

# **CENTER FOR PUBLIC ISSUES EDUCATION**

**IN AGRICULTURE AND NATURAL RESOURCES**

## **Final/ Executive Report**

**Prevent & Protect: Mosquito Messages  
for Your Community**

Prepared for the Florida Department of Health

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## Executive Summary

Prevent and Protect: Mosquito Messages for Your Community

Department of Health

July, 2019

### Introduction

The University of Florida/Institute of Food and Agricultural Sciences (UF/IFAS) Center for Public Issues and Education in Agriculture and Natural Resources (PIE Center) was asked to create materials designed to educate local elected and appointed officials and targeted audiences about mosquito control in a simplified, understandable format that would increase public understanding of scientific information on the topic without potentially causing members of the public to dismiss scientific information.

This project was employed March through June 2019 as a continuation of the original *Prevent & Protect* campaign, which ran from March to July 2018. Specifically, the goal of the 2019 research conducted as part of the project was done to better evaluate the *Prevent & Protect* materials, and gain further insight into how these materials may be utilized in various contexts with various audiences to promote communication and education regarding mosquito control topics. Several components were included as part of this project:

- Survey research conducted with the Florida public
- Survey research conducted with Florida Department of Health (DOH) and Florida mosquito control district (MCD) professionals
- Focus groups conducted with the Florida public
- A unit of instruction developed for/implemented in Florida middle and high school agricultural education courses
- Electronic field trips focused on mosquitoes, mosquito-borne illnesses, and personal responsibility
- Content analysis of web and social media content of Florida mosquito control programs
- Development of new educational and informative resources and materials on mosquitoes, mosquito-borne illnesses, and personal responsibility

### Key Findings

#### Public Survey

- When asked why controlling the mosquito population in Florida is important, the public agreed most that controlling the mosquito population is important because it protects Florida residents from mosquito-borne diseases ( $M = 5.52$ ;  $SD = .85$ ).
- When asked when controlling the mosquito population is important, the public agreed most that it is important during an outbreak of a mosquito-borne illness ( $M = 5.68$ ;  $SD = .69$ ).
- Florida residents perceived controlling the mosquito population in Florida is primarily the responsibility of mosquito control programs ( $M = 5.24$ ;  $SD = .92$ ) and Florida DOH ( $M = 5.14$ ;  $SD = 1.03$ ).
- Regarding Florida residents' information seeking behaviors, the largest number of respondents reported they had sought such information rarely (1-2 times;  $f = 193$ ; 38.7%) or never ( $f = 165$ ; 33.1%) over the past year.
- If they were to seek such information, the overall trends in the data indicate they would be more likely to use websites over social media, regardless of the source.



- Of the information sources listed, respondents identified local mosquito control programs' websites ( $M = 3.87$ ;  $SD = 1.09$ ), Centers for Disease Control and Prevention's (CDC's) websites ( $M = 3.82$ ;  $SD = 1.13$ ), and DOH's websites ( $M = 3.78$ ;  $SD = 1.16$ ) as the sources they would most likely use to do so.
- Respondents perceived most of the sources listed as trustworthy, with CDC's websites ( $M = 4.27$ ;  $SD = .77$ ) and DOH's websites ( $M = 4.22$ ;  $SD = .77$ ) as the most trustworthy.
- Respondents demonstrated higher degrees of actual knowledge of mosquito control topics after being exposed to the P&P materials ( $M = 17.71$ ;  $SD = 3.68$ ) than before ( $M = 15.85$ ;  $SD = 3.00$ ).
- Respondents also perceived themselves to be more knowledgeable about mosquito control topics after being exposed to the P&P materials ( $M = 5.31$ ;  $SD = .75$ ) than they did prior to exposure to the materials ( $M = 4.19$ ;  $SD = .99$ ).
- Respondents reported having used most at-home methods of mosquito protection and control, of which the largest number of respondents were keeping doors and windows shut (88.5%) and regularly putting away water holding items that are outside and not being used (83.1%).
- Statistically significant differences were observed in respondents' beliefs and intentions regarding their use of at-home methods of mosquito control before and after viewing the P&P materials, which supports the use of P&P materials to increase the likelihood of future behavior change.
- When asked to evaluate the P&P materials, respondents reported very positive perceptions of the materials ( $M = 6.47$ ;  $SD = 1.00$ ).

#### DOH and MCD Survey

- The sources of information used most frequently by DOH professionals to gather information about mosquitoes/mosquito control topics were Florida DOH reports/publications ( $M = 4.14$ ;  $SD = 1.08$ ) and Florida DOH online mosquito control communication resources ( $M = 3.92$ ;  $SD = 1.20$ ).
- The sources used most frequently by MCD professionals were Florida Department of Agriculture and Consumer Services (FDACS) reports/publications ( $M = 3.36$ ;  $SD = .95$ ) and Florida DOH reports/publications ( $M = 3.35$ ;  $SD = 1.11$ ).
- DOH professionals who communicated with the public as part of their job (72.2%) reported they more often did so via local DOH websites ( $M = 4.21$ ;  $SD = 1.04$ ) and Florida DOH websites ( $M = 4.17$ ;  $SD = 1.42$ ) than other channels listed.
- MCD professionals who identified communicating with the public as part of their job description ( $f = 23$ ; 100%) reported using print materials ( $M = 4.00$ ;  $SD = .85$ ) and community events ( $M = 3.52$ ;  $SD = 1.24$ ) more frequently than other sources listed.
- MCD professionals who communicated with their technicians as part of their job description (87%) identified face-to-face scheduled meetings ( $M = 4.42$ ;  $SD = .84$ ), in-person workshops ( $M = 3.85$ ;  $SD = 1.00$ ), and phone calls ( $M = 3.85$ ;  $SD = 1.27$ ) as the channels used most frequently to do so.
- The majority of DOH professionals (66.7%) and MCD professionals (52.2%) had not yet used any of the P&P materials at the time this survey was conducted.
  - Only 31.8% of DOH professionals and 47.8% of MCD professionals were identified as early adopters who had used at least one of the P&P materials.
  - 50% of DOH respondents indicated being unaware that the P&P materials existed.
- Of the DOH and MCD professionals who had used at least one of the P&P materials, most had used print materials and the webpage.
- DOH professionals perceived the P&P materials as easy to use (i.e. complexity) and relatively advantageous compared to the resources they were currently using. However, DOH respondents did not perceive the P&P materials to be very compatible with their current job practices/activities.



- MCD respondents perceived the P&P materials as easy to use, compatible with their current job practices/activities, and relatively more advantageous than the materials they were previously using.
- The P&P website received high marks from both DOH and MCD professionals in terms of graphic design, structural design, content design, and branding.

### Public Focus Groups

- Focus group participants expressed they knew little to a moderate amount of information about mosquitoes. Participants' overall knowledge of mosquito control methods was also low.
  - However, follow-up questions revealed that several of the focus group participants knew more information than they had originally expressed. Knowledge of participants included factual information regarding mosquitoes, diseases transmitted by mosquitoes, and tips for avoiding mosquitoes.
  - Participants also expressed statements of misinformation regarding mosquitoes and mosquito control.
- Regarding their perceptions of the importance of mosquito control, the majority of group participants indicated their support of mosquito control in their communities to protect themselves and their pets.
- The majority of the focus group participants believed that a combination of personal mosquito control efforts and efforts by mosquito control programs provided by the government would be the most effective way of controlling the mosquito population in Florida.
  - At-home methods of mosquito control employed by participants included using repellents (e.g. sprays, citronella candles, Skin-So-Soft, tiki torches, nets, commercial fans, fog machines), emptying and/or treating standing water in yards, keeping doors and windows closed, and wearing long-sleeved clothing.
- Regarding methods of mosquito control used by mosquito control programs, participants in all eight groups expressed a concern over the chemicals used and the short- and long-term impacts those chemicals may have on humans, animals, environment, and other insects
  - The groups differed on perceptions of effectiveness with truck versus aerial spraying and stated that they would like to know more information about both efforts.
- Focus group participants were aware that mosquitoes carried diseases and were able to name some of the diseases that they carried including West Nile, Yellow Fever, Malaria, Chikungunya, Encephalitis, Dengue, and heartworms.
  - When further discussing diseases that mosquitoes carry, several participants in each of the groups indicated that their interest and concern with mosquitoes and mosquito control would intensify if there was a disease outbreak in their community or if they knew someone that had contracted a disease from a mosquito.
- When asked where focus group participants would look for information on mosquitoes and mosquito control, all groups answered with Google, local news, and word of mouth. Majority of focus group participants had not actively sought out information regarding mosquitoes or mosquito control.
  - Groups suggested information be disseminated on social media, including Facebook, Twitter, NextDoor App, weather apps, and via phone, e-mail, regular mail, through children's school, stickers, local news, alerts, and text messages. Trusted sources of information included government, medical professionals, and scientists.
- Overall, most of the groups had a positive opinion of the mosquito control materials created by the PIE Center.



- They liked the infographics, information, and layout of information on both the larger card and the rack cards.
- They also indicated the materials were informative and useful.
- Suggestions for improvement included adding sources of information, a website to go to for more information, adding a QR code, adding Department of Health logo, and adding contact information.
  - Several of the groups also indicated that the cards needed to be designed to indicate danger in order to grab attention such as adding the colors red, black, and yellow.

### Unit of Instruction

- Students' demonstrated a higher degree of knowledge on the post-test ( $M = .64$ ;  $SD = .21$ ) than the pretest ( $M = .43$ ;  $SD = .18$ )
- Students demonstrated slight, but statistically significant differences in their attitudes toward source reduction before ( $M = 3.72$ ;  $SD = 1.23$ ) and after ( $M = 3.90$ ;  $SD = .90$ ) the unit of instruction.
- There were no statistically significant differences observed between students' attitudes toward mosquito-borne illnesses before ( $M = 4.02$ ;  $SD = 1.17$ ) and after ( $M = 4.09$ ;  $SD = .90$ ) the unit of instruction.
- Statistically significant differences were observed between students' attitudes toward mosquito control practices used by mosquito control programs before ( $M = 3.85$ ;  $SD = 1.24$ ) and after ( $M = 4.18$ ;  $SD = 1.33$ ) the unit of instruction.

### Electronic Field Trips

- Overall, the participating students appreciated viewing research labs, interacting with scientists in real-time, and viewing visual examples and models of concepts taught.
- Students expressed an interest in science and asked the entomologists detailed questions about mosquitoes and their research.
- Participating teachers believed their students had positive attitudes toward the program and enjoyed the live dialogue with entomologists.
- Preliminary analysis of student post-surveys indicated most students found the topic interesting and agreed the scientists did a good job communicating with them.
- The top three concepts students reported having learned from the program included mentions of the mosquito life cycle, that some mosquitoes are deadly, and prevention methods such as, "you can wear long sleeve shirts to prevent mosquitoes biting you."

### Content Analysis

- 53 mosquito control programs had a website or page, with only 15 programs having a website.
- 18 mosquito control programs had no website or page.
- 94% of the websites or pages had contact information for the mosquito control programs available to visitors.
- Only 36% of the websites or pages provided up-to-date spray schedules.
- 89% of the websites or pages provided informational or educational resources.
- 79% of the website or pages included photos.
- Only 18% of the mosquito control programs had Facebook pages.
- All Facebook pages provided contact information and a link to their program's website or page.



