in food as a laboratory criterion for diagnosis; suspected and probable case definitions were added; comments modified to include definition of epidemiologically implicated meals and meat products and criteria to distinguish between new and existing cases.
2013	Arboviral diseases (including West Nile virus)	Arboviral disease case definition moved to reportable conditions section; separate West Nile virus infection case definition removed (with no change to content).
	Botulism	Changes to the classification (botulism with subtypes: foodborne, wound and other).
	Burkholderia mallei (Glanders)	Changes to the classification (Separated from *Burkholderia pseudomallei*).
	Cholera	Changes to the laboratory criteria.
	Cryptosporidiosis	Changes to the laboratory criteria.
	Encephalitis, viral or parasitic	Differentiation between encephalitis - parasitic and encephalitis - viral. Case definition for infections caused by free-living amebae moved to Encephalitis, Parasitic.
	Enterohemorrhagic *Escherichia coli*	Changes to the laboratory criteria and to the probable case definition.
	Hansen’s disease	Changes to the laboratory criteria.
	Hepatitis A	Addition of the probable case definition.
	Haemophilus influenzae	Changes to the confirmed and probable case definitions.

	Hepatitis B, acute	Addition of the probable and suspect case definitions.
	Hepatitis C, acute	Changes to the clinical description.
	Hepatitis C, chronic or past infection	Changes to the laboratory criteria and to the confirmed case definition.
	Influenza A novel virus	Addition of influenza A novel virus to the reportable conditions. (Although influenza A novel virus is not explicitly reportable, influenza virus is reportable by laboratories.)
	Leptospirosis	Changes to the clinical and laboratory criteria.
	Lyme disease	Changes to the confirmed and probable case definitions.
	Measles	Changes to the laboratory criteria and deletion of the suspect case classification.
	Mumps	Changes to the confirmed case definition.
	Plague	Changes to the confirmed and probable case definitions and addition of the suspect case classification.
	Rocky Mountain spotted fever	Changes to the suspect case definition.
	Rubella	Changes to the laboratory criteria and to the confirmed and suspect case definition.
	Severe acute respiratory syndrome-associated coronavirus disease	Changes to the exposure criteria.
	Streptococcal group A toxic shock syndrome (STSS)	Clinical criteria for STSS have been moved to the Toxic Shock Syndrome case definition.
	Toxic shock syndrome (TSS)	Changes to the laboratory criteria and all case definitions for Streptococcal toxic shock syndrome.
	Varicella	Changes to the laboratory criteria and addition of suspect case classification.
2012	Campylobacteriosis	Addition of suspect laboratory criteria and suspect case classification.
	Hepatitis B, acute	Deletion of the probable case classification.
	Influenza-associated hospitalizations	Addition of influenza-associated hospitalizations under the non-reportable communicable morbidities of public health significance.
	Infections caused by free-living amebae	Addition of infections caused by free-living amebae under the non-reportable communicable morbidities of public health significance. [Later moved to the reportable category of Encephalitis, Parasitic.]
	Salmonellosis	Changes to the laboratory criteria and addition of the suspect case classification.
	Shigellosis	Changes to the laboratory criteria and addition of the suspect case classification.
	Unexplained death with history of fever	Changes to the clinical description.
2011	Arboviruses	Addition of arboviruses under the non-reportable communicable morbidities of public health significance. [Entire category later moved under Reportable conditions in 2013.]
	Babesiosis	Addition of babesiosis under the non-reportable communicable morbidities of public health significance.
	Botulism, foodborne	Addition of probable case classification.
	Botulism, wound	Addition of probable case classification and changes to the confirmed case definition.

	Giardiasis	Changes to the laboratory criteria, addition of probable case classification.
	West Nile virus infection	Addition of differentiation between neuroinvasive and non-neuroinvasive, by applying the national arbovirus case definition to West Nile virus infection.
2010	Anthrax	Changes in laboratory criteria for diagnosis, in the confirmed case definition; addition of probable and suspect case classifications.
	Brucellosis	Addition of presumptive laboratory criteria, changes in the probable case definition.
	Cryptosporidiosis	Changes to the confirmed and probable case definitions and laboratory criteria.
	Cyclosporiasis	Addition of probable case classification and changes in the confirmed case definition.
	Dengue	Changes in the clinical description and laboratory criteria, addition of suspect case classification and of dengue shock syndrome clinical description.
	Malaria	Changes to the laboratory criteria for diagnosis and to the confirmed case definition, addition of the suspect case classification.
	Psittacosis	Changes to the laboratory criteria and addition of the probable case classification.
	Tetanus	Deletion of confirmed case classification and addition of probable case classification.
	Toxic shock syndrome (TSS)	Addition of the differentiation between non-Streptococcal and Streptococcal toxic-shock syndrome.
	Viral hemorrhagic fevers	Addition of exposure/epidemiological criteria.
2009	Cryptosporidiosis	Changes to the laboratory criteria, addition of the probable case classification and elimination of symptomatic/asymptomatic classifications for confirmed cases.
	Lyme disease	Changes to the clinical presentation; changes to confirmed and probable case definitions.
2008	Basidiobolomycosis	Changes to the laboratory criteria.
	Creutzfeldt-Jakob disease	Changes to all the case definitions.
	Ehrlichiosis	Reclassified to include anaplasmosis. Changes to the clinical description, laboratory criteria and case definitions. Addition of the suspect case classification.
	Lyme disease	Changes to the laboratory criteria and to the confirmed case definition; addition of probable and suspect case classifications.
	Mumps	Changes to the laboratory criteria, to the confirmed and probable case definitions and addition of the suspect case classification.
	Polio, nonparalytic	Added to the list of reportable conditions.
	Q fever	Changes to the case classifications.
	Rocky Mountain spotted fever	Changes to the confirmed and probable case definitions and addition of the suspect case classification.
	VISA or VRSA	Changes to the laboratory criteria.
	Vibrio	Changes to the laboratory criteria.

