



Survey of Member and Nonmember Stakeholders  
Report of Findings  
November 2020

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# Background and Methodology

What were the research  
goals and methodology of  
the AMCA Survey?

# Background

The American Mosquito Control Association (AMCA) engaged with Association Laboratory to implement a membership engagement research process.

The goal of this engagement is to help AMCA understand the needs of the diversity of stakeholders active with the association to identify how best to meet their needs.

Primary areas of investigation included:

- Audience investigation (Who do you represent?)
- Environmental scan (What issues are audience members dealing with?)
- Goals (What are audience members trying to accomplish?)
- Member value proposition (What programs and services are driving audience engagement?)
- Alternatives (What are AMCA's strengths and weaknesses vis a vis other organizations serving this audience?)

The research process consisted of three main phases:

- Secondary research of existing AMCA information and past research
- A qualitative research phase which gathered open-ended feedback from a diverse group of 68 members, conducted in Aug/Sept 2020
- A quantitative survey administered to all member and nonmember contacts with valid emails in the AMCA database (the topic of this report)



# Methodology

- On behalf of AMCA, Association Laboratory sent an email invitation for the survey to all member and nonmember contacts in the AMCA database. The survey was administered using the Qualtrics survey platform.
  - Data collection occurred from October 7–19, 2020.
  - A total of 6,725 invitations were emailed; of these, 1,724 bounced and 127 were duplicates, resulting in a total of 4,872 potential respondents.
  - Individuals who did not respond to the first email were sent a follow-up reminder, and a final reminder email was sent to the remaining non-respondents.
  - In all, 696 responses were collected (a 14% overall response rate)
    - Members: 482 responses/2474 valid emails = 19% response rate
    - Nonmembers: 214 responses/2398 valid emails = 9% response rate
- Individuals could respond using a laptop/desktop computer, tablet or smartphone; 18% of respondents completed the survey using a mobile device.

Given the interpretive nature of environmental scanning and needs assessment research, **Association Laboratory recommends** that the findings be considered directional research and that precise interpretations of the results be minimized.



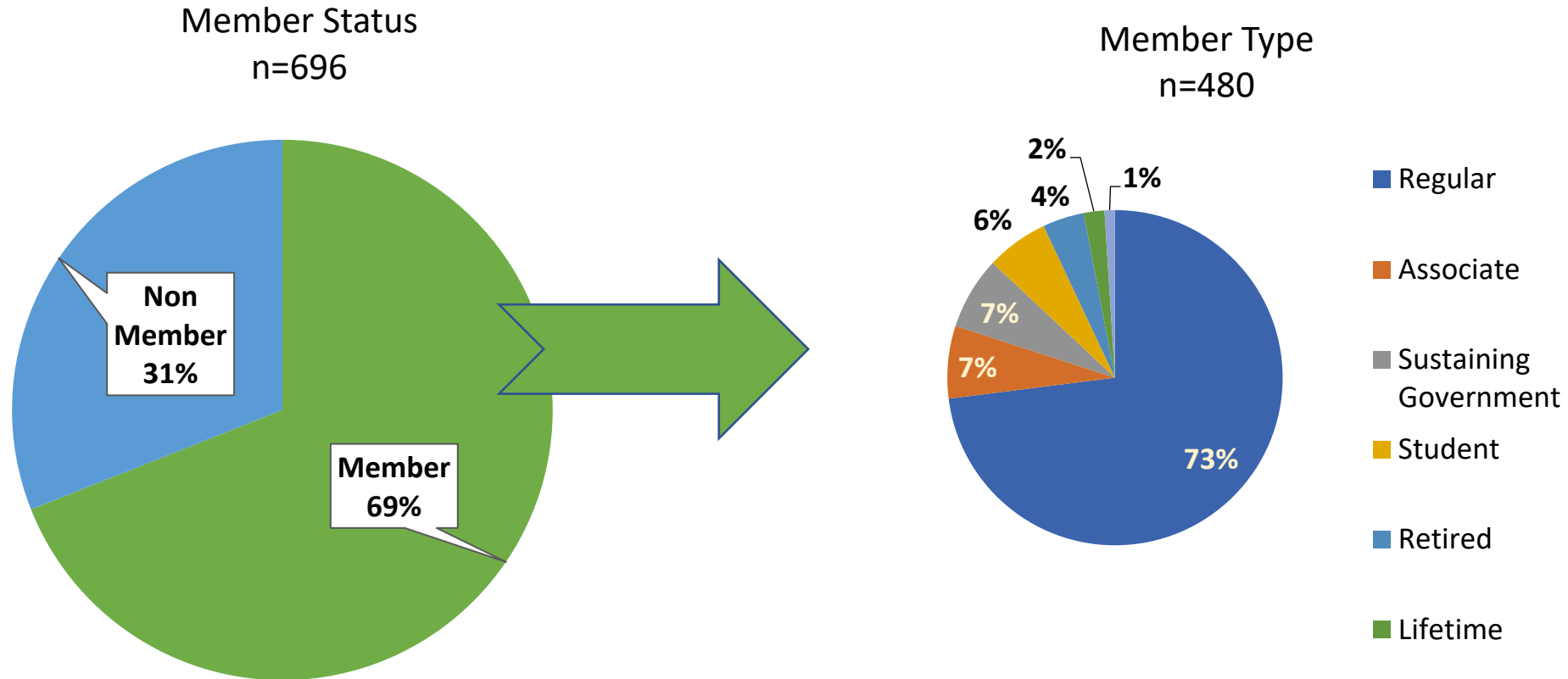
# Statistical Notes Review

- Statistically significant differences are evaluated at a 95% confidence interval. Due to the large number of respondents noted on the previous slide, statistical power is 100% (Cohen's d: 0.63) at the aggregate level and at all subgroup levels noted in this report.
- Because this survey represents a census of the AMCA database of contacts, there is no margin of sampling error to report. Although every effort was taken to minimize survey bias, there is no way to completely eliminate all sources of potential bias. Other sources of potential bias include, but are not limited to, the following:
  - Non-response bias
  - Confounding bias
  - Question wording bias
  - Question order bias
  - Habituation
  - Sponsor bias
  - Confirmation bias

# Respondent Demographics

What are the individual and organizational demographics of respondents?

A majority (69%) of respondents are members, while about a third (31%) are nonmembers. Among members, 73% are Regular Members.

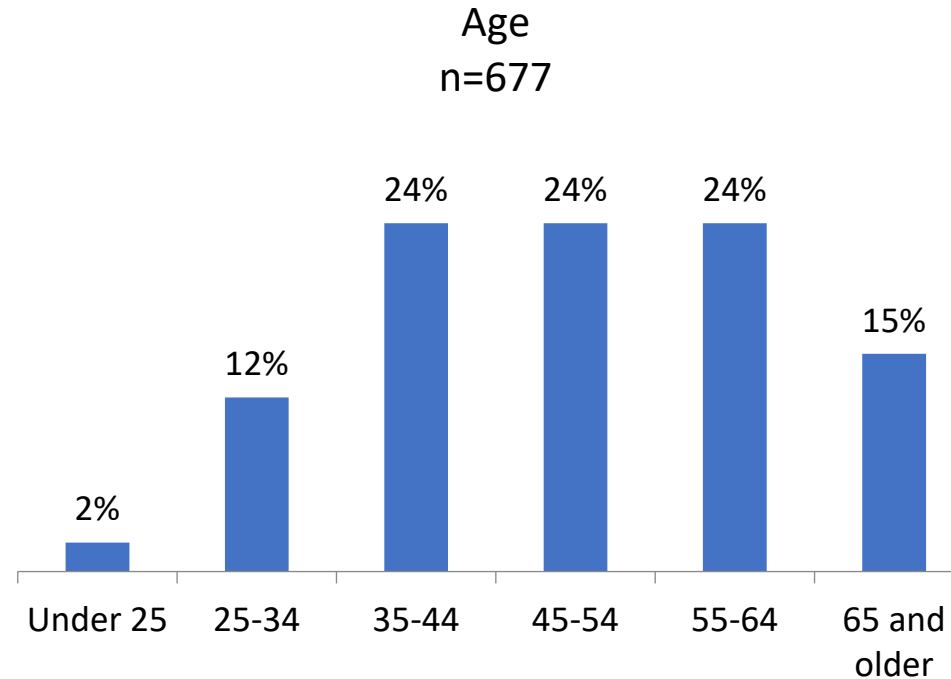


Data taken from AMCA database



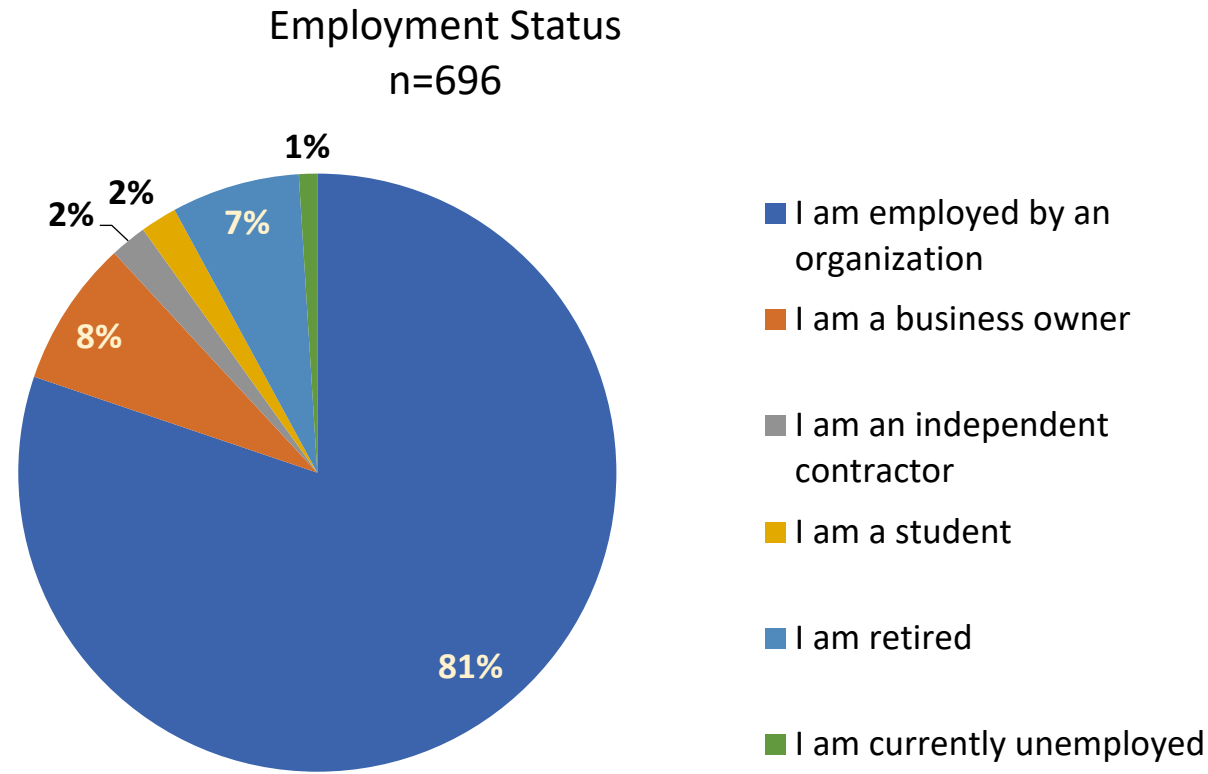
# The median age of respondents is 49.

- There is no significant difference in age distributions between members and nonmembers



Q2. Please enter your 4-digit birth year

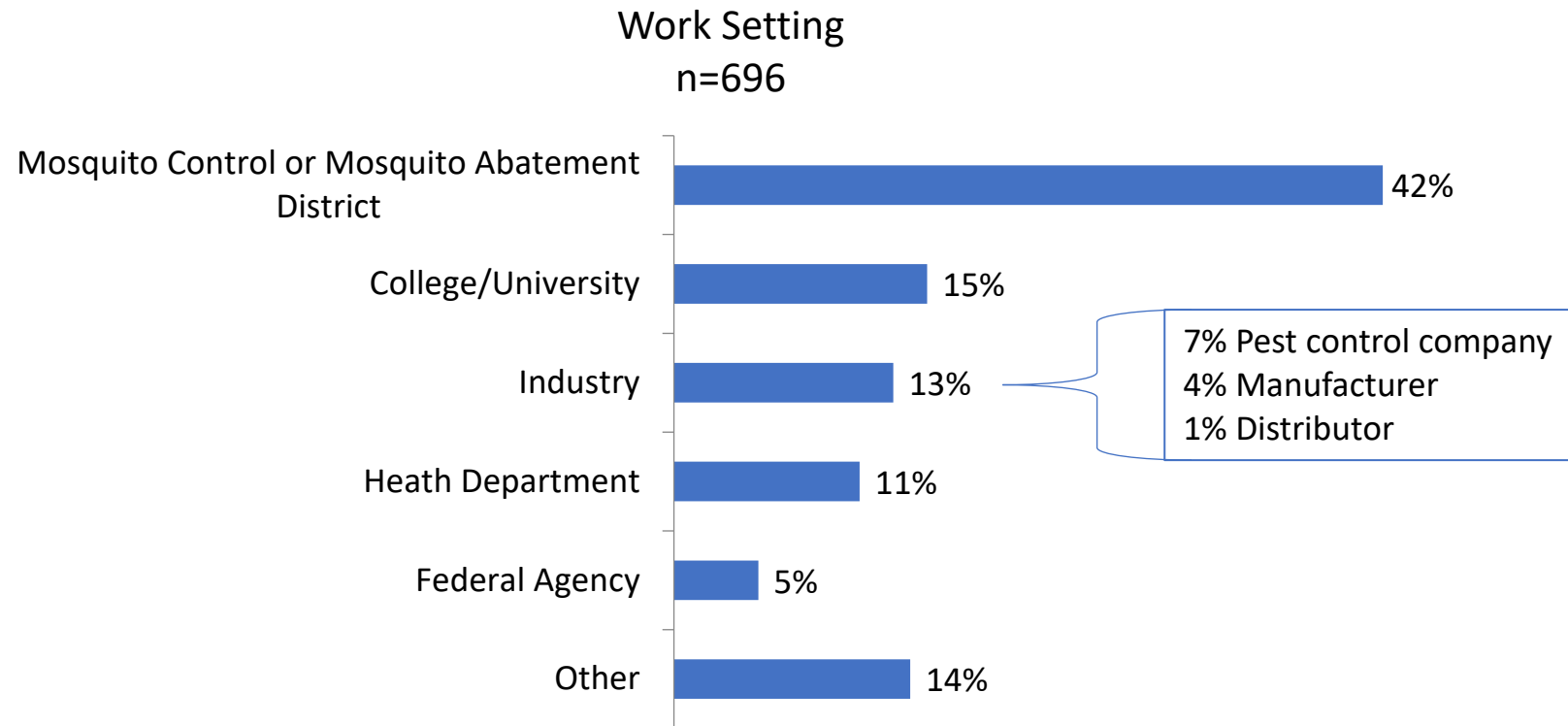
The vast majority of respondents (81%) are employed by an organization.



Q3. Which of the following best describes you?

# Close to half (42%) of respondents work for a Mosquito Control or Mosquito Abatement District.

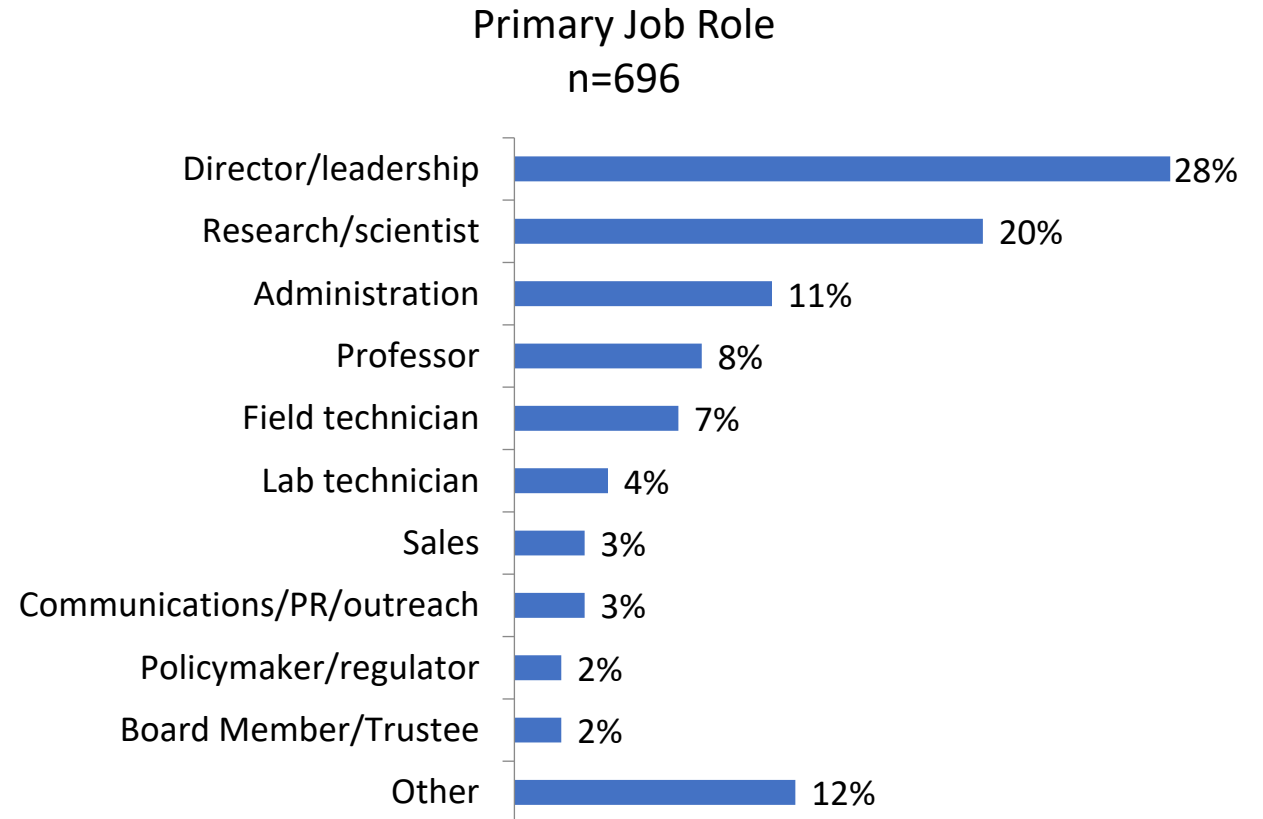
- Younger respondents (under 35) are more likely to work at an MCD/MAD (57% vs. 43% of those 35-64)



Q4. Which of the following best describes your work setting?

People whose primary job role is Director/Leadership or Research/Scientist account for almost half (48%) of respondents.