## Key Conclusions and Recommendations

- Florida residents in both the public survey and focus groups perceived mosquito control in their communities as important to protect themselves and their pets. Further, they perceived that controlling the mosquito population in Florida was important during an outbreak of a mosquito-borne illness, during peak mosquito breeding seasons, and after natural disasters (e.g. floods and hurricanes). These findings are encouraging for mosquito control programs in that they suggest public support of their efforts.
  - However, Florida residents were slightly less convinced that mosquito control efforts were important year-round. This finding warrants further investigation as respondents' perceptions of year-round mosquito control may differ based on their location of residence (e.g. those in areas that need year-round control and those that do not).
  - As mosquito control methods are employed year-round in some areas in Florida, efforts should be made in these areas to help convince residents of the importance of year-round control. Moreover, efforts to promote public education and awareness of mosquito control methods should be made year-round to all residents to increase the likelihood they will understand and be accepting of such methods during the times they are employed in their communities.
- Findings pertaining to Florida residents' attitudes toward mosquito control application methods (i.e. aerial and truck-mounted spraying) were somewhat mixed. Respondents in the public survey demonstrated fairly favorable attitudes toward both aerial and truck-mounted spraying. However, focus group participants in all eight focus groups expressed concern over the chemicals used and the short- and long-term impacts those chemicals may have on humans, animals, environment, and other insects. The groups differed on perceptions of effectiveness with truck versus aerial spraying and stated that they would like to know more information about both efforts. Therefore, efforts to inform the public of mosquito control application methods should be continued. Due to the positive change in public attitudes after viewing the P&P materials, it is recommended that these materials be used as part of those efforts.
- Florida residents in both the public survey and focus groups reporting using at-home methods of mosquito control, including keeping doors and windows shut and regularly putting away water holding items that are outside and not being used. Other methods mentioned by focus group participants included using repellents (e.g. sprays, citronella candles, Skin-So-Soft, tiki torches, mosquito nets, fog machines), emptying and/or treating standing water in yards, and wearing long-sleeved clothing.
  - These findings suggest that the majority of Florida residents are using methods to help protect themselves from mosquitoes. Future assessments should be conducted with residents who did not use such methods to better understand why.
- After viewing the P&P materials, Florida residents who participated in the public survey demonstrated statistically significant increases in their actual and self-perceived knowledge of mosquito control topics, more favorable attitudes toward aerial and truck-mounted applications as a method of mosquito control, more favorable beliefs about their use of at-home methods of mosquito control, and greater intentions to employ such methods. Therefore, it is recommended that the P&P resources be adopted by mosquito control communication and education specialists to help disseminate information to the public.
  - It should also be noted that, though significant, the observed differences were slight. As such, it is not recommended that the P&P materials be used alone. Rather, the materials should be used to supplement larger, collective efforts to facilitate education and desired behaviors among the Florida public.
- Such larger, collective efforts to facilitate public education about mosquito control topics should include educational programs and opportunities for youth.



- The P&P instructional unit developed for high school and middle school agriculture students yielded positive results in terms of gains in knowledge and development of more favorable attitudes about mosquito control. This instructional unit should be made available to and promoted among Florida high school and middle school teachers of agriculture and other sciences.
- Electronic field trips, like those conducted in this project, should also be used by entomologists and social scientists in the field to help connect students with scientists and facilitate the spread of accurate mosquito control information.
- Efforts should be made by Florida mosquito control district programs to update and/or create a website or web page for their program. Florida residents who participated in the public survey indicated being slightly more likely to utilize websites over social media if they were to seek information about mosquito control topics. They also perceived websites as slightly more trustworthy than social media sources. Mosquito control programs should also include regularly updated spray schedules on their websites. Participants in the public focus groups expressed the desire to have this information be made available. Only 36% of the mosquito control program websites or pages examined in the content analysis provided up-to-date spray schedules.
- Mosquito control programs should also make efforts to increase and enhance their social media presence. Though Florida residents in the public survey indicated a greater likeliness of using websites over social media to seek information about mosquito control topics, the majority had either never or rarely sought such information in the past year. Utilizing social media platforms as a means of disseminating key information to the public may provide a better avenue for reaching residents who do not actively seeking such information. In addition, focus group participants indicated that social media and local news were their main sources of information. Working with local media to broadly publicize methods of mosquito control may be helpful in making community members aware of mosquito control programs' efforts.
- The P&P materials and resources have not yet been widely adopted among DOH and MCD professionals, largely due to lack of awareness of the materials. Considering the positive results associated with the P&P resources, efforts should be made to facilitate the adoption of these resources among mosquito control and public health agency professionals charged with communicating information to the public.



## Background

*Prevent & Protect* was funded by a grant through the Florida Department of Health. In March 2018, the University of Florida/Institute of Food and Agricultural Sciences (UF/IFAS) Center for Public Issues and Education in Agriculture and Natural Resources (PIE Center) was asked to create materials designed to educate local elected and appointed officials and targeted audiences about mosquito control in a simplified, understandable format that would increase public understanding of scientific information on the topic without potentially causing members of the public to dismiss scientific information. To ensure the accuracy of *Prevent & Protect* materials, the PIE Center conferred with multiple scientists, including the director of the Centers for Disease Control and Prevention (CDC) Southeastern Center of Excellence in Vector Borne Diseases, the chief of the Bureau of Scientific Evaluation and Technical Assistance for the Florida Department of Agriculture and Consumer Services, and the assistant division director for the Florida Department of Agriculture and Consumer Services' Division of Agricultural Environmental Sciences. The entire project had a very tight time frame from start to end date, officially beginning in mid-March and ending on June 30, 2018.

The original *Prevent & Protect* project consisted of several components, including two toolkits (Mosquito Control and Emergency Response), infographics, information sheets, social media posts for Twitter and Facebook, and a webpage on the PIE Center's website ([www.piecenter.com/mosquito](http://www.piecenter.com/mosquito)). The PIE Center used several outlets to promote the *Prevent & Protect* toolkits. Efforts were made to target key influencers throughout the state, including mosquito control professionals, public officials, healthcare providers, agricultural professionals, UF/IFAS Extension faculty, and emergency managers. Advertisements were placed in several magazines, including *Florida Trend*, *Central Florida Ag News*, and *Central Florida Health News*. Targeted emails were sent to multiple groups, including mosquito control program directors, UF/IFAS Extension faculty, and Florida Emergency Preparedness Association (FEPA) members. Copies of the 24-page booklet, with inserted rack cards, were mailed to 238 recipients, which included mosquito control programs, UF/IFAS county Extension offices, county health department offices, and county commissioner offices. Two webinars were held to inform attendees about the importance of mosquito control and how to access the *Prevent & Protect* toolkits at the web page.

This project was employed March through June 2019 as a continuation of the original *Prevent & Protect* campaign. Specifically, the goal of the research conducted as part of the project was done to better evaluate the *Prevent & Protect* materials, and gain further insight into how these materials may be utilized in various contexts with various audiences to promote communication and education regarding mosquito control topics. Several components were included as part of this project.:

- Survey research conducted with the Florida public
- Survey research conducted with Florida Department of Health (DOH) communication and education specialists
- Survey research conducted with Florida mosquito control district communication and education specialists
- Focus groups conducted with the Florida public
- A unit of instruction developed for/implemented in Florida middle and high school agricultural education courses
- Electronic field trips focused on mosquitoes, mosquito-borne illnesses, and personal responsibility
- Content analysis of web and social media content of Florida mosquito control programs
- Development of new educational and informative resources and materials on mosquitoes, mosquito-borne illnesses, and personal responsibility



This report will provide details of the results of the PIE Center's research in these areas. In addition to the research summarized in this report, the PIE Center also created the following materials as part of this P&P project:

- Compiled a list of mosquito-related researchers in Florida who have science communication training and are available to talk to media or the general public about mosquito-borne illnesses or mosquito control application methods
- Compiled communication resources – video clips, photographs, story sources, and frequently asked questions (FAQs) – on the new P&P website: [preventmosquitoes.org](http://preventmosquitoes.org)
- Revised previously developed P&P materials to incorporate findings from the survey and focus group research
- Conducted a media campaign to promote the newly developed media resources and revised P&P materials

## Survey with the Florida Public

The methodology, results, and recommendations pertaining to the survey conducted with the Florida public are included in the sections below.

### Methods

The population of interest was Florida residents, age 18 or older. An online survey was distributed via a public opinion survey research company, Qualtrics, to Florida residents representative of the state population based on the 2010 Census data. An online link to the instrument was distributed to a total of 1,503 residents. Attention filters (e.g. select “strongly agree” for this answer) were used to identify respondents not paying attention to the questions. Respondents who did not complete all items of the instrument, those who did not select the appropriate answer to attention filters, and those who did not fall within the parameters of being a Florida resident at 18 years of age or older were excluded from analysis. Useable responses were obtained from 789 residents for a 52% response rate. Of the 789 cases, 500 were randomly selected for primary data analysis in this study and the remaining 289 cases were designated for instrument analysis. Potential exclusion, selection, and non-participation biases can limit the use of nonprobability samples (Baker et al., 2013). Therefore, to alleviate such impacts, post-stratification weighting methods were executed post hoc. Such weighting methods have been found to yield results in non-probability opt-in samples comparable in standard to those obtained using probability-based samples (Twyman, 2008). Specifically, demographics were used to balance the results based on the 2010 Florida census data to ensure the sample reflected the adult Florida population and to produce results intended to approximate the population of interest (Baker et al., 2013).

The survey questionnaire included a pre-post-test design with embedded *Prevent & Protect* (P&P) materials as the treatment to measure changes in respondents' intention to perform mosquito control behaviors, as well as factors such as respondents' knowledge, perceptions, and attitudes regarding mosquito control that may be used to predict the likelihood of behavioral change. The questionnaire also included items designed to examine the current mosquito control behaviors conducted by Florida residents, the sources they use to gather information about mosquito control topics, their perceived trustworthiness of those sources, their perceptions of the importance of mosquito control, and their evaluative feedback about the P&P materials. The questionnaire was reviewed for face and content validity by a panel of experts consisting of faculty and specialists from the UF/IFAS Department of Agricultural Education and Communication (AEC); Department of Family, Youth, and Community Sciences; Department of Entomology and Nematology; Florida Department of Agriculture and Consumer Services (FDACS); and the CDC Southeastern Center of Excellence in Vector Borne Diseases. Data analyses included descriptive





statistics and paired samples t-test to compare means. A significance level of  $p < .05$  was set a priori. Cronbach's alpha was reported for internal consistency reliability of scales.

## Results

### Perceived Importance of Mosquito Control

Residents' perceived importance of mosquito control was assessed in terms of why and when controlling the mosquito population is important. To assess why mosquito control is important, respondents were asked to indicate their level of agreement with six items following the stem: "Controlling the mosquito population in Florida is important because..." Responses were collected using a 5-point Likert-type scale: 1 = *disagree strongly*, 2 = *disagree*, 3 = *disagree slightly*, 4 = *agree slightly*, 5 = *agree*, and 6 = *agree strongly*.

Respondents indicated some degree of agreement for all items, with most agreement that controlling the mosquito population in Florida is important because it protects Florida residents from mosquito-borne diseases ( $M = 5.52$ ;  $SD = .85$ ; see Table 1).

*Table 1. Respondents' agreement with statements regarding why mosquito control is important*

<b>"Controlling the mosquito population in Florida is important because . . ."</b>	<b>M</b>	<b>SD</b>	<b>Interpretation</b>
It protects Florida residents from mosquito-borne illnesses	5.52	.85	Agree strongly
It protects Florida pets from mosquito-borne diseases	5.47	.83	Agree
It reduces the nuisance of mosquitoes	5.43	.89	Agree
It protects Florida livestock from mosquito-borne diseases	5.36	.97	Agree
It enhances the economy in Florida	4.50	1.32	Agree slightly
It increases the tourism revenue in Florida	4.45	1.39	Agree slightly

*Note.* Real limits for interpretation of responses: 1.00 to 1.50 = *disagree strongly*; 1.51 to 2.50 = *disagree*; 2.51 to 3.50 = *disagree slightly*; 3.51 to 4.50 = *agree slightly*; 4.51 to 5.50 = *agree*; and 5.51 to 6.00 = *agree strongly*.

Respondents were then asked to indicate their level of agreement with five items pertaining to when controlling the mosquito population in Florida is important (see Table 2). Respondents agreed or agreed strongly with all statements, of which respondents agreed that controlling the mosquito population in Florida is important during an outbreak of a mosquito-borne illness ( $M = 5.68$ ;  $SD = .69$ ).

*Table 2. Florida residents' agreement with statements regarding when mosquito control is important*

<b>"Controlling the mosquito population in Florida is important . . ."</b>	<b>M</b>	<b>SD</b>	<b>Interpretation</b>
During an outbreak of a mosquito-borne illness	5.68	.69	Agree strongly
During peak mosquito breeding seasons	5.63	.80	Agree strongly
After natural disasters, such as floods or hurricanes	5.61	.79	Agree strongly
When mosquitoes are preventing Florida residents from enjoying the outdoors	5.40	.96	Agree
Year-round	5.11	1.11	Agree



### Perceived Responsibility of Mosquito Control

Respondents' perceptions of who is responsible for mosquito control efforts were also examined. Respondents were asked to indicate the degree to which they agreed or disagreed with nine statements following the stem: "controlling the mosquito population in Florida is . . ." Respondents agreed or agreed slightly with all sources listed as those responsible for controlling the mosquito population in Florida, of which they agreed most that this is the responsibility of mosquito control programs ( $M = 5.24$ ;  $SD = .92$ ) and the Florida Department of Health ( $M = 5.14$ ;  $SD = 1.03$ ; see Table 3).

