Public Health Practice Problem Definition
Arboviral Disease Surveillance

CONTACT INFORMATION

Submitter name:	Sara Imholte
Jurisdiction or affiliation:	Arizona Department of Health Services (ADHS)
Phone:	602-364-3889
Email:	Sara.Imholte@azdhs.gov
Co-submitters and affiliations:	Local Health Departments, Arizona BioSense Workgroup and Arizona Arboviral Workgroup

PROBLEM DESCRIPTION

Summarize the problem:

Dengue, chikungunya, and Zika viruses are emerging and expanding public health threats in recent years, all of which are spread through the bite of infected *Aedes* spp. mosquitoes. Arizona is at elevated risk for travel-associated cases of disease due to the proximity and high volume of travel to Mexico and other countries, where transmission of all three diseases is ongoing. The combination of frequent travelers and the presence of *Aedes aegypti* in multiple regions of the state raises the level of concern for sporadic local transmission of these diseases as well as sustained endemicity.

Identifying the areas in Arizona at highest risk for developing locally acquired cases is critical to facilitate rapid response, strengthen public health actions, and reduce the risk of additional disease spread.

SOLUTION REQUIREMENTS

Describe the type of solution you are seeking (e.g., anomaly detection, signal validation, data quality characterization):

The primary objective of the solution would be to integrate laboratory, demographic, syndromic, vector, climate, and geographic data to better understand the areas at greatest risk for importation and local transmission of dengue, chikungunya or Zika viruses in order to determine when and where to implement public health response actions. This could be visualized as a dynamic risk map that updates with current weather, vector, and disease conditions on a routine basis (potentially daily updates).

As a secondary objective, Arizona would benefit from a system that assists in the identification of cases or clusters of these emerging arboviral diseases.

Describe what type of solution would enable you to implement it in your practice setting (e.g., Do you need an algorithm? Do you need code? If you need code, does it have to be written in any particular programming language?).

The ideal solution would be sustainable using state and local resources, functional with existing software, and modifiable/useable by local staff. An algorithm and coding assistance would be valuable; programs used currently include SAS, R, and ArcGIS.

Describe who will use the solution. For example, how many users will there be and what level of skill do the users have? Are the users all within a single jurisdiction/organization?

Risk maps would be used primarily by local health departments (15 counties and several tribes); basic operations would ideally be user-friendly and intuitive, with minimal training required. State health department staff (likely 3-4 involved) would use the system to update maps or algorithms; skill levels range from intermediate to advanced with the programs mentioned above.

Note any other constraints:

Time and money are the key limiting factors.

VALIDATION

Does a gold standard exist with which to validate the proposed solutions?

☐ Gold standard exists within the provided data set (e.g., an outbreak signal nested within baseline data)

☐ Gold standard exists in a separate data set, which can be provided to the workgroup (e.g., laboratory data to validate ED data)

☐ Gold standard exists but cannot be furnished

☒ Gold standard does not exist

Comment: data are available about travel-associated cases of disease, including a large cluster of travel-associated dengue cases in late 2014; however, data are not available about locally acquired cases of dengue, chikungunya, or Zika in Arizona, as these cases have not yet occurred.

INPUT DATA

List the minimum data elements that can be provided to address the problem:

- **MEDSIS**: electronic disease surveillance system capturing suspected, probable, and confirmed cases of reportable diseases. With some variability in completeness, information will include basic demographics, laboratory results, location of case residence (full address), symptoms, and dates of symptom onset. Cases are identified by physician and laboratory reports; in addition, an enhanced surveillance project facilitates early identification of dengue and chikungunya test orders.
- **BioSense:** hospital ED and inpatient syndromic surveillance; includes information about patient's diagnosis, chief complaint, and reporting facility, patient address zip code (not full address)
- **Arizona Arbonet Database**: includes reports from local vector control agencies to include trap type, location coordinates, testing performed, and species of mosquitoes identified.
- **Historical mosquito surveys**: available at the county level, includes species of mosquitoes identified; data completeness varies across jurisdictions.
- **Census data**
- **Weather data**
- **BRFSS**
- Other data from Claritas or ESRI may be available

How much historical data can be provided?

Due to the nature of these emerging arboviral diseases, limited historical data is available.

- **Human case information** is available from 2006–present, and includes 171 dengue cases and 42 chikungunya cases, all travel-associated.
- **Enhanced *Aedes aegypti* surveillance** began statewide in 2015, with data from Maricopa County Environmental Services Vector Control dating back to 2006. Historical mosquito surveys have found *Aedes aegypti* mosquitoes in multiple Arizona counties; however, current surveillance may not fully represent these areas.
- **Mosquito testing** for chikungunya began in 2015, when over 2,800 *Aedes aegypti* pools were tested for chikungunya virus (all in Maricopa County); however, no positive results were found. Dengue testing for mosquitoes in Maricopa County is expected to start in spring 2016.
- **BioSense** data does not cover all hospitals in Arizona. One large hospital group was sending data until September 2012. After that there was no Arizona hospital data in BioSense until onboarding began for meaningful use. Since July 2014 the number of hospitals has increased.
- **Non-target morbidities**: we have much more comprehensive mosquito and human data available for West Nile virus, and to a limited degree for St. Louis encephalitis virus. For WNV we can provide human data from 2006 to present; the same is true for SLEV (but far less data due to lack of testing). Mosquito data for Maricopa County can be provided for *Culex* spp. for the past decade, including WNV testing among mosquito pools.

Describe any restrictions for sharing the data:

Partially de-identified data (remove name and BOB but contains location information) and can be shared with partners under a memorandum of understanding regarding data use and sharing.

OUTPUT DATA

An algorithm or tool for identifying high-risk areas of the state for imported and locally acquired cases of dengue, chikungunya, and Zika viruses; a risk map delineating these areas that can be updated on a regular basis.