Health Center Preparedness and Response Forum

Session 1: October 12, 2023
Infectious and Vector-Borne Diseases
Today’s Facilitators

Arielle Mather, MPH (she/her)
Program Manager, National Center for Equitable Care for Elders

Bob Burns, MPA (he/him)
Director, National Center for Health in Public Housing
Housekeeping

- All participants are muted on entry to limit background noise
- Use the Q&A or chat box to ask a question during the session
- This webinar is being recorded and materials will be emailed to participants
- We would love to hear your feedback – please fill out our brief evaluation at the end of this session!
About this Forum

- NTTAP group originally hosted the Special & Vulnerable Populations COVID-19 Forum, September 2021-January 2023
- FY23-26 HRSA Objective: Preparedness for Emergencies and Environmental Impacts on Health
- This Forum will promote promising practices and offer strategies for addressing challenges related to both emergency planning and recovery for the following topics:
  - Infectious and Vector-Borne Diseases
  - Natural Disasters
  - Extreme Heat & Wildfires
  - Workforce & Community Supports
Today’s Agenda

- Welcome and Introductions
- Mentimeter: Identifying your Preparedness Priorities
- Climate change and health impacts on infectious and vector-borne disease
  - Hunter Jones, NOAA
- Disease trend data for reportable climate-influenced infectious diseases
  - C. Ben Beard, CDC
- Impact and methods of addressing infectious & vector-borne disease in underserved communities
  - Deliana Garcia, MCN
- Evaluation & Close
Instructions
What are the top emergency preparedness and response priorities for your health center?
82 responses
What are the current needs/gaps in emergency planning for your organization?

91 responses
Please respond to these statements.

Vector-borne diseases are an emergency preparedness priority for my organization.

I/My health center is prepared to respond to emerging vector-borne diseases.
Today’s Speaker

Hunter Jones
NIHHIS Program Manager
Climate Program Office, National Oceanic and Atmospheric Administration (NOAA)
Climate's Role in Vector-Borne Disease
Human health is intimately tied to environmental conditions, and NOAA provides key stakeholders in the public health sector with the environmental intelligence from NOAA they need to mitigate emerging health threats.
Understanding the Prediction Potential for Vector-borne Diseases

Vectors are products of their environments.
Global Mobility, Climate and Ecological Changes Threaten Centuries of Progress

Deaths over the 20th century, United States

- Accidents: The annual reported number of deaths, broken down by cause. This includes accidents, non-communicable causes¹, and a category showing communicable causes², infectious, neonatal and other deaths together.

  - 100%
  - 80%
  - 60%
  - 40%
  - 20%
  - 0%

  - 1900
  - 1920
  - 1940
  - 1960
  - 1980
  - 1998

- Communicable, infectious, neonatal and other deaths

- Non-communicable diseases (NCDs)

Source: Centres for Disease Control and Prevention (CDC)

Climate Suitability for the Transmission of Dengue

Percent change in the basic reproduction number ($R_0$) of dengue by Aedes aegypti and Aedes albopictus mosquitoes, compared to 1951-1960 average.

$R_0$ is an indication of a pathogen’s contagiousness and transmissibility.

- Aedes aegypti
- Aedes albopictus

Epidemiological Transition in the U.S.
CDC: West Nile virus (WNV) is the leading cause of mosquito-borne disease in the continental United States.
Rapid Spread of Emerging VBDs: Mobility, Migration, Ecology, Climate
Vectors are Products of Their Environment

- diapause, survival, biting rate, extrinsic incubation, transmission probability, interspecific competition
- migration, survival, diapause, habitat, biting rate, fecundity
- development, survival, behavior, diapause

VC = proportion of time when lifespan > incubation period
Spatiotemporal Patterns in WND Cases

