## Workshop Summary

# Infectious Disease Prioritization for Multijurisdictional Engagement at the United States Southern Border Region

**This report was authored by CDC, with input from Arizona Department of Health Services, California Department of Public Health, New Mexico Department of Health, Texas Department of State Health Services, and other participating health departments.**

**Centers for Disease Control and Prevention**
National Center for Emerging and Zoonotic Infectious Diseases

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**Photo 1. Woman and her daughter receiving Zika prevention health education.** *Photo credit: Maureen Fonseca-Ford*

# DISCLAIMER

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.

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**Photo 2. Santa Elena Canyon, Big Bend National Park, Texas and Mexico border**

# PARTICIPATING ORGANIZATIONS

Arizona Department of Health Services

California Department of Public Health

New Mexico Department of Health

Texas Department of State Health Services

Imperial County Public Health Department

San Diego County Health and Human Services Agency

United States Health and Human Services Agency, Office of Global Affairs

Centers for Disease Control and Prevention (CDC)

- Division of Global Migration and Quarantine, US-Mexico Unit (DGMQ, USMU)
- Division of Vector-borne Diseases (DVBD)
- Office of Public Health Preparedness and Response (OPHPR)
- One Health Office

# SUMMARY

The first of two purposes of the two-day Infectious Disease Prioritization Workshop was to identify and prioritize endemic and emerging infectious diseases in the US southern border region of mutual concern to US federal and state partners. Diseases to be considered were those that can be introduced and amplified, or cause an outbreak, because of movement of people, products, or animals between the United States and Mexico. The second purpose was to develop plans to address gaps in surveillance, response, or other relevant activities for the prioritized diseases. This initiative followed the One Health Zoonotic Disease Prioritization Process, a mixed methods prioritization process developed by the US Centers for Disease Control and Prevention (CDC).[1,2]

During a pre-workshop webinar, representatives from US federal agencies and from state and local public health agencies within the southern border states reviewed, discussed, and agreed on an initial list of 20 infectious diseases to go through the prioritization process. These diseases were drawn from a larger list developed during previous border health initiatives. During the workshop, representatives defined criteria for prioritization, developed questions to characterize each disease by the criteria, and assigned weights to each criterion. Using this semi-quantitative process, followed by a qualitative review for final ranking, participants identified four infectious diseases or disease groupings as priorities. The workshop identified preliminary recommendations for potential collaborative actions, with further discussion during three post-workshop webinars. The resulting prioritized infectious diseases for the US southern border region are tuberculosis, *Aedes* mosquito-transmitted arboviral diseases (dengue, chikungunya, Zika), enteric diseases (*Vibrio* spp., *Listeria monocytogenes*, nontyphoidal *Salmonella* (NTS), *Brucella* spp.), and rickettsioses (*R. rickettsii, R. typhi, R. parkeri*).

Working to control infectious diseases in a border region requires international collaboration and communication. While this disease prioritization initiative established a portfolio of mutual US state and federal domestic infectious disease priorities for the purposes of joint action and focus, many of the prioritized diseases are also being addressed as shared US-Mexico interests. Next steps will involve binational forums and activities. If the disease prioritization initiative moves the border health agenda forward, such an approach could be useful in a binational context.

**Photo 3. Infectious Disease Prioritization Workshop Participants.** *Photo credit: Maureen Fonseca-Ford*

# BACKGROUND

The United States and Mexico share a 1,954 mile-long land border, which extends from the Pacific Ocean to the Gulf of Mexico.[3] Four southern US states share a border with Mexico: California, Arizona, New Mexico, and Texas.[4] People from all over the world cross the US southern land border from Mexico to visit or to live in the United States. Some pass through the border region in transit to other areas, and others remain in the border region. Many people who live in the region regularly move between the United States and Mexico to visit, work, shop, and seek services. In 2016, there were 185 million northbound border crossings (from Mexico to the United States) at 25 land ports of entry. One of these, in San Ysidro (San Diego County), California, is one of the world's busiest border crossings.[5] The movement of people, animals, and products between the two countries creates a binational environment, interconnected by close social and economic ties, and a unique epidemiologic region for detecting, preventing, and controlling infectious diseases and their binational spread. In this report, we define the US southern border region (hereafter called "the border region") as the 44 US counties within 100 km of the Mexico border[6] (Appendix A). The border region has many adjacent "sister" cities flanking the US–Mexico border, such as those shown in the map below. The three largest US metropolitan areas in the border region are San Diego, California (population 1.4 million), El Paso, Texas (population 690,000), and Laredo, Texas (population 257,000).[7]


**Figure 1. The US-Mexico Border Sister Cities.** *Image credit: EPA—https://www.epa.gov/usmexicoborder*

In 2015, 7.7 million people lived in the 44 US counties that comprise the border region.* Most border region residents are Hispanic;[8] in several border counties, over 90% are Hispanic.[9] Border states are also among the five states with the largest Native American populations.[10] There are 25 federally recognized Native American reservations in the border counties,[11] and the Tohono O'odham tribal nation physically spans the US-Mexico border.[12] US border states are home to 9 million foreign-born persons from Spanish-speaking

* The Mexican side of the border is nearly as populous; in 2015, 6.7 million lived in 80 Mexican border municipalities.

countries, including 7.4 million born in Mexico and another 1.2 million born in Central America. The border states have 8.1 million Spanish speakers with limited English proficiency.[9]

Several border counties are among those with the highest rates of poverty in the United States, and some rural communities lack running water, electricity, and sewers, particularly in South Texas.[13–15] Border counties also have higher levels of uninsured individuals than the national average, and most of the border counties are designated Health Professional Shortage and Medically Underserved Areas for primary medical care.[11,16] San Diego, the most populous border county (population 3.2 million), has relatively low levels of poverty and differs significantly for many health and economic indicators from other parts of the border region.

Various climate zones are present in the border region, but in general, the border region is hot and dry. The zones range from arid and semi-arid to humid and subtropical in parts of the Lower Rio Grande Valley near the Gulf Coast. While several large metropolitan areas such as Phoenix and Tucson, Arizona, and El Paso, Texas, are in deserts, irrigation and drainage associated with farming and landscaping allow mosquitoes to persist in what might otherwise be an inhospitable environment for them. The two major rivers in the region are the Colorado River and the Rio Grande. Each state also has higher elevations with mountain ranges with snowfall.[17]

The states and counties along the US southern land border, and certain populations living within them, such as Hispanics, have had higher incidence of some infectious diseases, likely due in part to the flow of people and products between the United States and Mexico.[18–20] To better address border region infectious disease challenges related to population mobility, an Infectious Disease Prioritization Workshop for the border region was held September 27–28, 2018, in San Diego. The workshop used a multijurisdictional approach to identify infectious diseases of greatest mutual concern across the border region and to plan collaborative activities with relevant agencies. CDC's Division of Global Migration and Quarantine-US-Mexico Unit and One Health Office coordinated the effort. This prioritization process used the CDC-developed One Health Zoonotic Disease Prioritization Tool and Process (Appendix B).[1]

To build capacity to conduct future border region prioritization workshops, CDC's One Health Office trained three US-Mexico Unit (USMU) staff to facilitate the workshop and nine on the methodology.