Table 3. Florida residents' agreement with statements regarding who is responsible for mosquito control

<b>"Controlling the mosquito population in Florida is . . ."</b>	<b>M</b>	<b>SD</b>	<b>Interpretation</b>
Mosquito control programs' responsibility	5.24	.92	Agree
The Florida Department of Health's responsibility	5.14	1.03	Agree
The local government's responsibility	5.12	1.02	Agree
The state government's responsibility	5.11	1.04	Agree
The Centers for Disease Control and Prevention's (CDC's) responsibility	5.04	1.08	Agree
Mosquito scientists' responsibility	4.77	1.17	Agree
My responsibility	4.70	1.14	Agree
My neighbors' responsibility	4.63	1.22	Agree
The federal government's responsibility	4.47	1.43	Agree slightly

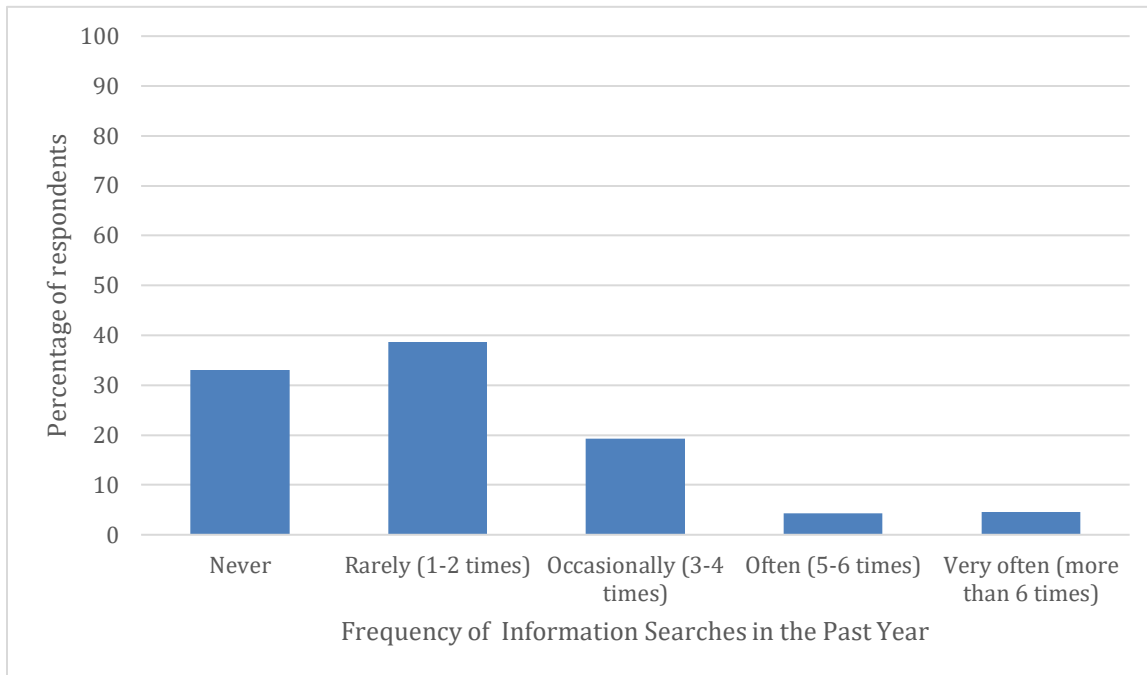
### Information Search Behaviors

Florida residents' information search behaviors were assessed in terms of (a) how frequently they sought information about mosquitoes/mosquito control topics, (b) the sources they would use to seek such information, and (c) their perceived trustworthiness of information sources.

Regarding how frequently they sought information about mosquitoes/mosquito control topics in the past year, the largest number of respondents reported they had sought such information rarely (1-2 times;  $f = 193$ ; 38.7%) or never ( $f = 165$ ; 33.1%; see Figure 1).



Figure 1. Florida residents' frequency of searching for information about mosquito topics



Respondents were then asked to indicate how likely they would be to utilize selected sources if they were to seek information about mosquitoes/mosquito control topics. Response were collected using a 5-point Likert-type scale: 1 = *very unlikely*; 2 = *unlikely*; 3 = *neither likely nor unlikely*; 4 = *likely*; 5 = *very likely*.

When examining overall trends in data, respondents appeared to be more likely to use websites over social media pages or posts, regardless of the source affiliation (see Table 4). Of the informational sources listed in the questionnaire, respondents identified local mosquito control programs' websites ( $M = 3.87$ ;  $SD = 1.09$ ), Centers for Disease Control and Prevention's (CDC's) websites ( $M = 3.82$ ;  $SD = 1.13$ ), and Department of Health's (DOH's) websites ( $M = 3.78$ ;  $SD = 1.16$ ) as those they would be more likely to use.

Table 4. Respondents' likeliness of using select sources for information about mosquito topics

Source	M	SD	Interpretation
Local mosquito control programs' websites	3.87	1.09	Likely
CDC's websites	3.82	1.13	Likely
DOH's websites	3.78	1.16	Likely
Websites about mosquitoes ending in ".org"	3.67	1.16	Likely
County government websites	3.65	1.14	Likely
Websites about mosquitoes ending in ".com"	3.50	1.19	Neither likely nor unlikely
UF/IFAS Extension's websites	3.49	1.18	Neither likely nor unlikely
Local mosquito control programs' social media pages	3.41	1.33	Neither likely nor unlikely
CDC's social media pages	3.39	1.31	Neither likely nor unlikely
Local pest control company websites	3.37	1.18	Neither likely nor unlikely
DOH's social media pages	3.32	1.29	Neither likely nor unlikely
Friends or family members	3.21	1.18	Neither likely nor unlikely
UF/IFAS social media pages	3.14	1.32	Neither likely nor unlikely
Social media posts from friends or family members	2.85	1.29	Neither likely nor unlikely



*Note.* Real limits for interpretation of responses: 1.00 to 1.50 *very unlikely*; 1.51 to 2.50 = *unlikely*; 2.51 to 3.50 = *neither likely nor unlikely*; 3.51 to 4.50 = *likely*; 4.51 to 5.00 = *very likely*

Lastly, respondents were presented with the same list of sources and asked to indicate how trustworthy they perceived each to be as a source of information about mosquitoes/mosquito control topics (1 = *very untrustworthy*, 2 = *untrustworthy*, 3 = *neither trustworthy nor untrustworthy*, 4 = *trustworthy*, 5 = *very trustworthy*). Respondents perceived the CDC's websites ( $M = 4.27$ ;  $SD = .77$ ) and DOH's websites ( $M = 4.22$ ;  $SD = .77$ ) as the most trustworthy of the sources provided (see Table 5).

*Table 5. Respondents' perceived trustworthiness of sources of information about mosquito topics*

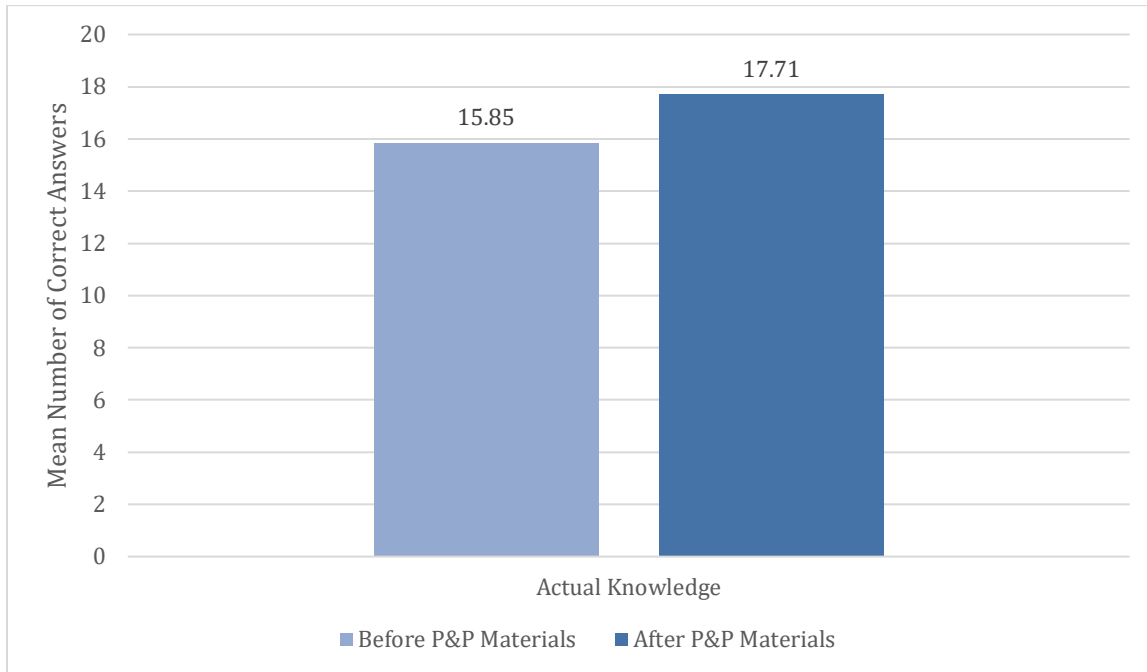
Source	M	SD	Interpretation
CDC's websites	4.27	.77	Trustworthy
DOH's websites	4.22	.77	Trustworthy
UF/IFAS Extension's websites	4.09	.86	Trustworthy
Local mosquito control programs' websites	4.09	.79	Trustworthy
County government websites	4.05	.84	Trustworthy
Websites about mosquitoes ending in ".org"	3.97	.80	Trustworthy
CDC's social media pages	3.90	.96	Trustworthy
DOH's social media pages	3.80	.95	Trustworthy
UF/IFAS social media pages	3.77	1.00	Trustworthy
Local mosquito control programs' social media pages	3.75	.98	Trustworthy
Local pest control company websites	3.60	.93	Trustworthy
Websites about mosquitoes ending in ".com"	3.57	.86	Trustworthy
Friends or family members	3.30	.99	Neither trustworthy nor untrustworthy
Social media posts from friends or family members	3.08	1.11	Neither trustworthy nor untrustworthy

*Note.* Real limits for interpretation of responses: 1.00 to 1.50 = *very untrustworthy*; 1.51 to 2.50 = *untrustworthy*; 2.51 to 3.50 = *neither trustworthy nor untrustworthy*; 3.51 to 4.50 = *trustworthy*; 4.51 to 5.00 = *very trustworthy*

### Knowledge of Mosquito Control Topics

To assess changes in actual knowledge, respondents were asked to answer a series of multiple-choice questions prior to and following their exposure to the P&P materials. Answers were recoded (1 = correct; 0 = incorrect) and a summated score was computed. On average, respondents answered more questions correctly after being exposed to the P&P materials ( $M = 17.71$ ;  $SD = 3.68$ ) than before ( $M = 15.85$ ;  $SD = 3.00$ );  $t(499) = -15.30$ ,  $p = .000$  (see Figure 2).

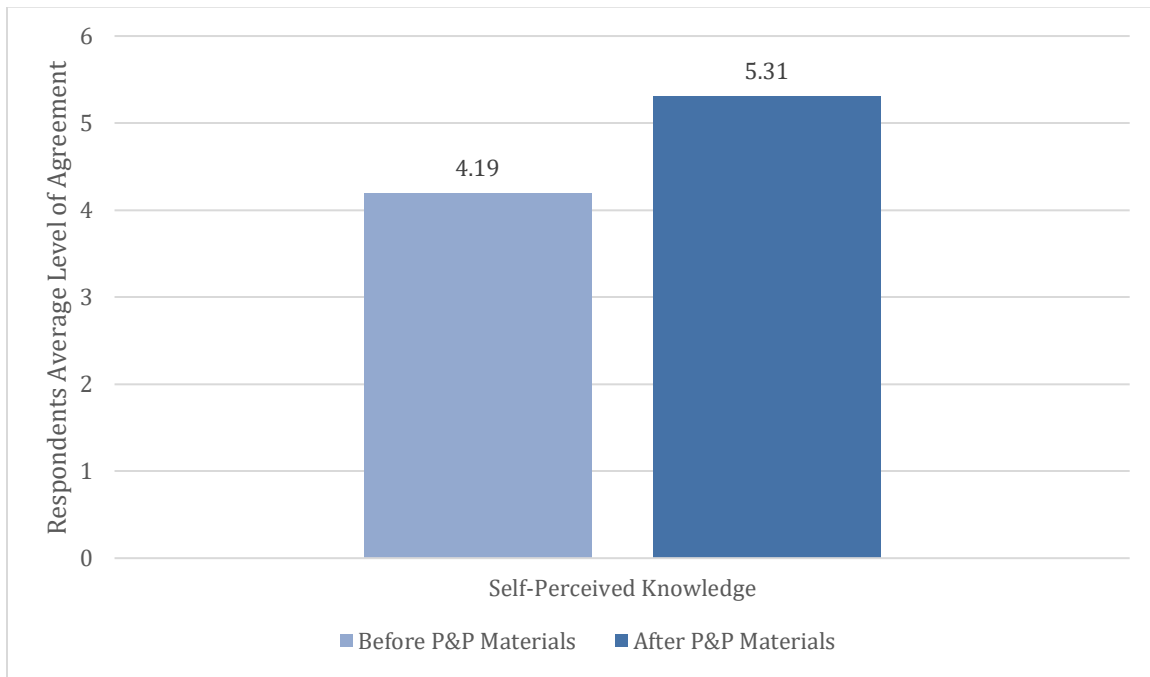


*Figure 2. Respondents' actual knowledge of mosquito control topics before and after exposure to P&P materials*

Florida residents in this study also demonstrated statistically significant differences in their self-perceived knowledge of mosquito control topics prior to and after being exposed to P&P materials. Self-perceived knowledge was assessed using items pertaining to respondents' knowledge of mosquito control topics, such as "I can list at least three negative impacts associated with increased mosquito control population." Responses were collected using a 6-point Likert-type scale of agreement: 1 = strongly disagree; 2 = disagree; 3 = slightly disagree; 4 = slightly agree; 5 = agree; and 6 = strongly agree. On average, respondents perceived themselves to be more knowledgeable about mosquito control topics after being exposed to the materials ( $M = 5.31$ ;  $SD = .75$ ) than they did prior to exposure to the materials ( $M = 4.19$ ;  $SD = .99$ );  $t(499) = -26.22, p = .000$ .



