Arizona Department of Health Services Vectorborne Outbreak Investigation 2015

Situation Manual (SITMAN) Facilitator's Version July 21, 2015

Arizona Department of Health Services

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Preface

The Vector-borne Outbreak Investigation (TTX) 2015 is sponsored by the Arizona Department of Health Services (ADHS). This Situation Manual (SITMAN) was produced with input, advice, and assistance from the Infectious Diseases Epidemiology TTX 2015 Exercise Planning Team, which followed the guidance set forth in the Federal Emergency Management Agency (FEMA), Homeland Security Exercise and Evaluation Program (HSEEP).

The SITMAN gives officials, observers, and players from participating organizations the information necessary to observe or participate in a healthcare exercise focusing on participants' emergency response plans, policies, and procedures as they pertain to their preparedness and response capabilities. The information in this document is current as of the date of publication, **July 21, 2015**, and is subject to change as determined by the Infectious Diseases Epidemiology TTX 2015 Exercise Planning Team.

The Vector-borne Outbreak Investigation TTX 2015 is an *unclassified exercise*. The control of information is based more on public sensitivity regarding the nature of the exercise than on the actual exercise content. Some exercise material is intended for the exclusive use of exercise planners, facilitators, and evaluators, but players may view other materials deemed necessary to their performance. The SITMAN may be viewed by all exercise participants.

All exercise participants should use appropriate guidelines to ensure the proper control of information within their areas of expertise and to protect this material in accordance with current jurisdictional directives. Public release of exercise materials to third parties is at the discretion of ADHS.

This SITMAN and TTX were supported by the U.S. Department of Health and Human Services (HHS), Office of the Assistant Secretary for Preparedness and Response (ASPR), Office of Preparedness and Emergency Operations (OPEO), Division of National Healthcare Preparedness Programs (NHPP) HPP Cooperative Agreement Catalog of Federal Domestic Assistance (CFDA) number 93.889. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of HHS.

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3. At a minimum, the attached materials will be disseminated only on a need-to-know basis and when unattended, will be stored in a locked container or area offering sufficient protection against theft, compromise, inadvertent access, and unauthorized disclosure.

4. For more information, please consult the following point of contact (POC):
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Table of Contents

Contents

Agenda

0800 – 0900	**Registration**
0900 – 0930	**Welcoming Remarks & Exercise Overview and Briefing** Lydia Plante, ADHS

Module 1 (Assigned Breakout Room)

0935 – 0945	Introductions
0945 – 1005	Module 1: Part I Discussion
1005 – 1030	Module 1: Part II Discussion
1030 – 1045	Module 1: Part III Discussion
1045 – 1100	**Break (10 minutes)**
1100 – 1130	**Large Group Brief Back and Questions/Comments**

Module 2 (Assigned Breakout Room)

1135 – 1205	Module 2: Part I Discussion
1205 – 1230	Module 2: Part II Discussion
1230 – 1300	Module 2: Part III Discussion
1300 – 1400	**Lunch (1 hour)**

Module 3 (Assigned Breakout Room)

1400 – 1430	**Large Group Brief Back and Questions/Comments**
1435 – 1530	Module 3 Discussion
1530 – 1540	**Break (10 minutes)**

Module 4 (Assigned Breakout Room)

1545 – 1620	Module 4 Discussion
1620 – 1700	**Large Group Brief Back/HOTWASH, Questions/Comments & Evaluation**
1700	**Adjourn**

*Subject to change if necessary

Introduction

Background

The Infectious Disease Epidemiology and Preparedness (IDEP) Vector-borne Tabletop Exercise (TTX) 2015 is designed to establish a learning environment for local health departments and community partner participants to exercise their outbreak plans, policies, and procedures. To conduct an effective exercise local representatives from numerous agencies have taken part in the planning process and will take part in exercise conduct and evaluation. This Situation Manual (SITMAN) was produced at the direction of the Arizona Department of Health Services (ADHS) with the input, advice, and assistance of the Infectious Diseases Epidemiology TTX 2015 Exercise Planning Team.

Purpose

The purpose of this exercise is to provide participants an opportunity to evaluate current response concepts, plans, and capabilities for a response to an outbreak in YOUR jurisdiction. The exercise will focus on communication within your agency as well as with other counties, state, and federal partners and will also focus on the epidemiological and environmental investigation and response required for the event. The exercise also looks at what assets and resources may be needed to deal with the incident, as well as the role of public information to the overall response effort.

Scope

This tabletop exercise will involve county health departments, county environmental health services programs, hospital infection control programs, other local partners, and state and federal agencies, and will include discussions for response to a health emergency caused by a vector-borne disease.

Target Capabilities

The National Planning Scenarios and the establishment of the National Preparedness Priorities have steered the focus of homeland security toward a capabilities-based planning approach. Capabilities-based planning focuses on planning under uncertainty, since the next threat or disaster can never be forecast with complete accuracy. Therefore, capabilities-based planning takes an all-hazards approach to planning and preparation which builds capabilities that can be applied to a wide variety of incidents. States and Urban Areas use capabilities-based planning to identify a baseline assessment of their homeland security efforts by comparing their current capabilities against the Target Capabilities List (TCL) and the critical tasks of the Universal Task List (UTL). This approach identifies gaps in current capabilities and focuses efforts on identifying and developing

priority capabilities and tasks for the jurisdiction. These priority capabilities are articulated in the jurisdiction's homeland security strategy and Multi-Year Training and Exercise Plan.

The target capabilities listed below have been selected by the Exercise Planning Team and correspond with the priority capabilities identified in the ADHS Multi-Year Training and Exercise Plan. These capabilities provide the foundation for development of the exercise objectives and scenario, as the purpose of this exercise is to measure and validate performance of these capabilities and their associated critical tasks.