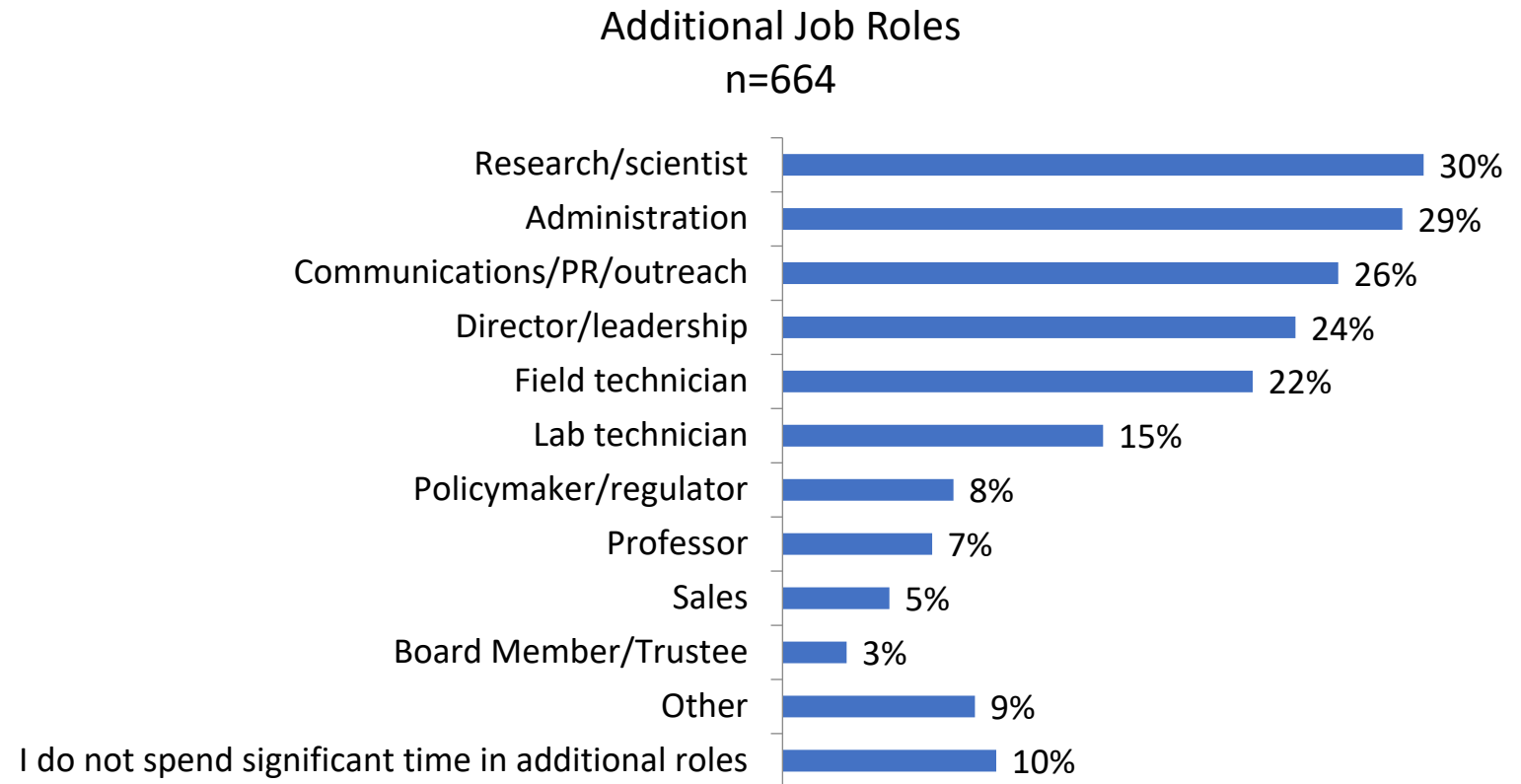
- Members are more likely than nonmembers to be in Director/Leadership roles (31% vs. 21% of nonmembers)
- Nonmembers are more likely than members to be primarily in Field Technician roles (16% vs. 4%)
- A plurality of people working at an MCD/MAD (39%) are in Director/Leadership roles



Q5. Which of the following best describes your primary job role?

Almost a third of respondents have additional job duties as Research/Scientist (30%) or Administration (29%).

- About a quarter of respondents have additional roles in Communications/PR/Outreach (26%), Director/Leadership (24%), or Field Technician (22%).
- Younger respondents are more likely than those 35-64 to have additional duties as Lab Technicians (34% vs. 13%) or Field Technicians (37% vs. 22%)



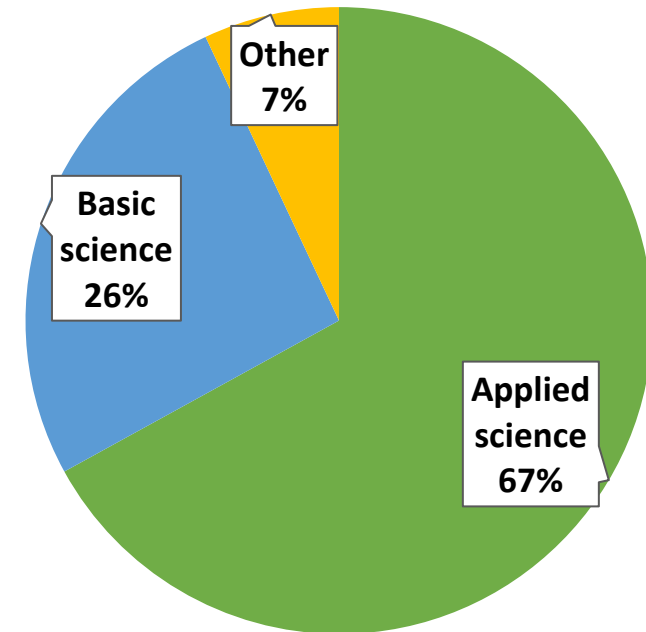
Q6. Are there additional roles in which you spend significant amounts of time? Select up to 3.

Among respondents who perform a Research/Scientist role, two-thirds (67%) focus on Applied Science.

- Member respondents are more likely to focus on Applied Science than nonmember respondents (71% vs. 56%)
- Respondents age 35-64 are more likely than younger respondents to focus on Applied Science (71% vs. 53%); while respondents under age 35 are more likely to focus on Basic Science (38% vs. 22%)
- Industry respondents are especially likely to focus on Applied Science (83%), and College/University respondents are especially likely to focus on Basic Science (35%)

Additional detail about research focus was collected via open-ended write-in response (data provided separately).

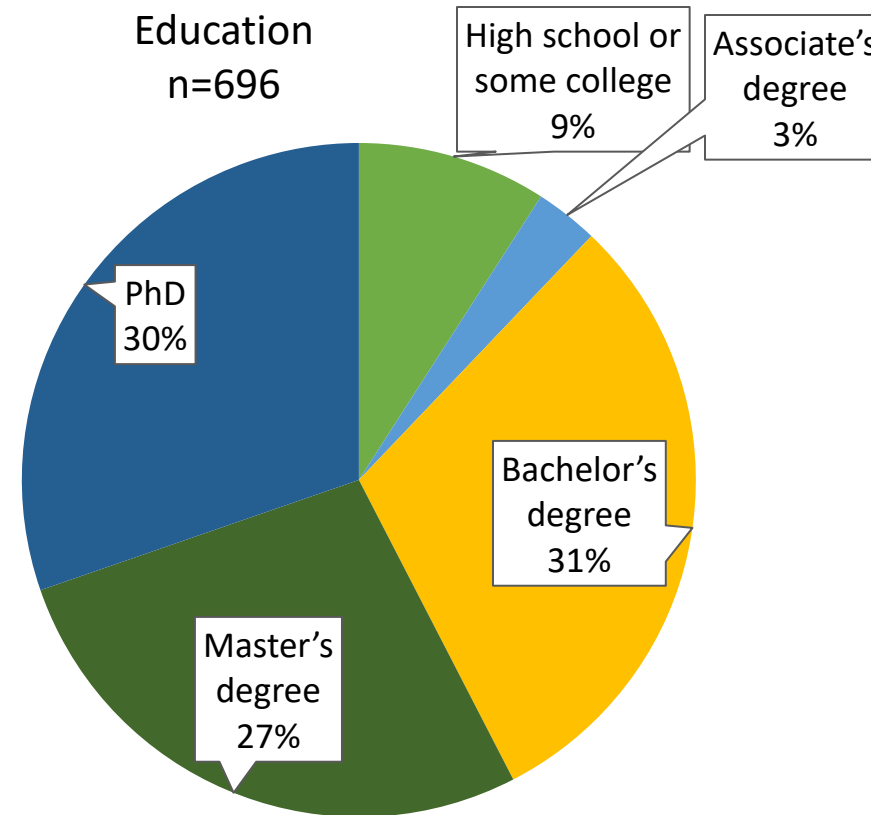
Area of Research Focus (General)  
n=300



Q7. What is your area of research focus?

Over half (57%) of respondents have a Master's degree or higher.

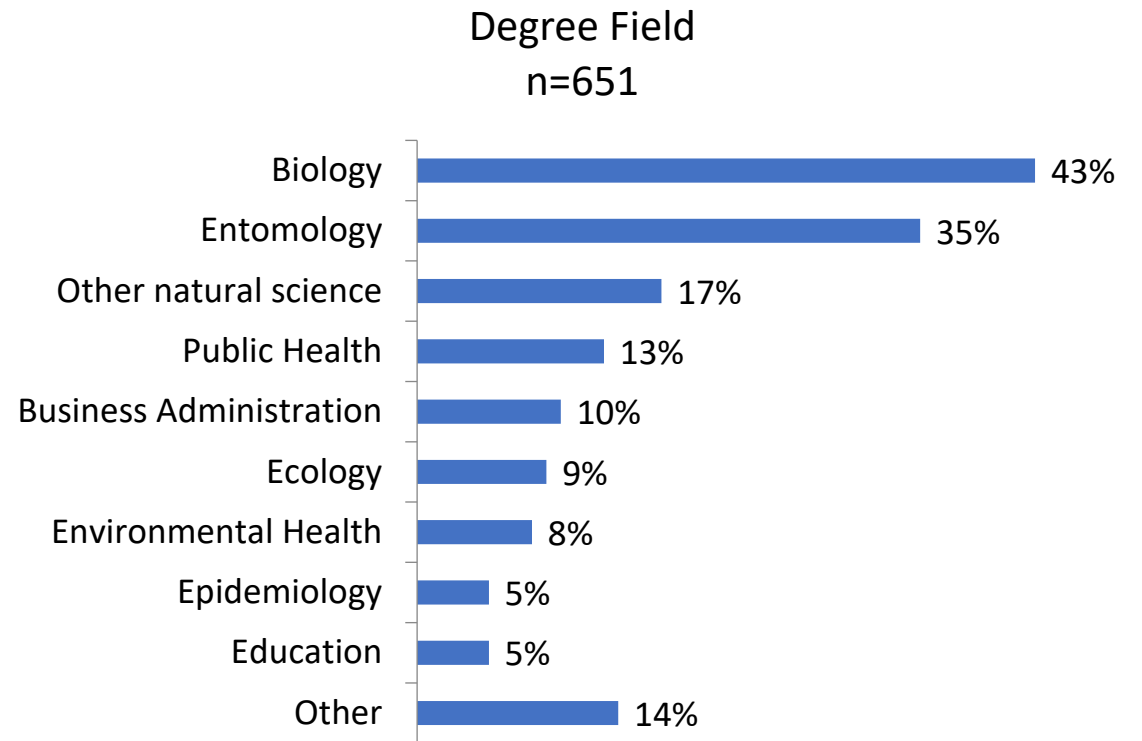
- Members are more likely than nonmembers to have an MA or higher (61% vs. 49% of nonmembers)
- 42% of respondents under 35 have an MA or above, compared with 56% of those 35-64
- Nearly all respondents working at a Federal Agency or College/University have an MA or above (97% and 94% respectively)
- 40% of MCD/MAD respondents have an MA or above



Q8. What is the highest level of education you've completed?

The most common fields of study among all respondents are Biology (43%) and Entomology (35%).

- Members are more likely to have specialized in Entomology (38% vs. 28% of nonmembers)



A full list of the 18 areas of study tested is included in Appendix 1.

Q9. In what field(s) do you have your degree(s)? Select all that apply.

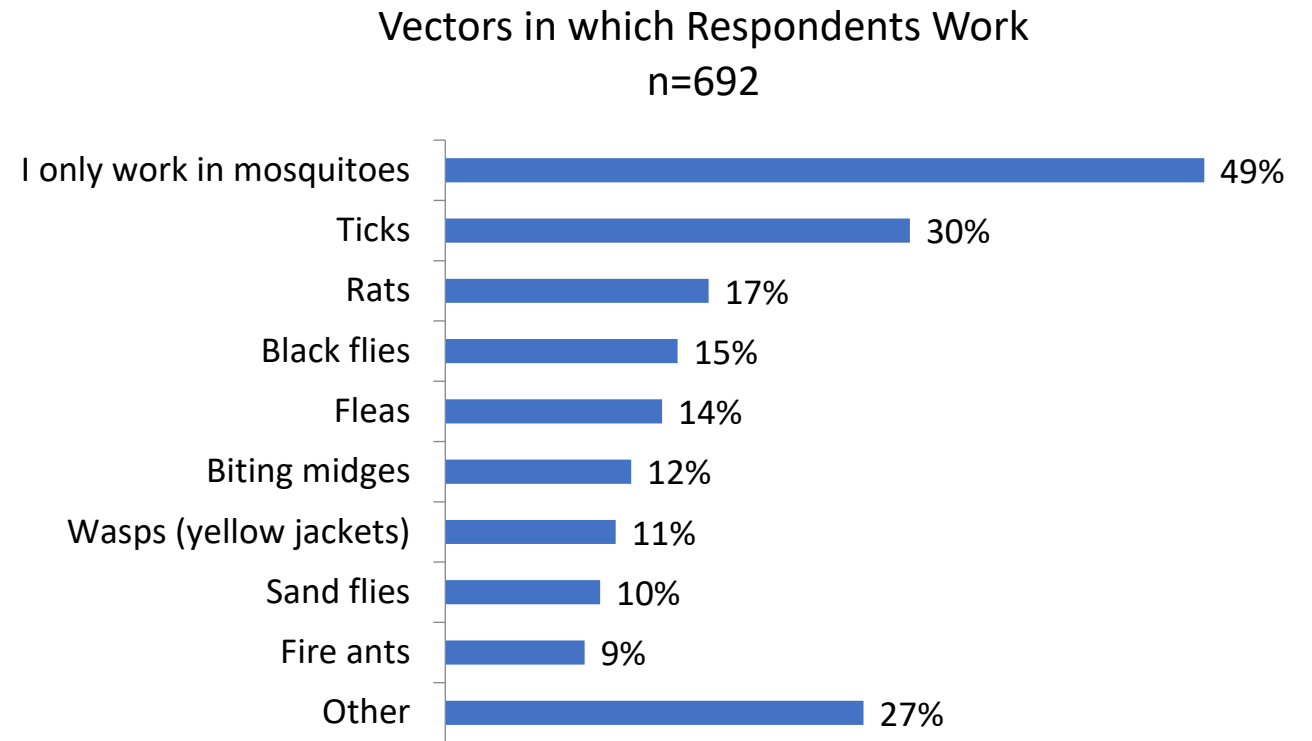


About half of respondents (49%) do not work in additional vectors besides mosquitoes. Thirty percent (30%) of all respondents work with ticks.

- Members are more likely to work only in mosquitoes (53% vs. 40% of nonmembers)
- MCD/MAD respondents are also more likely than respondents in other work settings to work only in mosquitoes (66%)

A complete list of the 17 vectors tested in included in Appendix 1.

Detail about additional (“Other”) vectors was collected via open-ended write-in response (data provided separately).

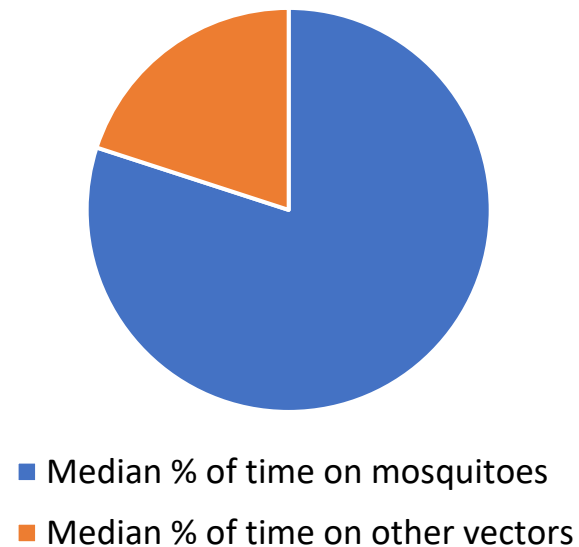


Q10. In which of the following vectors do you work? Select all that apply.

Respondents who work on vectors besides mosquitoes spend a median of 80% of their time focused on mosquitoes, and 20% of their time on other vectors.

