

Vector-Borne Disease Workforce Training & Development Needs Assessment

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Contents

| | |
|---|----|
| Executive Summary | 2 |
| Introduction | 3 |
| Methods | 3 |
| Results | 5 |
| Respondent Demographics | 5 |
| Training Priority Ratings | 7 |
| Mosquito-Focused Skill Areas | 7 |
| Tick-Focused Skill Areas | 8 |
| Preferred Training Formats & Barriers to Engagement | 9 |
| Discussion | 13 |
| Recommendations and Opportunities | 14 |
| Limitations | 15 |
| Acknowledgements | 16 |
| Appendix | 17 |



Executive Summary

A primary goal of the Northeast Regional Center for Excellence in Vector-Borne Diseases: Teaching & Evaluation Center (NEVBD-TEC) is to offer professional development opportunities for the public health entomology workforce. In spring 2024, NEVBD-TEC conducted an online needs assessment to understand the training needs for vector-borne disease (VBD) and public health professionals working in public agencies. The assessment focused on those involved in the surveillance and control of ticks, mosquitoes, and their associated diseases in the northeastern United States.

A total of 117 responses were submitted; 90 were included for analysis after removal of poor-quality responses. The majority of respondents worked in New Jersey (21%), New York (20%), Massachusetts (13%), and Virginia (13%). Respondents were affiliated with Departments of Health (38%), vector-control units/Departments of Public Works (39%), and Departments of Agriculture/Environment (23%). Most respondents worked at the sub-state jurisdiction level (58%), followed by the state level (39%), and only 3% worked at the federal or indigenous nation level.

Overall, needs assessment results showed similar trends across tick and mosquito-focused skill areas where a need for increased training was frequently noted, including public health communication, data management and analysis, and vector control.

Seventy participants (78%) responded to questions regarding priority training areas for mosquitoes and mosquito-borne diseases. High priorities for mosquito-focused training included: blood feeding behavior and host preferences, insecticide resistance monitoring techniques, GIS/spatial display and analysis, long-term data management best practices, communication with environmentalist groups, communicating with anti-pesticide groups, addressing misinformation, and best practices for health messaging.

Forty participants (44%) responded to questions on priority training areas for ticks and tickborne diseases. High priorities for tick-focused training included: blood feeding behavior and host preferences, overwintering survival, activity – time of day/seasons/phenology, biostatistics, GIS / spatial display & analysis, calculating local or regional summary statistics, best practices for health messaging, and addressing misinformation.

The easiest training formats for respondents to access were online workshops or webinars and online certificate programs, while the hardest engagement formats were in-person, multi-day workshops and attendance at regional conferences. The most common barriers to engagement across all training formats were cost, time away from work, and securing travel approvals. Online programs had the highest proportion of respondents reporting 'no perceived barriers' to engagement.

In conclusion, our survey indicated broad interest of the vector-borne disease workforce in the skills outlined above, but a nuanced focus may be needed to provide responsive training to different professions within the workforce based upon their individualized needs. Our recommendations for development of VBD training programs include the following considerations: 1) optimize content to training format, 2) understand barriers to access, and 3) prioritize program development by feasibility and impact.

Introduction

Vector-borne diseases (VBDs) are caused by viruses, bacteria, and parasites transmitted by infected arthropods, such as mosquitoes and ticks. VBDs affect a growing number of people in the United States, with reported cases doubling over the past two decades¹. VBD professionals working in state and local organizations across the U.S. protect the public's health by conducting surveillance and implementing control methods to detect and prevent spread of mosquito- and tickborne diseases. However, recent workforce capacity and needs assessments have revealed gaps in program capabilities to prepare for and respond to VBD threats². Training programs can address this challenge and empower the current workforce with the skills needed to conduct essential public health functions, including vector surveillance, health communication, and vector control¹. Effective training programs should be responsive to regional contexts and grounded in assessments of regional demographics, needs, and opportunities.

The Northeast Regional Center for Excellence in Vector-Borne Diseases: Teaching & Evaluation Center (NEVBD-TEC) was established in July 2023 through Cooperative Agreement U50CK000633 between Cornell University and the Centers for Disease Control and Prevention. One of the primary goals of NEVBD-TEC is to offer professional development opportunities for the public health entomology workforce. Professional groups working in the field of public health entomology are diverse and represent a variety of disciplines, including epidemiologists, entomologists, sanitarians, pesticide applicators, and more. NEVBD-TEC developed a subcommittee focused on professional development and training to direct our network's efforts to support this diverse audience. The first initiative of this subcommittee was centered on understanding the training needs and opportunities for vector-borne disease and public health professionals working in public agencies that are involved in the surveillance and control of ticks, mosquitoes, and their associated diseases.

Methods

The NEVBD-TEC professional development and training subcommittee developed an online survey questionnaire to assess training needs of VBD professionals in the Northeast region. The content of the questionnaire was designed with feedback from the NEVBD-TEC Investigator Leadership Team. The questionnaire included four sections, further detailed in Table 1. Prior to finalization, the questionnaire was beta tested by NEVBD-TEC Advisory Board members and stakeholders representative of state and local vector control divisions and departments of public health.

The subcommittee developed a chain-referral, or snowball, sampling strategy to engage the target audience of professionals directly involved in the surveillance and control of vectors and VBDs in the Northeast³. Direct email invitations were disseminated to NEVBD-TEC stakeholders

¹ The U.S. Department of Health and Human Services and the U.S. Centers for Disease Control and Prevention. The National Public Health Strategy to Prevent and Control Vector-Borne Diseases in People. U.S. DHHS, CDC; 2024.

² Roy, A., Gridley-Smith, C., Patel, K., Garofalini, C., & McCall, T. C. (2024). Vector surveillance and control at the local level: Findings from the 2023 Vector Control Assessment. National Association of County and City Health Officials. Washington, DC. <https://bit.ly/2023VectorReport>

³ Penrod J, Preston DB, Cain RE, Starks MT. A Discussion of Chain Referral as a Method of Sampling Hard-to-Reach Populations. *Journal of Transcultural Nursing*. 2003;14(2):100-107. doi:[10.1177/1043659602250614](https://doi.org/10.1177/1043659602250614)

that participate in our regional pesticide resistance monitoring program and our regional arbovirus situational awareness calls. Advertisements for survey participation were also distributed at annual conferences and via email listservs for national and regional professional associations, including American Mosquito Control Association (AMCA), Mid-Atlantic Mosquito Control Association (MAMCA), New Jersey Mosquito Control Association (NJMCA), Northeastern Mosquito Control Association (NMCA), Pennsylvania Vector Control Association (PVCA), and Virginia Mosquito Control Association (VMCA). Recipients of direct emails were asked to share the survey with colleagues in their professional networks. NEVBD-TEC also promoted survey participation through our weekly e-newsletter and Twitter (X) handle. Responses were collected through the Qualtrics online survey platform between February 22 and May 6, 2024⁴. Reminder emails were sent on March 11 and April 1. The project protocol was reviewed by the Cornell University Institutional Review Board and did not meet the definition of human subjects research (IRB0148284).

Table 1. Workforce Needs Assessment Questionnaire Content Areas

| Questionnaire Section | Content |
|--|---|
| Respondent workplace demographics | Agency type and location Years in workforce Supervisory and hiring responsibilities Professional association affiliation |
| Training needs: skills in mosquitoes and mosquito-borne disease management | Biology and ecology Surveillance Control |
| Training needs: skills in ticks and tickborne disease management | Epidemiology Data Management and Analysis Public Health Communication |
| Preferences for and access to training programs | Venues Annual timing Instructional format Financial support Access barriers Willingness to pay |

Data from the Qualtrics survey platform were exported to Microsoft Excel for response quality review. Survey response quality (i.e., identification of bots, duplicate responses, poor completion) was evaluated using the Qualtrics Fraud Detection features (Duplicate Score, Recaptcha Score, and Fraud Score), response duration, and a review of responses to open-ended and primary demographic question items⁵. Responses with a Duplicate Score greater than or equal to 75; Recaptcha Score greater than or equal to 0.5; Fraud Score greater than or equal to 30; and survey completion time of less than 5 minutes were flagged for review. Low quality responses were

⁴ Qualtrics, Provo, UT, USA. <https://www.qualtrics.com>

⁵ Qualtrics. "Fraud detection". Provo, UT, USA. <https://www.qualtrics.com/support/survey-platform/survey-module/survey-checker/fraud-detection/>

excluded from analysis, as were responses from individuals working outside the northeast region of the U.S. and those working for private and nonprofit entities.

Analyses of quantitative survey responses were conducted in SPSS⁶. Responses regarding tick and mosquito skill areas, barriers to training, and format preferences were assessed by key respondent demographics through Chi-square and Kruskal-Wallis group comparisons. Responses were grouped geographically by U.S. Department of Health and Human Services regions⁷. Response options were collapsed into the following groups to allow comparisons: 1) Department of Health, 2) vector control/Dept. of Public Works (Vector-DPW), and 3) Dept. of Agriculture/Environment (Dept. Ag/Env). Additionally, response options were collapsed into the following jurisdiction levels: state, sub-state, and federal/indigenous nation (Federal-N). The sub-state level included any jurisdiction below the state level including county, district, and local programs. Content analysis of qualitative open-ended responses was conducted in Atlas.ti (version 24.1.1)⁸.

Results

Respondent Demographics

A total of 117 responses were submitted through the Qualtrics survey platform; 90 responses were included for analysis after removal of poor-quality responses. The distribution of responses across the NEVBD-TEC catchment area are listed in Table 2. The majority of respondents worked in New Jersey (21%), New York (20%), Massachusetts (13%), and Virginia (13%). Respondent organization was evenly distributed across Dept. of Health (38%) and Vector-DPW (39%), with fewer affiliated with Dept. of Ag/Env (23%). Most respondents worked at the sub-state jurisdiction level (58%), followed by the state level (39%), and only 3% worked at the Federal-N level. Figure 1 depicts the distribution of responses by organization-sector. Most Region I respondents worked in state-level Dept. Ag/Env, most Region II respondents worked in sub-state-level Vector-DPW, and most Region III respondents worked in sub-state-level Vector-DPW and State Dept. Ag/Env.

