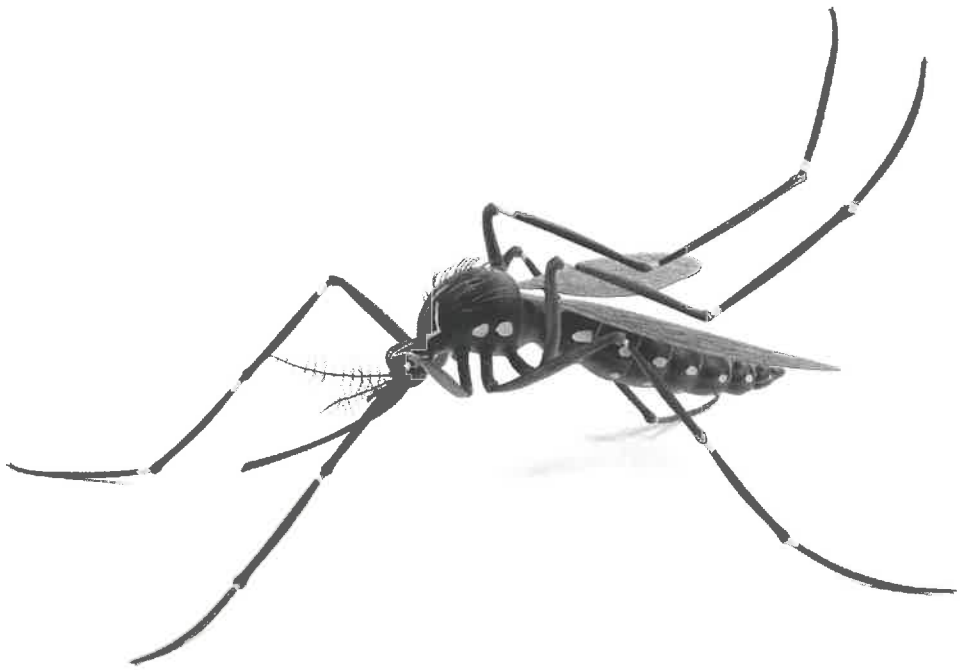


SOUTH CAROLINA ZIKA VIRUS

PREPAREDNESS AND RESPONSE PLAN

Annex 1 to the South Carolina Infectious Disease Plan

dhec
Healthy People. Healthy Communities

TABLE OF CONTENTS

Record of Changes

Change #	Date	Description of Change	Page #	Initials

Distribution

Name	Date	Agency	# Copies	Initials

Statement of Promulgation

The Zika Task Force was established to meet the dynamic and potentially dangerous threat of Zika virus disease (Zika) in South Carolina. Confirmed travel-related cases of Zika in South Carolina and the possibility of local transmission demonstrate the need to develop strategies to keep South Carolinians healthy throughout mosquito season by supporting efforts to prevent or mitigate the transmission of Zika virus.

This Annex of the South Carolina Infectious Disease Plan is the official response plan for South Carolina and supersedes previous versions. All agencies and organizations mentioned in this annex have the authority to carry out the tasks in this Annex. (See S.C. Code Ann. Sections 25-1-420 through 450; 44-1-80 through 110; 44-1-140.)

All agencies and organizations with roles and responsibilities for Zika virus preparedness and response are expected to update, maintain, and train to their policies, plans, and procedures to ensure their ability to prepare for and respond to travel-related and local transmission of Zika in South Carolina.

The South Carolina Department of Health and Environmental Control Director of the Office of Public Health Preparedness and/or his or her designee has the authority to update and maintain this Annex.

Signed:

Catherine E. Heigel

Catherine E. Heigel
Director
SC Department of Health & Environmental Control

5/11/2017
Date

Coordinating Agency
Department of Health & Environmental Control (DHEC)

Primary Agencies and Organizations
- SC Emergency Management Division (SC EMD)
- Clemson University Cooperative Extension
- Clemson University, Department of Pesticide Regulation (CUDPR)
- SC Department of Administration, Division of Technology Operations (SC DOA/ DTO)
- County or Local Government, Vector Control, and/ or Emergency Management entities

Supporting Agencies and Organizations
- SC Department of Mental Health (SC DMH)
- SC Department of Parks, Recreation and Tourism (SC PRT)
- SC Department of Natural Resources (SC DNR)
- SC Forestry Commission (SC FC)
- SC Beekeepers Association
- SC Hospital Association (SCHA)
- SC Medical Association (SCMA)
- SC Primary Health Care Association
- SC Chapter of the American Academy of Pediatrics (SCAAP)
- SC Department of Education (SC DOE)
- SC State Housing Finance and Development Authority
- SC PASOs
- Regional Healthcare Coalitions
- American Red Cross, other Blood Services Organizations
- SC Association of Counties
- Municipal Association of SC (MASC)
- Other local and federal partners
- SC Mosquito Control Association

Purpose
To prepare for, respond to and mitigate the impact of transmission of the Zika virus through proactive activities, and to define roles performed and components necessary for successful outcomes.

Scope & Applicability
This document outlines agency plans to coordinate State efforts to prepare for and respond to Zika virus in South Carolina. It is designed to complement, and not replace the Center for Disease Control (CDC) Zika Virus Action Plan, the CDC Interim Zika Response Plan, the South Carolina Emergency Operations Plan (SC EOP), the South Carolina Infectious Disease Plan, and/ or Annex 8 (Health and Medical Services) to the SC EOP. Information contained in the aforementioned plans is not duplicated within this document, and being thoroughly

familiar with these source references and the procedures contained herein is incumbent on participating agencies and individuals.

This plan outlines expected operational actions and activities of DHEC and others for the identification and mitigation of non-local and locally transmitted Zika virus. The plan was created to be flexible and adaptable to an emerging situation involving Zika virus. Any actions herein could be subject to change based on variables that are not predictable at this time. During the course of viremic activity for non-locally or locally transmitted cases, DHEC, in conjunction with the CDC and local government officials, will help guide a response to Zika virus and associated issues. Outlined in this plan are steps and procedures that stakeholders will follow for both mitigation and response to Zika virus. This plan will facilitate coordination among partners such as federal and local authorities, healthcare providers, blood supply services, and mosquito control organizations.

Public outreach and education, in addition to surveillance and epidemiological investigation and mosquito control, are among the most important strategies for preventing or mitigating the spread of Zika. Coordination, synchronization and seamless integration of local, county, and state efforts are essential to success. Other activities may require large-scale efforts and may involve additional state agencies and/or Emergency Support Functions (ESFs). Activities that may be implemented during Zika response include but are not limited to:

- Coordination with federal, state, and local entities, as well as blood collection centers and mosquito control organizations;
- Epidemiological surveillance, investigation, and laboratory testing;
- Coordination with the US Zika Pregnancy Registry;
- Mosquito surveillance and control as outlined in **Appendix H** of this Annex;
- Analysis of Zika surveillance data to inform the development of objectives and strategies;
- Development and dissemination of information for the medical community, responders, schools, special populations, public safety officials, and the general public;
- Designation of "Areas of Active Zika Transmission," if necessary.

Situation Overview

Description of the Disease

Zika virus was first isolated in 1947 and the first outbreak was reported in 2007 on Yap Island, Federated States of Micronesia. The virus is spread primarily by infected *Aedes (Stegomyia)* species mosquitoes. Because the virus is spread through the bite of an arthropod, it is a member of a group of conditions known as arboviral diseases, which include mosquito diseases like West Nile virus, and travel-related diseases like dengue fever, Chikungunya fever, and Yellow fever. At this time, there is no evidence that Zika can be transmitted to humans from animals or from insects other than mosquitoes.

Zika virus began to spread more globally in 2015, and by January 2017, 76 countries reported mosquito-borne Zika virus transmission. In 2016, through public health surveillance and investigation activities, the first active mosquito-borne Zika virus transmission (local transmission) was identified in the United States, in Miami-Dade County, Florida. Through rapid, coordinated local, state and federal actions, sustained local transmission was successfully interrupted. Public health surveillance systems are critical to successfully monitoring Zika virus disease and limiting impact.

In the U.S. states, as of January 2017, most cases have been related to exposure due to travel outside of the U.S. states (travel-related) and have occurred between the months of May and November among persons ages 20-59 years old.

Zika virus typically causes asymptomatic illness or mild illness with symptoms including fever, rash, joint pain, and conjunctivitis (inflammation of the outer membrane of the eye). Symptoms typically start between three and 14 days after being bitten by an infected mosquito and last several days to a week. The Zika virus typically remains in the blood of an infected person for one week.

However, new modes of transmission and clinical manifestations were identified during the 2015-16 outbreaks. In addition to being spread by mosquitoes, the virus can be spread through sex, from a pregnant woman to her fetus during pregnancy, from a mother to her infant during birth, through laboratory exposure, and through blood transfusion. It is possible that it may also be spread through organ or tissue transplantation, breast milk and other body fluids.

Clinical manifestations also include fetal loss, severe birth defects, Guillain-Barré syndrome (rapid onset of muscle weakness, caused by the body's immune system attacking part of the peripheral nervous system, which can be life-threatening), and thrombocytopenia (lack of platelets in the blood, which can cause bleeding and slow blood clotting after injury).

When diagnosing Zika virus disease, clinicians need to differentiate it from dengue fever and Chikungunya fever, which are also travel-related and present with similar symptoms. Laboratory testing is available to assist in diagnosing Zika virus infection.

There is currently no cure for Zika virus disease and treatment consists of supportive care to relieve symptoms.

A vaccine is not yet available to protect against Zika virus. A coordinated federal government effort is underway to facilitate vaccine development with the goal of deploying a vaccine by 2018, under the appropriate regulatory mechanism, to U.S. populations at high risk of exposure. The federal government is also working with the vaccine manufacturing industry with the goal of commercializing a vaccine for broad distribution by 2020.

In August 2016, the U.S. Food and Drug Administration (FDA) recommended routine Zika virus screening of all blood donations in the United States.

Transmission through Mosquito Vectors

Zika virus is transmitted to people primarily through the bite of an infected *Aedes* species mosquito, specifically the *Aedes aegypti (*Yellow Fever mosquito*)* and the *Aedes albopictus (*Asian tiger mosquito*)* mosquito species. The Asian tiger mosquito, the most common nuisance mosquito in South Carolina, is present in all 46 counties. The Yellow Fever mosquito is less common but has been detected in Charleston and Berkeley counties. These mosquitoes live in close association with humans and are a "container-breeding" mosquito which means reproduction can occur in numerous types of water-holding containers such as buckets, pet water bowls, plastic containers, discarded tires, rain gutters, tarps, bird baths, lawn ornaments, outdoor toys, and other items often found around human dwellings. They do not live in ditches, marshes, or other large bodies of water. Mosquito season typically lasts from March 1 – November 30 in South Carolina but may vary due to climatic conditions. Actively avoiding mosquito bites is the best defense against Zika virus.

To reduce *Aedes* mosquito populations, all South Carolinians should continually eliminate standing water from containers around their property to reduce mosquito breeding and habitat sites. This includes bird baths, flower pots, used tires, drainage pipes, buckets, etc.

Actions to avoid mosquito bites include wearing protective, permethrin-treated clothing, using mosquito repellent, and the use of air conditioning, window and door screens, and mosquito netting.

To avoid introducing Zika virus to local mosquito populations, all individuals traveling to Zika-affected areas should take specific precautions to actively avoid mosquito bites while traveling and for three weeks upon returning from travel. Because Zika virus may not cause symptoms, infected persons could unknowingly serve as a source for mosquito infection that can further spread the virus. Zika virus can be present in the blood of an infected person even when they do not have symptoms, and during that time, a mosquito may acquire the infection by biting the infected individual. The mosquito can then become infected, bite another person, and spread the virus to that person.

To reduce the risk of infecting others, symptomatic individuals infected with Zika should avoid mosquito bites for the first week after the onset of symptoms.

Government, at all levels should engage in both public health and mosquito mitigation efforts. Federally, multiple agencies provide national level surveillance, expertise and guidance, as well as coordinate vaccine development and emergency funding. States,

including our own, conduct human and mosquito surveillance, epidemiological investigations, and assist in, the coordination of prevention and response measures. Local governments routinely conduct vector control operations and enact ordinances for the good of their citizens and visitors. An example of government success in eliminating mosquito-borne public health threats can be gleaned from efforts between 1947 and 1951, where the National Malaria Eradication Program eliminated the malaria threat from the southeastern US, including SC, through focused efforts by governments at all levels working as partners in active public health and abatement practices.

Mosquito control in SC is conducted at the local government level. Local governments create, review and update local ordinances to reduce the risk of vector-borne disease; for example, eliminating standing water that provides breeding sites for mosquitoes. Local mosquito control programs are locally-funded. Some community programs are funded through home-owner association fees, and some lake impoundments are funded through electric cooperatives.

Local mosquito control programs are encouraged to self-evaluate current response capacities, and when gaps are determined, pursue memoranda of agreement or understanding to better facilitate neighbors helping neighbors. Localities that currently do not have mosquito abatement capabilities should develop plans and procedures to protect their communities, which could be through mutual support. Mutual aid agreements exist within South Carolina, providing a possible mechanism to supplement requirements when or if needed.

As the state's public health agency, DHEC provides technical assistance, coordinates a mosquito surveillance program, and conducts laboratory testing of mosquitoes for viruses, including Zika virus. DHEC also provides human disease surveillance, laboratory testing, and investigation of reportable infectious diseases, including Zika. When Zika virus is identified, localities should take mosquito abatement action in the areas where it is identified.

DHEC is organized with central state offices and regional and local offices in four regions across the state. Each region provides technical assistance and coordination for public health preparedness and response. Centralized services are provided in support of regions as required. In the event of local transmission, DHEC regional personnel will act as liaisons to support local governments in a coordinated federal, state and local response.

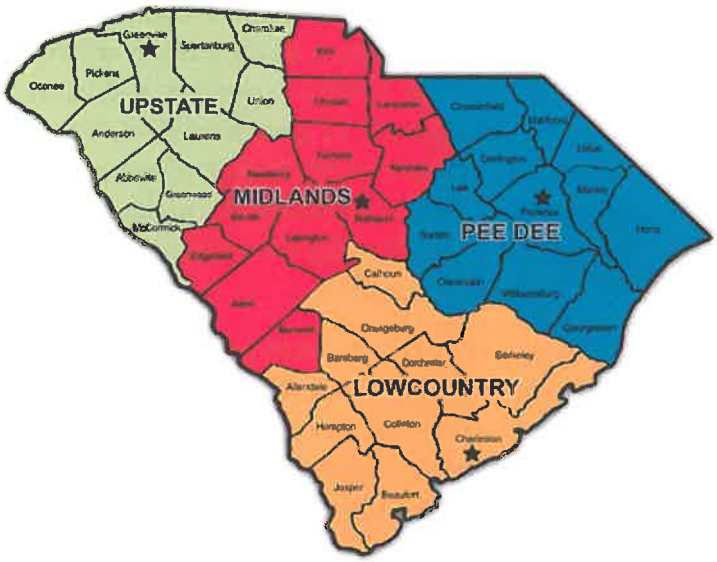


Figure 1. Public Health Regions

Collaboration between DHEC, healthcare providers, local governments, and other governmental and non-governmental agencies will decrease negative effects of Zika virus disease through a comprehensive approach. This includes public education, human disease surveillance and investigation, treatment of ill persons, the discovery of mosquito breeding sites, and the incrimination of mosquito vectors by identification and testing. Information about Zika surveillance, prevention and response will be published on the DHEC website at www.scdhec.gov/zika and will be updated regularly.

Facts and Assumptions

- Knowledge of Zika is improving over time. Scientists are studying the full range of potential health problems that Zika virus infection may cause, including during pregnancy. Guidance and recommendations from CDC will change as more is learned about Zika. The content of this plan will change accordingly.

- Pregnant women and their babies are highly vulnerable populations that need to be protected against Zika disease.

- Zika may continue to be a public health threat escalating during mosquito season each year.

- The number of imported cases among travelers visiting or returning to SC will likely increase. These imported cases increase risk of local transmission.

- South Carolina is at risk for local transmission of Zika virus by the *Aedes aegypti* mosquito (Yellow Fever mosquito) and the *Aedes albopictus* mosquito (Asian tiger mosquito). Both are competent vectors for Zika virus transmission, though transmission by the *Aedes albopictus* (Asian tiger mosquito) may be more limited than transmission by the *Aedes aegypti* (Yellow Fever mosquito).

- Mosquito surveillance and control actions may not be limited to the home of a Zika patient, but may apply to other relevant sites of potential mosquito exposure (e.g., work sites, recreational sites, etc.).

- *Aedes albopictus* and *Aedes aegypti* should be controlled by using an Integrated Mosquito Management (IMM) approach that utilizes all available mosquito control methods to exploit the known vulnerabilities of these mosquitoes. Such a strategy should involve education and outreach, surveillance, source reduction (the elimination, removal or modification of container-breeding habitats), biological control, larvicides, and adulticides.

- The use of pesticides and other agents to control mosquito populations may cause concern about potential damage to the environment or harm to other species. Clemson University, Department of Pesticide Regulation (CUDPR) is the regulatory authority for pesticides and should be consulted if there are concerns or if special considerations need to be made. Bee populations are a known concern and consideration.

- The public may utilize private mosquito control companies to apply mosquito barrier applications around their properties.

- Federal facilities and military installations in SC have mosquito management programs, policies and procedures separate and distinct of this plan. (except McEntire Joint National Guard Base)

- The Director of DHEC will announce the first confirmed case of locally transmitted Zika.

- DHEC will be the initial lead agency to coordinate state support for response to Zika. An Incident Command System (ICS) structure comprised of DHEC personnel will interface with local authorities. Conditions may prompt additional agency involvement or measures to be taken.

- In preparation for or in response to one or more confirmed cases of locally transmitted Zika, the Governor may order activation of the SC EOP, designate a State Coordinating Officer, or establish a Unified Command.

- The Governor may consider issuing a State of Emergency if Zika presents a major threat to the public. This action will activate the SC EOP.

- Public interest and concern will occur should one or more confirmed locally-transmitted case of Zika appear in SC. Public messaging should be consistent and ongoing throughout all levels of government to help mitigate infections, regardless of the number of caseloads and size of the patient management component. Circumstances may warrant establishing a Joint Information Center (JIC). Based on familiarity with associated functions and effects of Zika, the DHEC Office of Communications will serve as the lead entity for JIC operations.

- Local governments have the primary responsibility to provide initial emergency response, mosquito control and emergency management services within their jurisdictions.

- Hospitals and providers can expect a potential surge to clinics and emergency departments due to a high level of public anxiety in local transmission situations.

- Sustained interoperability between state and local officials, medical services and any other impacted human resource asset is required due to the potential for long-term medical, behavioral and social supportive care for those adversely impacted with significant complications.

Goals and Objectives

The overarching goal is to make South Carolina communities more resistant and resilient to infectious disease hazards, specifically Zika virus. These objectives are based on a review of the current hazard risk and vulnerability assessment of Zika virus in South Carolina.

South Carolina has identified several hazard mitigation and response goals for Zika virus:

- Conduct unified coordination, communication and information sharing among stakeholders.
- Minimize infection and reduce potential adverse outcomes from Zika virus events.
- Mitigate exposure to the virus through enhanced surveillance and abatement techniques.
- Provide guidance on technical issues or other assistance as needed to affected counties.
- Maximize public education and awareness of Zika virus so that residents and visitors can anticipate the risks and protect themselves.
- Increase health care provider awareness of Zika virus, to include guidelines for patient evaluation and testing based on CDC's recommendations.
- Ensure that core public health functions sustain operations during Zika virus response activities and afterward during recovery operations.

Organizational Structure

DHEC will respond in an ICS structure similar to the example below. Specific assignments will be provided to all partner agencies utilizing the FEMA ICS Form 203. See Figure 2 below.

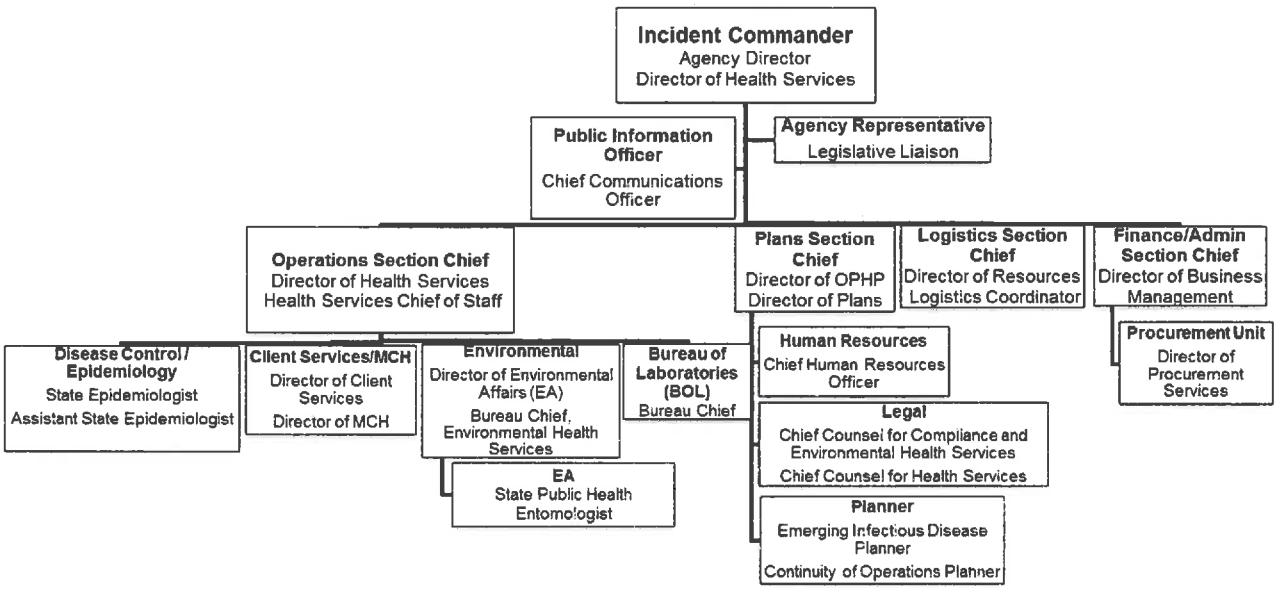


Figure 2. ICS Structure

In the case of local transmission, DHEC will activate the Agency Coordination Center (ACC) and the affected DHEC Regional Coordination Center (RCC).

If deemed necessary, a Joint Information Center (JIC) may be activated to provide timely release of coordinated information.

Due to the potential complexity of a Zika outbreak under Risk Category 3, additional options may be considered by the Governor. Options include activating the SC EOP, establishing a State Coordinating Officer (SCO), activating all or portions of the State Emergency Response Team (SERT)/ State Emergency Operations Center (SEOC), and/or establishing a Unified Command (UC) structure consistent with the National Incident Management System (NIMS). These actions may be taken to enhance coordination of the state's prevention, response, and mitigation activities. Each of these potentialities is addressed in the SC EOP and Annex 5 to the SC EOP, published separately and available at www.SCEMD.org.

Roles and Responsibilities

DHEC identifies, tracks, and works collaboratively to prevent and control the spread of infectious diseases in SC, including mosquito-borne diseases. DHEC coordinates closely with the CDC and creates awareness of Zika virus by collecting the data gathered from multiple modes of surveillance. This increases the likelihood of early detection of human cases and minimizes disease transmission among South Carolinians.

The monitoring of mosquito populations varies by jurisdiction. DHEC provides technical assistance to local governments' mosquito control programs and tests mosquitoes that might be carrying the virus. Mosquito surveillance participants (including DHEC environmental health staff, mosquito control staff, Public Works staff, and utility impoundment staff) assist with trapping of mosquitoes in designated areas of the state. Mosquitoes are transported to the DHEC lab for species identification, pooling, and testing.

DHEC does not provide mosquito control or provide chemicals to local mosquito control programs. DHEC has negotiated statewide a contract so pesticides can be purchased at a reduced cost. DHEC notifies localities to inform them of Zika virus or other mosquito-borne diseases in their area so that they can perform mosquito control. When an incident exceeds local or tribal resource and response capabilities, local or tribal governments utilize resources obtained by pre-arranged agreements with neighboring jurisdictions and the private sector. When a situation exceeds these capabilities these entities request assistance from the next higher level of government.

Specific Agency/Organization Roles:

South Carolina Department of Health and Environmental Control (DHEC):

- Protect public health and safety and assist local governments, businesses, and individuals during a Zika outbreak (e.g., one or more confirmed locally-transmitted cases).
- Collaborate with local government, federal agencies and other states.
- Provide health information related to Zika virus and mosquito control.
- Provide technical assistance to local vector control.
- Notify the Office of the Governor and SCEMD in the event of confirmed Zika local transmission.
- Notify the public and media of confirmed Zika local transmission.
- Identify and track the spread of Zika virus in humans, including adverse birth outcomes that may be caused by Zika.

- Provide guidance and updated information to healthcare facilities, providers, and public health partners using established protocols and the Health Alert Network (HAN).

- Lead the development of messaging to address the current status of Zika in the state.

- Develop and, as necessary, implement plans that address potential scenarios that pose the risk of further spread of Zika.