Capability 4: Emergency Public Information and Warning
Capability 6: Information Sharing
Capability 10: Medical Surge
Capability 11: Non-Pharmaceutical Interventions
Capability 12: Public Health Laboratory Testing
Capability 13: Public Health Surveillance and Epidemiological Investigation

Exercise Objectives

The exercise will focus on the following exercise objectives selected by the exercise planning team.

Learning Objectives

After completing this exercise, participants should be able to

Capability 4: Emergency Public Information and Warning
- Determine when to issue public information alerts, warnings, and notifications.

Capability 6: Information Sharing
- Identify which stakeholders should be incorporated into information flow.
- Determine communication needs during a vector-borne disease outbreak.

Capability 10: Medical Surge
- Assess the nature and scope of the incident causing the medical surge.
- Discuss and determine support measures available for medical surge operations.

Capability 11: Non-Pharmaceutical Interventions
- Determine the infection control measures that should be implemented.
- Determine the precautionary protective measures associated with this vector-borne outbreak that should be communicated to the public.

Capability 12: Public Health Laboratory Testing
- Describe collection of appropriate specimens and proper handling of specimens.
- Obtain and conduct confirmatory testing and analysis of clinical specimens at Arizona State Public Health Laboratory.

Capability 13: Public Health Surveillance and Epidemiological Investigation
- Discuss epidemiologic clues indicative of a vector-borne disease outbreak.
- Determine the source of an outbreak.
- Discuss prevention measures to be implemented to protect the public.
- Describe the clinical features, epidemiology, and control.
- Discuss how to determine the prevalence of an arboviral disease in an area.

Participants

Players will respond to the situation presented based on their knowledge of response procedures, current plans and procedures, and insights derived from training.

Observers support the group in developing responses to the situation during the discussion; however, they are not participants in the moderated discussion period.

Facilitators/Evaluators provide situation updates, moderate discussions, and evaluate the discussions. They also provide additional information or resolve questions as required.

Subject Matter Experts are resources of expert information on medical or technical issues.

Each module begins with an update that summarizes the key events occurring within that time period. Following the updates, participants review the situation and engage in group discussions in their respective breakout groups.

Following these discussions, participants then enter into a plenary brief back in which a spokesperson from each table presents a synopsis of the group's discussion based on the scenario and questions.

Exercise Guidelines

- This is an open, low-stress, no-fault environment. Varying viewpoints, even disagreements, are expected.
- Respond based on your knowledge of current plans and capabilities (i.e., you may use only existing assets) and insights derived from training.
- Decisions are not precedent setting and may not reflect your organization's final position on a given issue. This is an opportunity to discuss and present multiple options and possible solutions.
- Issue identification is not as valuable as suggestions and recommended actions that could improve response and preparedness efforts.

Assumptions and Artificialities

- In any exercise a number of assumptions and artificialities may be necessary to complete play in the time allotted. During this exercise, the following assumptions apply:
    - The scenario is plausible, and events occur as they are presented.
    - There is no "hidden agenda", nor any trick questions.
    - All players receive information at the same time.

Module 1:

Initial Case Identification, Part I

On an afternoon in late July, an 8 year old boy from the southern border region of Arizona was brought to a local hospital's emergency room with a fever of 103ºF, rash, swelling and pain in the hands and feet, and a severe headache.

Question 1: What questions would a healthcare provider want to ask this patient or his parents?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *Questions might include information about illness onset date, if anything makes the symptoms better or worse, details about the location and progression of each symptom, medical history, vaccination status, travel history (local or international), ill contacts, and any exposure to new medications or products, or to ticks or mosquitoes. Because exposure to mosquitoes is often unknown or difficult to recall, questions regarding general outdoor activities are also recommended.*
- ***Inject: The patient's symptoms began last night. He has no travel history outside of the town or Arizona in the past 3 months; he is up-to-date on all vaccinations and has no significant medical history. His parents report that someone else in the household, a 21 year old cousin, was sick with dengue about 2 weeks earlier after traveling to Mexico. They haven't seen any ticks, but say there are occasionally mosquitoes around the home.***

Question 2: What diseases could be on the healthcare provider's differential?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *Possibilities include influenza, chikungunya, dengue, viral meningitis, coccidioidomycosis, certain types of cancers, and a number of other pathogens that cause acute febrile illness.*

Question 3: What diagnostic tests would you order? Be as specific as possible. What specimens should be collected for testing?

- *Capability 12: Public Health Laboratory Testing*
- *Possible diagnostic tests to order include chikungunya and dengue PCR testing. CSF studies might also be considered for concerns over meningococcemia. Cancer screenings might also be of interest.*
- *Because illness onset date was less than 24 hours, not enough time has passed to have a reliable serology result; therefore, at this time the best test to use would be PCR.*
- *Whole blood or serum samples should be collected and sent to a commercial diagnostic lab for testing.*
- ***Inject: The provider decides to order dengue and chikungunya testing. Specimens were obtained and sent to SonoraQuest Lab for PCR testing.***

Question 4: When, and under what conditions, should public health be notified? Who should be called?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *Local public health should be notified as soon as a reportable disease is suspected. Chikungunya and dengue are both reportable diseases.*

Initial Case Identification, Part II

The 8-year old boy is admitted to the hospital due to his high fever. The doctor ordered tests for dengue and chikungunya, and finds out that the results may take up to 10 business days. The healthcare facility also notifies the local health department about the suspect case. Local health department staff begins an investigation into the case.

Question 5: What infection control measures would you implement at this point, if any?

