The Tale of 3 Competencies

A Baseline Assessment of Mosquito Surveillance and Control

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Literature and Desk Review Methodology

Literature Review

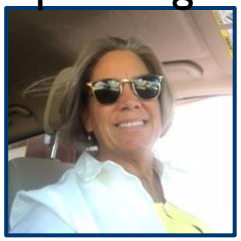
- Reviewed 29 documents for the following themes:
  - Planning and Response, Communication and Community Education, Vector Control, Human Surveillance, and Lab Testing
- Analyzed strengths and opportunities for improvement for each theme.

Desk review

- Review of LHD-submitted response materials
  - Examples: after action reports, response plans, community presentations
- Thirteen LHDs submitted a total of 17 documents
- Coded according to comprehensive list of Zika preparedness and response functions
- Analyzed whether each function was performed and the identified competency level for each of the performed functions
- Results uncovered the most and least commonly performed functions, and functions in which LHDs may have the highest and lowest competency levels

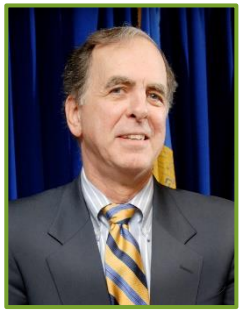
Zika Advisory Council

- Nineteen public health professionals from across the United States with experience working on Zika preparedness and response
- Convened to:
  - Respond to and contextualize NACCHO's literature and desk review assessment
  - Recommend resources, tools, subject matter experts, and other forms of technical assistance to strengthen LHDs' preparedness and response efforts for Zika
  - Inform planning efforts for this technical assistance workshop

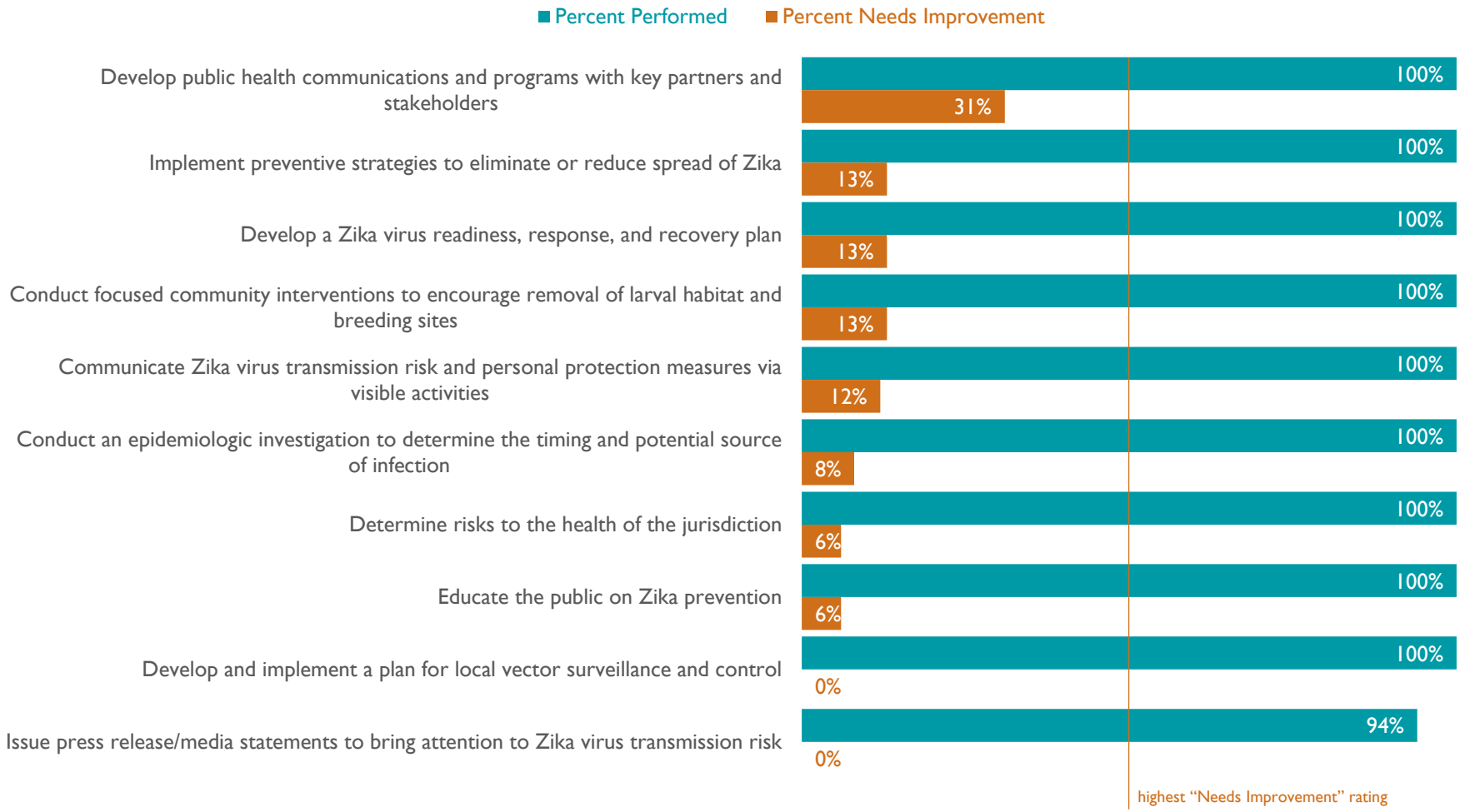






Results: Highest Competencies



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Results: Strategies that work

- Broaden existing campaigns to focus more generally on "Fight the Bite" messaging
- Invest in provider communication to improve reporting

- Utilize a One Health framework to address the multidisciplinary needs of the response and maximize limited staff
- Develop and maintain community partnerships before an emergency. Establish credibility as a trusted resource among these partners

- Partner with schools and neighborhood associations to engage residents in trapping mosquitoes for surveillance
- Implement a vector control fee to support and sustain vector control activities

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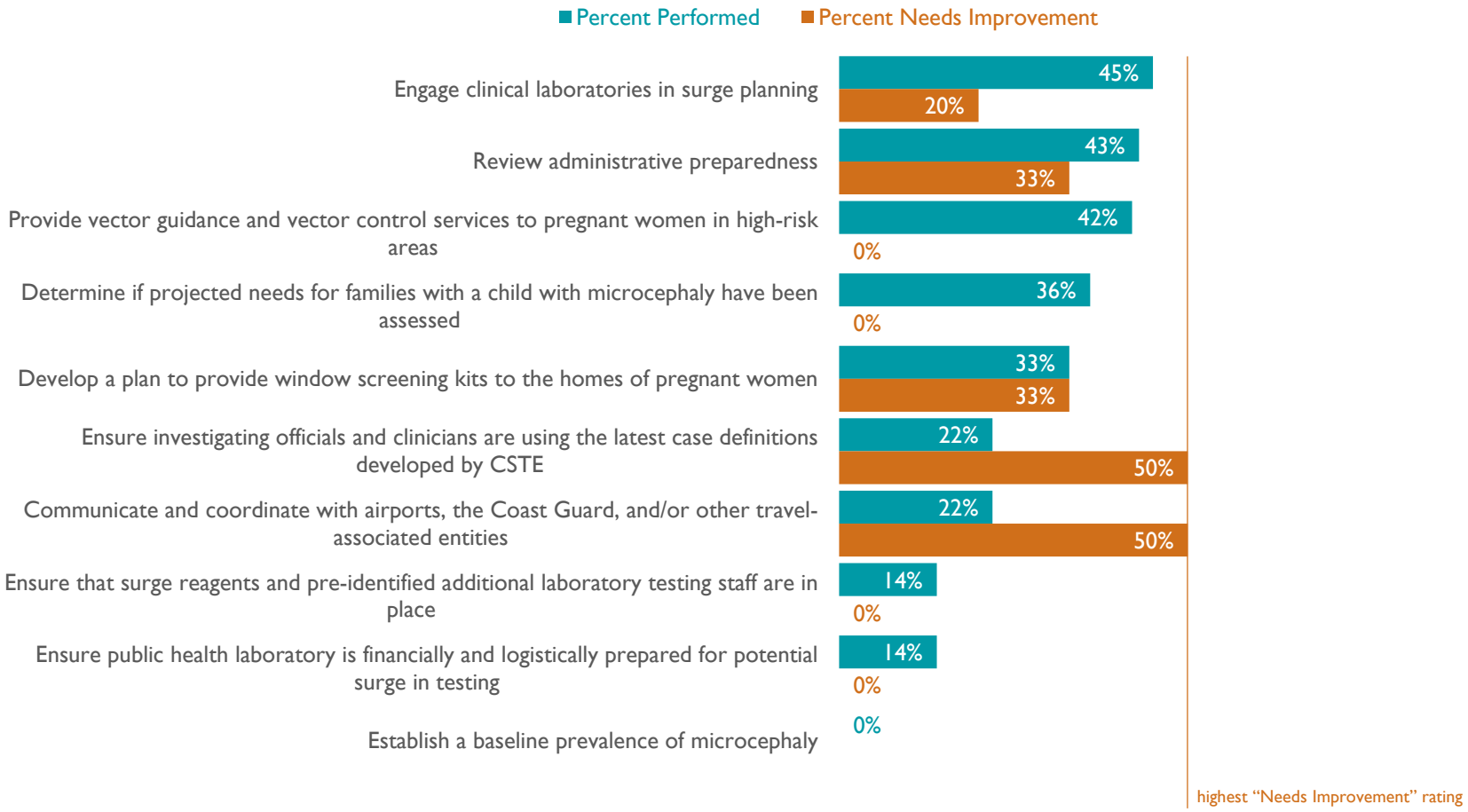
Results: Lowest Competencies



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Results: Challenges Experienced

Planning and Response

- Reviewing administrative preparedness

Communication/Community Education

Provider Audience:

- Keeping up with changes in case definitions and testing guidelines
- Verifying information shared is being utilized
- Partnering with maternal and child health providers

Public Audience:

- Messaging around multiple modes of transmission
- Overcoming language barriers
- Creating messages to motivate but not scare people
- Balancing Zika with other public health threats
- Managing pressure from community to respond

Results: Challenges Experienced

Vector Control

- Improving poor communication between human and vector surveillance
- Overcoming lack of capacity
- Managing logistical challenges with spraying during the day

Human Surveillance

- Overcoming the lack of interoperability between surveillance systems
- Missing cases due to absence of symptoms
- Keeping up with changing case definitions
- Monitoring travelers and communicating with travel-related agencies
- Conducting surveillance in border communities
- Participating in fetal surveillance activities
- Outreaching to pregnant women

Laboratory Testing

- Knowing which tests to use
- Keeping up with changing testing guidelines
- Dealing with testing method reliability reduction

Recommendations

The desk review revealed six specific Zika functions where additional support is needed for LHDs prioritizing by degree of performance and competency level:

- Establish a baseline prevalence of microcephaly through the use of existing birth defects registries or medical records abstractions.
- Communicate and coordinate with airports, the Coast Guard, and/or other travel-associated entities.
- Ensure investigating officials and clinicians are using the latest case definitions developed by CSTE.
- Develop a plan to provide window screening kits to the homes of pregnant women without air conditioning or window screens.
- Review administrative preparedness to ensure emergency rapid hiring, contracting processes and interjurisdictional compacts/agreements are in place.
- Develop public health communications messages, products, and programs with key partners and stakeholders.