C. MORBIDITIES DIFFERENT FROM CDC/CSTE CASE DEFINITIONS, BY YEAR, STARTING 2013

Arizona case definitions match the CDC/CSTE case definitions, *unless* noted in the table below with a "Yes". Not all morbidities have a CDC/CSTE case definition; this table applies only to those morbidities with both Arizona and national definitions.

Morbidity	2017	2016	2015	2014	2013
Coccidioidomycosis	Yes	Yes	Yes	Yes	Yes
Enterohemorrhagic *Escherichia coli*	Yes	Yes	Yes	Yes	Yes
Hepatitis A	Yes	Yes	Yes	Yes	Yes
Hepatitis B, acute	Yes	Yes	Yes	Yes	Yes
Legionellosis	Yes	Yes	-	-	-
Pertussis	Yes	Yes	Yes	Yes	Yes
Rocky Mountain spotted fever	Yes	Yes	Yes	Yes	Yes
Varicella and varicella deaths	Yes	Yes	Yes	Yes	Yes

"Yes" indicates that the Arizona case definition differs from the CDC/CSTE case definition.

D. MORBIDITIES WITH CHANGES TO INVESTIGATION FORMS

Morbidity	Year(s) updated
Acute flaccid myelitis	2015
Anthrax	2010
Arboviral disease	2017
Basidiobolomycosis	2009
Botulism (infant & other)	2010
Brucellosis	2010
Chagas disease	2010
Chikungunya	2017, 2015
Creutzfeldt-Jakob disease	2008
Cyclosporiasis	2014
Dengue	2017
Diphtheria	2014
***E. coli* enterohemorrhagic (Shiga toxin-producing)**	2010
***E. coli* enterotoxigenic**	2010
Ebola	2014
Ehrlichiosis	2011
Free-living ameba	2012
Gastroenteritis – viral	2008
***Haemophilus influenzae,* invasive disease**	2010
Hansen's disease (leprosy)	2010
Hemolytic uremic syndrome	2010
Hepatitis B and D	2017
Hepatitis E	2017
Influenza A (novel virus)	2015
Influenza-associated pediatric mortality	Updated each year
Kawasaki syndrome	2010
Legionellosis	2016, 2010
Listeriosis	2016
Lyme disease	2009
Malaria	2011
Meningococcal invasive disease	2017, 2011
Methicillin-resistant *Staphylococcus aureus* (MRSA)	2016
Middle East respiratory syndrome (MERS)	2015
Mumps	2008
Pertussis	2010
Plague	2015
Rocky Mountain spotted fever	2011
Rubella	2009

Salmonellosis	2010
Streptococcal group A (invasive)	2016
Unexplained death with a history of fever	2008
Vancomycin-resistant or -intermediate *Staphylococcus aureus* (VRSA/VISA)	2016, 2010
Vancomycin-resistant *Staphylococcus epidermidis* (VRSE)	2016, 2010
Varicella (chickenpox)	2012
West Nile virus	2017, 2011
Zika	2017, 2016

E. MORBIDITIES WITH CHANGES TO MEDSIS DSOS (NO UPDATES 2011–2014)

Morbidity	Year(s) updated
Arboviral disease	2017 (added DSOs for all, matching WNV: Cache Valley, California, Eastern Equine, Japanese encephalitis, Venezuelan Equine, Western Equine)
Chagas	2017 (added Type)
Dengue	2017 (added unaccompanied minor, pregnancy, and birth defects sections); 2015 (new form)
Influenza	2016 (B lineages added)
Legionellosis	2017 (many questions changed)
Meningococcal invasive disease	2016 (serogroup B vaccine added); 2015 (removed duplicative or unneeded variables)
Pertussis	2017 (changed several fields to “display only”)
Rocky Mountain spotted fever	2017 (added symptoms and species)
Salmonellosis	2017 (removed “Enterica” option); 2015 (additional serotypes added)
St. Louis encephalitis	2016 (viremic/blood donor modified), 2015 (addition of Type field, symptoms added, symptoms changed to drop-down boxes, travel section redesigned)
Unspecified flavivirus group 2	2017 (added unaccompanied minor, pregnancy, and birth defects sections)
West Nile virus	2016 (viremic/blood donor modified), 2015 (changes to Type options, symptoms added, symptoms changed to drop-down boxes, travel section redesigned)
Zika	2017 (added unaccompanied minor, pregnancy, and birth defects sections); 2015 (new form)