Most respondents (n=35, 39%) had been working in the VBD field for over 15 years, followed by 6 to 14 years (n=31, 34%), and 5 years or less (n=16, 18%). The majority reported that they supervise others who perform duties related to vector-borne disease management (n=60, 67%) and oversee or participate in the hiring process for VBD professionals at their organization (n=64, 71%). Of the 66 respondents who reported their professional association affiliations, the majority (n=37, 56%) listed the AMCA, followed by regional associations NMCA (n=21, 32%) and NJMCA (n=14, 21%). Figure 2 displays all professional association affiliations indicated by respondents. Across all three DHHS regions, Spanish (73%) was reported as the most common non-English language relevant to the community the respondent works in; this was followed by Chinese (8%).

⁶ IBM Corp. Released 2024. IBM SPSS Statistics for Windows, Version 29.0.1 Armonk, NY: IBM Corp

⁷ U.S. Department of Health and Human Services. "HHS Regional Offices". <https://www.hhs.gov/about/agencies/iea/regional-offices/index.html>

⁸ ATLAS.ti Scientific Software Development GmbH. Released 2024. ATLAS.ti for Windows, Version 24.1.1. Berlin, Germany.

Table 2. Respondent Distribution by State and Region (n=90)

| State | Organization | | | Jurisdiction | | | TOTAL |
|------------------------|-----------------|-----------------|------------|--------------|-----------|-----------|-----------|
| | Dept. of Health | Dept. of Ag/Env | Vector-DPW | State | Sub-State | Federal-N | |
| <i>DHHS Region I</i> | | | | | | | 27 |
| CT | 2 | 3 | 0 | 3 | 2 | 0 | 5 |
| ME | 1 | 1 | 0 | 2 | 0 | 0 | 2 |
| MA | 1 | 6 | 5 | 8 | 4 | 0 | 12 |
| NH | 2 | 0 | 0 | 2 | 0 | 0 | 2 |
| RI | 1 | 1 | 0 | 2 | 0 | 0 | 2 |
| VT | 2 | 1 | 1 | 3 | 1 | 0 | 4 |
| <i>DHHS Region II</i> | | | | | | | 37 |
| NJ | 3 | 0 | 16 | 1 | 18 | 0 | 19 |
| NY | 12 | 1 | 5 | 3 | 14 | 1 | 18 |
| <i>DHHS Region III</i> | | | | | | | 26 |
| DE | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| DC | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| MD | 2 | 5 | 0 | 5 | 0 | 2 | 7 |
| PA | 2 | 3 | 0 | 4 | 1 | 0 | 5 |
| VA | 4 | 0 | 8 | 0 | 12 | 0 | 12 |
| WV | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 34 | 21 | 35 | 35 | 52 | 3 | 90 |

Figure 1. Respondent Distribution by Organization and Sector (n=90)

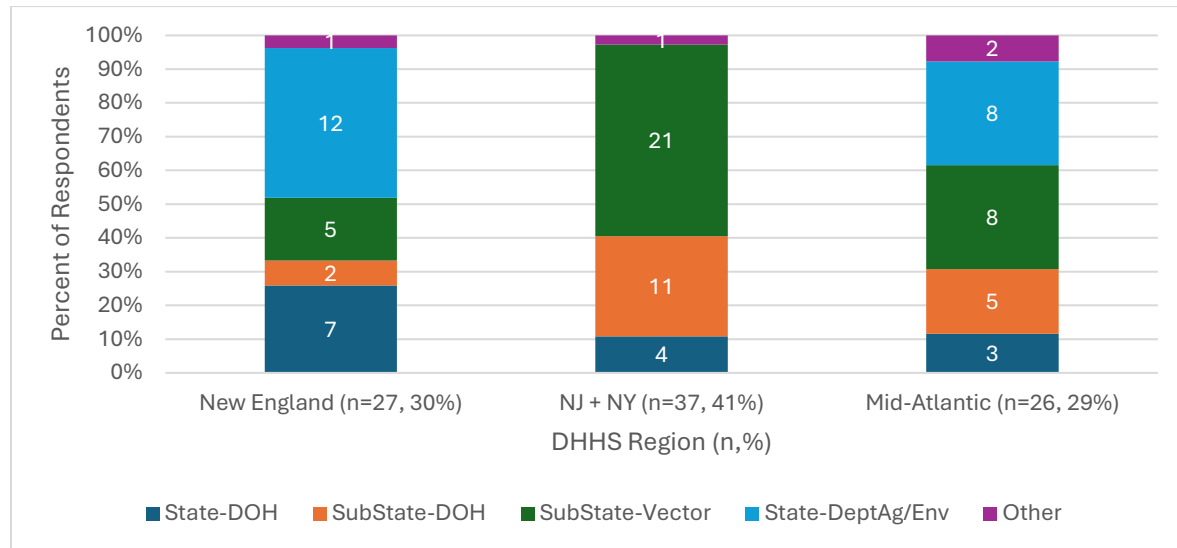
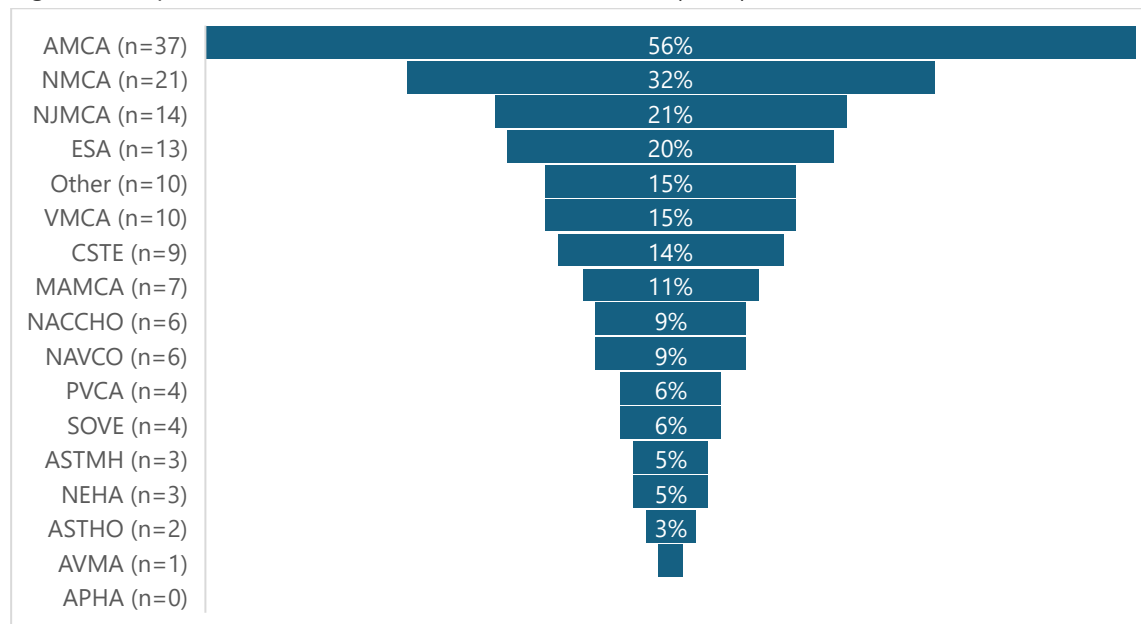


Figure 2. Respondent Professional Association Affiliations (n=66)



Training Priority Ratings

Mosquito-Focused Skill Areas

Seventy participants (78%) responded to the question set on priority training areas for mosquitoes and mosquito-borne diseases. Table 3 shows the distribution of these respondents by organization-sector and DHHS Region. On average, the mosquito-focused skill area rated highest for additional training was ‘Communication’, followed by ‘Data Analysis and Management’, and ‘Control’ (see Appendix for further details on skill areas). No differences were detected in the average skill area ratings by respondent region or number of years working in the VBD field. However, sub-state Vector-DPW respondents rated mosquito control skills higher on average than state Dept. of Health respondents (2.33 vs. 1.6, respectively, $p=0.045$). Figure 3 displays the average rating per mosquito-focused training skill area across all respondents. The most selected skill area subcomponents included,

- blood feeding behavior and host preferences (Ecology & Biology),
- insecticide resistance monitoring techniques (Control),
- GIS/spatial display and analysis (Data Management & Analysis),
- long-term data management best practices (Data Management & Analysis),
- communication with environmentalist groups (Communication),
- communicating with anti-pesticide groups (Communication),
- addressing misinformation (Communication), and
- best practices for health messaging (Communication).

