GLOBAL HEALTH SECURITY THREATS IN AMERICA

Zika Virus in Florida, 2016

2018

SGNL LARC CSTE

SGNL Solutions, in consultation with the Council of State and Territorial Epidemiologists (CSTE) and the Centers for Disease Control and Prevention (CDC), explored infectious disease outbreaks that threaten the health security of state, tribal, local, and territorial jurisdictions.

Description and Methods

Following a literature review, SGNL Solutions, in consultation with CSTE and CDC, selected and explored nine infectious disease outbreaks that threaten the health security of U.S. jurisdictions. Those selected focused on domestic outbreaks (1) caused by introduction of a pathogen from outside the United States, (2) associated with a declared public health emergency of international concern from the World Health Organization, (3) associated with CDC Bio-Terrorism Agents, and/or (4) associated with pathogens that are well controlled or eradicated in the United States. Impact areas of interest included public health operations and resources, hospital infection control, economic factors, policy and legislation, and others. SGNL Solutions initiated a data collection process, which included identifying, scheduling, and conducting interviews with key informants (e.g., government staff, local businesses); collecting consent forms; obtaining data for impact factors; and scanning for local media coverage of the incident. The collected data was first coded for sector type (e.g., local and state public health, healthcare, supply chain, workforce, education, tourism/hospitality, trade) and for impact type (e.g., economic, psychosocial, compliance with regulations/contracts/public expectations, policy, provision of goods/services). Additional themes also emerged during the analysis. Each SGNL Solutions coder independently coded at least three interviews, compared results, and discussed discrepancies to improve inter-rater reliability. All interview transcripts and collected news articles, reports, and other data were coded, synthesized, and summarized as part of the documentation process.

The following describes the outbreak of Zika Virus in Florida in 2016 and associated health, economic, and social impacts.

Description of those interviewed:

- **Anh Ton**, Director of Highway and Bridge Maintenance and Mosquito Control, Broward County

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Introduction

Zika virus is transmitted primarily by the *Aedes aegypti* mosquito, which typically prefers to bite during the day, and can also transmit the viruses that cause Dengue, Chikungunya, and Yellow Fever.[i] The virus was first identified in humans in 1952, and people who contract it can have symptoms such as mild fever, headache, muscle or joint pain for 2–7 days. However, the main concern is recent scientific evidence linking the diagnosis of Zika virus disease in pregnant women to microcephaly. Microcephaly is a birth defect marked by small head and brain size resulting in severe developmental problems, and Guillain-Barre Syndrome in the baby once born.[ii]

While the Zika virus and its serious impacts for pregnant women and infants began making the news in affected countries in South America and the Caribbean in the early half of 2016, the cases were limited to outside the continental United States. However, the *Aedes aegypti* mosquito calls Florida, Texas, and several other states home, making it a real possibility the Zika virus could become endemic. The World Health Organization declared Zika a public health emergency of international concern because of its link to microcephaly. One of the difficulties with the Zika virus, however, is though it may be widespread, a large number of affected people are asymptomatic. Several others may not even seek medical care,[iii] presenting a serious challenge to any entities hoping to identify and halt an outbreak before it spreads too far.

According to Anh Ton, Director of Highway and Bridge maintenance and mosquito control for Broward County, Florida, members of the Florida Mosquito Control Association had been monitoring the global Zika threat since late 2015. “In the heart of South Florida,” said Ton, “we have large numbers of populations that travel back and forth. We have high numbers of Brazilian, Columbian and Venezuelan residents here. Also, there are a lot of folks who go back and forth for vacation in South America, so that’s why we were concerned. With the travel back and forth like that, we knew it was just a matter of time before we would start getting travel-related cases in our area.”

Description of the Outbreak

In preparation for travel-related Zika cases, the Florida Department of Health (FDOH) visited all obstetrician and gynecologist offices in Broward County to distribute information about Zika and remind physicians of the reporting requirements. In addition, the mosquito control office developed a response protocol: upon the receipt of a possible Zika case notification from FDOH, the office would initiate measures to reduce the mosquito population where the suspected case was located.