- Ensure that accurate situational awareness regarding Zika activity in the state is maintained, while at the same time ensuring that any information shared complies with applicable laws, regulations, and policies regarding the protection of the confidentiality of personal health information.

South Carolina Emergency Management Division (SC EMD):

- Facilitate coordination with county emergency management agencies.

- Publish plans or other public preparedness information on www.SCEMD.org as required to facilitate public awareness.

- Support JIC operations as required.

- Activate all or portions of the SC EOP, appropriate members of the SERT, and or the SEOC as required.

- Assume roles and responsibilities or in accordance with the SC EOP as directed by the Governor should situational escalation warrant.

- In the event that FEMA assumes any role in the public health response within the state, facilitate coordination with FEMA.

Clemson University Cooperative Extension

- Provide technical assistance and expertise regarding bee populations.

- Disseminate subject matter information to clientele related to apiculture and agriculture.

- Serves as a supporting member to Clemson University's Regulatory Services in protecting SC's honey bee hives.

Clemson University, Department of Pesticide Regulation (CUDPR):

- Provide pesticide regulation and licensing information for certified applicators performing pesticide applications in agricultural as well as commercial and non-commercial pest control.

- Oversee the manufacture, sale, use and distribution of pesticides in South Carolina.

- Serve as primary enforcement authority, through a cooperative agreement, with the USEPA that investigates allegations of misuse, by way of, but not limited to drift, application of a pesticide in a manner inconsistent with that products labeling and individuals performing commercial pest control without the requisite license.

SC Department of Administration, Division of Technology Operations (SC DOA/ DTO):

- Be prepared to identify, acquire, and support communications requirements should they exceed DHEC capabilities.

County or Local Government:

- Review, update, or create local ordinances designed to support vector control programs in effort to reduce or treat standing water that can provide breeding sites for mosquitoes.

- Develop local integrated mosquito management programs, establish MOAs or MOUs regionally or with neighboring entities to support or augment abatement activities, and/or establish on-demand abatement contracts should local transmission occur and exceed local capabilities.

- Find content for local plans in the Zika Virus County/Municipal Preparation Guide found at http://www.scdhec.gov/library/CR-011878.pdf and by request via email at Zika@dhec.sc.gov.

- Assist with public health outreach and education. Request printed materials for widespread distribution from DHEC.

- Provide notification to beekeepers' associations during mosquito spray operations through the Clemson Pesticide Spray Alert program at www.kellysoulutions.com/clemson/beekeepers/pesticidealert/login.asp and if possible, through local beekeeper contacts.

- Coordinate training and/ or exercise needs with DHEC Office of Public Health Preparedness (OPHP).

- Maintain confidentiality of human cases.

- Stay informed of current events by participating in CDC's Crisis and Emergency Risk Communication (CERC) webinars and information at www.emergency.cdc.gov/cerc.

- Integrate public information campaigns with DHEC or the JIC if established. The DHEC Office of Communications and Public Affairs can be reached at media@dhec.sc.gov or (803) 898-7769.

Concept of Operations
Intent

The State of South Carolina will prepare for, respond to and mitigate the threat of local transmission of Zika virus disease within South Carolina.

Zika-related prevention, response, and mitigation actions addressed in this Annex will occur in four risk-based categories identified by CDC:

STAGE	RISK CATEGORY	DESCRIPTION
Pre-Incident	**0**	**Preparedness** – Vector present or possible in the state. No identified local transmission
	1	**Mosquito Season** – *Aedes* species mosquito vector biting activity. Introduced-travel-related or sexually transmitted cases.
Suspected / Confirmed Incident	**2**	**Confirmed Local Transmission** – Single, locally acquired case, or cases clustered in a single household and occurring < 2 weeks apart.
Major Incident	**3**	**Confirmed Multiperson Local Transmission** – Zika virus illnesses with onsets occurring ≥ 2 weeks apart but within an approximately 1 mile (1.5 km) diameter.

Risk categories are not phases of an operation, but rather reflect various conditions, or states, that exist over time.

Prevention, response, and mitigation activities always occur in the following areas, and thus are ongoing during each risk category. Associated tasks, and actions, increase in accordance with risk.

- Communication
- Surveillance and Investigation
- Laboratory testing
- Mosquito control
- Coordination with healthcare providers
- Outreach to pregnant women
- Blood safety

Activities build on and may occur concurrently with activities in subsequent risk categories. In addition to the activities above, administrative actions, training, and exercises may also occur throughout each risk category.

Risk Category 0: Pre-Incident Preparedness, No Local Transmission, Not in Mosquito Season

Prior to mosquito season, most Zika-related activities will be preventive or in preparation for confirmed locally-transmitted cases. Travel related or sexually transmitted cases are likely present in SC. DHEC is performing normal public health and environmental activities, including routine surveillance activities, prevention and preparation for confirmed travel-related or locally-transmitted cases. The most important preventive action is personal protection, which means using protective clothing (i.e., long pants and sleeves) and an approved mosquito repellent, preferably one containing DEET. No ICS structure is activated. The ACC, staffed by key personnel, is prepared to activate within 60 minutes of notice (per PHEP Capability 3, Function 2, Measure 1, dated March 2011).

Risk Category 0: Pre-Incident Preparedness Activities. No Local Mosquito Transmission. Not in Mosquito Season.	
COMMAND, CONTROL AND COORDINATION	
Actions	**Responsibility**
☐ Develop guidance documents and guide planning for SC to prepare for and respond to Zika disease. ☐ Develop, validate and maintain contacts for all state and county agencies. ☐ Monitor CDC and other state developments, updates, and situations. ☐ Be prepared to activate the DHEC ICS structure and ACC. ☐ Coordinate and conduct seminars, workshops, and exercises. The DHEC Office of General Counsel will provide legal advice and review documents. ☐ Be prepared to activate RCCs. ☐ Be prepared to establish liaison to and assist local government.	**Lead:** Office of Public Health Preparedness (OPHP) **Supporting:** Bureau of Disease Control (BDC); Maternal Child Health (MCH); Environmental Affairs (EA); Client Services; Office of General Counsel (OGC); Legislative Affairs
COMMUNICATIONS/ OUTREACH	
Actions	**Responsibility**
☐ Coordinate DHEC external and internal communications strategy and activities. ☐ Be prepared to facilitate or establish a JIC to facilitate local and state synchronized messaging within 12 hours if required.	**Lead:** Communications **Supporting:** MCH/EA BDC

☐ Research existing CDC and state education and outreach materials and identify messaging gaps. ☐ Develop and update event timeline for community engagement items past and future (speaking events/forums etc.) ☐ Post materials to Zika Plan SharePoint site ☐ Conduct public education campaigns on topics such as personal protection, source-reduction, and tire waste management and neighborhood clean-up measures to increase awareness and community involvement. Target: Pregnant women, travelers, health care providers and general public and businesses. Include sexual transmission messages. ☐ Maintain dedicated publicly accessible Zika webpage. Solicit and include information from the Division of Acute Disease Epidemiology (DADE), Maternal & Child Health (MCH) and Bureau of Environmental Health Services (BEHS), who will ensure clinical and technical information is up to date. See www.scdhec.gov/zika. ☐ Create messaging for general public based on CDC guidance. *(Include community-wide source reduction, neighborhood cleanup, prevention and personal protection themes.)* Solicit and include information from DADE and Environmental Affairs. ☐ Issue news release in late winter promoting Zika awareness and prevention for travelers on spring break and mission trips. Promote interviews to media statewide. ☐ Update Zika scripts for CAREline.	
☐ Create and deploy guidance for health care providers. *(Include case definition and reporting instructions.)*	**Lead:** BDC **Supporting:** MCH
☐ Create and deploy messaging points to educate elected officials, local governments and community leaders. ☐ Coordinate messaging with County Administrators and City Managers as appropriate.	**Lead:** Communications **Supporting:** Legislative Affairs Agency SMEs
☐ Coordinate messaging with regional and local health officials.	**Lead:** Client Service **Supporting:** BDC
☐ Coordinate messaging with state and local emergency management or designated points of contact.	**Lead:** OPHP
☐ Create and deploy messages for all DHEC employees.	**Lead:** Communications

☐ Identify key partners, stakeholders and community groups to help distribute Zika educational materials.	**Lead:** Communications **Supporting:** OPHP; DADE; Office of Health Equity
DISEASE SURVEILLANCE/ RESPONSE	
Actions	**Responsibility**
☐ Conduct surveillance for cases of Zika virus disease, to include travel-associated cases, locally acquired cases, and cases of maternal-fetal transmission. Travel-associated cases include those travelers returning from affected areas and their sexual contacts. ☐ Maintain surveillance and testing algorithms, with the goal of preventing or promptly identifying locally transmitted cases. ☐ Maintain updated internal guidelines, procedures, and data management activities as well as external communications conducted through the DHEC website and distributed via other appropriate forms of outreach. ☐ Provide guidance to regional epidemiology staff to include specific guidelines for data management and communication of test approvals and results reporting. ☐ Provide notification of a positive case to responders as outlined in the DHEC notification process.	**Lead:** BDC **Supporting:** Client Services
☐ Provide consultation to physicians with questions about the evaluation of patients who might have been exposed and require testing. ☐ Provide up-to-date guidance to healthcare providers regarding testing, specimen collection and clinical management. ☐ Provide updates on Zika case numbers per normal operating procedures and provide monthly updates to the Zika case map. Timing and content of data release will be determined in consultation with DADE, BDC, Health Services, Media Relations, etc. Data security and confidentiality rules will apply. ☐ Assess DHEC/DADE/Regional Epidemiologic investigative capabilities. ☐ Create messaging to include the case definition and reporting instructions for blood banks. ☐ Prior to the beginning of the mosquito season distribute message(s) regarding mosquito-borne diseases. Other education and outreach would be considered for SCHA, other medical organizations, IPs, social media, and news releases.	**Lead:** BDC **Supporting:** Client Services
LABORATORY/ TESTING	

Actions	Responsibility
☐ Evaluate laboratory surge capabilities for testing increased numbers of laboratory samples. ☐ Establish contract with private labs and other public health laboratories for overflow testing. ☐ Continue protocol development. ☐ Establish data sharing procedures with other public health laboratories.	**Lead:** BOL
VECTOR SURVEILLANCE/ COORDINATION	
Actions	**Responsibility**
☐ Maintain explanation of recommended mosquito abatement response to travel-related Zika case for local government awareness and preparation. ☐ Maintain list of mosquito control service companies and local government mosquito control programs and update this list annually. ☐ Determine and update vector surveillance strategies.	**Lead:** EA; State Public Health Entomologist
CLIENT SERVICES/ MATERNAL CHILD HEALTH	
Actions	**Responsibility**
☐ Establish a birth registry and determine guidelines for qualification. ☐ Establish a baseline prevalence of microcephaly through the use of existing birth defects registries or medical records abstractions in order to detect an increase in this birth defect potentially due to effects of Zika virus infection. ☐ Assess if projected needs (medical and support) for families with a child with microcephaly or another major birth defect have been planned for, and if there is a system in place with the capacity to adequately address those needs. ☐ Educate pregnant women about modes of transmission (mother/infant), the symptoms of Zika virus infection, the possible association with adverse pregnancy outcomes and that Zika virus causes microcephaly, and other serious brain defects. ☐ Ensure training and educational material is appropriately augmented with information on jurisdictional requirements and distribute to healthcare providers of infants/children who may have been prenatally or perinatally exposed to Zika virus.	**Lead:** MCH **Supporting:** Client Services

☐ Provide clinician outreach and education, seek to reduce pregnancies among women of reproductive age (i.e., avoiding or delaying). ☐ Develop and support preconception care practices that can help reduce the risk of sexual transmission of Zika virus and reduce unintended pregnancies through provision of effective contraception. ☐ Educate the public and clinicians so they are aware of the risks of sexual transmission of Zika virus. Promote abstinence or consistent condom use among vulnerable populations.	**Lead:** MCH **Supporting:** Client Services
☐ Ensure that obstetric providers understand the critical need for information from the U.S. Zika Pregnancy Registry for updating recommendations for clinical care, planning for services for pregnant women and families affected by Zika virus, and improving prevention of Zika virus infection during pregnancy. ☐ Ensure obstetric providers are familiar with CDC guidelines, stay aware of when testing is indicated, how to arrange for testing, and can evaluate and implement follow-up of women with possible Zika virus infection in accordance with these guidelines. ☐ Ensure that obstetric providers are aware of CDC's clinical consultation service and understand that they should coordinate with their state and local health department.	**Lead:** MCH **Supporting:** BDC

Risk Category 1: Pre-Incident Preparedness, No Local Transmission, Mosquito Season

This period of prevention, response, and mitigation activities coincides with biting activity of *Aedes aegypti* (Yellow Fever mosquito) or *Aedes albopictus* (Asian tiger mosquito). Mosquito season in SC typically lasts from March 1 through November 30. This period also includes the presence within the state of confirmed Zika cases that are determined to be travel-related, sexually or other body fluid transmitted cases. No ICS structure is activated. The ACC, staffed by key personnel, is prepared to activate within 60 minutes of notice (per PHEP Capability 3, Function 2, Measure 1, dated March 2011). **Activities from Risk Category 0 continue.**

Risk Category 1: Pre-Incident Preparedness Activities or Non-Local Transmission Activities Only. No Local Mosquito Transmission. In Mosquito Season.	
COMMAND, CONTROL AND COORDINATION	
Actions	**Responsibility**
☐ Develop, validate and maintain contacts for all state and county agencies. ☐ Monitor CDC and other state developments, updates, and situations. ☐ Be prepared to activate the DHEC ICS structure and ACC. ☐ Coordinate and conduct seminars, workshops, and exercises. ☐ Provide reports and updates to DHEC Director as requested.	**Lead:** OPHP **Supporting:** Health Services; EA
☐ Develop analysis and report of Zika presence in mosquitoes.	**Lead:** State Public Health Entomologist **Supporting:** EA; OPHP
☐ Be prepared to activate RCCs. ☐ Be prepared to establish liaison to and assist local government.	**Lead:** OPHP **Supporting:** Client Services
COMMUNICATIONS/ OUTREACH	
Actions	**Responsibility**
☐ Distribute an updated Zika response guidance to local emergency managers, elected officials and ESF-8 partners.	**Lead:** OPHP **Supporting:** Client Services

☐ Provide routine web updates to include: Daily case count updates by 4:30 p.m. Weekly updates on response and preparedness each Friday. Provide monthly updates to the on line Zika disease map.	**Lead:** Communications **Supporting:** DADE; MCH
DISEASE SURVEILLANCE/ RESPONSE	
Actions	**Responsibility**
☐ Work with blood centers and other partners to ensure implementation of FDA's revised blood safety recommendations.	**Lead:** State Epidemiologist or their designee
☐ Work with regional epidemiology staff and health care providers to heighten awareness in evaluating patients of suspected locally-acquired transmission of Zika virus. This evaluation will include: • Symptom and exposure history; • Assessment of history of travel, transfusion or transplantation, and illness in sexual contacts, with suspicion of local transmission increasing if none of these factors are identified in a person with symptoms compatible with Zika; • Patient's likely geographic area of risk for exposure (home, work, public space, or other area). ☐ Consider enhanced surveillance strategies to identify cases of local transmission including surveillance around travel-associated cases (household contacts, sexual partners, etc.), investigations of unusual clusters of rash illness; and implementation of expanded testing criteria for clinically compatible cases with no known exposure.	**Lead:** BDC
☐ Assess and enroll cases meeting the U.S. Zika Pregnancy Registry (ZPR) criteria and report to the CDC at established intervals.	**Lead: BDC** **Supporting:** MCH

☐ Implement information and education distribution including the following options: • HAN on Zika and other mosquito-borne diseases. • Work with SC Dept. of Social Services to provide a letter to child care centers for further distribution to students and parents. • Work with Dept. of Education and school nurses to distribute information to students and parents. • Social media posts • News releases • Distribution of provider information through SCHA, hospital IPs, and other medical organizations within the state. ☐ Send important health care information directly to health care providers across the state	**Lead:** BDC **Supporting:** HAN Coordinator
☐ Provide clinical guidance to medical providers, including obstetricians/gynecologists and pediatricians. ☐ Facilitate meetings for healthcare providers	**Lead:** BDC **Supporting:** State Epidemiologist; MCH
☐ Work with healthcare providers to provide information to cases to take precautions to avoid exposure to local mosquito populations based upon approved preventive recommendations.	**Lead:** State Epidemiologist **Supporting:** MCH; Client Services
☐ Work with Communications/Outreach to update talking points as information about the Zika virus is learned. ☐ Update Zika scripts for CAREline.	**Lead:** BDC **Supporting:** Communications
LABORATORY/ TESTING	
Actions	**Responsibility**
☐ Provide guidance from CDC to staff on sample collection and reporting.	**Lead:** BOL
VECTOR SURVEILLANCE/ COORDINATION	
Actions	**Responsibility**

☐ Advise local government about recommended mosquito abatement response for travel related Zika case ☐ Maintain list of mosquito control service companies and local government mosquito control programs and update this list annually. ☐ Determine and update vector surveillance strategies.	**Lead:** EA **Supporting:** BOL; BDC; Client Services
CLIENT SERVICES/ MATERNAL CHILD HEALTH	
Actions	**Responsibility**
☐ Provide reporting guidance to health care community on sample collection. ☐ Obtain reports from health care community.	**Lead:** BDC **Supporting:** BOL
☐ Identify/reduce barriers to access and deploy strategies to help women and men who wish to avoid or delay pregnancies choose and use appropriate contraceptive methods correctly and consistently. ☐ Develop a plan for the supply and distribution of condoms.	**Lead:** MCH **Supporting:** Client Services
☐ Create plans to work with community organizations and providers of high-risk groups. ☐ Create strategic plan to support the Early Intervention community that will support infants born with birth defects associated with Zika virus.	**Lead:** MCH

Risk Category 2: Confirmed Local Transmission, Single Case or Household, Incident Response.

Prevention, response, and mitigation activities in this period **occur when a single, locally acquired case, or cases clustered in a single household and occurring <2 weeks apart** are identified in SC. (See Attachment C, the DHEC Internal Notification Process Flow Chart).

The DHEC ICS (see Figure 2 above), ACC, and affected regional RCC activate. Unaffected regional RCCs are prepared to activate as required. Operational periods are established, and Incident Action Plans and Situation Reports are developed for each operational period. These periods are daily (24 hours) until modified by the Incident Commander. The Organization Assignment List (FEMA Form 203) **Attachment A** will be utilized as an organizational chart for the Incident Command structure of the evolving situation. The Zika Task Force will assemble to advise the ICS Command Staff on situational and procedural updates as soon as possible following activation. Further needs and roles for the Task Force will be determined by the Incident Commander or Chief of Operations.

Within 4 hours of identifying local transmission, the Regional Health Director will reach out to the affected County Administration and a meeting time and location will be determined for the arrival of the liaison team. The liaison team consists of the Regional Health Director, Regional OPHP Director or their designee, designated Environmental Affairs representative and designated Public Information Office representative. Under the direction of the ICS Command Staff, the liaison team will facilitate multi-directional information sharing, provide technical assistance, and support joint messaging to the public. The team will be augmented as required or upon request. Continuous liaison remains in effect until otherwise directed by the ACC.

Critical actions include using information gathering through surveillance and investigation activities to provide information and education to health care providers, local governments, including mosquito-control programs, the general public and other stakeholders. DHEC will send important messages via the Health Alert Network to health care providers who may need information about identifying and reporting Zika virus infections. (See **Attachment B**, CDC Testing Flow Chart).

Activities from Risk Categories 0 and 1 continue during this period. Termination of this period will occur after 45 days (3 mosquito incubation periods) without the identification of additional newly identified locally transmitted cases.

Risk Category 2: Confirmed Local Transmission. Single, locally acquired case, or cases clustered in a single household and occurring < 2 weeks apart. Incident Response.	
COMMAND, CONTROL AND COORDINATION	
Actions	**Responsibility**
☐ Activate the agency ICS and ACC. ☐ Contact Governor (Immediate Notification). ☐ Identify state and local partners and establish daily communications. ☐ Establish contact with ESF 8 partners and determine communication plan. ☐ Activate RCC in affected region. ☐ Establish liaison to and assist local government in affected region. ☐ Be prepared to activate RCCs in unaffected regions. ☐ Provide information updates to regional partners, governments and affiliated agencies in unaffected regions as required or requested. ☐ Regional Health Director calls County Administration to set up meeting for liaison team.	**Lead:** OPHP; ICS Designated Personnel **Supporting:** Client Services
COMMUNICATIONS/ OUTREACH	
Actions	**Responsibility**
☐ Notify affected state agencies. ☐ Notify affected local governments (Immediate Notification). ☐ Notify elected officials (Immediate Notification). ☐ Notify blood centers in affected area (Immediate Notification). ☐ Notify supporting partners (SCHA, Red Cross, United Way, LLR, and Municipal Association). ☐ Notify CDC's EOC (Immediate Notification). ☐ Notify healthcare providers in affected area (Immediate Notification through HAN System).	**ICS** Liaison Officers; Operations Section – Epi Branch; Planning

☐ Issue news release in coordination with local government. ☐ Hold initial press conference in affected area with key partners. ☐ Intensify outreach activities in the county to increase attention to Zika virus transmission risk and personal protection measures (flyers, community leaders and social media). ☐ Conduct enhanced communication efforts via local media, including TV, radio, print, agency blog and social media to: • Alert public of transmission zone as defined by Operations. • Alert the public, including pregnant women, to the risk of local mosquito transmission for a specified area and time frame. • Recommend all area residents take precautions to prevent mosquito breeding on their property and in their community, and to take measures to prevent mosquito bites. • Advise couples in the affected area to use condoms or abstain from sexual contact. ☐ Update and finalize FAQ document and distribute widely through media sources. ☐ Use social media to respond in real-time to constituent concerns and misinformation. ☐ Monitor local news stories and social media for accuracy and to identify messaging gaps. Make adjustments to communications as needed. ☐ Provide a daily update at 2 p.m. on the agency's website, including case counts, summary of investigation activities and new guidance to the public and health care providers. ☐ Hold a twice daily call with local EMD PIOs to ensure coordinated messaging. ☐ Coordinate with SCHA, SCMA, Department of LLR, SC Association of Counties and the MASC to discuss further targeted messages to health care providers and the general public as needed. ☐ DHEC physicians will hold media briefings as requested. ☐ News stories will be placed in major SC daily newspapers, television stations in all major metro markets as needed. ☐ DHEC will provide continuously updated information online at www.scdhec.gov/zika.	**ICS** Public Information Officer Operations Section – Epi Branch

DISEASE SURVEILLANCE/ RESPONSE	
Actions	**Responsibility**
☐ In coordination with the CDC, evaluate working with local partners to conduct surveillance activities to identify clinically compatible cases. ☐ In coordination with the CDC, define transmission zone based upon epidemiologic parameters. ☐ Enhance local surveillance for human cases, to include, for example, conducting local clinician outreach and syndromic surveillance in nearby hospitals and urgent care centers. ☐ Determine current capabilities of blood donation organizations in affected area. ☐ Update and deploy CAREline script ☐ Investigate all known cases to determine the timing and source of infection (travel-related, sexual, mosquito-borne, or other) through interviews with suspect cases, family, and possibly primary care providers. ☐ Continue surveillance, including strategies such as assessing for illness among household members and sexual partners of cases. ☐ Communicate with healthcare providers to increase awareness and recognition of persons with Zika-compatible symptoms. ☐ Work with healthcare providers to counsel individuals with locally transmitted Zika to take precautions to avoid exposure to local mosquito populations based upon approved preventive recommendations. ☐ Compile weekly updates of disease patterns in the state that provides an analysis by county of residence. • Prepare a hard copy map of disease incidence. • Prepare descriptive epidemiology tables and/or maps regarding the distribution of cases (example: attack rates by county) to assist in describing the distribution of Zika.	**ICS** Operations Section – Epi Branch
LABORATORY/ TESTING	
Actions	**Responsibility**
☐ Finalize and as needed activate contingency plan for specimen transportation and storage within the lab (Considerations: Transportation of specimens out of state to contracted labs. Supporting Reference: SOP created by Client Services for Urine Collection).	**ICS** Operations Section – Lab Branch

VECTOR SURVEILLANCE/ COORDINATION	
Actions	**Responsibility**
☐ Discuss mosquito control abatement and surveillance activities with mosquito control provider and/or local government. ☐ Maintain list of mosquito control service companies and local government mosquito control programs and update this list annually. ☐ Determine and update vector surveillance strategies in response to local transmission case. ☐ Continually assess need for additional vector control activities.	**ICS** Operations Section – Environmental Branch
CLIENT SERVICES/ MATERNAL CHILD HEALTH	
Actions	**Responsibility**
☐ Activate CAREline. ☐ Mobilize health educators and community outreach staff to deploy to affected area(s). ☐ Consider urine collection plan if recommended by CDC.	**ICS** Operations Section – Client Services/MCH Branch/EA
☐ Ensure that access to effective contraceptive methods is available in communities for women who are avoiding or delaying pregnancy. ☐ Utilize Text4Baby to inform SC pregnant women about areas with local transmission. Sign up additional pregnant women for Text4Baby. ☐ Distribute educational and outreach materials in affected area(s) and at local health department(s), including: door hangers, pamphlets and Zika kits for pregnant women.	**ICS** Operations Section -- Client Services/MCH Branch

Risk Category 3: Confirmed Multiperson Local Transmission, Major Incident Response.

