**Climate Readiness Training Module Outline**

**Module Name: Vector Borne Diseases**

**Total run time:**

In-Person Session: 120 minutes

**Module Objectives:**

1. Define vectors, vector-borne diseases, and vectors of concern for the Cambridge population
2. Understand how climate change is increasing the risk of tick- and mosquito-borne diseases
3. Understand how vector-borne diseases are related to climate justice
4. Identify tick- and mosquito-borne diseases and prevention strategies

**In-Person Session Agenda:**

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| **Section** | **Details** | **Facilitator/ Materials** | **Timing**  (Total: 120 Minutes) |
| **Welcome** | Allow 5 minutes for people to settle in.  Provide a formal welcome and review the goals of the day.  Ask C3 members to share:   * Name * Icebreaker: Where do you like to spend time outside in Cambridge during the summer?   Briefly describe the agenda for the day. Pause for questions/clarifications. | Facilitator leads | **10 mins** |
| **Pair & Share-** | Break into small groups of 2-3 to reflect on the following prompts:   * Where have you experienced mosquitos or ticks in Cambridge? * What are strategies you use to fend off mosquitos or ticks? * What are memorable news events related to mosquitos or ticks? Did it change how you think or act?   Back in the large group, go around the room and have one person from each group share something that stood out to them from their conversation.  Have the facilitator identify any themes and connect them to the day’s agenda. |  | **10 mins** |
| **Vectorborne Diseases 101**  **(Lesson)** | In this section the facilitator presents on:   * Definition of a vector & vector-borne disease * How climate change is affecting mosquito and tick populations & spread of vectorborne disease   **What is a VECTOR?**  in public health lingo: is “any organism that can transmit infectious pathogens between humans, or from animals to humans”.  In practice, in this region we are usually talking about diseases transmitted via mosquitoes, ticks and fleas. Spiders are not considered “vectors”, because they don’t transmit pathogens, only poisons  **VECTOR-BORNE DISEASES (VBD)**  The human and other animal illnesses carried by vectors are called Vector Borne Diseases (VBD). Vector borne diseases include:   * viral (Dengue, WNV, EEE, Zika, Chikungunya, Yellow fever) * protozoal (malaria,Chagas, schistosomiasis)   VBD account for one-sixth (1/6th) of all cases of infectious disease globally. TICKS Tick-borne Diseases Account for 77% of all vector-borne (insect-borne) disease in the US. Most important are Lyme, Anaplasmosis (deer tick), & Rocky Mountain Spotted Fever (dog tick). We'll talk more about this later  **Climate is expanding VBD risk**   1. Shifting the range of habitation for local species (warmer avg temps,more heavy rainfall, stronger storms, major flooding, fewer hard freezes) 2. Introduction of non-local species capable of carrying new VBDs (e.g. Aedes albopictus, Dengue) 3. Creating or altering habitat through major flooding and powerful storms   Example of shifts in weather patterns changing leading to changing ranges for VBD: **Dengue. From the NYTime Article** cited:   * “Worldwide each year, there are 100 million cases of dengue infections severe enough to cause symptoms, which may include fever, debilitating joint pain and internal bleeding. There are an estimated 10,000 deaths from dengue — also nicknamed breakbone fever — which is transmitted by Aedes mosquitoes that also spread [Zika](https://www.nytimes.com/2017/01/16/health/zika-virus-response.html) and chikungunya.” * “Research has found a likelihood for significant expansion of dengue in the southeastern United States, coastal areas of China and Japan, as well as to inland regions of Australia.” * “Warming temperatures help expand dengue’s range because, in part, as it gets warmer mosquitoes can thrive in more places where they couldn’t previously. Warming temperatures also shorten the time it takes a mosquito to become a biting adult and accelerate the time between when a mosquito picks up a disease and is able to pass it on”   Other Examples:   * 2023 Malaria returns to Florida and Texas * 2023 - First locally acquired case of Maria in the UA in 20 yrs * Increasing temperatures and increases in heavy rainfall have made new areas suitable for the species of mosquito that carries malaria (Anopheles mosquito) * 1999: West Nile virus (NYC, NE, national) * 2014: Chikungunya virus first in US * 2016-17: Zika virus first in US   **VBD risk is less predictable and more global**  West Nile virus moved via mosquitoes from Central Africa to Israel and Romania, then NYC. Aedes albopictus moving north Climate, loss of habitat and travel have made VBD risk more global and less predictable |  | **20 mins** |
| **Mosquitos** | Facilitator notes that focus of this summer is ticks, but mosquitos remain an issue to be aware of.  **Why are we worried about mosquitos?**   * Long human history with fleas, mosquitoes and ticks, but mosquitoes have been the biggest VBD threat for the last 600 years. * Before mosquitos, fleas carrying plague and protozoal disease (malaria, sleeping sickness) dominated. * We have much better surveillance for mosquitoes than ticks * Dozens of insect species carry diseases that can infect people, but only a few actually transmit to people directly. * Even among mosquitos, only a few species are human vectors. Some species transmit pathogens to other animals. * For example, sparrows and crows carried west nile virus to our region where local mosquito populations transmit the virus to people.   