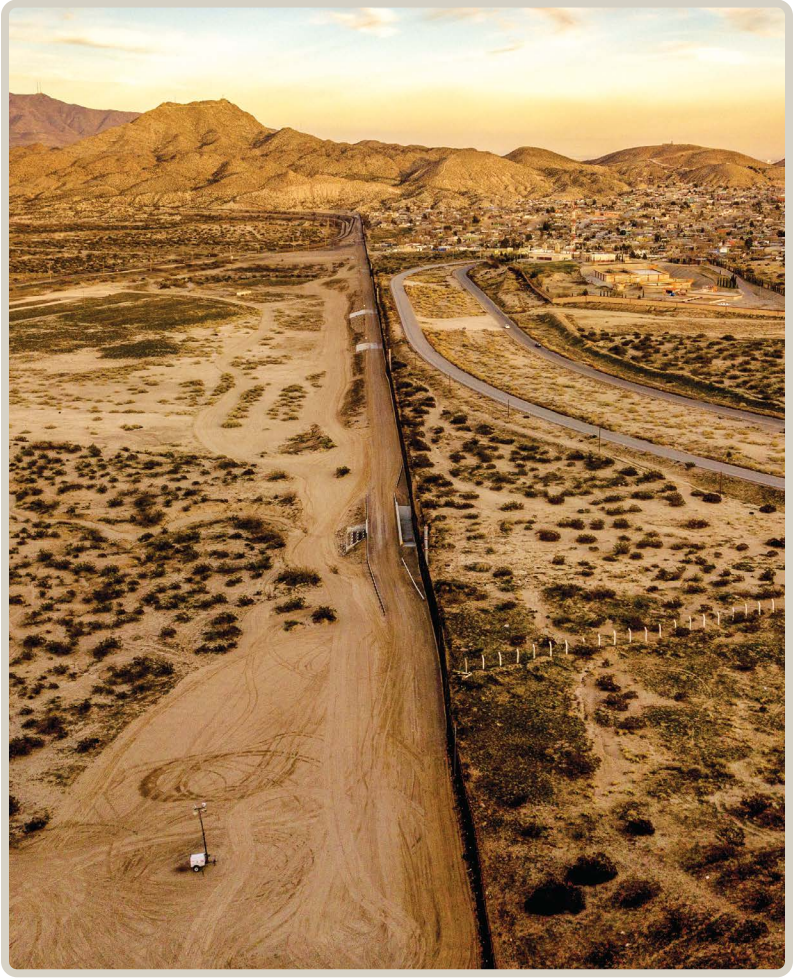

**Photo 4. The United States Mexico International Border Wall between Sunland Park New Mexico and Puerto Anapra, Chihuahua Mexico.**

## WORKSHOP METHODS

The mixed methods disease prioritization process developed by CDC has been described in detail in previous publications and is illustrated in Appendix B.[1,2] An initial pre-workshop step was to identify voting members for decision-making. This workshop had 12 voting members: two health authority leads from each of the four border states, and four federal representatives. In addition, each represented jurisdiction was able to invite or confer with subject matter advisors to inform their voting decisions and could invite other interested parties to observe. Voting members had broad expertise in infectious disease epidemiology, technical knowledge, familiarity with agency priorities and operational activities, and decision-making authority for their agency. At least one of each state's voting members was familiar with the border region. See Appendix C for a list of participants and their roles.

The first step of the prioritization process was to identify a list of infectious diseases of concern for the US southern border region. These were defined as diseases that can be introduced and amplified or cause an outbreak in the United States because of movement of people, products, or animals across the border. CDC developed this list based on binationally notifiable conditions in the 2016 Operational Protocol for U.S.-Mexico Binational Communication and Coordination on Disease Notifications and Outbreaks established by the US-Mexico Binational Technical Work Group.[21] CDC refined the list based on considerations including: the rarity and burden of disease in the 44 US border counties, the degree to which spread of the disease might be affected by population mobility, the existence of disparities in the disease epidemiology for border region subpopulations (e.g., Hispanic ethnicity), and diseases for which border region-specific resources are already dedicated (e.g., enhanced surveillance for influenza through the CDC's Border Infectious Disease Surveillance Program [BIDS]).[22,23] Agency representatives, including voting members and advisors, reviewed, discussed, and agreed upon the infectious disease list during a series of webinars before the in-person workshop. That list of 20 infectious diseases, shown in Appendix D, was considered during the prioritization workshop. During the two-day workshop, participants jointly identified five criteria for quantitative ranking of these 20 infectious diseases. Once the five criteria were developed, one categorical question was developed for each criterion through group discussion. Questions were developed to best measure each criterion. All questions were ordinal and had either binomial (yes/no) or multinomial (1%–5%, 5%–10%, 10%–20%, etc.) answers. Participants also considered data availability in defining the answers, as each question needed a known answer for each disease. The ordinal nature was necessary for the scoring process, and each answer choice was given a score determined by the participants. Voting members then individually ranked their preferences for the relative importance of each criterion. A facilitator entered each voting member's rankings into the One Health Zoonotic Disease Prioritization Tool, and

**Photo 5. Coordination between federal and local public health partners.** *Photo credit: Christine Fonseca-Perez*

a group weight for each criterion was calculated. The criteria and weights assigned to each are listed below and in Appendix E. Facilitators and participants answered each question for each infectious disease using information from published or internal agency sources. Data for the United States and Mexico were identified through an extensive pre-workshop review of over 450 publications and websites. Health departments provided information that was not readily or publicly available, particularly county data. Data on incidence, prevalence, morbidity, and mortality, and additional relevant information were collected for the 20 infectious diseases. If information for a particular infectious disease was not available for the border counties, data for the border states were used. If state data were not available, regional data were used; and if regional data were not available, national data were used.

After scoring of all diseases, decision tree analysis was used to determine the ranked disease list. Each weighted criterion was applied across each question's answers for each disease and then normalized across criteria. The scores for all five questions for each disease were then summed. The largest raw score was then normalized, giving that disease a normalized score of 1. See Appendix D for a complete listing of raw and normalized scores for all diseases that were considered for prioritization.

On day two of the workshop, the diseases with their raw and normalized scores were discussed. Workshop participants then used the ranked disease list to decide on a final list of priority diseases (Table 1). Based on qualitative considerations, the 12 voting members agreed to group some of the prioritized diseases into categories to develop the final prioritized list. This final qualitative step allowed for additional discussion, nuance, and practical considerations to create a final short list of infectious diseases for priority action and development of collaborative next steps.


**Photo 6. Brainstorming during a Zika outbreak.** *Photo credit: Maureen Fonseca-Ford*

## CRITERIA SELECTED FOR RANKING INFECTIOUS DISEASES

The criteria for ranking infectious diseases selected by the voting members are listed in order of importance below (and in Appendix E).

1. **Pandemic/epidemic potential**

   This criterion was assessed using state-level data. Diseases with at least one (≥1) outbreak in each of the four US southern border states received the highest score of 4. Diseases with multiple outbreaks (>1), but which did not occur in each of the four US southern border states, received a score of 3. Diseases with only one outbreak in any US southern border state received a score of 2. Diseases with either no outbreaks in US southern border states but at least one outbreak in Mexico, or no outbreaks in US southern border states or Mexico but potential for an outbreak, received a score of 1.

2. **Presence and rate of disease**

   This criterion was assessed by comparing rate data for only the US southern border counties with populations >100,000** with national rates, by state. Diseases for which all four states had a border county with an incidence rate (2017, or most recent available data) greater than the national incidence rate received a score of 3. If less than four states had a border county with incidence greater than the national incidence rate, the disease received a score of 2. If no states had a border county with incidence higher than the national incidence rate, the disease received a score of 1.

3. **Impact on human health**

   This criterion was assessed by a combined consideration of death, disability, and hospitalization. If the disease had a significant case fatality rate (CFR) (≥ 5%, untreated) AND had (significant disability-adjusted life years (DALYs) [at least one per 100,000 population/year or 0.1 log-scale per case/year] OR a significant hospitalization rate (≥ 10%)), the disease received the highest score of 3. If the disease had a CFR ≥5% BUT DALYs at <1 per 100,000 population/year or <0.1 log-scale per case/year AND hospitalization rate <10%, then the disease received a score of 2. A disease also received a score of 2 if the CFR <5% AND DALYs were at least one per 100,000 population/year or 0.1 log-scale per case/year AND hospitalization rate ≥10%. If the disease had a CFR <5% AND (DALY at <1 per 100,000 population/year or <0.1 log-scale per case/year OR hospitalization rate <10%), then the disease received the lowest score of 1.

4. **Capacity**

   This criterion was assessed using expert opinion by having the two voting members from each state complete a questionnaire about unmet needs in their state for each disease. Participants defined an unmet need as no or poor laboratory capacity (from collection of samples to reporting) including nonuse of available technology OR insufficient staffing OR another substantial gap that is generally not present outside the border region. If all four states had an unmet need, the disease received the highest score of 5. If three states had an unmet need, the disease received a score of 4. If two states had an unmet need, the disease received a score of 3. If one state had an unmet need, the disease received a score of 2. If no states had an unmet need, the disease received the lowest score of 1.