Prevention, response, and mitigation activities in this period occur when **multiple cases of locally-transmitted Zika virus disease have been confirmed in SC with onsets occurring ≥ 2 weeks apart but within an approximately 1 mile diameter.** There may be individual cases or case clusters in a single household, neighborhoods or communities. Activities from Risk Categories 0-2 continue.

The DHEC ICS (see Figure 2 above), ACC, and affected regional RCC(s) remain active. Unaffected regional RCCs are prepared to activate as required. As a major incident, efforts of the DHEC ICS may be increased or supplemented by additional actions directed or approved by the Office of the Governor. These may include a Declaration of a State of Emergency, Public Health Emergencies, establishing a Unified Command/ Unified Command Group, activating the State Emergency Operations Plan (SC EOP), and/ or activating parts or all of the State Emergency Response Team (SERT)/ State Emergency Operations Center (SEOC). Regardless of additional response measures, the DHEC ICS, ACC, and RCCs will continue to perform all roles and responsibilities within this plan. Additional tasks will be conducted by DHEC personnel in accordance with plans associated to these measures in accordance with the references shown in this plan. **Activities from Risk Categories 0 - 2 continue during this period.** Termination of this period will occur after 45 days (3 mosquito incubation periods) without the identification of additional newly identified locally transmitted cases.

Risk Category 3: Confirmed Multiperson Local Transmission. Major Incident Response.	
COMMAND, CONTROL AND COORDINATION	
Actions	**Responsibility**
☐ Coordinate all activities with the Unified Command and/ or SERT/ SEOC as required. ☐ Continue daily communications with state and local partners. ☐ Maintain contact with ESF 8 partners. ☐ Reassess gap analyses for needs assessments and identify what additional resources we will need.	**ICS** Command Structure
COMMUNICATIONS/ OUTREACH	
Actions	**Responsibility**
☐ Implement a daily press conference. ☐ Reinforce abatement guidance message through local media channels. ☐ Distribute FAQ document widely through media sources (content comes from DADE/EPI/EA). ☐ Establish community meeting locations and times in impacted areas for information dissemination.	**ICS** Public Information Officer

DISEASE SURVEILLANCE/ RESPONSE	
Actions	**Responsibility**
☐ Continue surveillance for human cases in the affected jurisdictions to include clinician outreach and syndromic surveillance as described in previous phases. ☐ Assist with intensified surveillance for Zika virus disease in expanded geographic areas at risk for transmission and expand assistance for epidemiologic investigations, including considerations for tracking neurologic complications. These efforts may include sentinel surveillance for Guillain-Barré syndrome or febrile rash illness. ☐ Review and maintain knowledge of new federal guidance documents that are released. ☐ In coordination with Environmental Branch of Operations, assist in the reinforcement of abatement guidance messages through HAN Channels and emergency management resources. ☐ Communicate with Blood donor centers regarding geographic area of Zika interventions, in order to consider implementing appropriate blood safety actions.	**ICS** Operations Section – EA Branch
LABORATORY/ TESTING	
Actions	**Responsibility**
☐ Activate laboratory surge testing plan as needed Mechanisms for data sharing and shipping need to be determined (Reporting process ironed out with DADE and BOL) ☐ Provide guidance on sample collection and reporting ☐ Expand laboratory data management capacity as necessary	**ICS** Operations Section – Lab Branch
VECTOR SURVEILLANCE/ COORDINATION	
Actions	**Responsibility**
☐ Determine and update vector surveillance strategies in response to local transmission cases. ☐ Continually assess need for additional vector control activities. ☐ At conclusion of local transmission event, assess statewide mosquito control capabilities of local governments and mosquito control providers to determine if improvement may be facilitated.	**ICS** Operations Section – EA Branch

CLIENT SERVICES/ MATERNAL CHILD HEALTH	
Actions	**Responsibility**
☐ Seek input from DHEC OB and Pediatric Advisory Committees ☐ Provide treatment and management guidelines to including obstetricians/gynecologists and pediatricians. ☐ If needed, develop just in time training for volunteers assisting with prevalence studies that require urine or other specimen collection. ☐ Develop/deploy communications for pregnant women and their obstetric and pediatric providers in the local areas of transmission. ☐ Develop/implement plans for community outreach to advise use of condoms or other barriers to prevent infection or abstain from sexual contact with pregnant women. ☐ Issue state-wide guidance advising pregnant women to postpone travel to the county/jurisdiction.	**ICS** Operations Section – Client Services/MCH Branch

Critical Information Requirements

Timely and accurate information is critical to successful response to one or more cases of confirmed locally-transmitted Zika. The following list includes information that will be reported in order to facilitate a timely and proper response:

- Suspected or confirmed cases of Zika virus disease;
- Presumptive and confirmed test results;
- Known locations of Zika transmission;
- Defined areas of active Zika transmission;
- Identified gaps in public health service delivery;
- Identified gaps in vector control/ abatement capability.

Authorities

- South Carolina Code of Regulations, Regulation 58-101 (State Government Preparedness Standards).
- South Carolina Code of Laws, Title 44, Chapter 4, Article 1; Section 44-4-100 thru 570 (Emergency Health Powers Act).
- South Carolina Code of Laws, Title 44, Chapter 1, Section 44-1-80 (Department of Health and Environmental Control – Duties and Powers of Board as to Communicable or Epidemic Disease).

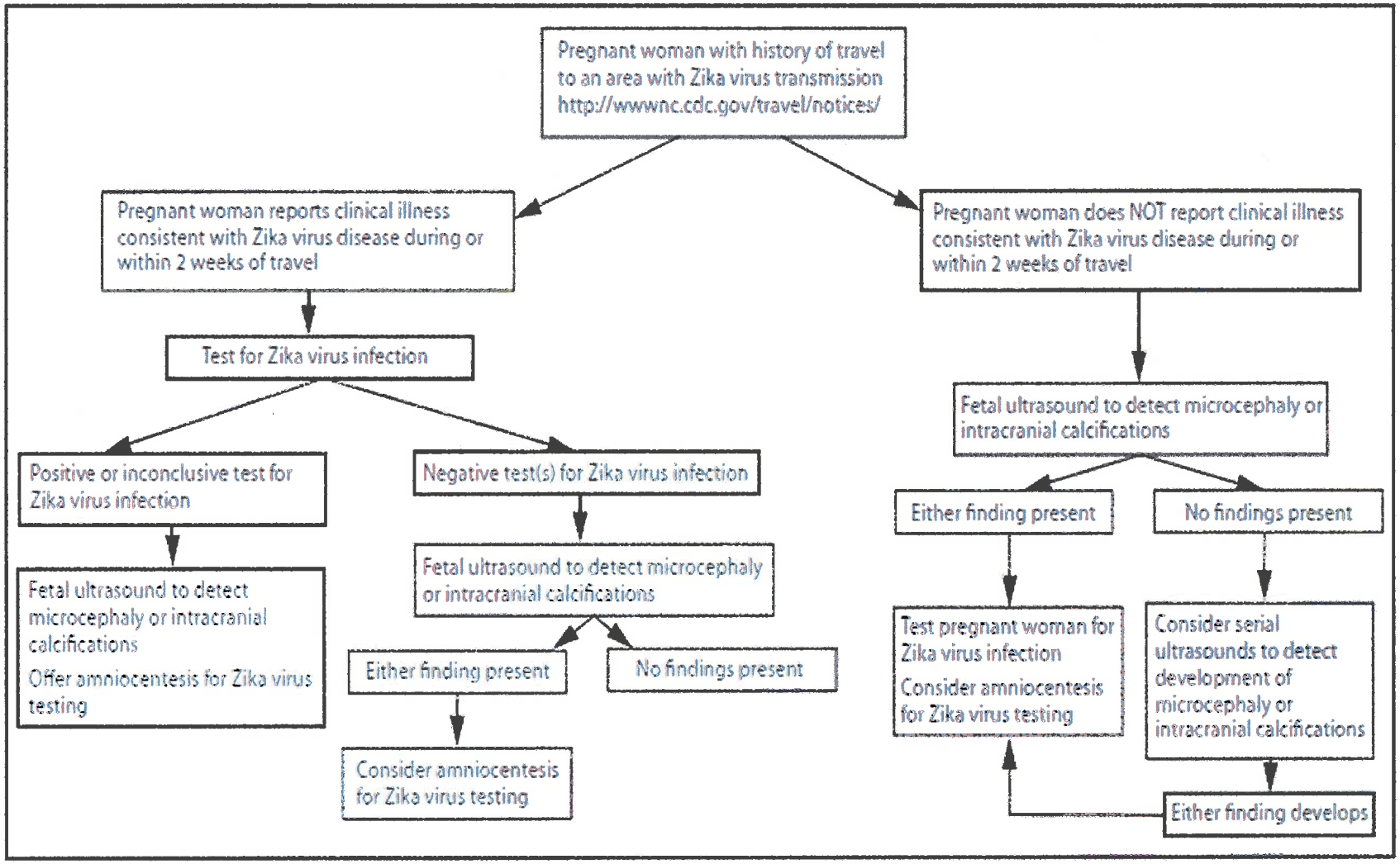
References

- United States Government Zika Virus Disease Contingency Response Plan
- CDC's National Information can be found at: http://www.cdc.gov/zika/
- CDC Guidelines for Health Care Providers Caring for Infants and Children with Possible Zika Infection can be found here: http://www.cdc.gov/mmwr/volumes/65/wr/mm6507e1.htm#suggestedcitation
- WHO Guidance on Assessment of Infants with Microcephaly can be found here: http://www.who.int/csr/resources/publications/zika/assessment-infants/en/
- WHO Guidance on Guillain-Barre Syndrome in the Context of Zika virus can be found here: http://www.who.int/csr/resources/publications/zika/guillain-barre-syndrome/en/
- WHO Guidance on Breastfeeding in the Context of Zika virus can be found here: http://www.who.int/csr/resources/publications/zika/breastfeeding/en/
- CDC Guidelines for Collection and Submission of Body Fluids for Zika virus Testing can be found here: http://www.cdc.gov/zika/hc-providers/body-fluids-collection-submission.html
- ASPR TRACIE Zika virus Resource can be found here: https://asprtracie.hhs.gov/documents/ASPR-TRACIE-Zika-Virus-Disease-Resources-At-Your-Fingertips.pdf
- FDA Fact Sheet for Health Care Providers: Interpreting Zika MAC-ELISA Results can be found here: http://www.fda.gov/downloads/MedicalDevices/Safety/EmergencySituations/UCM488041.pdf

Appendix A-ORGANIZATION ASSIGNMENT LIST

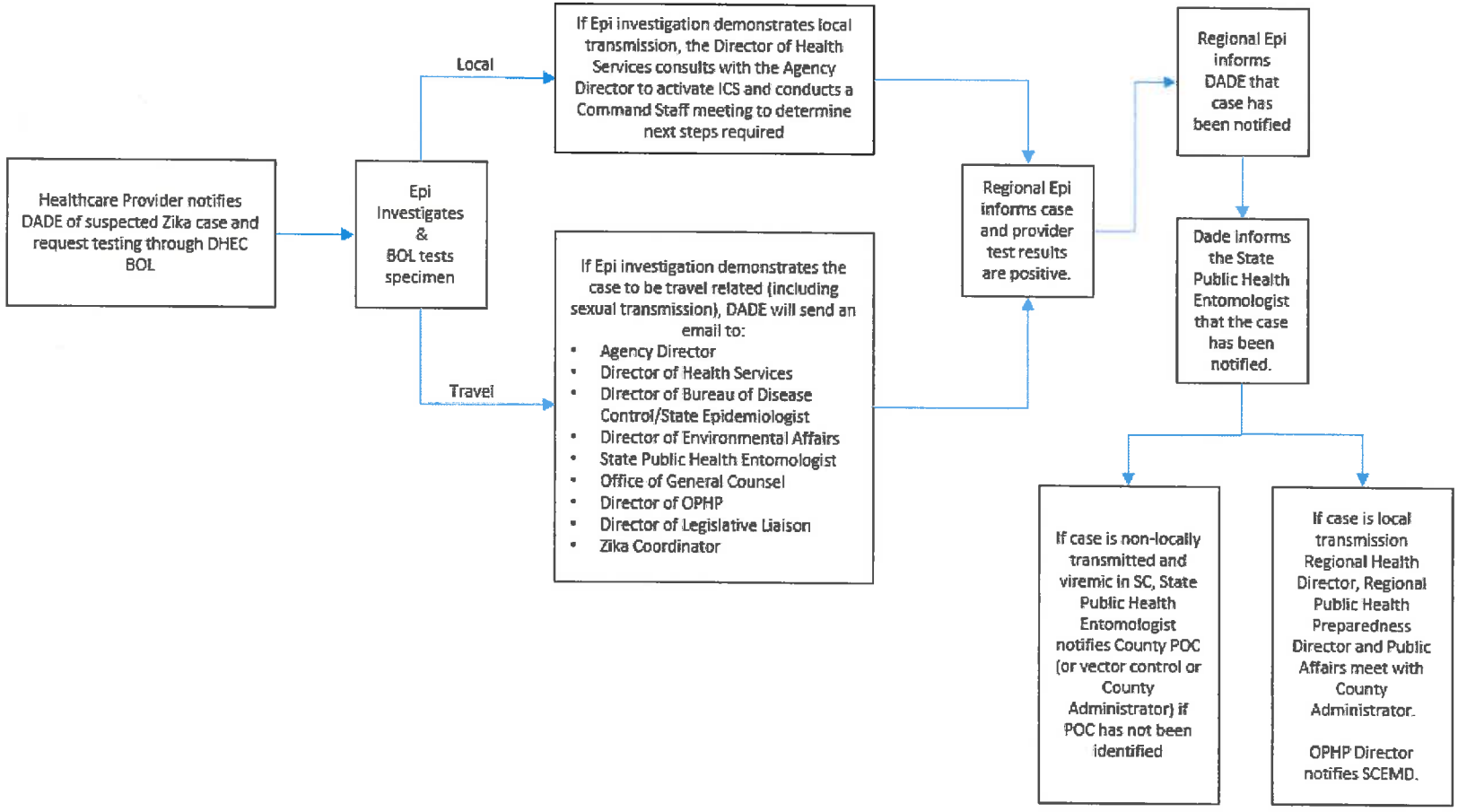
Event: Zika Preparedness and Response		**Operations Section**	
Date:	**Time: N/A**	Chief	*Health Services Director*
Operational Period:		Deputy	*State Epidemiologist*
Incident Commander and Staff		**Operations Branch I - Epidemiology**	
Incident Commander	*Agency Director*	Branch Director	*State Epidemiologist*
Deputy	*Health Services Director*	Deputy	*Assistant State Epidemiologist*
Safety Officer		Division/Group	
Information Officer	*Chief Communications Officer*	Division/Group	
State Legislator Liaison	*LA Bureau Chief*	Division/Group	
Planning Section		**Operations Branch II - Environmental**	
Chief	*OPHP Director*	Branch Director	*Director of EA*
Deputy	*Planning Director*	Deputy	*Bureau Chief of EHS*
Resource Unit	*OPHP Planner*	Division: Vector Control	*State Public Health Entomologist*
Situation Unit	*OPHP Planner*		
Documentation Unit			
Demobilization Unit			
Administration/Finance Section		**Operations Branch III –Laboratory**	
Branch Director	*COO*	Branch Director	*Director of BOL*
Deputy	*Chief Financial Officer*	Deputy	*Division Director, State Lab Microbiology*
Time Unit		Division/Group	
Procurement Unit		Division/Group	
Comp/Claims Unit		Division/Group	
Cost Unit		Division/Group	
Logistics Section		**Operations Branch IV – Client Services/MCH**	
Chief	*Resource Director*	Branch Director	*Director of Client Services*
Deputy	*Logistics Coordinator*	Deputy	*Regional Health Director*
Service Branch Dir.		Division/Group	
Support Branch Dir.		Division/Group	
Supply Unit		Division/Group	
Facilities Unit		Division/Group	
Ground Support Unit			
Communications Unit		**Technical Specialists**	
Medical Unit		Legal	*OGC Staff*
Security Unit		Legal	*OGC Staff*
Food Unit		Human Resources	*Director of HR*

Appendix B - Zika Testing Flow Chart from CDC as of 2/22/2017

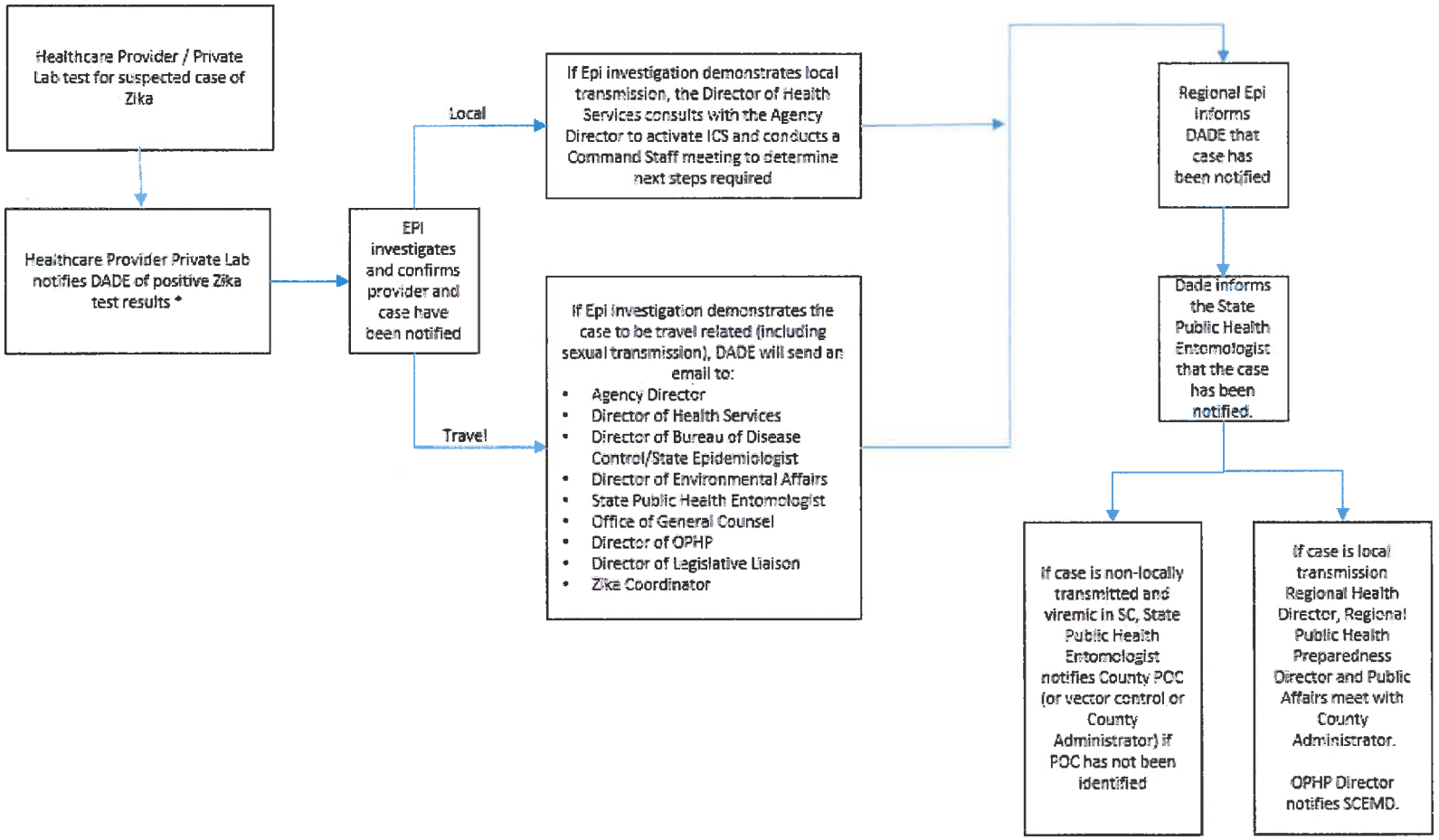


Appendix C - DHEC Notification Processes

DHEC Zika Notification Process for Specimen Tested by DHEC BOL

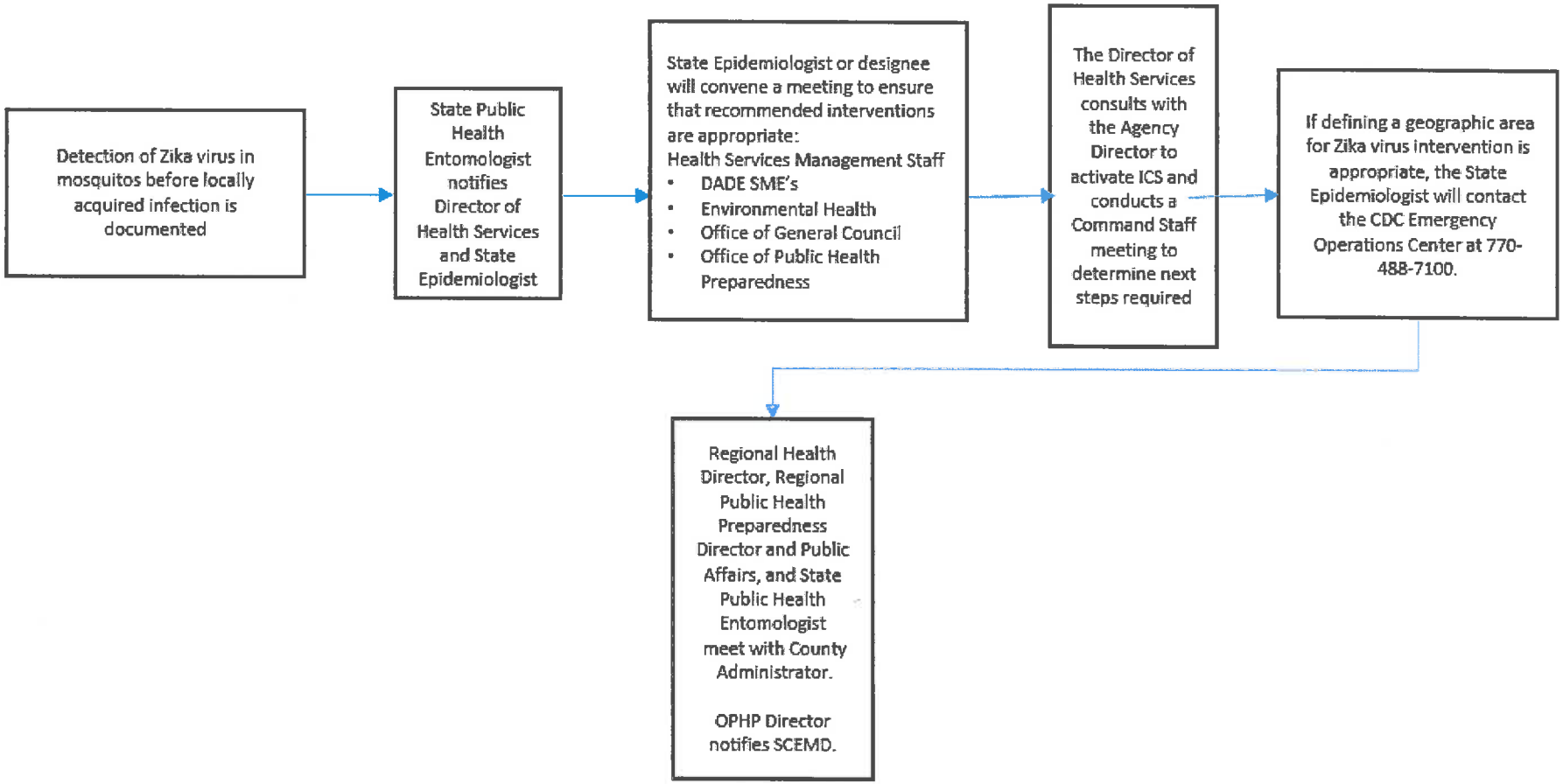


DHEC Zika Notification Process for Specimen Tested by Private Lab



* Note: Time laps may occur in this instance.

