

ISDS One Health Surveillance (OHS) Case Study

CASE STUDY TITLE

ENHANCED SURVEILLANCE FOR AEDES MOSQUITOES IN THE ARIZONA BORDER REGION

PROJECT/ACTIVITY TITLE

CITIZEN SCIENCE OVITRAPPING PROJECT

CONTACT INFORMATION

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WHAT DOMAIN(S) DO YOU WORK IN?

Human health

Animal health

Environmental health

OHS AREA(S) OF FOCUS ADDRESSED BY CASE STUDY

Cross-Agency Communication and Collaboration

Training and Resources

Technologies and Methodologies

Other: _____

PROBLEM DESCRIPTION (150 word maximum)

Summarize the problem/situation that was addressed with a OHS approach.

In 2014, a dengue outbreak affected northern Mexico and travel-associated dengue cases increased in southern Arizona. While Arizona has not detected a local dengue case, local transmission occurred in Nogales, Sonora, sister city of Nogales, Arizona across the border. The detection of the *Aedes aegypti* mosquito, a dengue and chikungunya vector, and the frequent human movement across the border with Sonora heightens Arizona's risk for introducing emerging mosquito-borne diseases.

Limited data exists on the extent or seasonality of *Aedes* mosquitoes in Arizona border counties. Mosquito surveillance historically targeted the West Nile Virus vector, and border county health departments serve small populations and have limited resources. Enhancing surveillance for *Aedes* is critical to inform the prevention of emerging mosquito-borne disease. Arizona seeks interdisciplinary solutions to gather baseline data on *Aedes* populations – especially in southern counties bordering Mexico – to inform public education and document the state's risk for dengue and chikungunya transmission.

ACTION TAKEN (500 word maximum)

Describe how the problem was addressed and how the action taken was measured. Please include a description of the collaborators and the data sources used.

Housed within the Office of Border Health at the Arizona Department of Health Services, the Border Infectious Disease Surveillance (BIDS) program is a multi-state network tasked by CDC to conduct binational disease surveillance with Mexico.

To address the threat of mosquito-borne disease and expand surveillance for *Aedes* mosquitoes in a resource-limited county, Arizona's BIDS program partnered with Santa Cruz County Health Services and the Southeast Arizona Area Health Education Center (SEAHEC) to initiate a county-wide citizen science project and gather mosquito population data. Two University of Arizona partners – an entomologist and a vector-borne disease expert – and a climate change scientist from the National Center for Atmospheric Research

offered guidance on surveillance protocol development.

As Aedes prefer living near people, we asked community members and high school students to maintain non-technical ovitraps in their yards to gather data about the presence, distribution, and seasonality of Aedes. Ovitrap attract Aedes by mimicking the mosquito's typical habitat. Mosquitoes lay eggs on germination paper lining a black mason jar filled with hay-infused water. Once a week, participants removed, dried, and labeled the germination paper and reset their trap. Once a month, participants turned in materials and project staff inspected the used papers for Aedes eggs. To coincide with Arizona's typical mosquito trapping season, the project began in late March with participants maintaining traps through September 2015. Additionally, the county and BIDS continue to maintain 11 ovitraps placed at county fire stations, offering strategically dispersed data collection sites.

To recruit a variety of participants for the citizen science effort, we hosted informational meetings at high schools, citizen groups, and the health department. The meetings provided an overview of mosquito-borne disease in the region, discussed mosquito bite prevention, and trained participants on ovitrap maintenance. BIDS used GIS technology to map trap locations and track weekly mosquito activity. In our database, a positive indicated the presence of any number of Aedes eggs, and a negative meant no eggs were found. By engaging community members in participatory surveillance, we achieved a wide dispersion of ovitraps in the county. We learned that Aedes mosquito activity began close to the border in late July, after monsoons brought heavy rains, and continued to spread north in the following weeks.

Through cross-sector collaboration, this project adopted the OneHealth approach to optimize surveillance in a low-resource county. A leading partner, Santa Cruz County offered environmental and epidemiological expertise. Our scientific partners offered guidance in entomology, data interpretation, climate, and community-based research. The local health education center linked us to high school students and science teachers. BIDS contributed to overall public outreach and offered an understanding of border surveillance and mosquito-borne disease in Mexico.

These key partnerships from environmental and human health helped build a novel surveillance strategy to address resource limitations and contribute to the urgent prevention efforts against emerging mosquito-borne disease in Arizona. Data was shared with the Arizona Department of Health Services and added to a state-wide map of Aedes populations.

FACILITATORS AND BARRIERS (100 words max each)

Please list and describe any factors that contributed positively to this project/activity.

Using low-cost ovitraps, the activity was sustainable and feasible for participants of varying ages and educational levels.

By offering educational training sessions, we raised interest in the project and awareness of mosquito-borne diseases in Arizona. Before volunteering to help, participants gained perspective of how engaging in this citizen science project would contribute to a major public health response.

With each training session, we gathered recommendations for new contacts in the community. Within two months we gained a wide span of trapping locations throughout the jurisdiction that more than tripled the county's previous mosquito surveillance efforts.

Please list and describe any factors that were a challenge or barrier to overcome.

Recruiting participants was the first challenge we overcame in project implementation. While we first approached high school students to help gather data, our first group of students had low participation rates, as the mosquito season overlapped summer vacation. In the summer months we focused on recruiting citizen groups, and returned to successfully recruit more students in September when school was in session. One barrier to participation was convenience of accessing materials. We worked with our community partners to establish two centrally-located stations where participants could turn in their data and gather new materials for continued trapping.

LESSONS LEARNED (250 word maximum)

Please describe any lessons learned or best practices identified by this project/activity.

We learned that maintaining student interest and participation in the project was a challenge, especially since the mosquito season overlaps summer vacation. We applied this lesson to a recent iteration of this project working with a high school in the border region outside of Santa Cruz County. We established a workshop to familiarize high school teachers and club facilitators with the project and gain feedback on how the school could best adapt the project for their students. This practice encourages student participation by first training teachers on how to implement the project.

As BIDS is located one hour's driving distance from Santa Cruz County and the border, we conducted communication with our community participants primarily through email. In some cases we lost communication with participants this way. It was crucial that the outreach staff sent regular, weekly reminders about trapping and promoted open two-way communication by sharing data and reading materials to maintain interest in the topic.

Having education and outreach as a component of this surveillance project is a best practice highlighting the OneHealth approach. With no vaccines available for dengue or chikungunya, prevention is largely reliant on public action. In collecting data through trapping, we also accessed audiences to promote awareness of protective behaviors to take against mosquito-borne disease. As we worked with linguistically-, culturally-, and age-diverse populations, our educational materials are similarly diverse and relevant. Public education paired with vector surveillance is a unique OneHealth approach to preventing mosquito-borne disease.

ADDITIONAL COMMENTS (75 words max)

Summarize the problem/situation that was addressed with a OHS approach.

As this is a pilot effort to gather data on Aedes mosquitoes in Santa Cruz County, we continually edit surveillance protocols to best fit the border region; for example, a university entomologist suggested filling the traps with cleaner water than our original hay infused water to attract the correct mosquito. Our next step in this ongoing effort will be to raise mosquito eggs to adulthood and identify which species of Aedes we trapped.