- Nonmembers who work on additional vectors spend less time on mosquitoes than members (median 75% of their time vs. 80% for members)

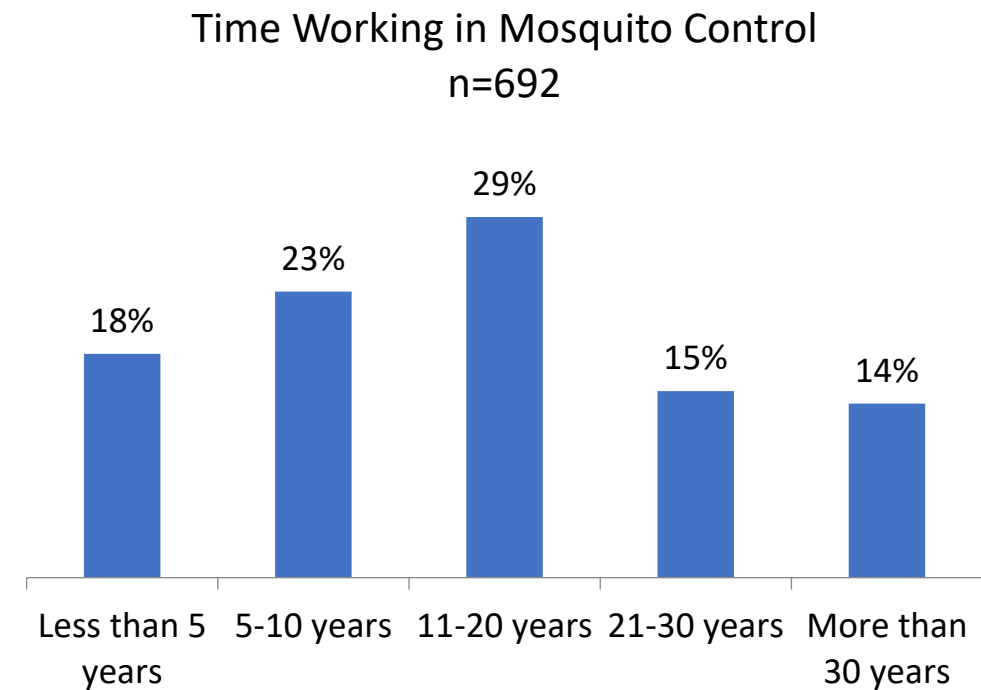
Time Spent on Mosquitoes  
n=357



Q11. Use the boxes below to identify how much of your time you spend on work related to mosquitoes versus other vectors. Note: Total must equal 100

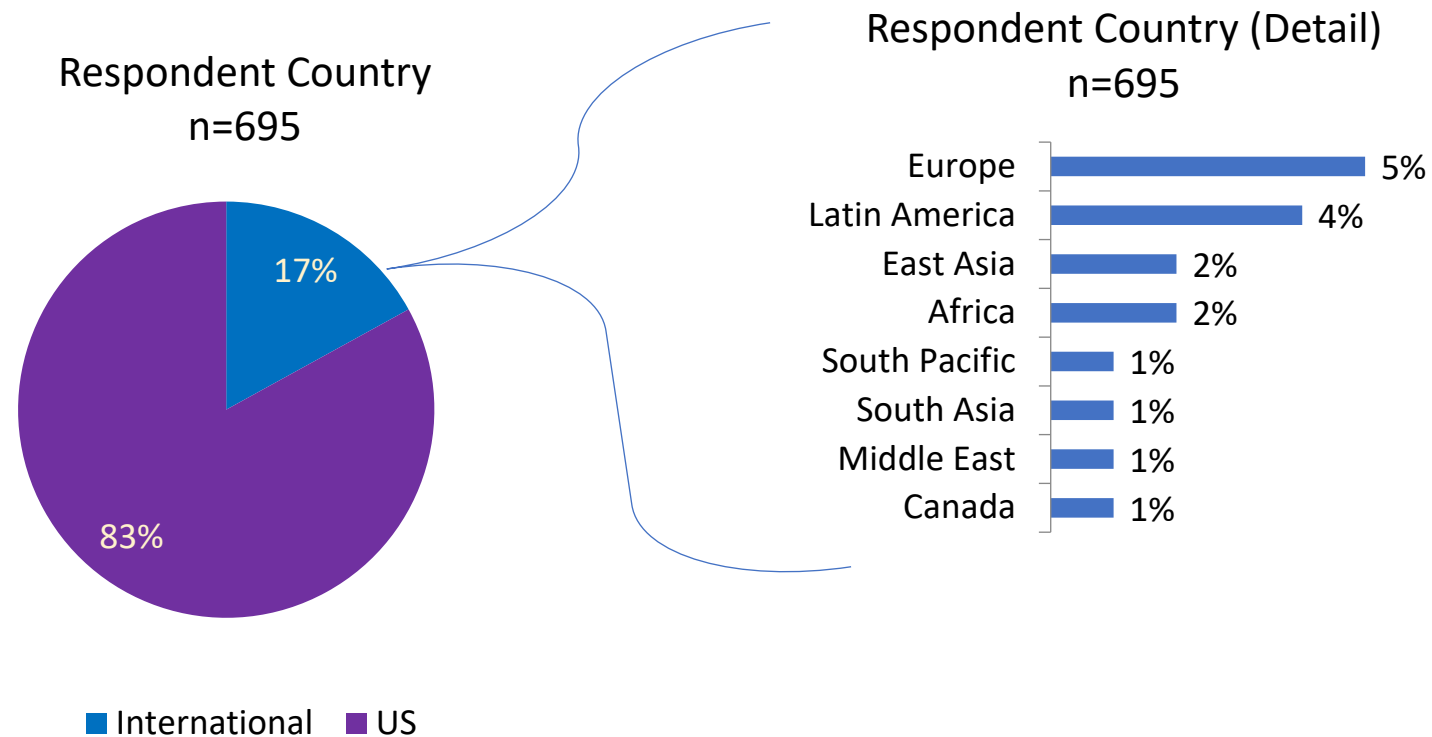
Over half (58%) of respondents have been doing work or research related to mosquito control for more than 10 years. The median is 15 years.

- Members are more likely to have been in the field longer (median of 15 years vs. 10 years for nonmembers)



Q12. About how many years has your work or research been related to mosquito control?

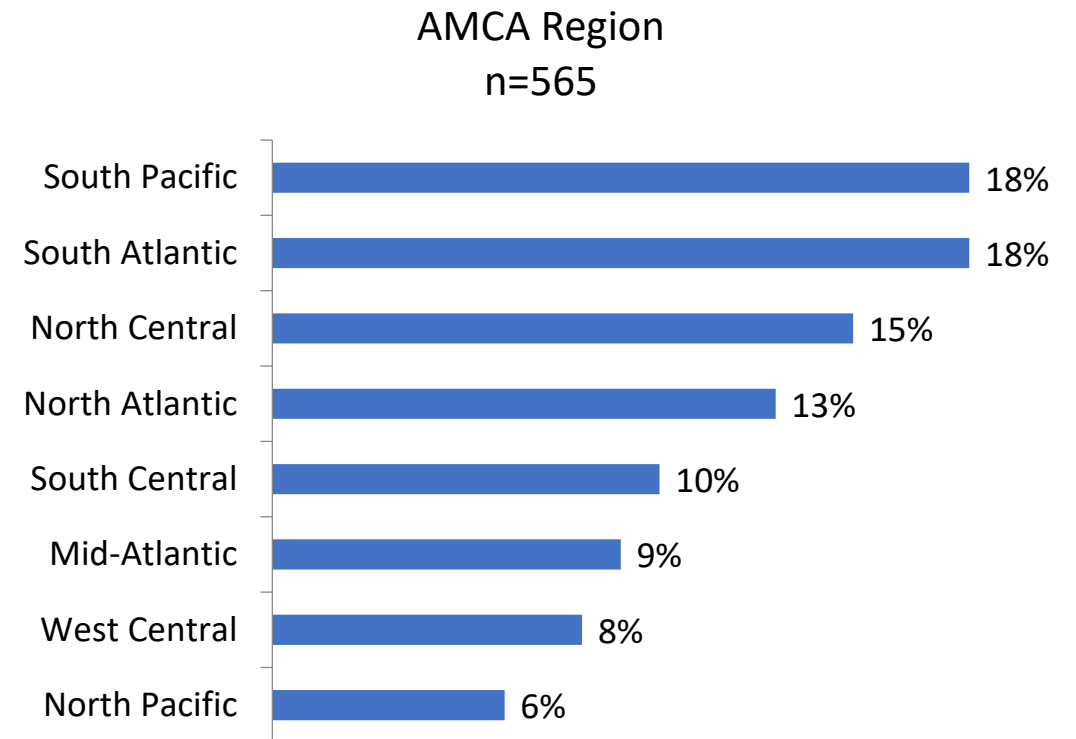
# 17 % of respondents are outside the US.



Data taken from AMCA database

The South Pacific and South Atlantic regions account for about a third (36%) of US respondents.

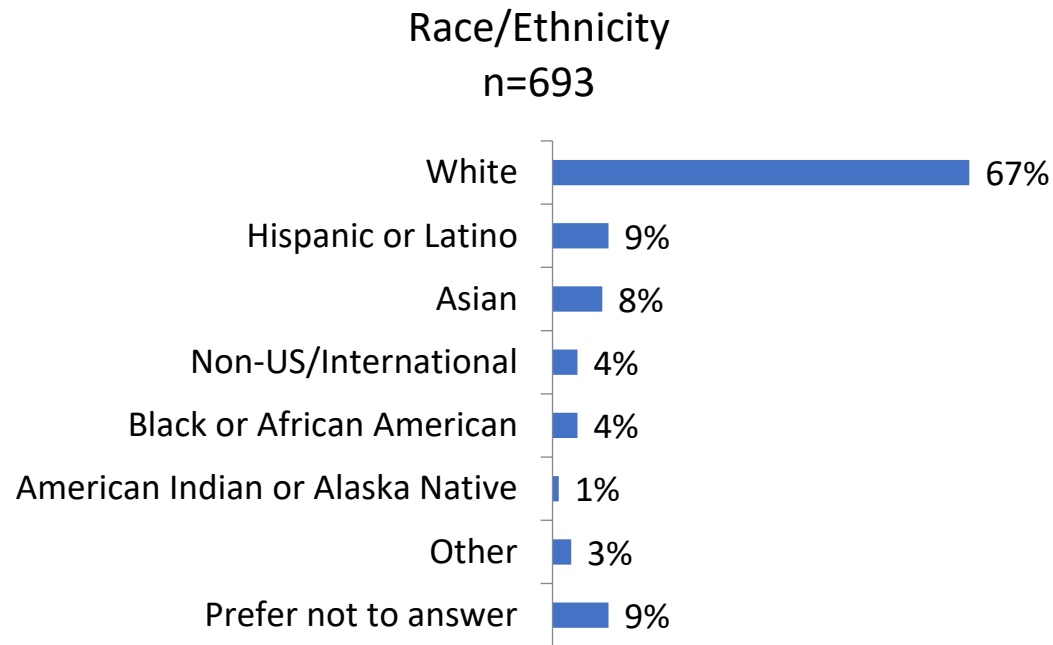
- Nonmember respondents are more likely than members to be in the South Pacific region (28% vs. 15% of members)
- Members are more likely to be in the South Atlantic region (20% vs. 11% of nonmembers)



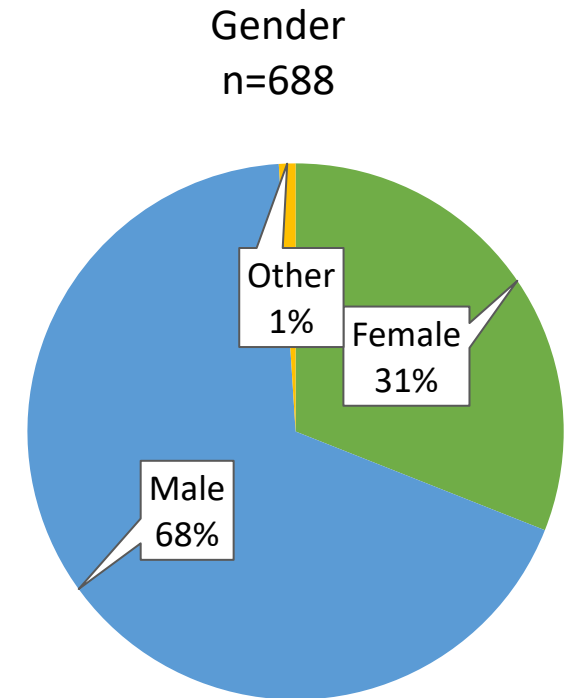
Data taken from AMCA database

About two thirds (67%) of respondents identify as white, and a similar proportion (68%) are male.

- Members are more likely than nonmembers to be white (72% vs. 57% of nonmembers)
- Individuals working in an MCD/MAD setting are more likely to be white than those working in a College/University (71% vs. 56%)

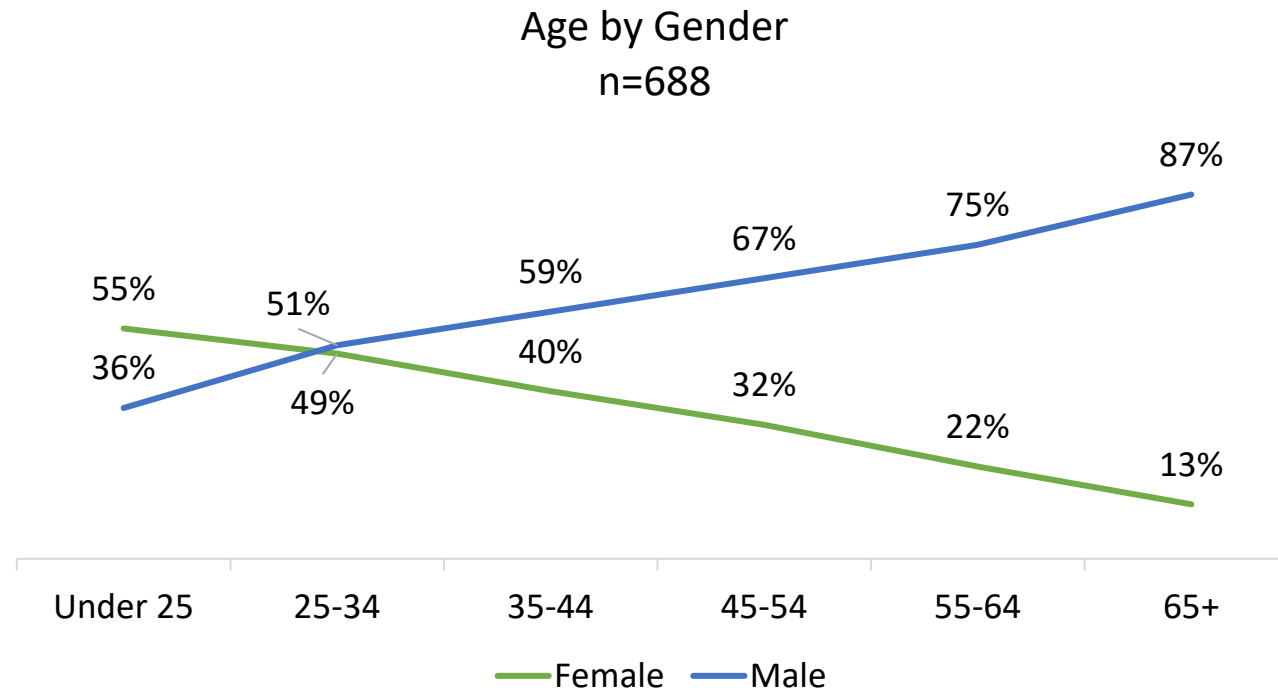


Q15. Which best describes your race/ethnicity? Select all than apply.



Q16. What is your gender identification?

Younger respondents are more likely to be female.



Q16. What is your gender identification?

Respondents are most likely to get full employer financial support for in-person educational events (registration and travel) and scheduled/live virtual educational events.

	Employer pays 100%	I pay 100%	Employer and I share the cost
Registration for in-person educational events	71%	19%	10%
In-state travel/accommodation for in-person educational events	70%	18%	12%
Registration for online educational events such as interactive webinars or online conferences	69%	22%	9%
Out-of-state travel/accommodation for in-person educational events	68%	18%	14%
Subscription or other publication fees for professional publications	62%	29%	9%
Membership dues	59%	36%	4%
Expenses for professional volunteer, speaking or other non-CE eligible activities	58%	29%	13%
Online self-study courses/on demand courses	55%	34%	11%

Q14. How are the expenses or costs of for each of the following usually covered? n=426-660



Nonmembers are less likely to receive full employer support for most professional development areas tested.

	Employer pays 100%*	
	Member	Nonmember
Registration for in-person educational events	74%	63%
In-state travel/accommodation for in-person educational events	73%	64%
Registration for online educational events such as interactive webinars or online conferences	71%	64%
Out-of-state travel/accommodation for in-person educational events	71%	62%
Subscription or other publication fees for professional publications	65%	56%
Membership Dues	61%	54%
Expenses for professional volunteer, speaking or other non-CE eligible activities	59%	56%
Online self-study courses/on demand courses	57%	48%

\*Figures in **purple** are statistically significant differences

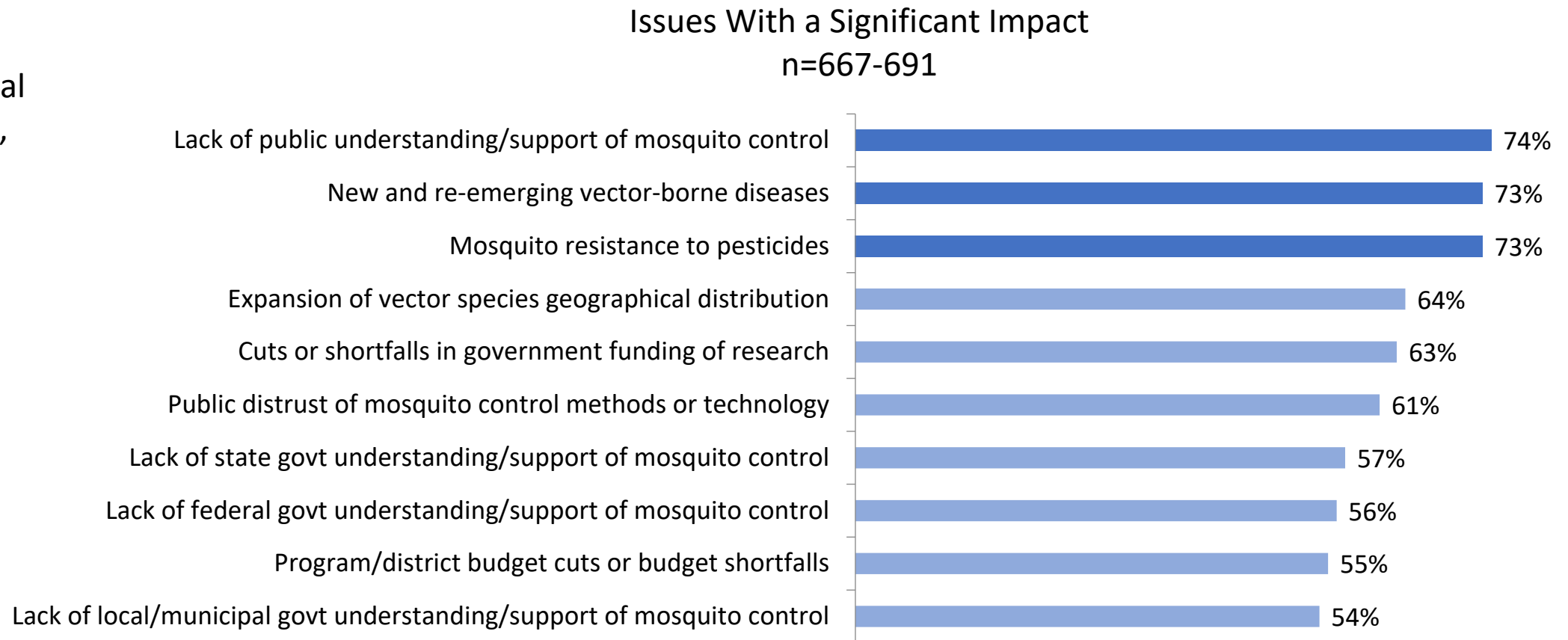
Q14. How are the expenses or costs of for each of the following usually covered? n=426-660

# Environmental Scan

What are the changing  
forces within the  
environment that influence  
mosquito professionals'  
needs?