DHEC Zika Notification Process for Mosquito that Tested Positive



Appendix D - County and Municipal Contact List

	Primary Contact		Secondary Contact	
County	**County Zika POC**	**Phone**	**County Admin/ EM**	**Phone**
Abbeville	William Blackwell	(864) 366-2400 x 2229	David Porter	(864) 366-6690
Aiken	Clay Killian	(803) 642-2012	Paul Matthews	(803) 642-1623
Allendale	Gidget Stanley-Banks	(803) 584-4081	Jo Ann Ussery Hill	(803) 584-3438
Anderson	Taylor Jones	(864) 260-4149	Rusty Burns	(864) 260-4031
Bamberg	Brittany Barnwell	(803) 245-4313 (Office) (803) 596-2743 (Cell)	Joey Preston	(803) 245-5191
Barnwell	Roger Riley	(803) 541-2013	F. Pickens Williams	(803) 541-1010
Beaufort	Greg Hunt	(843) 255-5800	Neil Baxley	(843) 255-4000
Berkeley	Tom Smith	(843) 719-4166 (Office) (843) 729-4860 (Cell)	William Peagler	(843) 719-4094
Calhoun	Ted Felder	(803)874-2435 (Office) (803) 331-9580 (Cell)	Bill Minikiewicz	(803) 250-5689
Charleston	Fran Carson	(843) 202-7882/ (843) 412-8684	Jason Patno	(843) 746-3800
Cherokee	Rick Peterson	(864) 487-2590	J. Holland Belue	(864) 902-2258
Chester	Eddie Murphy	(803) 377-4632 x 22 (803)209-0874	K. Shane Stuart	(803) 337-1020
Chesterfield	Herold Hainey	(843) 623-3362 (Office) (843) 910-7956 (Cell)	Denise Douglass	(843) 623-2535
Clarendon	Anthony Mack	(803) 435-9310	David Epperson	(803) 435-0135
Colleton	Suzanne Gant	(843) 549-5632	J. Griffin	(843) 549-5221
Darlington	Mike McDonald	(843) 398-4450 x 1102 / 616-0942	Marion C. Stewart	(843) 398-4100
Dillon	Moses Heyward	(843) 774-1414 / (843) 506-4973	W. Young	(843) 774-1401

	Primary Contact		Secondary Contact	
County	County Zika POC	Phone	County Admin/ EM	Phone
Dorchester	Mario Formisano	(843) 832-0341	Jason Ward	(843) 563-0100
Edgefield	Suzy Spurgeon	(803) 637-2123 (Office) (706) 631-5645	Thomas Paradise	(803) 637-4000
Fairfield	Jason Taylor	(803 815-4002	Phyllis Watkins	(803) 635-4444/5505/5057
Florence	Herbie Christmas	(843) 665-3053 / (843) 319-8031	Dusty Owens	(843) 665-7255
Georgetown	Sam Hodge	(843) 503-6954	Henry Hemingway	(843) 545-3006
Greenville	Damon Hubber	(864) 467-2680 x 1	Joe Kernell	(864) 467-7105
Greenwood	George McKinney	(864) 942-8553	Dereck Kinney	(864) 942-8683
Hampton	Susanne Peeples	(803) 914-2150/0010	Rose Dobson-Elliott	(803) 914-2100
Horry	Tom Garigen	(843) 915-5160	Randall Webster	(843) 915-5150
Jasper	Andrew Fulgham	(843) 717-3690	Wilbur Daley	(843) 726-7797
Kershaw	Gene Faulkenberry	(803) 425-1522 (Office) (803) 424-6942 (Cell)	Victor Carpenter	(803) 425-1500
Lancaster	Darren Player	(803) 320-0087	Steve Willis	(803) 416-9300
Laurens	Joey Avery	(864) 984-0812	Ernest Segars	(864) 984-5214
Lee	Alan Watkins	(803) 484-5321	Mike Bedenbaugh	(803) 484-5274
Lexington	Joseph Mergo	(803) 785-8100	Bo Davenport	(803) 785-8359
Marion	Jerry Williams	(843) 431-5009	G. Timothy Harper	(843) 423-3904
Marlboro	Steve Akers	(843) 479-5642 (Office) (843) 439-0285 (Cell)	Roy Allison	(843) 479-5642
McCormick	Chris Doolittle	(864) 465-2013 (Dispatch) (864)-602-1113 (Cell)	Columbus Stephens	(864) 852-2231
Newberry	Wayne Adams	(803) 321-2100	Michael Pisano	(803) 321-2180
Oconee	Scott Krien	(864) 638-4111 (Dispatch) (864)710-7027 (Cell)	T. Moulder	(864) 638-4245
Orangeburg	Odell Waddell	(803) 533-6166	Billy Staley	(803) 533-6265
Pickens	Denise Kwiatek	(864) 898-5362	Tom Hendricks	(864) 898-5845
Richland	Tammy Brewer	(803) 576-2425	Michael Kalec	(803) 576-3400
City of Columbia	Rick Blackmon	(803) 545-4229 (Office) (803) 391-5730 (Cell)		

	Primary Contact		Secondary Contact	
County	**County Zika POC**	**Phone**	**County Admin/ EM**	**Phone**
Saluda	Jake Starnes	(864) 445-2112	Josh Morton	(864) 445-2529
Spartanburg	Katherine O'Neill	(864) 596-2526	Doug Bryson	(864) 595-5366
Sumter	Erik Hayes	(803) 436-2158	Gary Mixon	(803) 436-2102
Union	Rob Fraim	(864) 466-4772	Joseph Hart	(864) 441-2219
Williamsburg	Renee Coker-Bryant	(843) 355-5195	Tiffany Cooks	(843) 354-9330/7016/6891
York	William Shanahan Jr.	(803) 684-8511	Chuck Haynes	(803) 326-2300
Fort Jackson	Anton Quist	(803) 751-5157 / (803) 751-5200		
Savannah River Site (SRS)	Dr. Monica Manigo-Johnson	(803) 557-4009 (Office) (803) 514-0455 (Cell)		
National Park Service (NPS)	Danielle Buttke (In Colorado)	(970) 267-2118 (Office) (970) 631-5084 (Cell)		
State Parks	Mark Dudley	(803) 734-0165 (Office) (803) 361-4382 (Cell)		

Appendix E - SC Blood Services Contact List

Organization	Contact Name	Phone Number	Email	Address
American Red Cross	Dr. Thomas Lightfoot (Medical Director)	704-562-5914	tom.lightfootmd@redcross.org	2425 Park Road Charlotte, NC 28203
AnMed Health	Kim Gerrald	864-512-1134	kim.gerrald@anmedhealth.org	800 North Fant Street Anderson, SC 29621
Biotest Pharmaceuticals Corporation	Marcela Magalhaes (Corporate Regulatory)	561-989-5743	mmagalhaes@biotestpharma.com	5800 Park of Commerce Blvd, NW Boca Raton, FL 33487
The Blood Connection	Denise Calloway (VP Quality Systems)	864-751-3059 x-3059	dcalloway@thebloodconnection.org	1099 Bracken Road Piedmont, SC 29673
Bon Secours St. Francis Hospital Blood Bank	Christine Gwinn (Blood Bank Lab)	843-402-1061	christine.gwinn@rsfh.com	2095 Henry Tecklenburg Drive Charleston, SC 29414
CSL Plasma, Inc	Harriett Williams (Center Manager)	803-254-2280	harriett.williams@cslplasma.com	215 Assembly Street Columbia, SC 29201
	Andrea Zeller (Center Manager)	864-962-4273	andrea.zeller@cslplasma.com	3221 W. Blue Ridge Drive Greenville, SC 29611
	Jonathan Knowles (Sr. Director Reg. Affairs and QA)	561-981-3723	affairs.regulatory@cslplasma.com	900 Broken Sound Parkway Suite 400 Boca Raton, FL 33487
Charles River Laboratories	John Dubczak (Operations Manager)	843-402-4900	john.dubczak@crl.com	1023 Wappoo Road, Ste 43-B Charleston, SC 29407
Department of Navy	Mary Hughes	843-228-2336	mary.a.hughes48.civ@mail.mil	One Pinckney Boulevard Beaufort, SC 29902

Organization	Contact Name	Phone Number	Email	Address
McLeod Regional Medical Center	Elizabeth Caldwell	843-777-2967	bcaldwell@mcleodhealth.org	555 East Cheves Street Florence, SC 29506
Greenville Memorial Hospital	Meri Guerry, MD (Blood Bank Lab)	864-455-7185	mguerry@ghs.org	701 Grove Road Greenville, SC 29605
Immunotek Bio Centers	Michael Messick	404-345-3570	mmessick@immunotek.com	3900 N. Causeway Ste 1200 Metairie, LA 70002
KEDPlasmas LLC	Derik Day	803-526-7300	dday@kedplasmausa.com	1843 Cherry Road Rock Hill, SC 29732
Lexington Medical Center Blood Bank	Susan Cockfield	803-791-2409 x-2441	skcockfield@lexhealth.org	2720 Sunset Boulevard West Columbia, SC 29169
Medical University Hospital Authority	Karen Garner	843-792-2671	garnerk@musc.edu	165 Ashley Avenue MSC 908 Charleston, SC 29425
Mount Pleasant Hospital	Christine Gwinn	843-724-2254	christine.gwinn@rsfh.com	316 Calhoun Street Charleston, SC 29401
Octopharma Plasma	Michelle Battle (Sr. Mgr. Regulatory Affairs)	704-654-4659	us2regulatoryalerts@octopharmaplasma.com	10 Gateway Corners Park, Ste 100 Columbia, SC 29203
OneBlood, Inc	Cindy Olivio	727-568-1203	lucinda.olivio@oneblood.org	10100 Dr Martin Luther King Jr St N St. Petersburg, FL 33716
Palmetto Health Richland	Paul Guerry (Lab Director)	803-434-2295	paul.guerry@ppspath.com	Five Richland Medical Park Columbia, SC 29203
	Dr. Larry Grant (Medical Director)	803-434-2295	larry.grant@ppspath.com	
Piedmont Medical Center	Anita Romano	803-985-4610	anita.romano@tenethealth.com	222 S. Herlong Avenue Rock Hill, SC 29732
Regional Medical Center of Orangeburg and Calhoun Counties Blood Bank	Jessica Meier (Blood Bank Supv.)	803-395-4802	jlmeier@regmed.com	3000 St. Matthews Road Orangeburg, SC 29118
Roper Hospital	Christine Gwinn	843-724-2254	christine.gwinn@rsfh.com	316 Calhoun Street Charleston, SC 29401

Organization	Contact Name	Phone Number	Email	Address
Walter L. Shepeard Community Blood Center	Eric Longacre (Asst. Director of QA)	706-737-4551	elongacre@shepeardblood.org	1533 Wrightsboro Road Augusta, GA 30904
Spartanburg Medical Center Blood Bank	Mara Richardson	864-560-7645	mrichardson@srhs.com	101 East Wood Street Spartanburg, SC 29303
Trident Medical Center	Stephanie Irick	843-847-4354	stephanie.irick@hcahealthcare.com	9330 Medical Plaza Drive Charleston, SC 29406
Department of Veterans Affairs William Jennings	Claudia Walker (Blood Bank Supv.)	803-776-4000 x-7371	claudia.walker@va.gov	6439 Garners Ferry Road Columbia, SC 29209
Department of the Army	Fred Hornick (QA Technologist)	803-751-2395	frederick.r.hornick.civ@mail.mil	4500 Stuart Street Fort Jackson, SC 29205

Appendix F – Human Disease Surveillance and Investigation Procedures

DADE Operating Procedures: Human disease surveillance for confirmed local transmission of Zika virus
Background: To date, none of the exotic arboviruses carried and transmitted by *Aedes aegypti* and *Aedes albopictus* are known to be circulating among humans or mosquitoes in South Carolina and the risk of the disease being introduced into the established *Aedes* mosquito populations from infected visitors and returning travelers is low. However, a single viremic person with dengue, chikungunya, or Zika who is subsequently bitten by a female *Ae. aegypti* or *Ae. albopictus* could conceivably start local disease transmission within a community.
Assumptions: There are several conditions and a sequence of events that would need to be in place for local transmission of dengue, chikungunya, or Zika to occur. These include:

1. An infected individual would need to return to a locality in South Carolina where there are *Ae. aegypti* and/or *Ae. albopictus* mosquitoes while still viremic.

   This period is typically:
   - 1-2 days before until 3-4 days after symptom onset for dengue,
   - 4-6 days after symptom onset for chikungunya, and
   - 3-5 days after symptom onset for Zika.

   Some people are asymptomatic. If the infected person returned more than a week after onset of illness, transmission of viruses from this person is less likely.
2. A female mosquito would need to bite the infected person while this person is viremic.
3. The mosquito would need to live approximately 7-10 days after taking a virus-infected blood meal to allow for the virus to multiply and migrate to the salivary glands (extrinsic incubation period); the lifespan of *Aedes aegypti* and *Aedes albopictus* in nature is not expected to exceed 30 days, but the survival time is temperature and humidity dependent.
4. The infected mosquito would need to bite one or more susceptible persons who become infected and then viremic, but may or may not become symptomatic. Both *Ae. aegypti* and *Ae. albopictus* typically take multiple blood meals during each gonotrophic cycle (the time between taking blood meals; 3.5-10 day intervals) and therefore an infectious female may contact multiple people over a short period of time.
5. This cycle would need to be repeated for sustained transmission to occur.

Note that detection of locally acquired human infection with dengue, chikungunya, or Zika virus may occur prior to *Aedes* mosquito detection. To those ends, local transmission of Zika virus can be identified in one of two scenarios:

- Scenario 1: Detection of Zika virus in *Aedes* mosquitoes before locally acquired human infection is documented, or
- Scenario 2: A locally acquired human infection is identified prior to detection of Zika virus in *Aedes* mosquitos.

Scenario 1: Detection of Zika virus in *Aedes* mosquitoes before locally acquired infection documented
Assumptions: An *Ae. aegypti* or *Ae. albopictus* mosquito sample that tests positive for Zika virus before any human case of locally acquired infection has been documented suggests that an infected individual returned from a region endemic for Zika virus while still viremic and was bitten locally by *Aedes* mosquitoes. In addition, the presence of locally infected mosquitoes suggests that the virus may be circulating in the environment at a low level and increases the threat for locally acquired human infection.

Operating Procedures:

- Internal notifications will follow the existing DHEC Notification Process.
    - The State Epidemiologist or designee will convene a meeting of Health Services Management staff to include:
        - DADE SMEs,
        - DHEC Entomologist,
        - Environmental Health,
        - Office of General Council,
        - Office of Public Health Preparedness.
- The purpose of the meeting will be to:
    1. Review if the Planning Assumptions listed above have been met, and
    2. Review the following factors to determine if defining a geographic area for Zika virus interventions is appropriate:
        - ☐ Human factors,
            - Number of cases identified and whether the incidence of cases is increasing or decreasing;
            - Known or suspected links between cases;
            - Ruling out sexual or other body fluid-associated transmission;
            - Geographic distribution of cases in an area (e.g., Clustered cases in an area would suggest a higher intensity of transmission);
            - Population density;
            - Multiple infections in a household, which may reflect a single prior transmission episode are of less concern than cases scattered in a neighborhood;
            - Privacy concerns (i.e., ensuring that individual case-patients cannot be identified).

        - ☐ Mosquito surveillance and control factors
            - Current vector surveillance data,
            - History of *Ae. aegypti* or *Ae. albopictus* in the area,
            - Presence of *Ae. aegypti* (greater concern) or *Ae. albopictus* (less concern),
            - Duration of mosquito breeding season remaining
            - Vector control interventions of sufficient intensity likely to eliminate infection incidence in areas where case exposure likely occurred

        - ☐ Environmental and ecologic factors
            - History of local dengue or chikungunya virus transmission in the area,
            - Area is within estimated geographic range of *Ae. aegypti* or *Ae. albopictus,*
            - Entire state is below 2000 meters in elevation (conditions are conducive to transmission),
            - Current or projected temperature supports vector activity,
            - Cases identified early (which are of more concern) or late (which are of less concern) in mosquito season.

        - ☐ Infrastructure in the area
            - Air conditioning;
            - Intact screens on windows and doors;
            - Non-secured water catchment systems.

If defining a geographic area for Zika virus intervention is appropriate, the following activities will occur:

- The State Epidemiologist will contact the CDC Emergency Operations Center at 770-488-7100. The purpose of this call will be to:
    1. Communicate the results of the review of factors to determine a potential geographic Zika virus intervention with the CDC, and

2. Determine if any additional support from the CDC is needed.

- The public and medical community will be notified of increased threat potential for arboviral infection while acknowledging that no locally acquired infection has yet been confirmed.
    - The public will be advised, via press release and social media messaging, to use mosquito bite prevention measures that have already been developed by DHEC.
    - A Health Alert Network (HAN) notification will be distributed to the medical community to encourage health care providers to consider Zika in patients with compatible illness. The HAN will also reiterate the requirement to report promptly all suspect, probable, or confirmed cases of Zika infection.
- An epidemiologic investigation and enhanced surveillance to detect potential human cases will be implemented within a 165-yard radius (or other boundary, as deemed appropriate) of the Zika positive mosquito sample. Activities will include:
    - Interview household members using the existing Zika Investigation Worksheet present in the DADE Zika Guidance document and conduct testing of anyone with symptoms consistent with Zika virus infection
        - Informing household members to notify their local public health department if symptoms develop.
        - Following up on households that had a non-locally transmitted case with onset of symptoms 14-21 days earlier in order to ascertain if any additional household members developed symptoms that could indicate local transmission; and to facilitate testing of newly symptomatic people.
            - Household members: Assess symptoms and obtain urine and serum specimens for RT-PCR testing.
            - Close neighbors/neighborhood in suspected area: Conduct a house-to-house survey of any available people, or survey at a local gathering place, to identify recently symptomatic people (onset <14- 21 days earlier) and, wherever possible, obtain urine and serum specimens for testing RT-PCR testing.
    - Delivering prevention and early detection messages to households during the house-to-house visits.
    - Calling local healthcare providers to solicit reports of clinically compatible cases, encourage testing and reporting of suspect cases and raise awareness.
    - Notify the medical community, including hospitals and laboratories, to look for all diagnosed and suspected cases of dengue, chikungunya, and Zika infections, regardless of recent travel history, and to report them as soon as possible. Focus on cases in and around areas where infected mosquitoes were collected.
    - Contact local laboratories performing testing for Zika virus to monitor number and geographic location of additional suspect cases, any preliminary positive results, reconcile with reports from public health departments, and ensure that laboratories are aware of reporting requirements.
    - Conduct syndromic surveillance at local healthcare facilities to detect early increases in illnesses that could be Zika virus disease, wherever possible.

- Recommending individuals to stay in air-conditioned/screened accommodations and use personal precautions to reduce mosquito bites.
- Local surveillance for human cases will be enhanced via outreach to local clinicians (phone calls to hospitals/practices, implementation of Zika-specific syndromic surveillance of hospitals in the vicinity).

The Regional health department where the Zika virus positive mosquitoes were identified will coordinate with the local vector control agency and DHEC Central Office on the follow up to human cases subsequently diagnosed in the vicinity of the positive mosquitoes to determine the extent of virus circulation in the environment.

Scenario 2: A locally acquired human Zika infection is identified prior to detection of Zika virus in *Aedes* mosquitos.

Assumptions: The discovery of one or more human infections of Zika virus suspected to have been locally acquired will be addressed aggressively and immediately.

Operating Procedures:

- Internal notifications will follow the existing DHEC Notification Process.
- The State Epidemiologist or designee will convene a meeting of:
  - Health Services Management staff,
  - DADE SMEs;
  - DHEC Entomologist;
  - Environmental Health,
  - Office of General Council;
  - Office of Public Health Preparedness.

- The purpose of the meeting will be to:
  1. Review if the Planning Assumptions listed above have been met, and
  2. Review the following factors to determine if a geographic area for Zika virus interventions is appropriate:

Human factors,

- Number of cases identified and whether the incidence of cases is increasing or decreasing,
- Known or suspected links between cases (e.g., multiple infections in a household, which may reflect a single prior transmission episode, are of less concern than cases scattered in a neighborhood), including ruling out sexual or other body fluid-associated transmission,
- Geographic distribution of cases in an area (e.g., clustered cases in an area would suggest a higher intensity of transmission),
- Population density,
- Privacy concerns (i.e., ensuring that individual case patients cannot be identified).

Mosquito surveillance and control factors

- Current vector surveillance data,
- History of *Ae. aegypti* or *Ae. albopictus* in the area,
- Presence of *Ae. aegypti* (greater concern) or *Ae. albopictus* (less concern),
- Duration of mosquito breeding season remaining o Vector control interventions of sufficient intensity likely to eliminate infection incidence in areas where case exposure likely occurred

Environmental and ecologic factors

- History of local dengue or chikungunya virus transmission in the area,
- Area is within estimated geographic range of *Ae. aegypti* or *Ae. albopictus,*
- Area is below 2000 meters in elevation (elevation above which conditions are not conducive to transmission),
- Current or projected temperature supports vector activity,
- Cases identified early (which are of more concern) or late (which are of less concern) in mosquito season.

Infrastructure in the area

- Estimated proportion of homes, workplaces, and other settings with air conditioning,
- Estimated proportion of homes, workplaces, and other settings with intact screens on windows and doors,
- Estimated proportion of homes, workplaces, and other settings with non-secured water catchment systems.

- A decision will be made by this group regarding the need for a geographic area for Zika virus intervention
- If a determination is made that a geographic area for Zika virus intervention is appropriate, the State Epidemiologist will contact the CDC Emergency Operations Center at 770-488-7100. The purpose of this call will be to:
    1. Communicate the results of the review of factors to determine a potential geographic Zika virus intervention with the CDC, and
    2. Determine is any additional support from the CDC is needed.

- To look for additional potential cases in the area where the locally acquired case was exposed to the infected mosquito, an epidemiologic investigation and enhanced surveillance will be implemented to cover the areas where the case-patient spent the most times in the 2 weeks before onset of illness, e.g., home, neighborhood, and work place. These actions will include: \
    - Using the existing Zika Investigation Worksheet present in the DADE Zika Guidance document, interview household members of cases, conduct testing of anyone with symptoms consistent with Zika virus infection, and inform household members to notify public health if symptoms develop.
    - Follow up on households that had a travel-associated case with onset of symptoms 14-21 days earlier, to ascertain if any additional household members developed symptoms that could indicate local transmission, and facilitate testing of newly symptomatic people.
    - Implement targeted activity around suspected area(s) of local transmission to identify if other recent cases are from same/nearby mosquito pool; these activities can help quickly confirm local transmission.

        - Household members: prompt symptom assessment and urine and serum RT-PCR testing of household members.
        - Close neighbors/neighborhood in suspected area: house-to-house survey of any available people, or survey at local gathering place, to identify if recently symptomatic people (onset <14- 21 days earlier) and, wherever possible, obtain urine and serum specimens for testing by RT-PCR.

    - Deliver prevention and early detection messages to nearby households.
    - Call local healthcare providers to solicit reports of clinically compatible cases, encourage testing and reporting of suspect cases and raise awareness among providers.
    - Contact local laboratories performing testing for Zika virus to monitor number and geographic location of additional suspect cases, any preliminary positive results, reconcile with reports from public health departments, and ensure laboratories are aware of reporting requirements.
    - Conduct syndromic surveillance at local healthcare facilities to detect early increases in illnesses that could be Zika virus disease, wherever possible.

- The local vector control agency will be notified to ensure that mosquito surveillance and control is enhanced around the residence and any areas the identified case-patient may have been exposed to biting mosquitoes during the viremic period.
- Individuals will be advised to take all steps to prevent mosquito bites to reduce the risk of spread to local mosquito populations.

Appendix G – CDC US Pregnancy Registry and DHEC Procedures

The purpose of this document is to summarize DADE processes and procedures for enrolling pregnant women and the infants who reside in South Carolina into the US Zika Pregnancy Registry.

Purpose of the US Zika Pregnancy Registry:

- To understand more about Zika virus infection during pregnancy and congenital Zika virus infections, CDC has established the US Zika Pregnancy Registry.
- The data collected will be used to update guide recommendations for clinical care and testing, to plan for services for pregnant women and families affected by Zika virus, and to improve prevention of Zika virus infection during pregnancy.
- For more information, refer to CDC's US Zika Pregnancy Registry website.

Inclusion Criteria:

All women living in the US (except Puerto Rico where a separate registry is being established) who have been infected with Zika virus during their pregnancy and their infants are eligible for enrollment.

Pregnant women who meet laboratory criteria are included in the surveillance system whether they report symptoms or not. Women are included retrospectively if laboratory evidence of congenital Zika virus infection is identified in fetal tissues, the placenta, or the infant.

For the purposes of the USZPR, laboratory evidence of possible Zika virus infection is defined as:

- A positive Zika virus real-time reverse transcription-polymerase chain reaction (rRT-PCR) test result (i.e., a confirmed case of Zika virus infection), or
- An equivocal or presumptive positive Zika virus immunoglobulin M (IgM) antibody capture enzyme-linked immunosorbent assay (ELISA) test results. Plaque reduction neutralization testing (PRNT) performed in conjunction with the IgM ELISA must have Zika PRNT titers ≥ 10 for inclusion.
- For more information, refer to CDC's US Zika Pregnancy Registry website.

Data Collection and storage:

For South Carolina residents enrolled in the registry, information will be collected by DADE Staff and the Bureau of Maternal and Child Health abstractors from the healthcare provider. US Zika Pregnancy Registry forms will be used for persons enrolled in the registry (Maternal Health History, Neonatal Assessment, Infant Follow-Up, Laboratory Results, and Supplemental Maternal Prenatal Imaging and Diagnostics).