Figure 3. Respondents' self-perceived knowledge of mosquito control topics before and after exposure to P&P materials

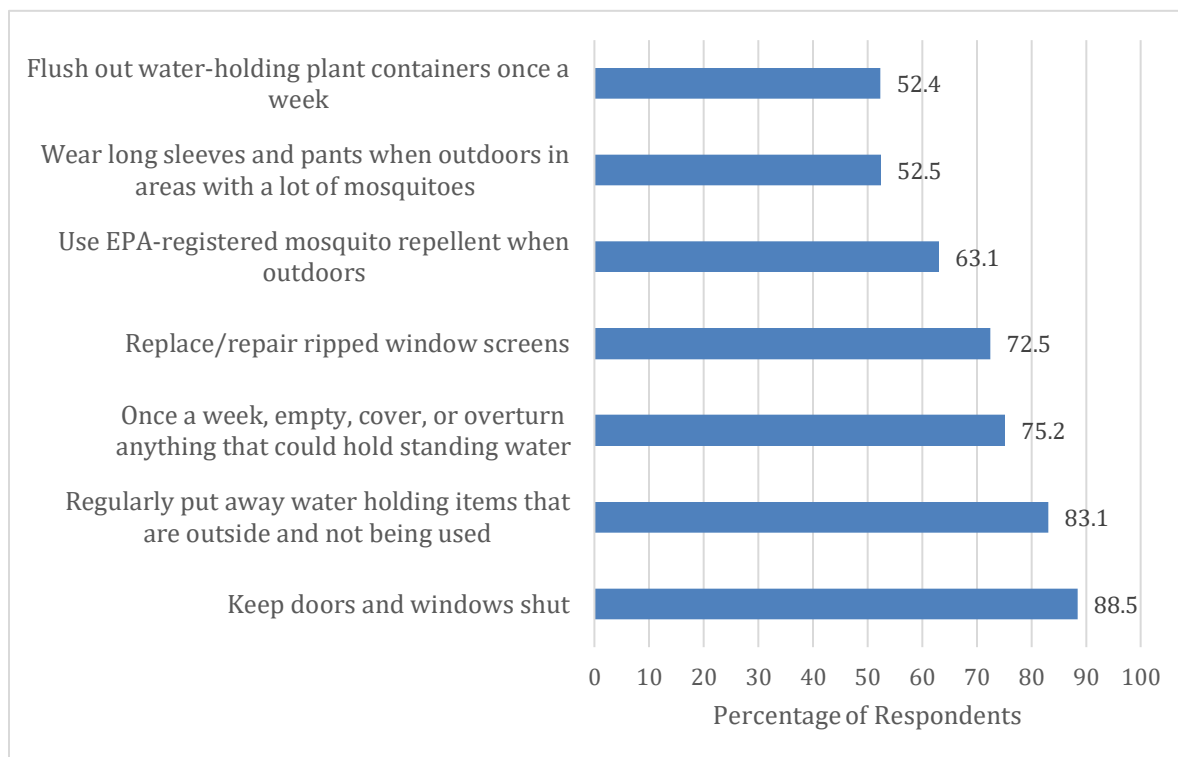


### Methods of Mosquito Control used by Florida Residents

Florida residents' current behavior was assessed by asking respondents to indicate, by checking all that apply, which at-home methods of mosquito protection and control they use. All at-home mosquito control methods were used by at least 50% of respondents (see Figure 4). The methods used by the largest number of respondents were keeping doors and windows shut (88.5%) and regularly putting away water holding items that are outside and not being used (83.1%).



Figure 4. Methods of mosquito control used by respondents



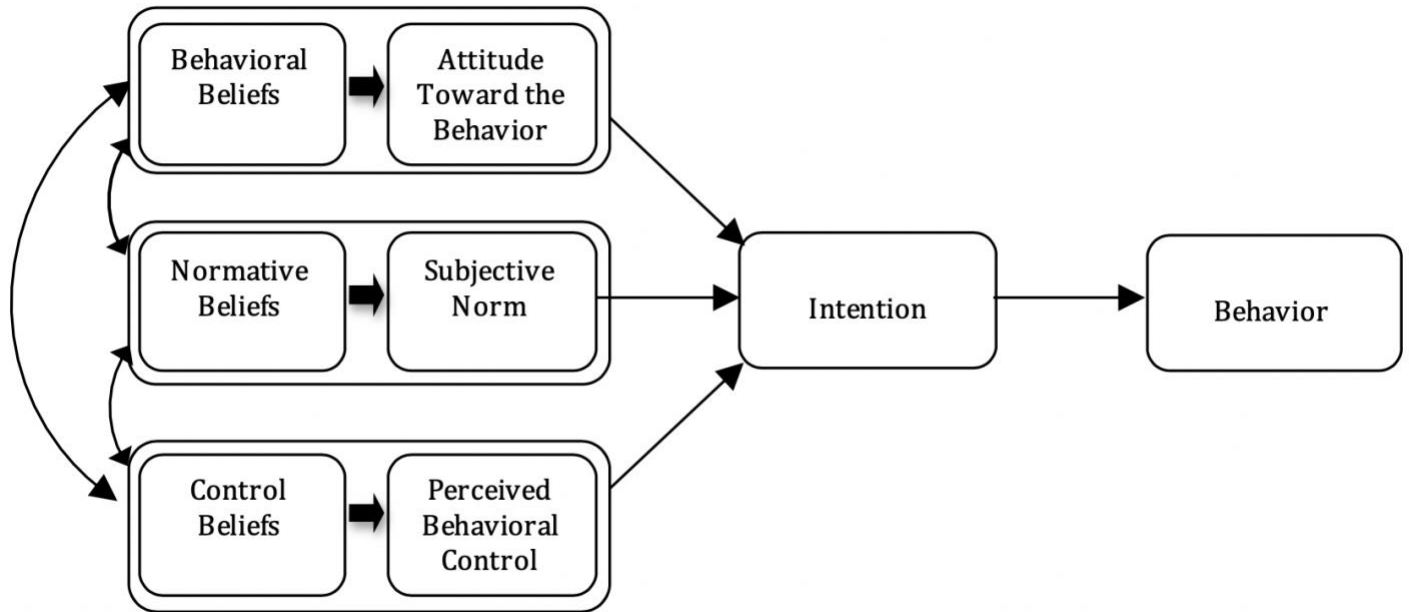
### Behavior Change

In addition to describing Florida residents' current mosquito control behaviors, a key objective of this project was to examine potential changes in their behavior as a result of being exposed to the P&P materials. While behavior change could not be assessed directly, indicators of such were examined to help predict the likelihood of actual behavior change. According to Ajzen's (1991) Theory of Planned Behavior (TPB), an individual's intention to perform a behavior is predictive of the likelihood he or she will actually perform that behavior. Further, intention to perform a behavior is influenced by an individual's behavioral, normative, and control beliefs about the behavior. For the purpose of this research inquiry, the targeted behavior was operationalized as "employing at-home methods of mosquito protection and control before and during peak mosquito breeding seasons in Florida." Respondents' behavioral beliefs (i.e. attitudes), normative beliefs (i.e. subjective norm), control beliefs, and intentions pertaining to the targeted behavior were examined.

*Behavioral beliefs* pertain to an individual's favorable or unfavorable attitude toward the outcomes of a particular behavior. If favorable outcomes are perceived to outweigh unfavorable outcomes, then the individual is more likely to perform that behavior. *Normative beliefs* pertain to an individual's perceptions of what is expected of him or her by important referent individuals or groups regarding a given behavior, as well as his or her motivation to comply with those expectations. Such beliefs are the antecedents to the *subjective norm*, which refers to the perceived social pressure to perform the behavior. Residents who believe significant others expect them to employ at-home methods of mosquito control, as well as have a strong desire to meet those expectations, are more likely to employ such methods. *Control beliefs* represent an individual's perceptions of the presence of factors that may hinder or facilitate his or her ability to perform a behavior, and the amount of control he or she has over those factors (Ajzen, 1991; see Figure 5).



Figure 5. The Theory of Planned Behavior. Adapted from "The Theory of Planned Behavior," by I. Ajzen, 1991, *Organizational Behavior and Human Decision Processes*, 50(2), p. 182. Copyright 2006 by Icek Ajzen.

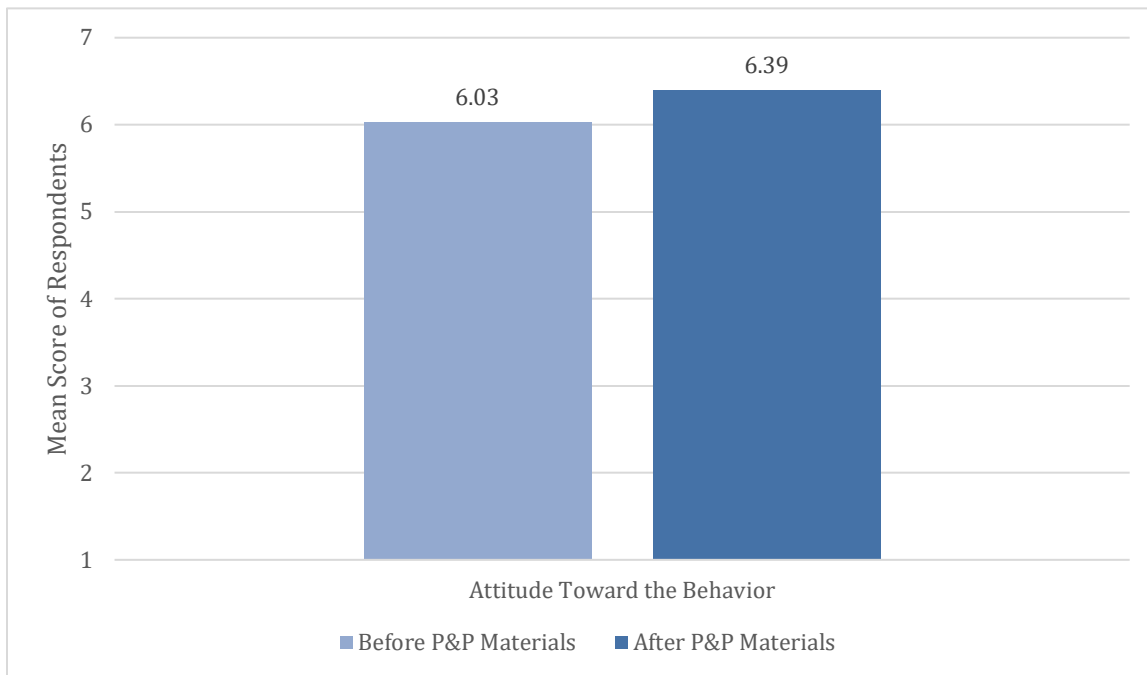


**Change in behavioral beliefs.** Due to the lack of qualitative research conducted to identify salient beliefs about at-home methods of mosquito protection and control (Ajzen, 1991), respondents' behavioral beliefs were assessed using a direct measure of their attitudes toward the behavior. Responses were collected using a 7-point semantic differential scale between 10 sets of bipolar descriptors following a single stem: "my use of at-home methods of mosquito protection and control during peak mosquito breeding seasons in Florida would be..." A mean score was calculated to represent respondents' overall attitudes toward the behavior, and a paired samples t-test was employed to determine significance in the difference of means. The pre-test internal reliability estimate for this scale was  $\alpha = .94$ ; the post-test reliability estimate was  $\alpha = .96$ . Significant differences were observed between respondents' attitudes toward the behavior prior to ( $M = 6.03$ ;  $SD = 1.14$ ) and after ( $M = 6.39$ ;  $SD = 1.02$ ) their exposure to the P&P materials;  $t(499) = -9.09$ ,  $p = .000$  (see Figure 6).