About three-fourths of respondents are concerned about Lack of public understanding/support of mosquito control, New and re-emerging vector-borne diseases, and Mosquito resistance to pesticides.

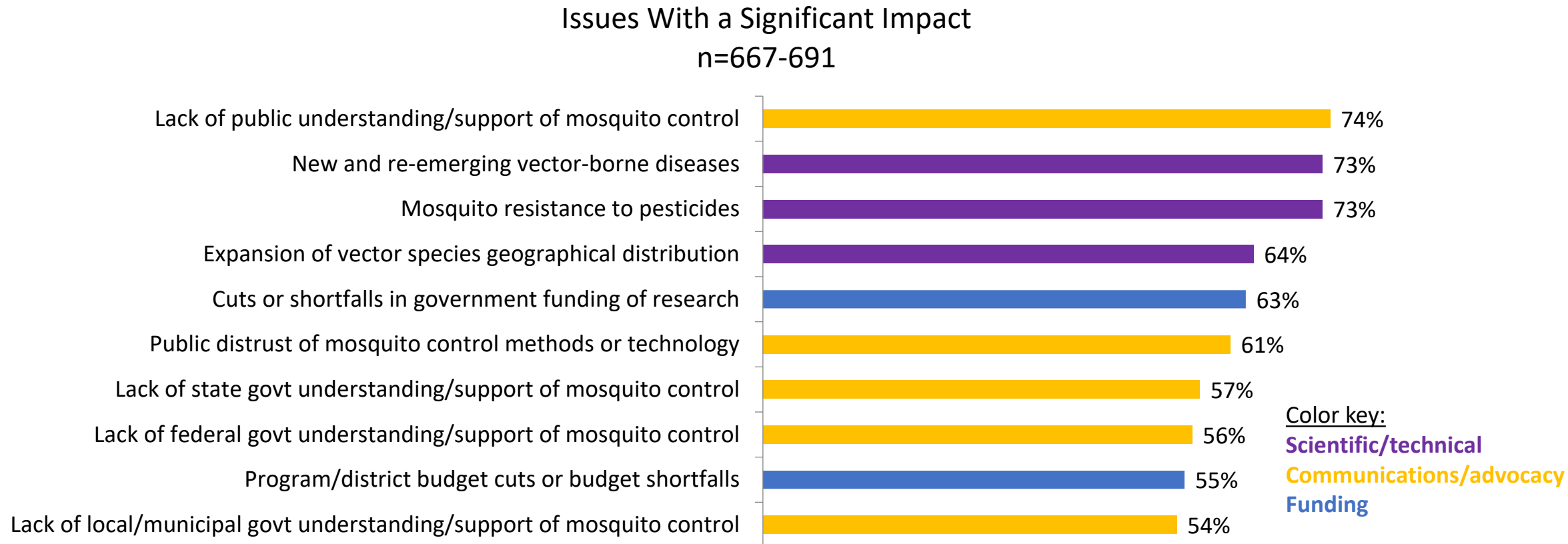
- Out of 40 total issues tested, 14 were identified as significant issues by at least 50% of respondents



A full list of the 40 issues tested is included in Appendix 1.

Q18-Q22. Which of these factors will have a significant impact on the mosquito control industry and profession over the next three years? Select all that apply.

Five of the top 10 issues are communication/advocacy issues.  
Three of the top 10 are science/technical issues and 2 are funding issues

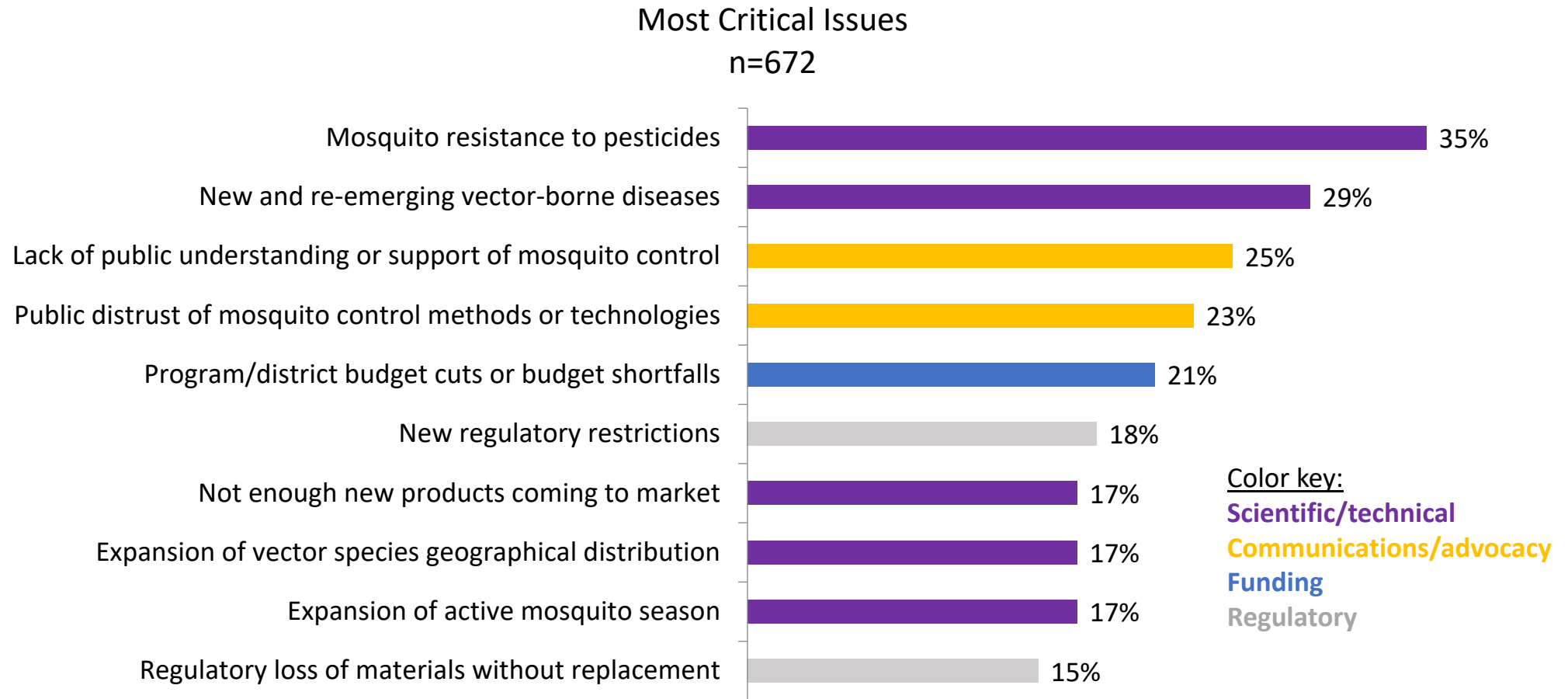


A full list of the 40 issues tested  
is included in Appendix 1.

Q18-Q22. Which of these factors will have a significant impact on the mosquito control industry and profession over the  
next three years? Select all that apply.

# The issue most likely to be identified as most critical is Mosquito resistance to pesticides.

- The top 3 most critical issues are the same as the top 3 issues overall
- Among the top 10 most critical issues, more science issues were identified as critical than communication /advocacy or funding issues



A full list of the 40 issues tested is included in Appendix 1.

Q23. Of the factors you think will have an impact on the mosquito control industry and profession over the next three years, which ones are the most critical? Select up to five.

# Goals Assessment

What are the organizational  
and professional goals  
driving mosquito  
professionals' decisions?

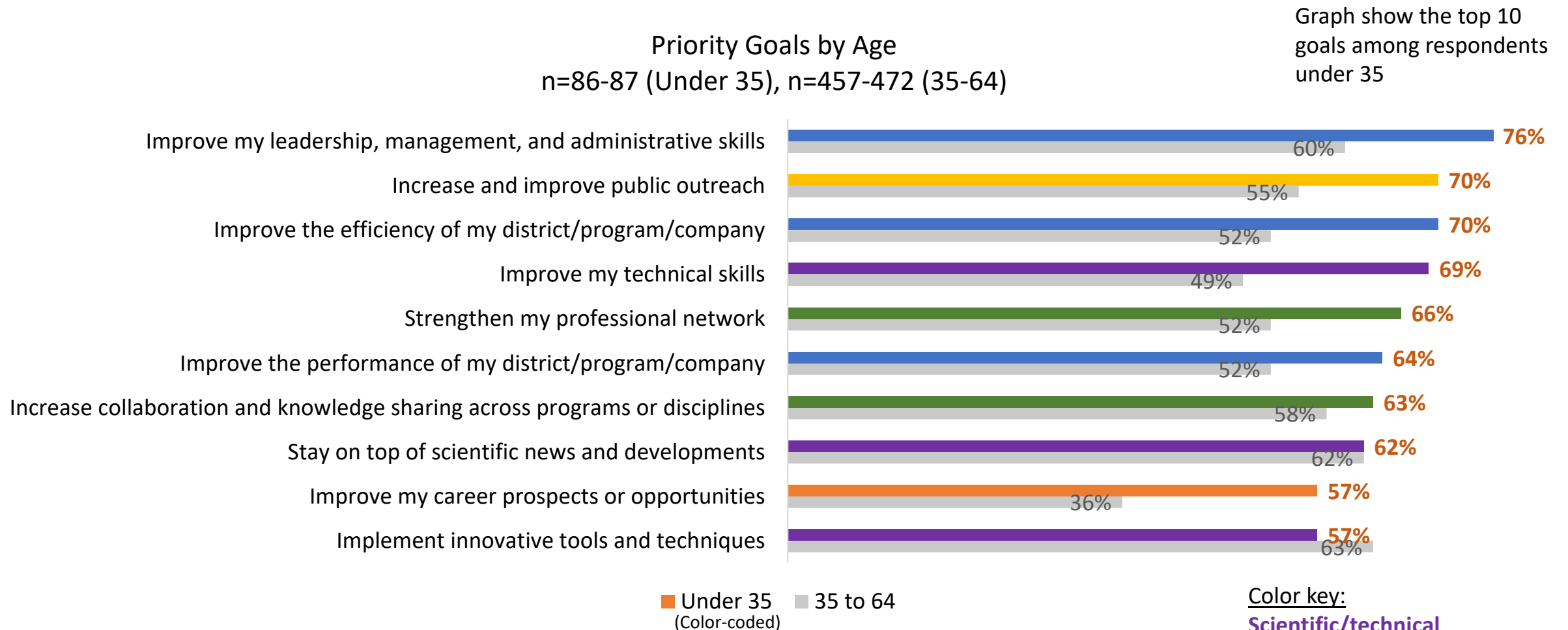
The most frequently selected goal is to Stay on top of scientific news and developments.



A full list of the 22 goals tested is included in Appendix 1.

Q25. Which of the following goals are a priority for you at work? Select all that apply.

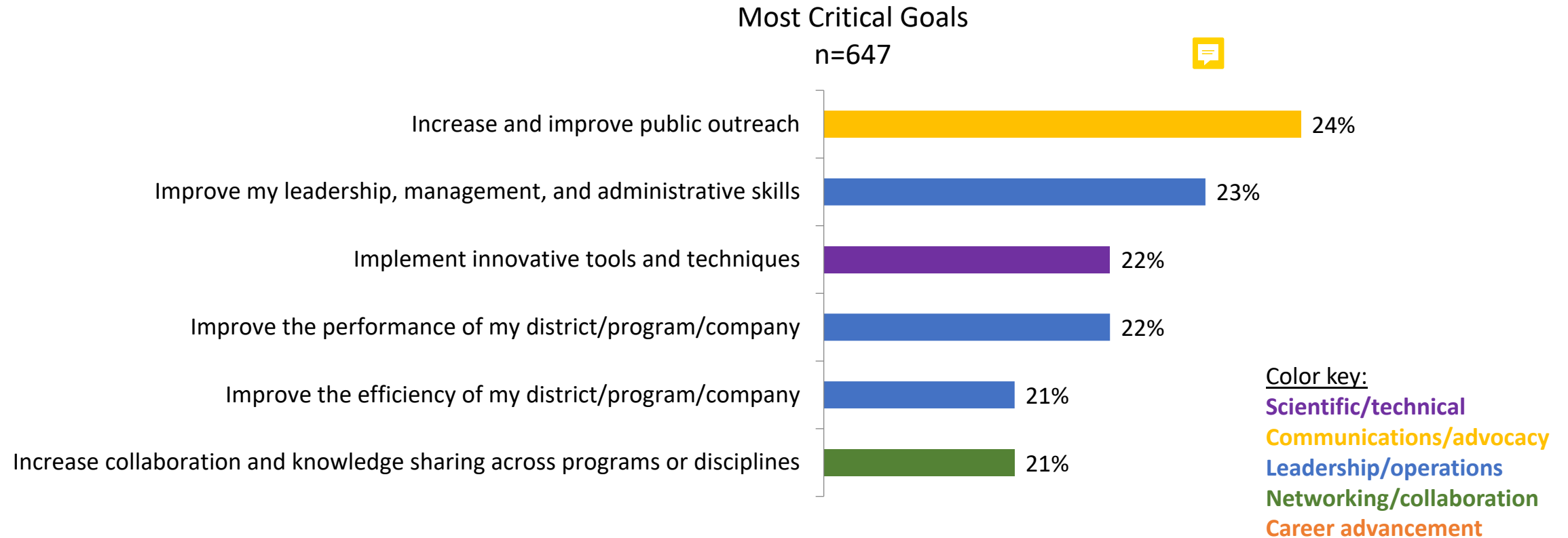
Over three-fourths (76%) of respondents under age 35 want to improve their leadership, management, and administration skills.



Q25. Which of the following goals are a priority for you at work? Select all that apply.



The goal most likely to be selected as most critical is Increase and improve public outreach.



Q28. Of the goals you selected, which ones are the top three?

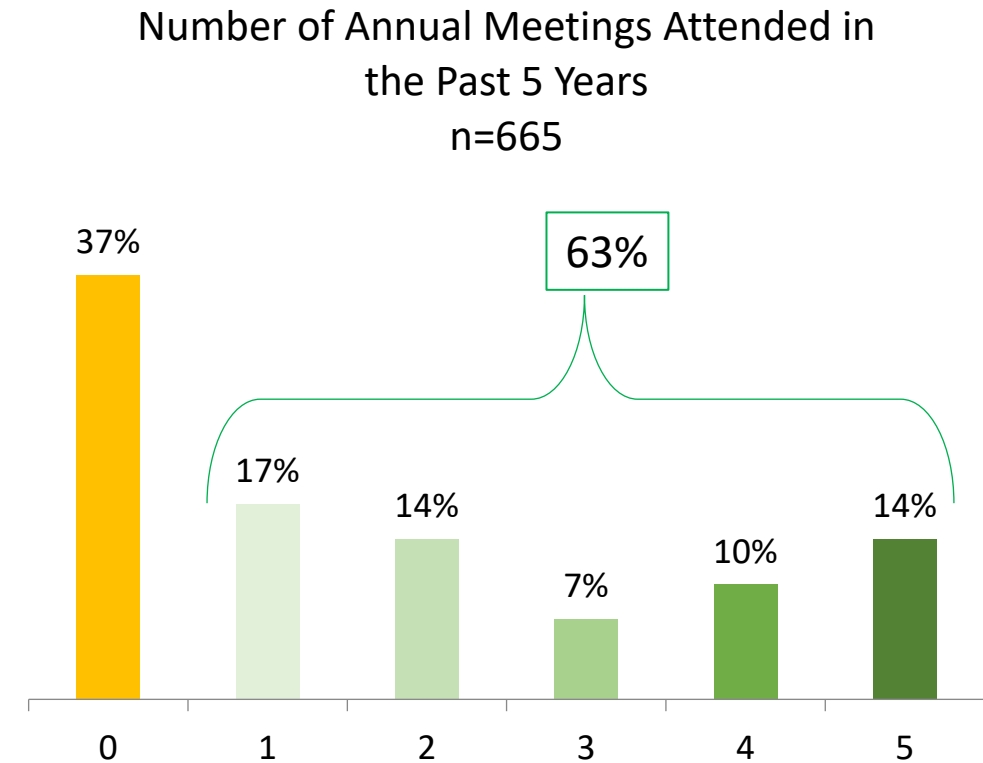
A full list of the 22 goals tested is included in Appendix 1.

# Association Engagement Drivers

What programs, products  
or initiatives are most likely  
to influence mosquito  
professionals' engagement  
with AMCA?

About two thirds (63%) of respondents have attended at least 1 Annual Meeting in the past 5 years.

- Nonmembers are more likely to have attended zero meetings (55% vs. 30% of members)
- Respondents under 35 and those working in a College/University setting are also more likely to have attended zero meetings in the past 5 years (55% and 52%, respectively).



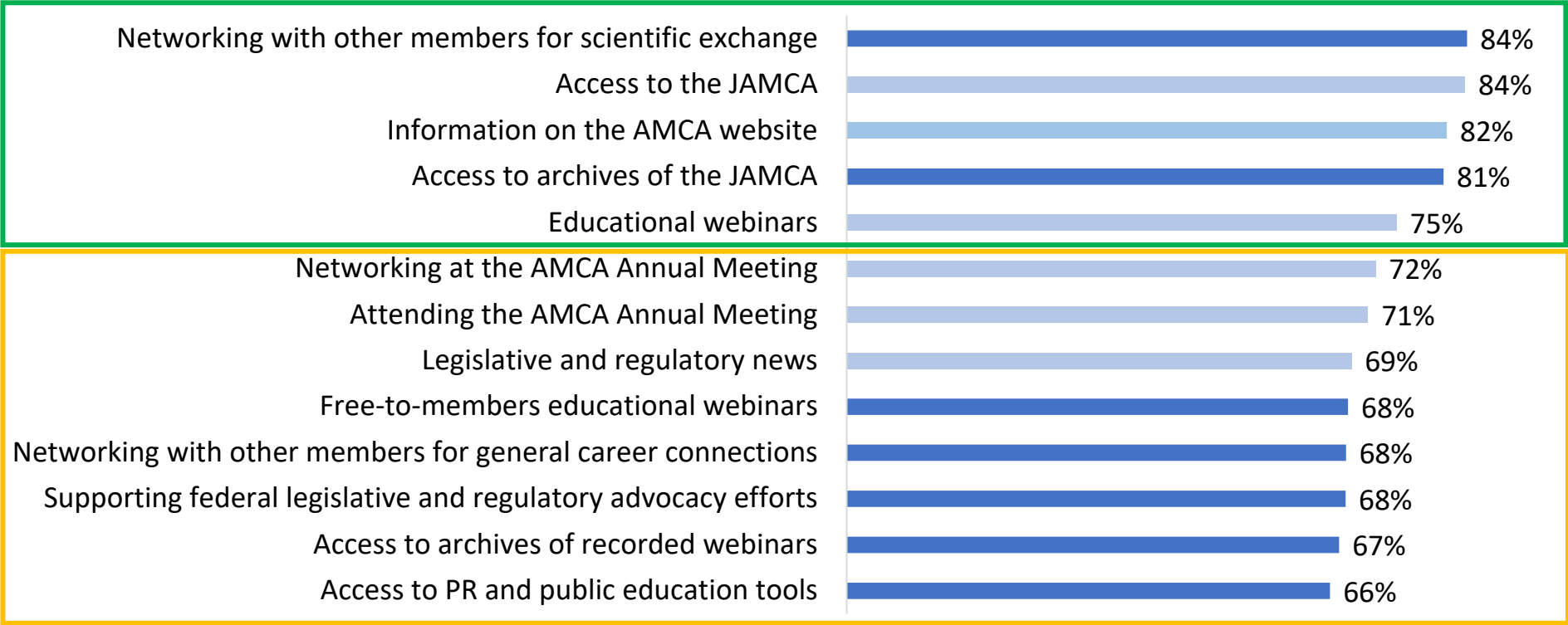
Q30. In the past 5 years, how many times have you attended the AMCA Annual Meeting?