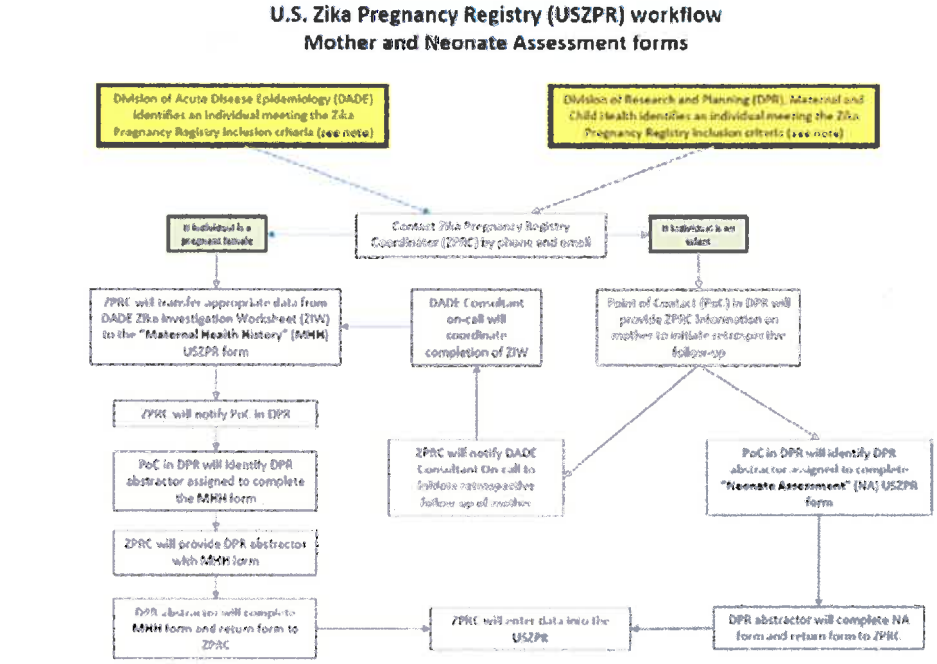
Data collection will occur at the following points in time:

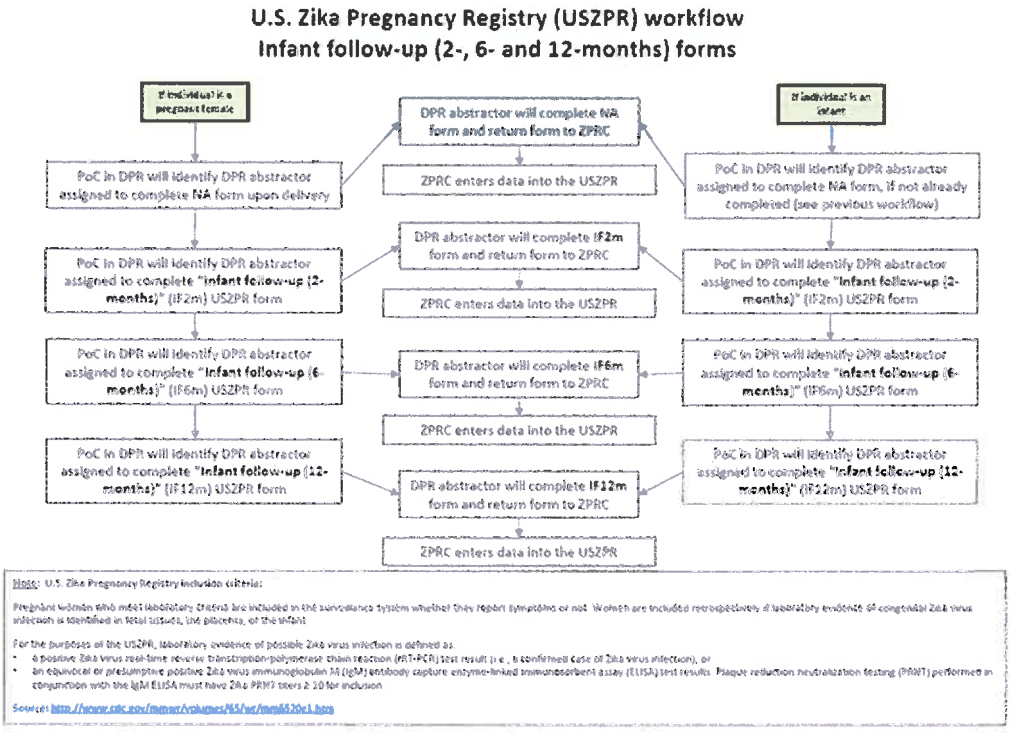
- Upon initial identification
- At the end of the second trimester (24 weeks) and at the end of the third trimester (35 weeks)
- At the time of delivery

- For the infant: at 2, 6, 12 months of age

Workflow:

See flow diagram below for the workflow interaction between DADE and MCH.





ZIKA VIRUS

South Carolina Mosquito Response Plan

March 2017

dhec
Healthy People. Healthy Communities.

Table of Contents

Introduction

Zika virus is spread to people primarily through the bite of an infected *Aedes aegypti* or *Aedes albopictus* mosquito. Effective mosquito vectors that bite an individual who is actively infected will be capable of transmitting the virus to another person in approximately 10 days. The mosquito remains infected for its entire life. Other modes of transmission include: from mother to child, through sex, through blood transfusion, through laboratory exposure, and through healthcare setting exposure. Zika virus can remain in semen longer than in other body fluids, including vaginal fluids, urine and blood.

Up to 80 percent of people who acquire Zika virus show no symptoms and do not get sick. For those who are symptomatic, the illness is usually mild. Symptoms last for several days to a week and can include fever, rash, joint pain, red eyes (conjunctivitis), muscle pain and headache. People usually do not get sick enough to seek medical care, and they very rarely die of Zika. Once a person has been infected with Zika virus, they are likely to be protected from future infections. Zika infection during pregnancy can cause serious birth defects and various neurological and autoimmune complications in the fetus.

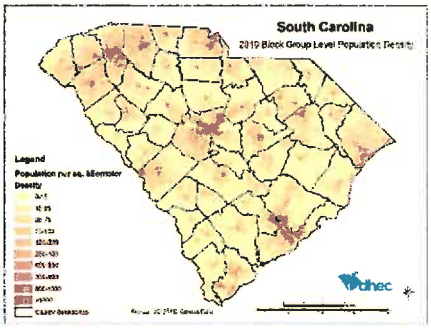
The fact that a large proportion of people infected are asymptomatic means that the daily routine of infected individuals will not be interrupted by the infection, potentially exposing them to mosquito bites. Even though many people exposed to the virus never get sick, the virus can remain in their system for several days after exposure. They would then serve as a source for mosquito infection that can further spread the virus. Zika virus is usually present in the blood of an infected person. At that time, a mosquito may acquire the infection by biting the infected individual.

Zika virus transmission is possible if a person, most likely someone who has traveled to an area with active Zika virus transmission, exposes local mosquitoes to the virus. A disease outbreak exists when a larger-than-expected number of cases of a specific illness occurs in a certain location during a defined period of time. The identification of a single case should not imply a risk of ongoing Zika virus transmission in South Carolina.

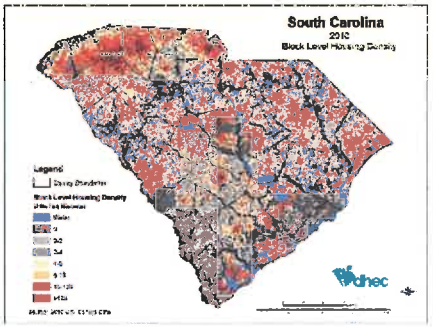
DHEC, in partnership with local government officials and other agencies and organizations, seeks to detect Zika virus as early as possible in travelers who visited areas where there is active transmission and in mosquito populations in South Carolina should local mosquitoes become infected. Because effective response to an emerging infectious disease depends on rapid identification of the causative agent, laboratory testing for a specific diagnosis, and effective disease surveillance for signs and symptoms of this virus will help us to identify imported cases or local transmission in South Carolina. In addition, providing residents with accurate information on the prevention of Zika virus and when to seek health care if illness is suspected, will help to prevent the virus from spreading.

Some communities might be at a higher risk for Zika Virus interventions than others **(Attachment A)**. The most heavily populated jurisdictions in South Carolina is where Zika virus (ZIKV) is likely to take hold and be spread from local mosquitoes to people. A high population density increases the risk of local transmission because the virus transmission cycle requires a concentration of people and mosquitoes in an area to maintain a person-to-mosquito-to-person transmission cycle. Areas where house lot sizes may be small and housing density is high and where homes may be in poor repair, may allow the virus to move more easily between people and mosquitoes.

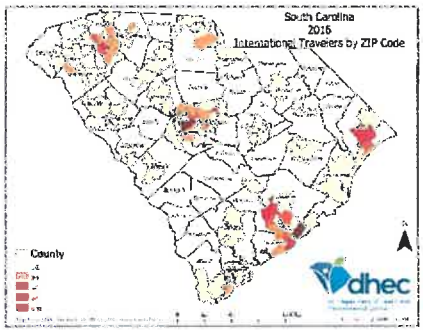
Some geographic locations may be at higher risk for Zika transmission because of typical travel patterns such as tourism, business, immigration, foreign visitors, etc.



Population Density
(More ideal container-breeding habitats)



Housing Density
(Zika vectors have short flight ranges)



International Travelers
(Higher risk of introduction)

Facts and Assumptions

- Some local governmental agencies are currently monitoring mosquito populations and controlling mosquitoes in their jurisdiction. SC DHEC encourages local governments to develop or engage sufficient mosquito control capacity via internal resources, contract services, or mutual aid agreements with other local governments.
- SC DHEC monitors for mosquito-borne diseases in South Carolina and provides technical assistance to local governments as they conduct mosquito abatement for a Zika human case.
- SC DHEC's public health staff works to detect the presence of the Zika virus as early as possible in mosquito populations and in travelers returning from an area where active transmission is occurring. The goal is to prevent the illness from infecting anyone and to stop the spread when a human case has been identified. DHEC staff also assists with mosquito trapping in designated areas of the state. Mosquitoes are transported to the SC DHEC lab for species identification and subsequent testing.
- Mosquito-borne pathogen transmission is influenced by many variables unique to given locations; these include environmental (e.g., mosquito season) and human (e.g., house construction) variables. This response guidance can be modified to fit current needs and conditions.
- The infectivity of asymptomatic patients, which are the majority (80%) of Zika virus infections, is not yet known.
- *Aedes aegypti* and *Aedes albopictus* live in close association with humans and are "container-breeding" mosquitoes. That means reproduction can occur in numerous types of water-holding containers such as buckets, pet water bowls, plastic containers, discarded tires, rain gutters, tarps, bird baths, lawn ornaments, outdoor toys and other items often found around human dwellings. They do not live in ditches, marshes, or other large bodies of water.
- DHEC will provide continuously updated information online at: www.scdhec.gov/zika.
- *Aedes aegypti* females might bite several people before obtaining a full blood meal, potentially creating household clusters of cases with the same date of onset.
- Lifetime flight range will typically be less than 100 meters from the site of *Aedes aegypti* and *Aedes albopictus* emergence, therefore timely control within 150 meters of a case should reduce or eliminate transmission.

- Schools, workplaces and other public venues can be transmission sites. Further guidance on schools can be found in the Interim Guidance for School District and School Administrators in the Continental United States and Hawaii.
- The probability of longitudinal, transovarial passage (from mother to egg) of Zika virus between *Aedes aegypti* generations is 0.34% (1 out of 290). Infected eggs, which can survive for months on dry surfaces, could keep the virus circulating even after dry or cold spells, when adult mosquitoes die off.
- The average lifespan of *Aedes aegypti* and *Aedes albopictus* in nature is not expected to exceed 30 days. Therefore, assuming a maximum viremic period of one week from symptom onset for an infected person and assuming a 7- to 10-day incubation time in the mosquito, the longest interval between symptom onset of one case and acquisition of infection in a secondary case is estimated to be six weeks.
- The rates of mutation conferring insecticide resistance are slow enough that testing once in a season should be sufficient to base that year's insecticide selection on.

Mosquito Vectors

Two species of mosquitoes that occur in the United States, the yellow fever mosquito (*Aedes aegypti*) and the Asian tiger mosquito (*Aedes albopictus*), have been implicated in large outbreaks of Zika virus. Both of these species occur in tropical and sub-tropical regions, whereas *Aedes albopictus* can also be found in more northern, temperate regions. *Aedes albopictus* is more cold tolerant than *Aedes aegypti*, which only occurs in the coastal regions of the southeastern United States.

Aedes albopictus mosquitoes are the most common nuisance mosquito in South Carolina and are present and common in every county in the state. Currently, *Aedes aegypti* has only been detected in Charleston and Berkeley counties. These mosquito species live in close association with people in indoor or outdoor water-holding containers such as tree holes, cut bamboo, plant axils, buckets, pet water bowls, plastic containers, discarded tires, rain gutters, tarps, bird baths, lawn ornaments, outdoor toys and other items often found around human dwellings. They do not live in ditches, marshes, or other large bodies of water.

A disease vector is any animal or microorganism that carries and transmits an infectious pathogen into another living organism

About four or five days after feeding on blood, the adult female mosquito lays her eggs just above the surface of the water in the container. When rain covers the eggs with water, the larvae hatch. Larvae grow and develop into pupae and then into adult mosquitoes. The life cycle from egg to adult can occur in as little as six to ten days. The life span for adult mosquitoes is around two to three weeks. The typical flight range is short (150 meters or ~165 yards), so egg production sites are likely to be close to where these mosquitoes are found.

Peak biting activities of *Aedes aegypti* and *Aedes albopictus* are at pre-dawn and pre-dusk, but will bite during the day, especially in shaded areas.

Both *Aedes albopictus* and *Aedes aegypti* are perfectly capable of becoming infected with and transmitting Zika virus. A mosquito can become infectious in an average of about 7 to 10 days, depending on environmental factors. *Aedes albopictus* mosquitoes tend to live about 35 days (range 4-72 days), and *Aedes aegypti* mosquitoes tend to live about 30 days (range 8-42 days).

Aedes aegypti mosquitoes have behavioral characteristics that make them more likely to sustain Zika virus transmission in a community, more so than *Aedes albopictus* mosquitoes:

- ***Aedes aegypti* bites multiple people to complete a blood meal**
  Aedes aegypti adult mosquitoes are more likely to take multiple blood feedings from several people, which improves their chance of being a more efficient vector of Zika virus. In contrast, *Aedes albopictus* are more likely to take a single blood meal from one person.

- ***Aedes aegypti* prefers human hosts**
  Aedes aegypti adult mosquitoes almost exclusively feed on human blood, which improves their chance of being a more efficient vector of Zika virus. In contrast, *Aedes albopictus* adult mosquitoes tend to feed on a wide variety of animals and only bite people when they are near. *Aedes albopictus* are less efficient at sustaining Zika virus transmission because many of their blood meals come from animals that are not known to serve as reservoirs for the viruses.

- ***Aedes aegypti* prefers to rest indoors**
  Aedes aegypti adult mosquitoes more often rest indoors, which improves its chance of being a more efficient vector of Zika virus. In contrast, *Aedes albopictus* adult mosquitoes most often rests outdoors; however, when *Aedes albopictus* mosquitoes are among people, they don't stray far from their breeding sources – usually within 100-300 yards.

- ***Aedes aegypti* are more restricted to sites around human habitation**
  Aedes aegypti mosquitoes almost exclusively confine themselves to water-filled containers around human habitation, which improves their chance of being a more efficient vector of Zika virus. In contrast, *Aedes albopictus* thrives in both urban and rural environments.

The behavior of *Aedes albopictus* does not completely eliminate its threat of disease transmission, especially when the temporal dynamics of host, vector, and pathogen populations interact spatially within a permissive environment to enable transmission. *Aedes albopictus* is expected to cause some local spread of Zika virus in the United States — although any U.S. outbreaks are expected to be small and short-lived, thanks to well-built homes, air conditioning, and screened windows.

Prevention and Control of Zika Virus Transmission

The principal functions of ZIKV mosquito-based surveillance programs are to:

- Determine which neighborhoods might be likely places for ZIKV transmission
- Monitor for the presence of *Aedes albopictus* and *Aedes aegypti* in target neighborhoods and identify geographic areas of high mosquito abundance (high-risk) within the neighborhoods
- Identify which container habitats or properties are producing the most mosquitoes
- Identify and map larval sites that cannot be accessed or eliminated.
- Monitor mosquito populations to gauge the effectiveness of vector control efforts
- Test collected mosquitoes to monitor for ZIKV infection rates during outbreaks to:
  - identify primary/secondary mosquito vectors
  - establish thresholds at which humans get infected

Given that local jurisdictions have varying levels of available resources and capabilities, not all jurisdictions can, or will, achieve total preparedness. Taking into consideration available resources and

unique needs of each jurisdiction, leaders should identify risks in their communities in order to achieve optimal and reasonable levels of preparedness. Even a minimal program focusing on eliminating mosquito habitats and educating people about ways to prevent mosquito breeding and avoid bites can be a worthwhile undertaking. The most efficient use of mosquito surveillance and control resources is to focus on neighborhoods that are most likely to have imported human Zika virus infections (greater population density, greater housing density, and more international travelers). Additionally, resources should be focused on neighborhoods where persons with identified infections reside and who are more likely to be a source for local mosquito-borne transmission.

Whereas mosquito-based surveillance is the preferred method for monitoring or predicting West Nile virus outbreaks, it is not the preferred method for monitoring or predicting chikungunya, dengue, and Zika disease outbreaks. For these arboviruses, detecting infections in people and focusing surveillance and control efforts around the identified patients is more efficient. In the United States, chikungunya, dengue, and Zika virus disease are nationally notifiable conditions, and healthcare providers are required to report any confirmed or suspect cases to local and state health departments. In turn, health departments should quickly notify state and local mosquito control authorities about human cases that passed at least a portion of their viremic phase of illness locally. Timely identification and response to mosquito-borne disease outbreaks of Zika, dengue, and chikungunya requires constant communication between healthcare providers, local and state public health departments, and mosquito control specialists.

Modern mosquito control methodology dictates the use of an integrated pest management program, utilizing adulticiding, larviciding and source reduction as appropriate, and incorporating a public education component (**Attachments B and C**).

If a jurisdiction does not have a mosquito control program, it will need to arrange for mosquito control services with a licensed, local company or utilize another county's or municipality's vector control program through a mutual aid agreement. http://www.scemd.org/ > Statewide Mutual Aid Agreement.

Insecticides can be purchased by using the South Carolina Statewide Term Contract for Mosquito Control Pesticides at the following link: https://procurement.sc.gov/ > "Agency Users" > Statewide Contracts > Goods and Services Contracts > "Chemicals/Gases" > Pesticide, Mosquito Control.

The prevention or reduction of transmission of Zika virus is completely dependent on limiting mosquito-to-person contact and the control of mosquito vectors. Necessary and timely actions that reduce the opportunity for local mosquitoes to become infected with Zika virus and to spread it should be taken immediately once a human case is confirmed. These activities should be conducted simultaneously or as near together as possible.

1. **Adulticiding.** Adulticides are products used to kill adult mosquitoes. Adulticides help to reduce the number of mosquitoes in an area and reduce the risk that people will get sick.
2. **Public education and elimination of water-filled containers where mosquitoes breed.** Eliminate water-filled containers and educate landowners on how to eliminate water-filled containers around their property.
3. **Larviciding.** Larvicides are products used regularly to kill mosquito larvae in standing water that cannot be dumped or drained.

The public and professionals should use US Environmental Protection Agency (EPA)-registered insecticides according to label instructions. Follow manufacturer recommendations for equipment use and refer to the Safety Data Sheet (SDS) for Personal Protection Equipment (PPE) requirements.

Mosquito Control Activities Performed During Non-local and Local Virus Transmission

Transmission Type	Mosquito Control Activities to Perform	Duration of Activities	Treatment Area	Comments
Non-local Transmission: **Travel-related or sexually transmitted cases**	• Door-to-door home or business visits • Dissemination of educational materials • Source reduction (Elimination of water-holding containers) • Larviciding	2 weeks (minimum)	165-yard radius (minimum)	Continue source reduction and larviciding for 45 days* if *Aedes aegypti* or *Aedes albopictus* is still found, assuming no further cases are identified

Transmission Type	Mosquito Control Activities to Perform	Duration of Activities	Treatment Area	Comments
	• Adulticiding	Intermittently over a 2-week time period (minimum), according to the pesticide label instructions	165- to 500-yard radius (minimum)	Continue adulticiding for 45 days* if *Aedes aegypti* or *Aedes albopictus* is still found, assuming no further cases are identified
Local Transmission	• Door-to-door home or business visits • Dissemination of educational materials • Source reduction (Elimination of water-holding containers) • Larviciding • Adulticiding	No less than 45 days after the date of onset of the last known case	Size of area depends on the extent of transmission †. A one-mile diameter is a good starting point.	As a precaution, the jurisdiction might choose to continue moderate control efforts beyond the 45-day buffer or until the end of mosquito season.

** The time it is possible for an Aedes mosquito feeding on a Zika virus-infected person to continue to transmit the virus*

† A Zika virus transmission area is defined by terminology and landmarks recognizable to residents and visitors (e.g., a neighborhood, city, county, or group of counties depending on the extent of transmission).

Keep records of all actions taken, and report these activities to the SC DHEC State Public Health Entomologist, upon request or upon completion (**Attachment E**).

Landowners can legally treat adult mosquitoes or larval habitats on their own property with over-the-counter pesticide products available to the public. However, the application of pesticides on property owned by another person can only be done by personnel who are trained and certified/licensed for mosquito control.

Pesticide applicators must have a Category 8 Public Health Pest Control applicator's license. This category includes any individual using or supervising the use of restricted use pesticides, including the installation of devices, in public health programs for the management and control of pests having medical and public health importance. A license will be required for applicators working in this category on someone else's property unless they are working under the supervision of someone who is properly licensed. Use of either a Restricted Use Pesticide (RUP) or a general use pesticide will require a license.
http://www.clemson.edu/extension/pest_ed/app_training/category/cat08.html

Pesticide applicators must have a Category 11 Aerial Applicator Pest Control license to apply restricted use pesticides using any type of aircraft.
http://www.clemson.edu/extension/pest_ed/app_training/category/cat11.html

Mosquito Surveillance and Control Response to Identified Zika Cases

Perform targeted adult and larval mosquito control activities, as well as mosquito surveillance and public education, around the case household to prevent infected persons from transmitting virus to mosquitoes (**Attachment F**). Targeted mosquito control and surveillance is recommended for a Zika virus-positive person who spent any time in South Carolina during the viremic period (the time when virus is present in the bloodstream), which is during the first seven days after the illness onset date. Persons who have an onset of illness seven days or more prior to their return to South Carolina are not a significant threat for passing the virus to local mosquitoes, and no mosquito surveillance and control response is necessary.

If resources are limited, localities should prioritize targeted surveillance and control activities for human cases who are highly suspected or confirmed to be locally acquired.

The mosquito control and surveillance methods described in this section can be carried out in different phases or varying levels of Zika virus transmission risk. See "Phased Zika Virus Planning and Response".

Timeline for Responding to Confirmed Zika Virus Cases

Mosquito control professionals should respond to confirmed Zika cases within a few days after notification of an individual with active Zika infection.

Performing mosquito control around the potential Zika transmission area is appropriate for up to 45 days after the onset of illness or until environmental conditions are no longer conducive to mosquito transmission (for example, cold weather). This timeline allows for three mosquito incubation periods (the time from when a mosquito acquires Zika virus from an infected human to the time it is capable of transmitting the virus to a new human host). SC DHEC will provide the location information and a treatment interval that are appropriate for the circumstances.

Adult Mosquito Control

Adult mosquito control should be performed as soon as possible to eliminate adult mosquitoes that might have been infected with virus.

Insecticides are dispersed by backpack, vehicle- or aircraft-mounted equipment. Aerosol treatments can be made at close range with portable aerosol generators/foggers or from up to 150 feet away by use of vehicle-mounted foggers. Aircraft-mounted equipment may be used when widespread local transmission is occurring, the area to be treated is too large to be treated by hand or by vehicle, or vehicular or pedestrian traffic is heavy.

Space spraying is performed with ultra-low volume (ULV) sprays (cold fogs) or by thermal fogs. With ULV sprays or "cold fogs", a nozzle is used to aerosolize the insecticide, whereas with thermal fogs, heat is used to aerosolize the insecticide. Space sprays do not leave any residual layer of insecticide in the treated area and only kill the mosquitoes that are flying in the area at the time of the treatment.

Outdoor Space Spraying

- Perform within a 165-yard radius for non-local transmission cases or within a 1-mile diameter if local transmission is occurring, or within a Zika transmission area as defined by public health officials.
- Adult mosquito control for the vectors of Zika is generally not very effective if container habitats have not been first eliminated (*i.e.*, removed, dumped or treated). Adult mosquito control is warranted if *Aedes aegypti* or *Aedes albopictus* are still being found.
- Adulticiding should be performed at pre-dusk or pre-dawn peak activity periods for *Aedes aegypti* and *Aedes albopictus* container-breeding mosquitoes.
- If adulticiding is not feasible at pre-dusk or pre-dawn, then an insecticide that has the ability to stimulate resting mosquitoes into flight should be used. For example, insecticides with the ingredient prallethrin in combination with piperonyl butoxide have been used for Asian tiger mosquito control with varying degrees of success.
- Select a product that has quick knockdown (within minutes).
- Space sprays should not be made when it is raining or when wind speeds are above 10 mph.
- Spraying missions should occur intermittently according to the pesticide label instructions to achieve a significant reduction of the mosquito population.
- Consult Clemson University's Voluntary Beehive Mapping Program to locate and avoid spraying beehives in the designated mosquito treatment zone before any pesticides are applied (http://www.kellysolutions.com/Clemson/Beekeepers/).