** These included California (San Diego and Imperial counties); Arizona (Cochise, Pima, and Yuma counties); New Mexico (Doña Ana and Santa Cruz counties), and Texas (Cameron, El Paso, Hidalgo, and Webb counties). An exception was also made to combine and evaluate the rates for Maverick and Val Verde counties in Texas (border counties with populations of ~50,000) to ensure geographic consideration of vast rural areas with very low populations along the Texas-Mexico border.

**5. Effective prevention and control measures**

This criterion was assessed using expert opinion by having the two voting members from each state complete a questionnaire about surveillance, prevention, or control measures (e.g. vaccine, treatment other than supportive care) and interventions (beyond vaccine or treatment, such as case management, vector control, or infection control) in their state for each disease. If surveillance was in place in the state AND effective prevention and control measures were available in the state AND an intervention was available in each of the four southern border states, the disease received the highest score of 3. Diseases also received a score of 3 if:

- there were established surveillance systems AND effective prevention and control measures for the disease in all four southern border states;
- there were established surveillance systems AND an intervention available for the disease in all four southern border states;
- there were an intervention available AND effective prevention and control measures for the disease in all four southern border states.

If there was established surveillance only OR prevention/control measures only OR an intervention only available in all four border states, the disease received a score of 2. If there were no established surveillance systems, prevention/control measures, or interventions, or they were available in some states but not others, the disease received the lowest score of 1.


**Photo 7. Measles messaging at the US-Mexico land border.**

# RESULTS

Federal and state health officials agreed upon a prioritized list of four infectious diseases or disease groups:

1. **Tuberculosis**
2. ***Aedes* mosquito-transmitted arboviral diseases (dengue, chikungunya, Zika)**
3. **Enteric diseases (*Vibrio* spp., *Listeria monocytogenes*, nontyphoidal *Salmonella*, *Brucella* spp.)**
4. **Rickettsioses (*R. rickettsii R. typhi, R. parkeri*)**

The final ranking of each disease and the raw and normalized scores for each disease are presented in Appendix D, where the top prioritized infectious diseases selected by the voting members are shown in bold. The ranking reflects the consensus that tuberculosis should be the top priority for the border region. There was also consensus that dengue was appropriately ranked in the top five infectious disease concerns. However, because surveillance and response for other Aedes mosquito-transmitted arboviral diseases were intertwined, voting participants opted to prioritize all Aedes mosquito-borne arboviruses as a group. Similarly, participants agreed that vibriosis was reasonably ranked in the top five diseases and that other enteric diseases with greater incidence (salmonellosis) and border-region specific risk factors (brucellosis and listeriosis) may be grouped with vibriosis for practical purposes. A majority of voting members also agreed that, despite the relatively low ranking of rickettsioses, the current epidemiologic situation in the border region (ongoing Rocky Mountain spotted fever epidemics in northern Mexico, and the significant burden of typhus in Texas) warranted their prioritization over several of the vaccine-preventable diseases. The epidemiology of the selected diseases in the border region is described in Table 1.

**Photo 8. Young girl getting a bandage after receiving her flu shot.**

**Table 1. Description of priority infectious diseases at the US southern border region† selected by voting members using a multijurisdictional process in the Infectious Disease Prioritization Workshop conducted in September 2018**

| Infectious Disease/ Causative Agent | Human Disease Burden in the Southern Border Region | Diagnostics, Treatment, and Prevention |
|---|---|---|
| **Tuberculosis (TB)/ *Mycobacterium tuberculosis, M. bovis*** | TB is endemic in the border region. California and Texas report the most TB disease cases in the nation and have among the highest incidence rates (5.2 and 4.0/100,000).[24] Among border counties with populations >100,000, Imperial County, California, reports the highest TB incidence of 21.2/100,000, followed by Cameron County, Texas, with a rate of 12.3/100,000.[25–28] Nationally, TB incidence is 2.8/100,000.[24]<br><br>In 2017, border counties reported a total of 562 TB cases.[25–28]<br><br>Nationally, *M. bovis* represents 1.4% of all reported TB morbidity, but it accounts for up to 6% in border counties such as San Diego.[24,29] | TB is diagnosed via the presence of acid-fast bacilli on microscopy or culture, histopathology, or identification via nucleic acid amplification.[30] TB is treated with a multidrug regimen for between 6 to 24 months, depending on the resistance pattern.[31] Treating latent tuberculosis infection can prevent progression to active disease, and accurate screening tests are available.[32]<br><br>Contact investigation is a critical component of TB control. In the border region, contact investigation, and treatment of TB disease or latent tuberculosis infection, often requires enhanced efforts to coordinate with Mexico to fully identify contacts and provide continuity of care for persons moving back and forth between countries.<br><br>If left untreated, tuberculosis has a 10-year case fatality of 70%.[33] |
| ***Aedes*-transmitted arboviruses/dengue, Zika, chikungunya viruses** | Autochthonous dengue virus transmission has become more frequent in the continental United States and in the border region since 1980.[34] Dengue outbreaks in south Texas, and most recently a 2015 travel-associated outbreak in Arizona, have occurred in association with dengue epidemics in northern Mexico.[35-37] Dengue has also recently spread to new areas of northern Mexico.[38,39] In US border counties, dengue cases are infrequent (26 in 2016), with rates ranging from 0 to 1.5/100,000)[40–42] and typically associated with travel to endemic areas.[43] However, studies suggest that dengue is likely underdiagnosed in the border region.[39]<br><br>Chikungunya and Zika viruses have circulated in the Americas since 2014 and 2015 44,45, respectively, but in the US southern border region, cases have been sporadic and mostly associated with travel. There have been no known chikungunya outbreaks in the border counties. In 2016, there was a small outbreak of local mosquito-transmitted Zika in Brownsville, Texas.[46]<br><br>*Aedes aegypti*, the principal mosquito vector of all three viruses, has expanded its geographic distribution in the southern United States, and the southern US border has reported year-round *Aedes aegypti* mosquito populations from Texas to Arizona.[36,47] | Diagnosis is made by nucleic acid amplification, antibody testing (IgG, IgM), and plaque reduction neutralization testing for all three diseases.[48–50] Treatment is supportive care.<br><br>Although asymptomatic or mild dengue infection is more common, there are severe manifestations such as dengue shock syndrome. While there is no pharmaceutical treatment, with early detection and proper care, less than 1% of patients die.[30] Without appropriate supportive care, the case fatality rate can reach 10%.[51]<br><br>Prevention measures include using insect repellent, wearing long-sleeved shirts and long pants, and controlling mosquitoes indoors and outdoors.[52,53] |

† The US southern border region has been defined as the 44 US counties within 100km of the Mexico border, originally laid out by the 1983 La Paz Agreement. The term "border counties" is also used in this report to refer to the US southern border region.