Maternal Child Health Capacity for Zika Response

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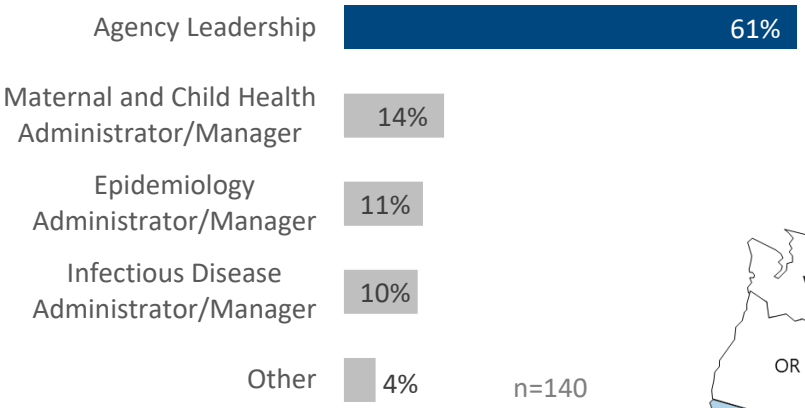
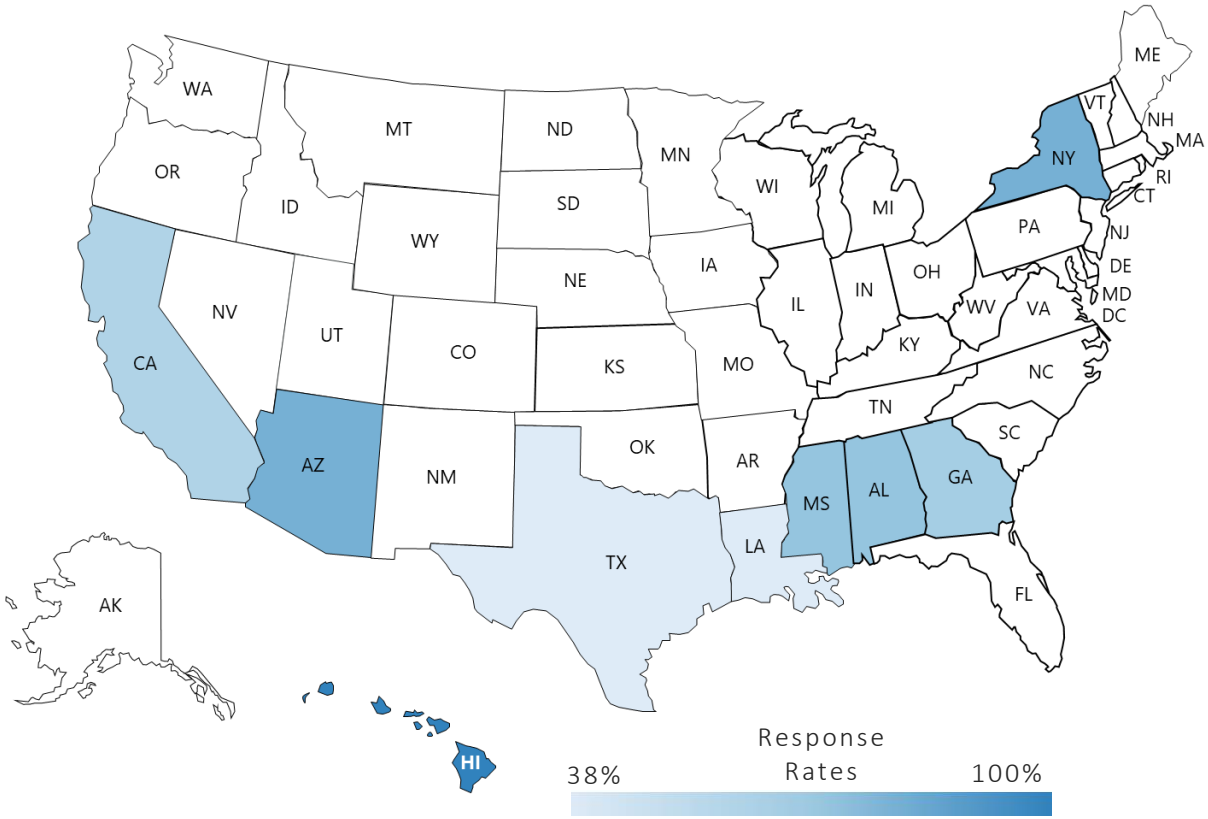
LHD MCH Zika Capacity Assessment Response Characteristics

Role of LHD respondent



Most survey respondents were agency leadership, such as the local health officer or health department director.

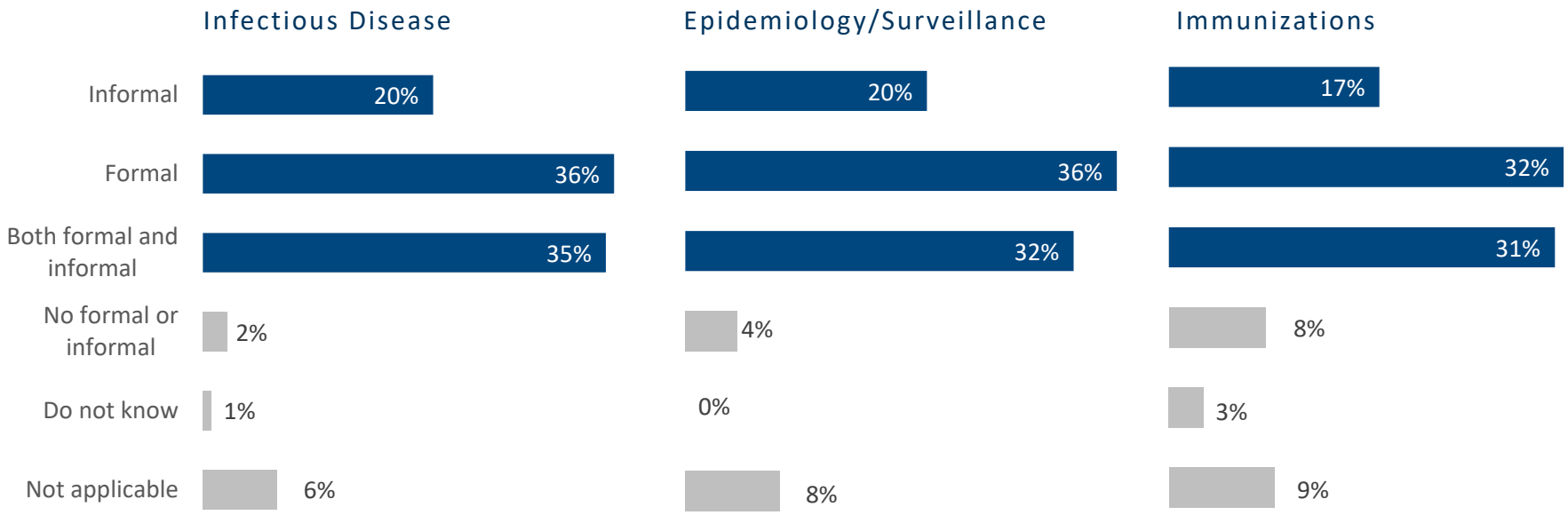
Response to the MCH Zika Capacity Assessment was received from 9 of the 10 high-priority states identified. On average, 65% of LHDs, regional/district offices, and state offices responded to the assessment in each state.



LHD internal referral capacity between MCH and key programmatic areas.

Respondents were asked about internal partnerships and referral activities between the MCH program and other key programmatic areas, which included infectious disease, epidemiology/surveillance, and immunization programs.

The majority of respondents reported that the LHD has a formal and/or informal process for referral/notification between their maternal and child health program and infectious disease (91%), epidemiology/surveillance (88%), and immunizations (80%) programmatic areas within the health department.



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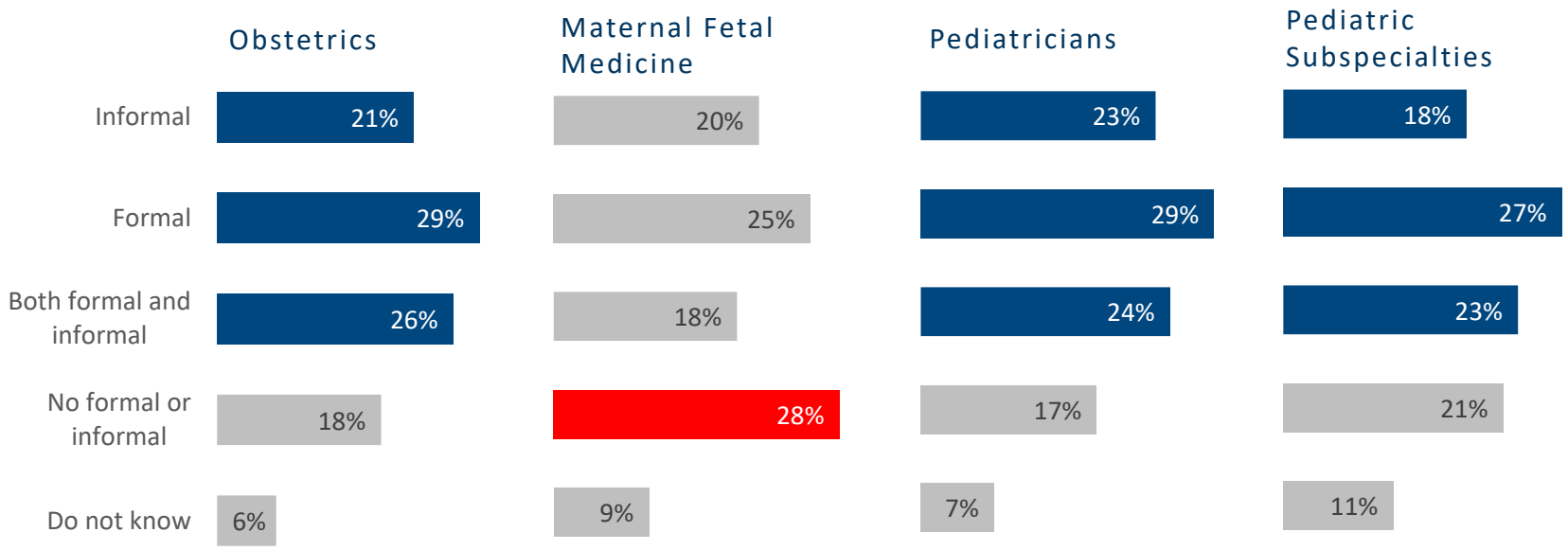
LHD external partnerships and referral activities between MCH and key healthcare providers.