Special considerations for pesticide applications made from vehicle-mounted equipment:

- The aerosol-generating nozzle on ULV machines should be aimed at a 45° angle.
- The street layout must allow for applications that are close to the targeted area. The target property must be within 150 feet of the vehicle-mounted sprayer.
  - All streets and alleyways in the neighborhood should be used to maximize aerosol coverage and minimize the distance between the aerosol generator and the target properties.

Use backpack or hand-held equipment when:

- Street layout does not allow for applications that are close to the target area.
- A vehicle-mounted sprayer cannot get within 150 feet of the target area.
- The cost of the pesticide application is more economically feasible when only treating around one or several homes in a rural area.

- A high population of mosquitoes remain after the larval survey and the adulticide mission are complete.

Residual Applications (Barrier Treatments)

- Residual insecticides are used on surfaces that adult mosquitoes frequently visit and land on, such as under porches or decks, foundations, in and under shrubs, very tall grass, ivy, discarded containers, and other shady, sheltered areas.
- Barrier treatments are applied by the use of powered backpack sprayers, vehicle- or trailer-mounted power sprayers, pump-type sprayers, or hose-end sprayers. Barrier sprays are meant to generate droplet sizes that are large enough to stick to surfaces, and will kill any mosquitoes or other insects that sit on that foliage for a period of up to three or four weeks after treatment, depending on rainfall and pesticide type.
- Barrier treatments can be used when:
  - Local transmission is occurring
  - When adult mosquito populations are large and originate primarily from larval habitats that cannot be accessed or eliminated.
  - A high population of mosquitoes remains after the larval survey and the adulticide mission are complete
- Barrier treatments can be used on the property or on other neighborhood properties adjoining or surrounding untreatable larval habitats.
- To avoid run-off or loss of the sprayed product, barrier applications should not be made fewer than two hours before an expected rain event.
- The applicator should avoid applying insecticides directly to or nearby any flowering plants to minimize harm to pollinator species.
- For local transmission, mosquito control personnel should provide barrier sprays (residual sprays) intermittently according to label directions and frequently enough to cover at least a 45-day span.

Mosquito Surveillance and Larval Control Activities

Control immature mosquitoes before they become biting adults that are capable of transmitting disease. Targeted surveillance and control activities involving home visits should be closely coordinated with concurrent educational efforts and messaging.

In localities where there are no existing mosquito surveillance programs, SC DHEC Bureau of Environmental Health personnel will be deployed to conduct targeted mosquito surveillance activities for applicable case patients, as resources and time permit. If no local mosquito control programs exist, localities should explore options for soliciting support from neighboring jurisdictions or through contractual services.

- Perform within a 165-yard radius for non-local transmission cases or within a 1-mile diameter if local transmission is occurring, or within a Zika transmission area as defined by public health officials.
- Inspect the property and neighborhood for mosquito-breeding habitats.
- Eliminate these mosquito-breeding habitats when possible (*i.e.*, dump containers).
- Apply larvicide to containers that cannot be eliminated (including storm drains).
- Disseminate educational materials at homes and neighborhoods visited while performing mosquito surveillance and control. Educational materials should be appropriate for the type of housing and potential for the presence of containers that may serve as mosquito-breeding habitats.

  - DHEC's Zika webpage (www.scdhec.gov/Zika) and CDC's Zika webpage (www.cdc.gov/zika) have a public awareness campaign and health educational materials.
- Target educational and surveillance activities across a large enough area so as to not inadvertently identify the address of a suspected/confirmed case-patient.
- When possible, mosquito surveillance personnel should speak to the homeowner or other household members and point out any containers that should be discarded, stored in a dry place, dumped on a weekly basis, or regularly treated with larvicides.
  - Note: the application of larvicides on a homeowner's property can only be done by surveillance personnel who are trained and certified/licensed for mosquito control, but homeowners can legally treat habitats on their own property with over-the-counter larvicide products available to the public.
- Trap mosquitoes for virus testing, as resources and time permit.

Disclosure Requirements for Public Health Applications of Pesticides

Beekeepers, organic farmers and people with allergies or asthma may wish to avoid insecticides used with adult mosquito control. For non-commercial applicators only, or for commercial applicators making applications for and under the direct supervision of a governmental entity, pesticide applicators must disclose the following information to the public at their request in a statement that is fully legible:

(1) Company or firm name and address
(2) The pest to be controlled or the purpose of the pesticide application
(3) The chemical or common name of the active ingredient(s), not the brand name, of the pesticide to be applied
(4) Name(s) of the responsible licensed applicator

These requirements may be met by announcement or publication of the nature and timing of pesticide applications in the appropriate mass media outlets not less than 24 hours prior to the pesticide application (http://www.clemson.edu > "Outreach" > "Agricultural Services" > Regulatory Services > Pesticide Regulation > Rules and Regulations for the Enforcement of the SC Pesticide Control Act). The announcement does not have to contain detailed information about the spray mission, but you might elect to provide more details in the announcement to avoid being bombarded with requests for particulars. If a company is contracted to make the application, those requests can be forwarded to the company.

In the event of a confirmed human case of Zika virus, immediate measures should be implemented by the closest municipality or their licensed contractor, upon notification by SC DHEC, to implement treatment strategies already in place to eliminate both the larval and adult stage of mosquitoes. These treatments would be performed beginning at ground zero and radiating out from the suspected site of transmission. *Given the clear and present public health risk, at such time as an infected traveler returns to South Carolina or a local transmission via vector to human is confirmed by SC DHEC, please contact the Clemson Department of Pesticide Regulation regarding current notification requirements to be given prior to pesticide applications.*

Protecting Personal Health Information and Preserving Confidentiality

DHEC is charged with protecting the public health while also maintaining the privacy of individuals and the confidentiality of their personal information.

Limit the number of people who have access to personal information.

Share personal information with others only on a need-to-know basis in order to carry out duties related to Zika virus response.

If DHEC determines a case of Zika virus infection has occurred, DHEC will notify the local government to initiate mosquito abatement measures. In order for the local government to conduct abatement measures where specifically needed, DHEC might provide certain personal information (such as name, contact information and location of the case, date of illness onset, maps) to the Point of Contact (POC)/Zika Coordinator. Personal information must be kept confidential by law. DHEC will provide a notice about the confidential nature of information that will be shared (**Attachment G**). Confidential information should only be given to those who have an ACTUAL NEED TO KNOW. As the POC/Zika Coordinator might share the personal information with a mosquito abatement contractor, the contract with the vendor should require that information be kept confidential. The number of people who have access to personal information must be as limited as possible to preserve confidentiality and avoid public identification of persons infected with Zika virus. Release of any identifying information to mosquito control should include the condition that the case-patient's information will not be disclosed to the public.

Patient confidentiality issues that determine if mosquito surveillance and control can be conducted around a case-patient's home. Due to confidentiality laws and the concern for protecting patient anonymity, any targeted mosquito surveillance and control activities being conducted on or around a suspected or confirmed case-patient's home should be implemented in a fashion that preserves the anonymity of the patient.

Notification of patient prior to activating mosquito control. Local health departments should inform the case patient of the expected abatement processes prior to sharing address (or other identifying) information to any local mosquito control program. The case-patient should be advised to avoid contact with mosquitoes (if still in their viremic period, i.e., the time when virus is present in the bloodstream) and to take other personal protective measures. During this phone contact, the health department representative should inform the case-patient of next steps to include the sharing of the case-patient's contact information with local mosquito surveillance/control personnel.

Conducting Mosquito Control on a Case-Patient's Property

If the mosquito population appears to have originated primarily from container habitats on the patients property, adult mosquito control could be accomplished either by an aerosol treatment with portable foggers, or a residual "barrier treatment" can be applied.

If the mosquito population appears to originate from adjoining properties, a barrier treatment should be applied to foliage (e.g., ivy, shrubs, bushes or hedges) around the case-patient's property and mosquito personnel should inspect other properties on the block for the breeding habitat of the mosquitoes.

Risk Categories and Mosquito Control Response

STAGE	RISK CATEGORY	DESCRIPTION
Pre-Incident	**0**	**Preparedness** – Vector present or possible in the state. No identified local transmission
	1	**Mosquito Season** – *Aedes* species mosquito vector biting activity. Introduced-travel-related or sexually transmitted cases.
Suspected / Confirmed Incident	**2**	**Confirmed Local Transmission** – Single, locally acquired case, or cases clustered in a single household and occurring < 2 weeks apart.
Major Incident	**3**	**Confirmed Multiperson Local Transmission** – Zika virus illnesses with onsets occurring ≥ 2 weeks apart but within an approximately 1 mile (1.5 km) diameter.

This section provides guidance on immediate steps to accomplish effective vector control at varying levels of Zika virus transmission risk.

Risk Category 0 - Preparedness: ***Mosquito vector present or possible in the state***
Efforts to survey for and eliminate mosquito habitats before mosquito season are always advisable, but might only be possible in jurisdictions that have ample mosquito surveillance and control resources. However, if local transmission was detected in a neighborhood during the previous season, local resources and personnel should be made available to inspect the affected community and eliminate or minimize the presence of larval habitats before the next mosquito season.

Recommended Action Steps:

- Develop a Response and Preparedness Plan
- Develop a communications network to ensure timely exchange of information, and collaboratively share information to guide optimum vector control efforts.
- Identify leadership positions that need to be notified if/when there is a case of Zika identified within the jurisdiction and establish a notification process.
- Identify other stakeholders who need to be included in decision making for abatement procedures and have a meeting to discuss options.
- Identify locations at high risk. All areas with a history of competent mosquito vectors are at risk. Population centers in these areas are at more risk than rural areas because of ideal container-breeding habitats, greater housing density (as the mosquito vectors have short flight ranges), and international travelers.
- Assess the readiness and competencies of those control operations in the areas at highest risk.
    - Review existing staffing capacity, resource allocation, funding and technical expertise at the local level for vector control.
    - Perform a self-assessment of resources available to vector control operators, including pesticides, truck-mounted ultra-low volume fumigation units and aerial units.
    - Establish and foster communication plans with existing local mosquito control resources.
- If a program does not exist,
    - Consider the use of mutual aid agreements for vector control from adjacent jurisdictions: http://www.scemd.org/ > Statewide Mutual Aid Agreement.

  - Hire a certified, licensed contractor to perform mosquito control.
  - Pre-position contracts with vendors or utilize the SC Statewide Contract: https://procurement.sc.gov/ > "Agency Users" > Statewide Contracts > Goods and Services Contracts > "Services" > *website link not yet available*.

- Consider passing ordinances to empower local jurisdictions to force homeowners, landowners, or business owners to maintain their properties to prevent environments that create mosquito-breeding habitats.
- Develop or acquire educational materials from DHEC (www.scdhec.gov/Zika) and begin to conduct public mosquito education campaigns focusing on:
  - Personal protection and risk avoidance measures, such as a topical repellent, property sanitation and window screens.
  - How citizens can reduce or eliminate larval mosquito habitats.
  - Motivating the community to remove/dispose of any water-holding containers.
  - Organize area/community clean-up campaigns targeting disposable containers (source reduction), including large junk objects that accumulate water (broken washing machines, refrigerators, toilets) in buildings, public areas, etc.
  - Promote proper handling of new, used, or waste tires in an effort to eliminate tires as a mosquito habitat. Use or establish a tire regulatory authority to address problem sites.
  - Consider a "Tire Amnesty Day" to allow residents and neighborhood associations the opportunity to rid themselves of used tires in a responsible manner.
- Conduct surveys to determine abundance, location and type of containers; large accumulations of containers (e.g. tire piles), or large containers (e.g., flooded boats, neglected swimming pools, etc.) that could result in locally high mosquito abundance.
- Cover, dump, modify or treat any large water-holding containers with long-lasting larvicides.
- Initiate a community-wide source reduction campaign.
  - The goal of the campaign is to motivate the community to remove and dispose of any water-holding containers (e.g., tire removal, trash pickup, removal/scrubbing containers).
- Leverage partnerships with local governments and non-profits for support.

Risk Category 1– Mosquito Season: ***Introduced travel-related, sexually, or other body fluid transmitted cases. Aedes aegypti or Aedes albopictus mosquito-biting activity.***
The goal is to reduce transmission risk by preemptively reducing mosquito vector populations and initiating precautionary vector control measures around introduced cases (i.e., residents with suspected symptomatic Zika virus infection acquired through travel or sexual contact).

Recommended Action Steps:

- Prevent local mosquitoes from biting a virus-infected individual, which can then spread the disease by biting others. Adulticiding, larviciding, source reduction and public health education activities should be conducted simultaneously or as near together as possible.
- Protect the confidentiality of the person with suspected/confirmed Zika virus disease.
- Perform adulticiding for at least **2 weeks** (the approximate survival time of an infected mosquito), with spraying missions occurring intermittently according to the pesticide label instructions. DHEC recommends spraying within a minimum **500-yard radius** around the Zika virus case site (the minimum recommended radius by CDC is **165 yards**). Continue adulticiding for **45 days** if *Aedes aegypti* or *Aedes albopictus* is still found, assuming no further cases are identified.
  - Initiate adult mosquito trapping in targeted communities to identify or confirm areas of high adult mosquito abundance

  - Initiate preventive adult mosquito control measures to reduce adult populations targeting areas of high mosquito abundance.
  - Concentrate control efforts around places with high mosquito density
  - For areas such as the workplace or community place where only indigenous *Aedes albopictus* are at low density, local officials might elect not to conduct vector control around introduced cases, due to low likelihood of transmission.
- Perform public health education within a **165-yard radius**.
  - Utilize educational materials that encourage the public to continually dispose of water-holding containers to eliminate larval habitats and perform personal protection measures.
  - Treat any water-holding containers that cannot be dumped, covered, discarded or otherwise modified with a long-lasting larvicide.
  - Encourage the public to protect themselves from Zika virus exposure from mosquito bites by using an EPA-approved mosquito repellent, wearing long-sleeved shirts and long pants when outdoors and making sure that all screens and doors are properly sealed closed in order to keep mosquitoes outside. Include messaging on the risk of sexual transmission and steps people can take to prevent it.
  - Provide/Recommend supplies for personal protection to the case household to prevent infected persons from transmitting virus to mosquitoes.
- Perform mosquito surveillance and larval control activities in the form of door-to-door home or business visits for a minimum of **2 weeks**, with follow-up visits occurring **every 5 to 7 days**, within a minimum **165-yard radius** of the Zika case site. Continue source reduction and larviciding for **45 days** if *Aedes aegypti* or *Aedes albopictus* is still found, assuming no further cases are identified.
  - Perform systematic searches for immature mosquito or larval stages by searching for water-holding containers near human habitation. Discard or turn over water-filled containers, or use larvicide in containers, including storm drains, which cannot be dumped.
  - Continue/maintain community source reduction efforts.
- Initiate/continue mosquito surveys in targeted communities to:
  - Estimate relative abundance;
  - Determine distribution area;
  - Develop detailed vector distribution maps; and
  - Evaluate the efficacy of source reduction and larvicide treatments.

Risk Category 2– Confirmed Local Transmission: ***Single, locally acquired case, or cases clustered in a single household and occurring <2 weeks apart***

Once non-travel or non-sexually transmitted cases are identified, local transmission is presumed. The purpose of vector control is to prevent transmission from expanding to unaffected areas and to break transmission where it exists.

Recommended Action Steps:

- **Perform the same basic elements of response as in Risk Category 1 with travel cases, but increase the intensity of intervention and scale of resources that are committed.**
- Establish limits of the affected area. The size of the transmission area will be unclear at the outset. The Zika virus transmission area may model a neighborhood, city, county, or group of counties depending on the extent of transmission. Vector control teams and epidemiologists should work closely together to delineate an initial area for control efforts.

- A one-mile diameter is a good starting point for identifying the transmission area, but might not be the ultimate geographic area of concern.
    - The identified area might be expanded or reduced if indicated by epidemiologic, entomologic, and environmental information.
- Use adulticides, larvicides and source reduction to immediately control adult and larval mosquitoes.
    - Insecticide selection must be based on resistance testing results.
    - Area treatment with truck-mounted ultra-low volume (ULV) applicators or aerial delivery should be based on local assessment of spatial risk.
        - Aerial spraying covers a larger area than that covered by ground applications.
        - Aerial spraying may be used when conditions on the ground are such that larval habitats are not easily accessible or spray trucks can't easily maneuver down streets because of traffic or crowds of people.
        - Due to its relative ineffectiveness compared to ground or truck-mounted spraying, DHEC recommends that aerial spraying of adulticide or larvicide to control the spread of the Zika virus should be used only in the event that both ground and truck-mounted spraying are determined to be inadequate to stem local Zika transmission.
    - Interior residual spraying of open houses (no screening or air conditioning) or exterior residual spraying (under porches or decks, foundations, in and under shrubs, very tall grass, ivy, discarded containers, and other shady, sheltered areas) might be made available to those in the affected area.
- When recommended and if resources permit, use backpack or handheld aerosol generators to apply residual insecticides on surfaces that adult mosquitoes frequently visit and land on, such as under porches or decks, foundations, in and under shrubs, very tall grass, ivy, discarded containers and other shady, sheltered areas.
    - Apply the residual insecticides to the home of any persons with suspect or confirmed infections, and if permissible, to adjacent properties.
    - Perform residual sprays (barrier sprays) intermittently according to label directions and frequently enough to cover at least a 45-day span.
- A decrease in vector density is a measure of the efficacy of treatment. Trapping and immature surveys should be used as properties are treated so the efficacy of treatment can be assessed and to drive decisions on retreatments.
- **Duration of activities should be no less than 45 days after the date of onset of the last known case** (the time it is possible for an *Aedes* feeding on that person to continue to transmit Zika virus). As a precaution, the state might choose to continue moderate control efforts beyond the 45-day buffer or until the end of mosquito season.
- Evaluate the need for federal assistance. Considerations for federal assistance should be addressed and communicated to CDC through SC DHEC. The CDC will then coordinate through SC DHEC.
    - Considerations for a CDC Emergency Response Team (CERT)
        - CERTs are designed to fill potential gaps in the state's capacity to respond, including all or some staff to fill functional areas of epidemiology, entomology, vector control, communication and laboratory testing.
    - Requests for additional contracted assistance with response activities may be prioritized to Risk Category 3.

Risk Category 3 – Confirmed Multi-Person Local Transmission: ***Zika virus illnesses with onsets occurring ≥2 weeks apart within an approximate 1 mile (1.6 km) diameter***

Recommended Action Steps:

- **Perform the same response as in Risk Category 2, but increase the intensity of intervention and scale of resources that are committed.**
- Vector control efforts should align with state and local government decisions regarding boundaries for declaring an area as a site of "active Zika transmission." This may model a neighborhood, city, county or group of counties, depending on the extent of transmission. At this phase, when resources allow, consider intensifying and expanding vector control efforts within the areas of active transmission.
- When recommended and feasible,
    - Divide the outbreak area into operational management areas where control measures can be effectively applied to all buildings and public areas within a few days; repeat as needed to reduce mosquito density
    - Conduct door-to-door inspections and mosquito control in an area-wide fashion (reach >90 percent coverage of the control area within a week).
    - Identify and treat, modify, or remove mosquito-producing containers. Don't forget to treat storm drains, roof gutters and other often overlooked water sources.
- Combine any outdoor spatial or residual spraying with source reduction and larviciding (including residual spraying of container surfaces and adjacent mosquito resting areas).
- Organize area/community clean-up campaigns targeting disposable containers, including large junk objects that accumulate water (*e.g.,* broken washing machines, refrigerators, toilets) in buildings, public areas, *etc.*
- At wider transmission, some methods not practicable for small foci, such as aerial insecticide application, might be incorporated.

Trapping and Surveillance Methods for *Aedes aegypti* and *Aedes albopictus*

Ovitraps

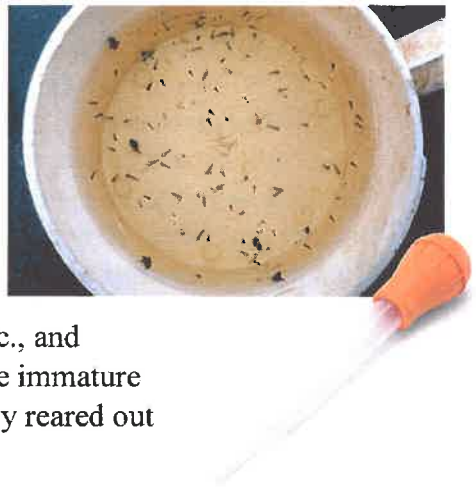
Ovitraps are small metal, glass or plastic containers, usually dark in color, containing water and a substrate (wood, seed germination paper, cloth, plant gel) where female mosquitoes lay their eggs. Ovitraps can be used to detect the presence of gravid *Aedes aegypti*, *Aedes albopictus* and a wide variety of other gravid females of container-breeding *Aedes* mosquito species (Fay and Eliason 1966, Mackay et al. 2013, Reiter et al., 1991). Ovitraps take advantage of the fact that gravid *Aedes aegypti* and *Aedes albopictus* females lay their eggs in artificial containers. Adequate sampling requires regular (weekly) trapping at fixed sites, representative of the habitat types, present in the community. Ovitraps should not be deployed in the field for more than a week at a time because they could become larval sites and may begin producing adult mosquitoes; however, some ovitraps are specifically designed not to produce mosquitoes (Chan et al. 1977; Barrera et al. 2013).

Ovitraps have several advantages, including being inexpensive, easily deployed, and not invasive (they can be placed outside of houses, not requiring entry into homes). A small number of ovitraps is usually

enough to determine vector presence; less than 100 ovitraps can reliably estimate abundance in a large urban neighborhood (Mogi et al., 1990). Typically, one ovitrap is placed per city block. Lastly, ovitrap data is easy to analyze; it is usually expressed as the percentage of positive ovitraps (ovitraps with eggs). The mean number of eggs per ovitrap can be used to estimate adult mosquito abundance.

Interpreting ovitrap data may require caution, because ovitraps compete with naturally occurring larval habitats and the estimates from oviposition surveys may not accurately reflect the abundance of gravid females under some conditions. For example, oviposition indices may be skewed after source reduction campaigns when gravid females find fewer suitable habitats and lay larger proportions of eggs in the ovitraps confounding the evaluation of control efforts (Focks 2003). Some degree of training in microscopy may be needed for accurate egg counting especially when there is debris on the oviposition surfaces. Lastly, the collected eggs need to be hatched and reared out in the laboratory and the larvae or adults identified to species, which requires trained personnel.

Immature Stage (Larvae and Pupae) Surveys



Because of a wide variety in type, size and shapes of water-holding containers, there is no standard equipment for sampling the immature stages of container breeding mosquitoes. If the container is large enough, such as a 55 gallon barrel, a dipper or net may be used. However, the common containers are small cans, tires etc., and usually the entire contents are emptied onto a tray or a pan and the immature stages picked out using a dropper. The immature stages are usually reared out in the lab and identified to species.

Adult Mosquito Trapping

Aedes aegypti and *Aedes albopictus* are not efficiently captured by the most commonly used mosquito traps, such as the miniature light trap or gravid trap. Currently the most commonly used adult traps for *Aedes aegypti* and *Aedes albopictus* are BG Sentinel Traps, and a variety of gravid traps such the CDC-Autocidal Gravid Ovitrap (CDC-AGO).

The BG Sentinel Trap. Used in combination with the BG-Lure, a dispenser which releases a combination of non-toxic substances that are also found on human skin (ammonia, lactic acid, and caproic acid), the BG-Sentinel is especially attractive for the yellow fever mosquito, the Asian tiger mosquito, the southern house mosquito, and selected other species. With the addition of carbon dioxide, the BG-Sentinel can be a surveillance tool for mosquitoes in general. The BG-Sentinel mosquito trap is essentially a collapsible, fabric container with a white lid with holes covering its opening. Air is sucked into the

trap through a black catch pipe by an electrical fan, which draws approaching mosquitoes into a catch bag.

Gravid female trap. The gravid trap uses a tub filled with water that provides an organically rich egg-laying habitat. The water attracts gravid female mosquitoes (females carrying eggs), and a fan draws them into the trap.

Autocidal Gravid Ovitrap. The autocidal ovitrap collects *Aedes aegypti* and *Aedes albopictus* eggs and prevent hatching larvae from ever completing their development and emergence as adults, through either mechanical means, such as sticky traps, or chemical control.

Landing Rate Counts. Landing rate counts are used to measure adult mosquito activity in a specific area by counting the number of mosquitoes that land on a person in a given amount of time, usually 1 to 3 minutes (**Attachment H**). The same inspector at each location should perform the counts for consistency because mosquitoes react differently to each individual. Landing rate counts one of the oldest and most effective, but labor-intensive techniques used to detect, capture, and quantify host-seeking daytime biting mosquito vectors such as *Aedes aegypti* and *Aedes albopictus*. However, due to potential health risks to field staff, especially in areas with ongoing arbovirus transmission, CDC does not recommend this technique.