In our region, we are most concerned about EEE and WNV  **Mosquito-borne Diseases in New England: West Nile Virus**   * Explain how to read a vector transmission diagram: WNV transmits between birds, people and horses   + The mosquito species in New England that carries WNV is *Culex pipens* * Most cases are now in Midwest and West of US, but New England has bad years too * West Nile Virus (WNV) is the leading cause of mosquito-borne illness in the US * WNV causes fevers and can cause neurological impairment   + US mortality rate from WNV is estimated to be 1% and higher in older residents   + 1 in 5 infected get fever and other neurologic symptoms * The mosquitos who transmit breed in a container, urban/suburban habitat * Initial response in 2000 caused high anxiety. Why? Like COVID, lack of guidance, misinformation:   + CDC didn’t offer clear guidance, data was slow   + Many feared truck spray   **Mosquito-borne Diseases in New England: Eastern Equine Encephalitis (EEE)**   * Wetlands-breeding Culiseta Melanura (transmission to/from birds) * The misquto species in New England that carries WNV is Culex pipens * Aedes, Culex, and Coquillettidia (direct bridge vector to humans/horses) * Although rare, EEE is a very serious disease. 1 in 3 people with EEE die and survivors often have neurological damage   + 30%+ mortality rate, 70% neurological damage * Explain MAP: Risk is highest in SE Mass and RI, (moving into Central MA). NOT Boston Area   + The mosquitos who transmit it to birds breed in wetlands * There were 12 human cases of EEE in Massachusetts in 2019 with six deaths and 5 human cases with one death in 2020. there have been no EEE case in MA this summer   **Welcome the Tiger Mosquito (Aedes albopictus) to New England!**   * *Aedes albopictus*, also known as the Asian tiger mosquito is from Southeast Asia. Human activity has allowed *Ae. albopictus* to expand its range throughout much of the world. * Currently, the Asian tiger mosquito is found in localized areas of Massachusetts. The Centers for Disease Control (CDC) predicts that the mosquito will expand its range into all of Massachusetts. * The Asian tiger mosquito is distinctive for several reasons. The mosquito is a very aggressive human biter and is capable of transmitting many diseases.   **Puddle Patrol: mosquito habitat control**   * In previous summers, Cambridge established crews to survey storm drains for misquito larva * Storm were then treated to prevent larvae from becoming adults * The City also educates the public on the risks of standing water * To consider: In 2000, Cambridge “fogged” mosquitos – spraying from trucks. People were worried more about insecticide applications than the new WNV. Cambridge hasn’t done any spraying since.   **Discussion:**  Pause and ask the group to consider for themselves:   * What activities make you at higher risk to be exposed to WNV? And, EEE? * Based off this, What groups might we want to focus on for outreach on mosquito-borne illnesses?   **Mosquito risk messaging when talking with residents**  Share this slide as a resource. Summarizes a lot of what we talked about today. Do NOT walk through it all unless there is time. |  | **20 mins** |
| **Break!** | Break! | Break! | **10 mins** |
| **Watch** | Introduction to the relationship between Ticks and Climate Change: <https://www.youtube.com/watch?v=FHQqKWxF1Tg> | Facilitator | **5 mins** |
| **Ticks and Vectorborne Diseases**  **(Lesson)** | **What are Ticks? Deer vs. Dog**  Deer Ticks   * Sesame seed size * Orange/rusty colored abdomen * Carries Lyme Disease   Dog Ticks   * Apple seed size * All brown * Carries Rocky Mountain Spotted Fever   **Lyme Disease & Symptoms**   * Bacterial infection * Fever, headache, fatigue, “Bullseye Rash” * Can lead to chronic symptoms, autoimmune response (link unclear) * Low risk if treated within 72 hours after tick removal   **Lyme Disease is Getting More Prevalent**   * Explain DPH graph of tick-borne diseases in US * There are 2 main reasons why:   + Deforestation and/or Intermediate reforestation (Image!)   + Spread of Deer   **Where do Ticks Live?**  Deer Ticks   * Shady, moist areas at ground level * Cling to tall grass, shrubs, “brushy” areas/wooded grasslands * Where deer go, ticks follow- even in cities   Dog Ticks   * Similar to deer ticks, common on overgrown trails or scrubland * Found in less tree-covered areas   Look at the high risk vs. Low risk environments and discuss what might make them riskier or not.  **Mini-Activity:** High vs low risk  For each environment, take a hand poll of high vs. low risk. Then have a participant explain why they think that is the correct answer.   * Note that all these photos come from Cambridge, where previous tick hunts have found ticks! Debunk the myth that ticks are a rural/suburban problem only. | Slides | **15 mins** |
| **How to protect yourself** | Explain the difference between personal protection, limiting exposure to ticks, and limiting tick habitat where you can control the environment. Note that for Cambridge residents, the personal protection will be most relevant.  **What do I do after being in a high-exposure habitat?**   1. Once home, take a shower. Any ticks that are unlatched will wash off 2. Put clothes in dryer on high heat for 10 minutes to kill hidden ticks 3. Check your body- start around feet and ankles, travel up. Use mirror or phone 4. If you find a tick, use tweezers as close to the skin as possible   **How to do a tick check**   * Check your body- start around feet and ankles, travel up. Use mirror or phone * Common areas for ticks |  | **10mins** |
| **Debrief & Closing** | **Present:** Introduce and set expectations for the Tick Hunt or any other field activity   * Meeting Evaluation form * +/Δ: What went well, what would you like facilitators to do differently in next session |  | **10 mins** |