| Infectious Disease/ Causative Agent | Human Disease Burden in the Southern Border Region | Diagnostics, Treatment, and Prevention |
|---|---|---|
| **Enteric diseases/ *Vibrio* spp., *Listeria monocytogenes,* nontyphoidal *Salmonella* spp., *Brucella* spp. bacteria** | Nontyphoidal Salmonella (NTS) infection is common in the US southern border counties, with rates as high as 23.5/100,000 population in large border counties in 2016, presenting a significant burden of disease.[54-56] *Vibrio*, *Listeria*, and *Brucella spp*. infections are much less common. Among border states, 2016 brucellosis rates ranged from .01 to .2/100,000 population and vibriosis and listeriosis rates both ranged from .1 to .3/100,000.[54-57]<br><br>NTS outbreaks are common. *Listeria* and *Vibrio* outbreaks have also occurred in all 4 border states in the past 10 years. There have been 3 brucellosis outbreaks in California and Texas in the past 10 years.[58] | Enteric disease diagnosis is typically made through culture of stool, blood, cerebrospinal fluid (CSF), etc. Culture-independent diagnostic testing (CIDT) may also be used for some enteric diseases.[59] NTS is the most common cause of bacterial diarrheal illness and is diagnosed by stool culture or CIDT; systemic infections can be diagnosed by culture of normally sterile body sites such as blood and CSF. While *Listeria monocytogenes* can cause diarrheal illness, the main concern is systemic infection, which is diagnosed by culture of blood and CSF. *Vibrio vulnificus* is diagnosed by wound or blood culture, while *Vibrio cholerae* and other *Vibrio* spp. that cause gastrointestinal illness are diagnosed with stool culture. Brucellosis can be diagnosed with the microagglutination test (BMAT) serology for *B. abortus*, *B. melitensis*, and *B. suis*.[60] Treatment varies by disease but includes antibiotics. Enteric diseases are prevented through good sanitation and hygiene and avoidance of contaminated food and water, contact with high-risk animals, and ill persons [61]<br><br>Case fatality rates (CFRs) for these diseases are .5% for salmonellosis, 2% for brucellosis, and 18% for invasive listeriosis.[30,62] Of *Vibrio* infections, *V. vulnificus* has the highest mortality, with an estimated CFR of 34.8%.[63] |
| **Rickettsioses/*R. rickettsii, R. typhi, R. parkeri* bacteria** | Spotted fever group rickettsioses (SFGR) are transmitted by ticks infected with *R. rickettsii*, *R. parkeri*, and other closely related bacteria; in 2016, Texas reported 87 cases, Arizona reported 27, and California reported 14 confirmed and probable SFGR cases.[64]<br><br>Large outbreaks of Rocky Mountain spotted fever (RMSF) have occurred on<br><br>Native American reservations in Arizona.[65] Cases and outbreaks in Arizona have been attributed to the vector *Rhipicephalus sanguineus* (the brown dog tick),[66] which occurs widely throughout the United States, including California and Texas.[67,68]<br><br>RMSF epidemics have been ongoing in the Mexican border states of Baja California and Sonora, with binational cases occurring in California and Arizona, posing a continual risk in the border region.[69]<br><br>*R. typhi* causes flea-borne (murine) typhus, which mostly occurs in Texas and California. In Texas, cases have been most frequent in South Texas, where it is endemic.[70] Since the mid-2000s, the number of typhus group rickettsioses reported in Texas has increased significantly, and the geographic distribution of cases has expanded. In 2016, Texas reported 134 cases in border counties out of 364 cases statewide.[54] | Rickettsioses are diagnosed via serology, polymerase chain reaction, immunohisto-chemistry, histopathology, or cell culture and are treated with doxycycline.[65,71] No vaccine is available. Minimizing arthropod exposure (fleas and ticks), using insect repellents, and wearing protective clothing serve as prevention tools.[71]<br><br>Of the rickettsioses, RMSF is the most severe. In the United States, the CFR for SFGR (based on surveillance data) is roughly 0.5%. However, CFRs from reviews of RMSF cases range from 5% to 10%.[66]<br><br>Murine typhus is usually self-limiting but can be fatal when treatment is delayed 72, and complications can be severe.[73] |

# KEY THEMES AND NEXT STEPS

After finalizing the list of priority infectious diseases, workshop participants discussed recommendations and further actions that could be jointly taken to address the diseases. During the workshop, participants identified opportunities for improving coordination, surveillance, laboratory approaches, outbreak response and preparedness, and health education for the prioritized diseases in the border region. In a series of discussions after the workshop, partners determined potential next steps to address those opportunities for improvement and gave each next step a priority level from 1 to 3. Some of the highest-priority activities were initiated after the workshop, and efforts to conduct all the activities will be pursued over the next 5 years.

The summary that follows highlights the consistently prioritized recommendations. Though non-binding, they represent ways to jointly address the prioritized infectious diseases. A complete listing of all key themes and identified opportunities is shown in Appendix F.

## COORDINATION

Participants identified a need to better coordinate initiatives to address the priority diseases between agencies involved in public health in the border region. Such initiatives include CDC's Binational Border Infectious Disease Surveillance (BIDS) Program, the US-Mexico Binational Technical Working Group (BTWG), the U.S.-Mexico Border Health Commission (BHC), and multiple city/state/region binational meetings and committees. This would ensure synergy and optimize resource use between agencies with similar interests in preventing and controlling infectious diseases. Following the workshop, participants planned to look for ways to harmonize the existing coordinating mechanisms and leverage best practices and resources to address the prioritized diseases as well as relevant challenges, such as antimicrobial resistance and insecticide resistance.

Participants also proposed a gap analysis for TB and the prioritized enteric diseases to identify areas of need in surveillance, laboratory capacity, preparedness, and communication/outreach, and to develop comprehensive approaches to address those gaps. As a first step, participants will convene a workgroup to discuss the scope and process of a border-wide gap analysis, beginning with TB prevention and control, and potentially exploring surveillance and control efforts for the prioritized enteric diseases in future years.

**Photo 9. Backpackers shopping in a Mexican street market.**

## SURVEILLANCE

Identifying binational disease clusters allows for a more complete understanding of the scope and nature of regional disease transmission and should lead to improved bilateral control strategies. As such, participants felt the identification of binational outbreaks/clusters of the priority diseases was an important area of work. US border states and counties are in varying stages of developing systems to identify binational cases, clusters, and outbreaks. Therefore, multiple approaches may need to be taken. As a first step, participants proposed to assess current systems and identify best practices for identifying transmission patterns and emerging clusters in the border region for each disease. Participants will also explore various information platforms to develop a system for monitoring reports of outbreaks in Mexico that would supplement existing official reporting mechanisms. And finally, participants would review border state/county TB and enteric disease clusters and drug-resistant cases as well as pediatric TB case investigations that may require binational collaboration.

Providers that serve populations that cross the US-Mexico border are critical in disease surveillance and control strategies. Participants agreed on the importance of engaging relevant healthcare providers to ensure case identification and reporting mechanisms are optimal for monitoring infectious diseases among mobile populations. As a first step, participants will work to develop approaches, including potential thresholds, to alert border region community health centers serving mobile populations about increases in Aedes mosquito populations, and cases or outbreaks of Zika, dengue, or chikungunya, to stimulate and increase testing of patients with acute febrile illness.

Participants additionally identified a need to strengthen surveillance for vector-borne diseases and vector presence in the border region through active surveillance approaches. Participants in regions with higher levels of risk will discuss the feasibility of expanding syndromic sentinel surveillance for acute febrile illness with confirmatory testing at key sites in the border region. Some of CDC's BIDS Program sites conduct active sentinel surveillance with confirmatory laboratory testing for vector-borne diseases along the border and could be expanded to increase active surveillance in the border region.

**Photo 10. Tick collection in field using flagging method.**
*Photo credit: Alba Phippard*

## LABORATORY

Participants proposed reviewing and implementing approaches to strengthen surveillance and laboratory practices for antimicrobial resistance in the border region, while working to ensure that culture-independent diagnostic testing (CIDT) does not reduce high-quality public health surveillance in the border region. Nationally, foodborne disease outbreak surveillance has transitioned to whole genome sequencing (WGS), which is expected to improve efficiency and precision in identifying clusters and outbreaks. However, current state and local resources are insufficient to ensure WGS is performed on all isolates. Increasing the use of

CIDT would limit the ability to perform WGS on specimens if no cultures were available. A critical next step will be for participants to discuss the potential impact of WGS on surveillance in the border region, identification of binational cases and outbreaks of the prioritized diseases, and related antimicrobial resistance.

## OUTBREAK RESPONSE AND PREPAREDNESS

Participants identified cross-agency coordination as the key to address preparedness, foster awareness of emerging public health issues, and encourage collaboration in the border region. In particular, coordination between US border states and counties and Mexico is critical to maintaining comprehensive preparedness and response plans. Multiple existing collaborations and forums, such as BTWG, BIDS, BHC, and state and local binational groups have developed strong foundations for continued work that should be leveraged and grown. Near-term next steps include using the multiple forums to discuss issues such as transporting specimens across the border, capacity building (through tabletop exercises), data sources important for preparedness activities, and mechanisms to strengthen outbreak response. Participants will also initiate a formal review of the *Operational Protocol for US-Mexico Binational Communication and Coordination on Disease Notifications and Outbreaks*. Finally, participants will work to clarify and leverage preparedness work being done at the local, state, and federal levels for the prioritized diseases.