Respondents reported on current capacity to partner with or refer clients to services external to the health department. Seventy-six percent of LHD MCH programs had a formal, informal, or both formal and informal referral process with Obstetric providers in the community.

Nearly one-third (28%) of LHD MCH programs had no formal or informal referral system or did not know (9%) if there was a referral system to Maternal Fetal Medicine providers in the community. Additionally, 11% of respondents did not know if they had a referral system for pediatric subspecialties.

Over two-thirds of respondents stated their MCH program had a formal, informal, or both a formal and informal referral system to pediatricians and pediatric subspecialties in their community.



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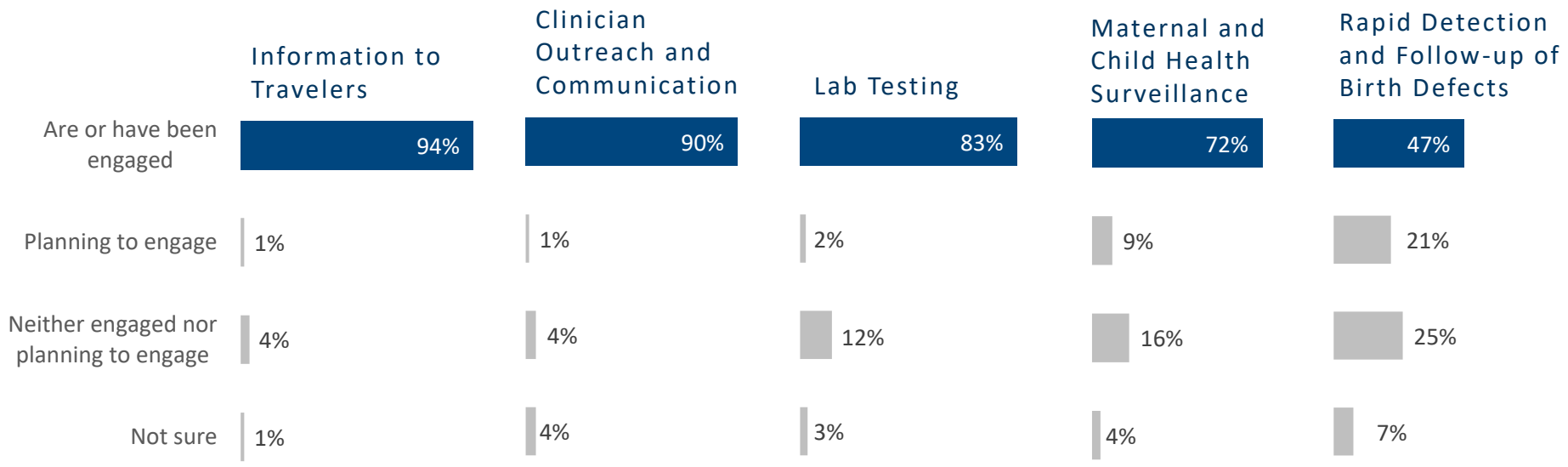
LHD engagement in local Zika prevention and response activities.

Respondents were asked to indicate their LHD's level of engagement in specific Zika prevention and response currently or during the most recent mosquito season. The key prevention and response activities were: providing information to travelers, clinician outreach and communication, lab testing, MCH surveillance, and rapid detection and follow-up of birth defects.

Ninety-four percent of respondents are providing information to travelers about Zika risk and protective measures, and 90% of respondents are providing clinical outreach and communication on Zika clinical care guidance.

Seventy-two percent of LHDs are or have been engaged in MCH surveillance and response activities, while only 47% of respondents are or have been engaged in rapid detection and follow-up of birth defects associated with ZIKV.



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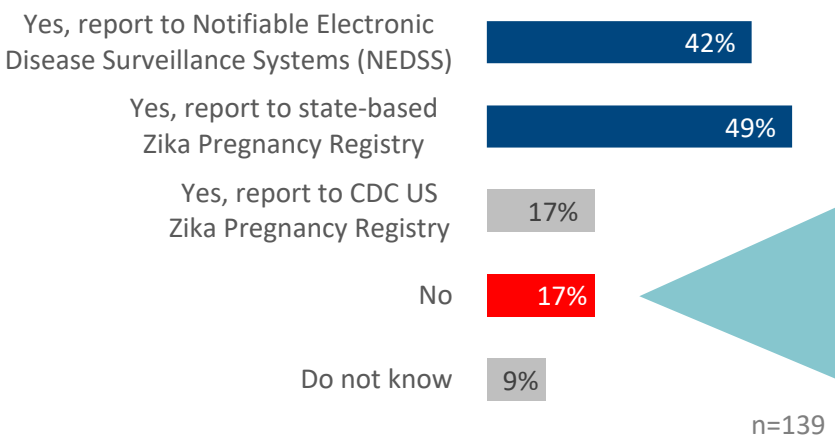
LHD responsibility for collecting and reporting positive Zika lab results.

Respondents were asked if they were primarily responsible for collecting and reporting positive Zika lab results for their jurisdiction. Almost half indicated they reported positive labs through the Notifiable Electronic Disease Surveillance System (42%) and/or a state-based Zika Pregnancy Registry (49%).

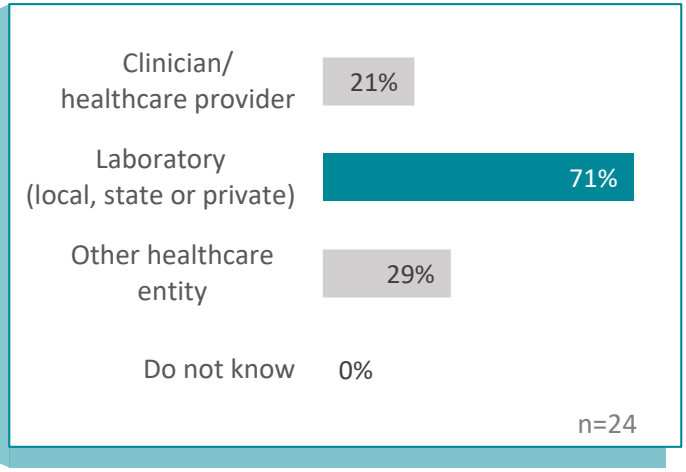
Seventeen percent of respondents indicated the LHD is not the primary reporter of positive Zika lab results. In jurisdictions where the LHD is not the primary reporter, state, local or private labs were responsible for reporting positive Zika lab results (71%).

Overall, 9% of the respondents were unaware if they or another entity in the jurisdiction is the primary agency responsible for reporting positive Zika lab results for their jurisdiction.

Respondents primarily responsible for collecting and reporting positive Zika lab results for pregnant women and infants in their jurisdiction.



Primary responsibility for collecting and reporting positive Zika lab results, where the LHD is not responsible.



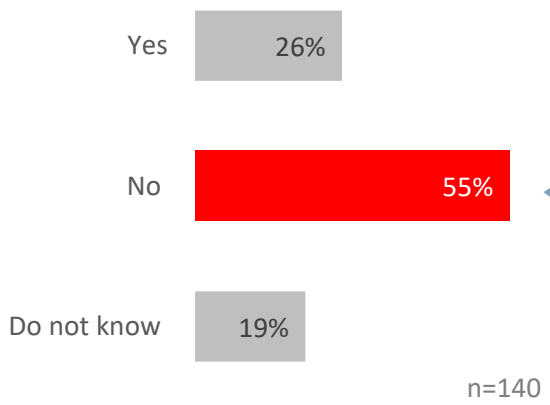
LHD responsibility for collecting and/or reporting data on birth defects.

The majority of respondents (55%) are not primarily responsible for collecting data and/or reporting on birth defects in their jurisdiction. Nineteen percent of respondents did not know if their agency or another entity in the jurisdiction had primary responsibility for reporting birth defects.

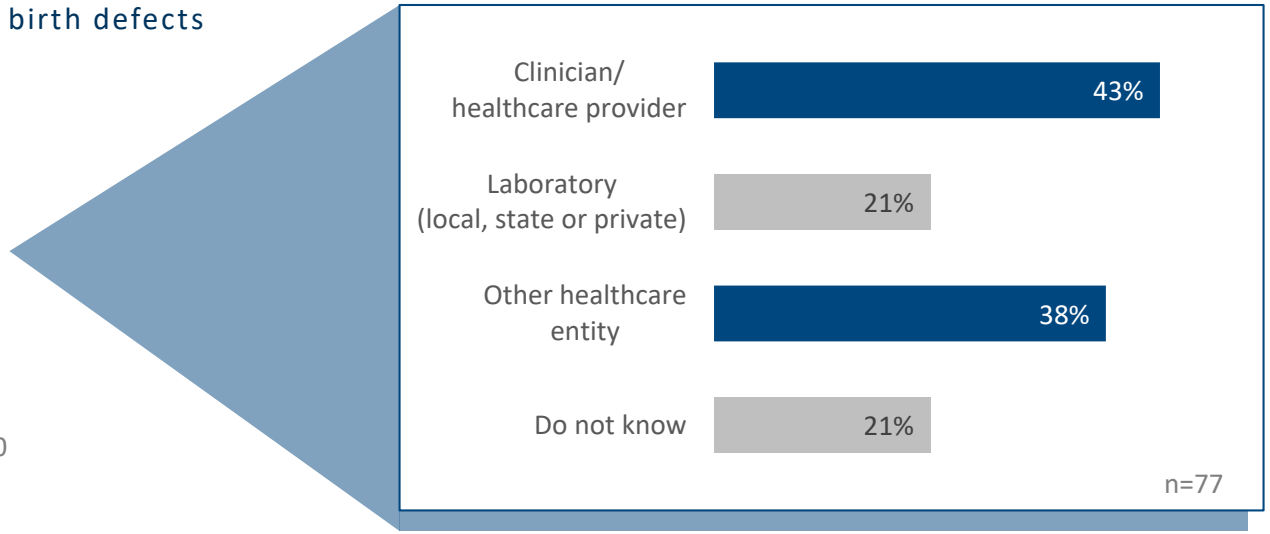
For respondents that are not primarily responsible for reporting on birth defects, the responsible entity is most commonly a clinician or healthcare provider (43%) or other healthcare entity (38%).

