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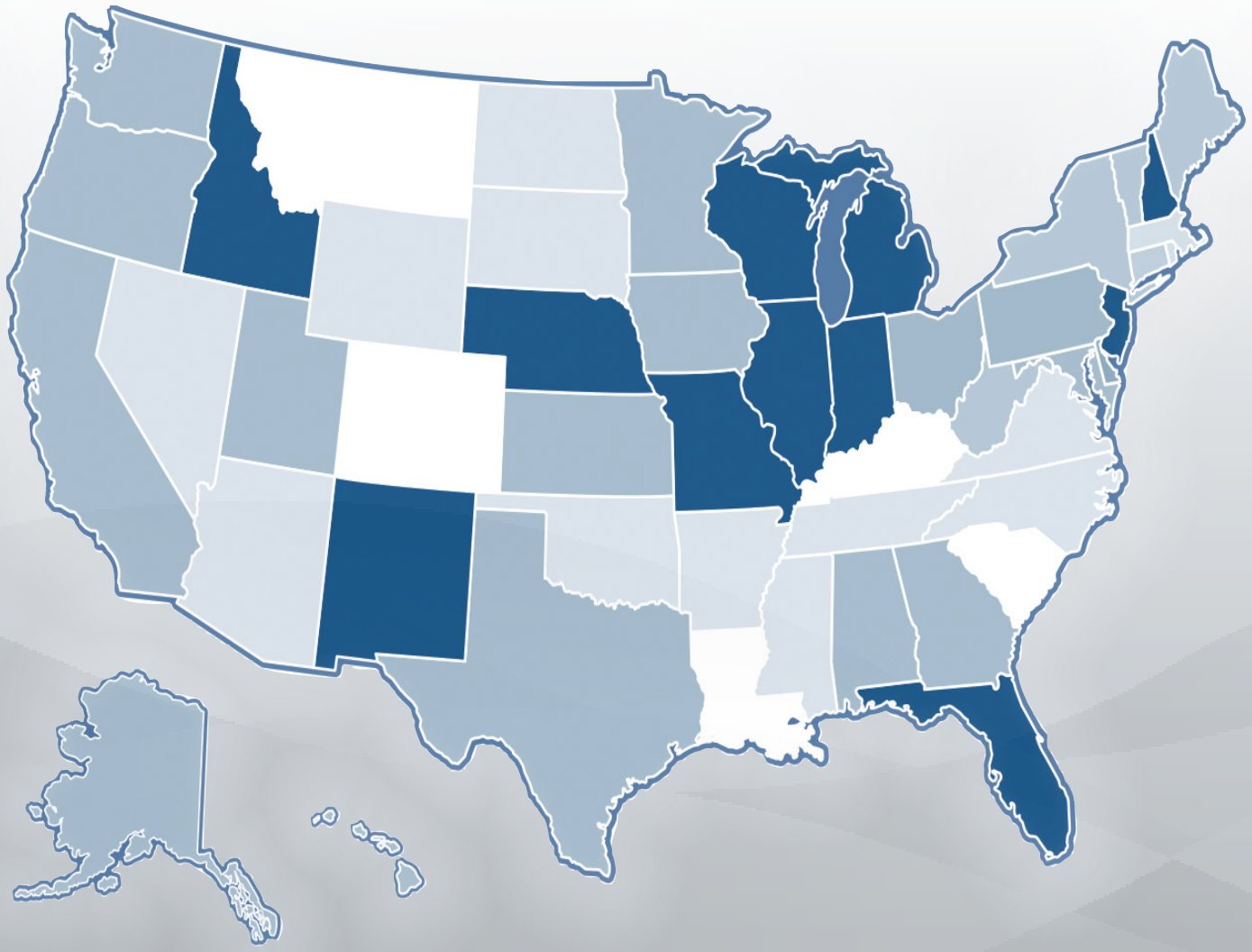
Assessment of Capacity in 2012 for the Surveillance, Prevention and Control of West Nile Virus and Other Mosquito-borne Virus Infections in State and Large City/ County Health Departments and How it Compares to 2004



February 2014

Assessment of Capacity in 2012 for the Surveillance, Prevention and Control of West Nile Virus and Other Mosquito-borne Virus Infections in State and Large City/County Health Departments and How it Compares to 2004

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EXECUTIVE SUMMARY

In 1999 an exotic mosquito-borne virus, West Nile virus (WNV), was recognized for the first time in the US, causing an outbreak of meningoencephalitis in people and a large-scale die-off in birds. At the time, there was no federal funding to directly support state and local surveillance for mosquito-borne illness and, consequently, there was no nationally coordinated arboviral surveillance system that could be mobilized to respond. There was only the patchy presence of home-grown state and locally-based surveillance and control systems established to cope with the annual threat in some states of outbreaks of St Louis encephalitis (SLE), eastern equine encephalitis (EEE), sporadic cases of other mosquito-borne viral disease and regular identification of persons infected with dengue virus and malaria acquired outside the US but with potential for local transmission.

While the initial surveillance and prevention response to WNV in 1999 in New York, New Jersey and Connecticut was accomplished by diverting staff hired to do other surveillance work, authorities anticipated that WNV could become endemic in those first affected areas and spread, posing a threat to more of the country. Beginning in 2000, Congress appropriated annual funding for WNV surveillance and prevention activities for the first affected states and, over the next few years as WNV spread across the US, to all states and six large city/county health departments through the Centers for Disease Control and Prevention (CDC) Epidemiology and Laboratory Capacity (ELC) cooperative agreements for emerging infectious diseases. Funding was accompanied by development of guidelines for WNV surveillance and prevention and development of ArboNet, a distributed national surveillance network coordinated by CDC.

By 2004, WNV had spread to and become endemic in all 48 contiguous states, and federal support to state and local jurisdictions for WNV surveillance and prevention reached its highest sustained level, approximately $24 million per year. A 2004 assessment conducted by the Council of State and Territorial Epidemiologists (CSTE) found that WNV surveillance and control programs were well developed in all states and major cities receiving specific ELC funding for that purpose. CSTE attributed the success of this public health effort to ELC funding and CDC leadership and coordination and declared that a national WNV surveillance program had been established. Based on the assessment results, CSTE recommended that ELC funding for WNV surveillance and control be sustained, with consideration for flexibility to use these funds to address vector-borne and arboviral diseases more broadly. Since then, funding guidelines have become more flexible, enabling surveillance for 11 domestic arboviruses (including WNV) and four travel-associated viruses (including dengue). However, despite recognition of a shared local, state and national interest in arbovirus control, funding for this purpose through the ELC cooperative agreement has gradually dropped to less than $10 million per year—a more than 60% decrease since 2004.

In August 2013, CSTE—with technical input from CDC and assistance from the National Association of City and County Health Officers (NACCHO), the Association of State and Territorial Health Officials (ASTHO) and the Association of Public Health Laboratories

(APHL)—assessed state health departments and 30 local health departments (LHDs) with either direct access to ELC funding or a high WNV threat level based on previous experience to describe: (a) the jurisdictions' current capacity to conduct surveillance for WNV and other mosquito-borne viral infections, (b) how current dedicated personnel are funded and (c) how capacity has changed since peak funding in 2004. The assessment partners shared an interest in the long-term sustainability of the national arboviral surveillance system (ArboNet) created in response to WNV.

The assessment instrument was developed in May and June 2013. The 2004 assessment was used as a template to enable comparison. The earlier assessment used published CDC guidelines for WNV surveillance to identify and measure 21 indicators of capacities related to human, equine, avian and mosquito infection; laboratory capacity and programmatic prevention activities. New questions were added in 2013 to assess the number and sources of funding of staff dedicated to WNV surveillance, their functional role, needs for additional staff to achieve "full epidemiology and laboratory capacity to conduct WNV and other mosquito-borne disease surveillance" and changes (if any) made in the past five years in response to reduced ELC funding. Respondents were instructed to answer questions based on program activities in 2012. All 50 states, all six LHDs with ELC funding support and 15 of 24 LHDs with no direct ELC support submitted responses.

There are six major findings.

1. All 48 contiguous states retain some capacity for WNV surveillance. Surveillance capacity ranges widely among the states, from a minimal ability to diagnose and report human WNV cases to ability for more comprehensive surveillance, including monitoring WNV activity in mosquitoes (80%), dead birds (39%) and sentinel chickens (10%).
2. Surveillance capacity has decreased since 2004, despite the endemicity of WNV, recurring large outbreaks with substantial morbidity and mortality and a pressing need to monitor other arboviruses that pose growing threats. The number of staff working at least half-time on WNV surveillance in states has dropped by 41%. The percentage of states conducting mosquito surveillance has dropped from 96% to 80%. The percentage conducting avian mortality surveillance has dropped from 98% to 39%. More than half of states (58%) have reduced mosquito trapping activities, and 68% have reduced mosquito testing. Alarmingly, laboratory and mosquito/environmental surveillance capacities for WNV have reached a tipping point, where further reductions in capacity will likely result in their loss entirely in some states.
3. Although many state and LHDs have made a substantial funding investment in WNV surveillance and control, some are entirely dependent on ELC WNV funding. Yet in all jurisdictions, ELC WNV funding remains critical to sustain current capacity, including in LHDs with no direct ELC funding but a historically high WNV burden. In addition to losing dedicated staff, ELC funding cuts have resulted in reduced mosquito surveillance (trapping, testing or both) in 70% of states and 75% of LHDs,

elimination of avian mortality surveillance in most jurisdictions and reduced testing of human specimens for WNV (and potentially other arboviruses) in 46% of states.

4. The capacity to conduct surveillance for other mosquito-borne viruses is patchy, with a few states having high-level capacity, but many having little to none. In particular, although many state public health laboratories have the capability to test for SLE (79%), EEE (59%), WEE (39%) or LaCrosse (42%) viruses, routine testing for these viruses by state laboratories in meningoencephalitis patient specimens actually occurs much less frequently than for WNV (SLE 73%, EEE 27%, WEE 9%, LaCrosse 8%). In part, this disparity results from inadequate laboratory staffing. Further, only nine state laboratories perform testing for dengue, four for Powassan, and two each for Chikungunya and Colorado tick fever viruses.
5. LHDs in areas with a historically high WNV burden play a key role in mosquito surveillance and control and in supporting surveillance for human WNV disease. They average more than double the amount of staffing per health department than state health departments for mosquito surveillance and for human disease surveillance. However, even in areas with a historically high WNV burden, current capacities in non-ELC LHDs are lower than those in LHDs that receive direct ELC funding. Although all ELC-funded LHDs conduct mosquito surveillance, only 67% of those without ELC-funding do so.
6. Most states and ELC-funded local health departments need additional support to be able to fully conduct surveillance for WNV and other mosquito-borne viruses (including dengue). Specifically, support is needed for an additional 137.6 FTE staff, a 58% increase in current staffing levels. An additional 49 FTE staff are needed in the 15 responding LHDs with a historically high WNV burden but no direct ELC funding, mostly for mosquito surveillance.

Based on these findings, CSTE—supported by ASTHO, NACCHO and APHL—recommends CDC take the following actions**.**

- At a minimum, assure that current state and local health department capacity for WNV surveillance is maintained to assure not just state-level, but a national infrastructure for WNV and arboviral surveillance. Sufficient funding through the ELC cooperative agreement is needed to achieve this goal; level ELC funding will result in further erosion of capacity.
- Secure additional support to distribute through the ELC cooperative agreement to: (a) expand mosquito-based surveillance in metropolitan areas with a historically large WNV disease burden (as many have reduced mosquito surveillance and a third have no mosquito surveillance capacity whatsoever) and (b) build sufficient capacity to conduct surveillance in all states for other endemic arboviruses (e.g., EEE, SLE, WEE, LaCrosse, Powassan viruses) and for emerging arboviral threats (e.g., dengue, Chikungunya, Japanese encephalitis, Zika, Heartland viruses). This includes having the public health laboratory capacity in most states to assure they routine test for and monitor the incidence of other arboviruses as is now done for WNV.
- Contingent on the availability of additional funding, expand core ELC cooperative agreement objectives to include the following enhanced capacities to monitor

endemic arboviruses and to detect and respond to the introduction of exotic arboviruses:

- All ELC recipients should have WNV surveillance and control plans, and as appropriate to local risk, surveillance and control plans for other arboviruses.
- Mosquito-based surveillance should be included in the programs for metropolitan areas with historically high WNV burden.
- Diagnostic human specimens (cerebrospinal fluid and sera) submitted for WNV testing should be routinely tested for other endemic and exotic arboviruses, depending on the clinical syndrome, exposure history and local vector populations.

Without additional funding, however, ELC-funded jurisdictions cannot be expected to do more than they currently are doing.

INTRODUCTION

West Nile virus (WNV) was first documented in the US in 1999 in New York City and surrounding counties and states.[1,2] By the end of 2004, it had become endemic throughout the contiguous states.[3] It is now the most common mosquito-borne disease on the US mainland. An average of 1,137 cases of neuroinvasive disease (range, 386-2,873 cases) and 110 deaths (range, 32-286 deaths) occurred each year between 2005 and 2012, with peaks in both in 2012.[4]

Beyond these numbers, authorities estimate that for every person who develops neuroinvasive disease, there are at least 100 additional cases of WNV infection, many with febrile illness. Some WNV patients develop a polio-like syndrome, many suffer months-long debilitation, and some never return to pre-infection levels of functioning.[5] Moreover, the acutely infected can infect others through blood and organ donations, often with devastating consequences to the recipient. [6,7] This possibility has led to routine screening of the blood supply for WNV and increased awareness of the need to screen organ donors, when feasible.

Of particular concern, WNV unpredictably causes intense outbreaks affecting thousands of individuals over a short period of time. Yet, infection and outbreaks are potentially preventable through individual behavior change (e.g., staying indoors when mosquitoes are most active) and efforts to reduce vector mosquito populations at times of peak threat. Both personal and population-level prevention activities depend upon near real-time surveillance data, including whether WNV is present in vector mosquito species, numbers of vector mosquitoes, infection level in vector mosquitoes, and levels of disease in humans and sentinel animals, such as horses and birds.

In 1999, there was no federal public health funding to directly support state or local mosquito-borne disease surveillance and, consequently, no nationally coordinated arboviral surveillance system that could be mobilized to respond to the nation's first WNV outbreaks. There was only the patchy presence of home-grown state and locally-based surveillance and control systems established to cope with the annual threat in some states of outbreaks of St Louis encephalitis (SLE), eastern equine encephalitis (EEE), sporadic cases of other mosquito-borne viral disease and regular identification of persons infected with dengue virus and malaria acquired outside the country, but with potential for local transmission. Few states had dedicated epidemiologic and laboratory staff to mount a sustained emergency WNV response without compromising other public health surveillance programs. While the initial surveillance and prevention response in New York, New Jersey and Connecticut was accomplished by diverting staff hired to do other surveillance work, authorities anticipated that WNV could become endemic in those first affected areas and spread, posing a threat to more of the country.

Beginning in 2000, Congress appropriated annual funding for WNV surveillance and prevention activities for the first affected states and, over succeeding years, to all states and six large city/county health departments through the Centers for Disease Control and

Prevention (CDC) Epidemiology and Laboratory Capacity (ELC) cooperative agreements for emerging infectious diseases. Funding was accompanied by development of guidelines for WNV surveillance and prevention and development of ArboNet, a distributed national surveillance network coordinated by CDC. By 2004, federal funding to support state and local WNV surveillance and prevention reached its highest sustained level, approximately $24 million per year. A 2004 assessment conducted by the Council of State and Territorial Epidemiologists (CSTE) found that WNV surveillance and control programs were well developed in all states and major cities receiving specific ELC funding for that purpose. CSTE attributed the success of this public health achievement to ELC funding and CDC leadership and coordination and declared that a national WNV surveillance program had been established. Based on the assessment results, CSTE recommended that ELC funding for WNV surveillance and control be sustained, with consideration for flexibility to use these funds to address vector-borne and arboviral diseases more broadly. Since then, funding guidelines have become more flexible, enabling surveillance for 11 domestic arboviruses (including WNV) and four travel-associated viruses (including dengue).

Since 2006, however, this federal funding has decreased each year, reaching a low of $9,340,637 in 2012, ironically, the year of highest WNV incidence since 2003 (See Figure 1). Past funding cuts and future fiscal uncertainty raise concerns about the sustainability of current capacity for human WNV surveillance; mosquito detection, testing and control; supportive laboratory services; and prevention messaging, given that they were largely developed with federal funding. Indeed the entire national arboviral surveillance system may be threatened.

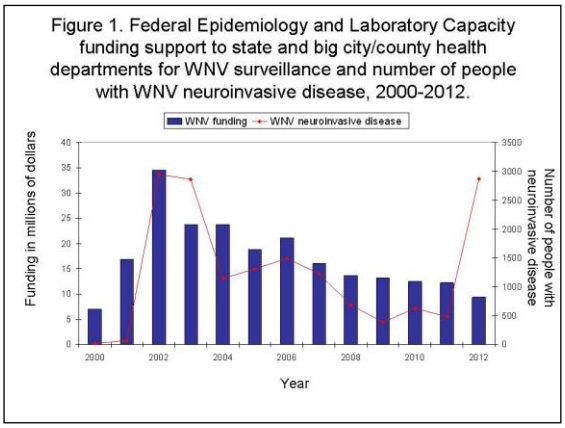


Figure 1. Federal Epidemiology and Laboratory Capacity funding support to state and big city/county health departments for WNV surveillance and number of people with WNV neuroinvasive disease, 2000-2012.

Another concern is the documented expansion of the range of several historically tropical *Aedes* mosquito species—including *Aedes aegypti* and *Aedes albopictus*—capable of transmitting viral diseases of public health importance. These species are competent vectors for endemic arboviruses, such as EEE, and for exotic viruses, such as dengue, Chikungunya and yellow fever. In fact, public health officials and researchers are documenting a growing number of introductions of dengue fever virus into the US, as well as episodes of local disease transmission.[11,12] Authorities worry that US states will have increasing difficulty dealing with the growing threat of dengue and other mosquito-borne diseases if the state and local public health infrastructure built to respond to WNV is eroded.

In May 2013, CSTE initiated efforts to assess the current surveillance and prevention capacity for WNV and other mosquito-borne viruses in state and select LHDs. The association had four broad objectives: (a) to assess current state and select LHD capacity to conduct surveillance for WNV and other mosquito-borne viruses, (b) to compare

staffing and capacity for WNV surveillance in 2004 and 2012; (c) to determine how state and large city/county health departments are currently funding, staffing and conducting WNV surveillance and control activities, and (d) to document health department staffing needs to achieve full WNV surveillance capacity.

METHODS

A working group was established in May 2013 to develop the assessment tools (See Appendices 2 and 3). The working group included representatives from CSTE national headquarters, CDC Division of Vector-Borne Diseases (DVBD), ASTHO, NACCHO and APHL, as well as a CSTE consultant and a consultant from Emory University. The 2004 assessment instrument was used as a starting point to enable comparison with its findings. The 2004 assessment included 21 indicators—taken from CDC's 2003 WNV guidelines[9]—of a range of capacities related to human, equine, avian and mosquito infection and disease surveillance; laboratory diagnostic testing; and program prevention activities. Questions no longer relevant in 2012 were eliminated (e.g., some details about avian mortality and equine surveillance) and new questions added, based in part on a draft of new WNV surveillance, prevention and control guidance.[10] In addition, questions were added to assess specific staffing needs, desired and actual state role in support of LHD mosquito control activities, presence of *Aedes aegypti* and associated dengue preparedness, and how reductions in funding in the past five years have affected WNV surveillance activities. Separate questionnaires were developed for large city/county health departments in which some of the state questions were modified, particularly to reflect the primary LHD role in mosquito surveillance and control. Respondents were instructed to answer questions based on program activities in 2012.

The assessment tools were completed in June and piloted during July in seven states and four LHDs. Based on feedback, several questions were reworded for clarity. In early August, a pdf file of the state assessment was sent via e-mail to the state epidemiologist in all 50 state health departments. Instructions stated that the "most appropriate staff person in your agency" be the key respondent and obtain relevant information from laboratory and mosquito surveillance and control staff in order to complete the assessment online. The online assessment used Epi Info™ Web Survey system.

A similar process was used to distribute the local assessment questionnaire to 30 large city/county health departments, although the contact person in many cases was the health officer in the absence of a city/county epidemiologist. City/county health departments were selected based on meeting at least one of three criteria: (a) receiving supplemental WNV surveillance funding through the ELC grant (n=6), (b) having had at least 100 cumulative reported cases of WNV neuroinvasive disease from 1999 through 2012 (n=22, excluding four of the ELC recipients), or (c) having had local dengue transmission (n=2, neither met the other criteria).

CSTE staff entered data that were not submitted online, including revised responses to questions that were unclear to health department staff who participated in the pilot assessment. Data from the state assessment and from the large city/county health

department assessment were analyzed separately. Results were tallied in aggregate and separately for state health departments and LHDs. In addition, state respondents were grouped into categories—and data analyzed separately for each—based on (a) state population (quartiles), (b) geographic region (five different regions), (c) magnitude of the state's 2012 CDC WNV surveillance funding and (d) state burden of WNV in 2008-2012 (See Appendix 1). Capacity for selected surveillance activities in 2012 was compared between states reporting a need for additional surveillance staff and those not reporting such a need.

LHD respondents were grouped into two categories—and data analyzed separately for each—based on receipt or non-receipt of direct CDC ELC cooperative agreement funding for WNV and other mosquito-borne virus surveillance.

Responses to some questions were left blank. For questions relating to staffing and staffing needs, CSTE assumed blank responses indicated a lack of staff in the given response category. Thus, responses from all states were counted. For all other questions, a blank response was assumed to be a missing response and states with no response were not counted.

Differences of at least ten percentage points among comparison groups are highlighted in the results. The chi-square test for trend was used to assess the statistical significance of observed trends based on state population, recent state funding levels and recent state WNV burden (since all categorizations were ordered). Only statistically significant trend associations are reported. Data analysis was performed using Microsoft Excel and Epi Info™ Version 7.

RESULTS

All 50 states and the six ELC-supported LHDs responded, as well as 15 (63%) of the 24 other surveyed LHDs These 15 LHDs include 13 that met the criterion of having had at least 100 cumulative reported cases of WNV neuroinvasive disease and two that had local dengue transmission.

Results are presented using figures to highlight important findings. Referenced tables can be found following the references section.

STATE ASSESSMENT

Staffing

One set of staffing questions pertained to whether states had any staff devoted to WNV surveillance with a master's or higher level degree and if so, their number and funding source. The percentage of states with at least one such staff member spending at least 50% time on WNV decreased substantially from 2004 to 2012 for each of three degree

Figure 2. Percentage of states with at least one position with masters or higher level training devoted to WNV and other mosquito-borne virus surveillance by amount of time they spend on WNV, 2004 and 2012

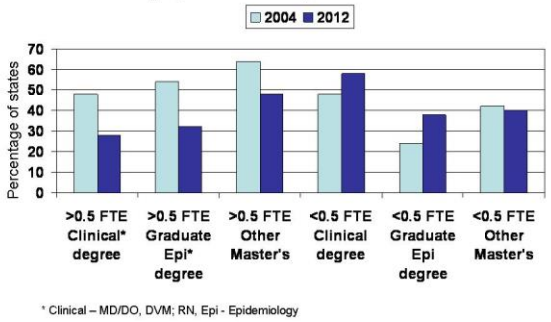
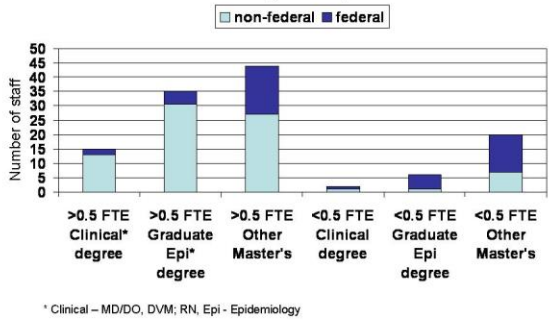


Figure 2a. Number of state-level staff with masters or higher level training devoted to WNV and other mosquito-borne virus surveillance by amount of time spent on WNV and funding source, 2012



categories (See Figure 2). More than half of states had someone with a graduate epidemiology degree who spent 50% or more of their time on WNV activities in 2004 versus about 30% of states who had such an employee in 2012. Nearly half had someone with a clinical degree—MD/DO, DVM or RN—who spent half time or more on WNV in 2004 versus not quite 30% in 2012. Overall, there was a 41% decrease in the number of staff, including administrative and clerical staff, working at least half time on WNV and other mosquito-borne disease surveillance: from 348 positions in 2004 to 206 positions in 2012. These included a 40% decrease in the number of staff with at least master's level-training working 50% or more of their time on WNV, from 168 positions to 100 positions (See Table S1).

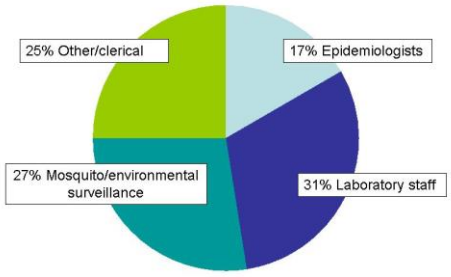
The reductions were smaller for part-time staff-persons spending <50% of their time on WNV (See Figure 2, Table S1): in 2012 there were 297 such staff compared to 354 in 2004, a 16% drop. Of note, some states have both staff working ≥50% time on WNV surveillance and staff working <50% time on WNV surveillance.

Although all state WNV programs are supported in part by CDC funding, 36 (72%) have invested state funds as well. In fact, the aggregate state investment in WNV and other mosquito-borne disease surveillance exceeds the CDC investment. Overall, 60% of staff, including contract staff, working ≥50% time on WNV (124.3/206 staff) are not federally supported (See Table S3). This tally includes 70% of those with graduate degrees working ≥50% time on WNV (69.5/100) (See Figure 2a, Table S3). In contrast, most staff (56%) working <50% time on WNV are supported by CDC funds (166/297), including most (55%) of such staff with graduate degrees (75/136) (See Table S3). In

toto, CDC funding supports more than twice the number of <0.5 full time equivalent (FTE) positions (166) as 0.5-1.0 FTE positions (81.7).

Staffing was also assessed in a different way: number of FTEs, not individual staff, by functional category. In 2012, there were 208.9 state FTE positions dedicated to WNV (See Table S4). Of these, 17% were held by epidemiologists, 31% by laboratory staff, 27% by mosquito/environmental surveillance staff, and 25% by other surveillance/clerical/administrative staff (See Figure 3, Table S4).