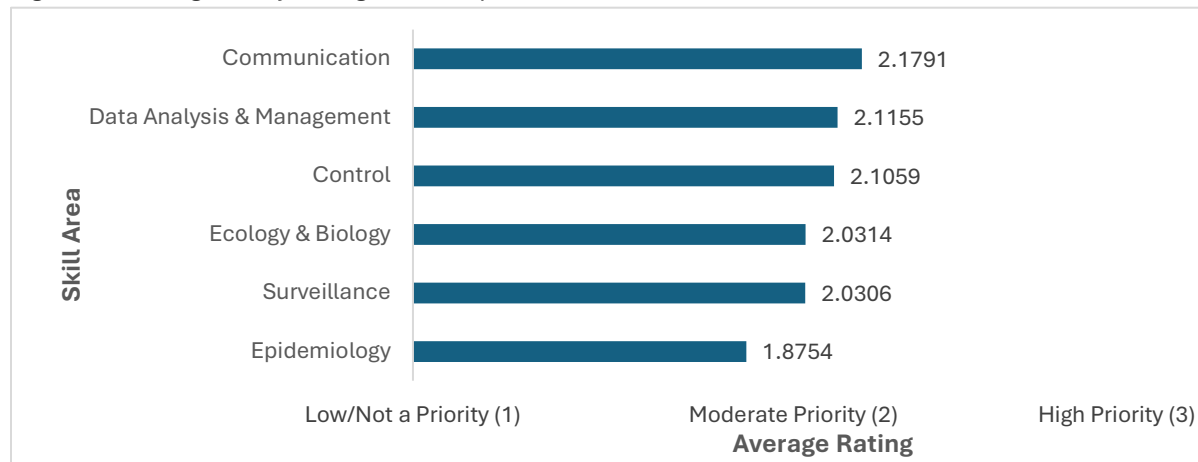
The least selected skill area subcomponents were human disease case definitions and human disease case reporting requirements (Epidemiology). When comparing subcomponent ratings across respondent organization-sector, a higher proportion of sub-state Vector-DPW respondents

compared to sub-state Dept. of Health respondents rated mosquito identification (86% vs. 46%, respectively, $p=0.040$) and communicating with environmentalist groups (93% vs. 62%, respectively, $p=0.048$) as training priorities. A full summary of skill area subcomponent ratings by respondent organization-sector are available in the Appendix. No significant differences were detected in skill area subcomponent ratings by respondent region or years working in the VBD field.

Table 3. Respondent Demographics per Training Question Set

| Organization-Sector | Number of Respondents (%) | |
|---------------------------|---------------------------|-----------|
| | Training Question Set | |
| | Mosquito | Tick |
| State Dept. of Health | 7 (10%) | 8 (20%) |
| Sub-State Dept. of Health | 13 (19%) | 9 (23%) |
| Sub-State Vector-DPW | 28 (40%) | 14 (35%) |
| State Dept. Ag/Env | 19 (27%) | 8 (20%) |
| Other | 3 (4%) | 1 (3%) |
| DHHS Region | Mosquito | Tick |
| Region I | 22 (31%) | 7 (18%) |
| Region II | 29 (41%) | 20 (50%) |
| Region III | 19 (27%) | 13 (33%) |
| TOTAL | 70 | 40 |

Figure 3. Training Priority Ratings for Mosquito-Focused Skill Areas



Tick-Focused Skill Areas

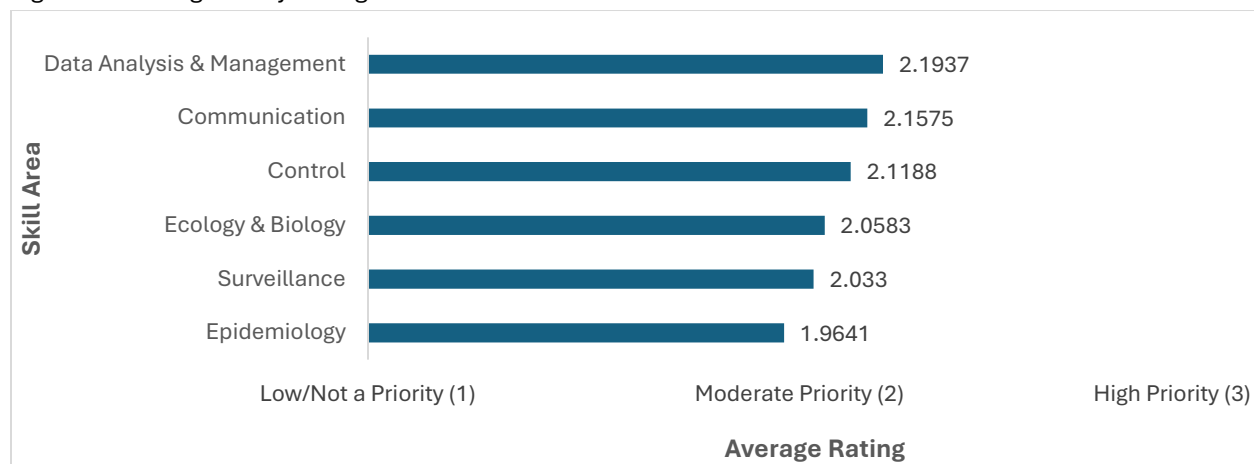
Forty participants (44%) responded to the question set on priority training areas for ticks and tickborne diseases. Table 3 shows the distribution of these respondents by organization-sector and DHHS Region. On average, the tick-focused skill area rated highest for additional training was ‘Data Analysis and Management’, followed by ‘Communication’ and ‘Control’. No differences were detected in the average skill area ratings by respondent region or number of years working in the VBD field. However, sub-state Vector-DPW respondents rated tick ecology and biology skills higher on average than state Dept. of Health respondents (2.33 vs. 1.6, respectively, $p=0.035$), and state

Dept. of Ag/Env respondents rated tick data analysis and management skills on average lower than all other respondent groups (1.57 vs. 2.03-2.5, respectively, $p=0.031$). Figure 4 displays the average rating per tick-focused training skill area across all respondents. The most selected skill area subcomponents included,

- blood feeding behavior and host preferences (Ecology & Biology),
- overwintering survival (Ecology & Biology),
- activity – time of day/seasons/phenology (Ecology & Biology),
- biostatistics (Epidemiology), and
- GIS / spatial display & analysis (Data Management & Analysis),
- calculating local or regional summary statistics (Data Management & Analysis),
- best practices for health messaging (Communication), and
- addressing misinformation (Communication).

The least selected skill area subcomponents were breeding colony establishment (Ecology & Biology), cold chain maintenance (Surveillance), and human disease case reporting requirements (Epidemiology). Several statistically significant differences were detected when comparing subcomponent ratings across respondent organization-sector. A higher proportion of sub-state Vector-DPW respondents rated blood feeding behavior and host preferences, non-pesticide-based control techniques, tickborne disease illness signs & symptoms, and biostatistics as training priorities compared to other groups, particularly state Dept. of Ag/Env respondents. A full summary of skill area subcomponent ratings by respondent organization-sector are available in the Appendix. No significant differences were detected in skill area subcomponent ratings by respondent region or years working in the VBD field.

Figure 4. Training Priority Ratings for Tick-Focused Skill Areas

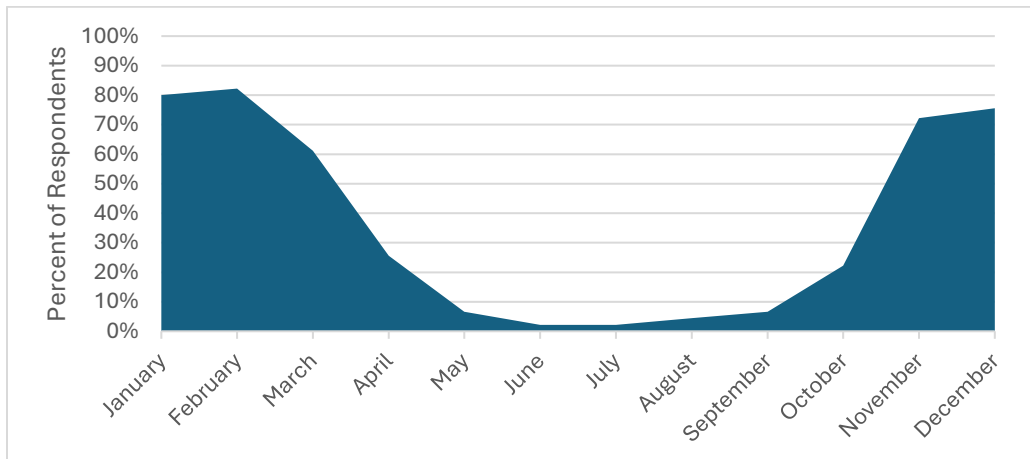


Preferred Training Formats & Barriers to Engagement

Respondents rated the first quarter of the year (Jan-Mar) and fourth quarter of the year (Oct-Dec) as the optimal times for participation in training programs, with the most popular months listed as January (n=72, 80%) and February (n=74, 82%). The summer months, including June, July,

and August, were reported as the least favorable months for engaging in training programs (see Figure 5). When respondents were asked where they look to access professional training opportunities, the most common responses included: CDC (13%), AMCA (12%), NMCA (11%), NEVBD (10%), NJMCA (9%), and Rutgers University (5.5%).

Figure 5. Optimal Times of Year to Participate in Training (n=90)



The easiest format for respondents to engage in were online workshops or webinars and online certificate programs, while the hardest engagement formats were in-person, multi-day workshops and attendance at regional conferences (see Figure 6). Shadowing experts had the largest proportion of respondents stating ‘not interested’ (18%).

Of the 60 respondents who reported being involved in the hiring process for VBD professionals, most reported a certificate in vector-borne diseases as being either somewhat valuable (53%) or very valuable (28%). Figure 7 portrays the perceived value of a certificate in VBDs by respondent organization-sector. Sub-state Dept. of Health and state Dept. of Ag/Env respondents had the highest proportion of ‘very valuable’ responses.

The most common barriers to engagement across all training formats were cost, time away from work, and securing travel approvals. Online programs had the highest proportion of respondents reporting ‘no perceived barriers’ to engagement. No statistically significant relationships were detected in reporting of engagement barriers by respondent organization-sector or years working in the VBD field. A small number of respondents reported ‘other’ barriers to training program engagement, which included family obligations, constraints within their approved budget, long travel distances, and lack of programs in their jurisdiction. Respondents also reported attention span issues and office distractions for engaging in online programs.