Twenty-one percent of LHDs that were not responsible for reporting birth defects did not know which entity in the jurisdiction was responsible for collecting data and/or reporting birth defects.

Respondents primarily responsible for collecting data and/or reporting birth defects



Primary responsibility for collecting data and/or reporting birth defects, where the LHD is not primarily responsible.



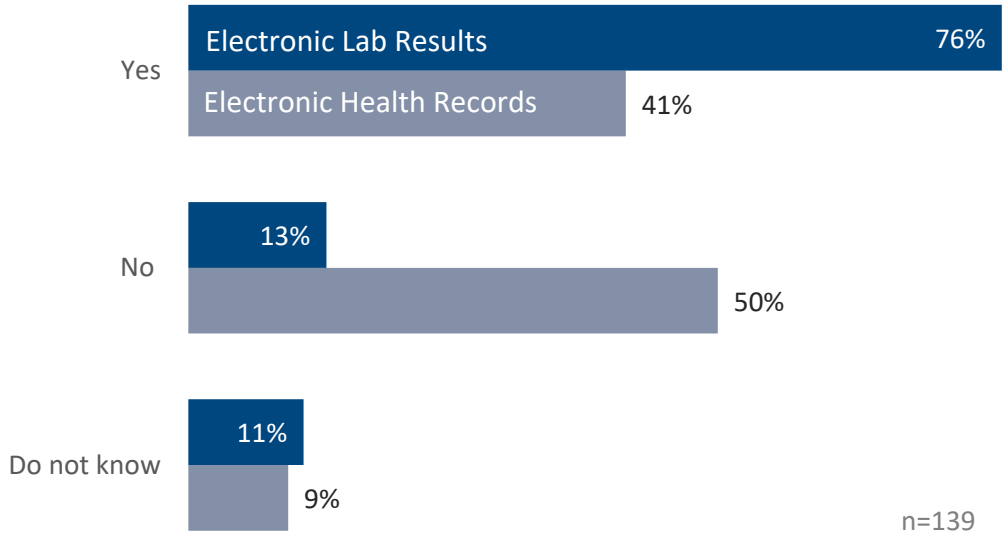
LHD access to electronic lab results and electronic health records.

Respondents were asked if the LHD had access to electronic lab results or electronic health records of pregnant women and/or infants with positive Zika lab test results.

Three-fourths (76%) of LHDs reported access to electronic lab results, whereas only 41% of LHDs have access to electronic health records.

Eleven percent and 9% of respondents did not know if they had access to electronic lab records or electronic health records, respectively.

LHD access to electronic lab results and electronic health records related to pregnant women and/or infants with positive Zika lab test results.



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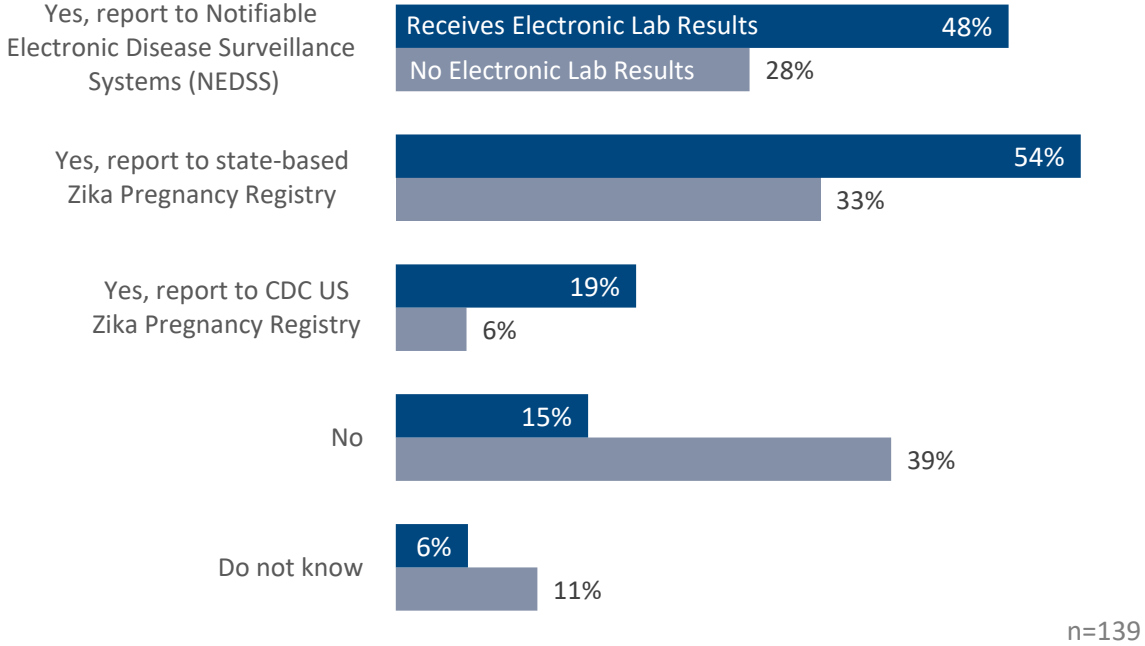
LHDs receiving electronic lab results and positive Zika lab test reporting.

Respondents who reported receiving electronic lab results are more likely to report positive Zika lab test results to the Notifiable Electronic Disease Surveillance System (48%), state-based Zika Pregnancy Registry (54%), and CDC U.S. Zika Pregnancy Registry (19%). Thirty-nine percent of respondents who do not have access to electronic lab results do not report to any of the registries.

Respondent access to electronic lab results and their reporting status of positive Zika lab test results.



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Community Engagement and Outreach

Review of LHD activities to educate and inform their jurisdiction about Zika exposure risk and prevention.

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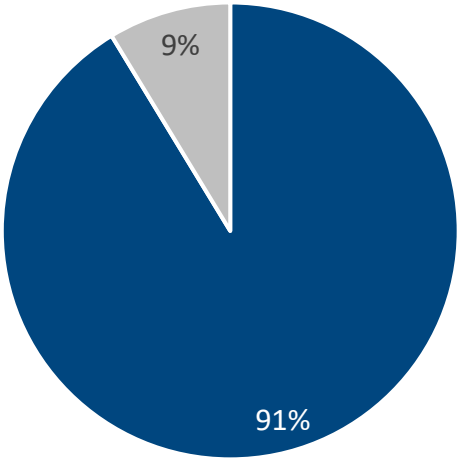
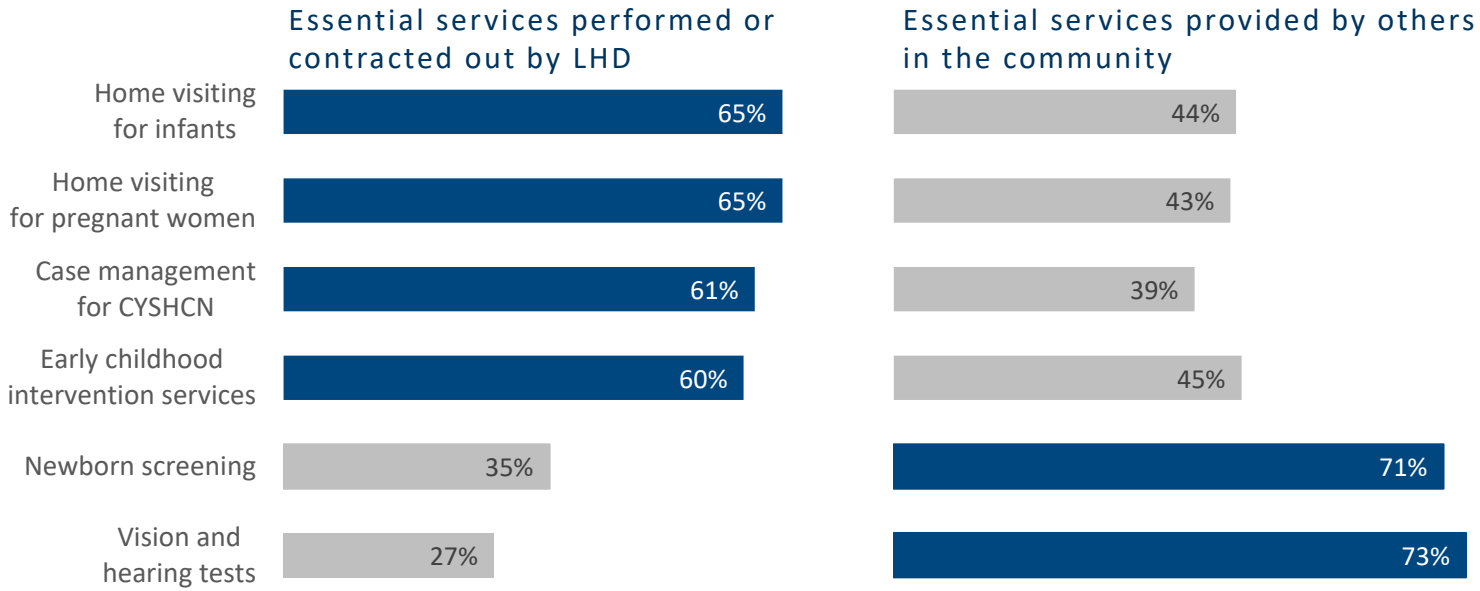
Essential maternal and child health services provided for pregnant women and/or infants.