## HEALTH COMMUNICATION, EDUCATION, AND OUTREACH

Significant proportions of border region residents may require or prefer health information in Spanish and may even seek or regularly get information from Mexican sources. Participants identified several near-term opportunities to improve health education, communication, and outreach for Spanish-speaking populations with limited English proficiency for the prioritized diseases. First, participants proposed to create a platform for regularly sharing translated and validated educational and prevention materials between agencies in border communities, and to seek opportunities to harmonize educational information with Mexico. Second, participants recommended working to ensure educational materials for Spanish-speaking border populations are tested for accuracy, cultural appropriateness, and understanding, which are all critical for messaging. Finally, participants identified a need to explore avenues and approaches for best disseminating targeted public health information to Spanish-speaking and other specific border populations, which might vary depending on the disease.

**Photo 11. The Rio Grande River on the US/Mexico Border in Big Bend National Park, Texas.**

# APPENDIX A: US Border Counties

Defining the border region is complex, and there are multiple definitions serving different purposes.[6] The 1983 La Paz Agreement defined it as the area that extends 100 kilometers north and south of the international border. On the US side, that strip traverses 48 US counties. However, to report infectious disease data consistent with the Border Health Commission[74] and other public health entities, in this report US border counties have been defined as the 44 listed and shown in the map below; La Paz, Maricopa, and Pinal county, Arizona, and Riverside county, California have been excluded.

**Arizona:** Cochise, Pima, Santa Cruz, Yuma

**California:** Imperial, San Diego

**New Mexico:** Doña Ana, Grant, Hidalgo, Luna, Otero, Sierra


**Photo 12. Woman crossing the United States-Mexico border with a dog.** *Photo credit: Maureen Fonseca-Ford*

**Texas:** Brewster, Brooks, Cameron, Crockett, Culberson, Dimmit, Duval, Edwards, El Paso, Frio, Hidalgo, Hudspeth, Jeff Davis, Jim Hogg, Kenedy, Kinney, La Salle, Maverick, McMullen, Pecos, Presidio, Real, Reeves, Starr, Sutton, Terrell, Uvalde, Val Verde, Webb, Willacy, Zapata, Zavala

# **APPENDIX B:** Overview of the One Health Zoonotic Disease Prioritization Process‡

Accessible information: https://www.cdc.gov/onehealth/what-we-do/zoonotic-disease-prioritization/fact-sheet.html

## ONE HEALTH ZOONOTIC DISEASE PRIORITIZATION PROCESS

ONE HEALTH

CS306732-A

*One Health recognizes the connection between human, animal, and environmental health.*

The One Health Zoonotic Disease Prioritization (OHZDP) process brings together representatives from human, animal, and environmental health sectors, as well as other relevant partners, to prioritize zoonotic diseases of greatest concern for multisectoral, One Health collaboration in a country, region, or other area. This process uses a transparent approach and incorporates equal input from all represented One Health sectors working at the human-animal-environment interface.

### Goals of the OHZDP Process

- To use a multisectoral, One Health approach to
  1. Prioritize zoonotic diseases of greatest concern
  2. Develop next steps and action plans to address the priority zoonotic diseases in collaboration with One Health partners

### Expected Outcomes of the OHZDP Process

- A list of priority zoonotic diseases of greatest concern agreed upon by all represented One Health sectors
- Recommendations for next steps and action plans for multisectoral, One Health engagement to address the priority zoonotic diseases
- Understanding of the roles and responsibilities of all represented One Health sectors
- The creation or strengthening of multisectoral, One Health coordination mechanisms and networks
- A report highlighting the outcomes of the workshop to help advocate for One Health priorities

### Benefits of the OHZDP Process

- Connects representatives from human, animal, and environmental health sectors and other relevant partners, building a foundation of trust that strengthens multisectoral, One Health collaboration, coordination, and communication
- Prioritizes zoonotic diseases using equal input from all represented One Health sectors through a transparent and collaborative process
- Supports the creation or strengthening of multisectoral, One Heath coordination mechanisms
- Helps participants focus limited resources to build capacity and collaboratively address the priority zoonotic diseases
- Adaptable to local context, since participating voting members determine criteria relevant to their country, region, or other area
- Scalable for use at the subnational, national, and regional levels, and can be adapted to apply to other infectious diseases and One Health issues
- Informs assessments, planning efforts, or strategy development relevant to One Health (for example, World Health Organization's International Health Regulations [2005] and World Organisation for Animal Health Performance of Veterinary Services Pathway)
- Provides real-time outcomes such as the list of priority zoonotic diseases, next steps and action plans, and a formal workshop report

CDC

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

This method was modified to prioritize infectious diseases for the border region, including both zoonoses and other diseases.

‡ www.cdc.gov/onehealth/what-we-do/zoonotic-disease-prioritization

# **APPENDIX C:** Infectious Disease Prioritization Workshop Participants for the US Southern Border Region

## Voting Members

| # | Name | Organization | Title/Position |
|---|---|---|---|
| 1 | Ken Komatsu | Arizona Department of Health Services | State Epidemiologist |
| 2 | Shane Brady | Arizona Department of Health Services | Deputy State Epidemiologist |
| 3 | Margarita Santibañez | California Department of Public Health | Epidemiologist |
| 4 | Esmeralda Iniguez-Stevens | California Department of Public Health | Epidemiologist |
| 5 | Sandra Melman | New Mexico Department of Health | Epidemiologist |
| 6 | Salina Torres | New Mexico Department of Health | Epidemiologist |
| 7 | Jennifer Shuford | Texas Department of State Health Services | Medical Officer |
| 8 | Allison Banicki | Texas Department of State Health Services | Epidemiologist |
| 9 | Kathy Moser | CDC/NCEZID[§]/DGMQ[¶]/US-Mexico Unit | Medical Epidemiologist |
| 10 | Sam Groseclose | CDC/Office of Public Health Preparedness and Response | Associate Director for Science |
| 11 | Michelle McConnell | Health and Human Services Agency/Office of the Secretary/Office of Global Affairs | Health Attaché, Mexico |
| 12 | Steve Waterman | CDC/NCEZID/Division of Vector-borne Disease | Dengue Branch Chief |

## Advisors/Observers

| # | Name | Organization | Title/Position |
|---|---|---|---|
| 13 | David Torres | Texas Department of Health Services | Epidemiologist |
| 14 | Dianne Escotto | CDC/NCEZID/DGMQ/US-Mexico Unit | Public Health Management Specialist |
| 15 | April Fernandez | California Department of Public Health | Chief of the Office of Border Health |
| 16 | Marian Fierro | Imperial County Public Health Department | Epidemiologist |
| 17 | Carla Tyler | Texas Department of State Health Services—Region II | Epidemiologist |
| 18 | Cory Arrouzet | CDC/NCEZID/DGMQ/US-Mexico Unit | Council of State and Territorial Epidemiologists Fellow |
| 19 | Alfonso Rodriguez-Lainz | CDC/NCEZID/DGMQ/US-Mexico Unit | Epidemiologist |
| 20 | Rosy De los Santos | Texas Department of State Health Services/Office of Border Public Health | Office of Border Public Health Program Manager |
| 21 | Tom Sidwa | Texas Department of State Health Services/Zoonosis Control Branch | State Veterinarian |
| 22 | Paula Kriner | Imperial Country Public Health Department | Epidemiologist |
| 23 | Justine Kozo | San Diego County Health and Human Services Agency/Office of Border Health | Chief of the Office of Border Health |

[§] National Center for Emerging and Zoonotic Infectious Diseases

[¶] Division of Global Migration and Quarantine

| # | Name | Organization | Title/Position |
|---|---|---|---|
| 24 | Maureen Fonseca-Ford | CDC/NCEZID/DGMQ/US-Mexico Unit | Quarantine Public Health Officer |
| 25 | Elsa Villarino | CDC/NCEZID/DGMQ/US-Mexico Unit | Country Director, Mexico |
| 26 | Olivia Arizmendi | Border Infectious Disease Surveillance—California | Epidemiologist |
| 27 | Alba Phippard | CDC/NCEZID/DGMQ/US-Mexico Unit | Epidemiologist |
| 28 | Crystal Clements | CDC/NCEZID/DGMQ/US-Mexico Unit | Oak Ridge Institute for Science and Education Fellow |
| 29 | Freida Adams | New Mexico Department of Health | Chief of the Office of Border Health |