Among members, the top engagement drivers are Networking with other members for scientific exchange (84%) and Access to the archives of the JAMCA (81%).

Association Engagement Drivers, Members Only  
% rating as Absolutely Critical or Very Important  
n=448-465

Light blue denotes  
an open-access  
benefit

- 5 of the 28 engagement drivers tested were rated as Absolutely Critical or Very Important by at least 3/4 of respondents. These can be considered primary engagement drivers among members
- An additional 8 benefits are critical/important to at least 2/3 of respondents. These can be considered secondary engagement drivers

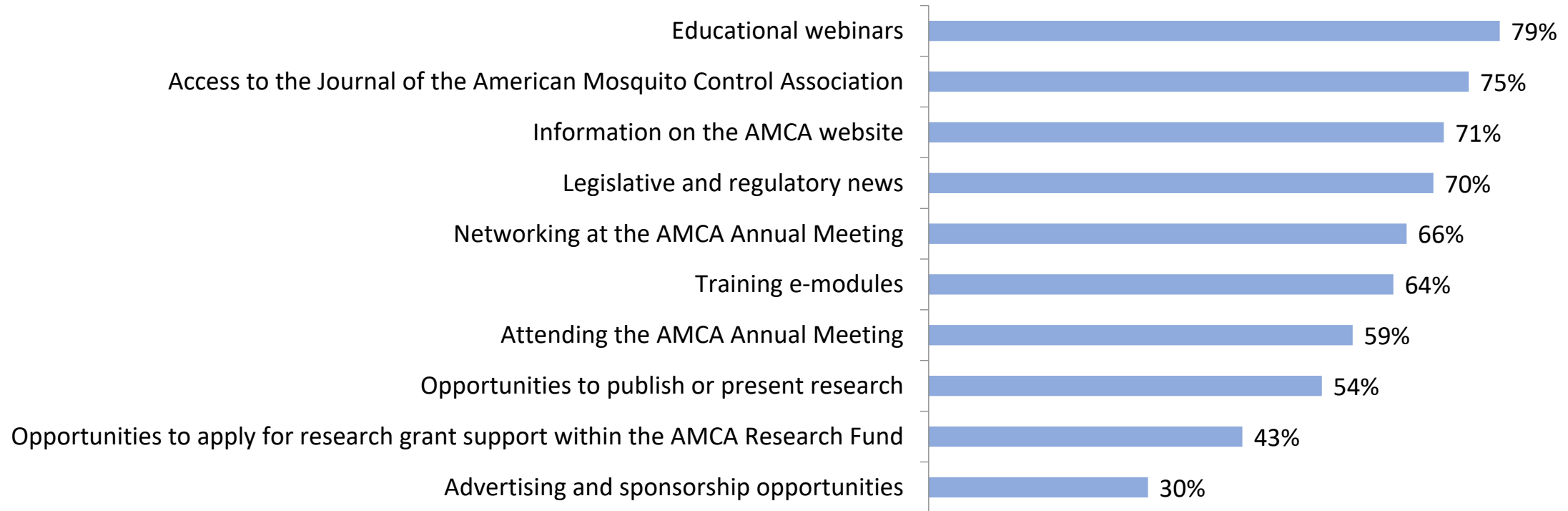


Q31. How important are these benefits to your decision to join or engage with AMCA?

A full list of the 18 member-only and 10 open-access engagement drivers tested is included in Appendix 1.

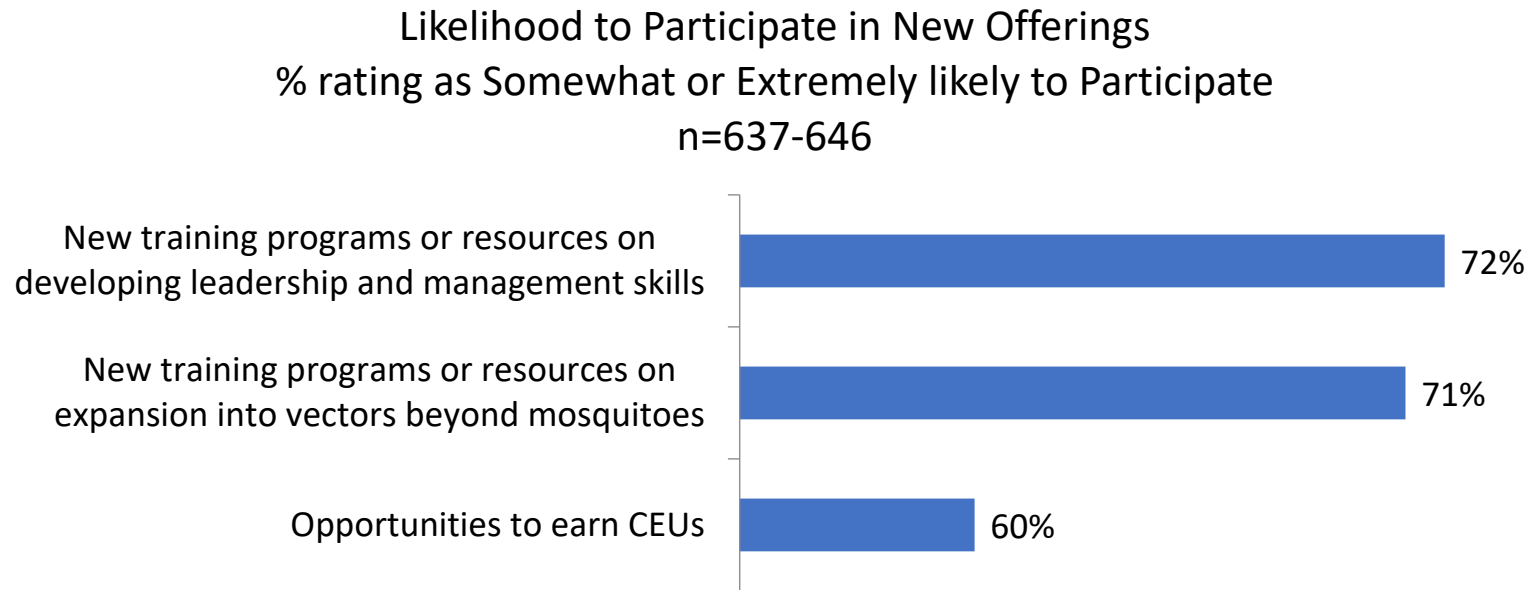
Among nonmembers, the top benefits are Educational webinars (79%) and Access to the JAMCA (75%).

Open-Access Engagement Drivers, Nonmembers Only  
% rating as Absolutely Critical or Very Important  
n=178-183



Q31. How important are these benefits to your decision to join or engage with AMCA?

All of the new programs tested are of interest to over half of respondents.



Q35. How likely would you be to participate in the following potential offerings?

Several subgroups are particularly likely to participate in the proposed new programs.

**Opportunities to earn CEUs**

(% somewhat or extremely likely):

Nonmembers (66%)  
MCD/MAD employees (73%)  
Field technicians (84%)  
Lab technicians (80%)  
Under 35 (68%)

New training programs or resources  
on **developing leadership and  
management skills**

(% somewhat or extremely likely):

Under 35 (86%)  
MCD/MAD employees (82%)

New training programs or resources  
on **expansion into vectors beyond  
mosquitoes**

(% somewhat or extremely likely):

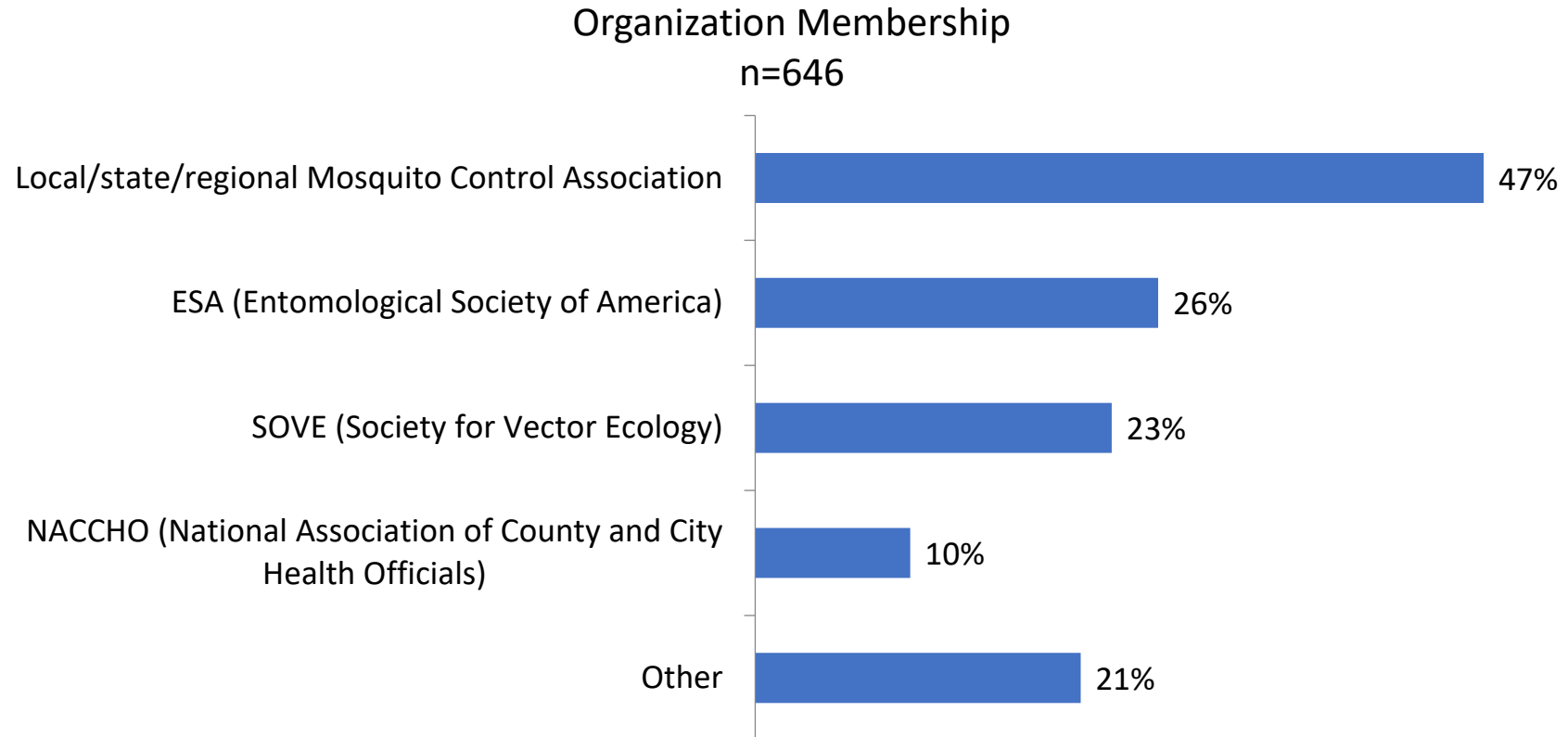
Research/scientist-primary role  
(82%)

# Association Alternatives

What organizations do respondents belong to and where do they go for professional support?



Almost half (47%) of respondents are members in their local/state/regional Mosquito Control Association.

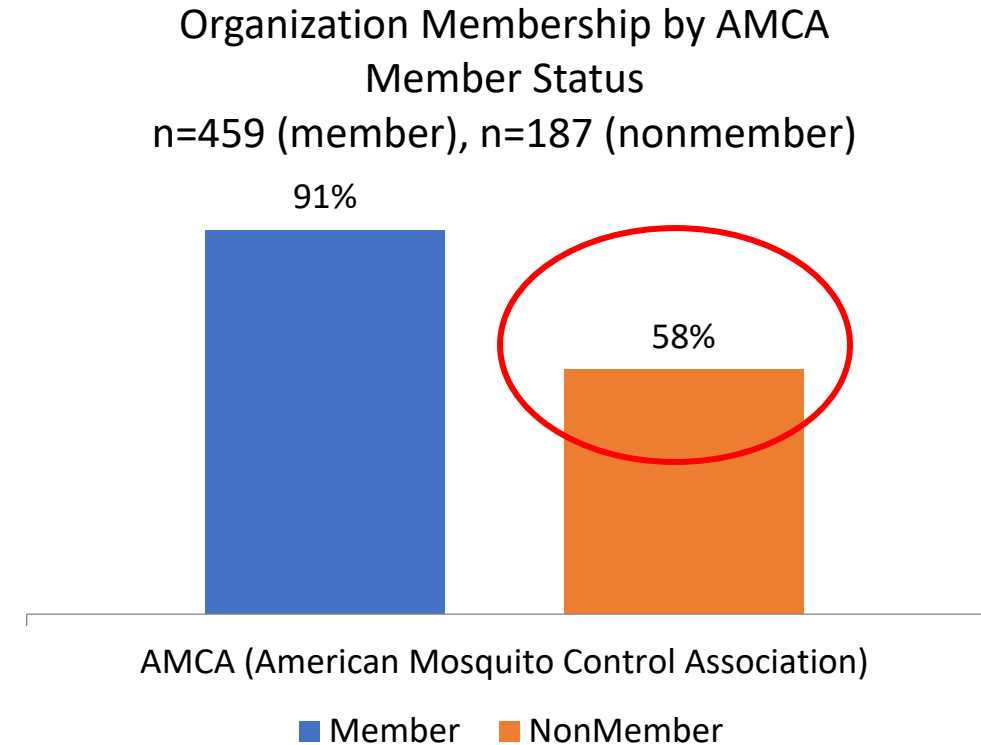


A full list of the 13 organizations tested is included in Appendix 1.

Q38. In which of the following organizations are you a member? Select all that apply.

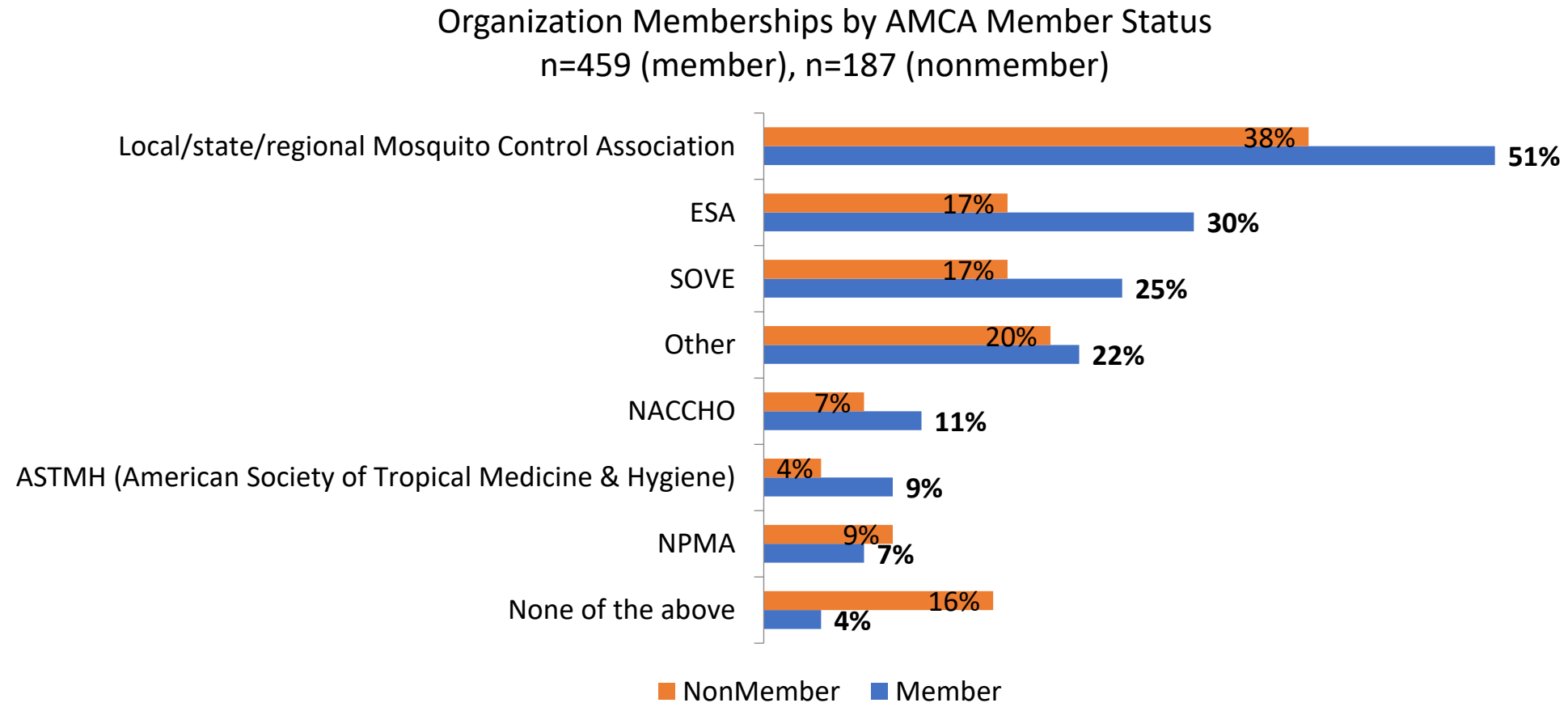
While only 69% of respondents are AMCA members, 81% of respondents selected AMCA as an organization to which they belong.

- 58% of nonmembers apparently believe they are AMCA members
- 9% of members believe they are not members



Q38. In which of the following organizations are you a member? Select all that apply. – Option: AMCA

AMCA members participate in a variety of organizations, while nonmembers are more likely to have fewer or no memberships.




Q38. In which of the following organizations are you a member? Select all that apply.

Mosquito control professionals look to a variety of sources for information or support on different issues.