In early July 2016, a female resident in Miami-Dade County sought care at a hospital, and following testing, was diagnosed with the Zika virus.[iv] Just a week later, a male resident sought treatment for similar symptoms in neighboring Broward county and was also diagnosed with Zika. As neither of these patients had any travel history to an area with active Zika transmission, nor any association or household contact with someone who had traveled or had been diagnosed with the virus, the FDOH suspected local transmission and began testing of mosquitoes across Miami-Dade, Broward, and Palm Beach Counties.[v] Upon further examination and interviews of the contacts of the two index patients, one household contact was identified as moving from Haiti to Florida one month prior, who also had a travel-associated case of Zika.

In August 2016, the CDC issued travel recommendations for pregnant women, their partners, and individuals planning to conceive who live or were planning to travel to the Wynwood neighborhood in Miami-Dade County. By mid-October, the Zika-related guidance had been expanded to all areas of Miami-Dade County. As time passed, local level advisory zones were cleared, and by June 2017, the CDC had lifted all Zika-related travel restrictions for the area.

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Impact of the Outbreak

Ton explained that Zika presented a unique threat to the region. Media interest was high and non-stop. Residents were contacting the local governments with questions and concerns on a regular basis. Broward County is also home to an airport and seaport, and a significant portion of the county's tax revenue stems from tourism. Unlike past mosquito-borne threats, Zika had the public's attention.

An economist from the University of Central Florida was concerned that young people and families would choose not to vacation in Florida.[vi] A tour operator reported that he had to cancel three quarters of his Miami tours due to reservation cancellations, causing him to lay off one employee. Wedding planners and nanny services also experienced cancellations and decreased business.

A survey of 44 Wynwood businesses, including restaurants, bars, retail stores, and art galleries, found that 91% experienced a loss of revenue and profits, some by as much as 40%, in just two months, from August 15th to October 19th, 2016.[vii] Eighty-four percent reported lost customers due to concern about the Zika virus. Some outdoor businesses closed completely out of fear that their customers and employees would contract the illness, and two businesses laid off employees. All 44 businesses surveyed said they felt state and local government provided little information about what to expect or what to do in case of an outbreak, and 91% said government was "very unresponsive" to their concerns. The Vice Chair of the Wynwood Business Improvement District Board, Albert Garcia stated: "This is a

lesson for government, both local and state, that as much as they need to have a health plan, they need to have an economic recovery plan ready to go because the next community could be devastated if the right resources aren't made accessible immediately. Zika is not a Miami thing, it's not a Florida thing; it's a global thing. Wynwood was just the unfortunate community to bear it first."[viii]

In August 2016, Ken Bercel did not know how much more of "the Z-word" his business could take. The Lost and Found Saloon in Wynwood had survived some rough patches, but selling beers within the only active area for the Zika virus in the continental United States proved difficult.[ix] "Money is coming out of our savings, our banks, our lenders, just to keep the business open right now," said Bercel, who was forced to take out a $15,000 loan after customers stopped showing up at his Northwest First Avenue bar. "How do we finish this summer?"

In terms of direct costs, the Miami Mayor's office noted the county had spent about $25 million from June 2016 to May 2017.[x] Costs included mosquito control workforce (inspectors, technicians, biologists), supplies (traps, spray trucks, laboratory equipment, insecticides), public awareness campaign materials, and care coordination programs for infants born to mothers infected with Zika while pregnant. School officials at a middle school near a declared Zika zone distributed cans of mosquito repellent to parents and made long-sleeved shirts and pants available to students.[xi] Ton noted that the Mosquito Control division requested additional funding to implement mitigation strategies and received emergency procurement authority, which allowed him to purchase supplies in an accelerated manner.

Controlling and preventing vector-borne infectious diseases is a resource intensive endeavor. Ton's division, Highway and Bridge Maintenance, and Mosquito Control has 140 staff, and most of those staff dedicated to engineering, construction, and maintenance. The division has a 15-person staff that handles mosquito control year-round. Broward County has a population of about 1.9 million people across 450 square miles. Ton added, in his opinion, that 15 people is not enough for routine mosquito control, and definitely not enough to handle something like Zika.