## Facilitators

| # | Name | Organization | Title/Position |
|---|---|---|---|
| 30 | Grace Goryoka | CDC/NCEZID/One Health Office | Health Scientist |
| 31 | Kristina Angelo | CDC/NCEZID/DGMQ/Travelers Health | Medical Epidemiologist |
| 32 | Sonia Contreras | CDC/NCEZID/DGMQ/US-Mexico Unit | Quarantine Public Health Officer |
| 33 | Sonia Montiel | CDC/NCEZID/DGMQ/US-Mexico Unit | Public Health Analyst |
| 34 | Alina Shaw | CDC/NCEZID/DGMQ/US-Mexico Unit | Health Communications Specialist |

## Workshop Organizers

| Name | Organization | Title/Position |
|---|---|---|
| Alba Phippard | CDC/NCEZID/DGMQ/US-Mexico Unit | Epidemiologist |
| Thomas Gray | CDC/NCEZID/DGMQ/US-Mexico Unit | Public Health Analyst |
| Crystal Clements | CDC/NCEZID/DGMQ/US-Mexico Unit | ORISE Fellow |
| Kathy Moser | CDC/NCEZID/DGMQ/US-Mexico Unit | Unit Lead, Medical Officer |
| Grace Goryoka | CDC/NCEZID/One Health Office | Health Scientist, CDC Facilitator |
| Kristina Angelo | CDC/NCEZID/DGMQ/Travelers' Health Branch | Medical Epidemiologist, CDC Facilitator |
| Casey Barton Behravesh | CDC/NCEZID/One Health Office | Director |

# **APPENDIX D:** Ranked Disease List and Scores from the Infectious Disease Prioritization Workshop for the US Southern Border Region

Infectious diseases considered for prioritization. The infectious disease priorities selected by the voting members are shown in **bold**.

| Rank | Infectious Disease | Raw Score | Normalized Final Score |
|---|---|---|---|
| **1** | **Tuberculosis** | **1.266686081** | **1** |
| **2** | **Vibriosis** | **1.237911983** | **0.977283955** |
| 3 | Hepatitis A | 1.218692442 | 0.962110866 |
| **4** | **Dengue** | **1.193208165** | **0.941992008** |
| 5 | Syphilis | 1.164434067 | 0.919275963 |
| **6** | **Listeriosis** | **1.159788977** | **0.915608843** |
| 7 | Pertussis | 1.151600921 | 0.909144688 |
| 8 | Chickenpox | 1.151600921 | 0.909144688 |
| 9 | Influenza | 1.142046364 | 0.901601732 |
| **10** | **Rickettsioses** | **1.115085159** | **0.880316896** |
| 11 | Campylobacteriosis | 1.102252014 | 0.870185621 |
| **12** | **Salmonellosis (nontyphoidal)** | **1.102252014** | **0.870185621** |
| 13 | Shiga Toxin-Producing *Escherichia coli* | 1.102252014 | 0.870185621 |
| **14** | **Zika** | **1.090956151** | **0.861267971** |
| 15 | Shigellosis | 1.007741664 | 0.795573331 |
| 16 | Hepatitis B | 0.991800712 | 0.782988561 |
| 17 | HIV infection | 0.959930039 | 0.75782789 |
| **18** | **Chikungunya** | **0.947096894** | **0.747696614** |
| **19** | **Brucellosis** | **0.918322796** | **0.724980569** |
| 20 | Chagas | 0.707818409 | 0.558795443 |

# **APPENDIX E:** The Criteria and Questions with Associated Weights Used for Ranking Infectious Diseases at the US Southern Border Region, and Scores for the Corresponding Answers to Questions

**1. Pandemic/epidemic potential (criterion weight = 0.307)**

**Question: What is the number of outbreaks (defined by the Council for State and Territorial Epidemiologists' case definition) in the US southern border states in the past 10 years?**

**Answer:**

- ☐ At least one outbreak has occurred in all four US southern border states (4)
- ☐ Multiple outbreaks, but outbreaks have not occurred in all four US southern border states (3)
- ☐ Only one outbreak in any US southern border state (2)
- ☐ No outbreaks in the US southern border states but at least one outbreak has occurred in Mexico (country) OR no outbreaks have occurred in US southern border states or Mexico (country) but there is potential for an outbreak (1)

**2. Presence and rate of disease (criterion weight = 0.249)**

**Question: Is the highest reported incidence rate (2017, or most recent available data) from the US southern border counties (within each state, and only for those counties with population >100,000 persons) greater than the national incidence rate?**

**Answer:**

- ☐ Yes, all four states have a higher incidence rate (3)
- ☐ Yes, less than four states have a higher incidence rate (2)
- ☐ No states have a higher incidence rate (1)

**3. Impact on human health (criterion weight = 0.230)**

**Question: Does the disease have a significant case fatality rate (untreated, ≥5%), and does it have significant disability-adjusted life years (DALY)s (at least one per 100,000 population/year or 0.1 log-scale per case/year) or a significant hospitalization rate (≥10%) for the disease?**

**Answer:**

- ☐ CFR ≥5% AND DALY at least one per 100,000 population/year or 0.1 log-scale per case/year OR hospitalization rate ≥10% (3)
- ☐ CFR ≥5% but DALY at <1 per 100,000 population/year or <0.1 log-scale per case/year AND hospitalization rate <10% (2)
- ☐ CFR <5% AND DALY at least one per 100,000 population/year or 0.1 log-scale per case/year AND hospitalization rate ≥10% (2)
- ☐ CFR <5% AND DALY at <1 per 100,000 population/year or <0.1 log-scale per case/year OR hospitalization rate <10% (1)

**4. Capacity (criterion weight = 0.115)**

**Question: Is there an unmet need in a given state in the border region (unmet need is defined as no or poor lab capacity [from collection of samples to reporting] including nonuse of available technology) OR insufficient staffing OR another substantial gap that is generally not present outside the border region)?**

**Answer:**

- ☐ Four states have an unmet need (5)
- ☐ Three states have an unmet need (4)
- ☐ Two states have an unmet need (3)
- ☐ One state has an unmet need (2)
- ☐ No states have an unmet need (1)

**5. Effective prevention and control measures (criterion weight = 0.099)**

**Question: Are established surveillance systems in place in the state OR effective prevention and control measures (vaccine, treatment—but not supportive care) available in the state OR a potential intervention (beyond vaccine or treatment, such as case management, vector control, infection control, etc.) available in the state for this disease in all four southern border states?**

**Answer:**

- ☐ Surveillance AND prevention/control measures AND potential intervention were available in all four southern border states (3)
  - » OR prevention/control measures AND potential intervention were available in all four southern border states
  - » OR surveillance AND prevention/control measures were available in all four southern border states
  - » OR Surveillance AND potential intervention were available in all four southern border states
- ☐ (Only surveillance available OR only prevention/control measures available OR only potential intervention available) in all four southern border states (2)
- ☐ No surveillance, prevention/control measures, or potential interventions, OR they were available in some states but not all (1)

# **APPENDIX F:** Key Themes and Next Steps for Prioritized Diseases

The table below summarizes opportunities and actions identified in discussions during and after the workshop through analysis of existing processes. These opportunities and potential next steps represent an informal roadmap to addressing gaps in multiagency coordination for the prioritized diseases. Creating these non-binding recommendations was a first step in brainstorming action items. Follow-up will bring together additional subject matter experts and other stakeholders to refine and move forward with specific action items.