Figure 6. Ease of Training Format Engagement (n=82)

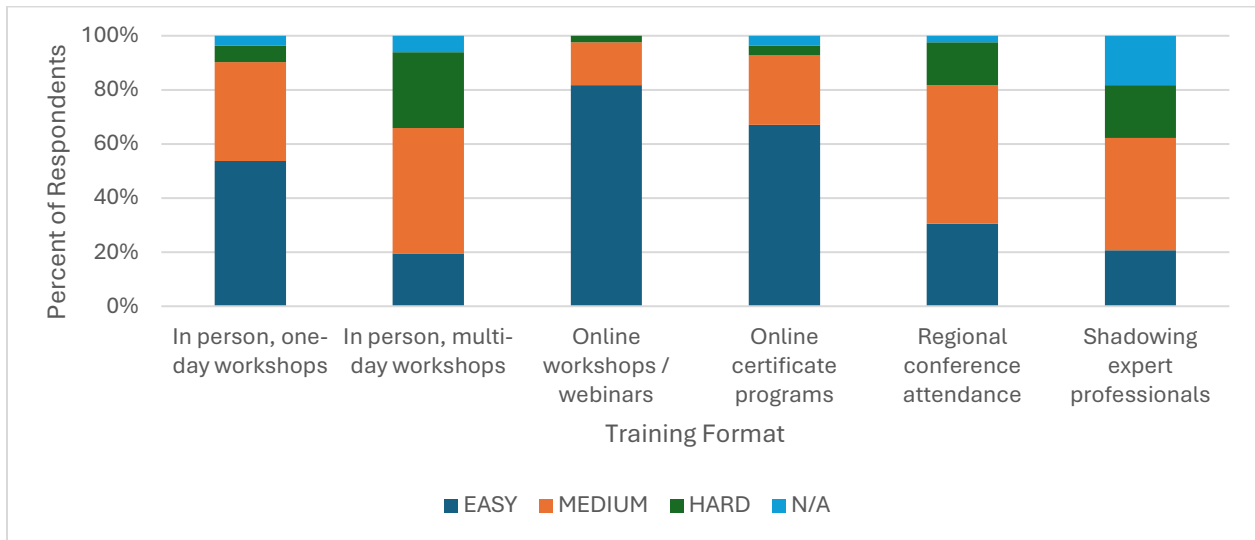
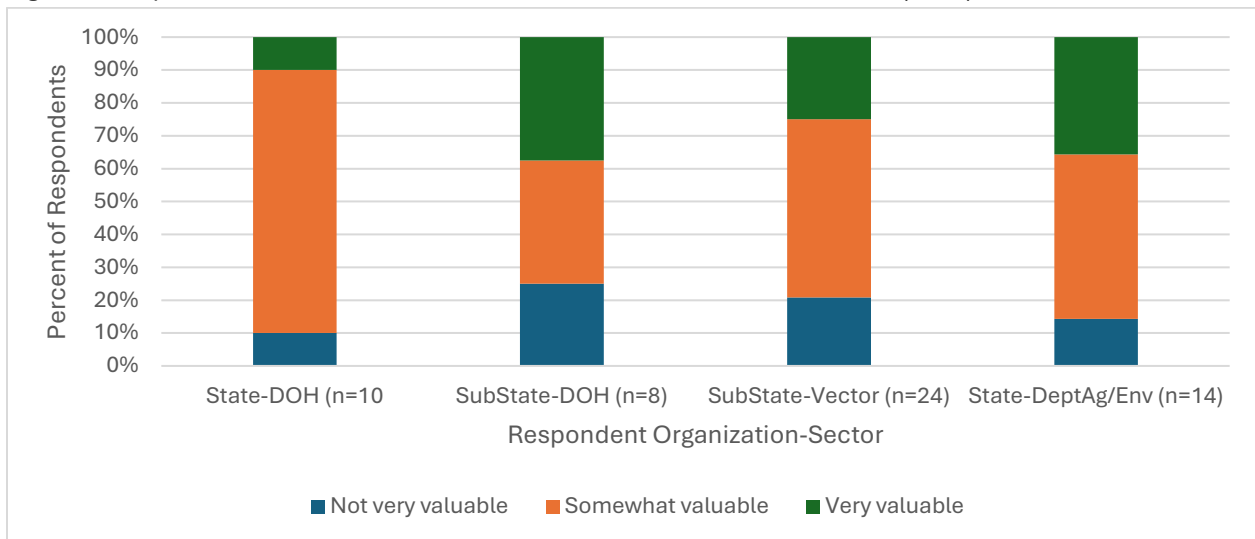


Figure 7. Respondent Views on Value of a Certificate in Vector-Borne Diseases (n=60)



Most respondents (61%) reported that they have access to employer financial support for professional development and continuing education. When presented with three vignettes of training programs that may be available, approximately one quarter of respondents reported that they felt these programs should be offered at no cost by federal or state partners. In fact, almost half of respondents reported they were not willing to pay for any of the training programs described.

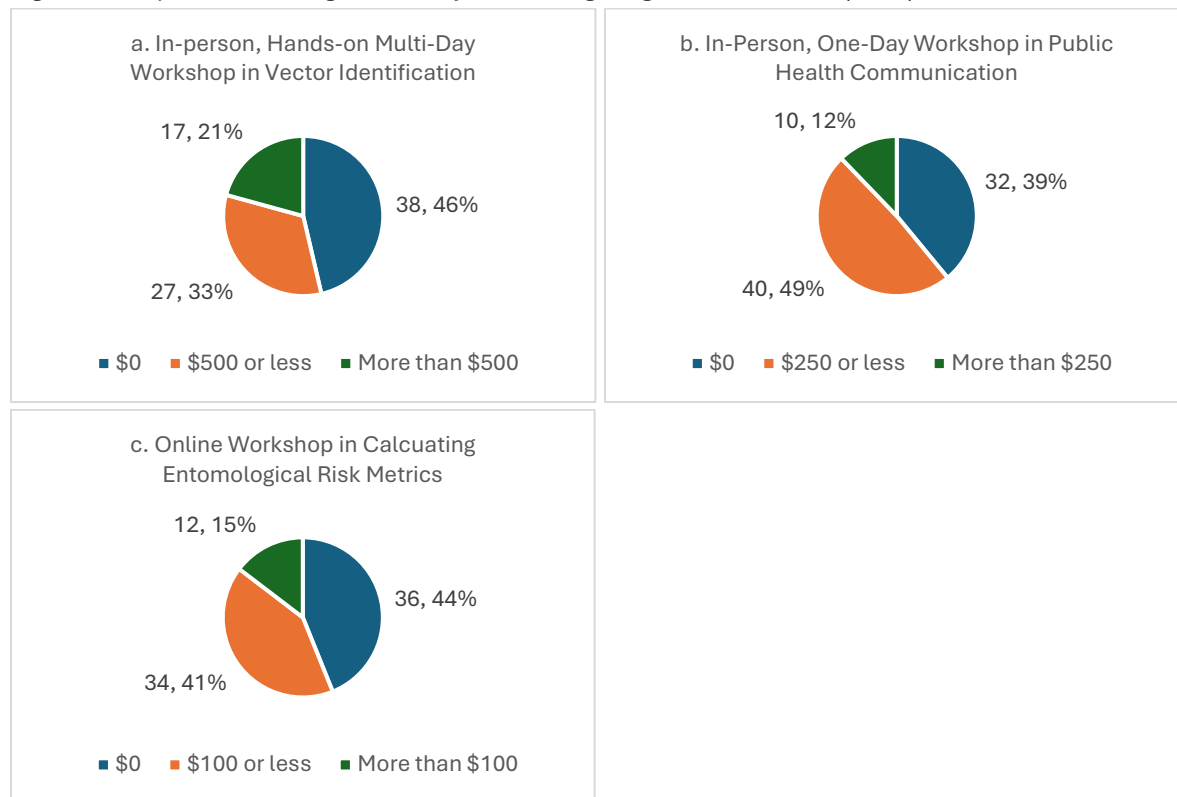
Table 4. Barriers to Training Program Engagement by Format

| Reported Barrier to Engagement | Training Format (% of respondents) | | | |
|----------------------------------|------------------------------------|------------------------|--------------------------|---------------------------------------|
| | In-Person Workshops (n=60) | Online Programs (n=22) | Shadowing Experts (n=48) | Attending Regional Conferences (n=53) |
| Cost | 80% | 32% | 54% | 83% |
| Travel approvals | 75% | -- | 69% | 74% |
| Time away from work | 60% | 64% | 69% | 64% |
| Meeting eligibility requirements | 7% | 9% | 6% | 8% |
| Lack of technology or software | 0% | 5% | 0% | 2% |
| No perceived barriers | 3% | 23% | 10% | 2% |
| Other | 5% | 32% | 8% | 9% |

Figure 8a-c displays the willingness to pay by respondents for the three training programs described. The in-person, one-day workshop had the largest proportion of respondents willing to pay to attend, while the in-person, multi-day workshop had the smallest proportion. However, when viewed by years working in the VBD field, significantly more respondents working less than 5 years in the field would be willing to pay for the in-person, multi-day workshop than respondents working more than 15 years in the field (56% vs. 17%, respectively, $p=0.045$). There were no other significant differences detected for willingness to pay by respondent characteristics.

Survey respondents were able to enter free text responses to highlight training needs not otherwise addressed in the survey. Multiple respondents reported training gaps pertaining to emerging and invasive vector species and their associated pathogens. Additionally, respondents across multiple sectors in all three DHHS regions reported a need for pesticide application training. Further details were also provided on insecticide resistance monitoring training needs. Specifically, in the mid-Atlantic region, state Dept. of Health, state Dept. of Ag/Env, and sub-state Vector-DPW respondents voiced a need for training on the interpretation of insecticide resistance results for both laboratory and field cage trials. Similarly, in New England, respondents working at the state Dept. of Ag/Env and the sub-state Vector-DPW level reported a need for training on conducting field cage trials for evaluation of pesticide efficacy.