Spatial clustering in the Great Plains, Desert, and Lower Mississippi

Late summer peak in cases
Predicted Presences of Culex Mosquitoes

Data from Gorris et al., 2021

Cx. tarsalis

Cx. restuans

Cx. quinquefasciatus

Cx. nigripalpus
South Dakota had an operational WNV Prediction System

- Vapor pressure and temperature are factored into state-wide models of WNV cases.
Predicted Outcomes Range from Environmental to Epidemiological

ENVIRONMENTAL
Climate or Habitat Suitability
Envelope Models
IRI Seasonal Climate Suitability for Malaria Transmission

ENTOMOLOGICAL
Species Distribution
Vector Abundance
Vectorial Capacity
Iwamura et al., 2020

EPIDEMIOLOGICAL
Case count
Probability # cases
Epidemic start, end, peak
CDC FluSight Compilation 2019-2020

IMPACT ORIENTED
Transmission Potential / $R_0$
Intervention Intensity
IRI’s Aedes-borne diseases’ environmental suitability (AeDES)
A very general framework: modeling climate & VBD

- Sustained User Engagement
- Climate & Health Research
- Decisions and Actions

Experimental and Operational Climate Services

- Integrated Climate & Health Early Warning Systems

Applied Science

Climate Services for Health

Foundational Capabilities

Sustained Observations

Reliable Forecasts

Surveillance (outcomes)

Report content from: http://mosquito.sdsstate.edu/
GETTING AHEAD OF THE CURVE: CHANGING THE CULTURE TO PREDICTION, PLANNING, AND PREVENTION

- Conventionally, epidemics are addressed via surveillance and response.
- With early warning that an increase in cases is expected, early action can be taken to target medical countermeasures and messaging where it is needed most.
- Early action “flattens the curve” by reducing the spread of the disease and preventing cases.
- Ultimately lives are saved and potentially costs are reduced.

Figure: Morin et al., 2018
NOAA Environmental Intelligence Supports Epidemiological Research and Health Operations

NOAA’s environmental observing systems and models provide essential variables such as temperature, soil moisture, humidity - past, present, and future - to support ecological and epidemiological modeling at all timescales.
NOAA Supports Intramural & Extramural VBD Modeling & Capacity Building

- NOAA Funds extramural VBD-prediction research.
- Climate Prediction Center conducts professional exchanges and issues experimental forecasts for Malaria (using LMM) in Africa.
- NOAA-CDC Postdoc Program with current postdoc focused on WNV prediction challenge.
**NOAA Works Internationally with DOS, WMO, WHO...**

- NOAA Works closely with the WMO-WHO Joint Office for Climate and Health
  + Global Heat Health Information Network (GHHIN)
  + Study Group on Integrated Health Services (SG-HEA) for WMO, which includes VBDs.
- NOAA supports building climate services for health domestically and internationally.
  + Currently building dengue forecasting capabilities in Costa Rica.
At the start of the COVID-19 Pandemic, the Global Heat Health Information Network (GHHIN) released information on coping with Heat + Infectious Disease.
HHS Climate and Health Outlook for October

- In collaboration with NOAA, CDC, and many other partners, the HHS Office of Climate Change and Health Equity prepares a monthly Outlook that puts climate information in a health context for decision-makers and the public.

- The October issue features a discussion of heat-related illness among veterans in the US.
Today’s Speaker

Charles Ben Beard, MS, PhD
Deputy Director, Division of Vector-Borne Diseases
Centers for Disease Control & Prevention (CDC)
The Impact of Climate Change on Infectious Diseases

C. Ben Beard, MS, Ph.D.
Deputy Director
Division of Vector-Borne Diseases, NCEZID, CDC
And
Co-Chair, CDC Task Force on Climate & Health
Types of Climate-Sensitive Infectious Diseases

- Zoonotic
  - Diseases that can be spread from animals to humans
- Vector-borne
  - Diseases that are transmitted to humans through carriers (vectors) such as mosquitoes or ticks and are usually harbored in wild animals
- Waterborne
- Foodborne
- Soil and dust associated
Climate change and emerging infectious diseases through a *One Health* lens

- Climate strongly influences the distribution and occurrence of environmentally-sensitive diseases.
- Changes in climate lead to changes in the environment, which result in changes in the ecology, incidence and distribution of these diseases.
Climate change – observations and trends...