To assess where people go for specific resources types, the survey asked respondents to consider the issue areas below, and then indicate which source best meets their needs for each issue area.

ISSUE AREAS	POTENTIAL SOURCES
Professional development in technical topics	AMCA
Professional development in leadership and business operations	College/ university or research institute
Identifying and evaluating new technologies to improve my work	Local district or health dept
PR and communications support and tools	ESA
Funding and financial support	NPMA
Research collaborations	SOVE
Finding job opportunities	Other specialty association
Identifying and recruiting talent	Federal agency
Opportunities for industry visibility or leadership	Private industry org
Networking and connecting with peers	Other Source
Legislative and regulatory advocacy	No Source Currently Meets My Needs
Local industry news	Not Applicable
National/international industry news	

Q39. There are many choices in the marketplace that help serve you in your career and workplace. For each issue area listed below, use the dropdown box to identify which organization provides resources or services that best meet your needs.

AMCA stands out as the go-to organization for National/international industry news and Legislative and regulatory advocacy. Even for issue areas with a less clear AMCA advantage, there is no clear preferred alternative source of support. 

	AMCA	College/ university or research institute	Local district or health dept	ESA	NPMA	SOVE	Other specialty assn.	Federal agency	Private industry org
National/international industry news	55%	2%	1%	5%	3%	2%	2%	2%	2%
Legislative and regulatory advocacy	53%	0%	3%	4%	3%	0%	7%	5%	1%
Networking and connecting with peers	42%	4%	7%	8%	3%	2%	13%	0%	1%
Professional development in technical topics	39%	9%	4%	6%	3%	1%	6%	2%	3%
Opportunities for industry visibility or leadership	36%	2%	4%	4%	3%	1%	6%	0%	3%
Identifying and evaluating new technologies to improve my work	36%	9%	3%	5%	3%	1%	7%	1%	8%
PR and communications support and tools	30%	4%	10%	3%	2%	1%	7%	2%	3%
Local industry news	28%	1%	17%	3%	3%	0%	12%	1%	5%
Research collaborations	23%	22%	4%	6%	1%	3%	5%	3%	2%
Finding job opportunities	21%	3%	4%	6%	0%	1%	7%	1%	1%
Professional development in leadership and business operations	17%	7%	6%	3%	2%	0%	7%	1%	5%
Identifying and recruiting talent	15%	8%	6%	5%	1%	0%	3%	1%	2%
Funding and financial support	10%	5%	14%	2%	0%	0%	3%	11%	4%

Q39. There are many choices in the marketplace that help serve you in your career and workplace. For each issue area listed below, use the dropdown box to identify which organization provides resources or services that best meet your needs.

In the areas where AMCA was least selected, a plurality of respondents indicated the issue does not apply to them.

The following slide contains a visual representation of AMCA's relative market share.

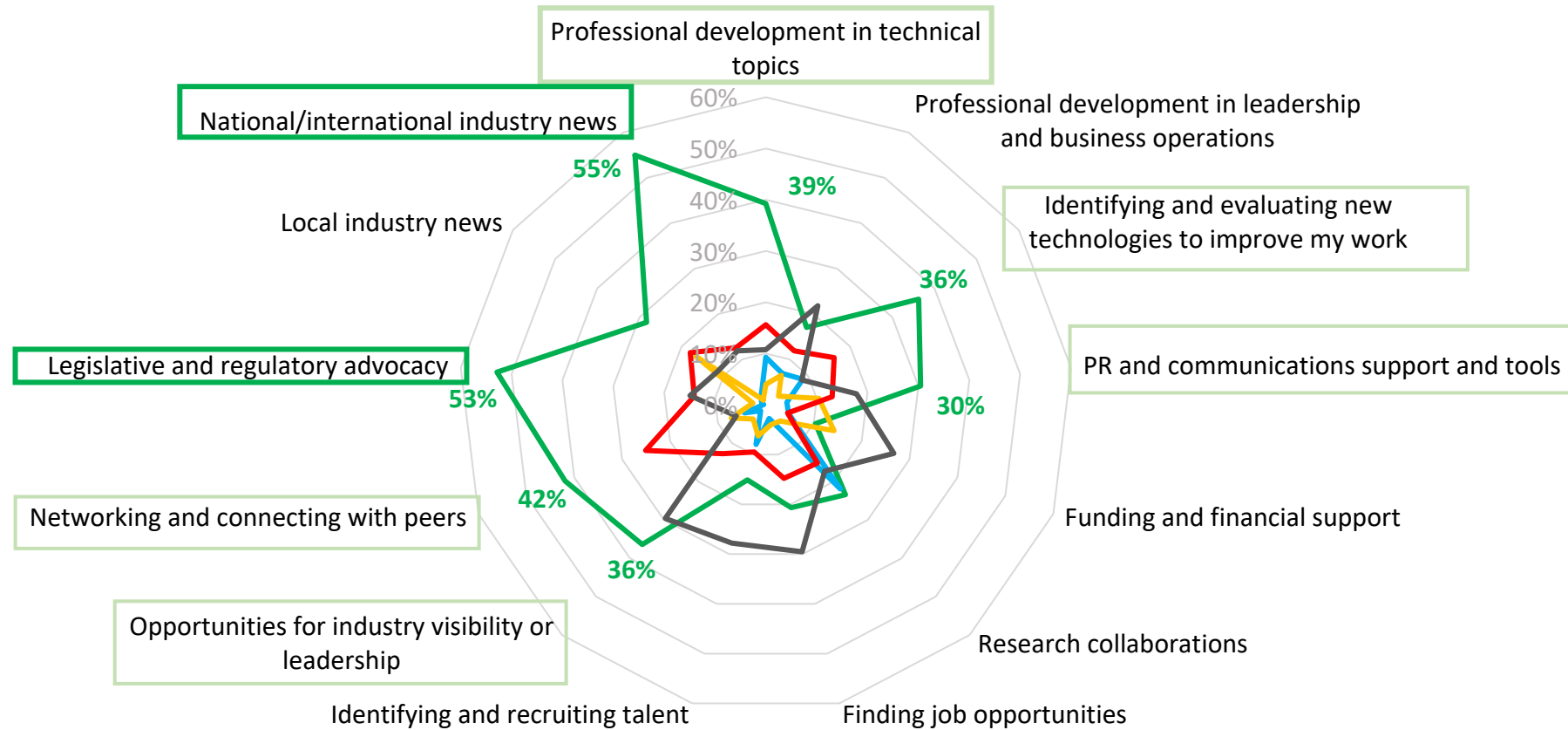
	AMCA	Other Source	No Source Currently Meets My Needs	Not Applicable
National/international industry news	55%	10%	3%	12%
Legislative and regulatory advocacy	53%	6%	4%	15%
Networking and connecting with peers	42%	11%	2%	6%
Professional development in technical topics	39%	12%	5%	11%
Opportunities for industry visibility or leadership	36%	5%	7%	30%
Identifying and evaluating new technologies to improve my work	36%	12%	6%	9%
PR and communications support and tools	30%	12%	7%	18%
Local industry news	28%	12%	7%	11%
Research collaborations	23%	9%	4%	17%
Finding job opportunities	21%	18%	7%	30%
Professional development in leadership and business operations	17%	15%	15%	22%
Identifying and recruiting talent	15%	17%	13%	28%
Funding and financial support	10%	12%	12%	27%

Q39. There are many choices in the marketplace that help serve you in your career and workplace. For each issue area listed below, use the dropdown box to identify which organization provides resources or services that best meet your needs.

## Organization Preferences by Issue Area n=460-474

SOVE + NPMA + ESA + Other  
specialty association

— AMCA — College/university or research institute — Local district or health department — Other Association — Not Applicable



Q39. There are many choices in the marketplace that help serve you in your career and workplace. For each issue area listed below, use the dropdown box to identify which organization provides resources or services that best meet your needs.

**CHICAGO, IL**

Suite 850

35 East Wacker Drive

Chicago, IL 60601

Telephone: 312-224-2626

**WASHINGTON, DC**

Suite 700

1444 I Street, NW

Washington, DC 20005

Telephone: 202-216-9675

**ONLINE**

Twitter: @associationlab

[www.associationlaboratory.com](http://www.associationlaboratory.com)



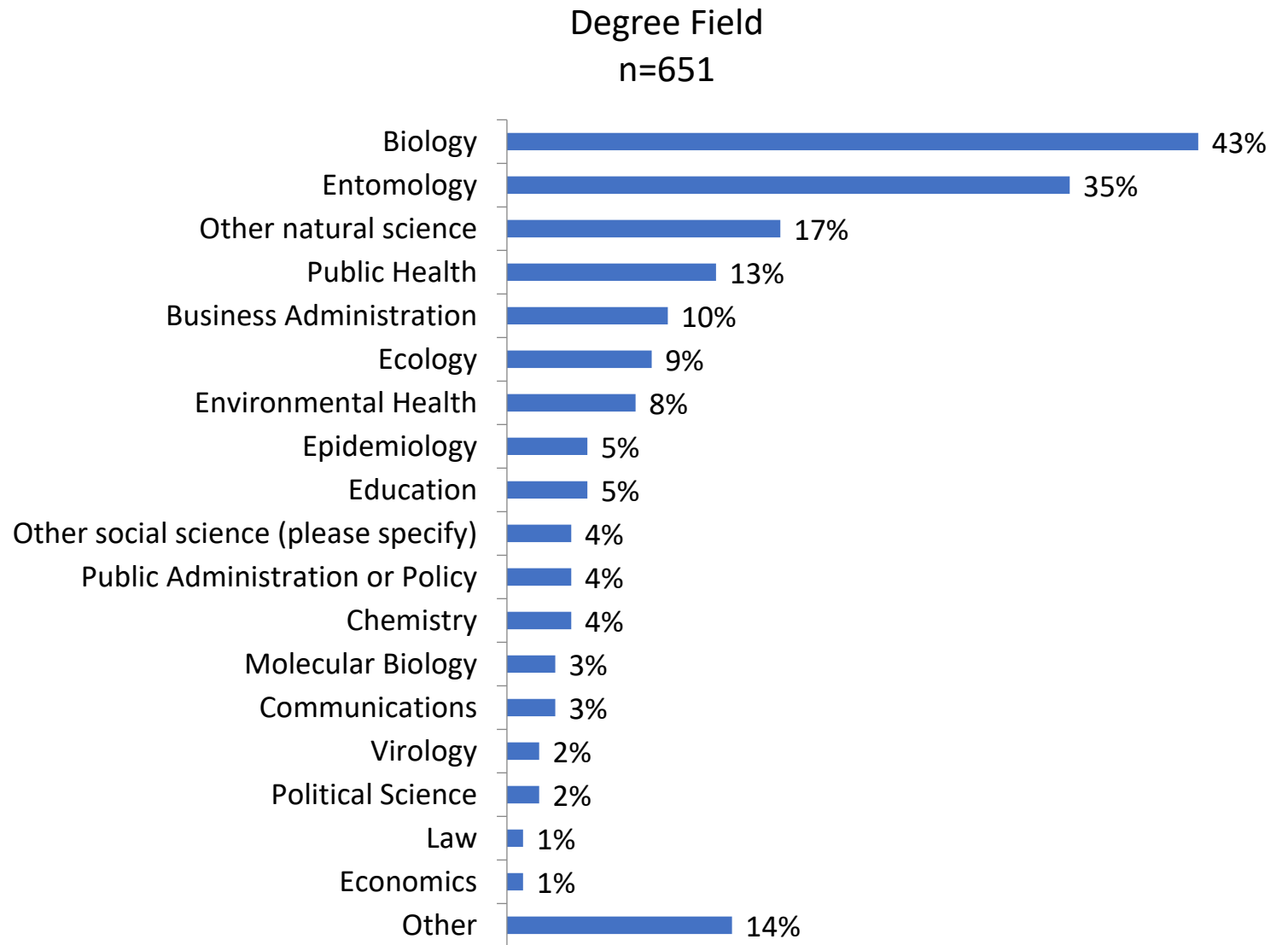
# Appendix 1

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## Additional Detail

## Degree Field (Detail)

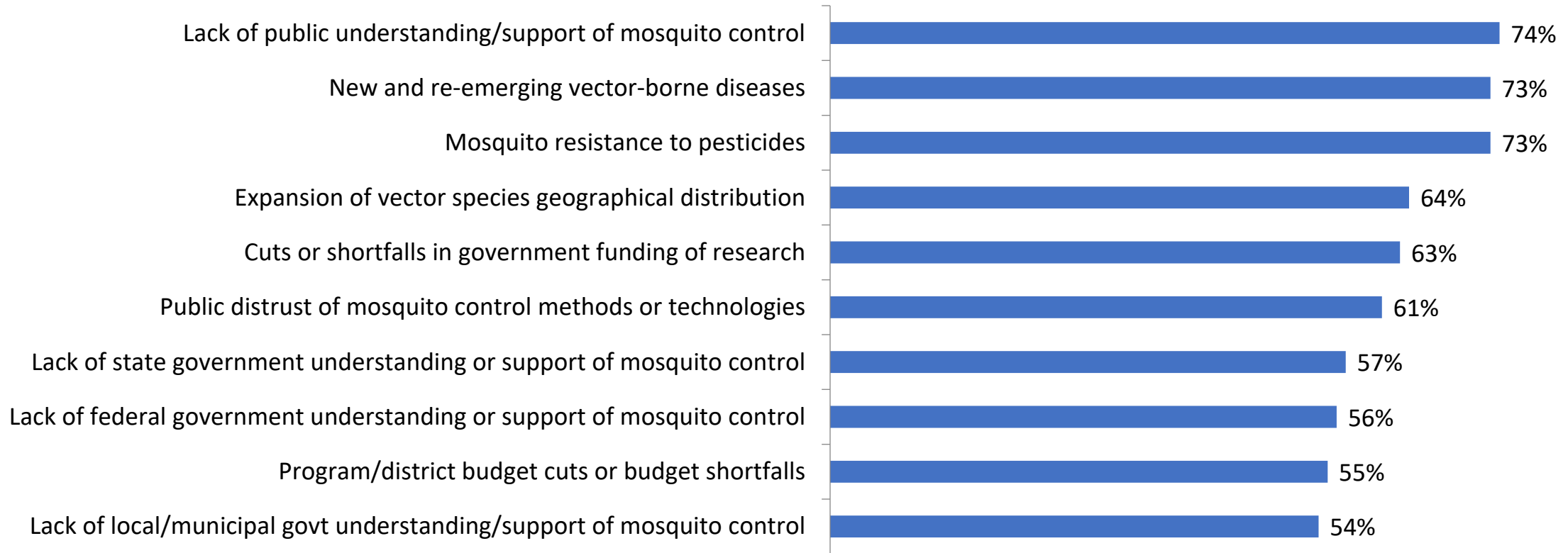
Open-ended responses  
(Other, Other natural  
science, and Other social  
science) are provided  
separately



Q9. In what field(s) do you have your degree(s)? Select all that apply.

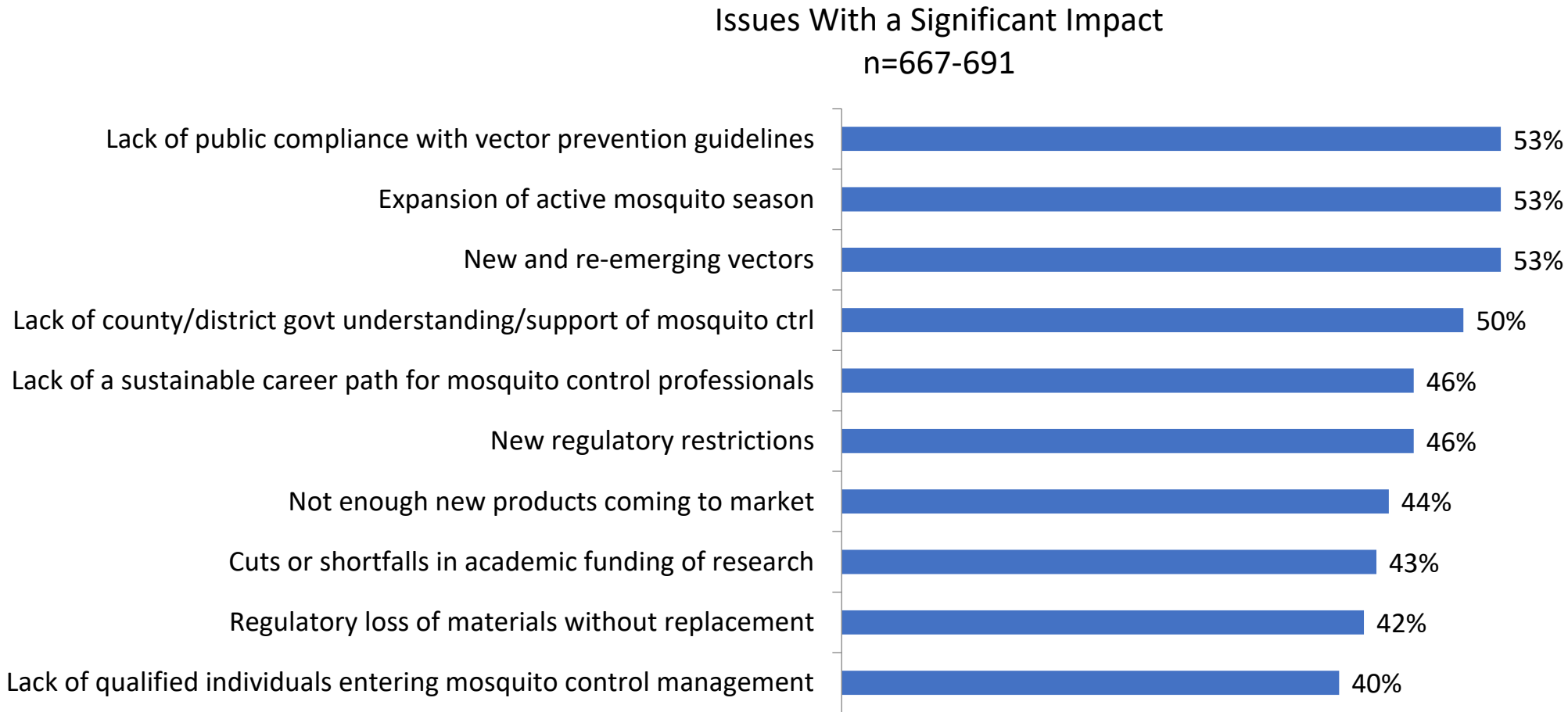
# Environmental Scan Detail (Slide 1 of 4)