Figure 3. Percentage by functional role of 208.9 FTE staff working on WNV and other mosquito-borne virus surveillance, 2012



The number of FTEs per state in each functional category was associated with several state characteristics. The average number of FTE epidemiologists working on WNV per state increased with increasing 2012 ELC funding level (See Figure 4a). The average number of FTE laboratory staff working on WNV per state increased with increasing 2012 ELC funding level and with increasing state population (See Figure 4b). Neither of the other job categories staff numbers was associated with funding level or population size.

Figure 4a. Relationship of 2012 WNV and other mosquito-borne virus ELC funding to number of FTE epidemiologists per state, August 2013

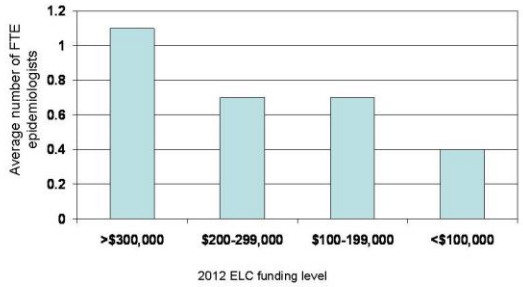
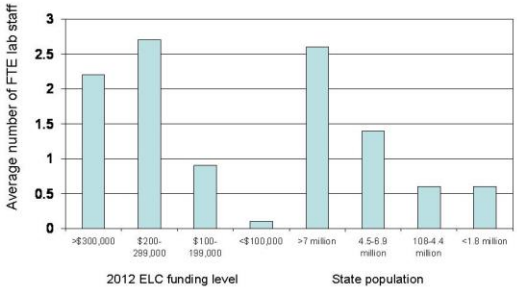


Figure 4b. Relationship of 2012 WNV and other mosquito-borne virus ELC funding level and state population to number of FTE laboratory staff per state, August 2013



If funding were available, many states would expand their WNV surveillance staff in order to achieve full surveillance capacity (See text box for definition of full epidemiology and laboratory capacity). Overall, 13 states reported needing additional staff in all four functional job categories, and 40 reported needing additional staff in at least one category. Specifically, 27 states (54%) reported needing more epidemiologists, 30 (60%) reported needing more laboratory staff, 28 (56%) reported needing more mosquito/environmental surveillance staff, and 19 (38%) reported needing more clerical/administrative staff (See Figure 5).

Full epidemiology and laboratory capacity to conduce WNV and other mosquito-borne disease surveillance:

1) ability to complete a standard case report form on every suspected/confirmed mosquito-borne arboviral disease case and report it to ArboNet;
2) ability to test by IgM for all relevant arboviruses (including dengue) on any CSF or serum specimen submitted to the state or city/county laboratory on a suspected case of arboviral disease; and
3) have an environmental surveillance system that includes mosquito surveillance to routinely monitor both larval and adult arboviral activity in all parts of your jurisdiction in which there is the potential for human outbreaks of arboviral disease based on past experience.

Figure 5. Percentage of states needing additional staffing for WNV and other mosquito-borne virus surveillance by functional role of staff, August 2013

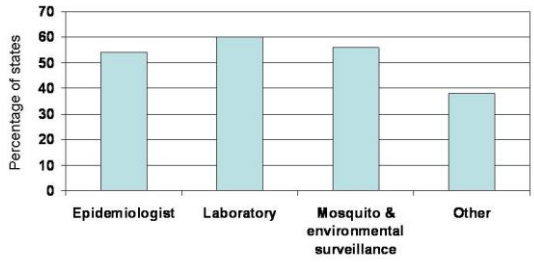
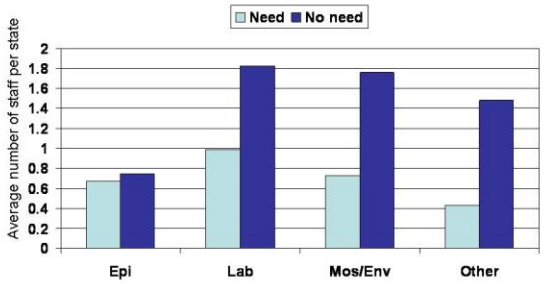


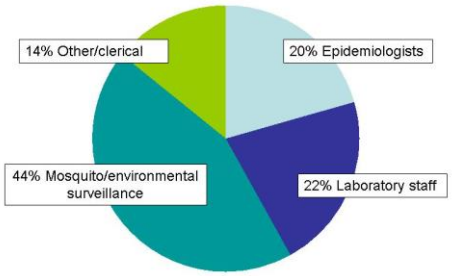
Figure 6. Average number of WNV and other mosquito-borne virus surveillance staff per state by whether state had additional need, August 2013



States reporting additional staffing needs had, on average, fewer workers in each functional job category than states reporting no additional staffing needs: 0.67 FTE epidemiologists versus 0.75, 0.99 FTE laboratorians versus 1.83, 0.73 FTE mosquito/environmental surveillance staff versus 1.76 and 0.43 FTE "other" staff versus 1.48 (See Figure 6, Table S4).

Altogether, state respondents reported needing 122.6 additional FTE staff, especially mosquito/environmental surveillance staff, who, at 53.6 FTEs, comprised 44% of the total reported staffing shortfall (See Figure 7, Table S4).

Figure 7. Percentage by functional role of 122.6 additional state-level staff needed for WNV and other mosquito-borne disease surveillance, August 2013



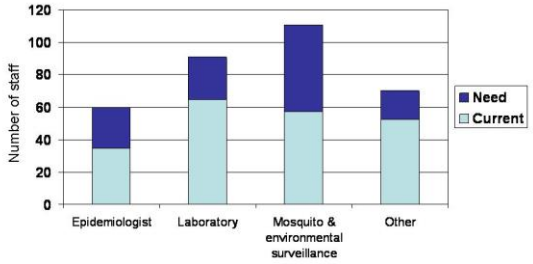
Among the states with reported staffing deficits, those with larger populations, more WNV cases in the preceding five years and more WNV ELC funding in 2012 indicated the greatest need for additional epidemiology staff: 1.4 FTEs per state for states with population >7 million versus 0.8 for the others, 1.3 FTEs per state with the

highest number of WNV cases in 2008-2012 versus 0.8 for the others, and 1.5 FTEs per state with ≥$300,000 in WNV ELC funding in 2012 versus 0.9 for those with less. The same trends held for reported mosquito/environmental surveillance staffing needs: 2.8 FTEs per state for states with population >7 million versus 1.6 for the others, 3.3 FTEs per state with the highest number of WNV cases in 2008-2012 versus 1.6 for the others, and 3.1 FTEs per state with >$300,000 in WNV ELC funding in 2012 versus. 1.8 for those with less.

For laboratorians, the reported need was greater in more populous states: 1.3 FTEs for states with >7 million residents, 1.0 FTE for states with 4.5-6.9 million residents, 0.7 FTE for states with 1.8-4.4 million residents, and 0.6 FTE for those with less than 1.8 million residents. Similarly, a greater proportion of high-population states reported a need for other/clerical/administrative staff than did less populous states. Just 17% of the smallest states (by population size) reported a need for additional other/clerical/administrative staff, compared with 31% of small-medium sized states, 46% of medium sized states and 58% of the most populous states (≥7 million) ($p<0.05$).

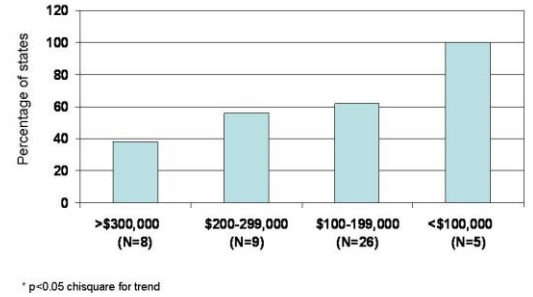
Overall, a 59% increase in staffing is needed to achieve full epidemiology and laboratory capacity among states for WNV and other arboviral surveillance. By job category, this includes a 72.5% increase in epidemiologists, a 40.9% increase in laboratory staff, a 93.7% increase in mosquito/environmental surveillance staff, and a 33.3% increase in "other" staff (See Figure 8).

Figure 8. Current number of FTE WNV and other mosquito-borne virus surveillance staff in states and additional need to achieve full capacity at the state level in the US, by functional role, August 2013.



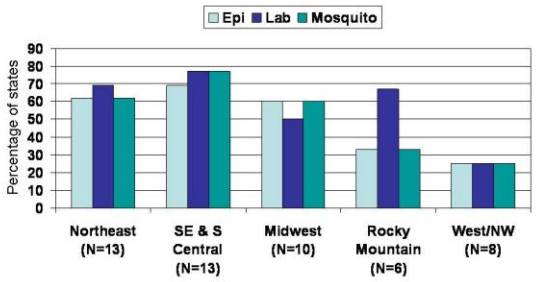
The need for additional staff was not associated with whether a state had state-funded positions; 86% of states *without* a state-funded position needed additional staff versus 75% of states *with* state-funded positions. However, the five states with the least ELC WNV funding in 2012 all reported a need for additional epidemiology, laboratory and mosquito/environmental surveillance staff. Further, the percentage of states needing additional laboratorians increased in inverse proportion to 2012 ELC funding levels: 38% of those with >$300,000 reported a need for additional laboratorians, 56% of those with $200,000-$299,000, 62% of those with $100,000-$199,000, and 100% of those with <$100,000 ($p=0.04$) (See Figure 9).

Figure 9. Percentages of responding states needing additional laboratory staffing to support WNV and other mosquito-borne virus surveillance by level of 2012 ELC funding*, August 2013



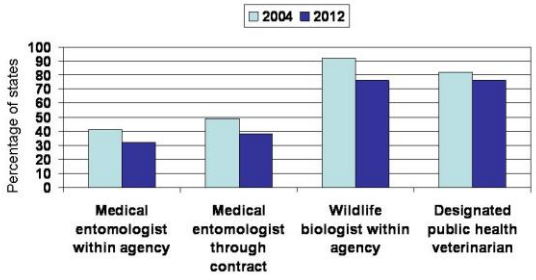
Staffing needs are greatest in the Southeast and South-Central US Public Health Service regions, where 69% of states reported needing more epidemiologists, 77% reported needing more laboratorians and 77% reported needing more mosquito/environmental surveillance staff (See Figure 10). In contrast, staffing needs are least severe—although still substantial—in the West/Northwest and Rocky Mountain US Public Health Service regions, where 29% of states reported needing more epidemiologists, 43% reported needing more laboratorians and 29% reported needing more mosquito/environmental surveillance staff.

Figure 10. Percentages of states with need for additional staff for WNV and other mosquito-borne virus surveillance by staff role and by USPHS region, August 2013



The proportion of states with adequate access to medical entomologists within or outside the public health agency and to expertise in wildlife biology within the agency fell roughly 10 percent from 2004 to 2012 (See Figure 11, Table S5).

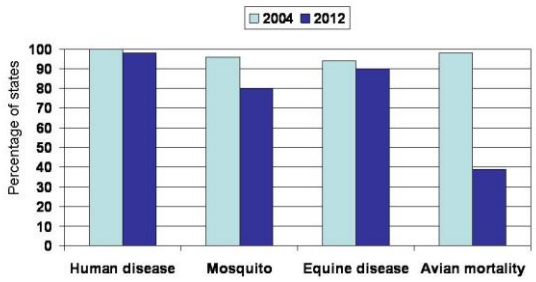
Figure 11. Percentage of all states with access to specialists related to arboviral surveillance within their department, 2004 and 2012



Overall Surveillance for WNV

There were three changes of note in overall surveillance efforts for WNV from 2004 to 2012: (a) the percentage of responding states with an avian mortality system plummeted from 98% to 39%, (b) the percentage with state-level mosquito surveillance dropped from 96% to 80% (See Figure 12), and (c) percentages of responding states with active human, equine or avian mortality surveillance dropped sharply (See Table S6). In 2012, just four responding states conducted active surveillance for equine WNV (down from 23 in 2004) and four for avian WNV mortality (down from 42 in 2004).

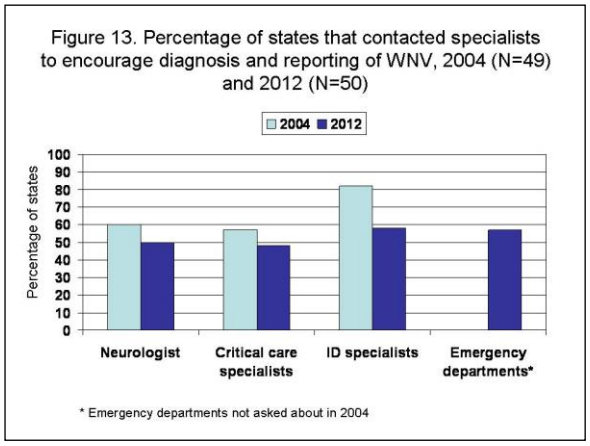
Figure 12. Percentage of states conducting surveillance for WNV by type of surveillance, 2004 (N=49) and 2012 (N=50)



Access to a medical entomologist within the agency and to a state public health veterinarian were both strongly associated with larger state population. More than half (58%) of states with >7 million residents had a medical entomologist within the health agency, compared with 8% of those with <1.8 million residents. And all of the most populous states had a state public health veterinarian, compared with 50% of the least populous states ($p \leq 0.002$, chi square for trend for each).

Human Surveillance

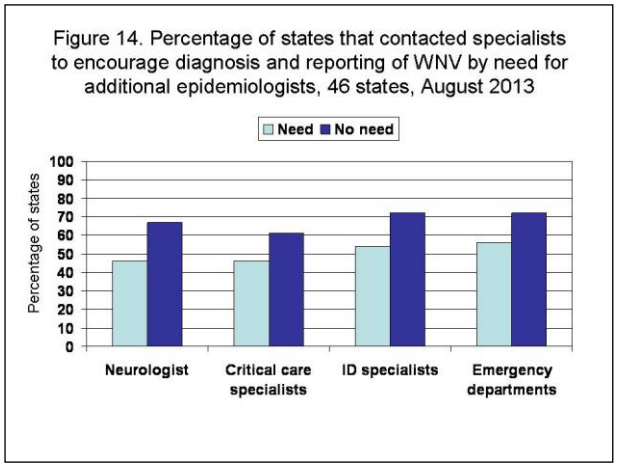
Human WNV surveillance occurs in all states, but became less intense and less rigorous in many states between 2004 and 2012. Fewer states actively contacted providers most likely to see WNV patients (neurologists, critical care specialists and infectious disease specialists) to encourage reporting, and fewer states required confirmation of commercial laboratory-positive specimens (See Figure 13).



However, by 2012, all states required WNV reporting by in-state laboratories, most states still actively contacted key providers to encourage reporting, and elapsed time from specimen collection to case reporting to the WNV surveillance program or to ArboNET was unchanged.

Although 2013 WNV surveillance guidance recommends that states audit in-state laboratories and review hospital discharge data to assure completeness of WNV case reporting, few states did either in 2012.

States reporting a need for additional epidemiologists (n=27) were less likely than those reporting adequate epidemiology staff (n=19) to have conducted outreach to encourage medical specialists to report positive WNV cases, including contacted neurologists (46% vs. 67%), contacted critical care specialists (46% vs 61%), contacted infectious disease specialists (54% vs 72%), and contacted emergency departments (56% vs 72%). (See Figure 14). States with insufficient epidemiology staff were also less likely to have performed end of the year catch-up surveillance, by contacting hospital or commercial laboratories (0% vs. 16%). However, there was no striking difference in the reporting time for positive human WNV cases or in the interval of time taken to report positive cases to ArboNet.



Equine Surveillance

Although equine WNV surveillance was pursued less intensely in 2012 than in 2004, most states in 2012 had systems in place for notification of possible equine cases (88%); had arrangements to test equine specimens for WNV (84%), other arboviruses (66%) and rabies (89%); and investigated reported clusters of equine illness to determine the cause of illness (50% of those with reported clusters) (See Table S8a).

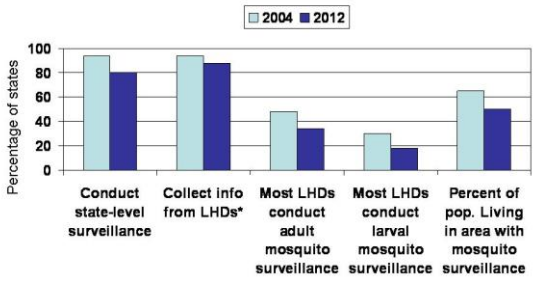
Avian Surveillance

Only 12 US states (24% of respondents) maintained a database of dead bird sightings in 2012 compared with 57% in 2004. Of those 12, almost all tested some of the dead birds for WNV, but only three states tested all dead birds (See Table S8b).

Mosquito Surveillance

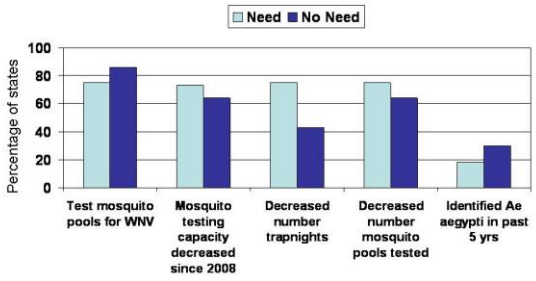
Although mosquito surveillance has become an essential element of WNV surveillance, capacity for such surveillance decreased somewhat between 2004 and 2012 (See Figure 15, Table S9). As noted above, fewer states conducted state-level mosquito surveillance in 2012 than did so in 2004 (80% vs. 94%). In addition, states reported that fewer LHDs conducted adult and larval mosquito surveillance. In 2004, 48% of states reported that "most LHDs in the state" conducted adult mosquito surveillance and 30% reported that "most LHDs in the state" conducted larval surveillance; in 2012 those percentages fell to 34% and 18%, respectively. Further, the median percentage of the population covered by mosquito surveillance in states dropped from 65% to 50%, and the median number of mosquito trap-nights dropped from >2600 to 1071 (See Table S9). Finally, among 40 responding state-funded laboratories doing mosquito testing, 68% (27) have cut back on testing mosquito pools for WNV. Most (22) test fewer pools, and several no longer test any (3) (See Table S10).

Figure 15. Changes in state-level mosquito surveillance for WNV and other mosquito-borne viruses from 2004 to 2012



Nonetheless, most states still conduct some mosquito surveillance, identify mosquitoes to species (86%) and do some testing for WNV (84%), with more than half testing for at least one other arbovirus. However, fewer than half of states (41%) calculate or receive data on minimal mosquito WNV infection rates.

Figure 16. Measures of mosquito surveillance for WNV and other mosquito-borne viruses in 2012, by association of state need for additional mosquito surveillance staff



States reporting a need for additional mosquito/environmental surveillance staff reported fewer mosquito trap-nights than states with sufficient staff (median 1,007 vs. 1,589), were more likely to report a decreased number of trap sites in response to funding cuts (75% vs. 43%, p=0.04), were less likely to have ever performed adulticiding (77% vs. 92%), and were less likely to have found *Aedes aegypti* in their state (31% vs. 50%) (See Figure 16). Those with mosquito/environmental surveillance staffing needs also had less laboratory capacity for mosquito testing, were less likely to test mosquito pools (75% vs. 86%), were more likely to report diminished testing capacity since 2008 (73% vs. 64%), and

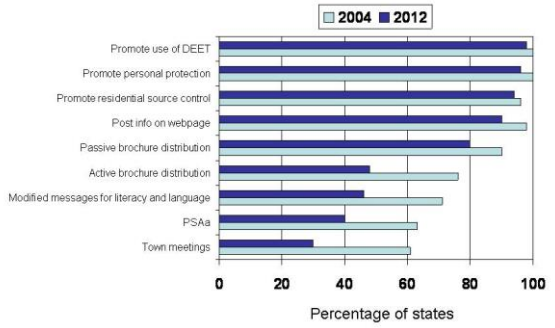
were more likely to have decreased the number of mosquito pools tested in response to ELC funding cuts (75% vs. 64%). However, they were just as likely to conduct state-level mosquito surveillance, to collect information from local jurisdictions and to identify mosquitoes to species.

Funding and population size were each associated with key mosquito surveillance activities. States with comparatively greater 2012 funding were more likely to collect information about mosquito surveillance from local jurisdictions (100% for states with highest funding levels vs. 40% for those with lowest) and to either identify mosquitoes to species or receive reports with this information (100% for highest vs. 20% for lowest, $p \leq 0.01$ for each, chi-square for trend over 4 groups). More populous states were more likely to perform or to fund mosquito testing for WNV (100% for most populous group vs. 50% for least populous) and to have identified *Aedes aegypti* in the past year (58% in most populous states vs. 17% in least populous, $p<0.02$ for each, chi-square for trend over 4 groups).

Prevention

In general, use of the media and other vehicles to educate residents about WNV prevention was high in 2012 and roughly comparable to prevention efforts documented in 2004. There were several exceptions, though: in 2012, fewer states had modified messages for lower literacy and non-English speaking audiences, had aired public service announcements regarding WNV prevention, had actively distributed informational brochures and had participated in community meetings (See Figure 17, Table S11).

Figure 17. WNV educational prevention activities in states, 2004 and 2012

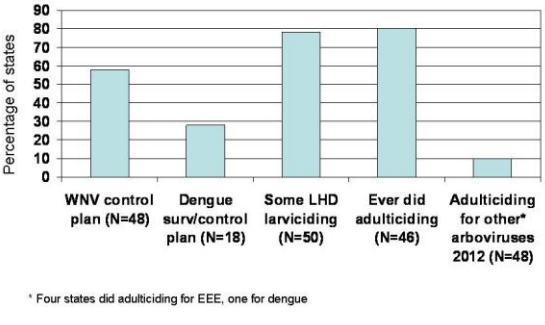


Mosquito control activities

Mosquito control activities were not assessed in 2004.

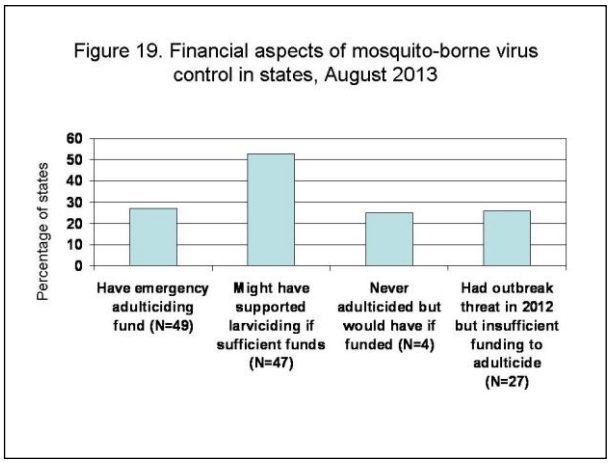
In 2012, only 58% of responding states reported having a plan for WNV control that includes adulticiding. Among these states, half have a threshold for adulticiding based solely on vector mosquito prevalence or WNV mosquito infection rate. Overall, 80% of responding states have ever conducted adulticiding to control WNV (See Figure 18).

Figure 18. Prevalence of mosquito-borne virus planning and mosquito control activities in states, 2012



The main reported reason for not having done adulticiding is insufficient outbreak threat. Still, one of the four states that have not performed adulticiding reported that it

would have done so if funding had been available. And seven states reported having "insufficient funding to adulticide" in 2012, despite an outbreak threat. Altogether, 27% of responding states reported the existence of an emergency funding mechanism to support adulticiding for WNV (See Figure 19, Table S12).

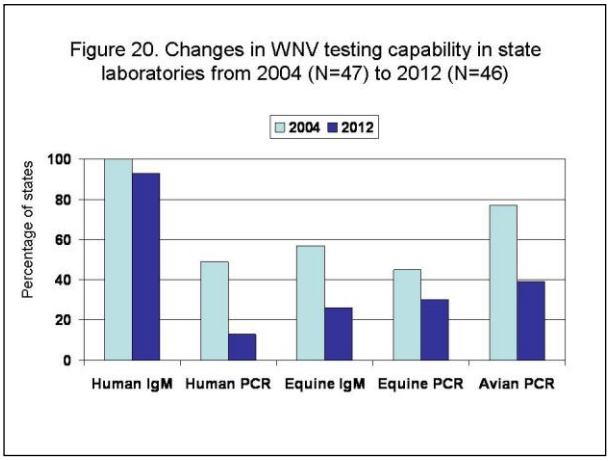


Larviciding was conducted in three quarters of states (78%), mostly by LHDs with their own funding. However, 31% of states either conducted or financially supported larviciding in 2012, and another 25 states might have done so if they had funding.

Regarding other arboviruses, five states reported mosquito adulticiding in 2012 for arboviral threats other than WNV: four for EEE and one for dengue. A total of 18 states have identified *Aedes aegypti* mosquitoes in the past five years. Five of these have written dengue surveillance and control plans (See Table S12).

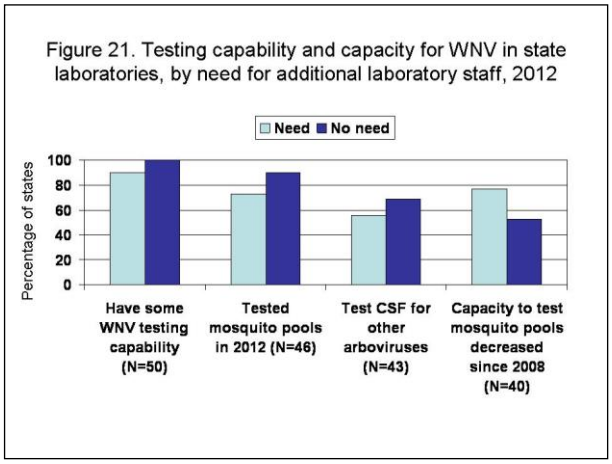
Overall WNV Laboratory Capability

Since 2004, the most basic WNV testing capability for human specimens, serum IgM testing, has been maintained at nearly all state public health laboratories, and capability for testing mosquitos via polymerase chain reaction (PCR) testing, culture, VecTest or RAMP has been maintained in most states.



However, testing capability has been reduced greatly for equine and for avian testing and for human PCR testing (See Figure 20, Table S13).

Approximately 40% of state laboratories in responding states maintain plaque reduction neutralization test (PRNT) capability to confirm WNV in human specimens, the same proportion as in 2004. Other states depend on CDC to perform confirmatory PRNT testing.



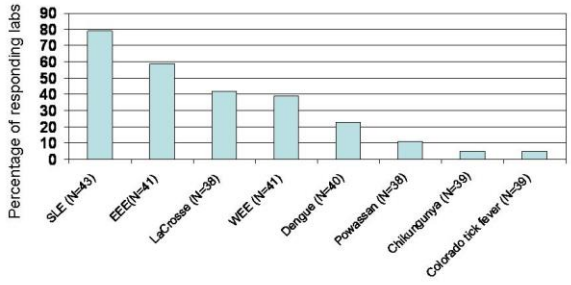
Compared with states reporting adequate WNV laboratory staff, states reporting a

need for additional laboratorians for WNV surveillance were less likely to perform testing on mosquito pools in 2012 (73% vs. 90% of responding states), more likely to report a reduction in mosquito pool testing capacity since 2008 (77% vs. 53%), less likely to have at least some WNV testing capacity (90% vs. 100%), and less likely to test WNV specimens for other mosquito-borne viruses (56% vs. 69%) (See Figure 21).

