An Evolving Environmental Health Services Role in the Zika Response

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Zika Virus Vectors: *Aedes* Mosquitoes

- *Aedes (stegomyia)* species mosquitoes
  - *Ae. aegypti*
  - *Ae. albopictus*

- Also transmit dengue and chikungunya viruses
*Maps have been updated from a variety of sources. These maps represent CDC's best estimate of the potential range of *Aedes aegypti* and *Aedes albopictus* in the United States. Maps are not meant to represent risk for spread of disease.
Specific Potentially Impacted Sub-Populations

- Pregnant Women
- Infants and Children
- Residents in Areas with Official Landfills
- Residents in Areas with High Volumes of Litter such as Tires that can Serve as Mosquito Habitat
- Residents in Areas with Abandoned Housing that may have Unmaintained Pools and Other Mosquito Habitat
CDC’s Top 10 Zika Response Planning Tips for State and Local Health Officials

1. Vector control and surveillance
2. Public health surveillance and epidemiological investigation
3. Laboratory testing and support services
4. Prevention of sexually transmitted Zika virus infections
5. Prevention of blood transfusion-transmitted Zika virus infections
6. Maternal and child health surveillance and response
7. Rapid birth defects monitoring and follow-up
8. Travel health news
9. Clinician outreach and communication
10. Risk communication/community education

1. Vector control and surveillance

Goal: To target vector control programs in priority areas/at-risk populations to suppress Zika virus transmission if local cases or an outbreak are detected.

What is Environmental Health & What Does it Have to Do with Mosquito Control

- Environmental Health (EH) comprises those aspects of human health, disease, and injury that are determined or influenced by factors in the environment – including disease vectors such as mosquitoes and their habitats.

- EH employs a strategy called Integrated Pest Management (IPM), which includes the elimination of environmental conditions that lead to pest infestations.

- One of most basic tactics in an integrated pest management strategy, known as Source Reduction, involves eliminating the habitat or modifying the aquatic habitat to prevent mosquitoes from breeding.
IPM for Pests of Animals & Humans

- Conventional: pesticides that kill on contact
- Biorational: repellants, diatomaceous earth, oils, insect growth regulators (IGR), microbials
- Biological: predators, parasites
- Physical - Mechanical: flea/lice combs, screens, proper clothing
- Cultural: good sanitation, habitat change
### Environmental Health Services

**FIGURE 6.9 LHDs Providing Select Environmental Health Services (by Population Served)**

<table>
<thead>
<tr>
<th>Environmental Health Services</th>
<th>All LHDs</th>
<th>&lt;25,000</th>
<th>25,000–49,999</th>
<th>50,000–99,999</th>
<th>100,000–499,999</th>
<th>500,000+</th>
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</thead>
<tbody>
<tr>
<td>Food Safety Education</td>
<td>72%</td>
<td>63%</td>
<td>76%</td>
<td>83%</td>
<td>79%</td>
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<td>57%</td>
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<td>53%</td>
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<tr>
<td>Surface Water Protection</td>
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<td>34%</td>
<td>37%</td>
<td>43%</td>
<td>46%</td>
</tr>
<tr>
<td>Indoor Air Quality</td>
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<td>45%</td>
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<tr>
<td>Pollution Prevention</td>
<td>22%</td>
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<td>44%</td>
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<tr>
<td>Hazmat Response</td>
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<td>13%</td>
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<td>32%</td>
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<tr>
<td>Collection of Unused Pharmaceuticals</td>
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<tr>
<td>Land Use Planning</td>
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<td>11%</td>
<td>13%</td>
<td>20%</td>
<td>17%</td>
<td>17%</td>
</tr>
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</table>
What are the Primary Environmental Health Issues Related to Mosquito Control

- Preventing, to the greatest degree possible, the emergence of a Zika-infected mosquito population through:
  - Surveillance,
  - Source Reduction,
  - Water Management Strategies To Encourage Indigenous Natural Enemies To Immature Mosquitoes, and
  - Larval and Adult Mosquito Control Strategies.

- Ensuring that prevention and mitigation efforts stay as close to the base of the pyramid to limit the potential negative effects that of the toxicity of pesticides, etc.

http://www.healthypeople.gov/2010/Document/tableofcontents.htm#volume1
http://www.cdc.gov/nceh/ehs/elearn/ipm.htm
Source Reduction

• Determine abundance, distribution, and type of water-holding containers; large numbers of containers may translate into high mosquito abundance and high risk

• Initiate a community wide source reduction campaign

• Provide public education focusing on reducing or eliminating larval habitats

• Incorporate breeding site identification and educational efforts into routine activities

http://www.cdc.gov/chikungunya/resources/vector-control.html
Control-Larvicide

• Chemicals or biologic agents to kill or prevent development of mosquito immature stages
  – Chemical larvicides: temephos
  – Biological larvicides: *Bacillus thuringiensis* var. *israelensis* (B.t.i.), spinosad, and Insect Growth Regulators (IGR’s)
  – Monomolecular films and oils: spread on the water surface forming a thin film that causes suffocation of immature mosquitoes by preventing gas exchange

http://www.cdc.gov/chikungunya/resources/vector-control.html
Control-Adulticide

• Decision to use chemical adulticides should be based on surveillance data and the risk of human disease
• Used in combination with other IPM strategies
• Includes targeted outdoor residual spraying, indoor residual spraying, widespread outdoor application
• Residual insecticides used on surfaces that adult mosquitoes frequently visit and land on
• Follow pesticide use and application regulations
• Maintain applicator certifications for staff
• May require contracting with a licensed pest control firm

http://www.cdc.gov/chikungunya/resources/vector-control.html
Challenges Ahead

- Although the 2nd most common Environmental Health Service, Vector Control is only directly supported in 48% of local health departments (LHDs)

- Across the country, at the state and local levels, there is a wide variety of activities and practices performed, including:
  - State-supported entomology technical assistance & vector surveillance/control
  - Local environmental public health delivery of IPM activities
  - Creation of separate Mosquito Control Districts
  - Absence of any mosquito control efforts at all
  - A combination or hybrid version of one or more of these models
There is Hope

- CDC started in 1942 as, in part, a mosquito control organization called Office of Malaria Control in War Areas

- The potential EH workforce is the second largest component of the public health workforce, including public and private workers in the following direct and related areas:
  - Environmental Science Specialists, incl. Health: 94,600
  - Environmental Science Technicians, incl. Health: 36,200
  - Environmental Engineers: 55,100
  - Community Health Workers/Educators (can be cross-trained): 115,700
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