In response to the threat of Zika, Ton diverted existing staff to new roles. A member of the Office of Public Communication provided full-time media support for radio, print, and television engagements. Ton and his staff visited any group that would listen, including homeowners associations and churches, to educate them about mosquito control. Senior-level engineers examined mosquito tracking processes and technologies to make improvements. Procurement experts ensured materials and resources were always on hand. Roadway construction staff were trained to become licensed mosquito control inspectors. Ton and his staff also trained code enforcement program staff from the County's 31 municipalities to identify and mitigate breeding grounds. While this approach enabled Ton to surge to respond to Zika, it also meant that routine maintenance and construction projects were put on hold, such as halting regular maintenance for drainage, reducing the pavement and guardrail construction and maintenance program, and cutting back mowing and pothole repair.

Observations from the Field

What did make things challenging, was that many jurisdictions experienced pushback from the public over vector control strategies. Residents protested the use of naled, a pesticide sprayed from planes, out of fear that it was more harmful than Zika and expressed concern about the experimental release of genetically modified mosquitos.

Ton said Broward County did not experience as much controversy as others, perhaps in part because the county shut down less effective adultifying-by-air operations and adopted organic, biological larvicides that had no negative environmental impact. Ton also made an effort with his staff to educate the public about the safety of the products.

One downside, however, of the larvicide selected by Broward County was its high cost. To address this issue, Ton asked his engineering staff to design a truck-mounted spray configuration that would use half the product to achieve the same level of effectiveness. Even though the county's mosquito control budget was cut in 2017, Ton was able to maintain protection for the community with the technology his team designed. Using census data to target vector control efforts and focusing on zip codes with higher risk, such as large portions of women of child bearing age, Ton and his team maximized limited resources.

Ton spoke highly of his staff, motivated to do what they could to protect the community from Zika. "I got so many calls from folks who were just so scared. A pregnant woman called and said, 'Hey, I got bitten by a mosquito.' She would be in tears, crying uncontrollably, thinking her baby was going to get some deformity. When our folks heard about that, they were all eager to work and help because … they were all very concerned … Getting them to work long hours and getting them trained to do other things that they weren't comfortable with…It wasn't an issue of folks not wanting to help."

Implications for the Future

There are lessons to be learned from history, as in 1947, the predecessor to the Pan-American Health Organization took on a hemisphere-wide eradication campaign for Yellow Fever, which was still affecting large numbers of the population in South America.

They pursued this through targeting of the mosquito responsible for spreading the disease and by 1962, 18 countries were declared free of Aedes aegypti, with three more countries to follow.[xii] Unfortunately, the United States did not commit to this effort, and because mosquitos easily travel across borders, the effort failed, and the mosquito population resurged in all countries, bringing with it the threats of not only Yellow Fever, but also the Dengue virus, and now Zika virus. In order to combat Zika successfully, coordinated mosquito control efforts–across states and regions–will be a necessary complement to vaccine development and other prevention activities.

Ton is an engineer by training and much of his experience has been with bridges and highways. He pointed out that in this field, the federal government does routine research and issues guidelines and standards for roadways and bridges. However, in his experience, similar cross jurisdictional standards are more difficult to establish with mosquito control. Local jurisdictions in Florida are left to develop and fund their own programs. Some have robust programs that receive dedicated tax dollars; others compete with other county programs for a portion of annual property taxes. This lack of research, standards, information sharing, and dedicated funding results in uneven vector control across the nation. Ton explained, “We may be well-funded enough to handle our program, but our neighbors to the north may not be able to, or to the west they may not be able to, and of course mosquitos don’t know when they cross over from Palm Beach County to Broward County–they don’t really care. That would really help in the future, if that could ever happen.”

The infectious diseases that threaten the health, welfare, and security of communities throughout the United States are in large part determined by interrelated global factors. No single nation can be protected if other nations remain unprepared to counter threats. Strong and sustainable public health surveillance, prevention, and control efforts across the globe are the first line of defense against infectious disease, often stabilized by ongoing international diplomacy. Yet, these protections are often the first to be neglected, both in terms of resourcing and political will, resulting the degradation or absence of necessary infrastructure and capacities. Given the speed at which diseases travel in the 21st century, continued investment in building capacity at the source of an outbreak, as well as sustainable workforce and infrastructure capabilities in the United States will be essential to protect U.S. communities. In the case of Zika, which is carried by vectors that have no understanding of borders, the differences in ability and approach from jurisdiction to jurisdiction mirror the challenges of public health at the global level. Concerted, cross-country and regional collaboration will be critical to mitigate these types of vector-borne threats.

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