- Longer and warmer summers
- Shorter and milder winters
- Increased frequency of severe and unpredictable weather events (e.g., storms, heat waves, droughts)
- Regional variations
- Influence on global weather patterns

Source: The frost-free season length, defined as the period between the last occurrence of 32°F in the spring and the first occurrence of 32°F in the fall, has increased in each U.S. region during 1991-2012 relative to 1901-1960. Increases in frost-free season length correspond to similar increases in growing season length. (Figure source: NOAA NCDC /CICS-NC.)
Northern forest winters have lost cold, snowy conditions that are important for ecosystems and human communities

Alexandra R. Contosta, Nora J. Casson, Sarah Garlick, Sarah J. Nelson, Matthew P. Ayres, Elizabeth A. Burakowski, John Campbell, Irene Creed, Catherine Eimers, Celia Evans, Ivan Fernandez, Colin Fuss, Thomas Huntington, Kazaz Patel, Rebecca Sands-DeMott, Kyongho Son, Pamela Temple, and Casey Tucknburgh
Trends in VBDs in the U.S.

- Between 2004 and 2022, more than 900,000 cases of VBDs were reported in the U.S.
- The number of annual reported cases approximately doubled over this period.
- Reported cases substantially underestimate actual disease occurrence (ex. Lyme disease: ~476,000 diagnosed and treated cases/year).
- Tickborne diseases (TBDs) now account for over 80% of all reported VBD cases.
- Local outbreaks of imported VBDs are occurring more frequently.
West Nile virus outbreak, Arizona, 2021

- Largest local outbreak in U.S. since WNV introduction in 1999
- 2,911 total cases and 227 deaths reported nationwide
- Approximately 59% of all cases occurred in Arizona
  - 1,715 cases with 125 deaths
  - Over 86% of cases occurring in Maricopa County (Phoenix)
    [Source: https://www.maricopa.gov/ArchiveCenter/ViewFile/Item/5481]
  - Cases occurred into November
- A wetter than average monsoonal season, may have interacted with other factors in causing this outbreak
Expanding geographic range of Lyme disease cases

Distribution of reported Lyme disease cases, 2001 and 2019

Source: cdc.gov/lyme/stats/index.html
Geographic distribution of *Ixodes scapularis* from 1996 to 2022

- **1996**
- **2022**

- **County meets criteria for established population**
- **Suitable habitat**

Source: https://www.cdc.gov/ticks/surveillance/index.html
VBD trends looking forward

- The factors driving VBD emergence are complex and include the influence of weather and climate (i.e., temperature and precipitation).
- Americans are at an increasing risk for VBDs.
- Current trends will likely persist and even worsen in the absence of effective prevention tools and implementation capacity.
- It remains uncertain how much of VBD trends can be attributed to climate change versus other factors, and how climate change is likely to influence these trends in the future.
CDC priorities related to VBDs and climate change

- In coordination with HHS/OASH, leading efforts to complete the VBD National Public Health Strategy
  - Expanding human and ecological surveillance and research, including modeling and forecasting
  - Identifying and validating effective prevention and control strategies that address environmental justice and health equity...and are tailored for communities that are disproportionately affected
  - Developing and maintaining local, state, and federal capacity to detect, diagnoses, and respond to emerging disease threats
  - Conducting outreach to the public and to clinical providers to increase awareness of changing disease patterns and/or exotic pathogens

Source: https://www.cdc.gov/ncezid/dvbd/framework.html
Conclusion

- Environmental change is altering the distribution of disease vectors and reservoirs and the pathogens they transmit.
- Larger numbers of people over expanding regions and for longer periods of time are being exposed to the bites of potentially infected vectors.
- Healthcare providers, public health workers, and the public at risk need to be aware of the changing patterns of exposure to emerging pathogens, where they live and travel.
- Healthcare providers need to be knowledgeable of diagnosis, treatment, and prevention of emerging VBDs.
Thank you and questions

C. Ben Beard, Ph.D.
Deputy Director
CDC, Division of Vector-borne Diseases
and
Co-chair, CDC Climate & Health Task Force
cbeard@cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.
Additional Resources...