Figure 8. Respondent Willingness to Pay for Training Program Attendance (n=82)



Discussion

The purpose of this needs assessment survey was to identify the skill areas in vector-borne disease and public health of highest training need for public agency professionals in the northeast, as well as barriers to and preferences for engaging in professional development opportunities. Survey respondents were geographically distributed in approximate even amounts across the three DHHS regions served by NEVBD-TEC; however, within these regions, responses were primarily from four states: Massachusetts, New Jersey, New York, and Virginia. Respondent organizations were evenly distributed across Departments of Health, vector control units, and Departments of Agriculture or Environment, with most respondents working within a sub-state jurisdiction. Most respondents had been working in the VBD field for 6 years or more, and over half of respondents were engaged in hiring and/or training VBD professionals.

Results of this needs assessment showed similar patterns across tick and mosquito-focused skill areas, where **increased training would be of highest value among the following areas: public health communication, data management and analysis, and vector control.** Popular components for training prioritization across both tick and mosquito skill areas included:

- biostatistics,
- GIS/spatial display and analysis,
- long-term data management best practices,
- calculating regional summary statistics,
- vector identification,

- insecticide resistance monitoring,
- health education training, and
- communicating with challenging audiences.

However, there were nuances in the specific skill components of most value to respondents across organization and jurisdiction. For example, skill components related to vector biology and ecology, such as host preferences, overwintering, and phenology, were of higher interest to sub-state Vector-DPW and state Dept. of Ag/Env respondents compared to other groups. Tick surveillance skills were of increased interest to state Dept. of Health respondents, and tick control skills were of increased interest to sub-state respondent groups.

We can conclude from these results that there are skill areas of broad interest to the vector-borne disease workforce, but a nuanced focus may be needed to provide responsive training to different professions within the workforce based upon their individualized needs.

Results of this needs assessment also provided valuable information on accessible training formats and barriers to engagement across surveyed professionals. Online training programs – including both short webinars and in-depth certificate programs – were the most accessible formats across all respondent groups, followed by one-day in-person training events. Multi-day training events and regional conferences, however, were the least accessible formats.

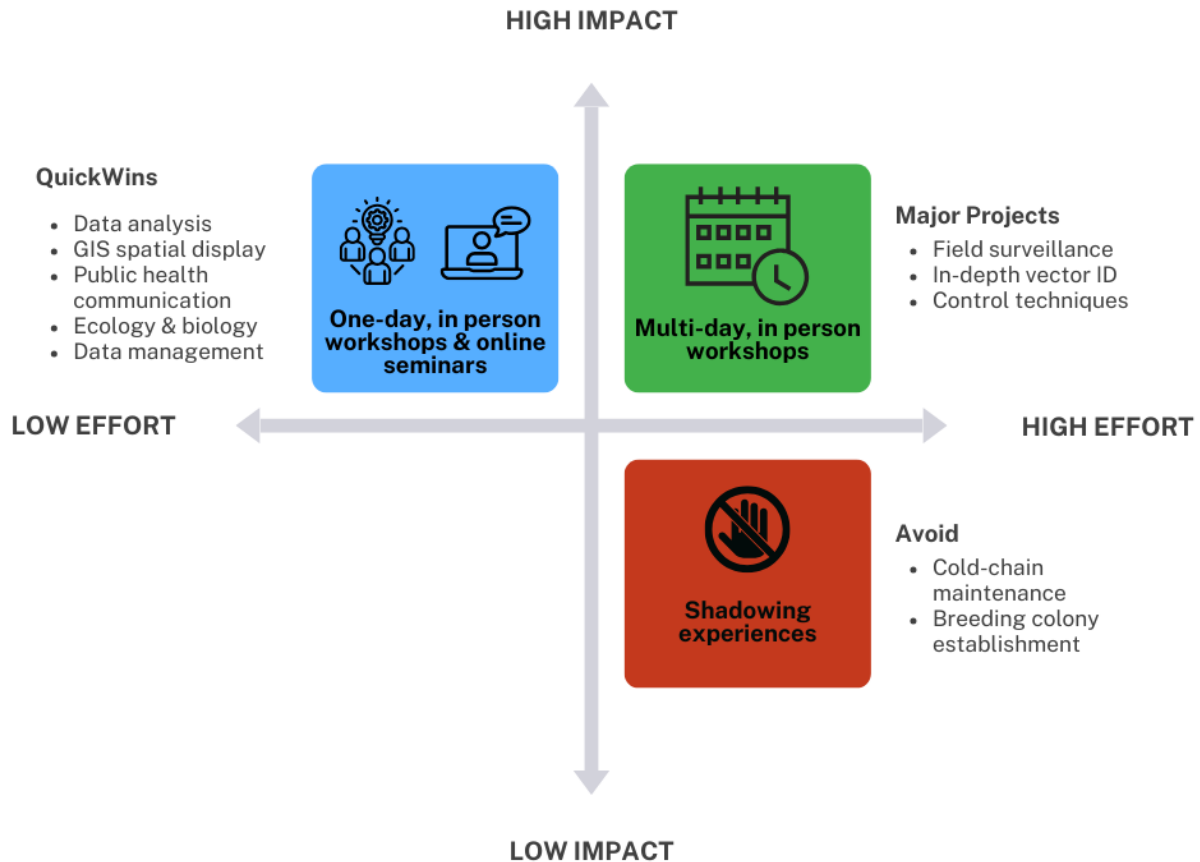
These **findings on program accessibility present a challenge for the development of new training opportunities**: respondents expressed stronger preference for hands-on learning experiences in their open-ended responses, but also reported a harder time engaging in these opportunities. **The major barriers to participation were cost, travel approvals, and time away from work.**

Recommendations and Opportunities

1. Optimize content to training format: While online opportunities are excellent venues for reaching broad audiences across a wide geography, they are not ideal formats for training professionals in field or lab-related skills. High priority training areas identified by survey respondents should be aligned with their optimal delivery format as an initial step in training program development.
2. Understand barriers to access: Respondents were consistent in listing cost, travel approvals, and time away from work as barriers to program engagement. Additional information on the nature of these barriers can inform strategies to circumvent or lessen their impact on program engagement. For example:
 - a. Identify documentation requirements and review timelines related to receiving travel approvals for different state and sub-state organizations
 - b. Conduct follow up inquiries to understand the nature of employer support for professional development costs, including limits, required documentation, and optimal timing
3. Prioritize program development by feasibility and impact: Use of program management tools, such as the Action Priority Matrix, will help NEVBD-TEC administrators incorporate

feedback gathered through this needs assessment in the development of additional training opportunities, maximizing the effectiveness of our programs⁹. An example Action Priority Matrix is listed in Figure 9.

Figure 9. Example Action Priority Matrix for Development of Responsive Vector-Borne Disease Training Programs



Limitations

This needs assessment has limitations that are important to mention. First, this survey was constructed for a target audience of professionals employed by a public agency. Our chain referral sampling approach likely reduced our sampling frame from the full population of public agency vector-borne disease professionals working in the northeast, as only individuals connected to NEVBD-TEC and regional association listservs would have received an invitation to the survey. This sampling approach also inhibited our ability to calculate a response rate, as we cannot know how many survey referrals were distributed through snowball sampling. In addition, most respondents were from just four states in our catchment area; we were not able to understand differences in needs by state. Results of this needs assessment should not be interpreted to reflect the viewpoints

⁹ Six sigma. Action priority matrix, or Eisenhower matrix: what is it and how it works. 24 July 2024. Access 2 December 2024. Available at: <https://www.6sigma.us/six-sigma-in-focus/action-priority-matrix-eisenhower-matrix/>

or opinions of respondents outside this target audience, such as those in the private or medical sectors, or under sampled groups.

Acknowledgements

Thank you to our NEVBD-TEC Advisory Board members Charles Abadam, Kim Cervantes, Andrew Lima, Kirby Stafford, and Jennifer White, and community partners Patti Casey and Melissa Prusinski for contributions to the design of the survey questionnaire.

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Appendix

Table A. Summary of Mosquito-Focused Skill Area Ratings by Respondent Organization-Sector

| Skill Set Area | Yes - Training Priority (n, %) | | | | | Fisher (p-value) |
|--|--------------------------------|------------------------------|------------------------------|----------------------------|--------------|----------------------|
| | State Dept. Health (n=7) | SubState Dept. Health (n=13) | SubState Vector – DPW (n=28) | State Dept. Ag/Env. (n=19) | Total (n=70) | |
| <i>Mosquito Ecology & Biology</i> | | | | | | |
| Habitat Recognition | 5 (71%) | 6 (46%) | 23 (82%) | 12 (63%) | 46 (69%) | 5.690 (0.119) |
| Blood feeding behavior & host preferences | 5 (71%) | 9 (69%) | 24 (86%) | 14 (74%) | 52 (78%) | 2.298 (0.571) |
| Life cycle stages | 4 (57%) | 6 (46%) | 19 (68%) | 11 (58%) | 40 (60%) | 1.927 (0.629) |
| Overwintering survival | 5 (71%) | 6 (46%) | 21 (75%) | 14 (74%) | 46 (69%) | 2.684 (0.445) |
| Activity (time of day / seasons / phenology) | 5 (71%) | 7 (54%) | 23 (82%) | 13 (68%) | 48 (72%) | 3.738 (0.280) |
| Breeding colony establishment & maintenance | 5 (71%) | 9 (69%) | 21 (75%) | 11 (58%) | 46 (69%) | 1.652 (0.663) |
| <i>Mosquito Surveillance</i> | | | | | | |
| Field collection methods & processing techniques | 4 (57%) | 7 (54%) | 22 (79%) | 10 (53%) | 43 (64%) | 4.600 (0.206) |
| CDC/AMCA best management practices for mosquito surveillance | 5 (71%) | 9 (69%) | 21 (75%) | 14 (74%) | 49 (73%) | 0.412 (0.977) |
| Mosquito identification | 4 (57%) _{a,b} | 6 (46%)_a | 24 (86%)_b | 15 (79%) _{a,b} | 49 (73%) | 7.951 (0.040) |
| Surveillance site selection | 6 (86%) | 8 (62%) | 23 (82%) | 13 (68%) | 50 (75%) | 2.784 (0.426) |
| Trap type selection | 4 (57%) | 8 (62%) | 22 (79%) | 10 (53%) | 44 (66%) | 4.022 (0.260) |
| Cold chain maintenance | 2 (29%) | 6 (46%) | 19 (68%) | 10 (53%) | 37 (55%) | 4.244 (0.228) |
| Guidance to share with property owners | 5 (71%) | 9 (69%) | 23 (82%) | 12 (63%) | 49 (73%) | 2.457 (0.494) |
| <i>Mosquito Control</i> | | | | | | |
| Pesticide-based control techniques | 3 (43%) | 8 (62%) | 22 (79%) | 10 (53%) | 43 (64%) | 5.729 (0.128) |
| Non-pesticide based control techniques | 3 (43%) | 9 (69%) | 23 (82%) | 11 (58%) | 46 (69%) | 6.254 (0.087) |
| Insecticide resistance monitoring techniques | 5 (71%) | 10 (77%) | 23 (82%) | 13 (68%) | 51 (76%) | 1.723 (0.694) |
| Pesticide application determinations | 3 (43%) | 9 (69%) | 22 (79%) | 10 (53%) | 44 (66%) | 5.588 (0.124) |
| Guidance to share with property owners | 4 (57%) | 9 (69%) | 23 (82%) | 11 (58%) | 47 (70%) | 4.540 (0.198) |
| <i>Epidemiology for Mosquito-Borne Diseases</i> | | | | | | |
| Human disease case definitions | 5 (71%) | 6 (46%) | 16 (57%) | 7 (37%) | 34 (51%) | 3.467 (0.336) |