Testing capability for other mosquito-borne viruses and efforts to detect them

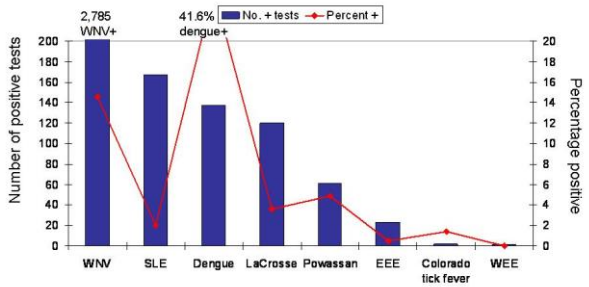
There is wide variability in state public health laboratory capacity to test WNV specimens for other mosquito-borne viruses (See Figure 22, Table S14, Table S15). Next to WNV, states are most prepared to test specimens for SLE and EEE. Of the responding states, 34 reported capacity to test for SLE and 24 to test for EEE. Over half of responding states (56%) routinely test cerebrospinal fluid specimens for SLE and over a quarter (28%) for EEE. In all, respondents reported the testing of more than 4,500 specimens for each of these arboviruses.

Figure 22. Testing capability for other mosquito-borne viruses in state laboratories, 2012



About 40% of responding states have capability for WEE and LaCrosse virus testing. However, routine testing of cerebrospinal fluid specimens for these pathogens occurs in few states (14% and 12% of responding states, respectively).

Figure 23. Frequency of positive tests for mosquito-borne viruses and percentage of tests positive, state laboratories, 2012

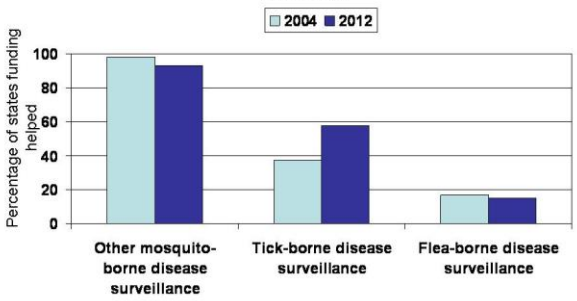


Just 16 responding states reported testing for LaCrosse virus, four for Powassan virus and nine for dengue. Although only 328 dengue tests were reportedly performed in state public health laboratories in 2012, 42% (137) were positive, making it the third most commonly detected arbovirus in state laboratories, behind WNV (2,795) and SLE (167) and ahead of LaCrosse virus (120) and Powassan virus (61) (See Figure 23). Chickungunya virus and Colorado tick fever virus testing capability was limited to two laboratories and were rarely tested for. Although tested for by a small percentage of state laboratories, when testing was done, LaCrosse and Powassan viruses were more likely to be detected than SLE, EEE and WEE (Figure 23).

Relationship of ELC funding to other surveillance capacities and response to reductions in funding

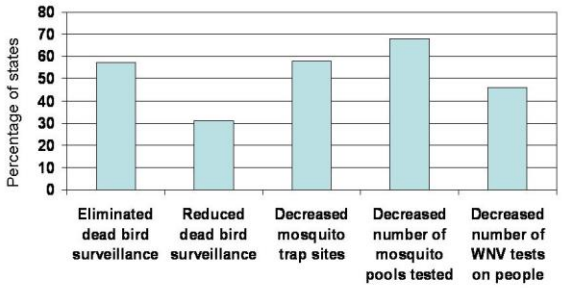
ELC funding for WNV continues to have a beneficial effect on surveillance for other mosquito-borne, tick-borne and flea-borne diseases. Comparable proportions of respondents cited a beneficial impact—especially on mosquito-borne disease detection—in 2004 and 2012, despite decreases in WNV-specific funding (See Figure 24, Table S16).

Figure 24. Percentage of states responding that ELC WNV and other mosquito-borne virus surveillance funding has helped other selected disease surveillance capacities, 2004 and 2012



States were asked how they have managed reductions to ELC funding for WNV surveillance. Funding cuts prompted 57% of responding states to eliminate dead bird surveillance, 58% to decrease mosquito trapping and 68% to decrease mosquito testing. Almost half (46%) have decreased the number of human specimens tested for WNV (See Figure 25, Table S16).

Figure 25. Percentage of states reducing selected surveillance activities in past 5 years in response to reduction in ELC WNV and other mosquito-borne virus funding, August 2013



States with reported laboratory staffing needs were somewhat more likely to indicate that ELC funding had enhanced surveillance for other mosquito-borne diseases (100% vs. 87%) and tick-borne diseases (65% vs. 53%). States needing additional epidemiology or mosquito/environmental surveillance staff were less likely than those with adequate staff to report that ELC funding had enhanced state capabilities for flea-borne disease surveillance (10% vs. 27% for epidemiologists, 8% vs. 30% for mosquito/environmental surveillance).

ELC-SUPPORTED LHDS 2012 VS. 2004

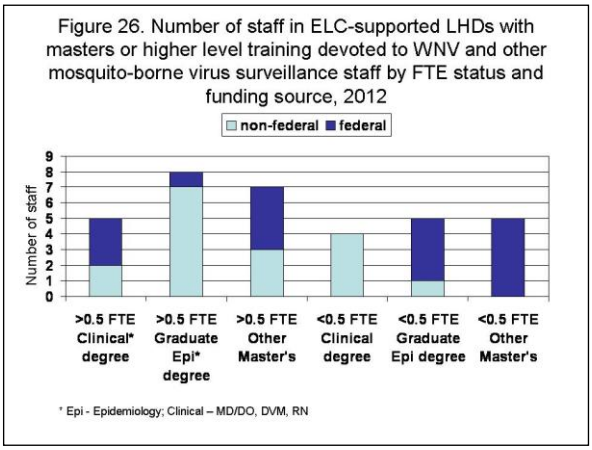
Like state survey respondents, LHD respondents reported capacity to carry out the most important WNV functions in 2012—human and mosquito surveillance—but reported having fewer federally funded staff to do this work and slightly lower surveillance levels than in 2004. While these localities reported having more or less maintained levels of human and mosquito surveillance since 2004, their public health laboratory capacity was greatly reduced compared to states.

Staffing

In 2004, the six ELC-supported LHDs reported having a collective total of 21 employees and contract staff with at least a master's degree working ≥50% time on WNV. In 2012, they reported having a collective total of 20 such employees, a negligible change (See Table ELC1).

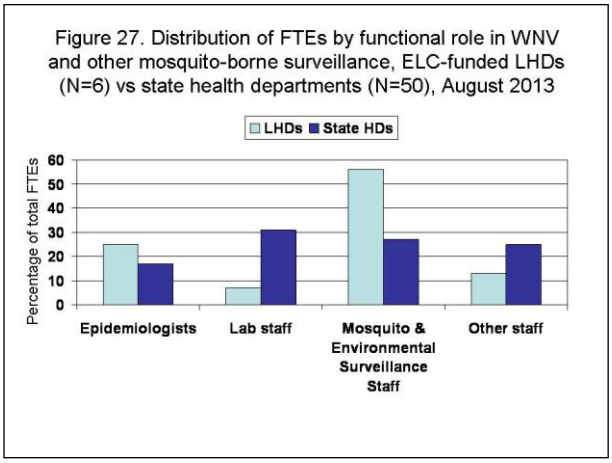
All six 2012 LHD respondents have locally as well as ELC-supported positions dedicated, at least in part, to mosquito-borne virus surveillance (See Figure 26). As in states, most staff working ≥50% time on WNV (20/29) are not funded by CDC, including 60% of those with master's or higher-level degrees (12/20) (See Figure 26, Table ELC3). Unlike states, however, most staff working <50% time on WNV do not receive CDC funding either. Overall, 87% of those working <50% time on WNV are not supported by CDC funding (26/30), including most of such staff with master's or higher-level degrees (10/14) (See Table ELC3). Overall, CDC funding to LHD respondents supports more ≥0.5 FTE positions (9) than <0.5 FTE positions (4), and almost all CDC-supported positions (12/13) are held by individuals with master's level or higher training.

Figure 26. Number of staff in ELC-supported LHDs with masters or higher level training devoted to WNV and other mosquito-borne virus surveillance staff by FTE status and funding source, 2012



In 2012, responding ELC-supported LHDs reported 27.9 FTEs working on WNV and other mosquito-borne virus surveillance (mean, 4.7 per LHD vs. 4.2 per state health department). The distribution of FTEs in LHDs was different than in state health departments. ELC-supported LHDs have relatively more epidemiology and mosquito surveillance staff: 25% of FTEs are epidemiologists and 56% mosquito-borne disease staff vs.17% and 27%, respectively, in state health departments. They have relatively

Figure 27. Distribution of FTEs by functional role in WNV and other mosquito-borne surveillance, ELC-funded LHDs (N=6) vs state health departments (N=50), August 2013



fewer laboratory and support staff (7% of FTEs are laboratory and 13% support staff vs. 31% and 25%, respectively) (See Figure 27).

Four (67%) LHDs reported needing more epidemiologists to achieve full epidemiology capacity for mosquito-borne virus surveillance. All four of the LHD respondents with laboratories reported needing more laboratorians to achieve full laboratory capacity for mosquito-borne disease surveillance. Three LHDs reported needing more mosquito/environmental surveillance staff, and two reported needing more clerical/administrative staff (See Figure 28a, Table ELC4).

Figure 28a. Percentages of 6 ELC-funded LHDs needing additional staffing for WNV and other mosquito-borne disease surveillance by functional role, August 2013

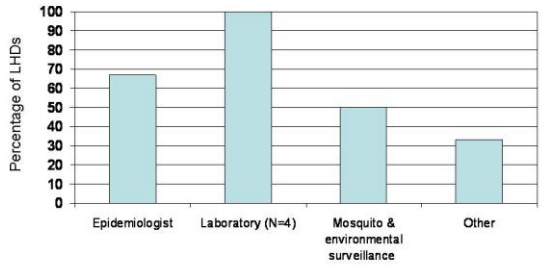
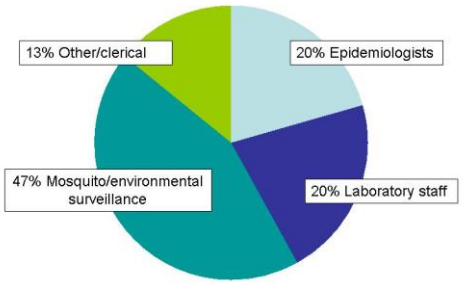
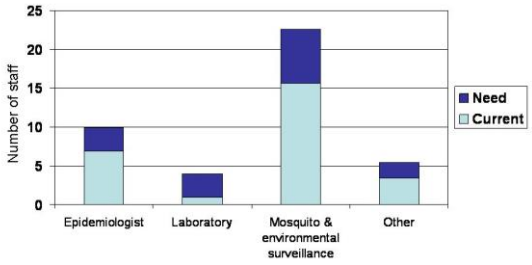


Figure 28b. Percentage by functional role of 15 additional ELC-funded LHD staff needed for WNV and other mosquito-borne disease surveillance, August 2013



Altogether, the six respondents cited a need for 15 additional FTE positions to achieve full epidemiology and laboratory capacity, with most being for mosquito/environmental surveillance staff (7 FTEs) (See Figure 28b, Table ELC4). The relative increase to achieve full capacity by functional category is a 54% increase in staffing overall, including a 43% increase in epidemiologists, a 158% increase in laboratory staff, a 45% increase in mosquito/environmental surveillance staff, and a 57% increase in "other" staff (See Figure 29, Table ELC4).

Figure 29. Current number of WNV and other mosquito-borne disease surveillance staff in ELC-funded LHDs and additional need to achieve full capacity at the local level, by functional role, August 2013.

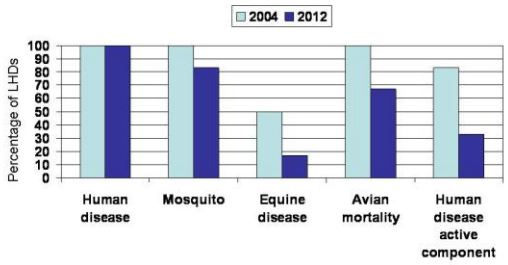


Compared with states, ELC-supported LHDs with full capacity would have more epidemiologists per agency (1.65 vs. 1.22), fewer lab staff (1.22 vs. 1.86), more mosquito/environmental surveillance staff (3.60 vs. 2.26) and fewer "other" staff (0.92 vs. 1.43).

Overall Surveillance for WNV

There were three changes of note in overall surveillance efforts for WNV from 2004 to 2012: (a) the percentage of ELC-funded LHDs with an avian mortality system dropped from 100% to 67%, (b) the percentage with equine disease surveillance dropped from 50% to 20%, and (c) the percentages with active human and equine surveillance both dropped sharply (See Figure 30, Table ELC6).

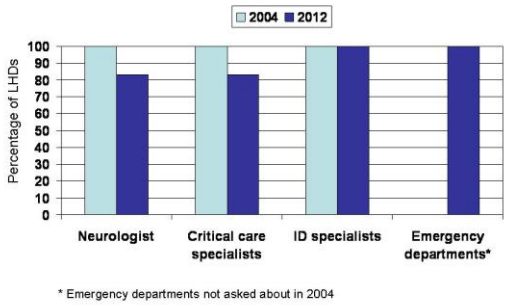
Figure 30. Percentage of ELC-funded LHDs conducting surveillance for WNV, 2004 (N=6) and 2012 (N=6)



Human Surveillance for WNV

As among state respondents, responding ELC-funded LHDs reported conducting human WNV surveillance, but doing so less actively than in 2004. Slightly fewer LHDs contacted neurologists and critical care specialists to encourage WNV reporting, but all indicated contacting infectious disease specialists and emergency departments (See Figure 31, Table ELC7).

Figure 31. Percentage of 6 ELC-funded LHDs that contacted specialists to encourage diagnosis and reporting of WNV, 2004 and 2012



All LHD respondents also reported continued requirements for WNV reporting by in-state laboratories in 2012, and the reported average turn-around-time from specimen collection to positive case reporting to the WNV surveillance program was the same as in 2004.

No LHD respondent reported auditing laboratories or reviewing hospital discharge data in 2012 to assure completeness of WNV case ascertainment.

Equine Surveillance

There was little equine WNV activity in 2012 and thus limited ability to assess workload changes (See Table ELC8a). Just two LHD respondents reported having a system in place for reporting cases of equine neurologic disease to state authorities, and only one LHD reported testing any equine specimens for WNV. However, equine surveillance is not emphasized in these agencies.

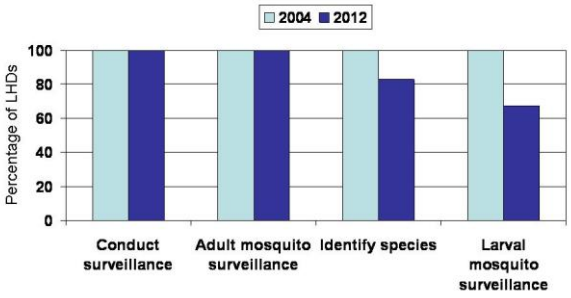
Avian Surveillance

Compared with 2004, the level of LHD avian surveillance was low: one LHD terminated its avian surveillance program, and only small numbers of dead birds were tested at any site (median 25 per site for 3 sites) (See Table ELC8b).

Mosquito Surveillance

As in states, mosquito surveillance capacity decreased somewhat in ELC-funded LHDs between 2004 and 2012, by some measures (See Figure 32). Only two LHDs reported conducting larval mosquito surveillance in 2012, compared with four in 2004. The number of mosquito trap-nights dropped from a mean of 4,632 in 2004 to 300 in 2012 (See Table ELC9). Of the four responding LHDs that test mosquitoes, one tested fewer mosquito pools for WNV in 2012—a strategy also used by some state public health laboratories to compensate for funding losses. (Table ELC10). Nonetheless, all six LHD respondents conduct mosquito surveillance, and five identify mosquitoes to species and calculate minimum mosquito infection rates as part of their WNV response plans.

Figure 32. Changes in mosquito surveillance for WNV and other mosquito-borne viruses from 2004 to 2012, responding ELC-funded LHDs



Four LHD respondents have laboratory capacity within the agency for mosquito testing; the other two rely on state public health laboratories for mosquito testing. Just one of the four LHDs with laboratory capacity reported a drop in capacity to test mosquito pools since 2008—a smaller percentage than for state laboratories (68%).

Prevention

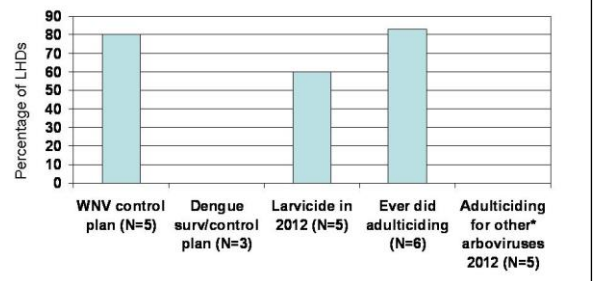
In general, use of the media and other vehicles to educate residents about WNV in 2012 was high, and unlike in states, comparable to efforts in 2004 (See Table ELC11).

Mosquito control activities

Mosquito control activities were not assessed in 2004.

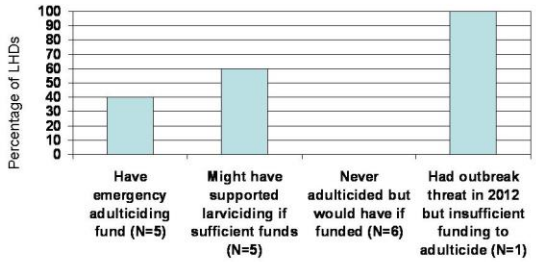
In 2012, five of the six LHDs had a plan for WNV surveillance and control (compared with 58% of responding states) (See Figure 33). Four of these LHD plans do not require human cases before adulticiding is recommended, compared to only half of states. Three LHD respondents reported conducting larviciding in 2012. However, as in states, more jurisdictions would have performed larviciding, or would have expanded its larviciding, if funding had been available (See Table ELC12).

Figure 33. Prevalence of planning to respond to mosquito-borne viruses and mosquito control activities in ELC-funded LHDs, 2012



All but one of the responding LHDs have conducted adulticiding at some point in time to control WNV. The sole responding LHD that has not conducted adulticiding relies on another jurisdiction to provide this service. Although no responding LHD performed adulticiding for viruses other than WNV in 2012, the one jurisdiction with an outbreak threat might have done so if funding had been available. Two responding LHDs have an emergency fund or funding mechanism to support adulticiding for WNV (See Figure 34).

Figure 34. Financial aspects of WNV and other mosquito-borne virus control in 6 ELC-funded LHDs, August 2013

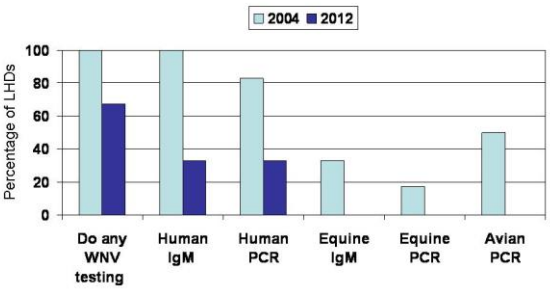


Although three responding LHDs have identified *Aedes aegypti* mosquitoes in the past five years, none has written dengue surveillance and control plans, compared with 28% of states that have identified *Aedes aegypti* in the past five year.

Overall WNV Laboratory Capability

Since 2004, there has been a large reduction in LHD laboratory capabilities (See Figure 35, Table EC13). Among the six LHDs, the number of LHD laboratories doing any testing for WNV fell from six to four. The number of laboratories performing human IgM testing fell from six to two. No LHD respondents reported any testing of equine or avian samples in 2012, compared with two and three, respectively, in 2004. The number of LHDs reporting mosquito testing dropped from three to one.

Figure 35. Changes in WNV testing capability in 6 ELC-funded LHD jurisdictions from 2004 to 2012



Two LHD respondents reported that their laboratories maintain PRNT capability, representing no change from 2004. Three other respondents rely on either another state's public health laboratory or CDC to do confirmatory PRNT testing.

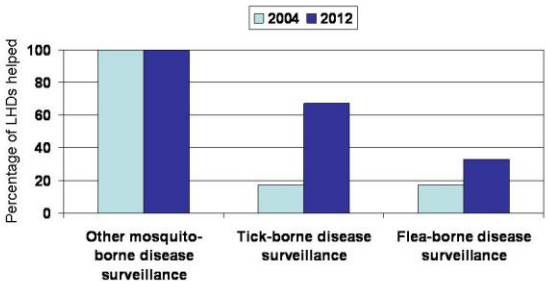
Testing capability for other mosquito-borne viruses and efforts to detect them

Testing capability and efforts to detect other mosquito-borne viruses on specimens submitted for WNV testing are more limited in ELC-funded LHD laboratories than in state public health laboratories (See Table ELC14, Table ELC15). Among the four LHD respondents with agency laboratories, just one *routinely* tests cerebrospinal fluid specimens for mosquito-borne viruses other than WNV—and it tests only for SLE. The only other mosquito-borne viruses responding LHDs tested for in 2012 are dengue (by one LHD laboratory), SLE (by two LHD laboratories) and WEE (by one LHD laboratory).

Relationship of ELC funding to other surveillance capacities and response to reductions in funding

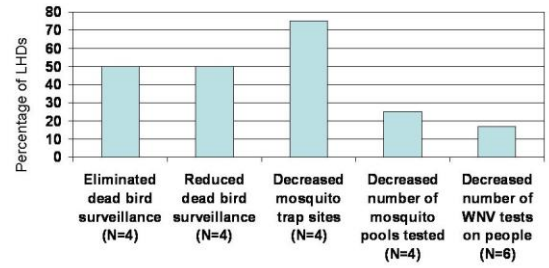
ELC funding for WNV surveillance continues to benefit LHD surveillance programs for other mosquito-borne, tick-borne and flea-borne diseases (See Figure 36, Table ELC16). The percentages of responding LHDs that cited a beneficial impact on each since 2004 increased, despite decreases in WNV-specific funding.

Figure 36. Percentage of ELC-supported LHDs responding that ELC WNV funding has helped other selected disease surveillance capacities, 2004 and 2012



Respondents cited a variety of strategies to manage ELC funding cuts for WNV and other mosquito-borne disease surveillance in addition to eliminating laboratory services: eliminating dead bird surveillance (2 LHDs), curbing mosquito trapping (3 LHDs), reducing mosquito pool testing (1 LHD) and reducing human WNV testing (1 LHD) (See Figure 37, Table ELC16).

Figure 37. Percentage of ELC-supported LHDs reducing selected surveillance activities in past 5 years in response to reduction in ELC WNV funding, August 2013



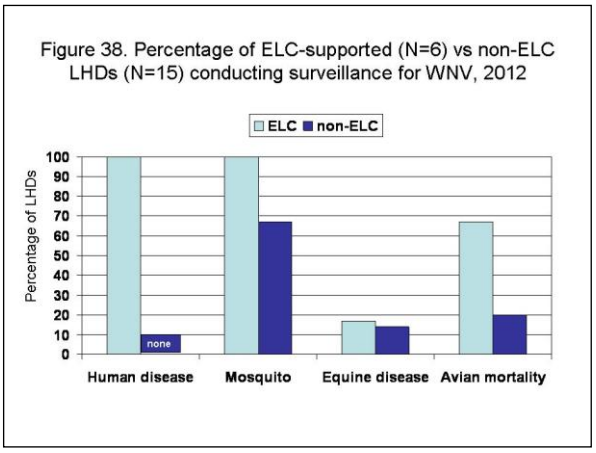
NON-ELC-SUPPORTED VS ELC-SUPPORTED LHDS, 2012

Compared with ELC-funded LHD respondents, the 15 non-ELC-funded LHD respondents reported less direct capacity for WNV surveillance in 2012, especially laboratory capacity, and relied more heavily on state services. However, many had substantial capacity for mosquito surveillance.

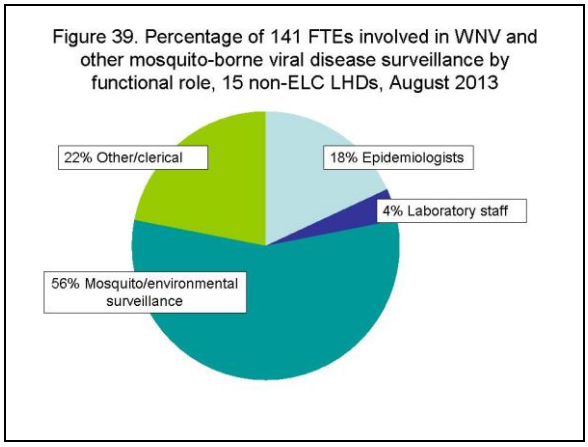
Overall Surveillance and Staffing

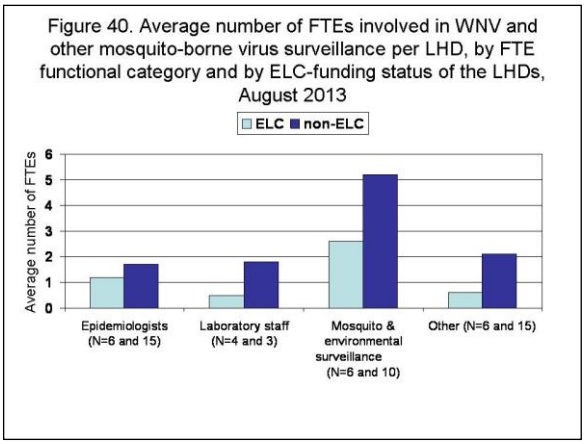
Both ELC-funded and non-ELC-funded LHDs reported that most of their mosquito-borne disease surveillance staff are not funded by CDC. About two-thirds of all professional staff who spend any amount of time on mosquito-borne disease surveillance in responding LHDs receive funding from non-CDC sources. Most CDC funding for responding LHDs—whether ELC-supported or not—supports staff members who spend ≥ 50% time on WNV surveillance activities and hold at least master's degree (See Tables LHD1-3).

Compared with their ELC-supported counterparts, non-ELC-supported LHDs were less likely to conduct any type of WNV surveillance: human, mosquito, equine or avian (See Figure 38, Table LHD6). No LHD not receiving ELC funds conducted its own human WNV surveillance, but two-thirds (10/15) conducted their own mosquito surveillance.