See following pages
CDC resources on prevention of VBDs

Avoiding Ticks

- Preventing tick bites
- Preventing ticks on your pets
- Preventing ticks in the yard

Source: https://www.cdc.gov/ticks/index.html
CDC resources on prevention of VBDs

Fight the Bite! Prevent Mosquito and Tick Bites

Print

Ticks and mosquitoes can be more than just a nuisance. They can spread germs that make you sick. Fight the bite by taking steps to prevent tick- and mosquito-borne disease.

Vector-borne diseases are on the rise in the United States. Mosquito and tick bites can spread viruses, bacteria, and parasites that cause several different diseases. Some of the most common vector-borne diseases in the U.S. include:

- Lyme disease
- West Nile virus disease
- Anaplasmosis

Source: https://www.cdc.gov/ncezid/dvbd/media/fight-the-bite.html
CDC VBD resources for healthcare providers

- RMSF Training Module: https://www.cdc.gov/rmsf/resources/module.html
- West Nile Virus HCP page: https://www.cdc.gov/westnile/healthcareproviders/index.html
- Dengue HCP page: https://www.cdc.gov/dengue/healthcare-providers/index.html
CDC Climate and Health Strategic Framework

- Preparedness, Response, Prevention, & Adaptation
- Research, Implementation Science, & Evaluation
- Surveillance, Analytics, & Modeling/Forecasting
- Health Equity & Environmental Justice
- Education & Dissemination

Source: https://www.cdc.gov/climateandhealth/climate-health-framework.htm
Today’s Speaker

Deliana Garcia, MA (she/her/ella)
Chief Program Officer, International and Emerging Issues
Migrant Clinicians Network
Health Center Preparedness and Response Forum
Session 1: Infectious and Vector Borne Diseases

Impact and Methods of Addressing Infectious and Vector Borne Disease in Underserved Communities

Deliana Garcia, Chief Program Officer
International and Emerging Issues
Migrant Clinicians Network
35-year-old Hispanic male presents to the health center with shortness of breath, fatigue and rapid heart beat.
What else do you want to know?

What is your most likely diagnosis?
35-year-old, Spanish speaking, Hispanic male from rural Honduras presents to your office with shortness of breath, fatigue and rapid heartbeat. He and his pregnant wife recently arrived from South Florida.
<table>
<thead>
<tr>
<th>Virus/Symptoms</th>
<th>Chikungunya</th>
<th>Dengue Fever</th>
<th>Malaria</th>
<th>West Nile</th>
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</thead>
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<td>X</td>
<td>X</td>
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<tr>
<td>Fever</td>
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<td>X</td>
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<td>Flu like symptoms</td>
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<td>X</td>
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<td>Joint pain/swelling</td>
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<td>Nausea</td>
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<td>X</td>
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<tr>
<td>Vomiting</td>
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<td>Pain behind the eyes</td>
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<td>Muscle aches</td>
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<tr>
<td>Chills</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Chagas Disease

A vector-borne parasitic disease caused by the bite of the triatomine bug
ENDEMIC IN 21 LATIN AMERICAN COUNTRIES

- Red: Endemic
- Orange: Not endemic but present
Lessons Learned

A culturally and linguistically competent focused comprehensive clinical history is the most valuable and powerful diagnostic tool in our current medical toolbox.

A robust public health/primary care health system is required to quickly identify/isolate/respond to emerging infectious diseases now and in the future.