| Skill Set Area | Yes - Training Priority (n, %) | | | | | Fisher (p-value) |
|--|--------------------------------|------------------------------|------------------------------|----------------------------|--------------|----------------------|
| | State Dept. Health (n=7) | SubState Dept. Health (n=13) | SubState Vector – DPW (n=28) | State Dept. Ag/Env. (n=19) | Total (n=70) | |
| Human disease case reporting requirements | 4 (57%) | 6 (46%) | 17 (61%) | 8 (42%) | 35 (52%) | 2.334 (0.512) |
| Mosquito-borne disease illness signs & symptoms | 4 (57%) | 5 (38%) | 20 (71%) | 8 (42%) | 37 (55%) | 6.727 (0.080) |
| Populations at increased exposure risk | 5 (71%) | 6 (46%) | 19 (68%) | 12 (63%) | 42 (63%) | 2.401 (0.498) |
| Biostatistics | 6 (86%) | 9 (69%) | 19 (68%) | 10 (53%) | 44 (66%) | 2.795 (0.425) |
| <i>Data Management and Analysis</i> | | | | | | |
| GIS / spatial display & analysis | 6 (86%) | 10 (77%) | 22 (79%) | 14 (74%) | 52 (78%) | 0.728 (0.970) |
| Calculating infection rates | 6 (86%) | 8 (62%) | 17 (61%) | 13 (68%) | 44 (66%) | 1.400 (0.712) |
| Calculating vector index | 6 (86%) | 9 (69%) | 18 (64%) | 11 (58%) | 44 (66%) | 1.702 (0.669) |
| Determining action thresholds | 5 (71%) | 10 (77%) | 22 (79%) | 12 (63%) | 49 (73%) | 1.570 (0.698) |
| Calculating sampling effort | 6 (86%) | 7 (54%) | 21 (75%) | 13 (68%) | 47 (70%) | 3.058 (0.393) |
| Calculating local or regional summary statistics | 6 (86%) | 10 (77%) | 19 (68%) | 14 (74%) | 49 (73%) | 0.658 (0.975) |
| Long-term data management best practices | 6 (86%) | 12 (92%) | 21 (75%) | 14 (74%) | 53 (79%) | 1.815 (0.683) |
| <i>Public Health Communication</i> | | | | | | |
| Health education training / certification | 4 (57%) | 8 (62%) | 20 (71%) | 10 (53%) | 42 (63%) | 1.917 (0.624) |
| Identifying public concerns | 3 (43%) | 9 (69%) | 23 (82%) | 14 (74%) | 49 (73%) | 3.928 (0.250) |
| Communicating with environmentalist groups | 5 (71%) _{a,b} | 8 (62%)_a | 26 (93%)_b | 14 (74%) _{a,b} | 53 (79%) | 7.904 (0.048) |
| Communicating with anti-pesticide groups | 5 (71%) | 9 (69%) | 24 (86%) | 16 (84%) | 54 (81%) | 2.917 (0.408) |
| Addressing misinformation | 6 (86%) | 11 (85%) | 24 (86%) | 14 (74%) | 55 (82%) | 1.792 (0.676) |
| Best practices for health messaging | 5 (71%) | 10 (77%) | 25 (89%) | 13 (68%) | 53 (79%) | 3.892 (0.275) |
| Non-English language fluency | 4 (57%) | 9 (69%) | 19 (68%) | 13 (68%) | 45 (67%) | 0.313 (1.000) |

Table B. Summary of Tick-Focused Skill Area Ratings by Respondent Organization-Sector

| Skill Set Area | Yes - Training Priority (n, %) | | | | | Fisher (p-value) |
|---|--------------------------------|-----------------------------|------------------------------|----------------------------|-----------------------|-----------------------|
| | State Dept. Health (n=8) | SubState Dept. Health (n=9) | SubState Vector – DPW (n=14) | State Dept. Ag/Env. (n=8) | Total (n=40) | |
| <i>Tick Ecology & Biology</i> | | | | | | |
| Habitat recognition | 3 (38%) | 6 (67%) | 12 (86%) | 5 (63%) | 26 (67%) | 5.274 (0.163) |
| Blood feeding behavior & host preferences | 5 (63%) _a | 5 (56%) _a | 14 (100%)_b | 5 (63%) _a | 29 (74%) | 8.401 (0.024) |
| Life cycles | 4 (50%) | 6 (67%) | 12 (86%) | 5 (63%) | 27 (69%) | 3.354 (0.354) |
| Overwintering survival | 5 (63%) | 5 (56%) | 13 (93%) | 6 (75%) | 29 (74%) | 5.320 (0.123) |
| Activity (time of day/seasons/phenology) | 4 (50%) | 7 (78%) | 13 (93%) | 6 (75%) | 30 (77%) | 5.223 (0.124) |
| Breeding colony establishment & maintenance | 3 (38%) _a | 5 (56%) _a | 9 (64%) _a | 0 (0%)_b | 17 (44%) _a | 8.694 (0.033) |
| <i>Tick Surveillance</i> | | | | | | |
| Field collection & processing techniques | 5 (63%) | 7 (78%) | 10 (71%) | 3 (38%) | 25 (64%) | 2.415 (0.532) |
| CDC guideline recommendations for tick surveillance | 3 (38%) | 7 (78%) | 11 (79%) | 4 (50%) | 25 (64%) | 4.438 (0.222) |
| Surveillance site selection | 6 (75%) | 4 (44%) | 11 (79%) | 3 (38%) | 24 (62%) | 4.379 (0.225) |
| Surveillance sampling design | 6 (75%) | 6 (67%) | 11 (79%) | 3 (38%) | 26 (67%) | 2.866 (0.422) |
| Cold chain maintenance | 2 (25%) | 6 (67%) | 8 (57%) | 3 (38%) | 19 (49%) | 3.705 (0.304) |
| Tick species and life stage identification | 5 (63%) | 7 (78%) | 12 (86%) | 4 (50%) | 28 (72%) | 2.781 (0.445) |
| Guidance to share with property owners | 5 (63%) | 5 (56%) | 11 (79%) | 4 (50%) | 25 (64%) | 1.933 (0.650) |
| <i>Tick Control</i> | | | | | | |
| Pesticide-based control techniques | 5 (63%) | 7 (78%) | 10 (71%) | 2 (25%) | 24 (62%) | 4.497 (0.216) |
| Non-pesticide based control techniques | 5 (63%) _a | 8 (89%)_a | 11 (79%)_a | 1 (13%)_b | 25 (64%) | 10.430 (0.010) |
| Pesticide application regulations | 5 (63%) | 7 (78%) | 10 (71%) | 2 (25%) | 24 (62%) | 4.497 (0.216) |
| Guidance to share with property owners | 5 (63%) | 7 (78%) | 11 (79%) | 4 (50%) | 27 (69%) | 1.701 (0.680) |
| <i>Epidemiology for Tick-Borne Diseases</i> | | | | | | |
| Human disease case definitions | 5 (63%) | 5 (56%) | 10 (71%) | 1 (13%) | 21 (54%) | 5.037 (0.184) |
| Human disease case reporting requirements | 4 (50%) _a | 6 (67%) _a | 10 (71%) _a | 0 (0%)_b | 20 (51%) | 9.372 (0.022) |
| Tickborne disease illness signs & symptoms | 5 (63%) _{a,b} | 7 (78%) _{a,b} | 13 (93%)_a | 2 (25%)_b | 27 (69%) | 7.685 (0.035) |