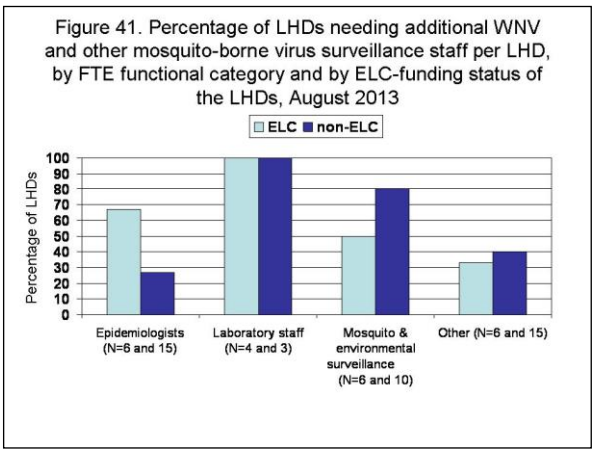
Overall, the 15 non-ELC-funded LHD respondents had 141 FTE staff members involved in some aspect of mosquito-borne viral disease surveillance. Staffing patterns were similar to those reported by the six responding ELC-supported LHDs: 56% perform mosquito surveillance, 22% "other" surveillance, 18% epidemiology, and 4% laboratory services (See Figure 39, Table LHD4).





The non-ELC-funded LHDs conducting at least some mosquito-born virus surveillance averaged more FTE positions devoted to those activities than the six responding ELC-supported LHDs: 9.4 versus 4.7 FTEs per LHD overall. Moreover, the trend held for each of four functional job categories: an average 1.7 versus 1.2 epidemiology FTEs, 1.8 versus 0.5 laboratory FTEs (comparing those respondents with agency laboratories), 7.8 versus 2.6 mosquito/environmental surveillance FTEs (comparing those respondents with mosquito surveillance programs), and 2.1 vs. 0.6 "other" FTEs (See Figure 40, Table LHD4).

Only 27% of non-ELC-supported LHDs reported a need for additional epidemiology staff, compared with.67% of ELC-supported LHDs. But, 80% of the ten non-ELC-supported LHDs with mosquito surveillance programs reported a need for more mosquito surveillance staff, compared with half (50%)



of the ELC-recipients (See Figure 41, Table LHD 4). In agencies with reported staffing needs, the average FTE need was higher in non-ELC-supported LHDs than in ELC-supported LHDs for laboratory staff (1.1 vs. 0.8 FTE), mosquito/environmental surveillance staff (3.7 vs. 2.3 FTEs) and "other" support staff (2.3 vs. 1.0) (See Figure 42, Table LHD4).

Figure 42. Average number of additional FTEs needed for WNV and other mosquito-borne virus surveillance per LHD, by FTE functional category and by ELC-funding status of the LHDs, August 2013

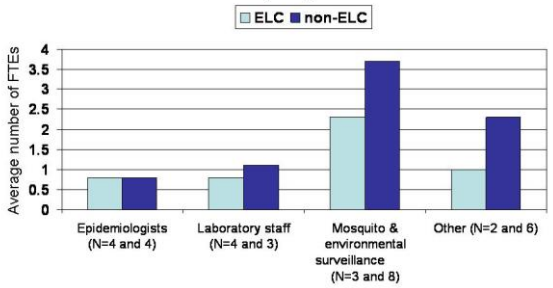
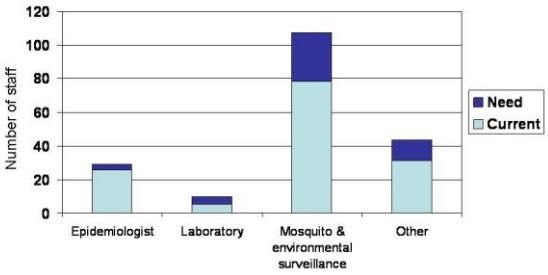


Figure 43. Current number of WNV and other mosquito-borne viral disease surveillance staff in non-ELC LHDs and additional need to achieve full capacity at the local level, by functional role, August 2013.



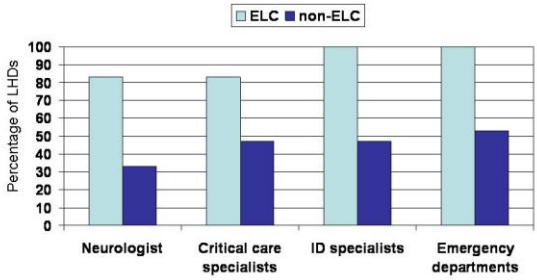
Overall, mosquito/environmental surveillance staff accounted for the biggest share of additional need in both types of LHDs: 47% of needed staff in ELC-supported LHDs and 60% of needed staff in non-ELC-supported LHDs. The total additional need was 15 FTEs in the six ELC-supported LHDs and 49.2 FTEs in the 15 non-ELC-funded LHDs. To achieve full capacity for WNV and other mosquito-borne viral disease surveillance, the 15 non-ELC-funded LHDs reported needing a total of 180.2 FTEs, overall, including current and additional needed staff (See Figure 43, Table LHD4).

Compared with the ELC recipients, the non-ELC LHDs had lesser access to expertise in medical entomology (29% vs. 50%), wildlife biology (20% vs. 50%) and veterinary medicine (33% vs. 50%) within their agency.

Human Surveillance for WNV

Despite not conducting their own surveillance for human WNV, many non-ELC-funded LHDs reported contacting key providers to encourage WNV reporting: neurologists (33%), critical care specialists (47%), infectious disease specialists (47%) and emergency departments (53%). However, these percentages are generally half those of ELC-supported LHDs (Figure 44, Table LHD7).

Figure 44. Percentage of 6 ELC-supported LHDs and 15 non-ELC LHDs that contacted specialists to encourage diagnosis and reporting of WNV in 2012



In 2012, one responding non-ELC-funded LHD audited laboratories and reviewed hospital discharge data to assure completeness of WNV case ascertainment within its jurisdiction, something no ELC-funded LHD did.

Equine Surveillance

Although nearly a third of all responding LHDs reported having a system in place for reporting cases of equine neurologic disease to the state health agency, just one (non-ELC-supported) LHD was informed of clusters of equine illness within the jurisdiction in 2012 and participated in the ensuing investigation (See Table LHD8a).

Avian Surveillance

Two non-ELC-funded LHDs (13%) and three ELC-funded LHDs (50%) reported maintaining a database of dead bird sightings in 2012. All five of these agencies submitted dead birds for testing in 2012, mostly to the state laboratory (60%). The median quantity submitted was 16-25 birds (See Table LHD8b).

Mosquito Surveillance

While all responding ELC-supported LHDs perform their own mosquito surveillance, just two thirds (67%) of non-ELC-supported LHDs reported doing so. However, those non-ELC-recipients conducting mosquito surveillance generally conduct as many or more types of mosquito surveillance activities than their ELC-funded counterparts: larval surveillance (90% vs. 67%), mapping larval breeding sites (57% vs. 50%), identifying mosquitoes to species (90% vs. 100%), trapping at fixed sites (90% vs. 100%), surveilling 100% of the local population (median, 100% each), and having mosquitoes tested for arboviruses other than WNV (See Tables LHD 9, 10).

Prevention

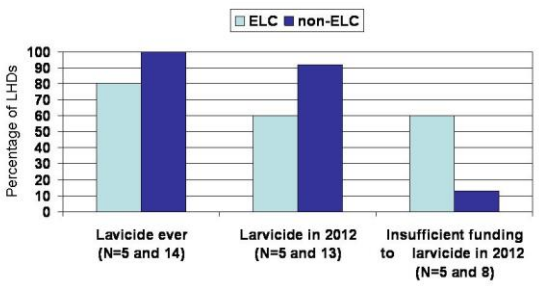
In general, use of the media and other vehicles to educate residents about WNV in 2012 was high for both types of LHDs. However, the percentages of responding agencies performing specific outreach activities—such as airing public service announcements, hosting community meetings or conducting door-to-door outreach—were 5-25% lower among LHDs without ELC funding (See Table LHD11).

Mosquito control activities

Both types of LHDs reported active roles in mosquito control. Of note, the non-ELC-funded LHDs tended to be more active in larval control while the ELC-funded agencies were more active in adult mosquito control.

Non-ELC-funded LHDs were more likely to have ever financially supported larviciding (100% vs. 80%) and to have conducted/supported it in 2012 (92% vs. 60%). They were also less likely to have had insufficient funding to conduct larviciding (13% vs. 60%) (See Figure 45, Table LHD 12).

Figure 45. Prevalence of larval mosquito control activities, ELC-supported vs non-ELC LHDs, 2012

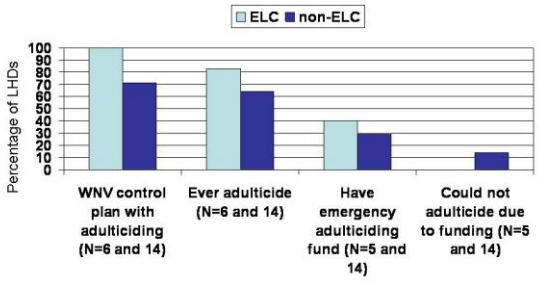


ELC-supported LHDs were more likely to have a WNV control plan that includes adulticiding (100% vs. 71%), to have

ever conducted adulticiding for WNV control (83% vs. 64%) and to have an emergency funding mechanism for adult mosquito control (40% vs. 29%). ELC-funded LHDs were less likely to have ever had a threat that reached the adulticiding threshold but for which there was no funding (0% vs. 17%) (See Figure 46, Table LHD 12).

While 40% or more of both groups reported a documented *Aedes aegypti* presence, only non-ELC-funded agencies had a written dengue surveillance and control plan (2 of 5 vs. 0 of 3) (See Table LHD 12).

Figure 46. Prevalence of adult mosquito control activities, ELC-supported vs non-ELC LHDs, 2012



Relationship of ELC funding to other surveillance capacities and response to reductions in funding

While ELC funding has clearly enhanced surveillance capacity for related vector-borne diseases in LHDs with direct ELC support, ELC funding has also impacted, to a lesser extent, non-ELC-supported LHDs (See Figure 47, Table LHD16).

Figure 47. Percentage of LHDs responding that ELC WNV funding has helped other selected disease surveillance capacities, by ELC funding status

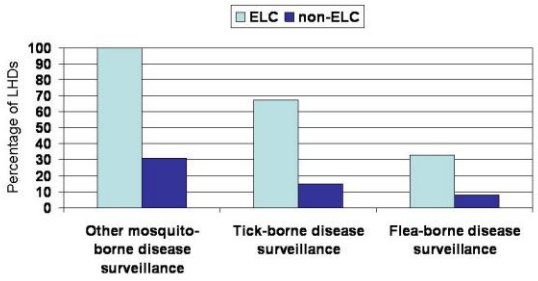
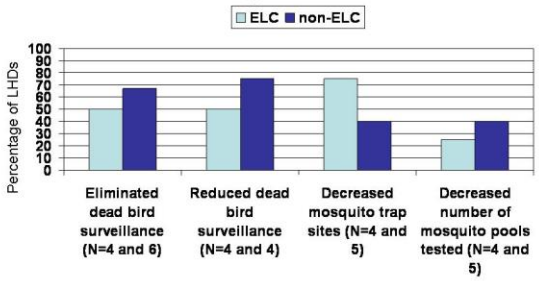


Figure 48. Percentage of LHDs reducing selected surveillance activities in past 5 years in response to reduction in ELC WNV funding, by LHD funding status, August 2013



Anywhere from one quarter to three quarters of responding LHDs—ELC-funded and not—report that ELC funding cuts have prompted the elimination or reduction of dead bird surveillance, reductions in mosquito trap sites and reductions in the number of mosquito pools tested (See Figure 48, Table LHD16).

DISCUSSION

Prior to the introduction of WNV in the US, there was neither federal funding nor a real national system for arboviral surveillance. The introduction of WNV led to the formation of ArboNet, now a distributed national system with participation from every state and six independently-funded LHDs, coordinated by CDC. ArboNet is now a critical part of the infrastructure to respond to the introduction/emergence of other arboviral diseases, such as dengue, and a platform for monitoring those that are endemic. Yet ArboNET's integrity is only as strong as arboviral disease surveillance systems in state and local health departments.

This assessment was conducted for two key reasons: (a) to examine changes since 2004 in state and federally-supported LHD capacity to conduct surveillance for WNV and other mosquito-borne viruses in light of substantial federal funding cuts and (b) to gauge current capacity for WNV and other mosquito-borne virus surveillance in state and local health agencies, including LHDs with high historical levels of WNV morbidity, but no direct ELC support. In addition, the assessment provided an opportunity to examine other funding for surveillance activities, to identify surveillance gaps and to document agency needs. Important findings are presented below.

State and local health departments supported *with* ELC funding

- Overall state and local capacity for WNV and other mosquito-borne virus surveillance has diminished since 2004. There is a 41% reduction in staff working at least half-time on WNV-related activities in states. Entomology and wildlife expertise is less readily available in health agencies. The percentage of states conducting mosquito surveillance and tracking avian mortality fell from 96% to 80% and from 98% to 39%, respectively. And the intensity of human and mosquito surveillance efforts and associated laboratory support has declined significantly; 58% of states have reduced mosquito trapping and 68% have reduced mosquito testing. Much of this program erosion may be attributable to federal funding cuts.
- Although almost all states and the six ELC-supported LHDs retain capacity for the most basic surveillance for human illness and mosquito disease vectors, some agencies are at a critical tipping point. Mosquito surveillance has been compromised, critical laboratory capacity has been lost, and efforts to conduct surveillance for other arboviruses are patchy, with <25% of states systematically examining submitted cerebrospinal fluid specimens for anything other than SLE and EEE. The number of states conducting active surveillance for human disease has decreased, many states have ceased avian mortality surveillance, and most states are only passively involved in equine surveillance.
- Most state and local health departments have made their own substantial investments in surveillance and prevention programs for WNV and other mosquito-borne viruses. Nearly 75% of states and all of the six ELC-supported LHDs have staff supported by other funding sources working on mosquito-borne virus surveillance.
- States are an important source of laboratory support for arbovirus surveillance. While all states have some WNV testing capacity, just 67% of ELC-supported LHDs and only two of 15 non-ELC-funded LHDs have any WNV testing capability. Testing

capability for other arboviruses is almost exclusively located at state health departments; only two responding ELC-supported LHDs and none of the non-ELC-supported LHDs have any such capability.

- ELC funding was instrumental in building the US arbovirus surveillance system and remains critical to maintain capacity for arbovirus surveillance in most state and local health departments. ELC funding cuts have had an adverse impact, resulting in reduced mosquito surveillance (either trapping, testing or both) in approximately 70% of states and 75% of LHDs, elimination of avian mortality surveillance in most jurisdictions and reduction in the number of human specimens tested for WNV or other mosquito-borne viruses. Moreover, states with the biggest need for additional laboratory staff are those with the least ELC funding.
- Approximately 123 FTE positions are needed in 27 state health departments and 15 FTE positions in four of the six responding ELC-supported LHDs to meet outstanding staffing needs for arbovirus surveillance. Based on an average cost of $100,000/position (including benefits and indirect costs), the staff funding shortfall totals about $13.8 million in these agencies—about the same amount of ELC cooperative agreement funding for WNV response that has been lost since fiscal year 2003-04. (The ELC WNV budget totaled $23.7 million in 2003-04, compared to $9.3 million at present).
- There are important gaps in each functional area for arbovirus surveillance that would benefit from restoring some of the funding that has been lost. Additional epidemiologists are needed to enhance human WNV surveillance and assure efforts are made to accurately diagnose other arboviral diseases. Data suggest the potential for missing cases of other arboviruses is large when testing is limited to WNV, SLE and EEE. Yet, less than a quarter of health departments appear to assure that human specimens submitted for WNV testing are also routinely tested for arboviruses other than SLE and EEE. Additional laboratory capacity is needed to meet the demand for arboviral testing of mosquito pools and for testing human specimens from persons with meningitis, encephalitis or syndromes consistent with dengue for other arboviruses. In 2012, only 14 (28%) state health department laboratories performed testing for arboviruses other than WNV, SLE and EEE, despite having capability. Additional mosquito/environmental surveillance staff are needed to conduct annual, systematic mosquito surveillance in areas at greatest risk for large outbreaks of mosquito-borne viruses, including dengue as well as WNV, SLE and EEE. Reported shortfalls of staff for mosquito surveillance, which is labor intensive, were greater than for other surveillance activities: 44% of all FTEs reportedly needed by states and 47% of those needed by the six responding ELC-funded LHDs are for mosquito surveillance.
- There are gaps in planning, especially at the state level. Despite the presence of WNV in all contiguous 48 states since 2004, 42% of states did not have a WNV control plan in 2012.
- The possibility of local dengue transmission with large outbreaks of illness is real. Eighteen states have confirmed the presence of *Aedes aegypti*. Almost all states have had at least one imported case of dengue fever and at least two states, Florida and Texas, have documented local transmission in several counties.[11,12] However, only five states have dengue surveillance and control plans.

- Surveillance data are actively used for prevention activities. In 2012, nearly all states notified the public of the threat of WNV by posting information on government web pages, among other things. And while prevention activities other than public education are not usually supported with ELC funding for surveillance and laboratory capacity, most states have jurisdictions that actively larvicide to slow WNV amplification and have performed adulticiding when they felt the data warranted it. Funding cuts have adversely impacted prevention activities. Compared with 2004, fewer states in 2012 actively distributed informational brochures, assured prevention messages were tailored for low-literacy groups and non-English speakers, aired public service announcements or held town meetings. Overall, more than half of states reported that, with sufficient funds, they might have supported larviciding efforts by LHDs.

Local-level health departments *without* direct ELC-support

- Local health departments with a proven high WNV threat make a major contribution to surveillance for WNV and other mosquito-borne viruses, particularly by contributing to mosquito surveillance and supporting state-level human disease surveillance. The 15 responding non-ELC-supported LHDs contributed an average of 1.7 FTE epidemiologists, 5.2 FTE mosquito/environmental surveillance staff and 2.1 FTE "other" surveillance staff to national capacity, compared with an average of 0.7 FTE epidemiologists, 1.2 FTE mosquito/environmental surveillance staff and 1.1 FTE "other" surveillance staff at the state level. Most of these staff are not supported through ELC or Public Health Preparedness and Response passdown funding from the state.
- Despite having substantial locally-funded capacity, state-level surveillance capacity and support through ELC passdowns are necessary for these LHDs to have surveillance data to respond to WNV and other mosquito-borne viruses. Only two of 15 non-ELC-funded LHDs have their own laboratory, and these two laboratories have limited capability to test for WNV and no capability to test for other arboviruses. Five responding LHDs without direct ELC support (33%) do not conduct their own mosquito surveillance. Of the ten that do, several reduced the number of mosquito pools collected and tested in 2012 as a result of reduced ELC funding. All depended on the state for human disease surveillance. In addition, approximately 18 (37%) of the 49 staff who spend ≥50% time on mosquito-borne virus surveillance activities are supported by CDC funding.
- LHDs without direct ELC support, but with a proven high WNV threat, need additional mosquito and human surveillance staff. There is a particular shortfall of mosquito/environmental surveillance personnel. Of the ten LHDs conducting mosquito surveillance, eight reported needing a total of 29 additional FTEs for mosquito surveillance.
- LHDs with a proven high WNV threat have taken an active role in mosquito control. Almost all conducted larviciding in 2012 and few reported insufficient funding to do it.

Given that just over half of all states reported additional staffing needs, it was possible to examine whether staffing needs were associated with diminished capacity for arbovirus

surveillance. In general they were. States with a reported need for epidemiologists were less proactive in contacting providers to encourage arbovirus diagnosis and reporting; they also were less likely to test suspect WNV specimens for other arboviruses. States with a reported need for laboratory staff were less likely to have capacity to test mosquito pools for WNV and more likely to report that testing capacity had fallen since 2008. States with a reported need for mosquito surveillance staff were more likely to report having decreased the number of mosquito trap-nights and were less likely to have identified *Aedes aegypti* within their geographic area.

Comparisons among state groupings showed few systematic differences. However, those differences identified aid the interpretation of the major findings outlined above. Current levels of WNV funding were directly associated with the number of FTE laboratory staff and epidemiologists per state. Conversely, the percentage of states needing additional laboratorians was strongly inversely associated with current levels of WNV funding. By region, southeastern and south central states had the most unmet needs overall, with more than 70% of these respondents reporting a need for staff in all four functional categories: epidemiology, environmental surveillance, laboratory support and "other." In contrast, relatively few western and Rocky Mountain states reported unmet staffing needs. In most regions, the need for additional laboratorians was slightly higher than the need for other kinds of staff.

Interpreting the changes in surveillance between 2004 and 2012 needs to be done with caution. Since 2004, states and localities have gained more experience with arbovirus surveillance, the relative importance of certain surveillance functions has changed, and funding cuts have forced some jurisdictions to focus on the most essential components of surveillance (human and mosquito). In particular, the importance of avian surveillance has diminished for several reasons. Jurisdictions found it difficult to maintain a consistent level of public vigilance and reporting from year to year as the public became more accustomed to the presence of WNV. There was concern that selective pressure would produce a population of Corvidae species (especially crows and blue jays) more tolerant of infection, and there was the gradual realization that mosquito surveillance could not only replace avian surveillance to detect the presence of WNV but that it could provide data of more immediate relevance to human risk and control. The value of equine WNV surveillance as an index of human risk also diminished; a result of the licensing and widespread use of the WNV equine vaccine and recognition that illness in horses usually occurs contemporaneously or later than human illness. From a laboratory perspective, reliable commercial laboratory testing of human specimens for WNV became widely available, making it less necessary for state laboratories to do high-volume WNV testing.

On the other hand, with diminished avian mortality surveillance, many states were compelled to expand mosquito surveillance to cover broader geographic areas. In addition, the recognition of risk posed by other arboviruses has increased. Powassan virus encephalitis is a new threat, and its magnitude and trends are poorly understood.[13,14] LaCrosse virus has been found to be more widespread than previously recognized. Chikungunya virus has the potential to be repeatedly imported, become established and cause large outbreaks.[15] And dengue has been repeatedly introduced all over the country,

with local transmission documented in an increasing number of Florida counties over the past four years.[11, 12] Surveillance systems for mosquito-borne and other arboviruses need to have sufficient capacity to rapidly recognize and respond to these challenges.

This assessment has several strengths. The high response rate from ELC-funded jurisdictions enables a nationwide assessment of arbovirus surveillance capacity and the impact of federal funding. Questions comparing 2004 to 2012 used identical wording, maximizing the potential to compare results. Information on the type of funding used to support surveillance staff, highlighted the importance of local as well as federal funding investments. In addition to current staffing levels, data were obtained on additional staffing needs and the nature of them. Many assessments of epidemiology capacity focus on states only and thus miss the surveillance and prevention contribution from LHDs and their potential need for state and federal support. This assessment extended to LHDs with reason to build their own WNV surveillance capacity: large WNV outbreaks and/or consistently significant morbidity in the past, but no direct ELC funding. Finally, the assessment obtained information on selected control activities and on dengue risk and preparedness.

This assessment also has a number of limitations. First, not all jurisdictions answered all questions; estimates of current staffing and staffing needs in particular may be underestimated because of incomplete responses. The ambiguity resulting from unanswered questions was managed in several ways. For questions about surveillance activities, denominators excluded those who failed to answer specific questions, so non-respondents were not included in the analysis. For questions relating to staffing, non-responses were treated as "zeros," i.e., no staff or staff needs.

Second, some respondents may have misinterpreted some questions, particularly those related to numbers of staff and FTEs. Misinterpretation could result in over or under-reporting of FTEs.

Third, some new questions were added to the 2012 questionnaire, particularly relating to number of FTEs by functional category and funding sources. Thus, we do not know what the state personnel investment was in WNV and other mosquito-borne virus surveillance in 2004, and we do not know how that has changed.

Fourth, as previously discussed, the relative importance of different surveillance methods shifted between 2004 and 2012. Whereas needs for human surveillance and laboratory testing capability and capacity are largely unchanged, the need for avian mortality and equine surveillance data has diminished, and the need for mosquito surveillance data has increased. Jurisdictions have adjusted resources to accommodate these changes, and this accommodation may explain, at least in part, the generally high US WNV surveillance capacity, despite federal funding cuts of more than 50%.

Fifth, yearly measures of workload are difficult to compare, as they depend, in part, on levels of WNV activity. However, the human WNV burden in 2012 was higher than in

2004, as measured by reported cases of neuroinvasive disease (2,873 cases in 2012 vs. 1,148 in 2004) and WNV mortality (270 deaths in 2012 vs. 94 in 2004).[4]

Finally, the 2012 assessment did not solicit information on funding or unmet needs for anything other than staff. Limited fiscal resources may, for example, preclude the purchase of updated laboratory equipment and testing reagents, thereby limiting laboratory testing of mosquito pools, and testing of human and non-human specimens for arboviruses other than WNV. It is likely that unmet non-personnel needs have contributed significantly to loss of arboviral surveillance capacity and would need to be addressed in any effort to maintain or improve it.

CONCLUSIONS

Based on assessment results, several summary conclusions can be drawn:

1. All 48 contiguous states retain some capacity for WNV surveillance.
2. Surveillance capacity varies widely among the states, from a minimal ability to diagnose and report WNV human cases to ability for more comprehensive surveillance, including monitoring WNV activity in mosquitoes, dead birds and sentinel chickens.
3. Overall, however, state capacity has decreased since 2004, despite WNV becoming endemic, despite the occurrence of large WNV outbreaks with substantial morbidity and mortality and despite a growing need to monitor other arboviruses that pose an increasing public health threat.
4. Many public health laboratory testing programs and mosquito/environmental surveillance programs for WNV have reached a tipping point where further funding reductions are likely to result in their loss entirely in some states.
5. Although many state and surveyed LHDs have made substantial funding investments in WNV surveillance and control, some are entirely dependent on ELC WNV funding. In those jurisdictions where a substantial state/local investment has been made, ELC WNV funding remains critical to sustain current capacity, including in LHDs with no direct ELC funding.
6. The capacity to conduct surveillance for other mosquito-borne viruses is patchy, with a few states having high-level capacity, but many having little to none. In particular, public health laboratory capacity for proactive surveillance is poor to non-existent in most states.
7. LHDs with a historically high WNV burden play a key role in mosquito surveillance and control and in supporting surveillance for human WNV disease. Among LHDs with historically high WNV incidence, surveillance capacity is higher in agencies with direct ELC funding than in agencies without direct funding.
8. Most states and ELC-funded LHDs need additional support to conduct full surveillance for WNV and other mosquito-borne viruses (including dengue). State and ELC-supported LHD respondents cite a need for an additional 137.6 FTE staff, a 58% increase in current staffing levels. The 15 responding LHDs with historically high WNV incidence but no direct ELC funding cite a need for an additional 49 FTE staff.