- *Capability 11: Non-Pharmaceutical Interventions*
- *Standard precautions are sufficient at this time. However, staff might consider working with vector control to ensure that proper precautions are taken against mosquitoes on the hospital premises and in the area around the household of the suspected case.*
- *In order to prevent the occurrence of locally-acquired cases, vector control and surveillance activities should begin at or near the case's home as soon as possible following suspicion of dengue or chikungunya, even before the return of lab results, if possible.*

Question 6: How would the delay in laboratory results affect treatment recommendations for the patient? How would it affect public health recommendations?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *Dengue cases have a higher fatality rate and require more careful monitoring and management than chikungunya cases. Dengue patients need to be monitored daily with particular care taken shortly after fever resolved as this is the period of time with the highest risk of serious complications. Also, suspect dengue cases should not be given aspirin-containing medications. Until a diagnosis is known, suspect cases should be managed as dengue to prevent severe disease.*
- *From a public health perspective, this delay in diagnosis may further delay interventions.*

Question 7: If you were the public health professional, what actions would you consider after notification of the suspect dengue or chikungunya case? What questions regarding exposure could the health department ask?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *Was there any known mosquito contact in or around the household? Were any other household contacts or neighbors recently sick? Has anyone in the household recently traveled to or from Mexico or other parts of the Americas where dengue and chikungunya are circulating? If they have traveled, specific locations and dates should be gathered.*
- *An environmental assessment for mosquito breeding areas around the patient's home could be considered at this time.*
- *As a public health professional the top priorities include, but are not limited to:*
  1. *Verify that the case corresponds to chikungunya or dengue based on the clinical case definition.*
  2. *Have specimens collected and sent to the Arizona State Public Health Laboratory, to ensure faster turn-around time for results.*

3. *Interview the patient (or parent) to verify the lack of travel history.*
4. *Work with vector control partners to put vector control measures in effect in and around the cases home.*
5. *Assess risk for locally acquired cases.*
6. *Inform state partners about the case.*
7. *Consider messaging to healthcare facilities in the area*
8. *Consider public notification.*

Initial Case Identification, Part III: 1 Week Later

One week has passed since the 8-year old boy first presented to the ER. The boy was discharged from the hospital three days after admittance, after his temperature dropped to a normal level following the appropriate supportive care. Public health partners had requested a sample be sent to Arizona State Public Health Laboratory (ASPHL) to speed results and diagnosis. ASPHL's results have just come back with a positive PCR result for chikungunya.

The local health department's interview with the case's mother confirmed that the boy had not traveled out of the community in the month before symptom onset. She reports that her husband, who last traveled to Mexico the previous weekend, is now complaining of a fever, joint pain, and body aches. She also commented that people in her neighborhood frequently travel to and from Mexico.

Question 8: Is the 8-year old boy considered a locally-acquired or travel-associated case of chikungunya? What about his father?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *The boy is considered a confirmed locally-acquired case; the father is considered a suspect travel-associated case, pending confirmation of chikungunya virus circulating in the area the patient traveled to. This can be confirmed or denied by the ADHS Office of Border Health.*

Question 9: Should a press release be issued? Why or why not? Whose decision is it?

- *Capability 4: Emergency Public Information and Warning*
- *It is recommended that a press release be issued at this stage but it's ultimately the decision of local public health. Some of the pros and cons of releasing a press release are as follows:*
    - *Pros: alerting the public will allow for stronger educational messaging and allow for people to take the necessary precautions against mosquito bites, greater acceptance of vector-control strategies*
    - *Cons: alerting the public may cause an unnecessary panic, and targeted vector-control strategies may inadvertently lead to identification of case areas which would be more identifiable when case info is made public.*

Question 10: What other actions could be considered by public health in response to the new information?

- *Interview household members and provide community education and outreach about chikungunya and protection from mosquitoes. This might include information flyers on chikungunya disease, and how to protect oneself from mosquitoes, news interviews, radio spots, etc.*
- *Consider activation of an EOC.*

- *Inform other partners/stakeholders about the event, including healthcare providers, vector control (both public and private), university/academic experts, and potentially CDC*
- *Some enhanced vector control activity options include: Organize community clean-up activities for immature habitat. Organize community wide disposal of backyard rubbish that may act as breeding sites. Work with senior citizens groups to ensure that those without the ability to take care of their environment get some assistance. Enroll in community-based participatory app to track.*

Module 2

Outbreak Detection and Investigation, Part I: 3 Weeks Later

Three weeks have passed since the initial case was identified in the 8-year old boy. Meanwhile, 20 more cases have been reported from commercial laboratories. Of the 20, 14 were reported from the city in southern Arizona where the index case was identified. Six of the cases were reported from other counties. Of the 14 from the city where the index case resides 3 have travel history outside of Arizona; 8 reported no travel in the past 3 weeks, and public health has not been able to contact 3 of the cases to obtain travel history.

Of the 14 in this city, 6 have PCR positive lab results from the state public health lab, and 8 have IgM positive results from commercial labs. There are at least 4 more cases that have negative IgM results from commercial labs, but have symptoms consistent with chikungunya infection.

Question 11: How would you interpret the positive and negative IgM results from commercial labs? What factors should be considered when interpreting the results? Should results be verified at the Arizona State Public Health Laboratory?

- *Capability 12: Public Health Laboratory Testing*
- *Positive IgM tests likely indicate true infection. Negative IgM tests can be false negatives. Negative results could also indicate there are other circulating illnesses with similar symptoms that may confound surveillance data.*
- *There is also the possibility of false negative IgM results from commercial labs. All results should be verified at the ASPHL.*

Question 12: What type of public messaging should be performed, and where should it come from? How much information should be released?