| Skill Set Area | Yes - Training Priority (n, %) | | | | | Fisher (p-value) |
|--|--------------------------------|-----------------------------|------------------------------|----------------------------|--------------|----------------------|
| | State Dept. Health (n=8) | SubState Dept. Health (n=9) | SubState Vector - DPW (n=14) | State Dept. Ag/Env. (n=8) | Total (n=40) | |
| Populations at increased risk | 4 (50%) | 6 (67%) | 12 (86%) | 2 (25%) | 24 (62%) | 6.017 (0.097) |
| Biostatistics | 7 (88%) _{a,b} | 8 (89%) _{a,b} | 13 (93%)_a | 2 (25%)_b | 30 (77%) | 8.061 (0.024) |
| <i>Data Management and Analysis</i> | | | | | | |
| GIS / spatial display & analysis | 7 (88%) | 8 (89%) | 11 (79%) | 3 (38%) | 29 (74%) | 4.755 (0.179) |
| Calculating density of infected ticks | 6 (75%) | 8 (89%) | 10 (71%) | 2 (25%) | 26 (67%) | 6.332 (0.096) |
| Calculating local or regional summary statistics | 7 (88%) | 7 (78%) | 12 (86%) | 3 (38%) | 29 (74%) | 4.755 (0.179) |
| Long-term data management best practices | 6 (75%) _a | 8 (89%) _a | 12 (86%) _a | 2 (25%)_b | 28 (72%) | 7.962 (0.029) |
| <i>Public Health Communication</i> | | | | | | |
| Health education training / certification | 6 (75%) | 5 (56%) | 12 (86%) | 2 (25%) | 25 (64%) | 5.849 (0.113) |
| Identifying public concerns | 4 (50%) | 7 (78%) | 12 (86%) | 3 (38%) | 26 (67%) | 4.543 (0.212) |
| Communicating with environmentalist groups | 7 (88%) | 6 (67%) | 12 (86%) | 3 (38%) | 28 (72%) | 3.711 (0.288) |
| Communicating with anti-pesticide groups | 5 (63%) | 6 (67%) | 11 (79%) | 4 (50%) | 26 (67%) | 1.098 (0.822) |
| Addressing misinformation | 8 (100%) | 8 (89%) | 12 (86%) | 3 (38%) | 31 (79%) | 5.289 (0.120) |
| Best practices for health messaging | 7 (88%) | 8 (89%) | 12 (86%) | 2 (25%) | 29 (74%) | 6.662 (0.054) |
| Non-English language fluency | 7 (88%) | 7 (78%) | 10 (71%) | 3 (38%) | 27 (69%) | 2.462 (0.532) |

NEVBD-TEC Professional Workforce Needs Assessment Survey

Start of Block: Respondent Demographics

Q2.1 Please indicate the state where you primarily work:

▼ Connecticut (1) ... I do not work in the United States (16)

Q2.2 Please indicate the category that best matches the organization you work for:

- Department of Health (1)
- Department of Agriculture (2)
- Department of Environment / Natural Resources (3)
- Department of Public Works (4)
- Vector Control Division or Unit (5)
- Private Industry (6)
- Nonprofit (7)
- Other (please describe): (8) _____

Q2.3 Please select the jurisdiction level that best matches the organization you work for:

- Federal (1)
- State (2)
- Native/Indigenous Nation (3)
- District/County (4)
- Municipal/City (5)
- Other (please describe): (6) _____

Q2.4 Do you oversee or participate in the hiring process for vector-borne disease professionals at your organization or unit?

- Yes (1)
- No (2)

End of Block: Respondent Demographics

Start of Block: Hiring Practices

Q3.1 How valuable is a **certificate in vector-borne diseases** for individuals working in your unit?

Note: For the purposes of this survey, a certificate in vector-borne diseases is obtained through completion of coursework and/or examinations that convey specialized knowledge and experience related to vector-borne disease management.

- Not very valuable (1)
- Somewhat valuable (2)
- Very valuable (3)

Q3.2 What are the **most pressing areas for additional training** on vector-borne disease management for **your staff or colleagues**?

End of Block: Hiring Practices

Start of Block: Mosquito Training Priorities

Q4.1 The following questions describe training needs for several skill areas important for professionals working with **mosquitoes and mosquito-borne disease management**.

If these topics are not relevant to your experience, select the appropriate response below to skip to the next section.

- I want to answer questions about mosquitoes and mosquito-borne disease management skills (1)
- Please take me to the next section of the survey (2)

Skip To: Q4.2 If The following questions describe training needs for several skill areas important for professional... = I want to answer questions about mosquitoes and mosquito-borne disease management skills

Skip To: End of Block If The following questions describe training needs for several skill areas important for professional... = Please take me to the next section of the survey

Q4.2 Please answer the following questions as they relate to **your** working experience using the following scale:

HIGH training priority: There is a significant gap in knowledge, skills & training in this area

MODERATE training priority: Training exists for this area, but there is room for improvement in knowledge & skills

LOW training priority: knowledge & skills in this area are strong; low priority for training

If a skill set is not applicable to your experience, please indicate 'not applicable' in the answer choices.

Q4.3 Please indicate training needs for the following skill areas related to **mosquito biology and ecology**:

| | HIGH training priority (1) | MODERATE training priority (2) | LOW training priority (3) | Not Applicable (4) |
|---|-----------------------------------|---------------------------------------|----------------------------------|-----------------------|
| Habitat recognition (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Blood feeding behavior & host preferences (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Life cycles stages (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Overwintering survival (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Activity (time of day /seasons / phenology) (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Breeding colony establishment & maintenance (6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q4.4 Please indicate training needs for the following skill areas related to **mosquito surveillance**:

| | HIGH priority training (1) | MODERATE priority training (2) | LOW priority training (3) | Not Applicable (4) |
|--|-----------------------------------|---------------------------------------|----------------------------------|-----------------------|
| Field collection methods & processing techniques (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| CDC/AMCA best management practices for mosquito surveillance (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Mosquito identification (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Surveillance site selection (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Trap type selection (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cold chain maintenance (6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Guidance to share with property owners (7) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q4.5 Please indicate training needs for the following skill areas related to **mosquito control**:

| | HIGH priority training (1) | MODERATE priority training (2) | LOW priority training (3) | Not Applicable (4) |
|---|-----------------------------------|---------------------------------------|----------------------------------|-----------------------|
| Pesticide-based control techniques (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Non-pesticide based control techniques (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Insecticide resistance monitoring techniques (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Pesticide application determinations (i.e., application rate) (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Guidance to share with property owners (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q4.6 Please indicate training needs for the following skill areas related to **epidemiology for mosquito-borne diseases**:

| | HIGH priority training (1) | MODERATE priority training (2) | LOW priority training (3) | Not Applicable (4) |
|--|-----------------------------------|---------------------------------------|----------------------------------|-----------------------|
| Human disease case definitions (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Human disease case reporting requirements (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Mosquito-borne disease illness signs & symptoms (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Populations at increased exposure risk (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Biostatistics (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q4.7 Please indicate training needs for the following skill areas related to **data management and analysis for mosquito-borne diseases:**

| | HIGH priority training (1) | MODERATE priority training (2) | LOW priority training (3) | Not Applicable (4) |
|---|-----------------------------------|---------------------------------------|----------------------------------|-----------------------|
| GIS / spatial display & analysis (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Calculating infection rates (ex: MIR, MLE) (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Calculating vector index (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Determining action thresholds (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Calculating sampling effort (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Calculating local or regional summary statistics (6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Long-term (longitudinal) data management best practices (7) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q4.8 Please indicate training needs for the following skill areas related to **public health communication for mosquito-borne diseases**:

| | HIGH priority training (1) | MODERATE priority training (2) | LOW priority training (3) | Not Applicable (4) |
|--|-----------------------------------|---------------------------------------|----------------------------------|-----------------------|
| Health education training / certification (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Identifying public concerns (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Communicating with environmentalist groups (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Communicating with anti-pesticide groups (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Addressing misinformation (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Best practices for health messaging (6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Non-English language fluency (7) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

End of Block: Mosquito Training Priorities

Start of Block: Tick Training Priorities

Q5.1 The following questions describe the training needs for several skill sets relevant to professionals working with **ticks and tick-borne disease management**.

If these topics are not relevant to your experience, please choose the appropriate response below to skip to the next section.

- I want to answer questions about ticks and tick-borne disease management (1)
- Please take me to the next section of the survey (2)

Skip To: Q5.2 If The following questions describe the training needs for several skill sets relevant to profession... = I want to answer questions about ticks and tick-borne disease management

Skip To: End of Block If The following questions describe the training needs for several skill sets relevant to profession... = Please take me to the next section of the survey

Q5.2 Please answer these questions as they relate to **your** working experience using the following scale:

HIGH training priority: There is a significant gap in knowledge, skills & training in this area

MODERATE training priority: Training exists for this area, but there is room for improvement in knowledge & skills

LOW training priority: knowledge & skills in this area are strong; low priority for training

If a skill set is not applicable to your experience, please indicate 'not applicable' in the answer choices.