Over 90% of respondents have a formal or informal referral system to community-level programs and services in their area. Overall, 6% of respondents said they did not have a formal or informal referral system, and only 2% of respondents were not aware if their LHD had a referral system to programs and services for pregnant women and/or children.

Specifically, 60% or more LHDs reported directly providing or contracting-out home visitation services for infants and pregnant women, case management services for children and youth with special health care needs, and early childhood intervention services. Over 70% of newborn screening and vision and hearing services are provided by others in the community. These services were not available at all in 2% of communities, and 5% of respondents were not aware if the services were available in their community.



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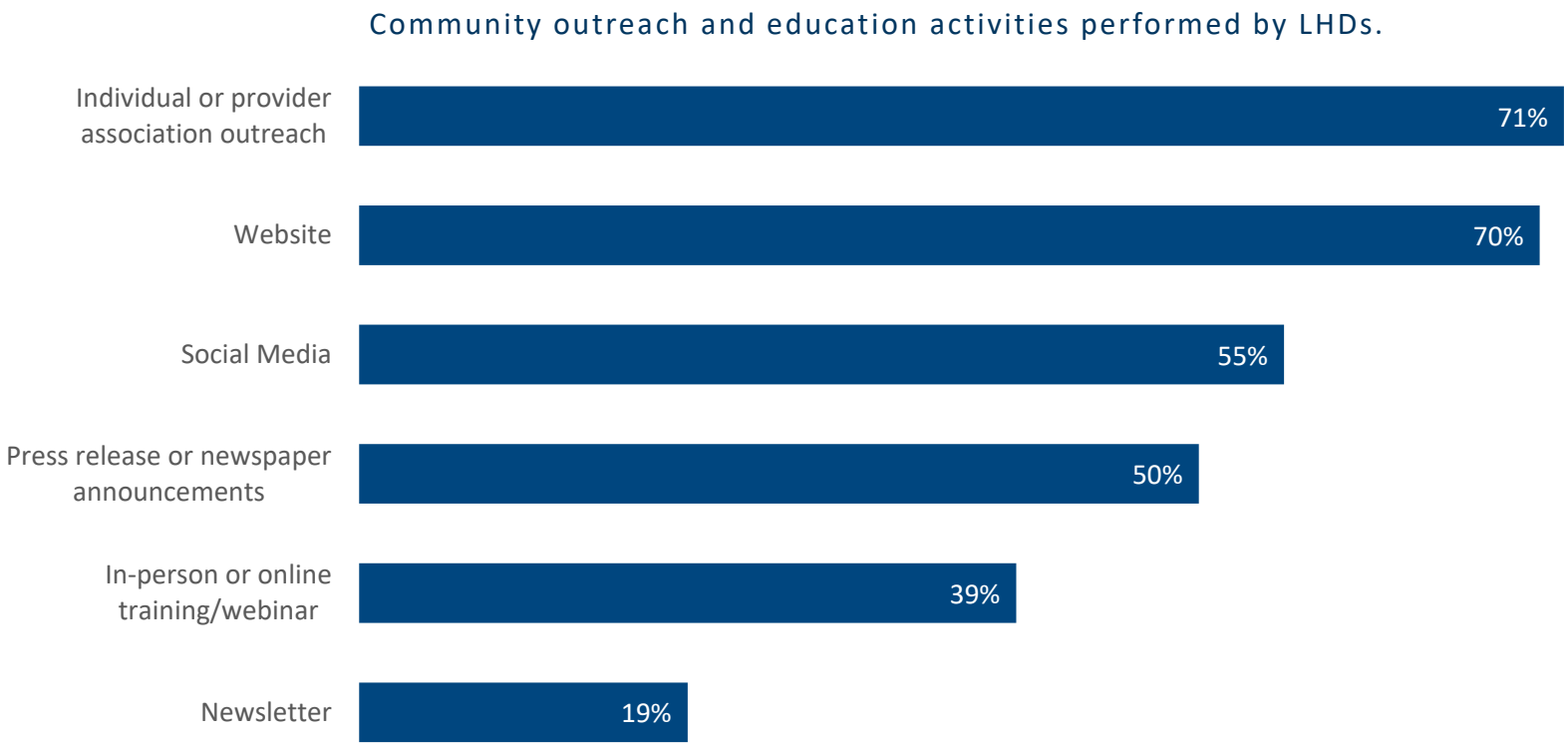
Zika community outreach and education activities performed by LHDs.

Respondents were asked to identify all community outreach activities they are engaged in to inform the public and health care providers of ZIKV risk and prevention.

Most LHDs reported individual or provider association outreach (71%) and sharing information on their website (70%) as the most common outreach and education activities related to Zika risk and prevention.

Over half of the LHDs are performing community outreach and education using social media (55%).

Only 7% of LHDs are not engaging in any community outreach and education activities.



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MCH Zika Assessment Conclusions and Limitations

This report is the first report of an assessment of the organizational capacity of LHDs and their MCH programs, in high-risk jurisdictions, to monitor, track and support pregnant women and/or infants potentially affected by the Zika virus.

Key Findings

Over 80% of LHDs have formal and/or informal communication and referral mechanisms between their MCH programs and key programmatic areas within their agency. Referrals between key programmatic areas can support identification and follow-up efforts of pregnant women and/or infants potentially exposed to the Zika virus.

Seventy-eight percent (78%) of LHDs have access to electronic lab results. LHDs receiving electronic lab results are more likely to report to local, state, and federal disease surveillance systems.

Disease surveillance and monitoring is an essential public health service of LHDs. Access to lab results allows LHDs to plan adequate response to the burden of disease within their communities.

LHDs are actively engaged in community-level Zika response activities. Over two-thirds of LHDs are currently or have participated in response activities including providing information to travelers about Zika risk and protective measures, providing clinical outreach and communication, supporting lab testing, and conducting MCH surveillance.

LHDs are less likely to provide screening and testing services to identify potential birth defects in infants. Seventy-one percent of newborn screening and 73% of vision and hearing testing were provided by other entities within LHD jurisdictions.

Limitations

Governance of LHDs in each state varies. Due to state preferences, the MCH assessment was not disseminated to each LHD in every state. Therefore, the results of the survey may not be broadly attributable to individual LHD capacity.

Resources, or lack thereof, to support MCH and Zika response activities was not addressed in this assessment. Therefore Zika response activity engagement by the LHD is not understood in relation to the available resources in the community.

Due to the 58% response rate, the presented responses may not reflect all LHD MCH Zika response capacity.

Recommendations

Increase LHD training and support for MCH reporting and surveillance.

- Provide support to LHD staff on Zika-related disease surveillance and monitoring
- Improve LHD access to electronic lab results to support reporting and follow-up of positive Zika lab results
- Train LHDs on how to engage pediatric clinicians and sub-specialties on the risk of Zika exposure in the community
- Increase capacity of LHDs to engage in rapid detection and reporting of birth defects in the jurisdiction, or to identify entities responsible for detecting and reporting birth defects

Enhance LHD capacity for formal and informal, internal and external referral processes.

- Support LHDs in identifying pediatric clinicians, specifically sub-specialties, to support Zika response and follow-up activities

Increase local support for LHD engagement in MCH Zika response.

- Ensure LHDs have access to resources and information that can be tailored to the individual needs, or risks, of their communities
- Engage LHDs in local, state, and federal partnerships to stay abreast of Zika exposure risk for vulnerable populations

Mosquito Control Capabilities in the U.S.

October 2017

Mosquito Surveillance and Control Assessment and Ranking

Definitions

A **Fully Capable** vector control organization performs all core and supplemental competencies.

A **Competent** vector control organization performs all core competencies.

A **Needs Improvement** vector control organization fails to perform one or more core competency.

A scoring matrix was created to prioritize or weight questions based on necessary capabilities of a competent vector control program. Using the CDC framework[2,3] for vector control competency as guidance, five core competencies were used to rank each organization as **Fully Capable**, **Competent**, or **Needs Improvement**.

Core Competencies

1. Routine mosquito surveillance through standardized trapping and species identification
2. Treatment decisions using surveillance data
3. Larviciding, adulticiding, or both
4. Routine vector control activities (e.g., chemical, biological, source reduction, or environmental management)
5. Pesticide resistance testing

Supplemental Competencies

6. Licensed pesticide application
7. Vector control activities other than chemical control (e.g., biological, source reduction, or water management)
8. Community outreach and education campaigns regarding mosquito-borne diseases, how they spread, and how to prevent infection
9. Regular communication with local health departments regarding surveillance and epidemiology
10. Outreach (e.g., communication and/or cooperation) with nearby vector control programs

Vector Control Organization Competency

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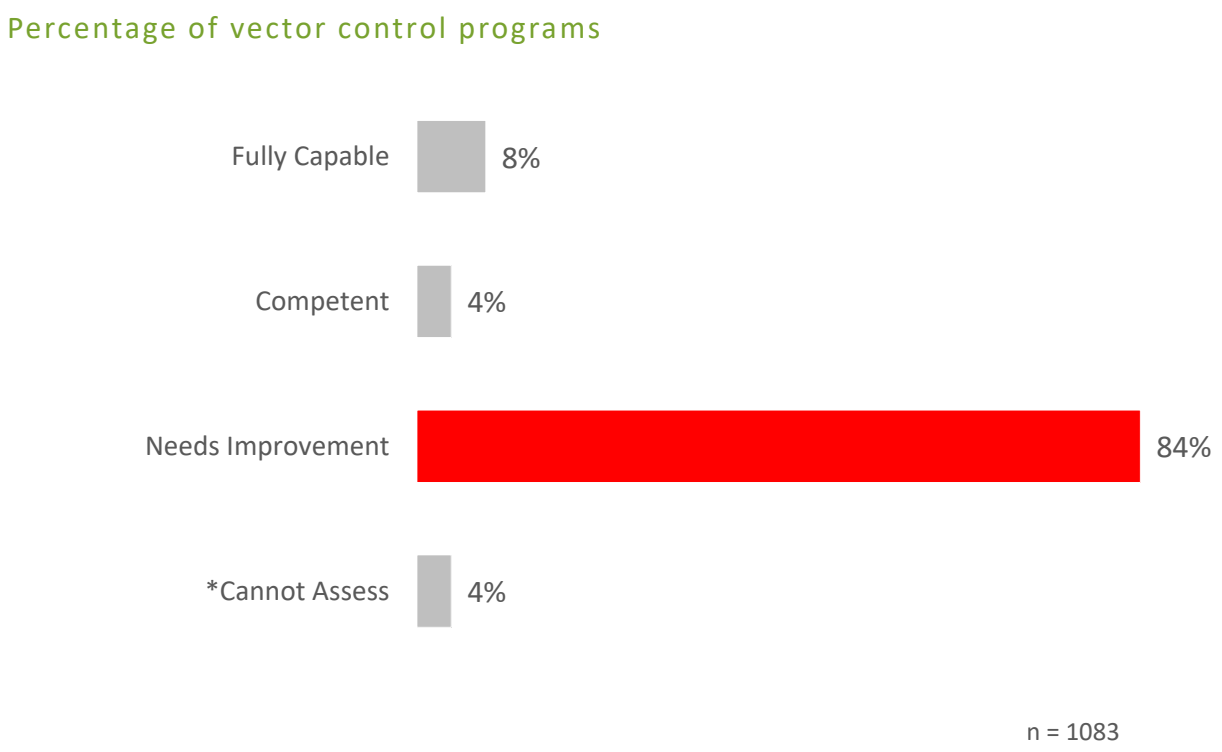
The overwhelming majority of vector control programs are in need of improvement

The assessment revealed that, based on the standards for competency developed and promoted by CDC and AMCA, **84% of respondents are in need of improvement** in at least one core competency area.