- *Capability 4: Emergency Public Information and Warning*
- *At this point, public messaging must be used to educate the public on how to protect themselves and their homes. This should include source reduction (i.e. disposing of or covering water-holding containers that could act as an egg-laying location for female Aedes aegypti mosquitoes), use of BTI to treat non-disposable water sources (fountains, etc.), use of mosquito repellant, and using screens in windows, avoidance of outdoor areas during peak biting times. Individuals with symptoms should be encouraged to seek testing and treatment. Some level of isolation of chikungunya positive patients from the outdoors and mosquitoes should be emphasized.*
- *Messaging should be coordinated across counties, and will likely come from ADHS.*
- *No HIPAA-protected information can be released about cases. Summary information about cases can be released. General location information (e.g., neighborhood) of cases could be shared with*

caution. Maps of Ae. aegypti populations should also be shared providing the surveillance is acceptable and coverage is good.

Question 13: Would you initiate any vector control actions at this point? Why or why not? If so, what types of vector control actions are available?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
  Enhanced vector control actions could include surveillance or trapping for Aedes aegypti mosquitoes around affected homes or communities, adulticide (pesticide) application, source reduction (eliminating breeding sites), larviciding, and potential testing of adult mosquitoes for dengue and chikungunya.
- *Having guides for neighborhood leaders (many communities have neighborhood associations) and how to mobilize to reduce immature habitat could be useful. Distribution of larvicide also important.*

Question 14: Would you activate your Emergency Operations Center? Why or why not?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*

Question 15: What type of information should be collected from suspect cases?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *Information to collect would include demographics, travel history, mosquito exposure history (or general outdoor activities, as a proxy), mosquito activity at case home, severity of illness/hospitalization, and laboratory results. Inquiries about illness in other household members or community members would also be helpful.*

Question 16: What type of recommendations should be made to suspect cases, if any?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *Suspect cases should be advised to avoid mosquitoes for the first week of illness by using insect repellant or remaining indoors, and ensuring that no mosquitoes are in the home. If there is local mosquito activity, family members should also avoid mosquito bites as they are at greatest risk for exposure. If any other family members develop illness they should contact public health.*

Outbreak Detection and Investigation, Part II

In the past 24 hours there have been 7 additional suspect cases reported from this southern Arizona cluster. Five of these cases were reported from the same hospital that the original 8-year old boy presented to. Four of the 7 people had not traveled outside of Arizona. Laboratory results are pending. Additionally, 5 hospital employees have called out sick.

Local vector control collected over 60 *Aedes aegypti* mosquitoes on the hospital premises the day before, as part of enhanced vector surveillance in the area. These were then sent to ASPHL to be tested for the presence of chikungunya virus. Two pools of mosquitoes that were collected on the hospital's premises test positive for chikungunya virus by PCR.

Question 17: Should medical surge plans be activated? Why or why not? If so, what actions might be taken?

- *Capability 10: Medical Surge*
- *Often, healthcare facilities have pre-established contracts with other facilities. These include assistance during times of medical surge with staff and resources. These plans could be put into action for this outbreak.*

Question 18: What actions can be taken to reduce risk of chikungunya transmission at the healthcare facility?

- *Capability 11: Non-Pharmaceutical Interventions*
- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *There should be a rigorous vector control program on hospital grounds. If hospitals aren't protected from mosquitoes, this could be an ideal place for mosquitos to pick up the virus from a chikungunya patient. Staff should be educated on how to protect themselves from mosquitos by using insect repellant and full coverage clothing, as well as how to protect their homes using source reduction techniques, air conditioning, and screens.*
- *The hospital could also consider an investigation to ensure there are no mosquito-breeding areas (such as potted plants) inside the facility, and that signs are posted outside to use mosquito repellant when outside. Adulticides could also be applied outside the facility.*
- *The hospital could also consider further action directed towards patient protection, such as offering patients insect repellant or bednets.*

Outbreak Detection and Investigation, Part III

Local vector control is continuing enhanced surveillance for *Aedes aegypti* mosquitoes. They are using CO2 traps, which are designed for *Culex spp.* mosquitoes, so they know that they're only trapping a small percentage of the *Ae. aegypti* out in the area.

The current number of identified cases in this cluster (confirmed, probable, and suspected) is 21. There could be more cases that haven't sought medical care, or that weren't tested for chikungunya. Of the known cases, epidemiologists have determined that 12 have come from a single mobile home community, including the 8-year old index case and his father.

Question 19: What additional steps could vector control consider at this time? Should anything be done at the mobile home park?

- *Capability 11: Non-Pharmaceutical Interventions*
- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *Enhanced surveillance and vector control activities should be continued. These activities might include focused efforts in areas where suspect or confirmed chikungunya cases live, as Aedes aegypti mosquitoes have a short flight distance and neighbors and household members are at highest risk. Specific actions in affected neighborhoods could include household visits to provide education about mosquito avoidance and reduction of mosquito-breeding habitats, inspections for mosquito-breeding containers, use of handheld sprayers to apply pesticides, fogging for mosquitoes, and enhanced mosquito surveillance (potentially with lethal traps). Vector control should work closely with public health partners to ensure that they are notified immediately about suspect cases to facilitate rapid vector control response.*

Question 20: Would you initiate any enhanced surveillance for human cases? Why or why not? If so, what types of enhanced surveillance could you use?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *Enhanced surveillance might include active case finding measures (such as actively searching for cases among the household members and neighbors of known cases), enhanced laboratory surveillance, syndromic surveillance, and actively contacting hospitals and urgent care centers in the affected area(s).*
- *Some benefits would include a better picture of the outbreak and risk areas; however, it is quite labor intensive.*
- *Automated calls to targeted areas may be useful, as might be targeted mailings to neighborhoods with high levels of cases.*
- *Encouragement of participation in the community-based participatory app to track individuals with suspect chikungunya symptoms may also be useful.*

Question 21: How would you educate local medical providers and facilities?