9. Responding LHDs with a historically high WNV burden all play an active role in mosquito control, particularly larviciding. Although some state health departments have provided funding to support local larviciding efforts, most do not have sufficient funding to provide such assistance.

RECOMMENDATIONS

Based on these findings, CSTE—supported by ASTHO, NACCHO and APHL—recommends that CDC take the following actions:

- At a minimum, assure that current state and local health department capacity for WNV surveillance is maintained to assure not just state-level, but a national infrastructure for WNV and arboviral surveillance. Sufficient funding through the ELC cooperative agreement is needed for this: level funding will result in further erosion of capacity.
- Secure additional support to distribute through the ELC cooperative agreement to: (a) expand mosquito-based surveillance in metropolitan areas with a historically large WNV disease burden (as many have reduced mosquito surveillance and a third have no mosquito surveillance capacity whatsoever) and (b) build sufficient capacity to conduct surveillance in all states for other endemic arboviruses (e.g., EEE, SLE, WEE, LaCrosse, Powassan viruses) and for emerging arboviral threats (e.g., dengue, Chikungunya, Japanese encephalitis, Zika, Heartland viruses). This includes having the public health laboratory capacity in most states to assure they routine test for and monitor the incidence of other arboviruses as is now done for WNV.
- Contingent on the availability of additional funding, expand core ELC cooperative agreement objectives to include the following enhanced capacities to monitor endemic arboviruses and to detect and respond to the introduction of exotic arboviruses:
    - All ELC recipients should have WNV surveillance and control plans, and as appropriate to local risk, surveillance and control plans for other arboviruses.
    - Mosquito-based surveillance should be included in the programs for metropolitan areas with historically high WNV burden.
    - Diagnostic human specimens (cerebrospinal fluid and sera) submitted for WNV testing should be routinely tested for other endemic and exotic arboviruses, depending on the clinical syndrome, exposure history and local vector populations.

  Without additional funding, however, ELC-funded jurisdictions cannot be expected to do more than they currently are doing.

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Tables S1-S16: State 2012 data, comparison with 2004 where possible

Table S1. Number of state-level WNV surveillance staff with specified levels of training, regardless of funding source, 2012 and 2004

Year	State employees			Contracted employees		
	1.0FTE	0.5-0.99 FTE	<0.5 FTE	1.0FTE	0.5-0.99 FTE	<0.5 FTE
Number of staff with DVM, MD/DO, RN or other clinical degrees						
2012	4	9	44	0	0	2
2004	18	17	66	1	7	5
Number of staff with PhD, DrPH, MSPH, MPH degrees in epidemiology						
2012	27	7	37	3	1	2
2004	26	18	19	3	2	2
Number of staff with PhD or Master's degree in related sciences						
2012	31	13	38	2	3	13
2004	46	17	36	6	7	21
Number of other staff in clerical, administrative or other programmatic categories						
2012	49	33	125	12	12	36
2004	66	53	147	38	23	58

Table S2. Number and percentage of states with WNV surveillance staff with specified levels of training, funded by non-CDC sources, and median number of such staff, 2012 (N=50)

	State employees			**Contracted employees**		
	1.0FTE	**0.5-0.99 FTE**	**<0.5 FTE**	**1.0FTE**	**0.5-0.99 FTE**	**<0.5 FTE**
N (%) states with staff with DVM, MD/DO, RN or other clinical degrees						
No. (%)	2 (4)	2 (4)	13 (26)	0 (0)	0 (0)	1 (2)
Median # staff	1.5	4	2	-	-	1
N (%) states with staff with PhD, DrPH, MSPH, MPH degrees in epidemiology						
No. (%)	4 (8)	3 (6)	7 (14)	0 (0)	0 (0)	1 (2)
Median # staff	3.5	1	2	-	-	1
N (%) of states with staff with PhD or Master's degree in related sciences						
No. (%)	5 (10)	8 (16)	9 (18)	2 (4)	0	2 (4)
Median # staff	2	1	3	2	-	1.5
N (%) of states with staff in clerical, administrative or other programmatic categories						
No. (%)	8 (16)	8 (16)	18 (26)	1 (2)	1 (2)	3 (6)
Median # staff	3.5	1	1.5	1	1	4

Table S3. Number of WNV surveillance staff with specified levels of training, by funding source, 2012 (N=50)						
Year	**State employees**			**Contracted employees**		
	1.0FTE	**0.5-0.99 FTE**	**<0.5 FTE**	**1.0FTE**	**0.5-0.99 FTE**	**<0.5 FTE**
Number of staff with DVM, MD/DO, RN or other clinical degrees						
Total	4	9	44	-	-	2
Other	3	8	25	-	-	1
CDC*	1	1	19	-	-	1
Number of staff with PhD, DrPH, MSPH, MPH degrees in epidemiology						
Total	27	7.0	37	3	1	2
Other	27	2.5	11	-	-	1
CDC*	0	4.5	26	3	1	1
Number of staff with PhD or Master's degree in related sciences						
Total	31	13	38	2	3	13
Other	17	10	20	2	-	3
CDC*	14	3	18	0	3	10
Number of staff in clerical, administrative or other programmatic categories						
Total	49.0	33	125	12	12	36
Other	32.8	20	59	1	1	11
CDC*	16.2	13	66	11	11	25

* Calculated by subtracting "other" from "total" (not asked directly).

Table S4. Number of FTE positions for WNV surveillance by functional role and need for additional positions

	Number of FTE epidemiologists			Number of FTE laboratory staff			Number of FTE mosquito/other environmental surveillance staff			Number of FTE other surveillance/ clerical/ administrative staff		
	N*	Total staff	Mean	N*	Total staff	Mean	N*	Total staff	Mean	N*	Total staff	Mean
Current total	49	34.6	0.71	49	64.6	1.32	49	57.2	1.17	49	52.5	1.07
Current, states with no further need	22	16.4	0.75	19	34.8	1.83	21	36.9	1.76	30	44.3	1.48
Current, states with further need	27	18.2	0.67	30	29.8	0.99	28	20.3	0.73	19	8.2	0.43
Additional needed	27	25.1	0.93	30	26.4	0.88	28	53.6	1.91	19	17.5	0.92
States with further need, if need met	27	43.3	1.60	30	56.2	1.87	28	73.9	2.64	19	25.7	1.35
All states, if need met	49	59.7	1.22	49	91.0	1.86	49	110.8	2.26	49	70.0	1.43

* N = # responding states

Table S5. Specialists working for state health departments, 2004 and 2012

Does your agency have adequate access to:	2012		In 2004	
	N	Yes (%)	N	Yes (%)
Medical entomologist within public health agency	50	16 (32)	49	20 (41)
Medical entomologist through contract with another agency	48	18 (38)	47	23 (49)
Expertise in wildlife biology within your agency	50	38 (76)	49	45 (92)
Designated state public health veterinarian within your agency	50	38 (76)	49	40 (82)

Table S6. Number and percentage of states with selected surveillance systems for WNV, their duration and whether have an active component, 2012 and 2004

	N	Conduct state-level surveillance Yes (%)	Median duration (months)	Range (months)	Percentage Active component
Human disease					
2012	50	49 (98)	12	6-12	28
2004	49	49 (100)	12	5-12	47
Equine disease					
2012	49	44 (90)	12	4-12	4
2004	49	46 (94)	12	5-12	23
Avian mortality					
2012	49	19 (39)	7	4-12	4
2004	49	48 (98)	7	2-12	42
Mosquito surveillance					
2012	49	39 (80)	5	2-12	
2004	49	47 (96)	6	3-12	

Table S7. Human WNV surveillance and reporting in states, 2012 and 2004				
	2012		**2004**	
	N	**Yes (%)**	**N**	**Yes (%)**
To encourage reporting and to suggest a high index of suspicion for arboviral encephalitis, did your agency contact				
- neurologists	48	24 (50)	48	29 (60)
- critical care specialists	48	23 (48)	49	28 (57)
- ID specialists	48	28 (58)	49	40 (82)
- Emergency depts.	49	28 (57)	-	-
Did your agency require reporting				
- of hospitalized encephalitis cases of unknown etiology?	50	24 (48)	49	31 (63)
- of hospitalized meningitis cases of unknown etiology?	50	25 (50)	49	27 (55)
- from in-state laboratories?	49	49 (100)	48	32 (67)
In order to count a case of WNV as confirmed or probable, did your agency				
- require reference lab confirmation of commercial lab-positive specimens?	50	18 (36)	46	37 (80)
- use the CDC/CSTE NPHSS case definition?	50	44 (88)	49	43 (88)
Was end of the year surveillance done to identify unreported human WNV cases by				
- auditing hospital or commercial labs?	50	3 (6)	-	-
- reviewing hospital discharge data?	50	1 (2)	-	-
What was the median interval in days between:				
	N	**Median (range)**	**N**	**Median (range)**
- date WNV-positive human specimen collected and data reported to WNV surveillance program?	39	6 (1.5-17)	35	7 (2-28)
- date of onset of the case and date case reported to ArboNET?	34	16.5 (4-49)	28	16.5 (2-45)

Table S8a. Equine WNV surveillance and reporting in states, 2004 and 2012						
	2012			**2004**		
	Yes (%)	**No (%)**	**Unk (%)**	**Yes (%)**	**No (%)**	**Unk (%)**
System in place for reporting cases of equine neurologic disease to the state health department?	44 (88)	5 (10)	1 (2)	41 (84)	8 (16)	
If yes, were specimens submitted for diagnostic testing for:						
- WNV	37 (84)	6 (14)	1 (2)	38 (97)	1 (3)	
- other arboviruses	29 (66)	9 (21)	6 (14)	30 (77)	6 (15)	3 (8)
- rabies	39 (89)	2 (5)	3 (7)	35 (90)	2 (5)	2 (5)
Temporal-geographic clusters (2 or more cases) of equine neurologic disease						
	N	**Yes (%)**		**N**	**Yes (%)**	
Were clusters reported to your agency?	44	10 (23)		47	13 (28)	
If yes, how many?	10	4.3 (mean)		11	1.7 (mean)	
Did your program or any state agency investigate clusters to determine cause of illness?	10	5 (50)		13	6 (62)	
How many equine specimens were tested in the public health or other state-sponsored lab for:						
	N (states)	**Median # specimens**	**Range**	**N (states)**	**Median # specimens**	**Range**
- WNV	31	16	(0-1763)	44	12.5	(0-1423)
- other arboviruses	25	8	(0-332)	39	0	(0-263)
- rabies	37	14	(1-143)	42	14.5	(0-80)

Table S8b. Avian WNV surveillance and reporting in states, 2004 and 2012						
	2012			**2004**		
	N	**Yes (%)**		**N**	**Yes (%)**	
Maintain a database of dead bird sightings?	49	12 (24)		49	28 (57)	
If state maintained a database of dead bird sightings						
- were specimens submitted for WNV testing?	12	11 (92)		28	27 (93)	
- How many specimens tested?	9	56 (median # specimens)	5-4467 (range)			
What strategies did your agency use for collecting and testing dead birds?						
- Collected all dead birds in an area all season	12	3 (25)				
- Tested all dead birds in an area all season	12	3 (25)				
- Collected all in an area until first tests positive	12	1 (8)				
- Tested all in an area until the first tests positive	12	1 (8)				
- Collected all of specified species all season long	12	4 (33)				
- Tested all of specified species all season long	12	3 (25)				
- Collected all of specific species until first tests +	12	2 (17)				
- Tested all of specific species until first tests +	12	3 (25)				
What was the median interval in days between a bird being collected and testing positive?						
	N	**Median**	**Range**	**N**	**Median**	**Range**
	7	7	(4-9)	40	7	(1-30)

Table S9. Mosquito surveillance for WNV in states, 2012 and 2004								
	2012				**2004**			
	N	**Yes (%)**	**No (%)**		**N**	**Yes (%)**	**No (%)**	
Does the state collect information about mosquito surveillance in LHDs?								
	49	44 (88)	4 (8)		49	46 (94)	3 (6)	
If yes,								
	N	**Yes (%)**	**Unk (%)**		**N**	**Yes (%)**	**Unk (%)**	
Do most LHDs in your state conduct adult mosquito surveillance?	44	15 (34)	0		44	21 (48)	0	
Do most conduct larval mosquito surveillance?	44	8 (18)	0		44	13 (30)	0	
Do you receive reports with mosquito species identified or does your lab identify the species?	43	37 (86)	0		45	36 (80)	2 (4)	
Does your agency calculate minimal mosquito infection rates or receive such data?	44	18 (41)	0		44	25 (47)	1 (2)	
	N	**median**	**range**	**unk**	**N**	**Median**	**range**	**unk**
What % of the population in your state lives in an area covered by mosquito surveillance?								
	43	50	(6-100)	5 (12)	37	65	5-100	6 (16)
Number of trap-nights mosquitos collected								
	43	1071	(83-23,704)	22 (55)	35	2602	1-16,840	14 (40)

Table S10. Laboratory aspects of arboviral mosquito surveillance in states, 2012			
	N	**Yes (%)**	**No (%)**
What labs performed WNV testing on mosquito pools collected in your state?			
- State or state-funded lab	46	40 (87)	
- Local health department lab	46	12 (26)	
- Local mosquito control district	46	17 (37)	
- Mosquito surveillance done, but no testing	46	4 (9)	
Not applicable (no mosquito surveillance)	50	4 (8)	
For what viruses are mosquito pools routinely tested, in addition to WNV?			
- EEE	45	22 (49)	
- SLE	45	24 (53)	
- California serogroup	45	13 (29)	
- Other	45	13 (29)	
- Not applicable (no testing done)	45	11 (24)	
Did your state lab or another state-funded lab perform testing for WNV on mosquito pools in 2008?			
	50	42 (84)	8 (16)
Has the capacity of these labs to test mosquito pools diminished since 2008?			
	40	27 (68)	13 (33)
If yes, how has it affected the number of pools tested for WNV?			
- No longer test any pools	27	3 (11)	
- Test fewer pools than before	27	22 (81)	
- Other	27	4 (15)	
Which agencies in your state monitor for pesticide resistance in mosquitos?			
- State health dept. or other state agency	49	3 (6)	
- Local health agencies/districts	49	9 (18)	
- No monitoring done	49	33 (67)	
- Don't know	49	7 (14)	
Does your or another state agency conduct or fund sentinel chicken/bird surveillance for WNV and/or other arboviruses?			
	50	5 (10)	
If yes, for which viruses?			
- WNV	5	5 (100)	
- EEE	5	3 (60)	
- SLE	5	3 (60)	
- Other	5	0 (0)	

Table S11. WNV educational prevention activities in states, 2012 and 2004				
	2012		**2004**	
	N	**Yes (%)**	**N**	**Yes (%)**
Which of the following WNV prevention messages and activities did your program use and promote?				
- Use of DEET-based/other repellents	50	49 (98)	49	49 (100)
- Peri-residential source reduction	50	47 (94)	49	47 (96)
- Personal protection measures	50	48 (96)	49	49 (100)
- Notification of adulticiding activities	50	17 (34)	49	13 (27)
- Modification of messages for lower literacy and non-English speaking audiences	50	23 (46)	49	35 (71)
Which of the following methods did your program use to provide WNV prevention information in 2012?				
- Press releases to electronic and printed media	50	48 (96)	49	47 (96)
- Public service announcements	50	20 (40)	49	31 (63)
- Passive distribution of info brochures	50	40 (80)	49	44 (90)
- Active distribution of info brochures	50	24 (48)	49	37 (76)
- Town, community, neighborhood meetings	50	15 (30)	49	30 (61)
- Posting info on the home page of your agency website	50	45 (90)	49	48 (98)
- Door-to-door outreach in selected locations	50	11(22)	49	11 (22)
- Participation in community clean-ups	50	6 (12)	49	4 (8)

Table S12. Mosquito control activities in states, 2012				
Larviciding for WNV prevention	**N**	**Yes (%)**	**No (%)**	**Unk (%)**
Have you ever financially supported or conducted larviciding in local jurisdictions?	47	26 (55)	21 (45)	
Did your state conduct or financially support larviciding in at least some local jurisdictions in 2012?	48	15 (31)	32 (69)	
Might your state have supported larviciding in 2012 if it had sufficient funding?	47	25 (53)	9 (19)	13 (28)
Did any local jurisdiction conduct larviciding in 2012 using its own funding?	50	39 (78)	7 (14)	4 (8)
Adulticiding for WNV Prevention				
Does your state have a plan for WNV control that includes a threshold level of vector mosquito abundance/infection rate that would result in a recommendation for adulticiding? (N=48)				
Yes – have a threshold not requiring any human cases of WNV		14 (29)		
Yes – have a threshold that requires concurrent human cases		1 (2)		
No – have a plan but no threshold		13 (27)		
No – do not have a formal plan for adulticiding in response to WNV		20 (42)		
Does your state have an emergency fund or a specified emergency funding mechanism for adult mosquito control for WNV or other arboviruses?				
	49	13 (27)	36 (73)	
Has this funding mechanism been used to pay for adulticiding for WNV control?	12	7 (58)	5 (42)	
Has your state or a local jurisdiction in it ever done adulticiding for WNV control?				
	46	37 (80)	9 (20)	
If no, why not?				
- Never had a serious outbreak	9	5 (56)		
- Had threat that reached adulticiding threshold, but no funding	4	1 (25)		
- Had threat that reached adulticiding threshold, but no public support	4	1 (25)		
- Other	4	3 (75)		
Did your state conduct or provide support to LHDs in 2012 to conduct adulticiding for other mosquito-borne diseases?				
	48	5 (10)	43 (90)	
If yes, for which viruses?				
- EEE	5	4 (80)		
- Dengue	5	1 (20)		
- Other	5	0 (0)		
If no, would you have provided support if you had the funding?				
- Not applicable, no outbreak threat	43	16 (37)		
- Yes, outbreak threat but insufficient funding	27	7 (26)		
Aedes aegypti				

Is there a record of Ae aegypti mosquitoes being found in your state in the past 5 years?	50	18 (36)	29 (58)	3 (6)
If yes, do you have a written dengue surveillance and control plan should it be detected (again)?	18	5 (28)	13 (72)	

Table S13. WNV laboratory testing capabilities in state labs, 2012 (N=46) and 2004 (N=47)

Percentage labs doing this test for a particular source

	IgM ELISA	**IgG ELISA**	**PRNT**	**Culture**	**PCR**	**Vec Test**	**RAMP**
Human							
2012	93	48	22	2	13		
2004	100	72	21	19	49		
Equine							
2012	26	11	9	9	30		
2004	57	23	13	19	45		
Avian							
2012	9	4	0	4	39	0	4
2004	9	2	6	13	77	7	
Sentinel							
2012	11	9	4	2	2		
2004	28	9	6	4	6		
Mosquito							
2012				13	72	7	11
2004				23	79	21	

	2012		**2004**	
	N	**Yes (%)**	**N**	**Yes (%)**
If your lab uses a PRNT test, how is it used?				
- All positive ELISAs	11	7 (64)	14	7 (50)
- Early season and any unusual ELISAs	11	1 (9)	14	3 (21)
- Only on equivocal ELISAs	11	3 (27)	14	4 (29)
If PRNT is not performed at your lab, where is it performed?				
- CDC	35	26 (74)	36	23 (64)
- Another state's public health lab	35	1 (3)	36	4 (11)
- ELISA positives are not confirmed by PRNT	35	9 (26)	36	9 (25)

Table S14. Arboviral laboratory testing capacity and experience in states, 2012

	N	Yes (%)
Does your state have at least some WNV testing capacity and/or contract with a lab for arboviral testing services?		
- Yes, have own testing capacity	50	46 (92)
- Yes, contract with another lab	50	2 (4)
- No, depend on another state's or regional or CDC lab	50	4 (8)
Were all CSF specimens tested for WNV in the state lab also routinely tested for one or more other arboviruses?	43	26 (60)
If yes, which arboviruses?		
- EEE	26	12 (46)
- SLE	26	24 (92)
- WEE	26	6 (23)
- LaCrosse	26	5 (19)
- Powassan	26	2 (8)
- Other	26	4 (15)
Is additional training necessary for your lab staff to test for WNV and/or other arboviruses?	43	12 (28)

For each of the following arboviruses, does your lab perform any testing and if so, what was the total number of CSF and/or serologic specimens tested for infection your lab in 2012 and how many were positive?

Arbovirus	Perform testing		Number tested		Number Positive	
	Yes	No				
	N (%)	N (%)	# respon-dents	Total tests	# respon-dents	Total positive
Chikungunya	2 (5)	37 (95)	1	12	1	0
Colorado tick fever	2 (5)	37 (95)	2	139	2	2
Dengue	9 (23)	31 (78)	8	328	7	137
EEE	24 (59)	17 (41)	18	4,766	16	23
Japanese encephalitis	1 (3)	38 (97)	0	-	0	-
LaCrosse	16 (42)	22 (58)	14	3,372	12	120
Powassan	4 (11)	34 (89)	3	1,257	2	61
SLE	34 (79)	9 (21)	28	8,216	27	167
WEE	16 (39)	25 (61)	14	3,888	9	1
West Nile virus	45 (100)	0 (0)	39	19,178	38	2,795
Yellow fever	2 (5)	37 (95)	2	2	1	2
Other	2 (8)	22 (92)	2	1	1	0

Table S15. Types of diagnostic tests for arboviruses and number of laboratories with specific diagnostic testing capacity for human specimens in 2012 (N=46 state labs)

	ELISA		MIA		IFA			
Virus	**IgM***	**IgG***	**IgM**	**IgG**	**IgM**	**IgG**	**PRNT***	**PCR***
California serogroup†	8	2	0	0	11	8	4	8
Chikungunya	1	1	0	0	1	2	2	1
Colorado tick fever	1	1	0	0	1	2	2	1
Dengue	7	5	0	0	1	2	2	10
Eastern equine encephalitis	8	4	5	0	10	8	5	14
Japanese encephalitis	1	1	0	0	0	1	1	1
Powassan	2	2	1	1	0	1	2	2
St. Louis encephalitis	13	7	18	2	9	8	10	15
Western equine encephalitis	3	3	0	1	10	8	4	7
West Nile	32	24	18	2	2	3	9	26
Yellow fever	2	1	0	0	0	1	2	2

*IgM=Immunoglobin M; IgG=Immunoglobulin G; PRNT=plaque reduction neutralization test; PCR=polymerase chain reaction

Table S16. Relationship of ELC WNV funding to selected surveillance capacities in states, 2012 and 2004				
Has ELC funding for WNV enhanced your agency's capacity to conduct surveillance for other vector-borne diseases?				
	2012		**2004**	
	N	**Yes (%)**	**N**	**Yes (%)**
Other mosquito-borne disease	44	41 (93)	47	46 (98)
Tick-borne disease	43	25 (58)	43	16(37)
Flea-borne disease	40	6 (15)	41	7 (17)
How have you managed reductions to ELC funding for WNV surveillance in the past 5 years?				
	N	**Yes (%)**	**No (%)**	**NA**
Eliminated dead bird surveillance	49	28 (57)	15 (31)	6 (12)
Reduced dead bird surveillance	49	15 (31)	17 (35)	17 (35)
Decreased number of mosquito trap sites	50	29 (58)	15 (30)	6 (12)
Decreased number of mosquito pools tested	50	34 (68)	12 (24)	4 (8)
Decreased number of WNV tests performed on human specimens	48	22 (46)	24 (50)	2 (4)
Other		11		

Tables ELC1-16: ELC-supported city/county health department 2012 data, comparison with 2004 where possible

Table ELC1. Number of WNV surveillance staff in ELC-supported LHDs with specified levels of training, regardless of funding source, 2012 and 2004						
Year	**LHD employees**			**Contracted employees**		
	1.0FTE	**0.5-0.99 FTE**	**<0.5 FTE**	**1.0FTE**	**0.5-0.99 FTE**	**<0.5 FTE**
Number of staff with DVM, MD/DO, RN or other clinical degrees						
2012	3	2	4	0	0	0
2004	1	2	3	0	0	0
Number of staff with PhD, DrPH, MSPH, MPH degrees in epidemiology						
2012	1	6	5	1	0	0
2004	3	4	9	0	0	0
Number of staff with PhD or Master's degree in related sciences						
2012	6	1	4	0	0	1
2004	10	1	0	0	0	0
Number of other staff in clerical, administrative or other programmatic categories						
2012	2	6	11	0	1	5
2004	11	2	26	0	0	0

Table ELC2. Number of ELC-supported LHDs with WNV surveillance staff with specified levels of training, funded by non-CDC sources, and median number of such staff, 2012 (N=6)						
	LHD employees			**Contracted employees**		
	1.0FTE	**0.5-0.99 FTE**	**<0.5 FTE**	**1.0FTE**	**0.5-0.99 FTE**	**<0.5 FTE**
Number of ELC-supported LHDs with staff with DVM, MD/DO, RN or other clinical degrees						
No. (%)	1	1	2	0	0	0
Median # staff	1	1	4	-	-	-
Number of ELC-supported LHDs with staff with PhD, DrPH, MSPH, MPH degrees in epidemiology						
No. (%)	1	4	1	0	0	0
Median # staff	1	1.5	1	-	-	-
Number of ELC-supported LHDs with staff with PhD or Master's degree in related sciences						
No. (%)	1	1	2	0	0	1
Median # staff	2	1	2	0	0	1
Number of ELC-supported LHDs with staff in clerical, administrative or other programmatic categories						
No. (%)	2	1	4	0	1	1
Median # staff	1	5	1	-	1	5

Table ELC3. Number of WNV surveillance staff in ELC-supported LHDs with specified levels of training, by funding source, 2012 (N=6)						
Year	**State employees**			**Contracted employees**		
	1.0FTE	**0.5-0.99 FTE**	**<0.5 FTE**	**1.0FTE**	**0.5-0.99 FTE**	**<0.5 FTE**
Number of staff with DVM, MD/DO, RN or other clinical degrees						
CDC grants	2	1	0	-	-	-
Other	1	1	4	-	-	-
Total	3	2	4	0	0	0
Number of staff with PhD, DrPH, MSPH, MPH degrees in epidemiology						
CDC grants	0	0	4	1	-	-
Other	1	6	1	0	-	-
Total	1	6	5	1	0	0
Number of staff with PhD or Master's degree in related sciences						
CDC grants	4	0	0	-	-	0
Other	2	1	4	-	-	1
Total	6	1	4	-	-	1
Number of staff in clerical, administrative or other programmatic categories						
CDC grants	0	1	0	-	0	0
Other	2	5	11	-	1	5
Total	2	6	11	-	1	5

Table ELC4. Number of FTE positions in ELC-supported LHDs for WNV surveillance by functional role and need for additional ones (N=6)