*Partially completed assessments were included for data analysis but could not be ranked for competency.



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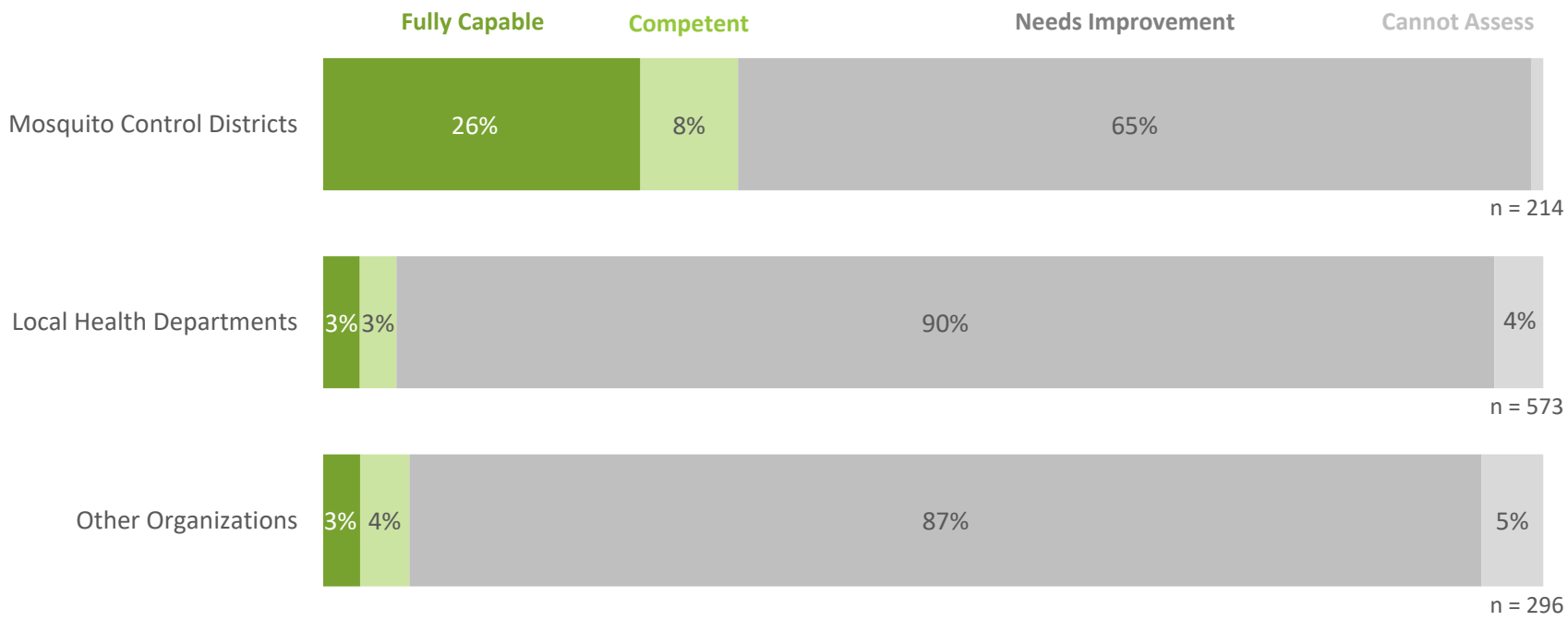
The level of vector control competency varies by organization type

Vector control programs are carried out by a variety of organizations across the U.S. Overall, they can be classified into three categories: **Local Health Departments**, **Mosquito Control Districts**, and **Others**.

"Other" includes a variety of city/local governmental agencies (e.g., public works departments, street and sanitation departments, Tribal networks, environmental health services, parish police juries, parks and recreation departments, weed and pest departments, and utilities departments).

These results reveal differences in mosquito surveillance and control capabilities based on organization type. For example, **mosquito control districts outperform** both local health departments and other city or local governmental agencies.

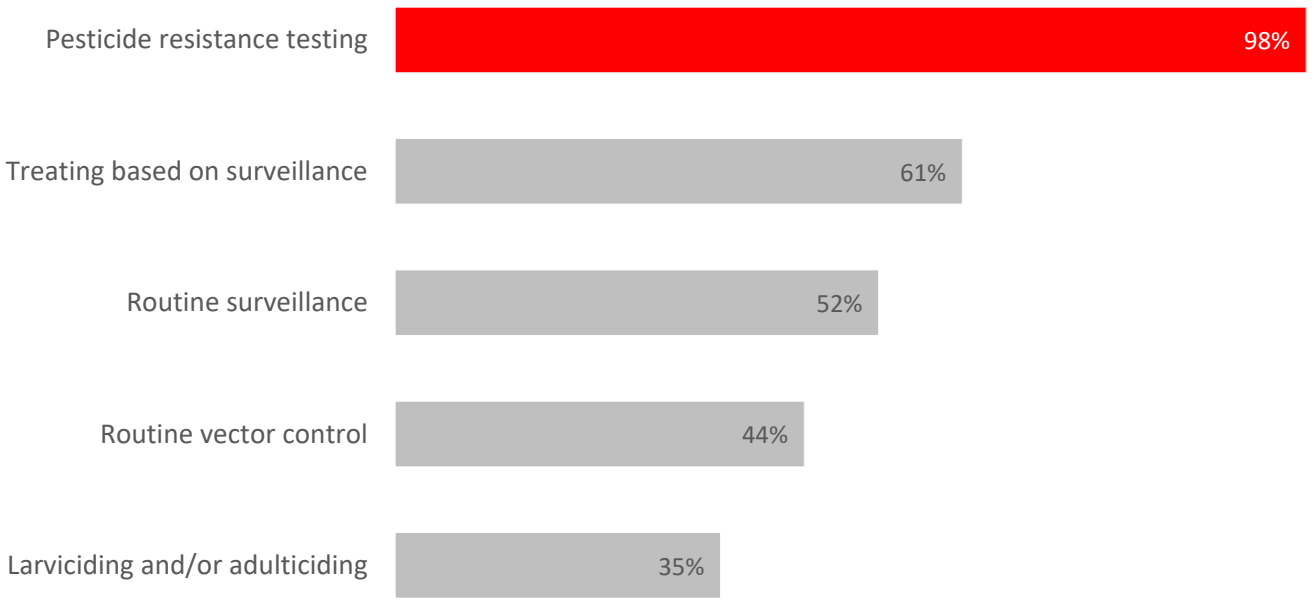


Pesticide resistance testing is the greatest competency gap for vector control programs

Of the vector control programs ranked as **Needs Improvement**, nearly all of them (98%) lack the capability or capacity to perform pesticide resistance testing.

More than half of these programs also lack competency in performing routine surveillance and species identification. Furthermore, gaps in competency exist related to using that surveillance data to make treatment decisions.

Percentage of "needs improvement" vector control programs lacking each core competency



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Core Competencies Performed by Vector Control Organizations

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Routine standardized surveillance is NOT ROUTINE for all vector control programs

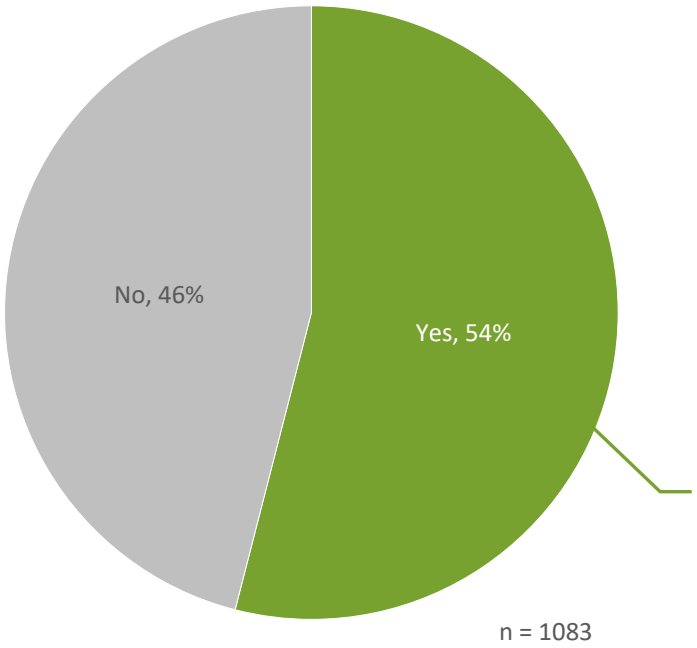
Mosquito surveillance involves species identification, abundance, and spatial distribution within a geographic area through the collection of eggs, larvae, and adult mosquitoes. It is necessary for:

- Monitoring changes in abundance and species distribution;
- Evaluating control efforts; and
- Informing intervention decisions.[4]

46% of programs do not perform routine standardized surveillance.

Of those that do perform routine surveillance, 15% reported NOT using this information to inform mosquito-borne disease treatment decisions.

Percentage of vector control programs conducting routine surveillance for mosquitoes



Of these, 85% of vector control programs reported using the information gathered to make treatment decisions.