- *Capability 6: Information Sharing*
- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *It's important to educate local medical providers on the growing problem. This can be done in conjunction with public messaging and outreach, but more specific outreach should be done to reach this group. This might include sending out HANs (i.e. health alert network messages), giving presentations at grand rounds, providing educational materials, or direct e-mails to hospital and clinic business e-mails. This messaging should include updates on the epidemiologic profile of the outbreak in Arizona, details on how to diagnose and treat cases, and how and when to alert local public health.*

Question 22: How and when would you raise community awareness on how to avoid mosquito bites and prevent mosquito breeding sites? Would you consider a call-center specifically designated for public calls related to the outbreak? What are the pros and cons of a call-center? If yes, how would you establish a call center?

- *Capability 4: Emergency Public Information and Warning*
- *There should be an intense public messaging campaign advising people about how to protect themselves and their homes from chikungunya and Aedes aegypti mosquitoes. This would include radio ads and interviews, social media messaging, and educational materials (brochures, posters, activities, etc.) distributed during community events. Any method to get information out to a large number of people is encouraged.*
- *A call center could be considered. Some pros of using a call center is that phone operators could be trained to give out the most up-to-date and accurate information. A con is that call centers can be expensive and demanding to maintain and effectively advertise. Recorded information could be used to provide the basics on the current status of the outbreak and if individuals had more in-depth questions they would be directed to an actual person. This may minimize the personnel required.*

Optional Question: If there is time, and you have school nurses in your group, ask what they and their schools would be doing to address absenteeism of teachers and students, and fear and questions coming from employees and parents.

Module 3:

Widespread Transmission

It is now late August and there has been a continuing increase in the number of chikungunya cases reported to public health. The geographic distribution has also disseminated greatly. There are now a total of 362 cases throughout the southern and central parts of the State, including both the Phoenix and Tucson metropolitan areas. About 30% of these cases report travel history outside of Arizona (mostly to Sonora, Mexico), 20% have been lost to follow-up, and 50% report no travel history outside of Arizona.

This increase in cases has corresponded with a particularly wet monsoon season, and vector control and university partners have noted a dramatic increase in the mosquito populations, including those of *Aedes aegypti*. Local vector control partners across the state have utilized all of their available resources and can't up-scale surveillance and control efforts any further, despite the continuing increase in human cases, and case expansion into new areas.

Many hospitals, especially those in more rural areas, are experiencing difficulties in keeping up with the demand to their ERs. There is a high level of public concern, and many people are showing up at medical centers out of panic. Retailers have been perpetually sold out of insect repellant for both the person and home, for weeks.

Question 23: What activities should vector control prioritize? How could they target interventions?

- *Capability 11: Non-Pharmaceutical Interventions*
- *Vector control should continue to prioritize control interventions to areas where known human chikungunya cases have occurred, as well as to areas where populations at risk for more severe disease may localize, such as in nursing homes and hospitals.*
- *Enlisting community participation is critical at this stage given that it is beyond the capacity of vector-control. Emphasizing neighborhood association work groups etc. to clean up high risk neighborhoods. Using school groups, church groups, Boy and Girl Scout groups to organize community clean-up and working with water and sanitation to assist in providing roll-offs and other means to decrease habitat.*

Question 24: Which laboratory tests should be prioritized?

- *Capability 12: Public Health Laboratory Testing*
- *If not all cases can have specimens tested in a timely manner then specimens coming from cases with an unusual presentation or severity should take priority and cases that have underlying chronic conditions that may exacerbate severity (i.e. diabetes etc.).*

Question 25: What human surveillance, investigation, and intervention activities should be prioritized? How would you target interventions?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *The following activities should be prioritized: conducting outreach to local urgent care centers and hospitals to facilitate case reporting, continuing case mapping to identify neighborhood clusters and identify new outbreak areas, identifying locally acquired chikungunya cases versus imported chikungunya cases, identifying areas with a high degree of localization, identifying at-risk population, public and clinician education, and collaborating closely with vector control partners.*
- *Targeting of areas with lower resources including areas that have higher population density, low economic status etc.*
- *Interventions should be targeted towards areas with a clustering of cases and less capacity to respond independently or with a high-risk population, such as nursing homes and healthcare facilities.*

Question 26: How do you handle the increasing number of ill and worried-well? How would you recommend triaging patients and managing the influx at ERs and urgent care facilities?

- *Capability 4: Emergency Public Information and Warning*
- *Capability 10: Medical Surge*
- *Adequate and appropriate public health messaging will help educate people on when to seek medical treatment and when not to seek medical treatment. Chikungunya does not always require professional medical care, especially for patients who are otherwise healthy. Whenever possible, encourage staying at home and stress the importance of mosquito avoidance. Public messaging will also help teach people to know the difference between the symptoms of chikungunya versus other illnesses.*
- *Each medical facility and clinic will have to decide for themselves when and if it is appropriate to triage or turn away patients, based on their available resources. Some recommendations might include if the patient is a member of an at-risk group, such as an elderly or immunocompromised person, or experiencing exceptionally severe disease.*
- *Possibility of setting up specialized locations – i.e. tent-cities or hospitals/ large clinics that sign on as the "chikungunya' facility allowing the other medical facilities to maintain standard of care a bit better.*
- *Identify alternative sites for screening patients, such as schools etc. Enlisting medical, nursing, and pharmacy, and public health students as surge capacity would be useful if available.*

Question 27: What are your communications needs with partners (i.e. the hospitals, clinics, laboratories, local public health, ADHS, and CDC)? What are some communications concerns? How can these concerns be addressed?