## Coordination Activities

| Identified Opportunity | Rationale | Considerations | Potential Next Steps |
|---|---|---|---|
| Enhance existing mechanisms for coordinating initiatives between the US federal, state, and local agencies involved in public health activities in the US-Mexico border region to address the priority diseases. | Ensure synergy and optimize resource use between agencies with similar interests in preventing and controlling infectious diseases in the border region. | Existing mechanisms include<br>• CDC's Binational Border Infectious Disease Surveillance (BIDS) Program;<br>• Binational Technical Working Group (BTWG);<br>• U.S.-Mexico Border Health Commission (BHC); and<br>• Border sister-city/state/region binational meetings and committees. | **General Next Steps**<br>Explore opportunities to harmonize existing mechanisms (BHC, BIDS, BTWG) to further coordinate, leverage best practices, and reduce duplication of efforts.<br>• Work with the BTWG on broadening partner participation on monthly teleconferences by including, based on the meeting topic and goal, different federal, state, and local partners and subject matter experts and decision-makers in programs such as STD/HIV, TB, and healthcare-associated infections.<br>• Work with BTWG to address topic areas specific to priority infectious diseases, and regularly exchange surveillance information on resistance trends including insecticide resistance.<br>• Identify and leverage resources for annual face-to-face meetings of local, state, and federal partners involved in border/binational health. |
| Conduct gap analysis for priority diseases in the border region to inform development of comprehensive approaches. | A structured method for identifying gaps in surveillance, laboratory capacity, preparedness and response, and health communication and outreach will facilitate planning and resource acquisition for areas of greatest need. | With regard to the vector-borne diseases, two Regional Centers of Excellence (COEs) funded by CDC work within the border region: the Pacific Southwest COE and the Western Gulf COE. There was no consensus on need for gap analyses for the prioritized enteric diseases. | **Arboviruses and Rickettsioses Next Steps**<br>• Identify the priorities of the Regional COEs working in the border region and coordinate to determine the need for a border region gap analysis for vector-borne diseases. Surveillance needs could include a survey of the number of laboratory tests for arboviruses from suspected human cases being performed in state and local public health laboratories along the border and by major commercial laboratories, or a survey of state public health laboratories regarding the availability of arbovirus diagnostics testing and kits.<br>**TB/Enteric Diseases Next Steps**<br>• Convene a workgroup to discuss scope and process of a borderwide gap analysis, beginning with TB prevention and control, and potentially exploring surveillance and control efforts for the prioritized enteric diseases in future years. |
| Share state models for exchanging public health data electronically with Mexican health jurisdiction partners. | Sharing public health information with Mexico electronically may improve completeness and timeliness of data exchange, leading to more timely binational public health response. | Arizona Department of Health Services' MEDSIS is an example of an electronic disease surveillance system that allows direct bilateral information sharing between the border states of Arizona and Sonora. There are other international data platforms, such as CDC's PulseNet, which may also improve collaborative surveillance efforts. | **General Next Steps**<br>• Share information and materials for existing models in the border region.<br>• Identify utility of existing US-Mexico cross-border data sharing platform and explore data-sharing projects between other countries. |

## Surveillance Activities

| Identified Opportunity | Rationale | Considerations | Potential Next Steps |
|---|---|---|---|
| Prioritize identification of binational outbreaks/clusters of priority diseases. | Identifying binational disease clusters allows for a more complete understanding of the scope and nature of regional transmission and should lead to improved bilateral control strategies. | US border states and counties are in varying stages of developing systems to identify binational cases, clusters, and outbreaks. Therefore, multiple approaches may need to be taken. | **General Next Steps**<br>• Clarify current systems and identify best practices for each prioritized disease, to identify transmission patterns and capture emerging clusters across the border region.<br>**Arboviruses and Rickettsioses Next Steps**<br>• Work with Mexico to better identify and respond to clusters and outbreaks, for example, by routinely sharing surveillance data and further leveraging binational forums for focused discussions on surveillance and control. VectorSurv, a vector data sharing partnership of vector control agencies, although not international, now spans several states including California, and could be explored as a means for data sharing in the border region and with Mexico.<br>• Explore platforms such as Spanish and English ProMed, CDC's Red Sky, HealthMap, and Canada's Global Public Health Intelligence Network, and develop a system to monitor reports of outbreaks in Mexico.<br>**Enteric Diseases Next Steps**<br>• Review border state/county clusters and drug-resistant cases that may require collaboration.<br>**TB Next Steps**<br>• Review border state/county clusters and pediatric case investigations that may require collaboration. |
| Engage relevant healthcare providers to ensure surveillance and reporting mechanisms are in place for monitoring infectious diseases among mobile populations. | Populations that cross the US-Mexico border and those otherwise linked to Mexico may have increased risk of exposure to the prioritized diseases. Providers that serve these groups are critical in surveillance and control strategies and should be included in education and outreach efforts. | Community health centers, individual providers, and Department of Homeland Security (DHS) facilities near the border are central to healthcare provision for mobile populations and their networks. Other relevant providers include those in binational health insurance networks and travel medicine clinics. | **General Next Steps**<br>• Work with DHS to improve understanding of DHS agencies public health notification systems and identify collaborative opportunities to enhance surveillance among both employees and immigrant populations.<br>• Convene workgroup to discuss strategies for engaging community healthcare providers on disease reporting (e.g., provider education on diagnosis and reporting, assessments of current reporting activities, and quality improvement) and general provider knowledge on the prioritized diseases.<br>• Share among partners the results of physician knowledge, attitude, and belief/practice surveys to inform the development of educational information for physicians.<br>**Arboviruses Next Steps**<br>• Develop approaches, including potential thresholds, to alert border region community health centers serving mobile populations about increases in *Aedes* mosquito populations, or cases or outbreaks of Zika, dengue, or chikungunya, to stimulate and increase testing of patients with acute febrile illness.<br>**Rickettsioses Next Steps**<br>• Develop additional approaches to better integrate veterinary and public health surveillance and systematize cross-reporting between sectors.<br>• Implement strategies to educate providers on the diagnostic tests and testing requirements for rickettsioses, as well as appropriate treatment. |

## Surveillance Activities (Continued)

| Identified Opportunity | Rationale | Considerations | Potential Next Steps |
|---|---|---|---|
| Create a web-based dashboard for selected notifiable diseases with county level and aggregated border region data for increased understanding of case counts, rates, and trends in the border region. Dashboard features could include mapping and interactivity depending on resources and feasibility. | Epidemiologic data are typically available only at state and county levels. Border health stakeholders would benefit from the ability to easily visualize, access, and analyze data for the border region at the county level and as an epidemiologic unit and compare them with non-border counties or regions. | Border health stakeholders may have diverse data needs and uses, necessitating broad participation to develop a product that meets the needs. Existing tools can serve as models, including<br>CDC's NCHHSTP Atlas Plus mapping and visualization tool for HIV, hepatitis, STD, and TB; CDC Wonder; Arizona Disease Data, Statistics & Reports; Arizona Flu & Respiratory Syncytial Virus Reports; and PulseNet for foodborne illnesses. | **General Next Steps**<br>• Establish a workgroup to discuss<br>» Feasibility, resources, and required partners;<br>» Inclusion of data from non-border counties to show true scope and pattern of disease burden; and<br>» Variables for inclusion.<br>• Explore how other programs have shared data through web-based applications. |
| Implement or strengthen active surveillance for prioritized vector-borne diseases and vector presence in the border region. | Active surveillance for the prioritized vector-borne diseases can identify cases that might otherwise go undiagnosed, allowing for earlier detection of cases, outbreaks, and emerging or re-emerging diseases. | CDC's Border Infectious Disease Surveillance Program conducts active sentinel surveillance with confirmatory laboratory testing for vector-borne diseases at select sites along the border and could be expanded in the border region. Participatory surveillance is another approach, invoking observations and reports from the public. Mobile phone apps such as Kidenga and The Tick App could be used for arboviral disease and vector surveillance. | **Arboviruses and Rickettsiosis Next Steps**<br>• Discuss feasibility of expanding syndromic sentinel surveillance for acute febrile illness with confirmatory testing at key sites in the border region.<br>• Convene border agency partners to explore and further operationalize participatory surveillance for vector-borne diseases and vector presence in the border region. |