Figure 6. Respondents' attitudes toward employing at-home methods of mosquito protection and control before and after exposure to the P&P materials



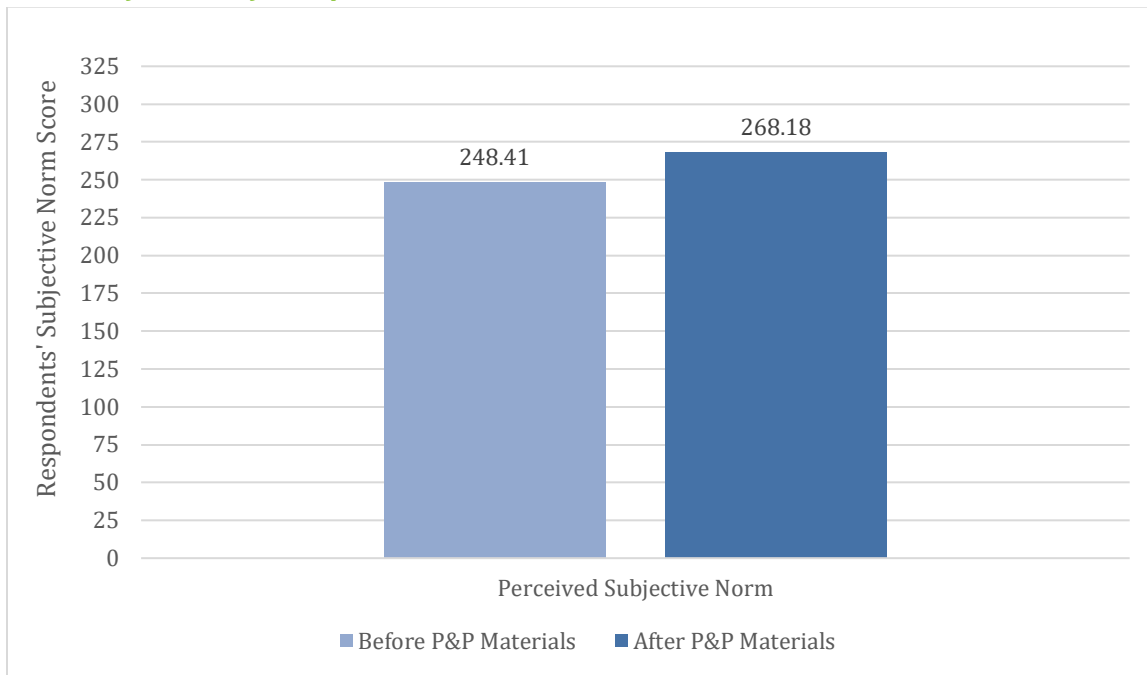
**Changes in normative beliefs.** Respondents' normative belief strength and motivation to comply were examined and used to create a global subjective norm score. The normative belief strength construct included seven items to assess respondents' beliefs regarding the perceived social pressure from select others (i.e. referents) to perform the behavior (e.g. "my family members think I should use at-home methods of mosquito protection and control during peak mosquito seasons in Florida"). Responses were collected using a 7-point semantic differential scale between a set of descriptors (strongly disagree, strongly agree). The motivation to comply construct was reflective of the seven items used to measure normative belief strength and was designed to assess respondents' desires to comply with the perceived social pressure from select others (e.g. "when it comes to using at-home methods of mosquito protection and control, I want to do what my family members think I should do"). The same 7-point semantic differential scale was used to collect responses. Construct means were calculated for both subjective norm constructs. The pre-test internal reliability estimate for the normative belief strength scale was  $\alpha = .90$ ; the post-test reliability estimate was  $\alpha = .89$ . The pre-test internal reliability estimate for the motivation to comply scale was  $\alpha = .88$ ; the post-test reliability estimate was  $\alpha = .84$ . The strength of each normative belief ( $n_i$ ) was multiplied by each respondent's motivation to comply ( $m_i$ ) with the referent in question, and a sum of the resulting products across the seven referents was computed to produce a single subjective norm (SN) score (Ajzen, 1991).

$$SN \propto \sum_{i=1}^n n_i m_i$$

Significant differences were observed in respondents' perceived subjective norm pre- and post-exposure to the P&P materials. Respondents' subjective norm score was higher after having viewed the materials ( $M = 268.18$ ;  $SD = 70.49$ ) than before ( $M = 248$ ;  $SD = 76.44$ );  $t(499) = -9.78$ ,  $p = .000$  (see Figure 7).



Figure 7. Respondents' perceived subjective norm about employing at-home methods of mosquito protection and control before and after exposure to the P&P materials

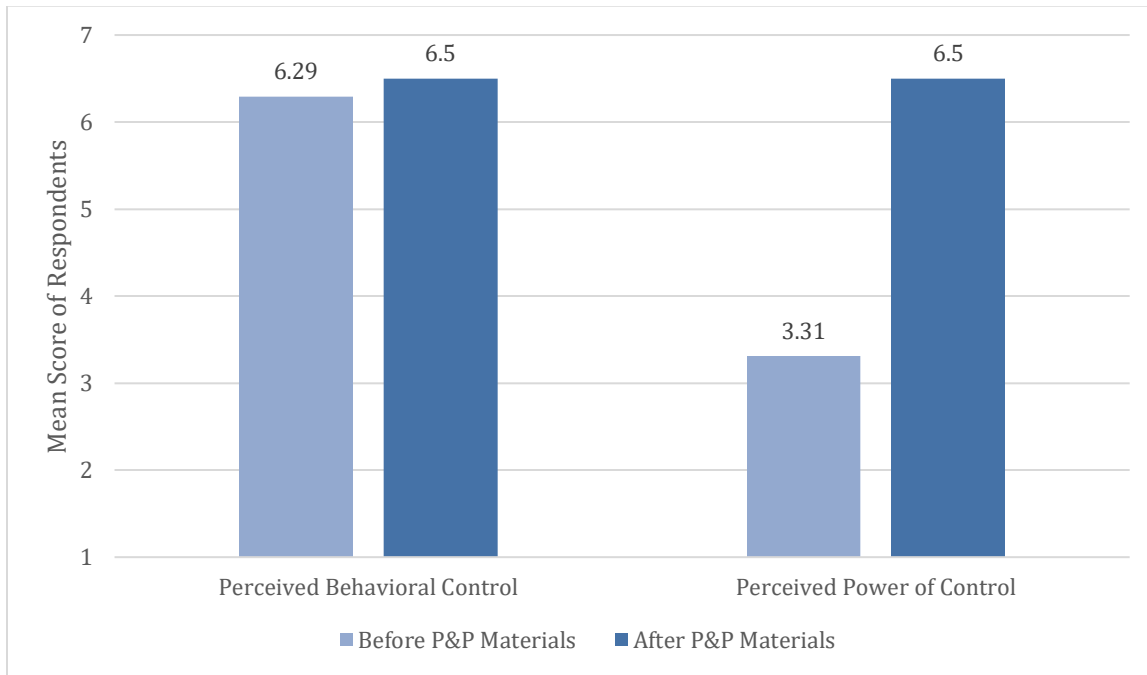


**Changes in control beliefs.** Behavioral control was assessed in terms of perceived control and power of control. Perceived control was a direct measure for which respondents were asked to indicate their agreement with four statements pertaining to their control over implementing at-home methods of mosquito control (e.g. “I am confident I can use at-home methods of mosquito protection and control during peak mosquito seasons in Florida”). The power of control construct included eight items intended to measure respondents’ perceptions of their power over select factors that may hinder or facilitate their abilities to perform the behavior (e.g. “financial constraints prevent me from using at-home methods of mosquito protection and control during peak mosquito seasons in Florida”). Responses for both constructs were collected using the previously mentioned 7-point semantic differential scale between a set of bipolar descriptors (strongly disagree, strongly agree). Construct means were calculated for both perceived control and power of control. The pre-test internal reliability estimate for the perceived control scale was  $\alpha = .87$ ; the post-test reliability estimate was  $\alpha = .88$ . The pre-test internal reliability estimate for the power of control scale was  $\alpha = .95$ ; the post-test reliability estimate was  $\alpha = .97$ .

Significant differences were observed for both perceived control and power of control pre- and post-exposure to the P&P materials (see Figure 8). Respondents reported a higher degree of perceived control over implementing at-home methods of mosquito protection and control after being exposed to the P&P materials ( $M = 6.50$ ;  $SD = .86$ ) than before ( $M = 6.30$ ;  $SD = .98$ );  $t(499) = -6.78$ ,  $p = .000$ . Respondents also reported a higher degree of perceived power of control after viewing the materials ( $M = 6.50$ ;  $SD = .86$ ) than they did prior to viewing the materials ( $M = 3.32$ ;  $SD = 1.87$ );  $t(499) = -32.31$ ,  $p = .000$ .



Figure 8. Respondents' perceived behavioral control and power of control regarding their use of at-home mosquito control methods before and after exposure to P&P materials

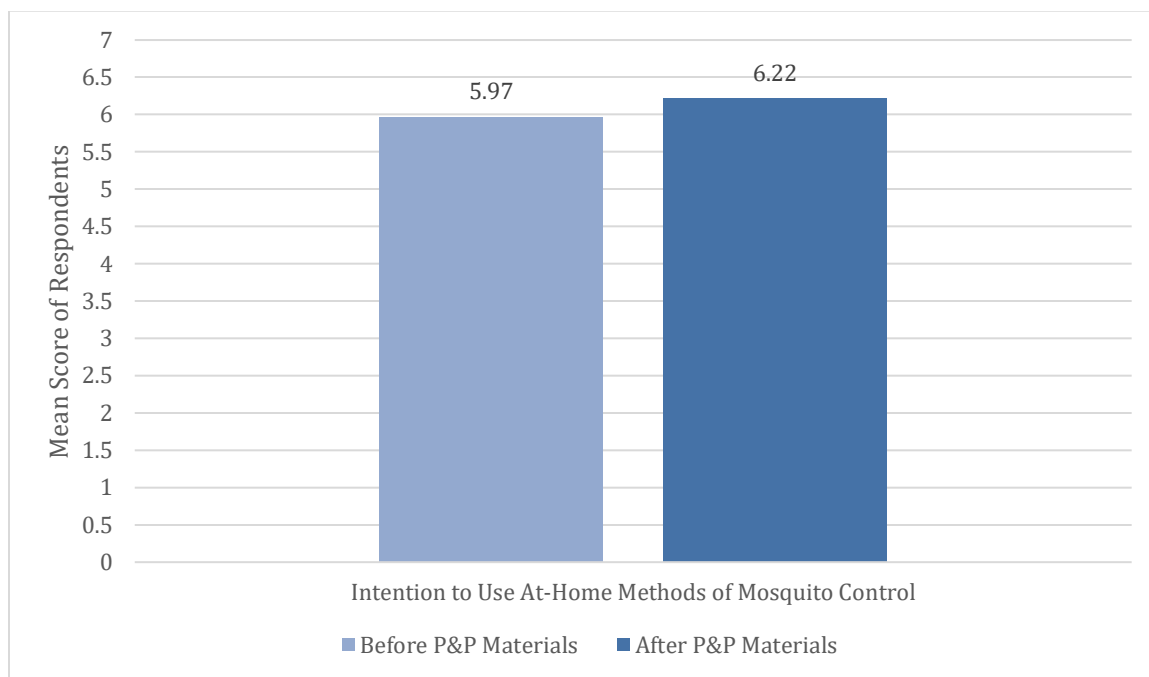


**Changes in intention.** To measure intentions to use at-home methods of mosquito protection and control, respondents were asked to indicate their degree of agreement with seven statements reflective of the activities that constitute the targeted behavior (e.g. “I intend put away water-holding items outside and not being used during peak mosquito breeding seasons in Florida”). Responses were collected using a 7-point semantic differential scale between bipolar descriptors (strongly disagree, strongly agree). Numerical values were provided for each scale point. An overall mean was calculated to represent respondents' intentions to perform the behavior. The pre-test internal reliability estimate for this scale was  $\alpha = .84$ ; the post-test reliability estimate was  $\alpha = .88$ .