Issues With a Significant Impact  
n=667-691



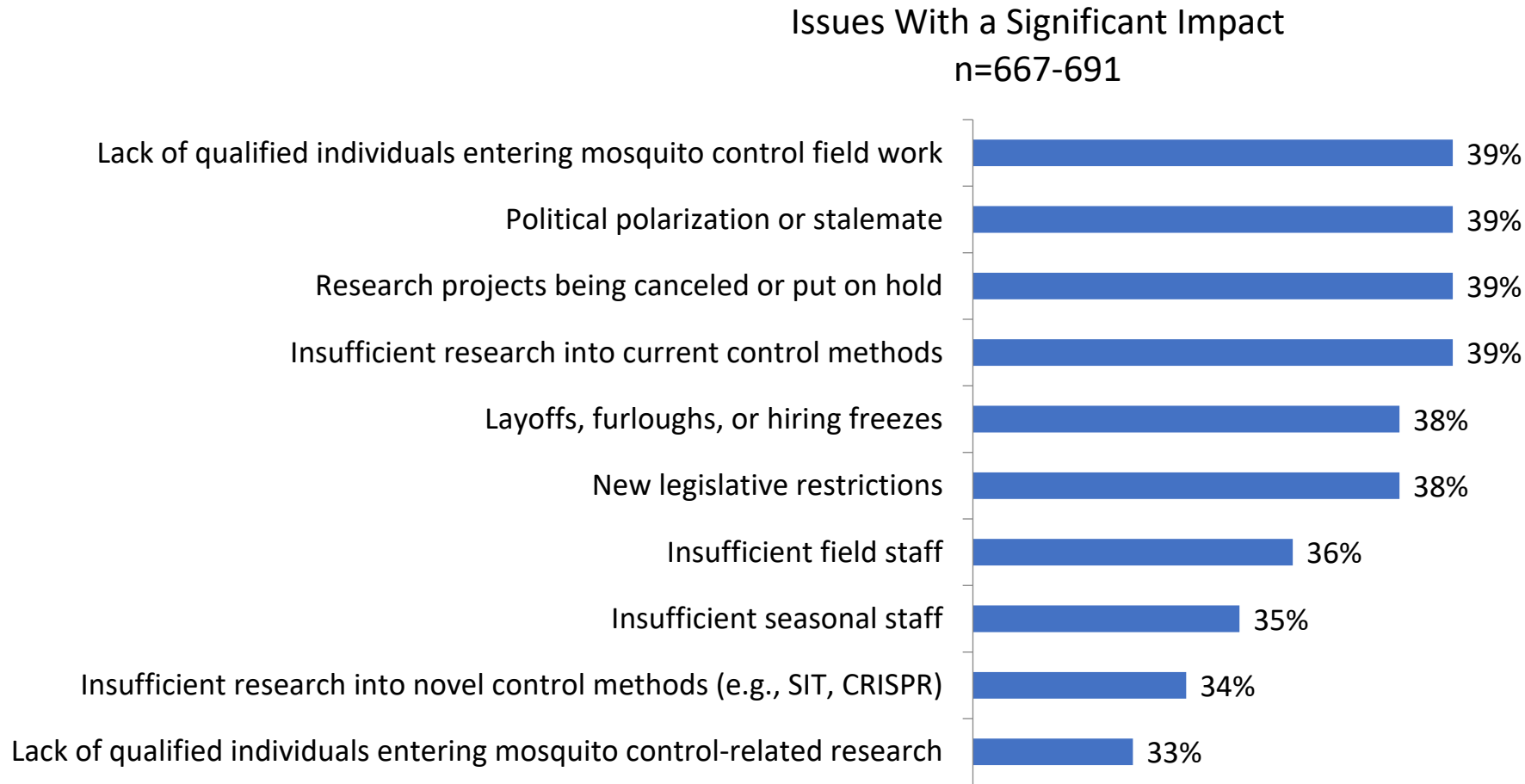
Q18-Q22. Which of these factors will have a significant impact on the mosquito control industry and profession over the next three years? Select all that apply.

## Environmental Scan Detail (Slide 2 of 4)



Q18-Q22. Which of these factors will have a significant impact on the mosquito control industry and profession over the next three years? Select all that apply.

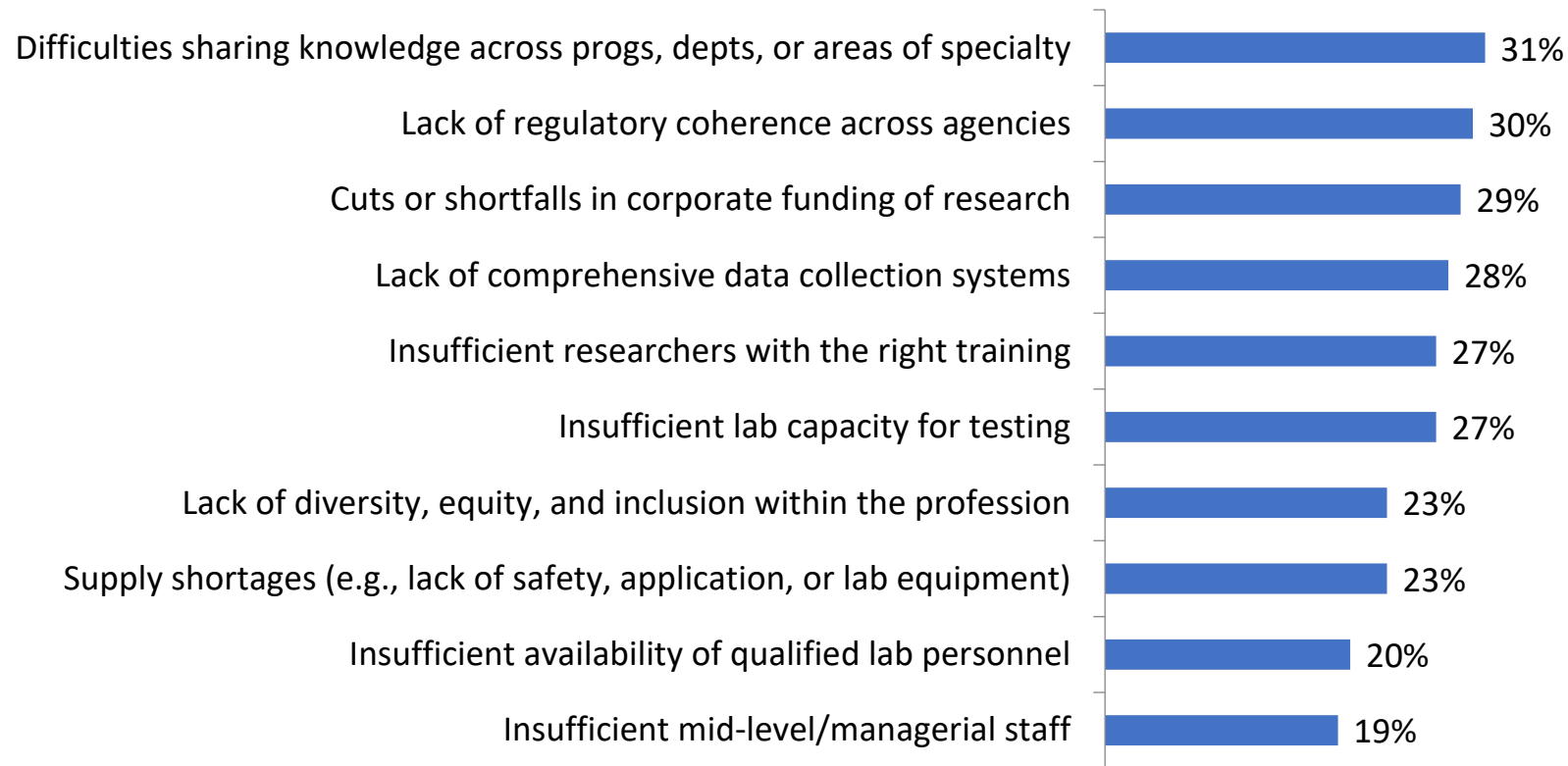
## Environmental Scan Detail (Slide 3 of 4)



Q18-Q22. Which of these factors will have a significant impact on the mosquito control industry and profession over the next three years? Select all that apply.

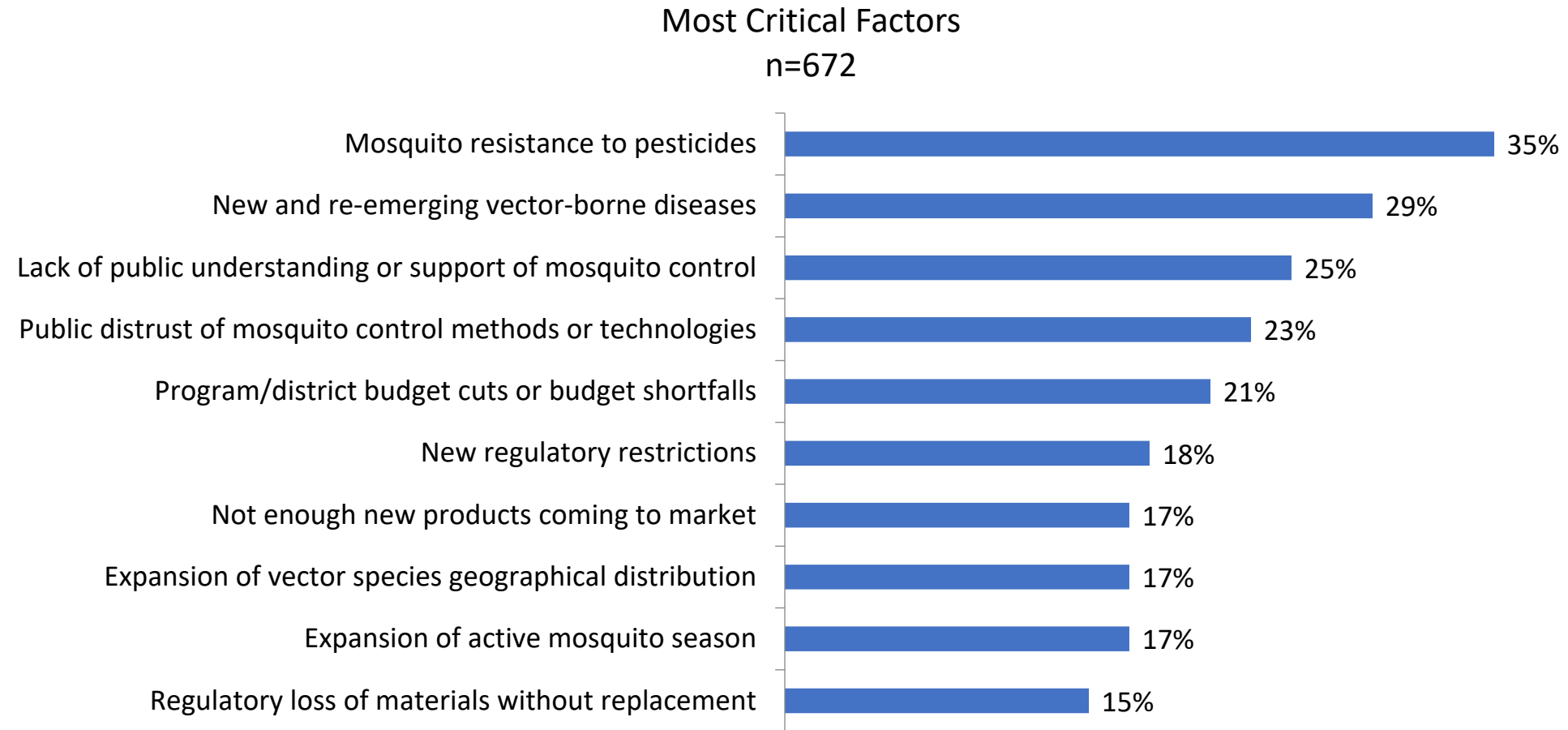
# Environmental Scan Detail (Slide 4 of 4)

Issues With a Significant Impact  
n=667-691



Q18-Q22. Which of these factors will have a significant impact on the mosquito control industry and profession over the next three years? Select all that apply.

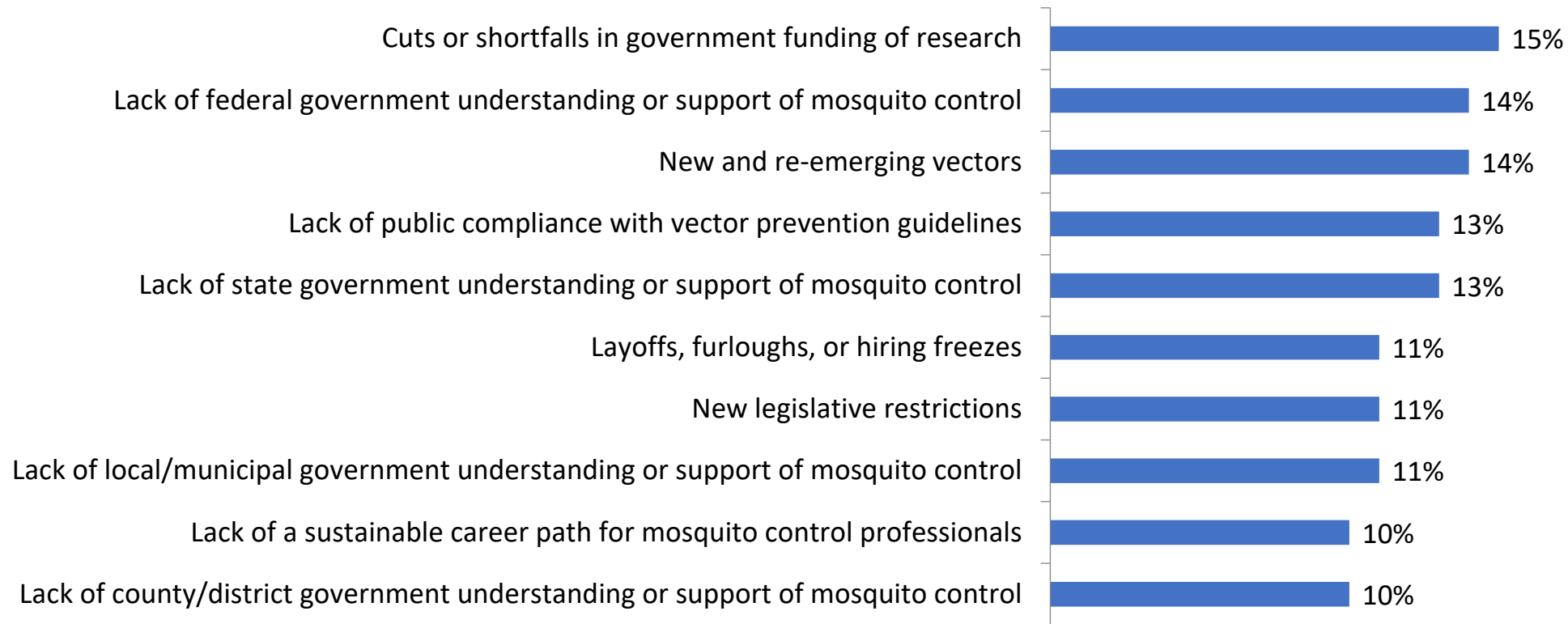
# Most Critical Factors Detail (Slide 1 of 4)



Q23. Of the factors you think will have an impact on the mosquito control industry and profession over the next three years, which ones are the most critical? Select up to five.

## Most Critical Factors Detail (Slide 2 of 4)

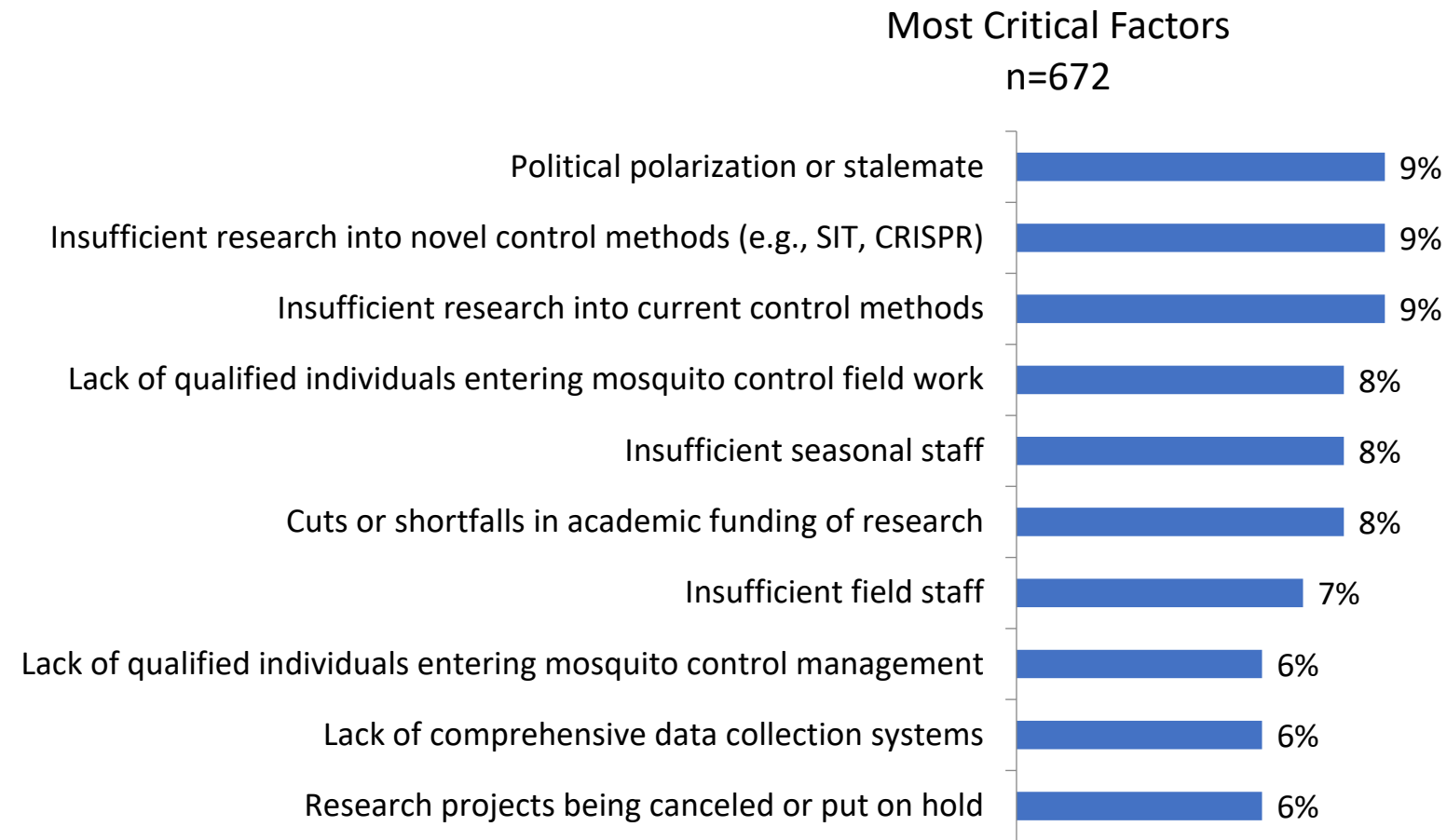
Most Critical Factors  
n=672



Q23. Of the factors you think will have an impact on the mosquito control industry and profession over the next three years, which ones are the most critical? Select up to five.