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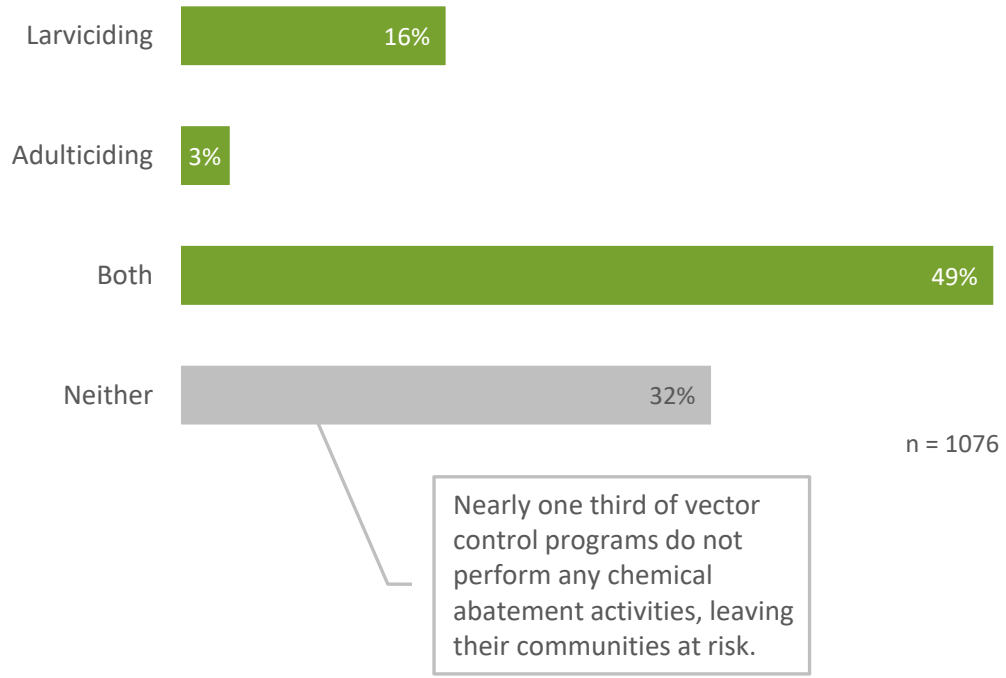
Chemical mosquito abatement is performed by most vector control programs

Larvicides (biopesticides and chemicals) inhibit the growth of mosquito larvae thereby reducing the number of adult mosquitoes in a given area.

Adulticides (insecticides) are toxic to mosquitoes, killing them via direct contact. Surveillance data is critical to justify the use of adulticides.

Chemical abatement using larvicides, adulticides, or a combination **is performed by the majority (68%) of vector control programs.**

Percentage of vector control programs conducting larviciding and/or adulticiding



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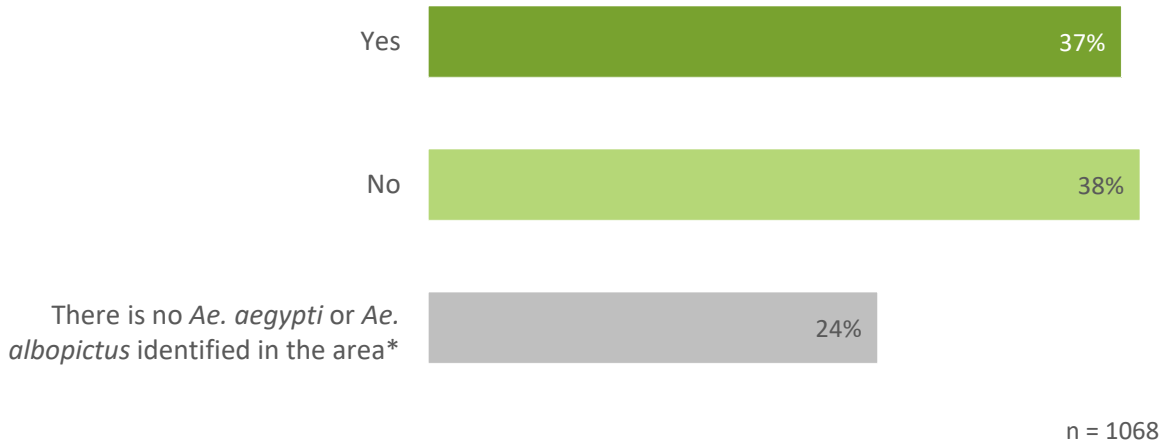
Routine species-specific mosquito control is NOT ROUTINE for all vector control programs

Species-specific vector control activities are not performed uniformly across the U.S. **38% of programs do not perform routine species-specific vector control**.

Routine species-specific vector control includes chemical, biological, source reduction, and/or environmental management activities tailored to the breeding and feeding habitats of different mosquito species.

* Respondents were not penalized if they indicated there is no *Ae. aegypti* or *Ae. albopictus* identified in the area.

Percentage of vector control programs engaging in routine vector control specifically for *Aedes aegypti* and/or *Aedes albopictus*



Vector control programs often lack pesticide resistance testing

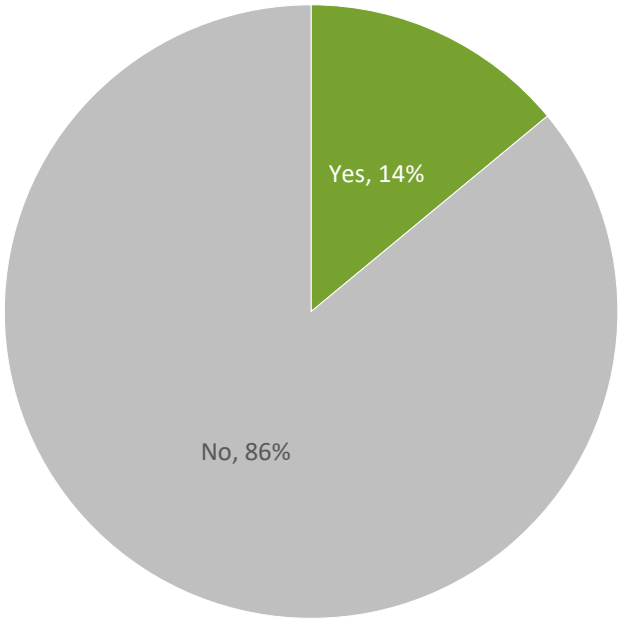
Pesticides and insecticides are chemicals used to control both larvae and adult mosquitoes. Mosquitoes repeatedly exposed to these chemicals over time can develop resistance.[3]

Pesticide resistance is an overall reduction in the ability of an insecticide to kill mosquitoes.

Of the responding vector control organizations, **86% do not perform pesticide resistance testing.**

To prevent or delay pesticide resistance from developing, vector control programs should include resistance testing, monitoring, and management.[4]

Percentage of vector control programs conducting pesticide resistance testing



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Supplemental Competencies Performed by Vector Control Organizations

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Licensed pesticide use varies among vector control programs across the United States

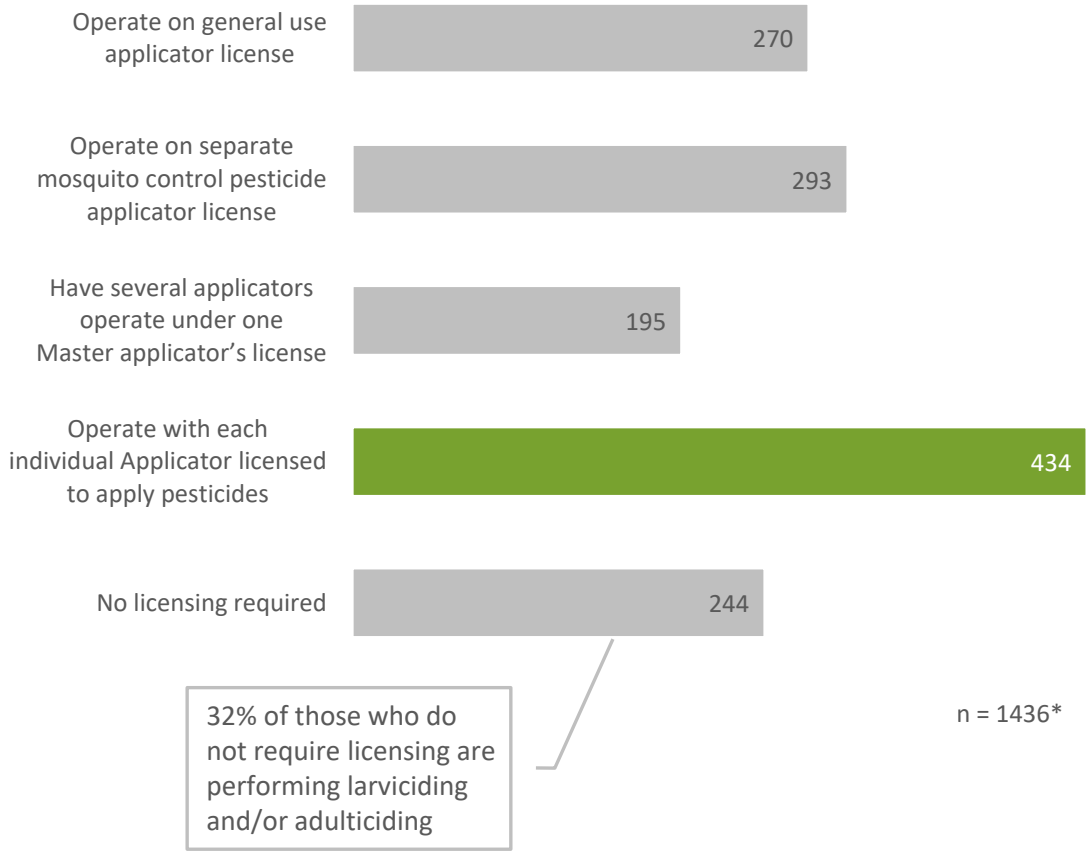
The majority of vector control programs require each operator to have an individual applicator license to apply pesticides.

Licensed pesticide application is one way to ensure that chemical mosquito abatement does not impact other non-target insects, plants, animals, and humans. Licensing requirements can vary by chemical type and state.

32% of programs applying larvicides and/or adulticides require no licensing, yet the assessment did not address their specific licensing requirements.

*Respondents were allowed to select all applicable answers.