Significant differences were observed between respondents' intentions to use at-home methods of mosquito control pre- and post-exposure to the P&P materials (see Figure 9). Respondents reported greater intentions to employ such methods after viewing the P&P materials ( $M = 6.22$ ;  $SD = .95$ ) than before they had viewed the materials ( $M = 5.97$ ;  $SD = 1.11$ );  $t(499) = -10.18$ ,  $p = .000$ .



Figure 9. Respondents' intentions to use at-home methods of mosquito control before and after exposure to the P&P materials.



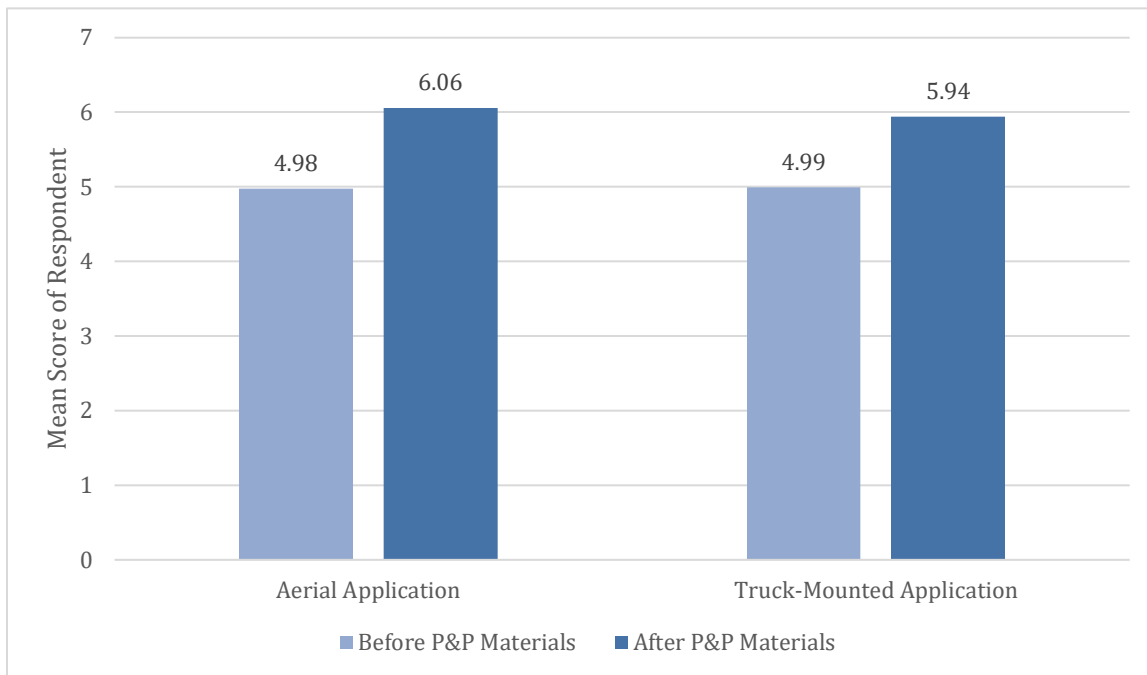
### Perceptions of Mosquito Control Application Methods

Florida residents' perceptions of mosquito control application methods were assessed in terms of their attitudes toward aerial spraying and truck-mounted applications before and after being exposed to the P&P materials. Participants were asked to respond to the statement, "aerial spraying as an application method of mosquito control used by mosquito control programs is..." on a 7-point scale between 11 sets of descriptors (e.g. bad/good, harmful/beneficial). This same design was employed for the truck-mounted application section of the instrument. Construct means were calculated and reported for aerial spraying attitudes and truck-mounted spraying attitudes. The pre-test internal reliability estimate for the aerial spraying scale was  $\alpha = .94$ ; the post-test reliability estimate was  $\alpha = .97$ . The pre-test internal reliability estimate for the truck-mounted spraying scale was  $\alpha = .96$ ; the post-test reliability estimate was  $\alpha = .97$ .

Significant differences were observed between respondents' pre-and post-attitudes for both aerial and truck mounted applications (see Figure 10). Respondents held more favorable attitudes toward aerial spraying as an application method of mosquito control after ( $M = 6.06$ ;  $SD = 1.30$ ) viewing the P&P materials than before ( $M = 4.98$ ;  $SD = 1.40$ );  $t(499) = -19.24$ ,  $p = .000$ . Similarly, respondents held more favorable attitudes toward truck-mounted spraying as an application method after viewing the materials ( $M = 5.94$ ;  $SD = 1.37$ ) than they did prior to viewing the materials ( $M = 4.99$ ;  $SD = 1.48$ );  $t(499) = -17.07$ ,  $p = .000$ .



Figure 10. Respondents' attitudes toward aerial and truck-mounted spraying as an application method of mosquito control before and after exposure to P&P materials



### Importance of Mosquito Control

Respondents' perceived importance of mosquito control was assessed in terms of both when and why mosquito control is important. To assess their perceptions of *when* mosquito control is important, respondents were asked to indicate their agreement with five items, such as "controlling the mosquito population in Florida is important year-round." To assess their perceptions of *why* mosquito control is important, respondents were asked to indicate their level of agreement with seven items pertaining to the importance of mosquito control to achieve select outcomes (e.g. "controlling the mosquito population in Florida is important because it protects Florida residents from mosquito-borne illnesses"). Responses to items in both sections were collected using a 6-point Likert-type scale: 1 = *strongly disagree*; 2 = *disagree*; 3 = *slightly disagree*; 4 = *slightly agree*; 5 = *agree*; and 6 = *strongly agree*. Real limits were set for the interpretation of the responses: 1.00 to 1.50 = *strongly disagree*; 1.51 to 2.50 = *disagree*; 2.51 to 3.50 = *slightly disagree*; 3.51 to 4.50 = *slightly agree*; 4.51 to 5.50 = *agree*; and 5.51 to 6.00 = *strongly agree*.

Regarding why mosquito control is important, respondents agreed most that it was important because it protects Florida residents from mosquito-borne illnesses ( $M = 5.52$ ;  $SD = .85$ ), protects pets from mosquito-borne diseases ( $M = 5.47$ ;  $SD = .83$ ), and reduces the nuisance of mosquitoes when participating in outdoor activities ( $M = 5.43$ ;  $SD = .89$ ; see Table 6).

Table 6. Respondents' agreement with statements pertaining to why mosquito control in Florida is important

"Controlling the mosquito population in Florida is important because ..."	M	SD	Interpretation
It protects Florida residents from mosquito-borne illnesses	5.52	.85	Agree strongly
It protects Florida pets from mosquito-borne diseases	5.47	.83	Agree
It reduces the nuisance of mosquitoes when participating in outdoor activities	5.43	.89	Agree



It protects Florida livestock from mosquito-borne diseases	5.36	.97	Agree
It enhances the economy in Florida	4.50	1.32	Agree
It increases the tourism revenue in Florida	4.45	1.39	Agree slightly

Regarding when mosquito control is important, respondents agreed strongly that it was important during an outbreak of a mosquito-borne illness ( $M = 5.68$ ;  $SD = .70$ ), during peak mosquito breeding seasons ( $M = 5.63$ ;  $SD = .80$ ), and after natural disasters such as floods or hurricanes ( $M = 5.61$ ;  $SD = 7.92$ ; see Table 7). Respondents indicated the lowest degree of agreement with controlling the mosquito population being important year-round ( $M = 5.11$ ;  $SD = 1.11$ ).

*Table 7. Respondents' agreement with statements pertaining to when mosquito control in Florida is important*

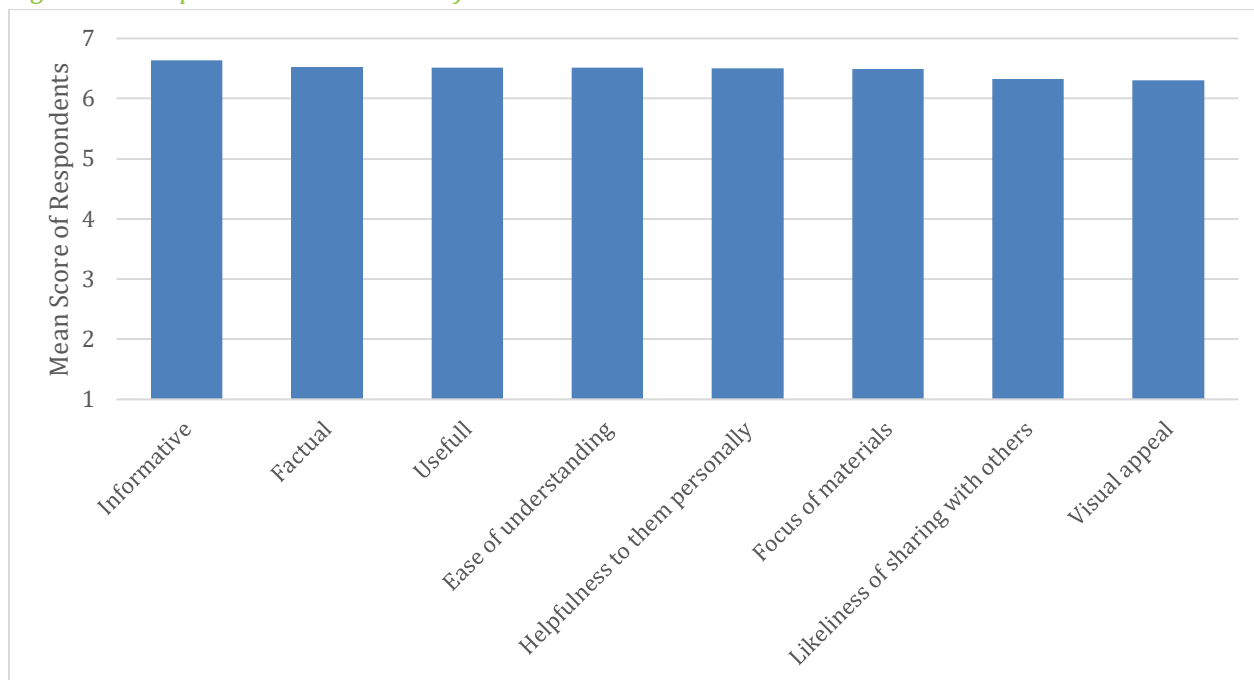
<b>"Controlling the mosquito population in Florida is important . . ."</b>	<b>M</b>	<b>SD</b>	<b>Interpretation</b>
During an outbreak of a mosquito-borne illness	5.68	.69	Agree strongly
During peak mosquito breeding seasons	5.63	.80	Agree strongly
After natural disasters such as floods or hurricanes	5.61	.79	Agree strongly
When mosquitoes are preventing Florida residents from enjoying outdoor activities	5.40	.92	Agree
Year-round	5.11	1.11	Agree

### Evaluation of Prevent & Protect Materials

Lastly, respondents were asked to evaluate the P&P materials they viewed as part of the survey. Responses were collected using a 7-point semantic differential scale between eight sets of bipolar descriptors following a single stem: "overall, I found the Prevent & Protect materials presented in this survey to be..." A score of 1 represents the lowest possible score; a score of 7 represents the highest. A mean score was computed to represent respondents' overall attitudes toward the materials. The internal reliability estimate for this scale was  $\alpha = .97$ . Overall, respondents had very positive perceptions of the P&P materials ( $M = 6.47$ ;  $SD = 1.00$ ). Responses to individual items and the overall construct mean are reported in Figure 11.



Figure 11. Respondents' evaluation of the P&amp;P materials



## Conclusions and Recommendations

- The data pertaining to information search behaviors of the Florida public remains somewhat inconclusive. While there appears to be a pattern separating the use and trustworthiness of website content versus social media, the differences are small.
  - Florida residents reported being more likely to use websites over social media, regardless of the source, if they were to seek information about mosquitoes/mosquito control topics. However, overall trends in the data suggest Florida residents are not active seekers of such information. As such, it is recommended that social media not be overlooked as a means of disseminating mosquito control information to the public as it may be the best means of reaching those not actively seeking such information.
  - Florida residents also perceived a higher degree of trustworthiness associated with websites over social media. However, differences in the perceived level of trustworthiness between sources was slight. This may be due to residents not often seeking mosquito control information and, therefore, not having strong views about the trustworthiness of sources of that information.
    - Of the sources listed, respondents perceived CDC's websites and DOH's websites as the most trustworthy. Therefore, it is recommended that mosquito control programs and local health agencies work closely with CDC and DOH to increase the perceived credibility of their efforts and informational materials.
- Florida residents perceived mosquito control in their communities as important to protect themselves and their pets. Further, they believed that controlling the mosquito population in Florida was important during an outbreak of a mosquito-borne illness, during peak mosquito breeding seasons, and after natural disasters (e.g. floods and hurricanes). These findings are encouraging for mosquito control programs in that they suggest public support of their efforts.
  - However, Florida residents were slightly less convinced that mosquito control efforts were important year-round. This finding warrants further investigation as respondents' perceptions of



year-round mosquito control may differ based on their location of residence (e.g. those in areas that need year-round control and those that do not).