Q5.3 Please indicate training needs for the following skill areas related to **tick biology and ecology**:

| | HIGH training priority (1) | MODERATE training priority (2) | LOW training priority (3) | Not Applicable (4) |
|--|-----------------------------------|---------------------------------------|----------------------------------|-----------------------|
| Habitat recognition (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Blood feeding behavior & host preferences (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Life cycles (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Overwintering survival (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Activity (time of day / seasons / phenology) (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Breeding colony establishment & maintenance (6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q5.4 Please indicate training needs for the following skill areas related to **tick surveillance**:

| | HIGH training priority (1) | MODERATE training priority (2) | LOW training priority (3) | Not Applicable (4) |
|---|-----------------------------------|---------------------------------------|----------------------------------|-----------------------|
| Field collection & processing techniques (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| CDC guideline recommendations for tick surveillance (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Surveillance site selection (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Surveillance sampling design (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cold chain maintenance (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Tick species and life stage identification (6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Guidance to share with property owners (7) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q5.5 Please indicate training needs for the following skill areas related to **tick control**:

| | HIGH training priority (1) | MODERATE training priority (2) | LOW training priority (3) | Not Applicable (4) |
|--|---------------------------------------|---|--------------------------------------|-----------------------|
| Pesticide-based control techniques (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Non-pesticide based control techniques (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Pesticide application regulations (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Guidance to share with property owners (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q5.6 Please indicate training needs for the following skill areas related to **epidemiology for tick-borne diseases**:

| | HIGH training priority (1) | MODERATE training priority (2) | LOW training priority (3) | Not Applicable (4) |
|--|-----------------------------------|---------------------------------------|----------------------------------|-----------------------|
| Human disease case definitions (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Human disease case reporting requirements (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Tick-borne disease illness signs & symptoms (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Populations at increased exposure risk (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Biostatistics (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q5.7 Please indicate training needs for the following skill areas related to **data management and analysis for tick-borne diseases:**

| | HIGH training priority (1) | MODERATE training priority (2) | LOW training priority (3) | Not Applicable (4) |
|---|-----------------------------------|---------------------------------------|----------------------------------|-----------------------|
| GIS / spatial display & analysis (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Calculating density of infected ticks (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Calculating local or regional summary statistics (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Long-term (longitudinal) data management best practices (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q5.8 Please indicate training needs for the following skill areas related to **public health communication for tick-borne diseases**:

| | HIGH training priority (1) | MODERATE training priority (2) | LOW training priority (3) | Not Applicable (4) |
|--|-----------------------------------|---------------------------------------|----------------------------------|-----------------------|
| Health education training / certification (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Identifying public concerns (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Communicating with environmentalist groups (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Communicating with anti-pesticide groups (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Addressing misinformation (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Best practices for health messaging (6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Non-English language fluency (7) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

End of Block: Tick Training Priorities

Start of Block: Training Program Access

Q6.1 The next set of questions will ask about your **preferences** for and **access** to training programs you would be interested in attending to learn more about vector-borne diseases. Please answer these questions as they relate to **your** experience.

Q6.2 Where do you typically look to access professional training opportunities?

Q6.3 What is the best time of year for you to participate in continuing education programs? (select all that apply)

January (1)

- February (2)
- March (3)
- April (4)
- May (5)
- June (6)
- July (7)
- August (8)
- September (9)
- October (10)
- November (11)
- December (12)

Q6.4 Please rate the following instructional formats for continuing education based on how easy it is for you to **engage** with them:

| | EASY - I can easily engage in this format (1) | MEDIUM - I can sometimes engage in this format, but still have barriers (2) | HARD - it is almost impossible for me to engage in this format (3) | NA - I am not interested in this format (4) |
|------------------------------------|--|--|---|--|
| In person, one-day workshops (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| In person, multi-day workshops (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Online workshops / webinars (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Online certificate programs (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Regional conference attendance (6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Shadowing expert professionals (7) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q6.5 Are there other instructional formats that suit your learning style that we haven't listed? If yes, please describe these formats in a few brief sentences.

Q6.6 Do you have access to **financial support from your employer** to participate in continuing education or professional development programs?

- Yes (1)
- No (2)
- I'm not sure (3)

Display This Question:

If Please rate the following instructional formats for continuing education based on how easy it is... = In person, one-day workshops [MEDIUM- I can sometimes engage in this format, but still have barriers]

Or Please rate the following instructional formats for continuing education based on how easy it is... = In person, one-day workshops [HARD - it is almost impossible for me to engage in this format]

Or Please rate the following instructional formats for continuing education based on how easy it is... = In person, multi-day workshops [MEDIUM- I can sometimes engage in this format, but still have barriers]

Or Please rate the following instructional formats for continuing education based on how easy it is... = In person, multi-day workshops [HARD - it is almost impossible for me to engage in this format]

Q6.7 What are the main barriers to accessing in person workshops? (select all that apply)

- Cost (1)
- Travel approvals (2)
- Time away from work constraints (3)
- Meeting eligibility requirements (4)
- Lack of technology or software (5)
- No perceived barriers (6)
- Other (please describe): (7) _____

Display This Question:

If Please rate the following instructional formats for continuing education based on how easy it is... = Online workshops / webinars [MEDIUM- I can sometimes engage in this format, but still have barriers]

Or Please rate the following instructional formats for continuing education based on how easy it is... = Online workshops / webinars [HARD - it is almost impossible for me to engage in this format]

Or Please rate the following instructional formats for continuing education based on how easy it is... = Online certificate programs [MEDIUM- I can sometimes engage in this format, but still have barriers]

Or Please rate the following instructional formats for continuing education based on how easy it is... = Online certificate programs [HARD - it is almost impossible for me to engage in this format]

Q6.8 What are the main barriers to accessing online programs? (select all that apply)

- Cost (1)
- Time away from work constraints (2)
- Meeting eligibility requirements (3)
- Lack of technology or software (4)
- No perceived barriers (5)

Other (please describe): (6) _____

Display This Question:

If Please rate the following instructional formats for continuing education based on how easy it is... = Shadowing expert professionals [MEDIUM- I can sometimes engage in this format, but still have barriers]

Or Please rate the following instructional formats for continuing education based on how easy it is... = Shadowing expert professionals [HARD - it is almost impossible for me to engage in this format]

Q6.9 What are the main barriers to being able to shadow expert professionals? (select all that apply)

- Cost (1)
- Travel approvals (2)
- Time away from work constraints (3)
- Meeting eligibility requirements (4)
- Lack of technology or software (5)
- No perceived barriers (6)
- Other (please describe): (7) _____

Display This Question:

If Please rate the following instructional formats for continuing education based on how easy it is... = Regional conference attendance [MEDIUM- I can sometimes engage in this format, but still have barriers]

Or Please rate the following instructional formats for continuing education based on how easy it is... = Regional conference attendance [HARD - it is almost impossible for me to engage in this format]

Q6.10 What are the main barriers to being able to attend regional conferences? (select all that apply)

- Cost (1)
- Travel approvals (2)
- Time away from work constraints (3)
- Meeting eligibility requirements (4)

- Lack of technology or software (5)
- No perceived barriers (6)
- Other (please describe): (7) _____

Q6.11 Are there other barriers that prevent you from accessing training programs you would like to complete? If yes, please describe these barriers in a few brief sentences.

Q6.12 The next set of questions will ask how much you think your organization is **willing to pay** for you to attend different types of training programs. We will present three scenarios where a training program will be offered and ask about willingness to pay.

Please keep in mind the total costs listed below *include* registration, travel, and lodging.

Q6.13 How much would you be willing to pay (in US dollars) to attend the following training program?

An in-person, multi-day workshop providing **hands-on experience in tick and mosquito identification**. Instruction is provided by entomologists affiliated with a regional university. The course includes a final exam and completion certificate.

- \$0 (1)
- \$1 to \$250 (2)
- \$251 to \$500 (3)
- \$501 to \$1,000 (4)
- \$1,001 to \$2,000 (5)
- \$2,001 or more (6)
- I believe this should be provided at no cost through federal/state partners (7)
- I am not interested in this type of program (8)

Q6.14 How much would you be willing to pay (in US dollars) to attend the following training program?

An in-person, one-day workshop covering **best practices in public health communication** for vector-borne disease prevention. The workshop is facilitated by an expert in public health communication affiliated with a regional research group. You will have access to enduring resources covered in the workshop.

- \$0 (1)
- \$1 to \$100 (2)
- \$101 to \$250 (3)
- \$251 to \$500 (4)
- \$501 to \$1,000 (5)
- \$1,001 or more (6)
- I believe this should be provided at no cost through federal/state partners (7)
- I am not interested in this type of program (8)

Q6.15 How much would you be willing to pay (in US dollars) to attend the following training program?

An online webinar providing instruction on calculating **entomological risk measures, GIS, and mapping** for vector surveillance data. The webinar is facilitated by an expert affiliated with a regional health department. You will have access to the webinar materials in PDF format.

- \$0 (1)
- \$1 to \$50 (2)
- \$51 to \$100 (3)
- \$101 to \$250 (4)
- \$251 to \$500 (5)
- \$500 or more (6)
- I believe this should be provided at no cost through federal/state partners (7)
- I am not interested in this type of program (8)

End of Block: Training Program Access

Start of Block: Closing Demographics

Q7.1 We are almost done with the survey! We will wrap up with a few last details about your work in the vector-borne disease field.

Q7.2 How many years have you been working in the vector-borne disease or public health field?

- Less than 2 years (1)

- 3 to 5 years (2)
- 6 to 10 years (3)
- 11 to 15 years (4)
- More than 15 years (5)

Q7.3 What is your current position title?

Q7.4 Do you supervise others who perform duties related to vector-borne disease management?

- Yes (1)
- No (2)

Q7.5 What are the most common non-English languages relevant to the communities you serve?

Q7.6 Are you a member or otherwise affiliated with any of the following associations? (select all that apply)

- American Mosquito Control Association (AMCA) (1)
- American Public Health Association (APHA) (2)
- American Society of Tropical Medicine and Hygiene (ASTMH) (3)
- American Veterinary Medical Association (AVMA) (4)
- Council of State and Territorial Epidemiologists (CSTE) (5)
- Entomological Society of America (ESA) (6)
- National Association of City and County Health Officials (NACCHO) (7)
- National Environmental Health Association (NEHA) (8)
- Society for Vector Ecology (SOVE) (9)

- Association of State and Territorial State Officials (ASTHO) (10)
- National Association of Vector Borne Disease Control Officials (NAVCO) (11)
- Regional/state mosquito/vector control association (please indicate name): (12)

- Other (please indicate): (13) _____

Q7.7 Please use the space below to share additional details or thoughts about professional development and training that have not otherwise been addressed in this survey.

Q7.8 You have finished answering all of the questions in this survey. Please let us know if you would like to enter the raffle drawing for a \$50 gift card.

Based on your response, you will either be directed to the end of the survey or to the gift card entry form.

Please note: By clicking "continue" below you are submitting your survey responses and can no longer make changes.

- I would like to enter the gift card raffle (1)
- I decline to enter the raffle (2)

End of Block: Closing Demographics