- *Capability 6: Information Sharing*
- *It is important to remember that communication to the public, to clinicians, and between agencies must be consistent to avoid confusion. The EOC should have a designated public information officer who will coordinate communication needs between agencies and out to the public. Each cooperating agency should have a public information point of contact so all entities are kept up-to-date on agreed upon messaging.*
- *ADHS's Office of Border Health will also be communicating with Mexico on the binational component of the outbreak.*

Question 28: How will you handle communication with the media? Who will you coordinate with? What types of information should be included in this type of messaging? Give examples.

- *Capability 4: Emergency Public Information and Warning*
- *Capability 6: Information Sharing*
- *It is likely that a JIC (Joint Information Center) would handle messaging.*
- *The following information should be included in messaging: how to tell if one has chikungunya, how to determine if one should seek medical care, how to protect one's person and home from mosquitoes and mosquito-borne diseases, and an update on the outbreak. Be sure to include information that paints an accurate portrayal of the risk level of the outbreak, this will help avoid an under or over reaction by the public.*

Question 29: What actions do the local health departments need to do? What actions does the state health department need to do? What services should they request from the federal level?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *The local health department should have already activated their EOC and should continue to follow up with new cases of chikungunya in their jurisdictions. Enhanced surveillance and increased interventions can be coordinated at the state level, with local and federal input. This division of labor ensures that routine tasks continue to get done, despite the enhanced activities being undertaken.*
- *The Arizona Department of Health Services will house and operate the statewide EOC, with input from local and federal partners. ADHS will also be responsible for overseeing and operating enhanced surveillance and multi-jurisdictional response efforts, in coordination with local and federal partners.*

Question 30: If cases are identified on tribal lands, what additional steps need to be taken? How do you and to whom would you communicate?

- *Capability 6: Information Sharing*
- *Capability 13: Public Health Surveillance and Epidemiological Investigation*

- *Even before cases are identified on tribal lands, tribes and sovereign nations should be included in outbreak updates and efforts. If high-risk areas or locally acquired cases are identified on tribal lands the tribe may choose to request assistance from state or federal partners, or may decline to. If state assistance is requested, ADHS will work with the tribe similarly to how they are working with county partners. Regardless of whether assistance is requested there should be a free and frequent communication regarding the epidemiologic profile of the outbreak between partners.*

Module 4

Recovery and Downscaling Response Efforts

It's now late December. After continuous efforts by public health and vector control partners, the number of new cases of chikungunya has declined. This occurred in conjunction with decreasing temperatures and rainfall during the fall months, which led to a natural decline in mosquito populations.

Question 31: How should the EOC be deescalated? Should anything remain in place?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *The physical EOC can be dismantled, and a virtual EOC can remain in place until*

Question 32: How should mosquito surveillance be deescalated? What would be considered a sustainable and adequate level?

- *Capability 11: Non-Pharmaceutical Interventions*
- *Mosquito surveillance should be deescalated as case numbers decrease. With fewer cases being reported to public health there will be less follow-up required by vector control partners. Vector control professionals should continue to respond to reported chikungunya cases as well as to areas where surveillance shows a high number of Aedes aegypti mosquitoes. As mosquito numbers and case numbers continue to decrease vector control can go back to pre-outbreak levels of surveillance and control based upon their available resources.*
- *The identification and elimination of persistent hotspot locations should be attempted in an effort to prepare for the following season.*

Question 33: How should epidemiologic investigations and interventions be deescalated? What would be considered a sustainable and adequate level?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *As the number of newly reported chikungunya cases decreases, the amount of investigations and follow-ups by public health will also decrease. Once disease incidence rate stabilize or return to pre-outbreak levels, public health interventions will stabilize with them.*

Question 34: For how long should enhanced surveillance be conducted?

- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *Enhanced surveillance activities that were put in place during the outbreak can continue until case incidence rates stabilize or return to pre-outbreak levels. They can also be dismantled when they stop providing new or useful information.*

Question 35: Is there anything you would have done differently now knowing what you know?

- *Capability 4: Emergency Public Information and Warning*
- *Capability 6: Information Sharing*
- *Capability 10: Medical Surge*
- *Capability 11: Non-Pharmaceutical Interventions*
- *Capability 12: Public Health Laboratory Testing*
- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *Answers will vary significantly based on the group's decision making earlier in the exercise. Some answers might include an earlier initiation of the EOC, earlier initiation of vector surveillance and control activities as well as earlier increased public messaging or cluster investigations. This is an opportunity for participants to look back at what they've learned during the later phases of the exercise to demonstrate an understanding of the material.*

Question 36: What should be done to prepare for the next mosquito season? What parties should participate in this planning phase?

- *Capability 4: Emergency Public Information and Warning*
- *Capability 6: Information Sharing*
- *Capability 10: Medical Surge*
- *Capability 11: Non-Pharmaceutical Interventions*
- *Capability 12: Public Health Laboratory Testing*
- *Capability 13: Public Health Surveillance and Epidemiological Investigation*
- *The top priority should be an increase in vector surveillance and control measures. This will allow for a more accurate evaluation of high-risk areas and will allow for the tailoring of interventions to these areas of concern.*
- *Due to the widespread nature of the outbreak, the public will likely be concerned about the upcoming mosquito season. It's encouraged to use this opportunity of high interest to increase directed public messaging towards the public. This should include information on how to protect oneself from mosquitoes, as well as how to prevent mosquito breeding around one's home.*
- *Mechanisms should be explored to better determine how the systems in place, water, sanitation, housing can be mobilized to improve overall infrastructure and reduce the risk of vector-borne disease. An assessment of hotspots should be made to enhance surveillance in the areas were the outbreak was first focused for concentrated surveillance.*

Additional Resources

- CDC Chikungunya Webpage: http://www.cdc.gov/chikungunya/
- Pan American Health Organization (PAHO) Chikungunya Webpage: http://www.paho.org/hq/index.php?option=com_topics&view=article&id=343&Itemid=40931

Appendix A: Reference Information and Maps

Chikungunya fever is a mosquito-borne disease caused by a virus in the Alphavirus genus, and Togaviridae family. Chikungunya virus is primarily transmitted by *Aedes aegypti* and *Aedes albopictus* mosquitos, which also transmit dengue and the yellow fever virus. Beginning in 2004, chikungunya has caused large outbreaks in Africa, Asia, Indian Ocean islands, and in Italy. Attack rates in these outbreaks ranged from 38-63% and have reached over 500,000 cases in multiple outbreaks.