	Number of FTE epidemiologists			Number of FTE laboratory staff			Number of FTE mosquito/other environmental surveillance staff			Number of FTE other surveillance/ clerical/ administrative staff		
	N*	Total staff	Average	N*	Total staff	Average	N*	Total staff	Average	N*	Total staff	Average
Current total	6	6.9	1.2	4	1.9	0.5	6	15.6	2.6	6	3.5	0.6
Current, LHDs with no further need	2	2.1	1.1	0	0	0	3	2.8	0.9	4	2.1	0.5
Current, LHD with further need	4	4.8	1.2	4	1.9	0.5	3	12.9	4.3	2	1.4	0.7
Additional needed	4	3	0.8	4	3	0.8	3	7	2.3	2	2.0	1.0
LHD with further need if need met	4	7.8	2.0	4	4.9	1.2	3	19.9	6.6	2	3.4	1.7
All ELC-LHDs if need met	6	9.9	1.7	4	4.9	1.2	6	22.6	3.8	6	5.5	0.9

Table ELC5. Specialists working for ELC-supported LHDs, 2012 and 2004

Does your LHD have adequate access to:	2012		In 2004	
	N	Yes (%)	N	Yes (%)
Medical entomologist within public health agency	6	3 (50)	6	5 (83)
Medical entomologist through contract with another local agency	6	3 (50)	4	1 (25)
Expertise in wildlife biology within a city/county agency	6	3 (50)	6	4 (67)
Designated state public health veterinarian within your agency	6	3 (50)	6	4 (67)

Table ELC6. Number and percentage of ELC-supported LHDs with selected surveillance systems for WNV, their duration and whether have an active component, 2012 and 2004

	N	Conduct local-level surveillance Yes (%)	Median duration (months)	Range (months)	Percentage Active component
Human disease					
2012	6	6 (100)	12	3-13	33%
2004	6	6 (100)	Mean 10.8		83
Equine disease					
2012	5	1 (20)	12	12	0
2004	6	3 (50)	Mean 6.3		25
Avian mortality					
2012	6	4 (67)	9	6-12	100%
2004	6	6 (100)	Mean 8.2		17
Mosquito surveillance					
2012	6	6 (100)	7	3-12	
2004	6	5 (83)???	Mean 9.8	-	

Table ELC7. Human WNV surveillance and reporting in ELC-supported LHDs, 2012 and 2004				
	2012		**2004**	
	N	**Yes (%)**	**N**	**Yes (%)**
To encourage reporting and to suggest a high index of suspicion for arboviral encephalitis, did your agency contact				
- neurologists	6	5 (83)	6	6 (100)
- critical care specialists	6	5 (83)	6	6 (100)
- ID specialists	6	6 (100)	6	6 (100)
- Emergency depts.	6	6 (100)	-	-
Did your agency (or state through your agency) require reporting				
- of hospitalized encephalitis cases of unknown etiology?	6	4 (67)	6	6 (100)
- of hospitalized meningitis cases of unknown etiology?	6	4 (67)	6	6 (100)
- from in-state laboratories?	6	6 (100)	5	5 (100)
In order to count a case of WNV a confirmed or probable, did your agency				
- require reference lab confirmation of commercial lab-positive specimens?	6	4 (67)	6	5 (83)
- use the CDC/CSTE NPHSS case definition?	6	5 (83)	6	4 (67)
Was end of the year surveillance done to identify unreported human WNV cases by				
- auditing hospital or commercial labs?	6	0	-	-
- reviewing hospital discharge data?	6	0	-	-
What was the median interval in days between:				
	N	**Median (range)**	**N**	**Median (range)**
- date WNV-positive human specimen collected and data reported to WNV surveillance program?	6	8.5 (5-13)	6	5.5 (3-14)

Table ELC8a. Equine WNV surveillance and reporting in ELC-supported LHDs, 2004 and 2012						
	2012			**2004**		
	Yes (%)	**No (%)**	**Unk (%)**	**Yes (%)**	**No (%)**	**Unk (%)**
System in place for reporting cases of equine neurologic disease to the state health department?	2 (33)	4 (67)		2 (33)	4 (67)	
If yes, were specimens submitted for diagnostic testing for:						
- WNV	0	1 (50)	1 (50)	1 (50)	1 (50)	0
- other arboviruses	0	1 (50)	1 (50)	0	2 (100)	0
- rabies	1 (50)	0	1 (50)	0	2 (100)	0
Temporal-geographic clusters (2 or more cases) of equine neurologic disease						
	N	**Yes (%)**		**N**	**Yes (%)**	
Were clusters reported to your agency?	3	0		4	0	
How many equine specimens were tested in the city/county public health, state or other contracted lab for:						
	N (states)	**Median # specimens**	**Range**	**N (states)**	**Median # specimens**	**Range**
- WNV	1	1	1			
- other arboviruses	0	-	-			
- rabies	1	1	1			

Table ELC8b. Avian WNV surveillance and reporting in ELC-supported LHDs, 2004 and 2012						
	2012			**2004**		
	N	**Yes (%)**		**N**	**Yes (%)**	
Maintain a database of dead bird sightings?	6	3 (50)		6	4 (67)	
If maintained a database of dead bird sightings						
- Were specimens submitted for WNV testing?	3	3 (100)		4	4 (100)	
- How many specimens tested?	3	25 (median)	5-265 (range)			
What strategies did your agency use for collecting and testing dead birds?						
- Collected all dead birds in an area all season	3	1 (33)				
- Tested all dead birds in an area all season	3	1 (33)				
- Collected all in an area until first tests positive	3	0				
- Tested all in an area until the first tests positive	3	0				
- Collected all of specified species all season long	3	0				
- Tested all of specified species all season long	3	1 (33)				
- Collected all of specific species until first tests +	3	0				
- Tested all of specific species until first tests +	3	0				
What was the median interval in days between a bird being collected and testing positive?						
	N	**Median**	**Range**	**N**	**Median**	**Range**
	3	7	(7-30)	5	14	(7-30)

Table ELC9. Mosquito surveillance for WNV in ELC-supported LHDs, 2012 and 2004								
	2012				**2004**			
	N	**Yes (%)**	**No (%)**		**N**	**Yes (%)**	**No (%)**	
Collect information for mosquito surveillance?								
	4	4 (100)	0		6	4 (67)	2 (33)	
If yes,								
	N	**Yes (%)**	**Unk (%)**		**N**	**Yes (%)**	**Unk (%)**	
Does your LHD or other local agency conduct adult mosquito surveillance?	3	3 (100)	0		4	4 (100)	0	
Does your LHD or other local agency conduct larval mosquito surveillance?	3	2 (67)	0		4	4 (100)	0	
Are trapped mosquitoes identified to species?	6	5 (83)	0		4	4 (100)	0	
Does your agency calculate minimal mosquito infection rates or receive such data?	6	5 (83)	0		4	3 (75)	0	
Do you trap at fixed sites most of the WNV season?	3	3 (100)	0					
If yes, how often was trapping done at most of these sites in 2012?								
- every 7 days	3	1 (33)						
- every 14 days	3	0						
- other	3	2 (67)						
	N	**median**	**range**	**unk**	**N**	**Median**	**range**	**unk**
What % of the population in your jurisdiction lives in an area covered by mosquito surveillance?								
	3	100	100-100	-	3	100	100	0
Number of trap-nights adult mosquitos collected								
	3	300 (mean)	3-820	-	3	4632 (mean)	?	0

Table ELC10. Laboratory aspects of arboviral mosquito surveillance in ELC-supported LHDs, 2012			
	N	**Yes (%)**	**No (%)**
What lab performed WNV testing on mosquito pools collected in your jurisdiction?			
- City/county health-dept. lab	6	4 (67)	
- Local mosquito control district lab	6	0	
- State health or other state agency lab	6	2 (33)	
- Mosquito surveillance done, but no testing	6	0	
Not applicable (no mosquito surveillance)	6	0	
For what viruses are mosquito pools routinely tested in addition to WNV?			
- EEE	6	0	
- SLE	6	2 (33)	
- California serogroup	6	0	
- Other	6	1 (17)	
- Not applicable (no testing done)	6	0	
Did your local public health lab or another locally-funded lab perform testing for WNV on mosquito pools in 2008?			
	5	4 (80)	1 (20)
If yes, has the capacity of these labs to test mosquito pools diminished since 2008?			
	3	1 (33)	2 (67)
If yes, how has it affected the number of pools tested for WNV?			
- No longer test any pools	1	0	
- Test fewer pools than before	1	1 (100)	
- Other	1	0	
Does your agency map larval breeding sites?	6	3 (50)	
Does your agency evaluate adult mosquito control using caged mosquitoes in sprayed areas?	6	1 (17)	
Does your or another local agency monitor for pesticide resistance in mosquitos?	6	1 (17)	

Table ELC11. WNV educational prevention activities in ELC-supported LHDs, 2012 and 2004				
	2012		2004	
	N	Yes (%)	N	Yes (%)
Which of the following WNV prevention messages and activities did your program use and promote?				
- Use of DEET-based/other repellents	6	6 (100)	6	6 (100)
- Peri-residential source reduction	6	6 (100)	6	6 (100)
- Personal protection measures	6	6 (100)	6	6 (100)
- Notification of adulticiding activities	6	4 (67)	6	5 (83)
- Modification of messages for lower literacy and non-English speaking audiences	6	6 (100)	6	5 (83)
Which of the following methods did your program use to provide WNV prevention information in 2012?				
- Press releases to electronic and printed media	6	6 (100)	6	6 (100)
- Public service announcements	6	4 (67)	6	4 (67)
- Passive distribution of info brochures	6	5 (83)	6	5 (83)
- Active distribution of info brochures	6	5 (83)	6	6 (100)
- Town, community, neighborhood meetings	6	4 (67)	6	6 (100)
- Posting info on the home page of your agency website	6	6 (100)	6	6 (100)
- Door-to-door outreach in selected locations	6	3 (50)	6	3 (50)
- Participation in community clean-ups	6	2 (33)	6	3 (50)

Table ELC12. Mosquito control activities in ELC-supported LHDs, 2012				
Larviciding for WNV prevention	**N**	**Yes (%)**	**No (%)**	**Unk (%)**
Has your city/county ever financially supported or conducted larviciding to prevent WNV in your jurisdiction?	5	4 (80)		
Did your city/county conduct or financially support larviciding in at least some locations in 2012?	5	3 (60)		
Might your city/county have supported larviciding in 2012 if it had sufficient funding?	5	3 (60)		
Adulticiding for WNV Prevention				
Does your city/county have a plan for WNV control that includes a threshold level of vector mosquito abundance/infection rate that would result in a recommendation for adulticiding?				
No – no local plan, defer to state plan		1 (20)		
Yes – have a threshold not requiring any human cases of WNV		4 (80)		
Yes – have a threshold that requires concurrent human cases		0		
No – have a plan but no threshold		0		
No – do not have a formal plan for adulticiding in response to WNV		0		
Does your jurisdiction have an emergency fund or a specified emergency funding mechanism for adult mosquito control for WNV or other arboviruses?				
	5	2 (40)	3 (60)	
Has this funding mechanism been used to pay for adulticiding for WNV control?	2	1 (50)	1 (50)	
Has your jurisdiction ever done adulticiding for WNV control?				
	6	5 (83)	1 (17)	
If no, why not?				
- never had a serious outbreak	1	0		
- had threat that reached adulticiding threshold, but no funding	1	0		
- had threat that reached adulticiding threshold, but no public support	1	0		
- Other	1	1		
Did your city/county conduct adulticiding for other mosquito-borne diseases in 2012?				
	5	0	5 (100)	
If no, would you have provided support if you had the funding?				
- Not applicable, no outbreak threat	5	3 (60)		
- Yes, outbreak threat but insufficient funding	5	1 (20)		
Aedes aegypti				
Is there a record of Ae aegypti mosquitoes being found in your jurisdiction in the past 5 years?	6	3 (50)	2 (33)	1 (17)
If yes, do you have a written dengue	3	0		

surveillance and control plan should it be detected (again)?					

Table ELC13. (Q30) WNV laboratory testing capabilities in ELC-supported labs, 2012 (N=4) and 2004 (N=6)							
Percentage labs doing this test for a particular source							
	IgM ELISA	**IgG ELISA**	**PRNT**	**Culture**	**PCR**	**Vec Test**	**RAMP**
Human							
2012	2 (50)	2 (50)	1 (25)	1 (25)	2 (50)		
2004	6 (100)	4 (67)	1 (17)	2 (33)	5 (83)		
Equine							
2012	0	0	0	0	0		
2004	2 (33)	0	0	1 (17)	1 (17)		
Avian							
2012	0	0	0	0	0	0	0
2004	0	0	0	0	3 (50)	2 (33)	
Sentinel							
2012	0	0	0	0	0		
2004	1 (17)	0	0	0	0		
Mosquito							
2012				0	1 (25)	0	0
2004				0	3 (50)	0	

	2012		**2004**	
	N	**Yes (%)**	**N**	**Yes (%)**
If your lab uses a PRNT test, how is it used?				
- all positive ELISAs	2	1 (50)	2	1 (50)
- early season and any unusual ELISAs	2	1 (50)	2	1 (50)
- only on equivocal ELISAs	2	0 (0)	2	0 (0)
If PRNT is not performed at your lab, where is it performed?				
- CDC	3	1 (33)	5	3 (60)
- Another state's public health lab	3	2 (67)	5	2 (40)
- ELISA positives are not confirmed by PRNT	3	0	5	0

Table ELC14. Arboviral laboratory testing capacity and experience in ELC-supported LHDs, 2012

	N	Yes (%)
Does your city/county have at least some WNV testing capacity and/or do you contract with a lab for arboviral testing services?		
- Yes, have own testing capacity	6	4 (67)
- Yes, contract with another lab	6	0
- No, depend on the state lab	6	2 (33)
- No, depend on another lab	6	0
Were all CSF specimens tested for WNV in the city/county lab also routinely tested for one or more other arboviruses?	4	1 (25)
If yes, which arboviruses?		
- EEE	1	0
- SLE	1	1
- WEE	1	0
- LaCrosse	1	0
- Powassan	1	0
- Other	1	0
Is additional training necessary for your lab staff to test for WNV and/or other arboviruses?	3	0

For each of the following arboviruses, does your lab perform any testing and if so, what was the total number of CSF and/or serologic specimens tested for infection your lab in 2012 and how many were positive?

Arbovirus	Perform testing		Number tested		Number Positive	
	Yes	No				
	N (%)	N (%)	# respon-dents	Total tested	# respon-dents	Total positive
Chikungunya			3	0	-	-
Colorado tick fever			3	0	-	-
Dengue			3	3	1	2
EEE			3	0		
Japanese encephalitis			3	0		
LaCrosse			3	0		
Powassan			3	0		
SLE			3	437	2	4
WEE			3	6	1	0
West Nile virus			3	582	2	161
Yellow fever			3	0	-	-
Other			2	0	-	-

Table ELC15. Types of diagnostic tests for arboviruses and number of LHD laboratories with specific diagnostic testing capacity for human specimens in 2012* (N=4 ELC-supported city/county laboratories)

	ELISA		MIA		IFA			
Virus	**IgM***	**IgG***	**IgM**	**IgG**	**IgM**	**IgG**	**PRNT***	**PCR***
California serogroup†	0	0	0	0	0	0	0	0
Chikungunya	0	0	0	0	0	0	0	0
Colorado tick fever	0	0	0	0	0	0	0	0
Dengue	1	1	0	0	1	1	1	3
Eastern equine encephalitis	1	1	0	0	0	0	1	1
Japanese encephalitis	0	0	0	0	0	0	0	0
Powassan	0	0	0	0	0	0	0	0
St. Louis encephalitis	1	1	1	0	1	1	1	1
Western equine encephalitis	0	0	0	0	1	1	0	0
West Nile	3	3	1	0	2	2	1	3
Yellow fever	0	0	0	0	0	0	0	0

†Such as La Crosse or Jamestown Canyon viruses

ELISA = Enzyme-linked immunosorbant assay
MIA = Microsphere immunoassay
IFA = Indirect immunoflourescent assay
PRNT = Plaque reduction neutralization test
PCR = Polymerase chain reaction
IgM = Immunoglobulin M
* IgM=Immunoglobin M; IgG=Immunoglobin G; PRNT=plaque reduction neutralization; PCR=polymerase chain reaction

Table ELC16. Relationship of ELC WNV funding to selected surveillance capacities in ELC-funded LHDs, 2012 and 2004				
Has ELC funding for WNV enhanced your agency's capacity to conduct surveillance for other vector-borne diseases?				
	2012		**2004**	
	N	**Yes* (%)**	**N**	**Yes (%)**
Other mosquito-borne disease	6	6 (100)	6	6 (100)
Tick-borne disease	6	4 (67)	6	1 (17)
Flea-borne disease	6	2 (33)	6	1 (17)
How have you managed reductions to ELC funding for WNV surveillance in the past 5 years?				
	N	**Yes (%)**	**No (%)**	**NA**
Eliminated dead bird surveillance	6	2 (50)	2 (50)	2
Reduced dead bird surveillance	6	2 (50)	1 (25)	2
Decreased number of mosquito trap sites	6	3 (75)	1 (25)	2
Decreased number of mosquito pools tested	6	1 (25)	3 (75)	2
Decreased number of WNV tests performed on human specimens	6	1 (20)	4 (80)	1
Other	6	0		

* Yes includes "highly," "substantially," "some" and "a little."

Tables LHD 1-16: Big city/county LHD data, comparison of ELC vs. non-ELC-funded LHDs

Table LHD1. Number and percentage of ELC- (N=6) vs. non-ELC-funded LHDs (N=15) with WNV surveillance staff with specified levels of training, regardless of funding source,

Year	LHD employees			Contracted employees		
	1.0FTE	0.5-0.99 FTE	<0.5 FTE	1.0FTE	0.5-0.99 FTE	<0.5 FTE
N (%) LHDs with staff with DVM, MD/DO, RN or other clinical degrees						
ELC	2 (33)	2 (33)	2 (33)	0	0	0
Non-ELC	2 (13)	3 (20)	3 (20	0	0	0
N (%) LHDs with staff with PhD, DrPH, MSPH, MPH degrees in epidemiology						
ELC	1 (17)	2 (33)	2 (33)	1 (17)	0	0
Non-ELC	6 (40)	1 (7)	4 (27)	0 (0)	0	0
N (%) LHDs with staff with PhD or Master's degree in related sciences						
ELC	2 (33)	0 (0)	2 (33)	0	0	1 (17)
Non-ELC	5 (33)	2 (13)	2 (13)	0	0	0
N (%) of LHDs with staff in clerical, administrative or other programmatic categories						
ELC	2 (33)	2 (33)	3 (50)	0	1 (17)	1 (17)
Non-ELC	6 (40)	2 (13)	6 (40)	0	0	0

Table LHD2. Number and percentage of ELC- (N=6) and non-ELC-funded (N=15) LHDs with WNV surveillance staff with specified levels of training, funded by non-CDC sources, and median number of such staff, 2012

	Employees of ELC-funded LHD			**Employees of non-ELC-funded LHD**		
	1.0FTE	**0.5-0.99 FTE**	**<0.5 FTE**	**1.0FTE**	**0.5-0.99 FTE**	**<0.5 FTE**
N (%) LHDs with staff with DVM, MD/DO, RN or other clinical degrees						
No. (%)	1 (17)	1 (17)	2 (33)	2 (13)	1 (7)	1 (7)
Median # staff	1	1	4	1.1	1	2
N (%) LHDs with staff with PhD, DrPH, MSPH, MPH degrees in epidemiology						
No. (%)	1 (17)	4 (67)	1 (7)	6 (40)	0 (0)	3 (20)
Median # staff	1	1.5	1	1.5	1	2.5
N (%) of LHDs with staff with PhD or Master's degree in related sciences						
No. (%)	1 (17)	1 (17)	2 (33)	6 (40)	1 (7)	2 (13)
Median # staff	2	1	2	1	1	2.5
N (%) of LHDs with staff in clerical, administrative or other programmatic categories						
No. (%)	2 (33)	1 (17)	4 (67)	5 (33)	1 (7)	5 (33)
Median # staff	1	5	1	6	4	1

Table LHD3. Number of WNV surveillance staff in ELC-funded and non-ELC-funded LHDs with specified levels of training, by funding source, 2012 (N=6 and N=15 respectively)

Year	LHDs with ELC funding			LHDs without ELC funding		
	1.0FTE	0.5-0.99 FTE	<0.5 FTE	1.0FTE	0.5-0.99 FTE	<0.5 FTE
Number of staff with DVM, MD/DO, RN or other clinical degrees						
CDC grants	2	1	0	1.9	5	3
Other	1	1	4	2.1	1	2
Total	3	2	4	4	6	5
Number of staff with PhD, DrPH, MSPH, MPH degrees in epidemiology						
CDC grants	1	?	4	5.9	2	2
Other	1	6	1	12.1	0	5
Total	2	3	5	18	2	7
Number of staff with PhD or Master's degree in related sciences						
CDC grants	4	0	0	0	1	0
Other	2	1	5	9	1	5
Total	6	1	5	9	2	5
Number of staff in clerical, administrative or other programmatic categories						
CDC grants	0	1	0	1	1	1
Other	2	6	16	5	1	5
Total	2	7	16	6	2	6

Table LHD4. Number of FTE positions in ELC-funded and non-ELC-funded LHDs for WNV surveillance by functional role and need for additional positions (N=6 and 15, respectively)

	Number of FTE epidemiologists			Number of FTE laboratory staff			Number of FTE mosquito/other environmental surveillance staff			Number of FTE other surveillance/ clerical/ administrative staff		
	N	Total staff	Average	N*	Total staff	Average	N*	Total staff	Average	N	Total staff	Average
ELC-funded Current	6	6.9	1.2	6	1.9	0.5	6	15.6	2.6	6	3.5	0.6
Additional needed	4	3	0.8	4	3	0.8	3	7	2.3	2	2	1.0
Optimal staffing	6	9.9	1.7	4	4.9	1.2	6	21.6	3.6	6	5.5	0.9
Non-ELC Current	15	25.9	1.7	3	5.5	1.8	10	78.3	5.2	15	31.3	2.1
Additional needed	4	3.2	0.8	4	4.5	1.1	8	29.3	3.7	6	12.2	2.3
Optimal staffing	15	29.1	1.9	3	10.0	3.3	10	107.6	7.2	15	43.5	2.9

* N = number LHDs with laboratories or mosquito control programs

Table LHD5. Specialists working for ELC-supported and nonELC LHDs, 2012

Does your LHD have adequate access to:	ELC-funded LHDs		Non-ELC-funded LHDs	
	N	Yes (%)	N	Yes (%)
Medical entomologist within public health agency	6	3 (50)	14	4 (29)
Medical entomologist through contract with another local agency	6	3 (50)	13	4 (31)
Expertise in wildlife biology within a city/county agency	6	3 (50)	15	3 (20)
Designated state public health veterinarian within your agency	6	3 (50)	15	5 (33)

Table LHD6. Number and percentage of ELC-funded and non-ELC-funded LHDs with selected surveillance systems for WNV, their duration and whether have an active component, 2012

	N	Conduct local-level surveillance Yes (%)	Median duration (months)	Range (months)	Percentage Active component
Human disease					
ELC	6	6 (100)	12	3-13	33
Non-ELC	15	0 (0)	12	4-12	53
Equine disease					
ELC	5	1 (20)	12	12	0
Non-ELC	14	2 (14)	12	12-12	17
Avian mortality					
ELC	6	4 (67)	9	6-12	100%
Non-ELC	15	3 (20)	12 (80)	12	5-12
Mosquito surveillance					
ELC	6	6 (100)	7	3-12	-
Non-ELC	15	10 (67)	8.5	3-12	-

Table LHD7. Human WNV surveillance and reporting in ELC-funded and non-ELC-funded LHDs, 2012				
	ELC-funded LHDs		**Non-ELC-funded LHDs**	
	N	**Yes (%)**	**N**	**Yes (%)**
To encourage reporting and to suggest a high index of suspicion for arboviral encephalitis, did your agency contact				
- neurologists	6	5 (83)	15	5 (33)
- critical care specialists	6	5 (83)	15	7 (47)
- ID specialists	6	6 (100)	15	7 (47)
- Emergency depts.	6	6 (100)	15	8 (53)
Did your agency (or state through your agency) require reporting				
- of hospitalized encephalitis cases of unknown etiology?	6	4 (67)	15	7 (47)
- of hospitalized meningitis cases of unknown etiology?	6	4 (67)	14	9 (64)
- from in-state laboratories?	6	6 (100)	15	13 (87)
In order to count a case of WNV a confirmed or probable, did your agency				
- require reference lab confirmation of commercial lab-positive specimens?	6	4 (67)	14	8 (57)
- use the CDC/CSTE NPHSS case definition?	6	5 (83)	14	11 (79)
Was end of the year surveillance done to identify unreported human WNV cases by				
- auditing hospital or commercial labs?	6	0	15	1 (7)
- reviewing hospital discharge data?	6	0	15	1 (7)
What was the median interval in days between:				
	N	**Median (range)**	**N**	**Median (range)**
- date WNV-positive human specimen collected and data reported to WNV surveillance program?	6	8.5 (5-13)	13	7 (0-14)

Table LHD8a. Equine WNV surveillance and reporting in ELC-funded and non-ELC-funded LHDs, 2012						
	ELC-funded LHDs			**Non-ELC-funded LHDs**		
	Yes (%)	**No (%)**	**Unk (%)**	**Yes (%)**	**No (%)**	**Unk (%)**
System in place for reporting cases of equine neurologic disease to the state health department?	2 (33)	4 (67)	2 (33)	4 (31)	9 (69)	
If yes, were specimens submitted for diagnostic testing for:						
- WNV	0	1 (50)	1 (50)	3 (75)	0	1 (25)
- other arboviruses	0	1 (50)	1 (50)	2 (50)	1 (25)	1 (25)
- rabies	1 (50)	0	1 (50)	3 (75)	1 (25)	0
Temporal-geographic clusters (2 or more cases) of equine neurologic disease						
	N	**Yes (%)**		**N**	**Yes (%)**	
Were clusters reported to your agency?	3	0		4	1 (25)	
How many equine specimens were tested in the city/county public health, state or other contracted lab for:						
	N (states)	**Median # specimens**	**Range**	**N (states)**	**Median # specimens**	**Range**
- WNV	1	1	1	3	11	0-13
- other arboviruses	0	-	-	3	0	0-11
- rabies	1	1	1	2	2	0-4