- In addition, as mosquito control methods are employed year-round in some areas in Florida, efforts should be made in these areas to help convince residents of the importance of year-round control. Moreover, efforts to promote public education and awareness of mosquito control methods should be made year-round to all residents to increase the likelihood they will understand and be accepting of such methods during the times they are employed in their communities.
- Regarding the mosquito control methods used by Florida residents, respondents reported having used most at-home methods of mosquito protection and control. Future research is needed to further assess why some methods are not used by some residents.
- After viewing the P&P materials, Florida residents demonstrated statistically significant increases in their actual and self-perceived knowledge of mosquito control topics, more favorable attitudes toward aerial and truck-mounted applications as a method of mosquito control, more favorable beliefs about their use of at-home methods of mosquito control, and greater intentions to employ such methods. Therefore, it is recommended that the P&P resources be adopted by communication and education specialists in mosquito control programs and local health agencies to help disseminate information to the public.
  - It should also be noted that, though significant, the observed differences were slight. As such, it is not recommended that the P&P materials be used alone. Rather, the materials should be used to supplement larger, collective efforts to facilitate education and desired behaviors among the Florida public.
- When asked to evaluate the P&P materials, respondents reported very positive perceptions of the materials, which further supports recommendations regarding the use of these resources to educate the public about mosquito control topics.





## Survey with Florida Department of Health and Florida Mosquito Control District Professionals

The methodology, results, and recommendations pertaining to the surveys conducted with Florida Department of Health (DOH) and mosquito control district (MCD) professionals are included in the sections below.

### Methods

The populations of interest were Florida DOH and MCD professionals with job positions related to mosquito control communication, education, and/or outreach. Two survey questionnaires were developed by the PIE Center to assess professionals' communication behaviors, use of *Prevent & Protect* materials, and perceptions of those materials. The questionnaires were reviewed for face and content validity by a panel of experts consisting of faculty and specialists from the UF/IFAS Department of Agricultural Education and Communication (AEC); Department of Family, Youth, and Community Sciences; Department of Entomology and Nematology; Florida Department of Agriculture and Consumer Services (FDACS); and the CDC Southeastern Center of Excellence in Vector Borne Diseases. Edits were made to ensure the accuracy of content, correctness of terminology used, and general readability of the instruments.

An online link to the DOH questionnaire was distributed by the internal communications manager for the Florida DOH to 193 Florida DOH professionals. Useable responses were collected from 66 of the 193 professionals for a 34.2% response rate. The online link to the MCD questionnaire was distributed by the researchers to 82 MCD professionals. Useable responses were collected from 23 of the 82 MCD professionals for a 28% response rate. Nonresponse error poses a threat to the external validity of this study. As such, the results of this study may not be generalizable to the targeted populations.

### Description of Participants

#### Florida DOH Participants

Florida DOH professionals who participated in this study were primarily female ( $f = 43$ ; 65.2%), white ( $f = 47$ ; 71.2%), and within the age range of 50 to 59 ( $f = 28.8\%$ ) or 40-49 ( $f = 18$ ; 27.3%). Regarding their job characteristics, the position of "director" was the job position most represented ( $f = 21$ ; 31.8%), and more respondents had been in the profession one to five years ( $f = 33$ ; 50%). As for communities served, the largest number of respondents served mixed, i.e. urban and rural ( $f = 36$ ; 54.5%) communities in which English was the primary language spoken ( $f = 64$ ; 97%; see Table 8).

Table 8. Demographic characteristics of Florida DOH professionals ( $N = 66$ )

Demographic Characteristic	<i>f</i>	%
Gender <sup>a</sup>		
Male	21	31.8
Female	43	65.2
Race <sup>b</sup>		
White	47	71.2
Black/African American	5	7.6
Hispanic	5	7.6
Multi-racial	4	6.1
Asian or Pacific Islander	1	1.5
American Indian/Alaska Native	0	0.0
Other	2	8.7



Age <sup>c</sup>		
20-29	10	15.2
30-39	8	12.1
40-49	18	27.3
50-59	19	28.8
60-69	6	9.1
70-79	3	4.5
80+	0	0.0
Job Position <sup>d</sup>		
Director or assistant director	23	34.8
Communication specialist	13	19.7
Education specialist	5	7.6
Program/administrative assistant	2	3.0
Nurse or nursing supervisor	2	3.0
Other	18	34.8
Years in the Profession <sup>e</sup>		
1-5 years	33	50.0
6-10 years	10	15.2
11-15 years	5	7.6
More than 15 years	13	19.7
Type of Communities Served <sup>f</sup>		
Rural	26	39.4
Urban	2	3.0
Mixed	64	54.5
Primary Language of Communities Served <sup>g</sup>		
English	64	97.0
Spanish	24	36.4
Haitian Creole	7	10.6
French/French Creole	0	0.0
Other	1	1.5

<sup>a</sup> Responses missing from 2 participants

<sup>b</sup> Responses missing from 4 participants

<sup>c</sup> Responses missing from 2 participants

<sup>d</sup> Responses missing from 3 participants

<sup>e</sup> Responses missing from 5 participants

<sup>f</sup> Responses missing from 2 participants

<sup>g</sup> Percentages do not add up to 100% due to the option to select more than one answer

### Florida MCD Participants

The MCD professionals who participated in this study were predominantly male ( $f = 12$ ; 52.2%), white ( $f = 13$ ; 56.5%), and within the age range of 50 to 59 years ( $f = 8$ ; 34.8%). Regarding their job characteristics, the title of “director” was the job position most represented ( $f = 15$ ; 65.2%), and the largest number of respondents had been in their professions for one to five years ( $f = 14$ ; 60.9%). As for communities served, the majority of respondents served mixed, i.e. urban and rural communities ( $f = 12$ ; 52.2%) in which English was the primary language spoken ( $f = 20$ ; 87.0%; see Table 9).

*Table 9. Demographic characteristics of Florida MCD professionals (N = 23)*

Demographic Characteristic	<i>f</i>	%
Gender <sup>a</sup>		
Male	12	52.2



	Female	7	30.4
	Other	1	4.3
Race <sup>b</sup>			
	White	13	56.5
	Black/African American	1	4.3
	Hispanic	2	8.7
	Multi-racial	1	4.3
	Asian or Pacific Islander	1	4.3
	American Indian/Alaska Native	0	0.0
	Other	2	8.7
Age <sup>c</sup>			
	20-29	1	4.3
	30-39	5	21.7
	40-49	4	17.4
	50-59	8	34.8
	60-69	2	8.7
	70+	0	0.0
Job Position <sup>d</sup>			
	Director	15	65.2
	Communication specialist	1	4.3
	Education specialist/outreach coordinator	1	4.3
	Environmental specialist	2	8.7
	Other	1	4.3
Years in the Profession <sup>e</sup>			
	1-5 years	14	60.9
	6-10 years	2	8.7
	11-15 years	0	0.0
	More than 15 years	3	13.0
Type of Communities Served <sup>f</sup>			
	Rural	7	30.4
	Urban	1	4.3
	Mixed	12	52.2
Primary Language of Communities Served <sup>g</sup>			
	English	20	87.0
	Spanish	6	26.1
	Haitian Creole	2	8.7
	French/French Creole	1	4.3

<sup>a</sup> Responses missing from 3 participants

<sup>b</sup> Responses missing from 3 participants

<sup>c</sup> Responses missing from 3 participants

<sup>d</sup> Responses missing from 3 participants

<sup>e</sup> Responses missing from 4 participants

<sup>f</sup> Responses missing from 3 participants

<sup>g</sup> Percentages do not add up to 100% due to the option to select more than one answer

## Results

### Information Sources

Respondents were asked to indicate how frequently they used select sources to gather information about mosquitoes/mosquito control topics. Responses were collected using a 5-point scale: 1 = *never*; 2 = *rarely (<25% of the time)*; 3 = *occasionally (25-50% of the time)*; 4 = *often (51-75% of the time)*; 5 = *very often (>75% of the time)*.



Sources of information used most frequently by DOH professionals were Florida DOH reports/publications ( $M = 4.14$ ;  $SD = 1.08$ ) and Florida DOH online mosquito control communication resources ( $M = 3.92$ ;  $SD = 1.20$ ). The sources used most frequently by MCD professionals were Florida Department of Agriculture and Consumer Services (FDACS) reports/publications ( $M = 3.36$ ;  $SD = .95$ ) and Florida DOH reports/publications ( $M = 3.35$ ;  $SD = 1.11$ ). Both DOH and MCD professionals rarely used private mosquito control companies or other sources not listed when seeking such information. The full results are displayed in Table 10.

*Table 10. Sources used by DOH and MCD professionals to gather information about mosquito control topics*

Source	DOH Professionals		MCD Professionals	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Florida DOH reports/publications	4.14	1.08	3.35	1.11
Florida DOH online mosquito control communication resources	3.92	1.20	3.05	1.05
CDC reports/publications	3.42	1.35	3.09	1.13
CDC online mosquito control communication resources	3.03	1.34	2.91	1.13
CDC communication and/or education specialists	3.03	1.38	2.74	1.32
FDACS reports/publications	2.20	1.62	3.36	.95
FDACS online mosquito control communication resources	2.05	1.07	3.18	1.01
FDACS communication and/or education professionals	2.00	1.08	3.27	1.08
UF/IFAS Extension specialists	2.12	1.02	2.77	1.23
UF Department of Entomology and Nematology specialists	1.77	1.01	3.23	1.31
Private mosquito control companies	1.63	.98	1.90	1.22
Other	2.00	1.54	2.17	1.47

*Note.* Real limits for interpretation of responses: 1.00 to 1.50 = *never*; 1.51 to 2.50 = *rarely (<25% of the time)*; 2.51 to 3.50 = *occasionally (25-50% of the time)*; 3.51 to 4.50 = *often (51-75% of the time)*; 4.51 to 5.00 = *very often (>75% of the time)*

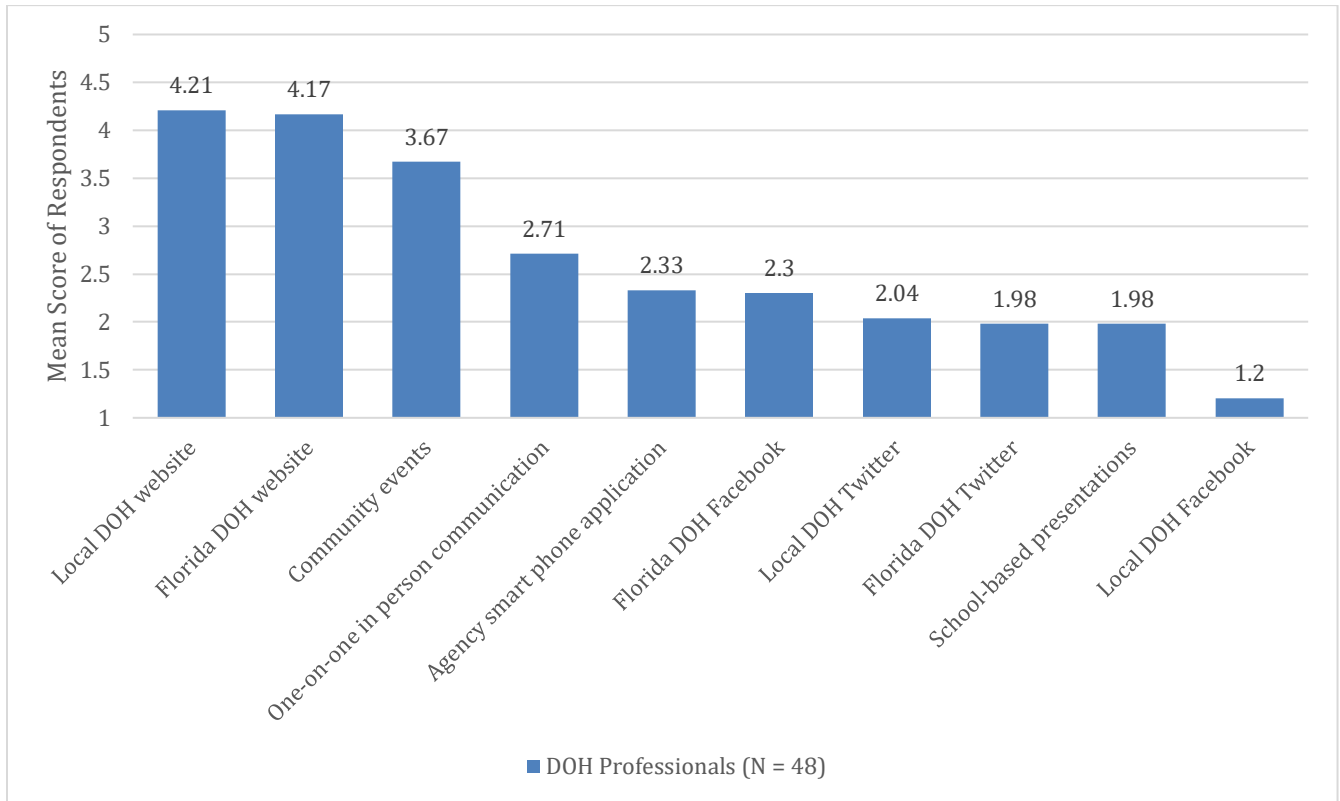
### Channels used to Communicate with the Florida Public

Respondents who identified communicating with the public as part of their job description were then asked to indicate how often they used select sources to disseminate information about mosquito control topics to the Florida public. The same, previously mentioned 5-point scale was used to collect responses.