In late 2013, the first cases of locally-acquired chikungunya in the western hemisphere were reported among residents of St. Martin in the Caribbean. The virus quickly began to spread across the Caribbean region, and locally-acquired cases have been reported from North, Central, and South America. As of this writing, there have been several locally-acquired cases of chikungunya fever in Florida, as well as a chikungunya positive mosquito found in the Houston area.

Three distinct lineages of chikungunya virus have been identified — including two from Africa and an Asian lineage. The Asian lineage is the strain currently circulating in the Americas, and has demonstrated less efficient transmission among *Aedes albopictus* mosquitoes than the Asian lineage. This difference might indicate lower risk for transmission in areas with only *Aedes albopictus* mosquitoes. The Asian lineage is well adapted to Aedes aegypti vectors, however.

Chikungunya in Arizona

The introduction of chikungunya virus to the Americas increases the risk of importation to Arizona. Arizona is also at risk for local transmission of chikungunya virus because of the presence of *Ae. aegypti*. This would most likely occur if a person were infected while traveling outside of Arizona, and then be fed on by local mosquitoes of the appropriate species following their return. This mosquito could pick up the virus from the infected person's blood and transfer it to the blood of the next person it feeds on. This person would be considered a locally-acquired case. However, the possibility also exists for infected mosquitos to travel across state or national borders. The primary mosquito vector of chikungunya virus, *Aedes aegypti*, is present in Arizona.

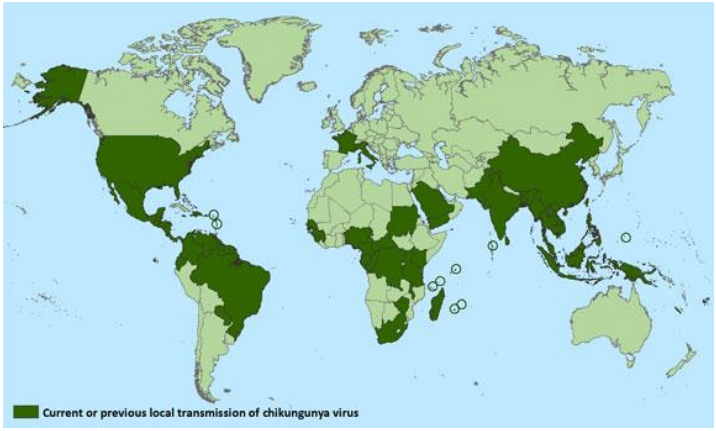

Figure 1: Countries and territories where chikungunya cases have been reported (as of February 10, 2015), CDC

Chikungunya Ecology & Transmission

Reservoirs

Humans serve as the primary reservoir for chikungunya, but several other vertebrate species have been implicated as potential reservoirs, including non-human primates, rodents, birds, and some small mammals. Animal reservoirs are not considered important for transmission during an outbreak.

Incubation periods

- **Humans**: **3-7 days**, on average, following the bite of an infected mosquito
- **Mosquitos**: **7-10 days** between intake of an infected blood meal and when mosquitos can transmit the virus to a human host

Susceptibility

All persons not previously infected with chikungunya virus are at risk for infection and disease. This can occur anywhere where there are infected *Aedes* spp. mosquitos. It is believed that once exposed, individuals will develop long-lasting immunity that protects against reinfection. Due to the immunological naiveté of most of Arizona's population, all areas with known populations of *Aedes aegypti* mosquitos are considered at risk for local transmission.

Chikungunya Clinical Disease & Case Management

An individual who is bitten by an infected mosquito usually develops signs and symptoms of disease 3–7 days after the bite (range 1–12 days). Most individuals (73–97%) develop symptomatic infection; however, some remain asymptomatic. Chikungunya can cause acute, subacute, and chronic disease.

Acute chikungunya fever usually lasts 3–10 days and is characterized by a sudden onset of high fever (usually >102ºF) and severe joint pain. Fever can last from several days up to a week, and is sometimes intermittent. Joint pain is usually symmetric, and most commonly seen in the hands and feet, but can manifest in other joints as well. Other signs and symptoms can include headache, diffuse back pain, myalgia, nausea, vomiting, polyarthritis, tenosynovitis, rash, and conjunctivitis. In about 50% of patients a rash occurs 2–5 days after fever onset. It is typically maculopapular or hive-like and involves the trunk and extremities, but can also occur on the hands and feet. Fatalities are extremely rare (<1% of

cases), but when they do occur it is often among the elderly, newborn, or those with comorbidities. Morbidity due to joint pain and swelling can be severe and impact the patient's ability to work or otherwise maintain a normal life. These symptoms typically only last a few weeks, but in some cases have been shown to last for months or even years. Abnormal laboratory findings can include thrombocytopenia, leukopenia, and elevated liver function tests.

Atypical manifestations of chikungunya can occur and include neurological, ocular, cardiovascular, dermatological, renal, or other complications.