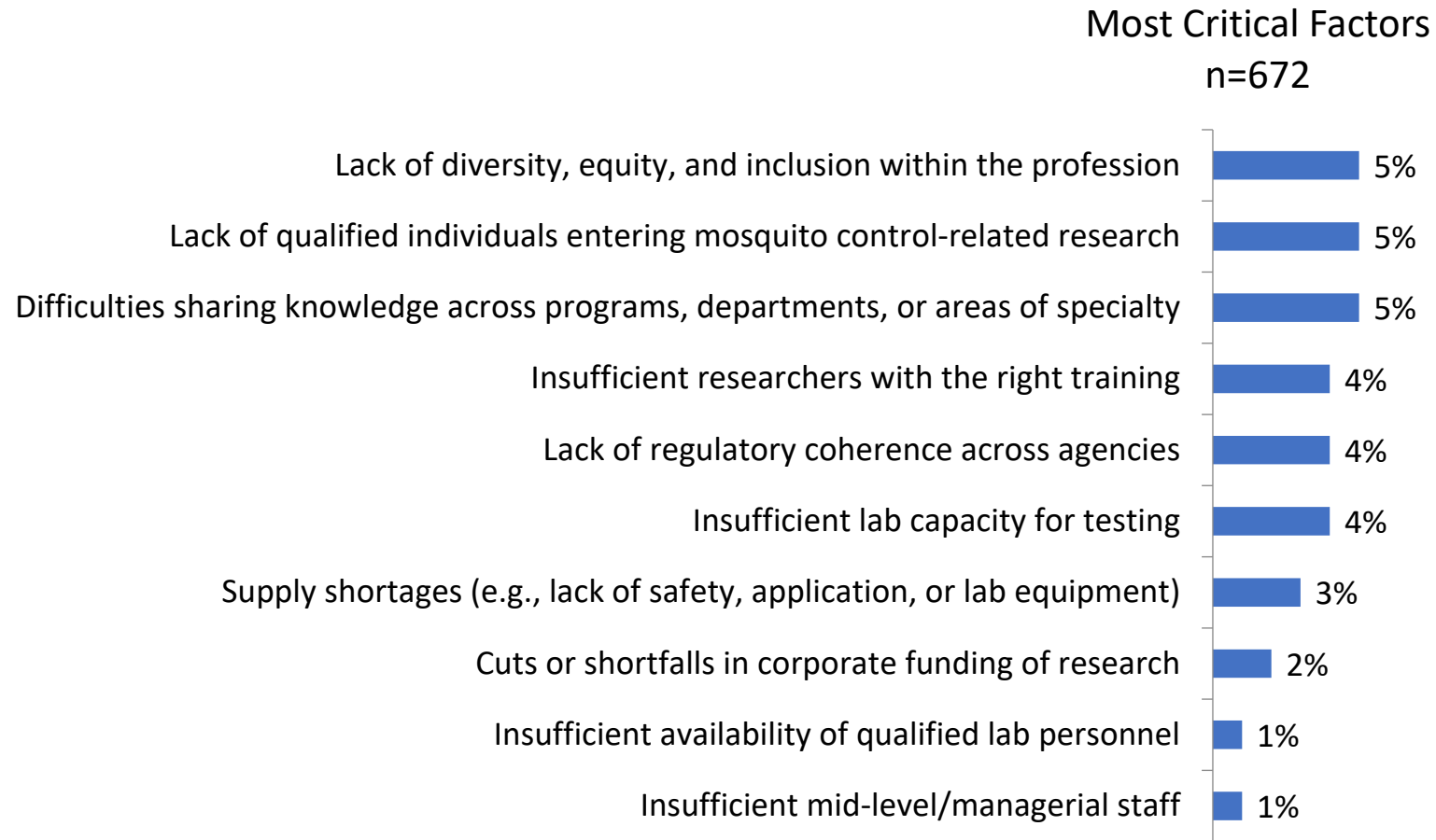


## Most Critical Factors Detail (Slide 3 of 4)



Q23. Of the factors you think will have an impact on the mosquito control industry and profession over the next three years, which ones are the most critical? Select up to five.

## Most Critical Factors Detail (Slide 4 of 4)



Q23. Of the factors you think will have an impact on the mosquito control industry and profession over the next three years, which ones are the most critical? Select up to five.

## Goals Detail (Slide 1 of 2)



Q25. Which of the following goals are a priority for you at work? Select all that apply.

## Goals Detail (Slide 2 of 2)



Q25. Which of the following goals are a priority for you at work? Select all that apply.

## Most Critical Goals Detail (Slide 1 of 2)



Q28. Of the goals you selected, which ones are the top three?

## Most Critical Goals Detail (Slide 2 of 2)

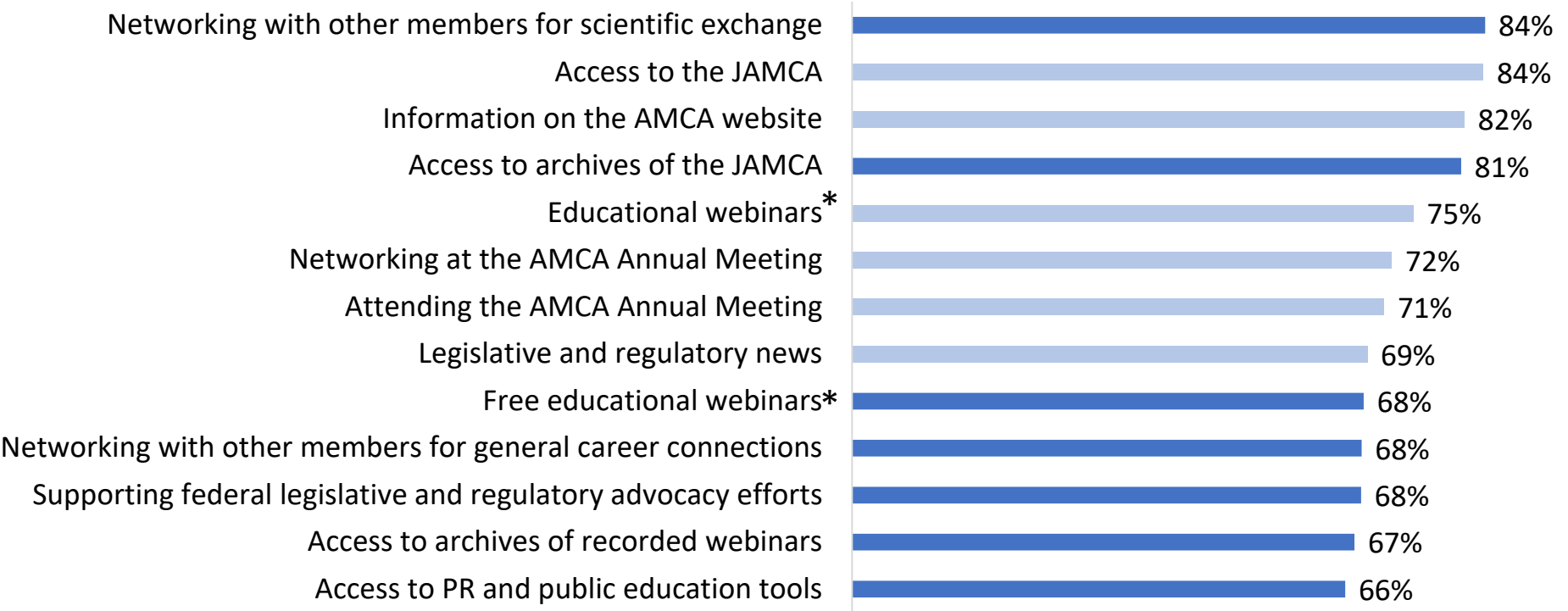


Q28. Of the goals you selected, which ones are the top three?

# Engagement Drivers – Members Only Detail (Slide 1 of 2)

Association Engagement Drivers, Members Only  
% rating as Absolutely Critical or Very Important  
n=448-465

Light blue denotes  
an open-access  
benefit



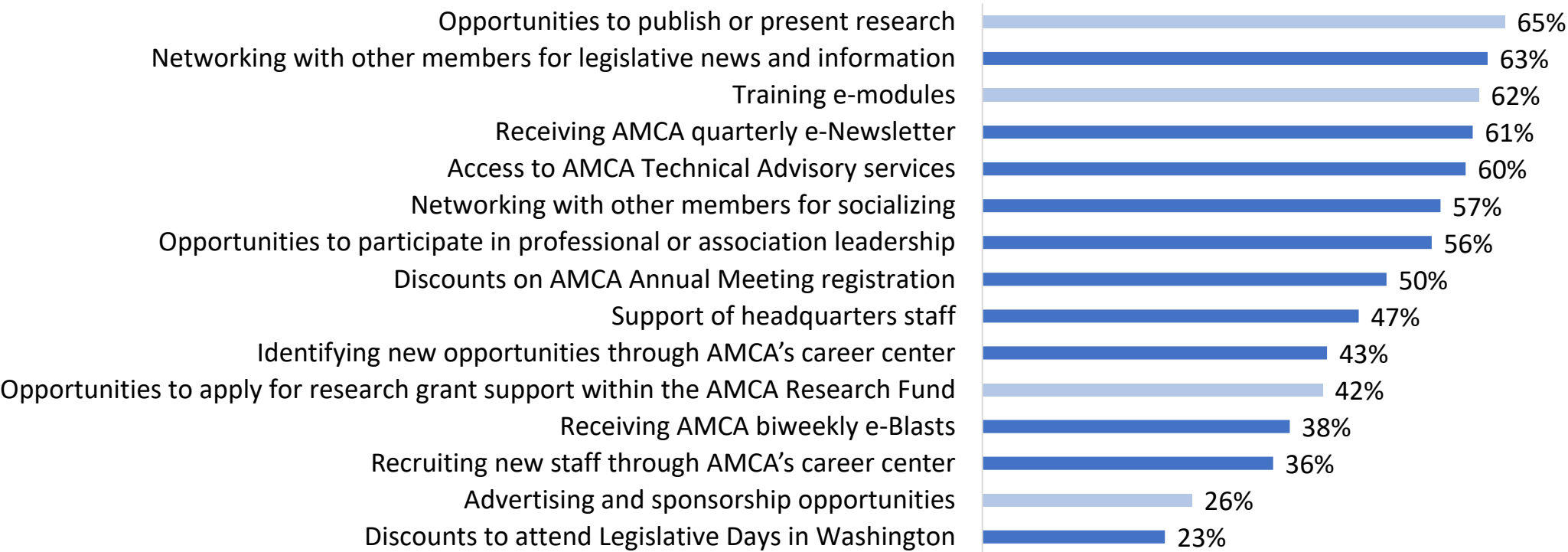
\* Webinars were asked about in 2 separate questions: member-only benefits (answered by members only) and open-access benefits (answered by members and nonmembers). “Free educational webinars” was included in the member-only list; “Educational webinars” was included in the open-access benefit list

Q31. How important are these benefits to your decision to join or engage with AMCA?

# Engagement Drivers – Members Only Detail (Slide 2 of 2)

Association Engagement Drivers, Members Only  
% rating as Absolutely Critical or Very Important  
n=448-465

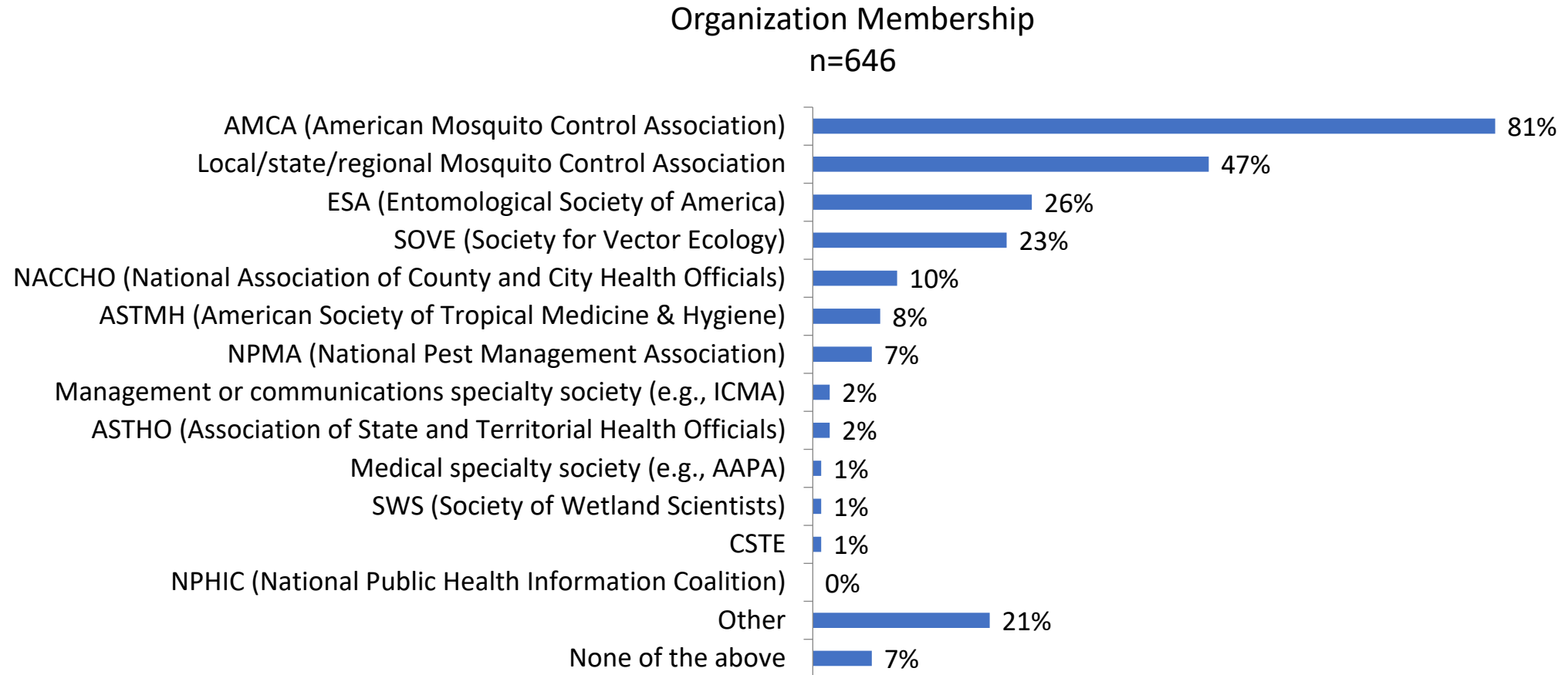
Light blue denotes  
an open-access  
benefit



Q31. How important are these benefits to your decision to join or engage with AMCA?



# Organization Membership Detail



Q38. In which of the following organizations are you a member? Select all that apply.

# Appendix 2

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## Statistical Notes

# Tests of Significance for Means

## **F-test**

When the mean is displayed for a row variable, MarketSight first runs an Analysis of Variance (ANOVA) using an F-test. Doing so tests the hypothesis that the means of multiple normally distributed populations, all having the same variance, are equal.

MarketSight tests whether or not the row variable's means are equal to one another for all columns in the crosstab. Rejecting the test hypothesis implies that at least one of the column means is significantly different from the others.

## **Fisher's Least Significant Difference (LSD) test**

If the statistics option to "Correct for Type I errors in all comparisons" is disabled, MarketSight will run Fisher's LSD test for both Pairwise tests and Contrast tests of means. MarketSight only runs Fisher's LSD test if the ANOVA F-test first rejects the null hypothesis that all column means are equal to one another.

Fisher's LSD test is a relatively powerful test because it uses the pooled variance estimate from the F-test, thus taking advantage of the increased sample size of all columns in the crosstab. Pooling the variance is valid because MarketSight explicitly tests for equality of variance among all columns prior to running the associated F-test.

Although the test is more powerful than either the Tukey HSD or Scheffé tests, it is more susceptible to Type I error when running multiple simultaneous tests.

# Tests of Significance for Means (cont'd)

## **Scheffé test**

If the statistics option to "Correct for Type I errors in all comparisons" is enabled, MarketSight will run the Scheffé test for Contrast tests of means. MarketSight only runs the Scheffé test if the ANOVA F-test first rejects the null hypothesis that all column means are equal to one another.

The Scheffé test is a conservative test for running multiple Contrast tests of Means which controls the overall Type I error rate for all possible contrasts based on the selected Confidence Level.

## **Tukey-Kramer tests**

MarketSight will run Tukey-Kramer test for Pairwise tests of means. MarketSight only runs Tukey-Kramer test if the ANOVA F-test first rejects the null hypothesis that all column means are equal to one another.

Tukey-Kramer test is a conservative test for running multiple Pairwise comparisons of Means. It controls the overall Type I error rate across a number of related Pairwise tests based on the selected Confidence Level.

# Tests of Significance for Proportions

## Chi-squared

When a Row Variable displays the Column % or Count option for individual Values, MarketSight runs a Chi-squared test. This test examines whether there is a relationship between the Column Variable(s) and the Row Variable.

Chi-squared tests involve a comparison of "actual" cell counts to "expected" cell counts in a crosstab.

The expected count for each cell is derived from a Row Variable's actual counts as follows: multiply the cell's row total by its column total, then divide by the sum total of all observations.

If the actual cell counts for one or more cells differ materially from their expected counts, the Chi-squared test may produce a statistically significant result which implies there is a relationship between the Column Variable(s) and the Row Variable.

A modified version of a Chi-Squared test is run for Multiple Response Variables.

# Tests of Significance for Proportions (cont'd)

## **Fisher's Exact**

For 2x2 crosstabs with small sample sizes, the Chi-squared test may be unreliable. Therefore, MarketSight runs an alternate test, Fisher's Exact Test, if more than 20% of the cells in a 2x2 crosstab have an expected cell count less than 5, or if any cells in a 2x2 cross-tab have an expected cell count less than 1.

Fisher's Exact Test calculates the true probability of observing a particular set of actual cell counts in a 2 x 2 crosstab, assuming that row and column totals are held constant.

Fisher's Exact Test is not run for Multiple Response Variables.

## **z-test**

MarketSight runs Z-tests for both Contrast and Pairwise tests of Column Proportions. A Z-test is used to test for a difference between two column proportions. The column proportions involved in the test are the cell counts divided by their respective column totals.

A Z-test is only run when the cells being compared have actual counts greater or equal to 5 and the column sample size minus the actual cell counts is greater than or equal to 5. If these data sufficiency conditions are not met, MarketSight runs Fisher's Exact Test instead.

A modified version of a Z-test is run for Multiple Response Variables.