Table LHDS8b. Avian WNV surveillance and reporting in ELC-funded and non-ELC-funded LHDs, 2012						
	ELC-funded LHDs			**Non-ELC-funded LHDs**		
	N	**Yes (%)**		**N**	**Yes (%)**	
Maintain a database of dead bird sightings?	6	3 (50)		15	2 (13)	
If maintained a database of dead bird sightings						
- were specimens submitted for WNV testing?	3	3 (100)		2	2 (100)	
- How many specimens tested?	3	25	5-265	2	16	5-27
What strategies did your agency use for collecting and testing dead birds?						
- Collected all dead birds in an area all season	3	1 (33)		2	2 (100)	
- Tested all dead birds in an area all season	3	1 (33)		2	2 (100)	
- Collected all in an area until first tests positive	3	0		2	0	
- Tested all in an area until the first tests positive	3	0		2	0	
- Collected all of specified species all season long	3	0		2	0	
- Tested all of specified species all season long	3	1 (33)		2	0	
- Collected all of specific species until first tests +	3	0		2	0	
- Tested all of specific species until first tests +	3	0		2	0	
What was the median interval in days between a bird being collected and testing positive?						
	N	**Median**	**Range**	**N**	**Median**	**Range**
	3	7	(7-30)	1	1	1

Table LHD9. Mosquito surveillance for WNV in ELC-funded and non-ELC-funded LHDs, 2012								
	ELC-funded LHDs				**Non-ELC-funded LHDs**			
	N	**Yes (%)**	**No (%)**		**N**	**Yes (%)**	**No (%)**	
Collect information for mosquito surveillance?								
	4	4 (100)	0		15	10 (67)	5 (33)	
If yes,								
	N	**Yes (%)**	**Unk (%)**		**N**	**Yes (%)**	**Unk (%)**	
Does your LHD or other local agency conduct adult mosquito surveillance?	3	3 (100)	0		10	10 (100)	0	
Does your LHD or other local agency conduct larval mosquito surveillance?	3	2 (67)	0		10	9 (90)	0	
Are trapped mosquitoes identified to species?	6	5 (83)	0		10	9 (90)	0	
Does your agency calculate minimal mosquito infection rates or receive such data?	6	5 (83)	0		10	5 (50)	0	
Do you trap at fixed sites most of the WNV season?	3	3 (100)	0		10	9 (90)	0	
If yes, how often was trapping done at most of these sites in 2012?								
- every 7 days	3	1 (33)			9	6 (67)		
- every 14 days	3	0			9	0		
- other	3	2 (67)			9	3 (33)		
	N	**median**	**range**	**unk**	**N**	**Median**	**range**	**unk**
What % of the population in your jurisdiction lives in an area covered by mosquito surveillance?								
	3	100	100-100	-	10	100	35-100	3
Number of trap-nights adult mosquitos collected								
	3	300 (mean)	3-820	-	10	2,661 (mean)	13-18,000	3

Table LHD10. Laboratory aspects of arboviral mosquito surveillance in ELC-funded and non-ELC-funded LHDs, 2012				
	ELC-funded LHDs		**Non-ELC-funded LHDs**	
	N	**Yes (%)**	**N**	**Yes (%)**
What lab performed WNV testing on mosquito pools collected in your jurisdiction?				
- City/county health-dept. lab	6	4 (67)	10	3 (30)
- Local mosquito control district lab	6	0	10	0 (0)
- State health or other state agency lab	6	2 (33)	10	7 (70)
- Mosquito surveillance done, but no testing	6	0	10	1 (10)
Not applicable (no mosquito surveillance)	6	0	15	5 (33)
For what viruses are mosquito pools routinely tested in addition to WNV?				
- EEE	6	0	10	2 (20)
- SLE	6	2 (33)	10	5 (50)
- California serogroup	6	0	10	2 (20)
- Other	6	1 (17)	10	3 (30)
Did your local public health lab or another locally-funded lab perform testing for WNV on mosquito pools in 2008?				
	5	4 (80)	14	4 (29)
If yes, has the capacity of these labs to test mosquito pools diminished since 2008?				
	3	1 (33)	4	0
If yes, how has it affected the number of pools tested for WNV?				
- No longer test any pools	1	0	-	-
- Test fewer pools than before	1	1 (100)	-	-
- Other	1	0	-	-
Does your agency map larval breeding sites?	6	3 (50)	14	8 (57)
Does your agency evaluate adult mosquito control using caged mosquitoes in sprayed areas?	6	1 (17)	14	3 (21)
Does your or another local agency monitor for pesticide resistance in mosquitos?	6	1 (17)	14	3 (21)

Table LHD11. WNV educational prevention activities in ELC-funded and non-ELC-funded LHDs, 2012

	ELC-funded LHDs		Non-ELC-funded LHDs	
	N	**Yes (%)**	**N**	**Yes (%)**
Which of the following WNV prevention messages and activities did your program use and promote?				
- Use of DEET-based/other repellents	6	6 (100)	15	14 (93)
- Peri-residential source reduction	6	6 (100)	15	12 (80)
- Personal protection measures	6	6 (100)	15	14 (93)
- Notification of adulticiding activities	6	4 (67)	15	6 (40)
- Modification of messages for lower literacy and non-English speaking audiences	6	6 (100)	15	9 (60)
Which of the following methods did your program use to provide WNV prevention information in 2012?				
- Press releases to electronic and printed media	6	6 (100)	15	14 (93)
- Public service announcements	6	4 (67)	15	4 (27)
- Passive distribution of info brochures	6	5 (83)	15	13 (87)
- Active distribution of info brochures	6	5 (83)	15	6 (40)
- Town, community, neighborhood meetings	6	4 (67)	15	6 (40)
- Posting info on the home page of your agency website	6	6 (100)	15	12 (80)
- Door-to-door outreach in selected locations	6	3 (50)	15	2 (13)
- Participation in community clean-ups	6	2 (33)	15	2 (13)

Table LHD12. Mosquito control activities in ELC-funded and non-ELC-funded LHDs, 2012

	ELC-funded LHDs		Non-ELC-funded LHDs	
Larviciding for WNV prevention	**N**	**Yes (%)**	**N**	**Yes (%)**
Has your city/county ever financially supported or conducted larviciding to prevent WNV in your jurisdiction?	5	4 (80)	14	14 (100)
Did your city/county conduct or financially support larviciding in at least some locations in 2012?	5	3 (60)	13	12 (92)
Might your city/county have supported larviciding in 2012 if it had sufficient funding?	5	3 (60)	8	1 (13)
Adulticiding for WNV Prevention				
Does your city/county have a plan for WNV control that includes a threshold level of vector mosquito abundance/infection rate that would result in a recommendation for adulticiding?				
No – no local plan, defer to state plan		1 (20)		1 (7)
Yes – have a threshold not requiring any human cases of WNV		4 (80)		4 (29)
Yes – have a threshold that requires concurrent human cases		0		1 (7)
No – have a plan but no threshold		0		4 (29)
No – do not have a formal plan for adulticiding in response to WNV		0		4 (29)
Does your jurisdiction have an emergency fund or a specified emergency funding mechanism for adult mosquito control for WNV or other arboviruses?				
	5	2 (40)	14	4 (29)
Has this funding mechanism been used to pay for adulticiding for WNV control?	2	1 (50)	4	3 (75)
Has your jurisdiction ever done adulticiding for WNV control?				
	6	5 (83)	14	9 (64)
If no, why not?				
- never had a serious outbreak	1	0	5	1 (20)
- had threat that reached adulticiding threshold, but no funding	0	0	4	2 (50)
- had threat that reached adulticiding threshold, but no public support	0	0	4	2 (50)
- Other	1	1	4	1 (25)
Did your city/county conduct adulticiding for other mosquito-borne diseases in 2012?				
	5	0	13	4 (31)
If yes, for which viruses?				
- EEE			4	1 (25)
- dengue			4	1 (25)
- other			4	2 (50)
If no, would you have provided support if you had the funding?				
- Not applicable, no outbreak threat	5	3 (60)	9	8 (89)

- Yes, outbreak threat but insufficient funding	3	1 (33)	1	1 (100)
Aedes aegypti				
Is there a record of Ae aegypti mosquitoes being found in your jurisdiction in the past 5 years?	6	3 (50)	15	6 (40)
If yes, do you have a written dengue surveillance and control plan should it be detected (again)?	3	0	5	2 (40)

Table LHD13. WNV laboratory testing capabilities in ELC-funded and non-ELC-funded labs, 2012 (N=4 and 2, respectively)

Percentage labs doing this test for a particular source

	IgM ELISA	IgG ELISA	PRNT	Culture	PCR	Vec Test	RAMP
Human							
ELC	2 (50)	2 (50)	1 (25)	1 (25)	2 (50)		
Non-ELC	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)		
Equine							
ELC	0	0	0	0	0		
Non-ELC	0	0	0	0	0		
Avian							
ELC	0	0	0	0	0	0	0
Non-ELC	0	0	0	0	0	0	
Sentinel							
ELC	0	0	0	0	0		
Non-ELC	1 (17)	0	0	0	0		
Mosquito							
ELC				0	1 (25)	0	0
Non-ELC				0	1 (50)	0	

	ELC-funded labs		Non-ELC-funded labs	
	N	**Yes (%)**	**N**	**Yes (%)**
If your lab uses a PRNT test, how is it used?				
- all positive ELISAs	2	1 (50)	1	0
- early season and any unusual ELISAs	2	1 (50)	1	0
- only on equivocal ELISAs	2	0 (0)	1	1 (100)
If PRNT is not performed at your lab, where is it performed?				
- CDC	3	1 (33)	2	1 (50)
- another state's public health lab	3	2 (67)	2	1 (50)
- ELISA positives are not confirmed by PRNT	3	0	2	0

Table LHD14 Arboviral laboratory testing capacity and experience in non-ELC-funded LHDs, 2012		
	N	**Yes (%)**
Does your city/county have at least some WNV testing capacity and/or do you contract with a lab for arboviral testing services?		
- Yes, have own testing capacity	14	2 (14)
- Yes, contract with another lab	14	0
- No, depend on the state lab	14	10 (71)
- No, depend on another lab	14	2 (14)
Were all CSF specimens tested for WNV in the state lab also routinely tested for one or more other arboviruses?	4	0
Is additional training necessary for your lab staff to test for WNV and/or other arboviruses?	4	0

For each of the following arboviruses, does your lab perform any testing and if so, what was the total number of CSF and/or serologic specimens tested for infection your lab in 2012 and how many were positive?

Arbovirus	Perform testing		Number tested		Number Positive	
	Yes	No				
	N (%)	N (%)	# respondents	Total tested	# respondents)	Total (median, range)
West Nile virus	2	13	2	148	2	71
All other mosquito-borne viruses	0	15	-	-	-	-

Table LHD15. Types of diagnostic tests for arboviruses and number of LHD laboratories with specific diagnostic testing capacity for human specimens in 2012* (N=2 city/county labs)

	ELISA		**MIA**		**IFA**			
Virus	**IgM**	**IgG**	**IgM**	**IgG**	**IgM**	**IgG**	**PRNT**	**PCR**
West Nile	1 (50)	1 (50)	0	0	1 (50)	1 (50)	0	1 (50)
All other mosquito-borne	0	0	0	0	0	0	0	0

ELISA = Enzyme-linked immunosorbant assay
MIA = Microsphere immunoassay
IFA = Indirect immunoflourescent assay
PRNT = Plaque reduction neutralization test
PCR = Polymerase chain reaction
IgM = Immunoglobulin M
IgG = Immunoglobulin G

Table LHD16. Relationship of ELC WNV funding to selected surveillance capacities in ELC-funded and non-ELC-funded LHDs, 2012				
Has ELC funding for WNV enhanced your agency's capacity to conduct surveillance for other vector-borne diseases?				
	ELC-funded LHDs		**Non-ELC-funded LHDs**	
	N	**Yes* (%)**	**N**	**Yes (%)**
Other mosquito-borne	6	6 (100)	13	4 (31)
Tick-borne	6	4 (67)	13	2 (15)
Flea-borne	6	2 (33)	13	1 (8)
How have you managed reductions to ELC funding for WNV surveillance in the past 5 years?				
	N**	**Yes (%)**	**N**	**Yes (%)**
Eliminated dead bird surveillance	4	2 (50)	6	4 (67)
Reduced dead bird surveillance	4	2 (50)	4	3 (75)
Decreased number of mosquito trap sites	4	3 (75)	5	2 (40)
Decreased number of mosquito pools tested	4	1 (25)	5	2 (40)
Decreased number of WNV tests performed on human specimens	5	1 (20)	2	1 (50)
Other	6	0		

* Yes includes "highly," "substantially," "some" and "a little."

** Only respondents who had a system and who answered the question either *yes* or *no*.

Appendix 1: Detailed information on state subgroupings

I. Quartile groupings by size of state and local health populations using population estimates based on the 2010, U.S. Census Bureau (listed in alphabetical order)

8.0 to 37.3 Million
California, Florida, Georgia, Illinois, Michigan, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Texas, Virginia

4.5 to 6.9 Million
Alabama, Arizona, Colorado, Indiana, Louisiana, Maryland, Massachusetts, Minnesota, Missouri, South Carolina, Tennessee, Washington, Wisconsin

2,0 to 4.9 Million
Arkansas, Connecticut, Iowa, Kansas, Kentucky, Mississippi, Nevada, New Mexico, Oklahoma, Oregon, Utah

0.6 to 1.9 Million
Alaska, Delaware, Hawaii, Idaho, Maine, Montana, Nebraska, New Hampshire, North Dakota, Rhode Island, South Dakota, Vermont, West Virginia

II. **State groupings by cumulative number of WNV cases reported to CDC 2008-2012**
(listed alphabetically within grouping)

≥100 cases
Arizona, California, Colorado, Illinois, Louisiana, Michigan, Mississippi, New York, Ohio, Oklahoma, Texas

30-99 cases
Alabama, Arkansas, Connecticut, Florida, Georgia, Indiana, Kansas, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, Nevada, New Jersey, New Mexico, North Dakota, Pennsylvania, South Dakota, Tennessee, Virginia, Washington, Wisconsin

10-29 cases
Idaho, Iowa, Kentucky, North Carolina, South Carolina, Utah, Wyoming

0-9 cases
Delaware, Hawaii, Maine, Montana, New Hampshire, Oregon, Rhode Island, Vermont, West Virginia

III. State groupings by U.S. Department of Health and Human Services (HHS) Regions
[available from URL: http://www.hhs.gov/about/regions]
(listed alphabetically within region)

Region	
I	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
II	New Jersey, New York

III Delaware, Maryland, Pennsylvania, Virginia, West Virginia
IV Alabama, Florida Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee
V Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
VI Arkansas, Louisiana, New Mexico, Oklahoma, Texas
VII Iowa, Kansas, Missouri, Nebraska
VIII Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming
IX California, Arizona, Hawaii, Nevada
X Alaska, Idaho, Oregon, Washington

Grouping
Northeast = I, II, III
Midwest = V, VII
Southeast and South central = IV, VI
Rocky Mountains = VIII
West and Northwest = IX, X

IV. State groupings by amount of FY2012 CDC ELC Cooperative Agreement, Arboviral Disease Activity Funding
Note: Separate awards to large cities are not included in the total for the state.
(listed alphabetically within grouping)

Greater than or equal to $300,000
Arizona, California, Colorado, Mississippi, Nebraska, New York, North Dakota, Texas

$200,000 to $299,000
Florida, Idaho, Illinois, Maryland, Minnesota, Montana, South Dakota, Tennessee, Utah

$100,000 to $199,999
Connecticut, Delaware, Georgia, Indiana, Iowa, Kansas, Louisiana, Massachusetts, Michigan, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Virginia, Washington, West Virginia, Wisconsin, Wyoming

Less than $100,000
Alabama, Arkansas, Hawaii, Maine, Vermont

CSTE Vector-borne Disease Surveillance Capacity Assessment for State Health Departments

Characterization of a State Health Department Arbovirus Surveillance Program

•Please respond for activities, data, and cases that occurred in calendar year 2012.

•Definitions:

"Your jurisdiction" = your state

"Your agency" = the state health dept, not county HDs

"Your program" = the state health dept. WNV/arbovirus or communicable disease program

"WNV/arbovirus surveillance program" = the program within your agency, not county HDs

State:
Name of respondent:
Title/Position of respondent:
Date:

1. Indicate below the number of WNV and other arboviral disease surveillance staff—both epidemiology and laboratory— from ***ALL*** funding sources based on highest professional degree. These are mutually exclusive categories, so place each staff person in only one column. Surveillance staff include those involved in human, animal (e.g., bird, horse) and mosquito surveillance.

State health dep't employees	# with DVM, MD/DO, RN or other clinical degrees	# with PhD, DrPH, MSPH, MPH degrees in epidemiology	# with PhD or masters degree in related sciences	# of all other clerical, administrative, and programmatic staff
1.0 FTE*				
0.5-0.99 FTE				
<0.50 FTE				
Contractors (not including county HDs)**				
1.0 FTE*				
0.5-0.99 FTE				
<0.50 FTE				

* a full time position for 6 months would be one 0.5 FTE; 5 full time positions each working 20% on WNV would be five <0.50 FTE (in appropriate column)

** contracted positions include a) those based in the state health department but hired by another agency, or b) those based in another agency who are funded by state/federal funds to support arboviral surveillance (e.g., for mosquito or bird surveillance or for laboratory testing).

2. Indicate below the number of WNV and other arboviral disease surveillance staff—both epidemiology and laboratory— NOT funded by the CDC Epidemiology and Laboratory Capacity (ELC) or Public Health Preparedness cooperative agreements based on highest professional degree. These are mutually exclusive categories, so place each staff person in only one column.

State health dep't employees	# with DVM, MD/DO, RN or other clinical degrees	# with PhD, DrPH, MSPH, MPH degrees in epidemiology	# with PhD or masters degree in related sciences	# of all other clerical, administrative, and programmatic staff
1.0 FTE*				
0.5-0.99 FTE				
<0.50 FTE				
Contractors (not including county HDs)**				
1.0 FTE*				
0.5-0.99 FTE				
<0.50 FTE				

* a full time position for 6 months would be one 0.5 FTE; 5 full time positions each working 20% on WNV would be five <0.50 FTE (in appropriate column)

3. Indicate below the number of FTE WNV and other mosquito-borne disease surveillance staff you have at the state level from ***ALL*** funding sources based on their surveillance role (include contractors but not county HDs). The total should take into account the time contributed by each of the FTEs in Q1. (e.g., if in Q1 there were 8 epidemiologists each contributing 10% of their time to WNV for 6 months, you should report 0.4 FTE)

Total	# FTE epidemiologists	# FTE laboratory staff	# FTE mosquito/other environmental surveillance staff	# FTE other surveillance /clerical/administrative staff

4. Indicate below how many ADDITIONAL FTE staff persons (including contractors but not county HDs) are needed at the state level in your state to achieve full epidemiology and laboratory capacity* to conduct WNV and other mosquito-borne disease surveillance. As above, count a full time seasonal position needed for 6 months as 0.5 FTE.

* Full epidemiology and laboratory capacity is defined as: i) ability to complete a standard case report form on every suspected/confirmed mosquito-borne arboviral disease case and report it to ArboNet; ii) ability to test by IgM for all

relevant arboviruses (including dengue) on any CSF or serum specimen submitted to the state lab on a suspected case of arboviral disease); and iii) have an environmental surveillance system that includes mosquito surveillance to routinely monitor arboviral activity in all parts of the state in which there is the potential for human outbreaks of arboviral disease based on past experience.

Total # additional FTEs needed	# additional FTE epidemiologists	# additional FTE laboratory staff	# additional FTE mosquito /other environmental surveillance staff	# additional FTE other surveillance /clerical /administrative staff

Optional comments to explain response to any of Questions 1-4 (leave space)

……

5. Does the state health department have adequate access to medical entomologist(s)
   - *within the public health agency* ___Yes ____No
   - *through contract or other formal arrangement with a local college or university or other state agency*? ___Yes ____No

6. Does the state health department have adequate access to expertise in wildlife biology *within a state agency*? ___Yes ____No

7. Does the state health department have a designated state public health veterinarian *within your agency*? ___Yes ____No

Optional comments to explain response to any of Questions 5-7 (leave space)

……

8. Please complete the following table concerning the duration of surveillance for WNV during 2012:

Type of Surveillance	***Conduct state-level surveillance?***		***If yes, for how many months each year?***
	Yes	***No***	
Human disease			
Equine disease			
Avian mortality			
Mosquito			

9. What type of surveillance is used in your jurisdiction for WNV-related (check most applicable box):

Type of Surveillance	***Primarily active***	***Combination of active and passive***	***Primarily passive***	***Not applicable, not conducting***
Human disease				
Equine disease				
Avian mortality				

…….

10. **For *human* West Nile *neuroinvasive* disease surveillance in 2012:**
    a. Did your agency specifically contact by telephone, fax, special mailing, or health alert any of the following specialists to encourage reporting and to suggest they have a high index of suspicion for arboviral encephalitis?
    Neurologists ____Yes ____No
    Critical care specialists ____Yes ____No
    Infectious disease specialists ____Yes ____No
    Emergency departments ____Yes ____No

    b. Did your agency require reporting of:
    - hospitalized encephalitis cases of unknown etiology?
    ____Yes ____No

    - hospitalized meningitis cases of unknown etiology?
    ____Yes ____No

    c. Did your agency require in-state laboratories to report CSF and/or serologic specimens positive for arboviral infection?
    ____Yes ____No

11. In 2012, in order to count a case of WNV infection as confirmed or probable, did your agency require confirmation of commercial – lab-positive specimens by your public health laboratory or another reference laboratory? ____ Yes ____ No

12. Did your program use the CDC/CSTE National Public Health Surveillance System (NPHSS) case definition for neuroinvasive disease to classify cases as confirmed or probable *or* did you use another case definition in your jurisdiction?
    ____ CDC/CSTE NPHSS case definition used exclusively
    ____ A modified case definition specific to my jurisdiction

Optional comments to explain response to any of Questions 10-12 (leave space)

The following questions pertain to all WNV human disease cases, not just neuroinvasive cases.

13. In 2012 what was the median interval in days between the date that a WNV positive *human specimen* was collected and the date that positive laboratory results were reported to the WNV surveillance program?
____ Days ____Don't know ____Not applicable (no cases)

14. In 2012 for cases of *human disease* that were ultimately determined to be probable/confirmed, what was the median interval in days between the date of onset of the case and the date that the case was reported to ArboNET?
____ Days ____Don't know ____Not applicable (no cases)

15. In 2012, was end-of-year surveillance (e.g., auditing) done of hospital or commercial laboratories to identify unreported human cases of WNV? ____Yes ____No

16. In 2012, was end-of-year surveillance done of hospital discharge data to identify unreported human cases of WNV? ____Yes ____No

Optional comments to explain response to any of Questions 13-16 (leave space)

……..

17. For *equine* West Nile disease surveillance in 2012:

a. Did your agency have a system in place for reporting cases of equine neurologic disease to the state health dept. either directly or through another agency (e.g., State Department of Agriculture) from veterinarians, veterinary diagnostic labs or other agency labs?
____ Yes ____ No ____ Unk

If no or unknown to Question 17a, please skip to Question 18.

b. If yes, were specimens submitted for diagnostic testing for:
- WNV? ____ Yes ____ No ____ Unk
- other arboviruses? ____Yes ____ No ____ Unk
- rabies? ____Yes ____ No ____ Unk

c. How many *equine* specimens were tested in the public health or other state-sponsored laboratory for:
- WNV? ____(#) ____Unk
- other arboviruses? ____ (#) ____Unk
- rabies? ____(#) ____ Unk

d. Were temporal-geographic clusters (2 or more cases) of equine neurologic disease reported to your agency?
____Yes ___ No

e. If yes, how many clusters were reported? ____

f. If yes to (d), did your program or any state agency investigate the clusters to determine the cause of the illness? ____Yes ____ No

Optional comments to explain response to any of Questions 17a-f (leave space)

……

18. For *avian* West Nile virus infection surveillance in 2012:

a. Did your agency maintain a database of dead bird sightings? ____Yes ____No

***If no to Question 18a, skip to question 19*.**

b. If yes, were specimens submitted for diagnostic testing for WNV?
____Yes ____ No

c. If yes, how many specimens were tested for WNV in 2012? ____(#)
____Unk

d. Where was testing of avian specimens done? ____ State lab

____ other state agency lab ____ other lab contracted by the state

e. What strategies did your agency use for collecting and testing dead birds? (check relevant box for each in grid below)

Strategy	***Collecting***	***Testing***
Collect or test all dead birds in an area all season long		
Collect or test all in an area until the first tests positive		
Collect or test all of specified species (e.g., corvids) in an area all season long		
Collect or test all of specified species in an area until the first tests positive		
Other (specify below)		

f. What was the median interval in days between the date that a WNV positive *dead bird* was collected and the date that positive laboratory results on that bird were reported to the WNV surveillance program?

____ days

Optional comments to explain response to any of Questions 18a-f (leave space)

……

19. **For *mosquito-based* West Nile Virus surveillance in 2012**:

a. Does your agency collect information about mosquito surveillance in local jurisdictions or areas of your state? ____Yes ____ No
____ Not applicable (no mosquito surveillance in local jurisdictions).

If no to question 19a, please skip to question 19h.

b. Approximately what percentage of the human population in your jurisdiction lives in an area covered by mosquito surveillance? ____%
____ don't know

c. Do most local health agencies within your jurisdiction conduct
-adult mosquito surveillance? ____Yes ____ No
-larval mosquito surveillance? ____Yes ____ No

d. For how many trap-nights were adult mosquitoes collected in 2012? (e.g., 3 traps in one night = 3 trap-nights)
____ # trap-nights ____ don't know

(no Question19e)

f. Concerning mosquito identification when testing for WNV and other arboviruses, does your agency either receive reports from local laboratories with mosquito species identified and/or does your public health laboratory identify the species?
____Yes ____ No ____ don't know

g. Does your agency either calculate minimum infection rates with your mosquito data or receive such data?
____ Yes ____ No ____ don't know

h. What laboratories performed testing for WNV on mosquito pools collected in your state in 2012? (check all that apply)
____ State public health laboratory or other state-funded laboratory
____ Local health-department laboratory
____ Local mosquito control district (if different from county health dep't)
____ Mosquito surveillance done, but no testing done on mosquito pools
____ Not applicable (no mosquito surveillance done)

i. For what viruses are mosquito pools routinely tested in addition to WNV?
____ EEE
____ SLE
____ California serogroup (LaCrosse, Jamestown Canyon, etc)
____ Other (specify) _____
____ Not applicable (no testing done)

j. Did your state public health laboratory or another state-funded laboratory perform testing for WNV on mosquito pools in 2008?
____Yes ____No

k. If yes to 19j, has the capacity of your state public health laboratory or other state-funded laboratory to perform testing for WNV on mosquito pools diminished since 2008? ____Yes ____No

l. If yes to 19k, how has it affected the number of mosquito pools tested for WNV?
____No longer test any pools
____Test fewer pools than before
____Other (specify) _____

(no Question 19m or 19n)

o. Which agencies in your state monitor for pesticide resistance in mosquitos? (if both state and local levels do such monitoring, check both)
____ State health department and/or other state agency
____ Local health agencies/mosquito control districts
____ No monitoring done
____ Don't know

p. Does your or another state agency (e.g., Environmental Protection) conduct or fund sentinel chicken/bird surveillance for WNV and/or other arboviruses? ____ Yes ____ No

If yes, for which viruses?
____ WNV
____ EEE
____ SLE
____ Other (specify) _____

Optional comments to explain response to any of Questions 19a-p (leave space)

.....