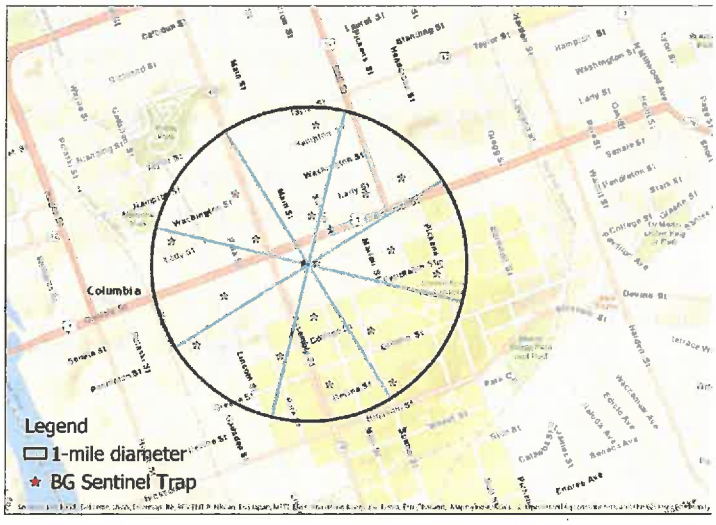
Mosquito Trapping During a Zika Virus Event

- **Non-Local Zika Virus Transmission**

Up to 2 BG Sentinel traps will be placed in the 165-yard radius transmission zone (~0.03 mi^2 area). Traps will run up to 3 days (24 hours per day) per week for two weeks.

- **Local Zika Virus Transmission**

At the outset of a local Zika virus transmission event, a 1-mile diameter transmission zone (~0.8 mi^2 area) will be established. The identified area might be expanded or reduced later if indicated by epidemiologic, entomologic and environmental information. Up to 18 BG Sentinel traps will be deployed in the ~0.8 mi^2 area, which will be divided into 8 sections. Up to 2 BG Sentinel traps will be placed in each section, and up to 2 BG Sentinel Traps will be placed around the patient-case mosquito exposure area. Traps will run up to 3 days per week for 45 days.



Specimen Handling and Processing

Mosquito-based arbovirus surveillance relies on identifying virus in the collected mosquitoes through detection of viral proteins, viral RNA, or live virus; therefore, efforts should be made to handle and process specimens in a way that minimizes exposure to conditions (e.g., heat, successive freeze-thaw cycles) that would degrade the virus. Optimally, maintain a cold chain from the time mosquitoes are removed from the traps to the time they are delivered to the processing laboratory, and through any short-term storage and processing. After allowing sufficient time for collection nets or chambers to dry, transport the mosquitoes from the field in a cooler either with cold packs or on dry ice. Sort and identify the mosquitoes to species on a chill-table if available. Maintaining a cold chain is particularly important if the specimens will be tested for infectious virus or viral antigen. However, lack of a cold chain does not appear to reduce the ability to detect WNV RNA by RT-PCR.

Mosquitoes are generally tested in pools of 50 to 100 specimens grouped by species, date, and location of collection. Larger pool sizes may result in a loss of sensitivity. South Carolina tests mosquitoes in pools of 10 to 30 specimens because mosquitoes are first screened by virus culture; sample containing more than 30 specimens often lead to contaminated virus cultures. Any blood-fed mosquitoes should be limited to 20 specimens. Usually only female mosquitoes are tested in routine arbovirus surveillance programs. If arbovirus screening is not done immediately after mosquito identification and pooling, the pooled samples should be stored frozen, optimally at -70°C, but temperatures below freezing may suffice for short-term storage.

Mosquito-Based Surveillance Indicators

- **Mosquito Immature Stage Survey Indices**
  Larval surveys usually involve identifying all or most of the immature mosquitoes found in every container (or a representative sample of containers) in the target area, home(s) community, neighborhood, etc. (**Attachment I**).

  Every water-holding container is inspected and categorized as positive (contains larvae/pupae) or negative otherwise (no larvae/pupae).

  The container indices below are computed from survey data.

  - House Index (Percentage of houses with at least one positive container)
  - Container Index (Percentage of all containers with water that are larva/pupa positive)
  - Breteau Index (Number of positive containers per 100 houses).

  Mosquito thresholds for dengue, chikungunya, Zika and yellow fever virus transmission, using larval indices, should be determined by each local vector control program for each location; state- or nation-wide thresholds should be used with caution.

- **Mosquito Adult Stage Survey Indices**
  Data derived from mosquito surveillance include estimates of mosquito species abundance and virus infection rate in those mosquito populations. The indices derived from those data are useful in determining levels of human risk. Commonly used indicators include:

  - Vector abundance
  - Infection rate

- Vector index

Vector abundance provides a measure of the relative number of mosquitoes in an area during a particular sampling period. It is simply the total number of mosquitoes of a particular species collected, divided by the number of trapping nights conducted during a specified sampling period, and is expressed as the number/trap night. Vector abundance can provide measures of population abundance that are useful as thresholds in conducting pro-active integrated vector management and in monitoring the outcome of mosquito control efforts. In the past, *Aedes aegypti* and *Aedes albopictus* surveillance has relied heavily on immature indices because until recently, monitor adult mosquito abundance has been difficult. However, the BG Sentinel Trap and a variety of gravid traps make it possible to accurately estimate adult mosquito abundance and to track infected mosquitoes. Tracking adult infected mosquitoes may help establish entomological infection rate thresholds for human disease risk for Zika virus.

The **Infection rate** in a vector population is an estimate of the prevalence of arbovirus-infected mosquitoes in the population and is a good indicator of human risk. Infection rate indices permit the use of variable pool numbers and pool sizes while retaining comparability. Larger sample sizes improve accuracy of the infection rate indicators. There are two commonly used methods for calculating and expressing the infection rate.

- The minimum infection rate (MIR) for a given mosquito species is calculated by dividing the number of arbovirus-positive pools by the total number of mosquitoes tested (not the number of pools tested). The MIR is based on the assumption that infection rates are generally low and that only one mosquito is positive in a positive pool. The MIR is commonly expressed as the number infected/1000 tested because infection rates are usually low.
- The maximum likelihood estimate (MLE) of the infection rate does not require the assumption of one positive mosquito per positive pool, and provides a more accurate estimate when infection rates are high; thus, it is the preferred method of estimating infection rate, particularly during outbreaks. The MLE and MIR are similar when infection rates are low. The MLE requires more complex calculations than the MIR; however, a Microsoft Excel® Add-In to compute infection rates from pooled data is available (https://www.cdc.gov/westnile/index.html > RESOURCES > MOSQUITO SURVEILLANCE SOFTWARE) or (https://www.cdc.gov/westnile/resourcepages/mosqsurvsoft.html).

The **Vector Index (VI)** is an estimate of the abundance of infected mosquitoes in an area and incorporates information describing the vector species that are present in the area, relative abundance of those species, and the WNV infection rate in each species into a single index. The VI is calculated by multiplying the average number of mosquitoes collected per trap night by the proportion infected with virus, and is expressed as the average number of infected mosquitoes collected per trap night in the area during the sampling period. The VI has demonstrated significantly better predictive ability than estimates of vector abundance or infection rate alone, clearly demonstrating the value of combining information for vector abundance and virus infection rates to generate a more meaningful risk index. As with other surveillance indicators, the accuracy of the Vector Index is dependent upon the number of trap nights used to estimate abundance and the number of specimens tested for virus to estimate infection rate.

Use of Mosquito-Based Indicators

The mosquito-based surveillance indicators, Infection Rate and Vector Index, should be calculated when mosquito samples are positive for arbovirus. These two indices have two important roles in arbovirus surveillance and response programs.

First, they can provide quantifiable thresholds for proactive vector control efforts. By identifying thresholds for vector abundance and infection rate that are below levels associated with disease outbreaks, integrated vector management programs can institute proactive measures to maintain mosquito populations at levels below which arbovirus amplification can occur.

Second, if thresholds related to outbreak levels of transmission can be identified, surveillance can be used to determine when proactive measures have been insufficient to dampen virus amplification and more aggressive measures, such as wide-scale application of mosquito adulticides and more aggressive public education messaging, are required to prevent or stop an outbreak.

Limitations to Mosquito-Based Surveillance

- Currently available information on adult infection rates and larval/pupal indices may not predict risk for human infection.
    - Larval/pupal surveys may miss cryptic, often overlooked habitats (e.g. gutters, broken septic tanks, sprinkler heads/assemblies, storm drains, etc.) and fail to provide accurate data on the relative abundance of the vector species.
- Larval/pupal indices may not correlate with adult mosquito abundance.
- Developing useful thresholds requires consistent effort to assure the surveillance indices and their association to human risk is comparable over time. Mosquito surveillance and human disease incidence data collected over several transmission seasons is required to produce useful predictive indicators. However, this is challenging to obtain with only sporadic arboviral outbreaks.

APPENDIX H – SC Mosquito Response Plan for Zika Virus

Listing of Attachments for APPENDIX H

ATTACHMENT A
Considerations for Identifying Communities at a Higher Risk for Zika Virus Interventions

Human factors

- Number of cases identified and whether the incidence of cases is increasing or decreasing
- Known or suspected links between cases (e.g., multiple infections in a household, which may reflect a single prior transmission episode, are of less concern than cases scattered in a neighborhood), including ruling out sexual or other bodily fluid associated transmission
- Geographic distribution of cases in an area (e.g., clustered cases in an area would suggest a higher intensity of transmission)
- Population density
- Housing density
- Privacy concerns (i.e., ensuring that individual case patients cannot be identified)

Mosquito surveillance and control factors

- Current vector surveillance data
- History of *Aedes aegypti* or *Aedes albopictus* in the area
- Presence of *Aedes aegypti* (greater concern) or *Aedes albopictus* (less concern)
- Mosquito breeding season remaining
- Vector control interventions of sufficient intensity likely to eliminate infection incidence in areas where case exposure likely occurred

Environmental and ecologic factors

- History of local dengue or chikungunya virus transmission in the area
- Area is within estimated geographic range of *Aedes aegypti* or *Aedes albopictus*
- Area is below 2,000 meters in elevation (elevation above which conditions are not conducive to transmission)
- Current or projected temperature supports vector activity
- Cases identified early (which are of more concern) or late (which are of less concern) in mosquito season

Infrastructure in area

- Estimated proportion of homes, workplaces and other settings with air conditioning
- Estimated proportion of homes, workplaces and other settings with intact screens on windows and doors
- Estimated proportion of homes, workplaces and other settings with non-secured water catchment systems

ATTACHMENT B
Mosquito Control for Container-Breeding Mosquitoes

Control of Immature Mosquitoes

Larvicides or pupicides are effective at killing larvae and pupae, but applying them is time consuming and labor intensive because individual larval habitats must be located and treated. Larvicides and pupicides should not be applied to drinking water, unless specified on the product label.

Evaluation of the effectiveness of pre-adult mosquito control may be accomplished by comparing the presence/absence and abundance of immature stages in treated containers before and after treatment or by comparing treated and untreated areas.

An important step in *Aedes aegypti* and *Aedes albopictus* control operations is identifying the types and abundance of containers producing mosquitoes and their productivity.

- Different containers require specific control measures that depend on the nature of the container and how it is used. There are five general types of containers producing *Aedes aegypti* and *Aedes albopictus*:
  - Water bodies held by terrestrial plants (Phytotelmata)
    - Treeholes, leaf axils, etc.
  - Non-essential or disposable containers
    - Food and drink containers, tires, broken appliances
  - Useful containers
    - Water-storage vessels, potted plants and trivets, animal drinking pans, paint trays, toys, pails, septic tanks
  - Cavities in structures
    - Fence poles, bricks, uneven floors and roofs, roof gutters, air-conditioner trays
  - Outdoor underground structures
    - Storms drains, water meters, public wells, septic tanks
- Commonly used control methods
  - **Source Reduction (Environmental Sanitation).** Remove and dispose of containers that hold water that may allow mosquito larvae and pupae to develop.
    - Source reduction is simple in concept but difficult to put into practice and sustain over long periods of time. Mosquito eggs are laid just above the water line in containers; scrubbing the container might be required to mechanically dislodge the eggs.
    - Local governments or communities can eliminate container-breeding mosquitoes by establishing:
      - Reliable supplies of piped water
      - Municipal refuse recycling programs (glass, metal, and plastic)
      - Used-tire recycling operations
      - Sewerage to replace septic tanks, etc.
  - **Larvicides.** Use chemicals or biological agents to kill or prevent development of mosquito immature stages.

    Larvicides are effective at killing larvae, but applying them is time consuming and labor intensive because individual larval habitats must be located and treated. Larvicides should not be applied to drinking water. There are a number of agents that can be used to control mosquito production in containers:

- **Biological larvicides.** Biological larvicides have little or no impact on non-target organisms and do not accumulate in the environment. Biological larvicides include:
    - Bacterial toxins ingested by mosquito larvae cause the larva's gut to rupture.
        - *Bacillus thuringiensis* var. *israelensis* (*B.t.i.*)
        - *Bacillus sphaericus* (*B.s.*)
    - Bacterial waste product
        - *Saccharopolyspora spinosa*
    - Insect Growth Regulators (IGRs): juvenile hormone analogs
        - Methoprene
        - Pyriproxyfen
    - Chitin synthesis inhibitors
        - Diflubenzuron
        - Diflubenzoylurea
- **Monomolecular films and oils.** These products spread on the water surface forming a thin film that causes suffocation of immature mosquitoes by preventing gas exchange.
- **Biological control.** Biological control may not be practical especially since *Aedes aegypti* and *Aedes albopictus* often develop in small containers. However, a variety of aquatic predators may be used, especially in large containers. These include:
    - Carnivorus copepods
    - Mosquitofish (*Gambusia affinis*).

Guidance on how to handle specific larval sites:

Larval Habitats	Empty/Clean Regularly	Store Under a Roof or Other Shelter	Fill with Sand	Throw Away or Recycle
Containers	X	X		X
Flower Pot Saucers	X		X	
Roof Gutters	X			
Tires		X		X
Tree Holes			X	

Control of Adult Mosquitoes

Adult *Aedes aegypti* and *Aedes albopictus* mosquitoes are day-biters. They tend to have peaks of activity during the hours after sunrise and the hours before sunset with less activity during the heat of the day and little to no activity at night.

Adult activity of *Aedes aegypti* and *Aedes albopictus* mosquitoes coincides with the times of highest vehicular traffic in their urban environments and unstable atmospheric conditions, often making aerial or truck adulticiding both impractical and ineffective. Localized spot treatments are the only effective adulticiding method for these species at this time.

Control measures should be carried out every 7 to 10 days to ensure that the breeding cycles of both *Aedes aegypti* and *Aedes albopictus* are disrupted. Spraying is performed with ultra-low volume (ULV) spray or thermal fogging within a 200-yard radius of the breeding habitat. For control of forest populations of *Aedes albopictus*, spraying in and around vegetation that serves as harborage is necessary.

Using insecticide to control adult mosquitoes should always include insecticide-resistance monitoring and management. Insecticide resistance has been demonstrated in almost every class of insecticide, including microbial pesticides and insect growth regulators (IGRs). Insecticide resistance, which is an inheritable trait, usually leads to significant reduction in the susceptibility of insect populations which renders insecticide treatments ineffective. Bioassays are used to monitor insecticide resistance in larvae and adult mosquitoes.

- **Chemical Control**
  - **Thresholds**
    - Determining the threshold when chemicals must be used is difficult to establish in mosquito control.
    - Deciding whether or not to treat is typically a response to a nuisance level or an individual perception of the problem, rather than a quantifiable presence or absence of mosquitoes. Thresholds can change with time and location as people's tolerance to biting changes.
    - When there are issues of public health, typical thresholds can be superseded by criteria described in approved emergency response plans.
  - **Barrier spraying**
    - Residual insecticides on external walls of houses and vegetation has been effectively used to reduce exposure to outdoor-loving mosquito species, including *Aedes albopictus*.
    - Residual insecticides are used on surfaces that adult mosquitoes frequently visit and land on, such as porches, doors, foundations, walls and ceilings, dark areas, discarded containers, vegetation, curtains, covers for water-storage vessels, lethal ovitrap oviposition strips, etc.
  - **Indoor residual spraying (IRS)**
    - Spraying residual insecticides indoors is particularly effective for controlling *Aedes aegypti*, primarily due to its indoor resting behavior.
    - Only two products, Suspend SC® (deltamethrin) and Talstar® P Professional (bifenthrin), are registered for use by the EPA as an indoor residual spray for mosquitoes.
    - Application to furniture or fabric should be restricted to areas where prolonged contact by humans will not occur.
    - Continuous insecticide exposure for the residents is a concern.
    - Targeted indoor residual spraying should be considered in places where housing does not have screens, air conditioning, or is otherwise open to mosquitoes, and especially if a pregnant woman is at risk.
      - Targeted areas in the house include such areas as under and behind furniture and in dark, undisturbed areas.
  - **Space spraying**
    - Insecticides are dispersed by backpack, vehicle- or aircraft-mounted equipment.
  - **Attractive toxic sugar baits**
    - Eugenol (a component of clove oil) and boric acid are toxic to adult mosquitoes. These baits might not work against *Aedes aegypti* in tropical urban areas because females of this species do not commonly consume sugars.
- **Physical Control (Non-insecticidal Mosquito Trap)**
  - **CDC Autocidal Gravid Ovitrap (AGO) trap**

        - Gravid female mosquitoes can be lured to traps baited with an egg-laying attractant and captured using sticky glue while attempting to lay eggs.
        - The use of three AGO traps per home in more than 85% of houses in neighborhoods in southern Puerto showed sustained and effective reductions of *Aedes aegypti* populations by 80%.
- **Personal Protection**
    - **Repellents**
        - CDC recommends the use of products containing active ingredients which have been registered by the U.S. Environmental Protection Agency (EPA) for use as repellents applied to skin and clothing. EPA registration of repellent active ingredients indicates the materials have been reviewed and approved for efficacy and human safety when applied according to the instructions on the label. Active ingredients include: DEET, Picaridin, Oil of Lemon Eucalyptus or PMD, and IR3535.
    - **Treat Clothing and Camping Gear with Permethrin**
        - Products that contain permethrin are recommended for use on clothing, shoes, bed nets, and camping gear, and are registered with EPA for this use. Do not apply permethrin directly to your skin.

Pesticides Used for Mosquito Control in the United States

Pesticide product labels provide critical information about how to safely and legally handle and use pesticide products. Unlike most other types of product labels, pesticide labels are legally enforceable, and all of them carry the statement: "It is a violation of Federal law to use this product in a manner inconsistent with its labeling." In other words, the label is the law.

EPA requires extensive scientific data on the potential health and environmental effects of a pesticide before granting a registration, which is a license to market that product in the United States. EPA evaluates the data and ensures that the label translates the results of those evaluations into a set of conditions, directions, and precautions that define who may use a pesticide, as well as where, how, how much, and how often it may be used.

A tolerance is the maximum limit of a pesticide residue considered safe. Tolerances are relevant to adult mosquito control because wind drift may carry the pesticide over agricultural crops where residues subject to legal tolerance requirements may occur.

Organisms Used for Biological Control of Mosquitoes

- Rearing copepods: https://edis.ifas.ufl.edu/in490
- Rearing mosquitofish: http://aquariumtidings.com/mosquitofish/

ATTACHMENT C
Best Management Practices for Integrated Mosquito Management (IMM)

IMM requires a thorough understanding of mosquitoes and their bionomics by control personnel; careful inspection and monitoring for their presence and conditions favoring their development; and prevention of oviposition and human/mosquito contact through effective public education, sanitation, and facility maintenance.

Overview

- Reduce mosquito numbers to tolerable levels while maintaining a quality environment. IMM does not emphasize mosquito elimination or eradication
- Utilize all available mosquito control methods singly or in combination while minimizing adverse environmental impacts
    - Cultural methods
    - Insecticidal methods
    - Habitat manipulations
- Deploy mosquito control measures based only on documented surveillance data and action thresholds, rather than on a pre-determined schedule absent a documented need.
- Accomplish the following:
    - Protect human, animal and environmental health
    - Promote a rational use of pesticides
    - Reduce environmental contamination to soil, ground water, surface water, pollinators, wildlife and endangered species as a result of mosquito control activities
    - Utilize biological controls (native, noninvasive predators) to conserve and augment other control methods
    - Utilize source reduction (elimination, removal or reduction of larval mosquito habitats) where practical and prudent
    - Use target specific pesticides at the lowest effective rates to the extent possible
    - Emphasize the proper timing of applications
    - Minimize pesticide resistance problems
- Exercise considerable judgment in allocation of limited resources to extract the maximum benefit for both the citizenry and the environment
- Perform Best Management Practices (BMPs) in concert with any general or individual National Pollution Discharge Elimination System (NPDES) permits that might be issued for mosquito control activities falling within the scope of Clean Water Act (CWA) requirements.
    - NPDES permits are issued for mosquito control activities falling within the scope of Clean Water Act (CWA) requirements.
        - NPDES/Pesticide Permit Information: http://www.scdhec.gov/Environment/WaterQuality/NPDES/PesticidePermit/
        - Summary to Understand the Permit: http://www.scdhec.gov/environment/docs/npdes_guidance.pdf
        - Notice of Intent (NOI): NPDES General Permit for Discharges from the Application of Pesticides (SCG160000): http://www.scdhec.gov/Environment/docs/d-2732.pdf
        - National Pollution Discharge Elimination System: https://www.epa.gov/npdes

- Adhere to BMPs to the maximum extent practicable is the necessary minimum to undertake or perform for purposes of regulatory compliance with general or individual NPDES permits for mosquitocide use.
    - Individual agencies/entities charged with mosquito management responsibilities may not have the resources to practice all of the specific sub-elements.
- Create a Pesticide Discharge Management Plan (PDMP), as part of the operative NPDES permit, to document how the nine BMP components listed below will be employed.

Ten Components of Best Management Practices for Integrated Mosquito Management (IMM)

- **Surveillance** – the backbone of all IMM programs. Identify problem species and population trends in order to direct and evaluate control methods.
    - Visually check for potential egg-laying habitats and larval populations.
        - Rural - swamps, salt & freshwater marshes, woodland pools, flooded fields/ pastures, roadside ditches, storm water retention ponds, tree holes, rice fields, etc.
        - Urban - flower pots, tires, trash containers holding water, gutters, tree holes, septic ditches, roadside ditches, lawn swales, non-functional swimming pools, stagnant bird baths, street catch basins, junk yards, depressions in tarp covers, etc.
    - Determine population levels of adult mosquitoes using professionally acceptable techniques, including service requests, trap or collection data (if applicable) and/or landing rate counts (when appropriate), to establish needs for action.
    - Determine if problem species are those that lay eggs primarily in containers around human habitation, which will dictate that prevention/control strategies be geared toward removal of egg-laying sites through public education.
- **Mapping** – Utilize maps of appropriate scale to continually monitor major sources of larval/adult mosquitoes in addition to documenting areas where control measures have been instituted. These maps should define treatment areas and can be used as appropriate in the PDMP.
- **Set Action Thresholds** – Decisions to initiate control measures should be based on the analysis of either larval or adult mosquito surveillance or other available field data.
    - Determine which methodology shall be used to determine if and when control measures are instituted.
    - For control of immature stages of mosquitoes, this methodology can consist of numbers of larvae and pupae observed in dip counts or observation of their presence in water sources.
    - For adult mosquito control this methodology can consist of:
        - Number and pattern of citizen's service requests.
        - Visual – numbers of mosquitoes landing on inspector/applicator within 1-minute periods. When practicable, landing rate counts should be taken near or at times of peak mosquito activity for the species of concern. Performance of landing rate counts is only advised in areas or at times without significant mosquito-borne disease activity.
- **Source Reduction** – Source reduction (the elimination, removal or modification of larval mosquito habitats) typically is the most effective and economical long-term method of mosquito control, but this may not be practicable for many larval habitats. Source reduction can be as simple as overturning a discarded bucket or disposing of a waste tire or as complex as habitat modification through Open Marsh Water Management techniques. These efforts often minimize and/or eliminate the need for mosquito larviciding in the affected habitat in addition to greatly reducing the need for adulticiding in nearby areas.
    - Determine feasibility of removing or modifying oviposition sites.
    - Encourage proper water management by public/private agencies responsible for storm water retention/detention structures and ditch and impoundment maintenance.

- Maintain familiarization with jurisdiction health nuisance abatement policy.