The world is becoming much smaller every year and millions of individuals will be migrating every year and with them will be potential for infections.
Globalization
≈248 million international migrants in 2020
MOVEMENT OF POPULATIONS

1. Voluntary vs Involuntary
2. Anticipated vs Unanticipated
3. Regular vs Unofficial
Status of migrants is relevant to disease control, since it has been problematic for one government agency to pursue immigration control while another encourages undocumented migrants to utilize local health services.
Geographically Stable Patients vs Mobile Patients
Chaga’s Disease

Triatomine stages:
1. Metacyclic trypomastigotes
2. Amastigotes
3. Trypomastigotes
4. Epimastigotes
5. Metacyclic trypomastigotes

Human stages:
1. Metacyclic trypomastigotes
2. Amastigotes
3. Trypomastigotes
4. Epimastigotes

Symptoms of Chronic Determinate Chagas Disease:
- Chagas Heart Disease:
  - fatigue and syncope
  - shortness of breath
  - palpitations

- Chagas GI Disease:
  - GI reflux
  - severe constipation
  - difficulty and pain swallowing

[Image of symptoms]

[Image of tissues]
1–2 weeks

**Acute phase**
- Positive smear
- Positive culture
- Positive PCR result

4–8 weeks

**Chronic phase**
- Negative smear
- Positive PCR result in 20–70% of infected persons
- Diagnosis based on serologic testing

**Indeterminate form**
- No signs or symptoms
- 70–80% of infected persons have the indeterminate form throughout life
- 20–30% of infected persons have disease progression over years to decades

**Determinate form**
- Chagas' cardiomyopathy, gastrointestinal Chagas' disease, or both
1. Trypomastigotes ingested by kissing bug when it bites an infected human

2. Trypomastigotes transform into epimastigotes and multiply

3. Epimastigotes transform into trypomastigotes and are excreted in the faeces of the bug

4. Trypomastigotes enter human body when kissing bug bites a human

5. Trypomastigotes transform into amastigotes and multiply by binary fission

6. Intracellular amastigotes transform into trypomastigotes that burst out of the cell and enter the bloodstream
Strong Hearts/Corazones Fuertes

Completely voluntary on the part of the provider and the patient

Adult and Family Medicine Departments at East Boston Neighborhood Health Center (EBNHC)

Across all departments there were 4,580 T. cruzi tests performed

Currently following 123 patients with Chagas disease

Screening has reached 14,000 primary care patients
Chagas Disease

More than 300,000 people in the United States are infected with *Trypanosoma cruzi*, the parasite that causes Chagas disease—and most don’t know it.

Learn more: [https://www.cdc.gov/parasites/npi/](https://www.cdc.gov/parasites/npi/)
Questions?
Session Resources

- **Vector-Borne Disease National Strategy (HHS)**
- **Strong Hearts/Corazones Fuertes**: Massachusetts-based screening and treatment initiative for Chagas disease
- **Important information for Cubans and Haitians entering the United States regarding Medical Care**, International Refugee Committee English, Spanish, French, Haitian Creole
Attention Health Center Staff and Executives:
Share your Voice on Training and Technical Assistance (TTA) Needs

Help HRSA/BPHC and their training entities understand YOUR:

- Health Center Role and Location
- Specific TTA Needs
- Preferred Ways to Receive and Participate in Training
- Priority TTA Topics

Please take a few moments to provide your ideas for health center TTA needs to HRSA/BPHC’s 22 National Training and Technical Assistance Partners (NTTAPs).

Use the below link or above QR code to access a quick list of questions for your response. This will take no longer than 15 minutes!

https://www.healthcenterinfo.org/training-and-technical-assistance-needs-assessment/

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Health Center Preparedness and Response Forum

A Four-Part Webinar Series

October 12, 2023: Infectious and Vector-Borne Diseases
December 14, 2023: Natural Disasters
February 8, 2024: Extreme Heat and Wildfires
April 11, 2024: Workforce and Community Supports

All sessions will be held from 1:00PM - 2:00PM ET

Register now at https://bit.ly/3r2OD0V
EVALUATION

Please take the time to complete the Forum evaluation via Zoom, and help us improve this activity for future sessions.
Thank you!

Next Session: December 14, 2023
Natural Disasters