## Laboratory

| Identified Opportunity | Rationale | Considerations | Potential Next Steps |
|---|---|---|---|
| Review and implement approaches to strengthen surveillance and laboratory capacity to detect antimicrobial resistant-bacteria in the border region.<br>Ensure that culture-independent diagnostic testing (CIDT) does not reduce high-quality public health surveillance in the border region. | Antimicrobial resistance is a threat to global health security. The United States has developed a National Strategy for Combating Antibiotic-Resistant Bacteria, which includes strengthening national surveillance and international collaboration. Because cross-border healthcare access is common, there may be increased opportunities to introduce antibiotic-resistant pathogens between countries in border locations. Increasingly, clinical laboratories use CIDT for rapid diagnosis; yet lack of cultures can limit typing and resistance testing.[59,75] | Nationally, foodborne outbreak surveillance has transitioned to whole genome sequencing (WGS), which is expected to improve efficiency and precision in identifying clusters and outbreaks. WGS is one of the laboratory analyses that require an isolate from culture. In addition, state and local resources are insufficient to ensure WGS of all isolates.<br>CDC's FoodNet has surveyed clinical laboratories since 2012 to assess changes in diagnostic testing practices. A recent FoodNet analysis of these survey data identified the largest percent increases in CIDT use for *Salmonella* and *Shigella*.[76] Such surveys could inform a border region-specific approach to address CIDT challenges. | **Enteric Diseases and TB Next Steps**<br>• Identify venues (BTWG, face-to-face meetings) that can be used to discuss WGS and its potential impact on surveillance in the border region. Topics for discussion include:<br>» How state health departments are managing ability/inability to conduct WGS for enteric specimens and the prioritization of specimens for testing;<br>» Time delays inherent in WGS;<br>» Possibility that gaps in enteric surveillance will widen with WGS and fewer outbreaks will be identified;<br>» How best to use WGS to investigate highest priority clusters; and<br>» How to engage with Mexican partners to identify cross-border clusters.<br>**Enteric Diseases Next Steps**<br>• Assess diagnostic methods used for enteric disease surveillance to ensure identification of outbreaks and drug resistance.<br>• Identify current and best practice state regulations for culture and susceptibility testing of priority diseases where use of CIDT can limit identification of resistant strains.<br>• Assess ways to improve timeliness of enteric disease confirmatory testing. |

## Outbreak Response and Preparation Activities

| Identified Opportunity | Rationale | Considerations | Potential Next Steps |
|---|---|---|---|
| Continue to use the BTWG and face-to-face meetings to work with partners, including Mexican counterparts, to address preparedness, foster awareness of emerging public health issues, and encourage collaboration. | Engagement and coordination between US border jurisdictions and with Mexico are critical to developing and maintaining comprehensive preparedness and response plans and activities for the border region. | Existing collaborations and forums such as BHC, BTWG, and multiple local groups have developed a strong foundation for continued work that should be leveraged and grown. Additionally, CDC supports states in preparedness work through the Public Health Emergency Preparedness Cooperative Agreement, and the Epidemiology and Laboratory Capacity Cooperative Agreement. | **General Next Steps**<br>• Use existing forums as platforms to discuss<br>» Solutions to ongoing challenges with specimen transport across the border for public health purposes (both routinely and during an outbreak);<br>» Preparedness and response capacity building, through tabletop exercises (e.g., for introduction of yellow fever), and sharing best practices (including regional plans);<br>» Data sources (e.g., US federal detention data and Mexico's national surveillance system) that are important for outbreak response and preparedness activities; and<br>» Mechanisms to coordinate and leverage prevention messaging between partners to strengthen outbreak response and investigations.<br>• Review use of the *Operational Protocol for U.S.-Mexico Binational Communication and Coordination on Disease Notifications and Outbreaks* and regional plans to inform revision and strengthening.<br>• Clarify, leverage, and coordinate with preparedness work being done at the local, state, and federal levels for the prioritized diseases. |
| Expand, standardize, and maintain mosquito surveillance to improve description of the geographic distribution of *Aedes* mosquitoes and where transmission is likely to occur. | *Aedes* mosquito presence is dynamic and dependent on many factors in the border region. Additionally, surveillance methods for these mosquitoes may vary even within states. The ever- changing mosquito distribution and inconsistent surveillance leads to gaps in knowledge of mosquito-borne disease risks. | Vector-Borne Disease Regional Centers of Excellence aim to address surveillance, prevention, and response of emerging vector-borne diseases. Additionally, CDC, the COEs, and others held an epidemic prediction initiative to predict the monthly presence of *Ae. aegypti* and *Ae. albopictus* in a subset of US counties in 2019. Such risk assessment efforts may help identify with greater precision where border surveillance efforts are most needed. | **Arboviruses Next Steps**<br>• Recommend that Vector-Borne Disease Regional COEs include New Mexico in their surveillance activities, when feasible.<br>• Share resources related to risk modeling and forecasting challenges and perhaps create a risk assessment for border states.<br>• Better disseminate information about Mexico's surveillance and data.<br>• Engage with the Vector-Borne Disease Regional COEs through BTWG and others to identify opportunities for collaboration and harmonization (e.g., virologic surveillance in mosquitoes). |
| Enhance follow-up with patients or contacts who cross the border or who are deported before treatment completion or after exposure. | Patients diagnosed with an infectious disease who cross the US-Mexico border may be at risk for gaps in treatment or continued infectiousness. While programs such as CureTB work to enhance continuity of TB care, there are limited initiatives, resources, and mechanisms for comprehensive TB program integration (e.g sharing information about proven or possible clusters and joint contact tracing). Similar gaps remain for other infectious diseases. | Existing efforts include BIDS binational case reporting activities, TB contact projects in California and Texas, CureTB, and "meet-and-greets" coordinated by Arizona Department of Health Services staff. | **TB and Enteric Diseases Next Steps**<br>• Leverage existing cross-border projects to establish best practices and continuing challenges in cross-border contact tracing infrastructure.<br>• Improve educational approaches for persons who leave the United States from custody before completing treatment for or after exposure to TB and potentially other priority diseases. |

## Outbreak Response and Preparation Activities (Continued)

| Identified Opportunity | Rationale | Considerations | Potential Next Steps |
|---|---|---|---|
| Develop and implement evidence-based methods to evaluate population mobility and healthcare use patterns among US-Mexico border crossers. | Understanding cross-border healthcare use in the US-Mexico border region is important for controlling infectious diseases, designing educational campaigns, and combating the emergence and spread of drug-resistant organisms. | Some surveys, although dated and incomplete, suggest that crossing the border for healthcare services may be quite common in some border communities or subpopulations. It would be important to capture both geographic variation within the border region as well as subpopulation variation, such as for Hispanics and foreign-born individuals. | **General Next Steps**<br>• Convene workgroup(s) to discuss strategies for capturing mobile populations' healthcare-seeking patterns.. |

## Health Education Activities

| Identified Opportunity | Rationale | Considerations | Potential Next Steps |
|---|---|---|---|
| Improve health education and outreach for Spanish-speaking border populations with limited English proficiency. | Significant proportions of border region residents may require or prefer health information in Spanish. | Spanish-speaking border region residents may also seek or regularly get information from Mexican sources. | **General Next Steps**<br>• Create opportunities and a platform for regularly sharing validated educational and prevention materials in border communities.<br>• Seek opportunities to harmonize educational information with Mexico.<br>• Formalize an information gathering process from border states and counties so that materials can be developed through CDC that are specific for border region Spanish speakers and that can be edited by state and local health departments, if necessary, for both emergency response and non-response times. |
| Ensure education materials for Spanish-speaking border populations are tested for accuracy, cultural appropriateness, and understandable messages. | Translation of educational content alone does not ensure that the content will be understood by or is culturally appropriate for the intended audience. Cultural validation and testing are critical to optimize messaging. | Health departments rarely have the resources for health communication specialists to develop culturally appropriate educational content intended for specific subpopulations. | **General Next Steps**<br>• Review existing health education information accessible to the border regions for the priority diseases to assess availability, accuracy, and cultural appropriateness of Spanish-language content.<br>• Share and assess the communication components of border region emergency response plans to assess outreach to Spanish-speaking border populations and make recommendations if needed.<br>• Identify and collaborate with community groups (such as Ventanillas de Salud) to test materials for translation accuracy and cultural appropriateness.<br>• Explore possible avenues and approaches to determine the best ways of disseminating targeted public health information. Some avenues that can be explored are<br>» Social media;<br>» Community health representatives, community health workers, and other community leaders or health champions; and<br>» Community networks, agencies, and organizations such as physician and border clinic networks, schools, tribal governments, and Ventanillas de Salud. |

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**Photo 13. Doctor talking to a little girl.**

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