- **Biological Control** – These control methodologies are often resource-intensive and may not be advisable or practicable for many programs. Nonetheless, their feasibility should be explored.
  - Stocking of certain species of native, non-invasive fish known to be predators of mosquito larvae, if allowed by applicable state or local authorities, may provide significant reductions in larval mosquito populations in basic programs where management of large perennial oviposition sites is to be the primary control strategy.
  - Utilization of bats, birds, dragonflies and other putative predators of mosquitoes can be both ecologically problematic and ineffective as a primary control strategy and is therefore not recommended as a major component of any control strategy.
- **Public Health Mosquitocides** – Handling, disposal, personal protective measures and applications must be made in full accordance with product label specifications.
  - **Larvicides** – Often may be the primary control method in natural or man-made wetlands (salt marshes or tidal wetlands, riverine bottomlands, woodland pools, freshwater marshes, meadow swales, roadside ditches, stormwater management ponds, etc.). These can also be a primary control method in locations where mosquito populations are determined to be arising from defined, concentrated sources in urban areas or in close proximity to houses. Due to continual influx of adult mosquitoes from outlying areas, larviciding programs may have limited visible effect on mosquito populations in jurisdictions lacking resources to adequately larvicide outlying production areas.
    - Several materials in various formulations registered by EPA are labeled for mosquito larviciding. Choice of active ingredient and formulation chosen will depend on site-specific factors and resistance management, and may include:
      - Microbial larvicides
      - Growth regulators
      - Chitin synthesis inhibitors
      - Monomolecular surface films
      - Oils – petroleum and mineral-based
    - Larvicides should minimize impacts to non-target organisms and must, in many instances, be capable of penetrating dense vegetative canopies. Larvicide formulations (e.g., liquid, granular, solid) must be appropriate to the habitat being treated, accurately applied and based on surveillance data or preemptively applied to known oviposition sites.
  - Larvicide application equipment should be calibrated and maintained per equipment manufacturer's specifications and timetable, or per instructions from product registrant.
- **Adulticides** – Adulticides are applied so as to impinge upon the mosquito target in flight or at rest on vegetation.
  - Adulticiding based on surveillance data is an extremely important part of any IMM program, and may form the primary treatment method for many programs where comprehensive larviciding is not practical.
  - Adulticides utilized in basic programs are typically applied as an Ultra-Low-Volume (ULV) spray or "cold fogs" where small amounts of insecticide are dispersed by aircraft or truck-mounted equipment. In some jurisdictions, adulticides may also be applied via "thermal fogs", utilizing heat to atomize droplets. Adult mosquitoes may also be targeted by "barrier treatments", which involve application of a residual insecticide to vegetation where mosquitoes are known to rest.
  - Adulticides should only be applied when established spray thresholds have been exceeded. When there are issues of public health, typical thresholds can be superseded by criteria described in approved emergency response plans.

  - Non-residual adulticides applied to the air column in order to impinge upon mosquitoes in flight should only be applied when the target species is active.
  - Adulticides should be applied strictly according to label specifications. This will produce minimal effects on non-target organisms and promote efficacy.
  - Adulticides should not be applied in rainy or windy conditions.
  - Adulticides should only be applied by personnel trained or certified in their usage and handling, or when operating under the supervision of an individual having met the necessary certification requirements.
  - Adulticides labeled for mosquito control in part may include:
    - Organophosphate
    - Natural pyrethrins
    - Pyrethroids
    - Pyrethroid derivatives
  - Adulticides should be applied at label rates that are efficacious as determined by monitoring. Applying doses lower than those that provide adequate control can in fact result in the need for additional adulticide treatments and might encourage development of insecticide resistance.
  - Adulticide application equipment should be calibrated and maintained per equipment manufacturer's specifications and timetable, or per instructions from the product registrant to ensure performance meets product label specifications.
- **Monitoring for Efficacy/Resistance** – Resistance management techniques attempt to minimize the risk of mosquitoes becoming resistant to the existing chemicals and should be practiced in even basic programs.
  - Basic resistance management techniques can include:
    - Utilizing physical control/source reduction and biological control methodologies to the maximum extent practicable.
    - Avoiding the use of the same class of chemical against both immature and adult mosquitoes.
    - Applying pesticide at the rate recommended on the label. Do not underdose.
    - Utilizing a different chemical class at the beginning and end of treatment season.
    - Assessing susceptibility at the beginning and sometime during the mosquito season.
  - Resistance management can also involve utilizing surveillance methods following larvicide or adulticide applications to continually check for control efficacy.
- **Education & Community Outreach** – IMM is knowledge-based and involves a concerted effort by both control personnel and the community to manage mosquito populations based upon informed decision-making.
  - Education of the general public should be encouraged to enlist resident's support in disposing of (or modifying) oviposition habitat, proper screening methods and proper application of personal protective measures such as repellents to minimize human/mosquito contact.
  - Mosquito control programs should keep their constituents informed of surveillance and control activities to the maximum extent practicable.
  - Mosquito control personnel are strongly encouraged to maintain and upgrade their professional knowledge through continuing education training and/or attendance at professional conferences.
- **Record-keeping** – Operators/applicators should record the following for each application and maintain the records for the time specified by the lead regulatory agency:
  - Applicator's name, address and pesticide applicator certification number (if applicable)
  - Application date and time of day
  - Product name and EPA registration number

- General location of application and approximate size of area treated
- Amount of material applied
- Rate of application

Reference:

American Mosquito Control Association. 2009. Best Management Practices for Integrated Mosquito Management. Last update: December 2, 2009. Available at http://www.mosquito.org/assets/Resources/PRTools/Resources/bmpsformosquitomanagement.pdf

ATTACHMENT E
Record of Mosquito Control Response Actions

Location of Service:

Company or Agency Performing the Service:

Mosquito Management Techniques that include:

1) The radius of the area from the case-patient site
2) Dates and times performed
3) Name(s) of product(s)
4) Amount(s) of product(s)
5) Dilution used
6) Application rates
7) Number of applications

Adulticiding:

Larviciding:

Source Reduction (Eliminating Water-filled Containers):

Educational Activities (door-to-door home visits, names of fliers):

For imported case or sexual transmission case – was a follow up done every 5 to 7 days for at least two weeks?

For local transmission – were treatments repeated per label instructions to ensure coverage for 45 days?

Comments:

ATTACHMENT F
Quick Start Guidance for Mosquito Control Response

1. Record the following information: disease name; travel-related (imported) case or local transmission; case-patient's name, address, and phone number; outdoor activity and locations visited, including address(es); date of onset; if person was infectious to mosquitoes while in SC.
2. Plot the point on a map (GIS software, Google Earth Pro, etc.) and draw the appropriate mosquito control target zone (e.g., 500-yard radius). SC DHEC can do this for you.
3. Review the target zone for "at risk" populations (e.g., schools, nursing homes, no-spray request zones, beekeepers' hives, etc.), appropriate breeding sites that might require attention, such as catch basins, yards with tires, water-holding containers, etc.
4. Set out traps made specifically to target *Aedes aegypti* and *Aedes albopictus* mosquitoes (e.g., BG Sentinel 2 trap). Run traps for the amount of time recommended by DHEC or for the duration of viral activity.
5. Set up a spray mission for the target area as soon as possible to kill adult mosquitoes (adulticiding). If local transmission is occurring, public health takes precedence over no-spray zones, such as beekeepers' hives, people with allergies, and medical care facilities. Contact these "at risk" populations as soon as possible. Beekeepers will have to take appropriate precautions, such as covering their hives with wet blankets.
6. Conduct a door-to-door survey, which consists of the following:
    a. Larval surveys usually involve identifying all or most of the immature mosquitoes found in every container (or a representative sample of containers) in the target area.
    b. Eliminate water-holding containers by tipping them over or throwing them away.
    c. Use a larvicide to treat containers that are too heavy to lift or otherwise cannot be tipped over. Include catch basins and storm drains.
    d. Give out educational fliers to landowners and speak to them when possible.
7. If a high population of mosquitoes remain after the larval survey and the adulticide mission is complete, spray the area with a hand-held or backpack unit to target adult mosquito resting sites, which are shady areas such as vegetation or underneath decks or porches.
8. Submit captured adults obtained from the mosquito traps to the DHEC public health laboratory (state lab) for virus testing.
9. Refer media inquiries to DHEC Media Relations (803-898-7769; media@dhec.sc.gov) or to your own media relations staff.
10. If virus activity is wide-spread, then aircraft might be appropriate.
11. Maintain all response records.
12. Conduct follow-up visits as required.

ATTACHMENT G

dhec Healthy People. Healthy Communities.	Confidentiality Notice Regarding Sharing of Information Related to Mosquito-Borne Diseases

The South Carolina Department of Health and Environmental Control (DHEC) is charged with investigating the causes, character, and means of preventing epidemic and endemic diseases in South Carolina. DHEC's responsibilities include investigating and preventing the spread of mosquito-borne diseases; however, DHEC does not provide any mosquito-abatement services, which are the responsibility of county, city and local governments (collectively, "local governments"). At times, DHEC receives information it finds necessary to share with local governments in order for them to initiate and perform appropriate mosquito-abatement services and prevent the spread of mosquito-borne diseases. Such information may include protected health information and personally identifiable information, which the Department is authorized to share in order to protect the public health pursuant to sections S.C. Code Ann., Sections 44-1-80 and 44-1-90. However, in accordance with these requirements, DHEC will restrict its sharing of such information to authorized personnel of local governments who have a need to know and to information necessary for the treatment, control, investigation, and prevention of the spread of mosquito-borne disease. While DHEC may share information with local governments, any information which could lead to the identity of an individual will not be made public by DHEC pursuant to S.C. Code Ann., Section 44-1-110.

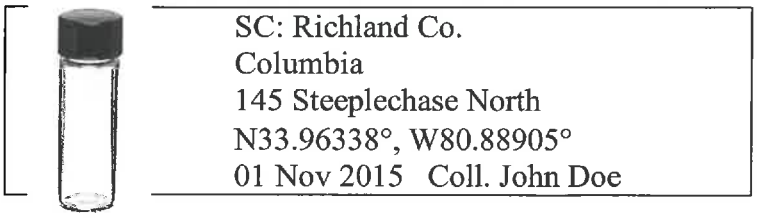
Once DHEC shares information with a local government, the responsibility for protecting the confidentiality of that information shifts from DHEC to the local government. Local governments are encouraged to consult their attorneys regarding their obligations to maintain the confidentiality of information shared by DHEC and to protect the identity of individuals infected with mosquito-borne diseases. It is strongly recommended that local governments include confidentiality requirements in their contracts with vendors who will provide mosquito control.

ATTACHMENT H
Conducting Landing Rate Counts

- Divide the city, precinct, or county into four geographical zones and conduct landing rate counts at 4 to 5 locations within each zone.
- Landing rate counts should be taken the same time each day. Recommended Time Period: Early in the day (between 7:30 a.m. and 10:00 a.m.) or late in the day (between 5:00 p.m. and dark)
- Counts should not be taken during the heat of the day because most mosquitoes are inactive.
- Wear solid light-colored long sleeves and pants. Mosquitoes are more easily seen on solid light-colored material versus a dark-patterned background.
- If possible, the same person should perform the counts to maintain consistency of before- and after-spray data.
- No repellents, after-shave lotions, or perfumes should be used.

PROTOCOL

1. Do not stand in direct sunlight. Choose a shaded site near bushes or trees.
2. Disturb surrounding vegetation before starting the counts.
3. Stand still for three minutes before beginning the count. In high density situations, this step may not be necessary as mosquitoes will start landing immediately.
4. Take all landing rate counts from a standing position.
5. Count (aspirate) only those mosquitoes that land in one minute on the front of one leg from the waist to the foot.
6. Complete the "Mosquito Landing Rate Data Sheet", using real numbers for the mosquito landing counts. For example, 25 or 75 are much more meaningful numbers than 50+ or 100+.
7. If aspirating mosquitoes, label the collection vial as in the following example and keep the collection in a cooler with gel ice packs.



Mosquito Landing Rate Data Sheet

City _____ **Zone** _____ **Date** **(DD/MM/YYYY)**
County **ZIP**
_____ **Code** _____ **Technician Performing Counting** _____
Human Subject _____

No.	Collection Site	X; Longitude −78.50 to −83.37	Y; Latitude 32.00 to 35.30	Time	Count	Weather Conditions (temperature °F, wind, overcast, clear, etc.)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

If not a physical street address, provide detailed directions with distances from nearby road intersections. If necessary, draw a map.

ATTACHMENT I
Conducting a Container-Breeding Survey

Because of a wide variety in type, size and shapes of water-holding containers, no standard equipment exists for sampling the immature stages of container-breeding mosquitoes. If the container is large enough, such as a 55-gallon barrel, a dipper or net may be used. However, the common containers are small cans, tires etc., and usually the entire contents are emptied onto a tray or a pan. The immature stages can be picked out using a dropper and reared out to adults in the lab and identified to species.

IMMATURE STAGE SURVEY INDICES

Larval surveys (*Stegomyia* indices): Larval surveys usually involve identifying all or most of the immature mosquitoes found in every container (or a representative sample of containers) in the target area, home(s) community, neighborhood, etc.

Every water-holding container is inspected and categorized as positive (contains larvae/pupae) or negative otherwise (no larvae/pupae).

The container indices below are computed from survey data.

- **House Index** (Percentage of houses with at least one positive container)
- **Container Index** (Percentage of all containers with water that are larva/pupa positive), and
- **Breteau Index** (Number of positive containers per 100 houses).

Mosquito thresholds for dengue, chikungunya, Zika, and yellow fever virus transmission, using larval indices, should be determined by each local vector control program for each location; state- or nation-wide thresholds should be used with caution. The following thresholds were proposed for some mosquito-borne diseases:

Virus	Example Container Indices Needed to Suppress Transmission*					
	House Index		Container Index		Breteau Index	
Dengue	1.0 % 1.0 %	(Chang et al. 2015) (Pontes et al. 2000)	1.8 %	(Chang et al. 2015)	1.2	(Chang et al. 2015)
Yellow fever	5.0 %	(Soper 1967)	10.0 %	(Connor et al. 1923)	5.0	(Brown 1977)

*Such thresholds may not apply to all locations and to all arboviruses.

References:

Brown AWA. 1977. Worldwide surveillance of *Aedes aegypti*. Proceedings of Annual Conference California Mosquito Control Association; NY, USA, Academic Press; p. 20-25.

Centers for Disease Control and Prevention. Surveillance and Control of *Aedes aegypti* and *Aedes albopictus* in the United States. Atlanta, Georgia: August 2015. The information presented in this document is subject to change as new information is learned. http://www.cdc.gov/chikungunya/resources/vector-control.html. Page last updated: April 2, 2016.

Chang FS, Tseng YT, Hsu PS, Chen CD, Lian IB, Chao DY. 2015. Re-assess vector indices threshold as an early warning tool for predicting dengue epidemic in a dengue non-endemic country. PLoS Negl Trop Dis 9(9): e0004043. doi:10.1371/journal.pntd.0004043.

Connor ME, Monroe WM. 1923. *Stegomyia* indices and their value in yellow fever control. American Journal of Tropical Medicine and Hygiene 3:9-19.

Pontes RJS, Freeman J, Oliveira-Lima JW, Hodgson JC, Spielman A. 2000. Vector densities that potentiate Dengue outbreaks in a Brazilian city. American Journal of Tropical Medicine and Hygiene 62:378-383.

Soper FL. 1967. *Aedes aegypti* and yellow fever. Bulletin of the World Health Organization 36:521-527.

Container-Breeding Survey Summary Report

Control Zone Surveyed: _____ Date: _____

Total # Houses Visited: _____ # of Inspectors _____

Houses Inaccessible = _____ # Houses Inspected = _____

Houses with Water-Holding Containers = _____ # Houses with Pos Water-Holding Containers = _____

Total # Water-Holding Containers (pos & neg) = _____ Tot # Pos Water-Holding Containers= _____

_____	**Man Hours**	=	# Inspectors	x	# Hours to Perform Survey		
_____	**House Index (HI)**	=	# Houses with Positive Containers	÷	# Houses Inspected	x 100	
_____	**Container Index (CI)**	=	Total # Containers	÷	Total # Water-Holding Containers	x 100	
_____	**Breteau Index (BI)**	=	# Positive Containers	÷	# Houses Inspected	x 100	

Container-Breeding Survey Summary Report

Control Zone Surveyed: _____ Date: _____

Total # Houses Visited: _____ # of Inspectors _____

Houses Inaccessible = _____ # Houses Inspected = _____

Houses with Water-Holding Containers = _____ # Houses with Pos Water-Holding Containers = _____

Total # Water-Holding Containers (pos & neg) = _____ Tot # Pos Water-Holding Containers= _____

_____	**Man Hours**	=	# Inspectors	x	# Hours to Perform Survey		
_____	**House Index (HI)**	=	# Houses with Positive Containers	÷	# Houses Inspected	x 100	
_____	**Container Index (CI)**	=	Total # Containers	÷	Total # Water-Holding Containers	x 100	
_____	**Breteau Index (BI)**	=	# Positive Containers	÷	# Houses Inspected	x 100	

Container-Breeding Survey Summary Report

Control Zone Surveyed: _____ Date: _____

Total # Houses Visited: _____ # of Inspectors _____

Houses Inaccessible = _____ # Houses Inspected = _____

Houses with Water-Holding Containers = _____ # Houses with Pos Water-Holding Containers = _____

Total # Water-Holding Containers (pos & neg) = _____ Tot # Pos Water-Holding Containers= _____

_____	**Man Hours**	=	# Inspectors	x	# Hours to Perform Survey	
_____	**House Index (HI)**	=	# Houses with Positive Containers	÷	# Houses Inspected	x 100
_____	**Container Index (CI)**	=	Total # Containers	÷	Total # Water-Holding Containers	x 100
_____	**Breteau Index (BI)**	=	# Positive Containers	÷	# Houses Inspected	x 100

Container-Breeding Survey

Area Name

Inspector's Name: _____ **Date:** _____

Address	Access?	# Water-Holding Containers	# + Water-Holding Containers	Comments

Address	Access?	# Water-Holding Containers	# + Water-Holding Containers	Comments
TOTALS:	**# Homes Inspected**	**Total # Water-Holding Containers**	**Total # + Water-Holding Containers**	**Total # of Water-Holding Containers (Pos. & Neg.)**

Appendix I

Door-to-door Dissemination of Information in Response to Local Transmission of Zika

I. Purpose:

The purpose of this document is to outline the process for providing door-to-door dissemination information and educational materials in response to local transmission of Zika virus.

II. Authorities:

When it is determined that information should be distributed door-to-door in response to local transmission of Zika virus, a team of DHEC staff from Health Services and Environmental Affairs, and volunteers and county staff as available, will be activated. Health Services Public Outreach staff in the regions, in conjunction with OPHP, will assume the lead role for organizing the team and overseeing their activities.

III. Process:

1. Identify targeted geographic area based on area of concern as defined by the State Epidemiologist, in conjunction with the State Public Health Entomologist.
2. Create or revise messaging in response to current situation. This could include guidance on actions people can take to protect themselves and/or specific instructions about participating in a prevalence study (collecting and testing urine, blood or other specimens for public health surveillance).
3. Identify standard materials for distribution, which may include Zika prevention kits, if available.
4. Establish a "geographical grid" within targeted area and assign staff to specific locations.
5. Create a matrix to identify current and future staffing needs, including evaluating the need for volunteers. The following formula will be used to determine the staff resources needed to serve 1,000 residences in 72 hrs. The estimate for a population of 1,000 can be multiplied to a larger scale as appropriate. This formula provides guidance for close proximity communities (traditional block neighborhood layout) and for rural settings where homes are more widely dispersed.

    - Homes in Close Proximity – 5 mins per residence
        - Using teams of two working 7 hour days (this excludes lunch/break)
        - It would require 4 teams to visit approximately 1,000 residences in 72 hrs.
        - This requires 8 people.
        - 12 homes/hr/team x 4 teams x 21 hrs = 1,008 residences

    - Rural Setting – 15 mins per residence
        - Using teams of two working 7 hour days (this excludes lunch/break)
        - It would require 12 teams to visit approximately 1,000 residences in 72 hrs.
        - This requires 24 people.
        - 4 homes/hr/team x 12 teams x21 hrs = 1008 residences hit

6. Utilize pairs of two for door-to-door canvasing.
7. Provide an agency cellphone or 800 Mhz radio for each pair to carry during the operation.
8. Establish and provide emergency contact lists.
9. Identify processes for moving materials and staff or volunteers to distribution locations.

10. Establish meeting location(s) with a facility large enough to support:

- Capability to support JIT training (including PowerPoint presentations)
- Storage of large quantities of materials needed for distribution
- Space to set up drink and food stations for staff and volunteers
- Space for staff and volunteers to rest and eat
- Restrooms
- Space for staff to park or leave their cars while distributing materials

11. Provide just-in-time (JIT) training, including safety measures, before deploying any teams.

12. Notify local law enforcement of door-to-door activity to include expected starting and stopping times.

13. Coordinate with CareLine to update scripts with information about outreach activities.

VI. Response Activities:

Identified staff should be ready to begin disseminating information in the field within 24 hours of being notified of the need.

Appendix J

Urine Collection Plan for Local Zika Transmission

I. Purpose:

The purpose of this document is to outline the processes and procedures required for urine collection needed to screen at risk individuals once local transmission has been confirmed. Confirmation from CDC that urine collection surveillance is required will occur prior to the notification of staff and partners that urine collection will be implemented.

II. Authorities:

Health Services will assume the lead role for activities related to the collection of urine.

III. Responsibilities

DHEC Responsibilities (i.e., both Regional and Central Office)

1. The Incident Commander and Area Commander responding to an event will:

a. Serve as the primary points of contact at both the Regional (Incident Commander) and Central Office (Area Commander) levels for the coordination and development of situational reports (SITREPS) related to the progress and resolution of the response to an Event.

b. Implement Incident Action Plans (IAP) which:

i. Establish designated parameters for area of concern
ii. Establish estimated number of people that will need testing
iii. Establish timeframes for testing
iv. Establish staff required to support this mission
v. Establish educational materials for staff
vi. Establish supplies required to support this mission
vii. Establish means to get needed supplies to the regions
viii. Establish means to get urine specimens to the BOL
ix. Establish guidelines for screening of clients
x. Establish process for communication of test results
xi. Follow guidelines for retention of client information
xii. Identify gaps in planning or staffing

c. Integrate guidance for sources (Red Book, Control of Communicable Diseases, ACIP Statements, and other national guidance) along with consultation of subject matter experts.

d. Maintain responsibility for assuring that standard principles of good investigation practice are followed, including performance of hypothesis generating interviews, collection of environmental samples and human specimens for laboratory testing, and performance of an appropriate epidemiologic study.

e. Form a case definition to identify outbreak-associated cases. Refer to disease specific outbreak policies (http://dhecnet/hs/policy/ade.htm) and guidance documents (http://dhecnet/hs/disease/dade/atoz.asp) for additional information, as well as the Steps in an Outbreak Investigation found in Appendix C of this document.

f. If the DHEC Regional Coordination Center and/or the Agency Coordination Center (ACC) is activated, establish a liaison and continue to coordinate the epidemiologic response via established communication channels.

2. The Director of Health Services will determine if activation of the Agency Coordination Center (ACC) is required via consultation with subject matter experts, including Public Health leadership. If needed, Incident Command will then move operations to the ACC.

3. The Incident Commander (IC) will:

a. Identify teams for the collection for ZIKA specimens.

i. Each health department should identify at least two teams to include 1 administrative person and 1 clinical person (lab or nurse) to process clients for urine surveillance. Health Departments or other designated collection sites should be ready to receive patients within 24 hours of confirmation of local transmission.

ii. Estimate that each team can process approximately 22 clients/day with the visit taking approximately 20 minutes.

7.5 hrs. /day (team = 1 clinician & 1 admin) = 450 mins, 1 client visit = 20 mins

450 mins/ 20 mins = 22.5 clients that can be served by 1 team in 1 day

iii. Based on the area for the urine surveillance's population, identify additional teams as indicated.

b. Begin the investigation on-site.

c. Identify appropriate storage locations within each main HD for ZIKA specimens.

d. Ensure transport of specimens to the BOL follow the established guidelines.

e. Provide regular updates in the progress of the investigation/response to the Incident Commander.

IV. Activation

This plan will be activated if the criteria has been met to determine that urine collection is required within an area that has confirmed local transmission of Zika virus. The following will be addressed:

1. Initial Identification of Local Transmission:
   a. The State Epidemiologist and the Director of OPHP will be consulted immediately.
   b. The State Epidemiologist will contact the CDC's EOC immediately following the suspicion of local transmission of Zika virus.
   c. Draft a standing medical order for the collection of urine for suspected Zika
2. Area of concern identified:
   i. The State Epidemiologist in conjunction with the State Medical Entomologist, and the CDC will identify the parameters for areas of concern for targeted notification.
   ii. Once these parameters have been determined, this information will be shared with Agency Leadership, Communications Department, OPHP, Health Services, SCEMD, Environmental Affairs, OGC, Legislative Affairs, and appropriate local officials.
3. BOL issues related to Zika virus testing will be identified and plans implemented to resolve the issues.

4. Reprioritization of health department functions in order to accommodate the expected surge in testing at a facility will be implemented as indicated.
5. If it is expected that the number of specimens could exceed the storage capacity of the facility before the specimens can be sent to the lab, a process for the storage of specimens will be developed prior to collection.
6. Confirmation with courier vendors to ensure the vendor can accommodate the increase shipment volume and that the current process for shipment of specimens is not disrupted.
7. Procurement processes for additional testing supplies and funding sources should be implemented.
8. A matrix will be created to identify all current and future staffing needs.
    a. The shifting of DHEC staff to areas of need should be addressed.
    b. The potential need for the MRC and/or other volunteers should be addressed.
    c. The role of the local government should be established.
9. The need for additional collection sites should be addressed.
    a. The County Health Department should be used as the primary collection site if it has the capability to do so.
    b. If it is determined that a Health Department within an affected area is not suitable to use as a collection location or if it is determined that the number of people that need to be tested is not manageable at the county's health department, then the following features are required and should be considered when choosing a secondary site:

        i. multiple bathrooms or stalls;
        ii. refrigeration;
        iii. areas that provide privacy for interviewing;
        iv. parking capacity;
        v. handicap and accessibility issues;
        vi. security;
        vii. storage of supplies.
        viii. phone service for access to tele-interpreters
        ix. location for onsite media interviews