Number of vector control programs in jurisdictions requiring licenses for pesticide application*



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Alternatives to chemical control are not universally applied

Alternatives to chemical control of mosquitoes include:

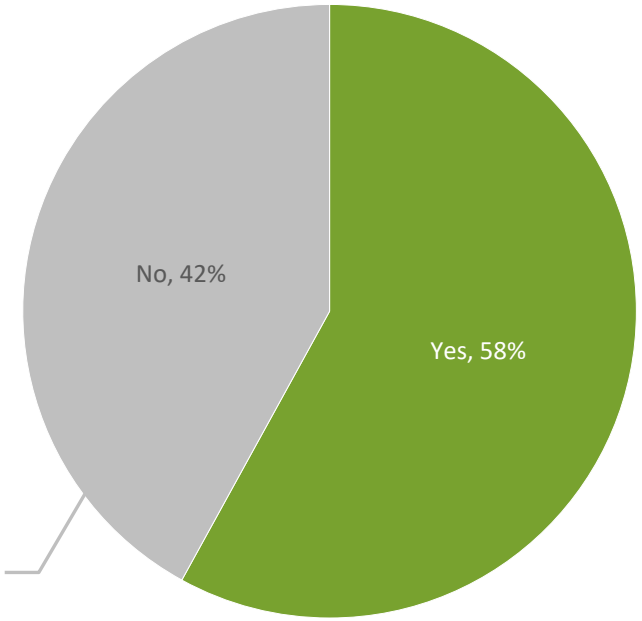
Larval source reduction is the most effective means of vector control. Mosquito larvae develop in standing, fresh water: through environmental modifications you can limit the water sources thereby reducing mosquito larvae.

Biological control entails using biological organisms to manage mosquitoes. These can include: aquatic predators and genetically modified organisms.

58% of programs perform non-chemical abatement activities, 42% do not.

*Of the programs reporting no non-chemical abatement, 56% do not perform any abatement activities, including chemical.

Percentage of vector control programs engaging in control activities other than chemical control



Of vector control programs reporting only chemical control, 4% use larviciding treatment only; 16% use adulticiding treatment only; 24% use both; and 56% do neither.*

n = 1066

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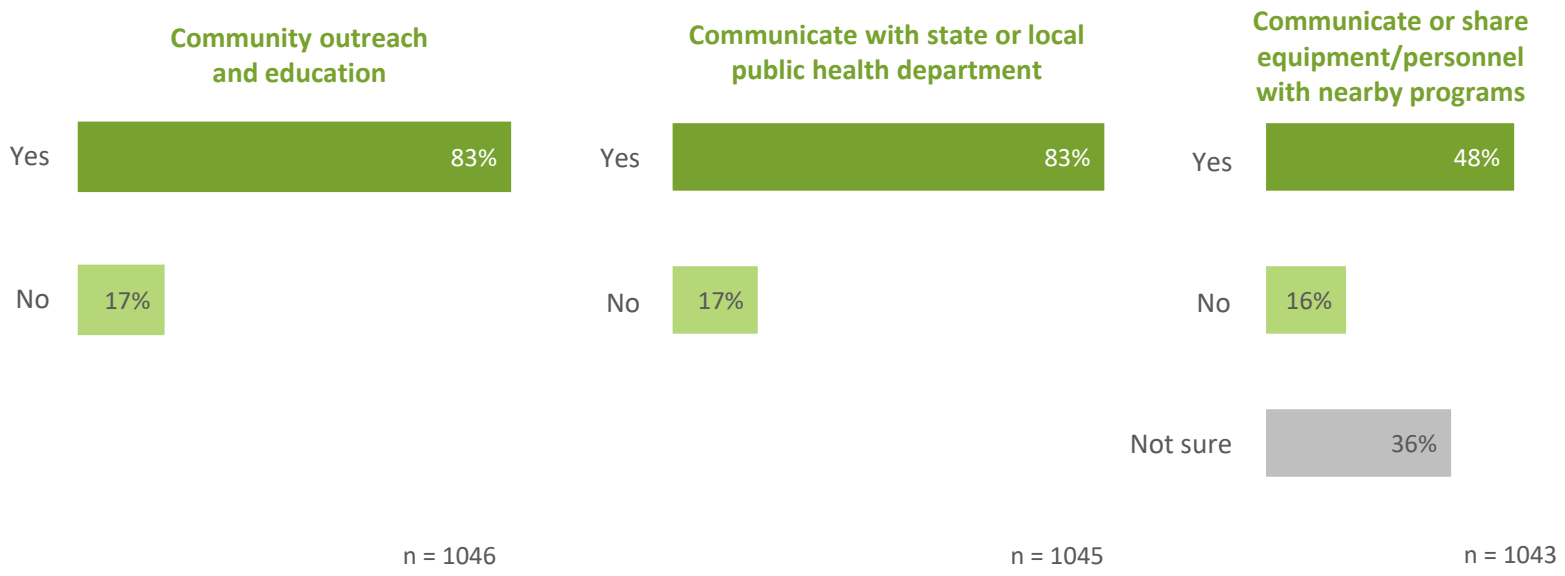
Community engagement and outreach is relatively common among vector control programs

The majority of vector control programs in the U.S. provide **community outreach activities to educate community members** on how to protect themselves from mosquito-borne diseases.

Programs also regularly **communicate with health departments** to receive human surveillance and epidemiology reports.

Nearly half of all programs are willing and able to **assist nearby vector control programs**, an important asset in controlling a disease outbreak.

Percentage of vector control programs engaging in activities



Competencies among U.S. Regions

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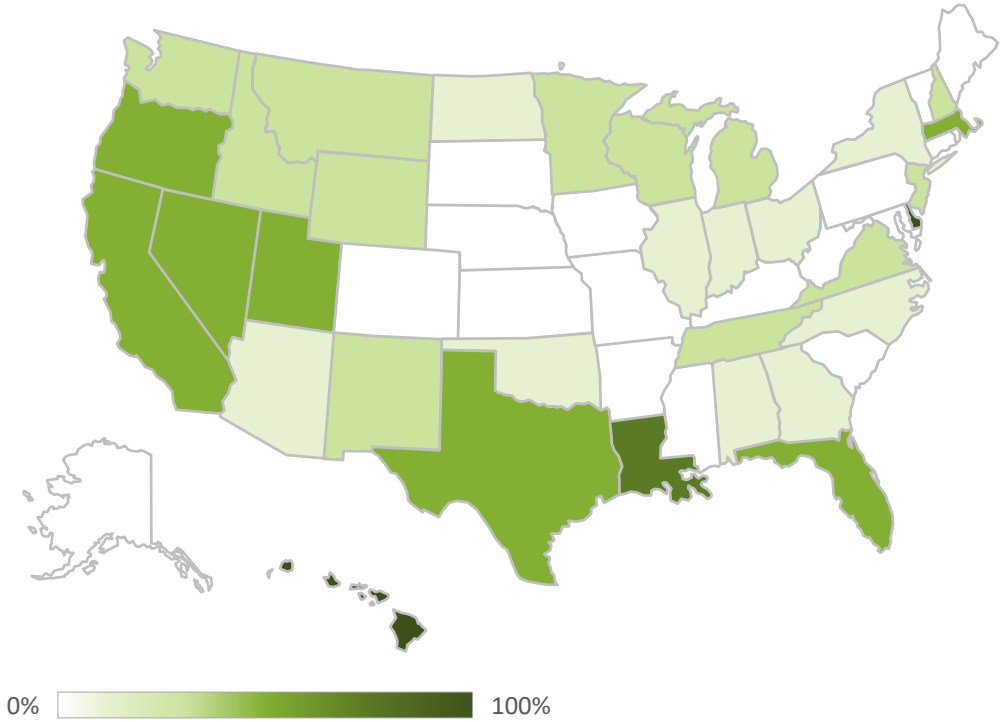
Vector control program competency varies across the United States

If you combine the fully capable and competent vector control programs in each state, the data reveals that **33 states had at least one vector control program meeting all core competencies**. All vector control programs in 17 states were rated needs improvement, indicating none of their vector control programs meet all core competencies.

Critical next steps include:

- **Identifying barriers** to implementing core competencies and
- **Revealing best practices** by fully capable and competent programs.

Percentage of vector control programs ranked as "fully capable" or "competent" by state



Limitations and Conclusions

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Limitations and Conclusions

This report describes the first nation-wide baseline assessment of mosquito surveillance and control activities across the U.S. This national report provides comparable data on baseline mosquito control programs to help identify local agencies' preparedness for mosquito-borne virus outbreaks.

A comprehensive understanding of mosquito surveillance and control activities in the U.S. is necessary to identify gaps and needs specific to vector control. As illustrated here, **84% of vector control programs in the country have been identified as "needs improvement"** in one or more core competency.

Reviewing the areas in which vector control programs need improvement can inform decision-makers of the top vector control priorities when allocating resources.

Top Vector Control Priorities:

1. Pesticide resistance testing;
2. Treating based on surveillance data;
3. Routine mosquito surveillance and species identification;
4. Routine, species-specific vector control;
5. Larviciding and/or adulticiding; and
6. Non-chemical vector control (e.g., biological, source reduction, water management).

Challenges and Gaps

Vector control programs are structured and operated differently in each jurisdiction.

Resources, or lack thereof, to support vector control programs was not addressed.

Due to the 57% response rate, the presented responses may not reflect all vector control programs.

Only publicly-funded vector control programs were assessed. Any town or jurisdiction that contracted out services was expected to complete the survey based on the terms of their contract.

Recommendations

Increase mosquito surveillance and control capacity through:

Providing quality and ongoing staff training in standard mosquito surveillance and control techniques;

Increasing awareness of the importance of pesticide resistance testing and the proper training to perform it routinely;

Forming mosquito control districts (34% of mosquito control districts perform all core competencies versus 6% and 7% of local health departments and other organizations, respectively); and

Ensuring sustainable funding and resources are dedicated to local vector control programs to maintain properly trained staff and adequate supplies to perform chemical and non-chemical abatement activities.

Decrease barriers to mosquito surveillance and control competency through:

Identifying the barriers to routine mosquito surveillance and pesticide resistance testing;

Bolster public communication strategies to educate property and home owners on eliminating mosquito breeding grounds;

Supporting data collection and sharing across jurisdictions to monitor mosquito species and density over time and pre-/post-control activities; and

Ensuring all mosquito control decisions are supported by surveillance data with appropriate thresholds.

NACCHO supports federal, state, and local funding for local health departments and mosquito control agencies to provide technical assistance, education, and research to support integrated mosquito management programs designed to benefit or cause minimal harm to people, domestic animals, wildlife, and the environment.