Differential diagnoses for chikungunya fever includes the following agents or diseases:

- Dengue fever
- Malaria
- Leptospirosis
- Other alphaviral infections (Mayaro, Ross River, Barmah Forest, O'nyong nyong, and Sindbis viruses)
- Post-infectious arthritis (including rheumatic fever)
- Juvenile rheumatoid arthritis

It's especially important to distinguish chikungunya fever from dengue fever, as dengue fever can have more serious outcomes despite an initially similar presentation. There are a few points that can help distinguish the two:

- ✓ Dengue is less likely to present with a maculopapular rash
- ✓ Shock and hemorrhagic symptoms are almost always indicative of dengue
- ✓ Dengue patients may complain of diffuse body pain, but chikungunya patients will complain of pain more pointedly in and around their joints

Treatment

Treatment for chikungunya is supportive therapy; however, healthcare providers should first exclude more serious conditions such as malaria, dengue, yellow fever, and bacterial infections that would require more specific treatment.

Chronic Chikungunya Infection

Disease symptoms may linger long after the initial infection is cleared. Typically, patients will begin to feel an improvement after the first 10 days of symptoms, but two to three months later will experience a recurrence of symptoms. This usually presents as various rheumatic symptoms including distal polyarthritis, exacerbation of pain in previously injured joints and bones, and tenosynovitis in wrists and ankles. Vascular manifestations may also occur, such as with Raynaud's syndrome, in which brief vasospasms lead to a

narrowing of the blood vessels. Many patients also complain of general depression, fatigue and weakness. Chronic disease is defined as disease symptoms lasting more than three months. Study results vary, but thus far have suggested that after 3 months 80-93% of patients complain of chronic disease. After 10 months 49% of patients will complain of chronic disease. Between 18 months and 36 months 12-18% of patients will complain of chronic disease. Chronic disease appears to be more common in those 65 years of age or older, in those who have preexisting joint conditions, and in those who experienced more severe acute stage disease.

Chikungunya Laboratory Testing

Laboratories

The Arizona State Public Health Laboratory (ASPHL) can perform PCR and IgM ELISA testing for chikungunya virus. Testing can also be performed at the CDC Arboviral Disease Branch laboratory in Fort Collins, CO. Several private commercial labs also offer chikungunya testing. Samples should first be sent to the appropriate diagnostic commercial laboratory for initial testing, and then sent on to the ASPHL reference laboratory for confirmatory testing.

Samples

Chikungunya virus or antibody testing is most commonly performed on blood or serum samples; cerebrospinal fluid can be used for neurological cases with meningoencephalitic symptoms. Additional testing can be performed on other specimens in rare cases (i.e., autopsy material following a suspect chikungunya death), but there is little information on the detection of virus by isolation or RT-PCR from tissue or organs. Several methods are available for chikungunya virus diagnostic assays, and include the following:

- Viral culture
- Reverse transcriptase-polymerase chain reaction (RT-PCR)
- Enzyme-linked immunosorbent assay (ELISA) or immunofluorescence assay (IFA) for immunoglobulin (Ig) M or IgG antibodies
- Plaque reduction neutralization tests (PRNT)
    - Not routinely performed; can identify neutralizing antibodies
    - Results are more specific than ELISA/IFA results and are generally required to confirm diagnosis
- Immunohistochemical staining (IHC)
    - Performed on tissues

For **routine** chikungunya virus diagnostic testing, serum specimens can be tested by RT-PCR and IgM antibody tests.

- **< 3 days after illness onset – RT-PCR** should detect virus if infected

- **3 – 8 days after illness onset – both RT-PCR and an IgM antibody test** should be run
- **>8 days to months after illness onset – IgM antibody tests** should detect immune response

Specimens collected during the first week of illness should be tested by both RT-PCR and IgM antibody tests. A convalescent phase serum should be collected 10-14 days later in patients with negative acute sample results to identify a change in antibody titer or definitively rule out the diagnosis. If only one sample can be collected, it should be collected between 5 and 14 days following illness onset to ensure that an adequate IgM response will be detected. This situation is not ideal, but can at least provide laboratory evidence to support a probable case classification. Note that IgM antibodies can persist for months after illness.

Specimen Collection, Storage and Transportation

Collect 4–5 ml of blood aseptically in a tube or a vial. Any serum vial is appropriate, such as a red top, orange top, or tiger top. Allow blood to clot at room temperature, centrifuge it at 2,000 rpm to separate serum, and then collect the serum in a clean dry vial. Samples should be transported at 2-8ºC and should not be frozen, as hemolysis can interfere with serologic testing. If specimens are frozen, virus isolation and molecular diagnosis are still possible. If a delay of over 24 hours is expected the specimen should be separated and stored at a refrigerated temperature.

Chikungunya Case Classification

Chikungunya falls under the arboviral disease case definition, as defined by the Council of State and Territorial Epidemiologists (CSTE). CSTE divides arboviral infection case classifications in two categories; neuroinvasive or non-neuroinvasive. Since chikungunya is a non-neuroinvasive disease we have only included non-neuroinvasive criteria in this handbook. The criteria are as follows:

Clinical Criteria

A clinically compatible case of chikungunya is defined as follows:

- Fever (chills) as reported by the patient or a healthcare provider, AND
- Absence of neuroinvasive disease, AND
    - Absence of more likely clinical explanation
    - Other clinically compatible symptoms include headache, myalgia, rash, arthralgia, vertigo, vomiting, paresis, and/or nuchal rigidity

Laboratory Criteria for Diagnosis

Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, CSF, or other body fluid, OR

- Four-fold or greater change in virus-specific quantitative antibody titers in paired sera, OR
- Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen, OR
- Virus-specific IgM antibodies in CSF or serum.

Appendix B: Reference Educational Materials