20. Which of the following **WNV and/or other mosquito-borne disease *prevention*** messages and activities did your program use and promote in 2012? (check all that apply)

____ the use of DEET-based or other effective repellents
____ peri-residential source reduction
____ personal protective measures
____ notification of adulticiding activities
____ modification of messages for lower literacy and non-English speaking audiences

21. Which of the methods did your program use to provide WNV and/or other mosquito-borne disease ***prevention*** information in 2012? (check all that apply)

____ press releases to electronic and printed media
____ public service announcements
____ passive distribution of informational brochures
____ active distribution of informational brochures
____ town, community, or neighborhood meetings
____ posting information on the home page of your agency's website
____ door-to-door outreach in selected locations
____ participation in community clean-ups

22. The following questions pertain to larviciding for mosquitoes to prevent amplification of WNV.

a. Has your state ever financially supported or conducted larviciding in local jurisdictions for WNV prevention? ____ Yes ____No

b. Did your state conduct or financially support larviciding for WNV in at least some local jurisdictions in 2012? ___Yes ____No

c. Might your state have conducted or financially supported larviciding activities in local jurisdictions in 2012 if it had sufficient funding? ____Yes ____No ____ Unk

d. Did any local jurisdiction conduct larviciding for WNV in 2012 with its own funding? ____Y ____N ____Unk

23. The following questions pertain to killing adult WNV-infected mosquitoes (adulticiding).

a. Does your state have a plan for WNV control that includes a threshold level of vector mosquito abundance and/or infection rate that would result in a recommendation for adulticiding?

____Yes – have a threshold that does not require concurrent human cases
____Yes – have a threshold that requires concurrent human cases
____No – have a plan but there is no specific theshold
____No – do not have a formal plan for adulticiding in respond to WNV

b. Does your state have an emergency fund or a specified emergency funding mechanism for adult mosquito control for WNV or other arbovirus outbreak control? ____Yes ____No

If yes, please describe: _____

Has this fund/funding mechanism ever been used to pay for adulticiding for WNV outbreak control? ____Yes ____No

c. Has the state or a local jurisdiction in your state ever conducted adulticiding activities for WNV control? ____Yes ____No

If no, why not? (check all that apply)
____Never had serious outbreak threat
____Had outbreak threat that reached adulticing threshold but no funding to support adulticiding
____Had outbreak threat that reached adulticiding threshold but no public support of spraying
____Other (specify): _____

24. Did your state conduct or provide financial support to local health departments in 2012 to conduct adulticiding activities for other mosquito-borne diseases such as EEE or dengue? ____ Yes ____ No

If yes, for which viruses ____ EEE ____ dengue ____ other (specify) _____
If no, would you have provided support if you had the funding?
____ Not applicable, no outbreak threat
____ Yes, outbreak threat but insufficient funding to conduct adulticiding

25. Is there a record of *Aedes aegypti* mosquitoes being found in your state in the past 5 years? ____Yes ____No ____ Don't know

If yes, do you have a written dengue surveillance and control plan should you detect dengue in your jurisdiction? ____Yes ____No

Optional comments to explain response to any of Questions 20-25 (leave space)

.....`

26. To what extent has ELC funding for WNV enhanced your agency's capacity to conduct surveillance for other vector-borne diseases?

	Highly (made it	***Substantially***	***Some***	***A little***	***Have a system***	***Not applicable***

	possible)				***but no influence***	***(no surveillance)***
	5	***4***	***3***	***2***	***1***	***0***
Other mosquito-borne						
Tick-borne						
Flea-borne						

27. How have you managed reductions to ELC funding for WNV surveillance in the past 5 years:

- Eliminated dead bird surveillance ____Yes ____No ____Not applicable (NA)
- Reduced (but still maintain some) dead bird surveillance ____Yes ____No ____NA
- Decreased the number of mosquito trapping sites ____Yes ____No ____NA
- Decreased the number of mosquito pools tested for WNV (i.e., only test a sample of mosquito pools collected)____Yes ____No ____NA
- Decreased the number of WNV tests on human specimens performed by the state laboratory (i.e., more dependent on commercial labs) ____Yes ____No ____NA
- Other (specify) _____

Optional comments to explain response to any of Questions 26-27 (leave space)

……

The following questions pertain to the ***state public health laboratory or laboratory contracted by your state to do WNV testing on suspected cases of disease in people***

28. Does your state public health laboratory have at least some WNV testing capacity and or do you contract with a laboratory for arboviral testing services?
____Yes, have own testing capacity
____Yes, contract with another laboratory for arboviral testing services
____No, depend on another state's or regional or CDC laboratory (specify which laboratory) _____

If you have no state public health laboratory WNV testing capacity, you are finished.

29. Were all CSF specimens tested for WNV in the state public health laboratory also routinely tested for one or more other arboviruses?
____ Yes ____ No

If Yes, which arboviruses: ____ EEE ____ SLE ____ WEE
____ LaCrosse ____ Powassan
____Other (specify) _____

30. Please complete the following table concerning testing for WNV by the *state public health laboratory* or a laboratory contracted by the state health dept. in your jurisdiction (check boxes as instructed below):

Source	Check box if the lab did this test for a particular source						
	IgM ELISA	IgG ELISA	PRNT	Culture	PCR	Vec Test	RAMP
Human							
Equine							
Avian							
Sentinel							
Mosquito							

31. If your laboratory uses a PRNT test, how is it used ? (check one)
____ all positive ELISAs
____ early season and any unusual ELISAs throughout the season
____ only on equivocal ELISAs

32. If PRNT is not performed in your state public health laboratory, where is confirmatory testing performed? (check one)
____ at CDC
____ at another state's public health laboratory
____ ELISA positives are not confirmed by PRNT

(No Question 33)

34. For each of the following arboviruses, does your laboratory perform any testing for them and, if so, what was the total number of CSF and/or serologic specimens tested for infection in the state public health laboratory ***in 2012*** and how many were positive?

Arbovirus	***Perform testing***		***Number tested***	***Number positive***
	Yes	***No***		
Chikungunya				
Colorabo tick fever				
Dengue				
EEE				
Japanese encephalitis				

LaCrosse				
Powassan				
SLE				
WEE				
West Nile virus				
Yellow fever				
Other (specify)				

35. Is additional training necessary to enable your laboratory staff to test for WNV and/or other arboviruses? ____Yes ____No (including not applicable)

    If yes, please briefly describe what additional training is needed:

Optional comments to explain response to any of Questions 28-35 (leave space)

END

Appendix 3: CSTE Vector-borne Disease Surveillance Capacity Local Assessment

CSTE Vector-borne Disease Surveillance Capacity Assessment for Local Health Departments

Characterization of a Local Health Department WNV and other arboviruses Surveillance Program

•Please respond for activities, data, and cases that occurred in calendar year 2012.
•Definitions:
"Your jurisdiction" = your city or county, as applicable
"Your agency" = the local health department, <u>not</u> the state HD
"Your program" = the local health dept. WNV, arbovirus or communicable disease program
"WNV/Arbovirus Surveillance program" = the program within your agency

City or County:
Name of respondent:
Title/Position of respondent:
Email of respondent:
Date:
May we contact you for follow-up? ____Yes ____No

2. Indicate below the number of WNV and other mosquito-borne disease surveillance staff—both epidemiology and laboratory— of the agencies within your jurisdiction regardless of funding source based on highest professional degree. Surveillance staff include those who are involved in human, animal (e.g., bird, horse) and mosquito surveillance. As the categories below are mutually exclusive, please place each staff person in only one column: Also, do not count state staff assigned to your jurisdiction.

Local health dep't employees	# with DVM, MD/DO, RN or other clinical degrees	# with PhD, DrPH, MSPH, MPH degrees in epidemiology	# with PhD or masters degree in related sciences	# of all other clerical, administrative, and programmatic staff
1.0 FTE*				
0.5-0.99 FTE				
<0.50 FTE				
Contractors (not including the state HD)**				
1.0 FTE*				
0.5-0.99 FTE				
<0.50 FTE				

* a full time position for 6 months would be one 0.5 FTE; 5 full time positions each working 20% on WNV would be five <0.50 FTE (in appropriate column)
** contracted positions include a) those based in the local health department but hired by another agency, or b) those based in another agency who are funded by local or federal funds to support arboviral surveillance specifically for your jurisdiction (e.g., for mosquito or bird surveillance or for laboratory testing).

2. Indicate below the number of WNV and other mosquito-borne disease surveillance staff—both epidemiology and laboratory— **NOT** funded by the CDC Epidemiology and Laboratory Cooperative Agreement (ELC) or Public Health Preparedness cooperative agreements, either indirectly (through the state) or directly based on highest professional degree. As the categories are mutually exclusive, please place each staff person in only one column:

Local health dep't employees	# with DVM, MD/DO, RN or other clinical degrees	# with PhD, DrPH, MSPH, MPH degrees in epidemiology	# with PhD or masters degree in related sciences	# of all other clerical, administrative, and programmatic staff
1.0 FTE*				
0.5-0.99 FTE				
<0.50 FTE				
Contractors (not including state HD)				
1.0 FTE*				
0.5-0.99 FTE				
<0.50 FTE				

* a full time position for 6 months would be one 0.5 FTE; 5 full time positions each working 20% on WNV would be five <0.50 FTE (in appropriate column)

3. Indicate below the number of FTE WNV and other mosquito-borne disease surveillance staff you have at your jurisdiction level from ***ALL*** funding sources based on their surveillance role. The total should take into account the time contributed by each of the FTEs in Q1. (e.g., if in Q1 there were 8 epidemiologists each contributing 10% of their time to WNV for 6 months, you should report 0.4 FTE)

Total	# FTE epidemiologists	# FTE laboratory staff	# FTE mosquito/other environmental surveillance staff	# FTE other surveillance /clerical/administrative staff

4. Indicate below how many ***ADDITIONAL FTE*** staff persons (including contractors) are needed in your jurisdiction to achieve full epidemiology and laboratory capacity* to conduct WNV and other mosquito-borne disease surveillance in an "average" year. As above, count a full time seasonal position needed for 6 months as 0.5 FTE.

* Full epidemiology and laboratory capacity is defined as: i) ability to complete a standard case report form on every suspected/confirmed mosquito-borne

arboviral disease case and report it to ArboNet; ii) ability to test by IgM for all relevant arboviruses (including dengue) on any CSF or serum specimen submitted to the city/county or state lab on a suspected case of arboviral disease); and iii) have an environmental surveillance system that includes mosquito surveillance to routinely monitor both larval and adult arboviral activity in all parts of your jurisdiction in which there is the potential for human outbreaks of arboviral disease based on past experience.

Total # additional FTEs needed	# additional FTE epidemiologists	# additional FTE laboratory staff	# additional FTE mosquito/ other environmental surveillance staff	# additional FTE other surveillance / clerical/ administrative staff

Optional comments to explain response to any of Questions 1-4. (leave space)

……

5. Does the your city/county health department have adequate access to medical entomologist(s)
   - *within the public health agency* ___Yes ____No

   - *through contract or other formal arrangement with a local college or university or other state/local agency*? ___Yes ____No

6. Does the city/county health department have adequate access to expertise in wildlife biology *within a city/county agency*? ___Yes ____No

7. Does the city/county health department have a designated public health veterinarian *within your agency*? ___Yes ____No

Optional Comments to explain response to any of Questions 5-7 (leave space).

……

8. Please complete the following table concerning the duration of surveillance for WNV disease within your jurisdiction during 2012:

Type of Surveillance	***Conduct surveillance at the city/county level?***		***If yes, for how many months each year?***
	Yes	***No***	
Human disease			
Equine disease			

Avian mortality			
Mosquito			

9. What type of surveillance is used in your jurisdiction for WNV-related (check most applicable box for each type of surveillance):

Type of Surveillance	***Primarily active***	***Combination of active and passive***	***Primarily passive***	***Not applicable, not conducting***
Human disease				
Equine disease				
Avian mortality				

……

10. **For *human* West Nile *neuroinvasive* disease surveillance in 2012:**
    a. Did your agency specifically contact by telephone, fax, special mailing, or health alert any of the following specialists to encourage reporting and to suggest they have a high index of suspicion for arboviral encephalitis?
    Neurologists ____Yes ____No
    Critical care specialists ____Yes ____No
    Infectious disease specialists ____Yes ____No
    Emergency departments ____Yes ____No

    b. Did your agency (or state through your agency) require reporting of:
    - hospitalized encephalitis cases of unknown etiology?
    ____Yes ____No

    - hospitalized meningitis cases of unknown etiology?
    ____Yes ____No

    c. Did your agency (or state through your agency) require in-state laboratories to report CSF specimens positive for arboviral infection?
    ____Yes ____No

11. In 2012, in order to count a case of WNV infection as confirmed or probable, did your agency require confirmation of commercial – lab-positive specimens by your public health laboratory or another reference laboratory? ____ Yes ____ No

12. Did your program use the CDC/CSTE National Public Health Surveillance System (NPHSS) case definition for neuroinvasive disease to classify cases as confirmed or probable *or* did you use another case definition in your jurisdiction?
    ____ CDC/CSTE NPHSS case definition used exclusively
    ____ A modified case definition specific to my jurisdiction

Optional comments to explain response to any of Questions 10-12 (leave space)

The following questions pertain to all WNV human disease cases, not just neuroinvasive cases.

13. In 2012 what was the median interval in days between the date that a WNV positive *human specimen* was collected and the date that positive laboratory results were reported to your WNV surveillance program? ____ Days

(no Question 14)

15. In 2012, was end-of-year surveillance (e.g., auditing) done of hospital or commercial laboratories to identify unreported human cases of WNV? ____Yes ____No

16..In 2012, was end-of-year surveillance done of hospital discharge data to identify unreported human cases of WNV? ____Yes ____No

Optional comments to explain response to any of Questions 13-16 (leave space)

……..

17. **For *equine* West Nile disease surveillance in 2012**:

a. Did your agency have a system in place for reporting cases of equine neurologic disease to your health dept. either directly or from another agency (e.g., State Department of Agriculture) from veterinarians, veterinary diagnostic labs or other agency labs?
____ Yes ____ No ____ Unk

If no or unknown to Question 17a, please skip to Question 18.

b. If yes, were specimens submitted for diagnostic testing for:
- WNV? ____ Yes ____ No ____Unk
- other arboviruses? ____Yes ____ No ____ Unk
- rabies? ____Yes ____ No ____ Unk

c. How many *equine* specimens on horses in your jurisdiction were tested in the city/county public health, state or contracted laboratory for:
- WNV? ____(#) ____Unk
- other arboviruses? ____(#) ____Unk
- rabies? ____(#) ____Unk

d. Were temporal-geographic clusters (2 or more cases) of equine

neurologic disease reported to your agency?
____Yes ___ No

e. If yes, how many clusters were reported? ____

f. If yes to (d), did your program or any city/county agency investigate the clusters to determine the cause of the illness? ____Yes ____ No

Optional comments to explain response to any of Questions 17a-f (leave space)

……

18. **For *avian* West Nile Virus infection surveillance in 2012**:

a. Did your agency maintain a database of dead bird sightings? ____Yes ____No

If no to Question 18, skip to Question 19.

b. If yes, were specimens submitted for diagnostic testing for WNV? ____Yes ____ No

e. If yes, how many specimens were tested for WNV in 2012? ____(#)
____Unk

d. Where was testing of avian specimens done? ____ City/county lab ____ State or other agency lab ____ other lab contracted by the city/county

e. What strategies did your agency use for collecting and testing dead birds? (check relevant box for each in grid below)

Strategy	***Collecting***	***Testing***
Collect or test all dead birds in an area all season long		
Collect or test all in an area until the first tests positive		
Collect or test all of specified species (e.g., corvids) in an area all season long		
Collect or test all of specified species in an area until the first tests positive		
Other (specify below)		

f. What was the median interval in days between the date that a WNV positive *dead bird* was collected and the date that positive laboratory results on that bird were reported to the WNV surveillance program?

____ days

Optional comments to explain response to any of Questions 18a-f (leave space)

……

19. **For *mosquito-based* West Nile Virus surveillance in 2012**:

a. Does your agency collect information for mosquito surveillance?
____Yes ____ No

If no to question 19a, please skip to question 19h.

b. Approximately what percentage of the human population in your jurisdiction is covered by mosquito surveillance?
____% ____ don't know

c. Does your agency or any other agency within your jurisdiction conduct:
-adult mosquito surveillance? ____Yes ____ No
-larval mosquito surveillance? ____Yes ____ No

d. For how many trap-nights were adult mosquitoes collected in 2012? (e.g., 3 traps in one night = 3 trap-nights)
____ # trap-nights ____ don't know

e. Do you trap mosquitoes at fixed trap sites for most of the WNV season?
____ Yes
____ No

If yes, how often was trapping done at most of these sites in 2012?
____ every 7 days
____ every 14 days
____ other (specify): _____
____ not applicable (no fixed trapping sites)

f. Are mosquitoes trapped in your jurisdiction identified to species?
____Yes ____ No ____ don't know

g. Does your agency either calculate minimum infection rates with your mosquito data or receive such data?
____ Yes ____ No ____ don't know

h. What laboratory performed testing for WNV on mosquito pools collected in your jurisdiction in 2012?

____ City/county health-department laboratory
____ Local mosquito control district lab (if different than city/county lab)
____ State public health laboratory or other state-funded laboratory
____ Mosquito surveillance done, but no testing done on mosquito pools for WNV.
____ Not applicable (no mosquito surveillance done)

i. For what viruses are mosquito pools routinely tested in addition to WNV?

____ EEE
____ SLE
____ California serogroup (LaCrosse, Jamestown Canyon, etc)
____ Other (specify) _____

j. Did your local public health laboratory or another locally-funded laboratory perform testing for WNV on mosquito pools in 2008?

____Yes ____No

k. If yes to 19j, has the capacity of your public health laboratory or other locally-funded laboratory to perform testing for WNV on mosquito pools diminished since 2008? ____Yes ____No

l. If yes to 19k, how has it affected the number of mosquito pools tested for WNV?

____No longer test any pools
____Test fewer pools than before
____Other (specify) _____

m. Does your agency map larval breeding sites?

____ Yes ____ No ____ don't know

n. Does your agency evaluate adult mosquito control using caged mosquitoes to measure kill rates in sprayed areas?

____Yes ____ No ____ Not applicable (no spraying) ____don't know.

o. Does your or another local agency monitor for pesticide resistance in mosquitoes?

____Yes ____ No ____ don't know

p.. Does your agency conduct or fund sentinel chicken/bird surveillance for WNV and/or other arboviruses? ____ Yes ____ No

If yes, for which viruses?

____ WNV

____ EEE
____ SLE
____ Other (specify) _____

Optional comments to explain response to any of Questions 19a-p (leave space)

……

20. Which of the following **WNV and/or other mosquito-borne disease *prevention*** messages and activities did your program use and promote in 2012? (check all that apply)

____ the use of DEET-based or other effective repellents
____ peri-residential source reduction
____ personal protective measures
____ notification of adulticiding activities
____ modification of messages for lower literacy and non-English speaking audiences

21. Which of the methods did your program use to provide WNV (and other mosquito-borne disease) ***prevention*** information in 2012? (check all that apply)

____ press releases to electronic and printed media
____ public service announcements
____ passive distribution of informational brochures
____ active distribution of informational brochures
____ town, community, or neighborhood meetings
____ posting information on the home page of your agency's website
____ door-to-door outreach in selected locations
____ participation in community clean-ups

22. The following questions pertain to larviciding for mosquitoes to prevent amplification of WNV in your jurisdiction.

a. Has your city/county ever conducted or financially supported larviciding for WNV prevention? ____ Yes ____No

b. Did your city/county conduct or financially support larviciding for WNV in at least some locations in 2012? ___Yes ____No

c. Might your city/county have conducted or financially supported larviciding activities in local jurisdictions in 2012 if it had sufficient funding? ____Yes ____No ____ Unk

23. The following questions pertain to killing adult WNV-infected mosquitos (adulticiding).

a. Does your city/county have a plan for WNV control that includes a threshold level of vector mosquito abundance and/or infection rate that would result in a recommendation for adulticiding?
____ No – no specific local plan, defer to state plan
____Yes – have a threshold that does not require concurrent human cases
____Yes – have a threshold that requires concurrent human cases
____No – have a plan but there is no specific theshold
____No – do not have a formal plan for adulticiding in response to WNV

b. Does your jurisdiction have an emergency fund or a specified emergency funding mechanism for adult mosquito control for WNV or other arbovirus outbreak control? ____Yes ____No

If yes, please describe: _____

Has this fund/funding mechanism ever been used to pay for adulticiding for WNV outbreak control? ____Yes ____No

c. Has your jurisdiction ever conducted adulticiding activities for WNV control? ____Yes ____No

If no, why not? (check all that apply)
____Never had serious outbreak threat
____Had outbreak threat that reached adulticing threshold but no funding to support adulticiding
____Had outbreak threat that reached adulticiding threshold but no public support of spraying
____ Other (specify): _____

24. Did your city/county conduct adulticiding activities for other mosquito-borne diseases such as EEE or dengue in 2012?
____ Yes ____ No

If yes, for which viruses ____ EEE ____ dengue ____ other (specify) _____
If no, would you have conducted adulticiding if you had the funding?
____ Not applicable, no outbreak threat
____ Yes, outbreak threat but insufficient funding to conduct adulticiding

25. Is there a record of Aedes aegypti mosquitoes being found in your jurisdiction in the past 5 years? ____Yes ____No ____ Don't know

If yes, do you have a written dengue surveillance and control plan should you detect dengue in your jurisdiction? ____Yes ____No

Optional comments to explain response to any of Questions 20-25 (leave space)

……

26. To what extent has ELC funding to either the state or directly to your jurisdiction for WNV enhanced your agency's capacity to conduct surveillance for other vector-borne diseases?

	Highly (made it possible)	Substantially	Some	A little	Have a system but no influence	Not applicable (no surveillance)
	5	4	3	2	1	0
Other mosquito-borne						
Tick-borne						
Flea-borne						

27. How have you managed reductions to ELC funding for WNV surveillance in the past 5 years:

- Eliminated dead bird surveillance ____Yes ____No ____Not applicable (NA)
- Reduced (but still maintain some) dead bird surveillance ____Yes ____No ____NA
- Decreased the number of mosquito trapping sites ____Yes ____No ____NA
- Decreased the number of mosquito pools tested for WNV (i.e., only test a sample of mosquito pools collected)____Yes ____No ____NA
- Decreased the number of WNV tests on human specimens performed by your local public health or other locally-contracted laboratory (i.e., more dependent on commercial labs) ____Yes ____No ____NA
- Other (specify)
  _____

Optional comments to explain response to any of Questions 26-27 (leave space)

……

The following questions pertain to the ***local public health laboratory or laboratory contracted by your jurisdiction to do arboviral testing on suspected cases of disease in people***.

28. Do you have a local public health laboratory with WNV testing capacity and/or contract with a laboratory for WNV testing services? (check all that apply)

____Yes, have own testing capacity
____Yes, contract with another laboratory for arboviral testing services
____No, depend on the state laboratory
____No, depend on other laboratory(specify) _____

If you have no local public health laboratory or do not contract with another laboratory to do arboviral testing for you, you are finished.

29. Were all CSF specimens tested for WNV *by your public health laboratory or the laboratory with which you contracted* on patients in your jurisdiction also routinely tested for one or more other arboviruses? ____ Yes ____ No

If Yes, which arboviruses: ____ EEE ____ SLE ____ WEE ____ LaCrosse ____ Powassan ____Other (specify) _____

30. Please complete the following table concerning testing for WNV by *your public health laboratory or a laboratory contracted by your agency* (if not applicable, put NA in each box):

Source	Check box if the lab did this test for a particular source						
	IgM ELISA	IgG ELISA	PRNT	Culture	PCR	Vec Test	RAMP
Human							
Equine							
Avian							
Sentinel							
Mosquito							

31. If your laboratory or the one with which you have a contract uses a PRNT test for specimens from your jurisdiction, how is it used ? (check one)
____ all positive ELISAs
____ early season and any unusual ELISAs throughout the season
____ only on equivocal ELISAs

32. If PRNT is not performed in your agency's public health laboratory or the one with which you contract, where is confirmatory testing performed? (check one)
____ at CDC
____ at the state or another state's public health laboratory
____ ELISA positives are not confirmed by PRNT

33. If you have your own city/county public health laboratory, please complete the following table re: your arboviral laboratory diagnostic testing capacity in 2012.

If you directly received ELC funding in 2012 and provided this data (Table 3 in the ELC cooperative agreement application), please check here and skip to the next question. ____Received ELC funding in 2012

Arboviral laboratory diagnostic testing capacity in 2012*

	ELISA		MIA		IFA			
Virus	**IgM**	**IgG**	**IgM**	**IgG**	**IgM**	**IgG**	**PRNT**	**PCR**
California serogroup†								
Chikungunya								
Colorado tick fever								
Dengue								
Eastern equine encephalitis								
Japanese encephalitis								
Powassan								
St. Louis encephalitis								
Western equine encephalitis								
West Nile								
Yellow fever								

*Please check boxes for assays that your laboratory currently has the capacity to perform, including trained staff and necessary equipment and supplies.

†Such as La Crosse or Jamestown Canyon viruses

ELISA = Enzyme-linked immunosorbant assay
MIA = Microsphere immunoassay
IFA = Indirect immunofluorescent assay
PRNT = Plaque reduction neutralization test
PCR = Polymerase chain reaction
IgM = Immunoglobulin M
IgG = Immunoglobulin G

34. For each of the following arboviruses, what was the total number of CSF and/or serologic specimens tested for infection for persons in your jurisdiction in *the city/county public health laboratory or laboratory with which you contracted* in 2012 and how many were positive? If had no lab testing performed,

Arbovirus	Number tested	Number positive
Chikungunya		
Colorado tick fever		
Dengue		
EEE		
Japanese encephalitis		
LaCrosse		
Powassan		
SLE		
WEE		
West Nile virus		
Yellow fever		
Other (specify)		

35. Is additional training necessary to enable your laboratory staff to test for WNV and/or other arboviruses? ____Yes ____No (including not applicable)

    If yes, please briefly describe what additional training is needed:

Optional comments to explain response to any of Questions 28-35 (leave space)

END