The DOH professionals who communicated with the public as part of their job ( $f = 48$ ; 72.2%) reported that they more often did so via local DOH websites ( $M = 4.21$ ;  $SD = 1.04$ ) and Florida DOH websites ( $M = 4.17$ ;  $SD = 1.42$ ) than other channels listed (see Figure 12).



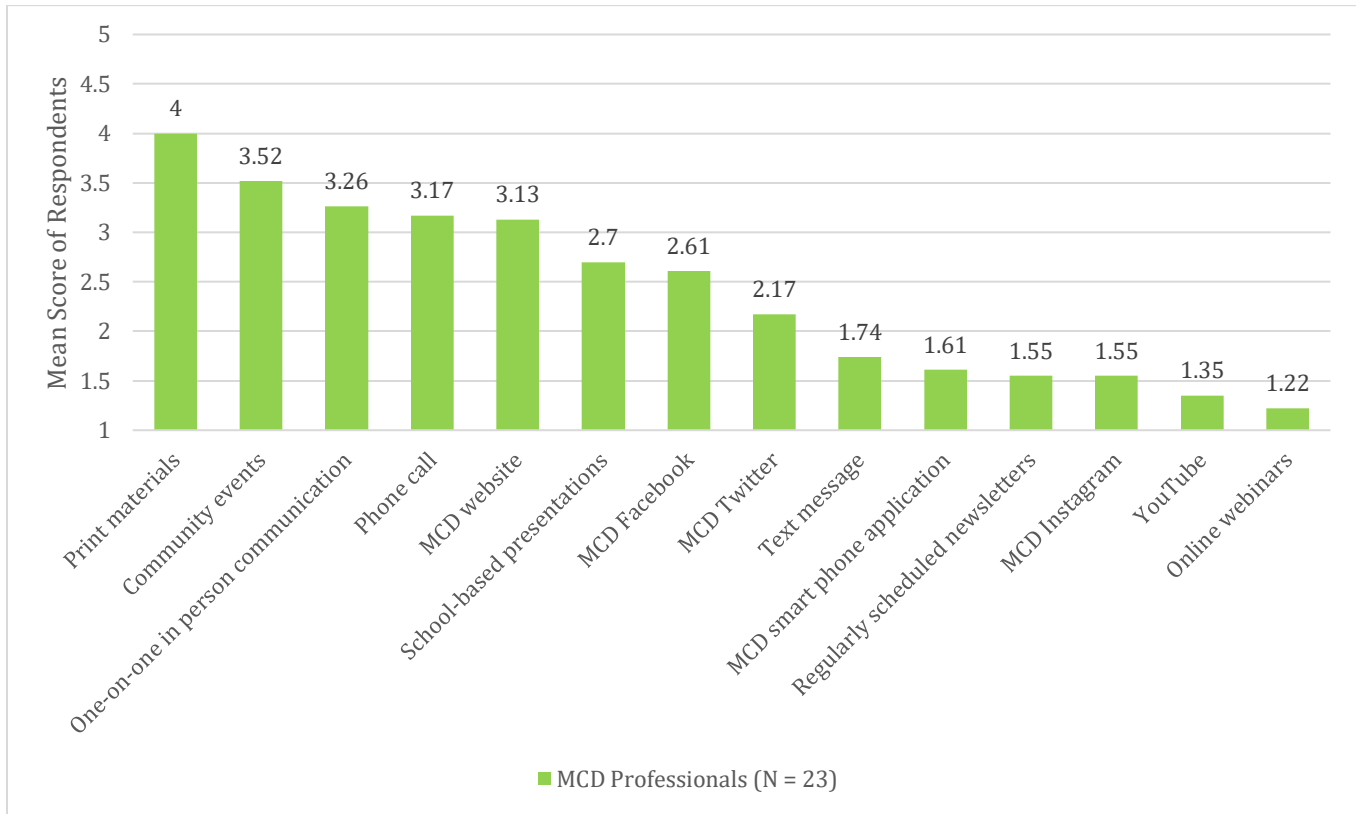
Figure 12. Channels used by DOH professionals to disseminate mosquito control information to the Florida public



MCD professionals who identified communicating with the public as part of their job description ( $f = 23$ ; 100%) reported using print materials ( $M = 4.00$ ;  $SD = .85$ ) and community events ( $M = 3.52$ ;  $SD = 1.24$ ) more frequently than other sources listed (see Figure 13).



Figure 13. Channels used by MCD professionals to disseminate mosquito control information to the public

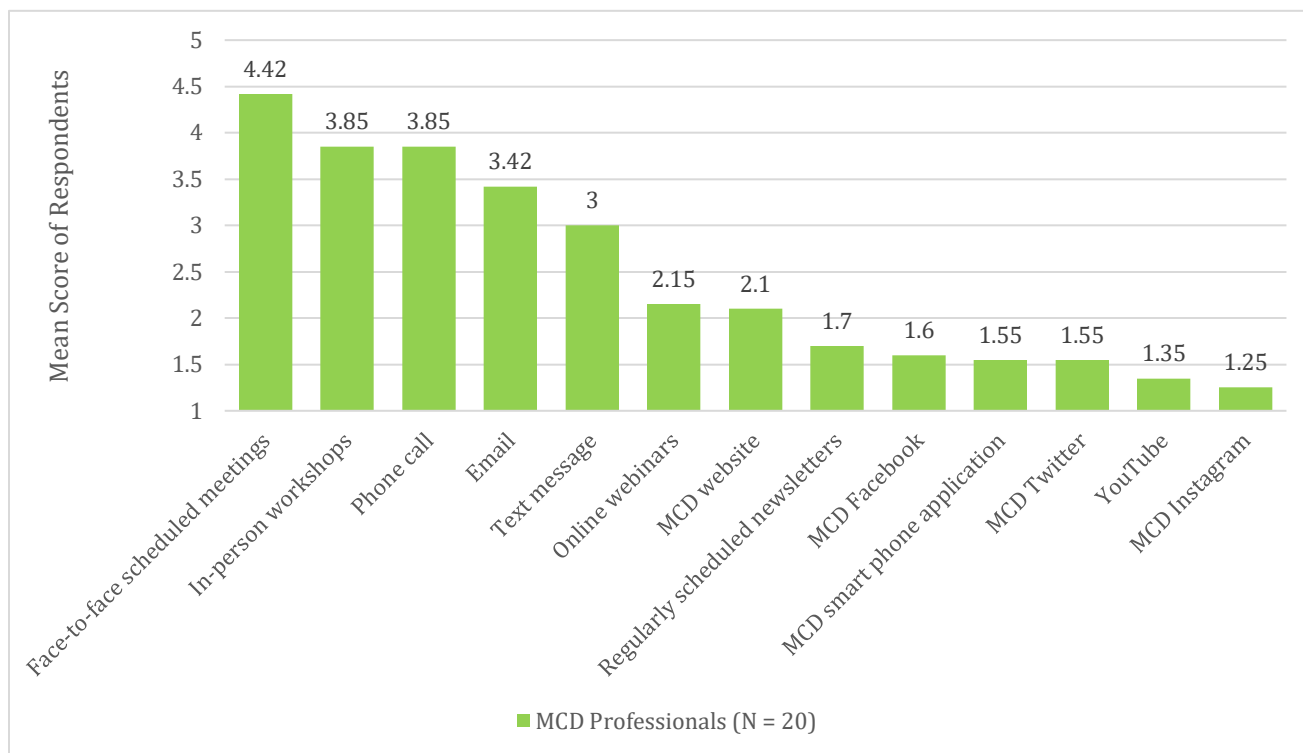


### Sources used to Communicate with MCD Mosquito Control Technicians

MCD professionals who reported that communicating with their technicians as being part of their job description ( $f = 20$ ; 87%) were also asked to indicate how frequently they used select channels to communicate with their technicians. Of the channels listed, respondents identified face-to-face scheduled meetings ( $M = 4.42$ ;  $SD = .84$ ), in-person workshops ( $M = 3.85$ ;  $SD = 1.00$ ), and phone calls ( $M = 3.85$ ;  $SD = 1.27$ ) as those used most frequently (see Figure 14).



Figure 14. Channels used by MCD professionals to communicate with their technicians



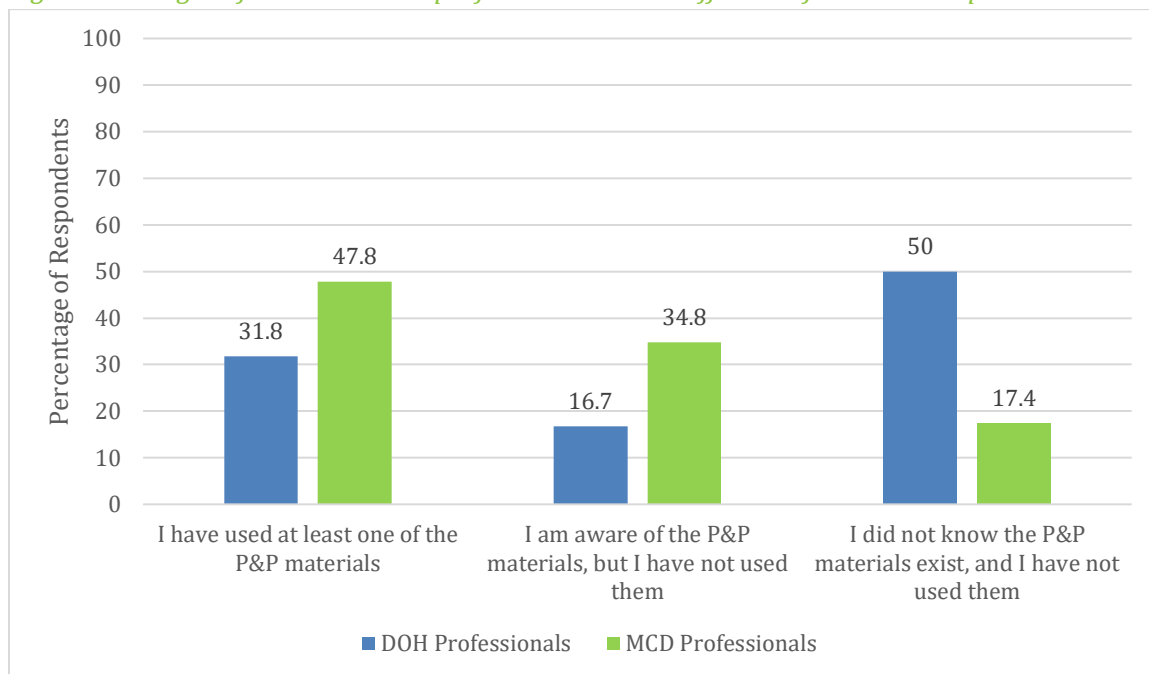
### Use of Prevent and Protect Materials

DOH and MCD professionals' use or lack of use of the P&P materials was assessed to identify early/late adopters and identify the stage of respondents in the diffusion of innovations process (Rogers, 2003). Respondents were asked to identify whether they had (a) used at least one of the P&P materials, (b) were aware of the materials, but had not used them, or (c) were unaware the materials existed and had not used them.

Overall, the majority of the DOH professionals (66.7%) and MCD professionals (52.2%) were late adopters in that they had not yet used any of the P&P materials at the time this survey was conducted. Only 31.8% of DOH professionals and 47.8% of MCD professionals were identified as early adopters who had used at least one of the P&P materials (see Figure15).



Figure 15. Stages of DOH and MCD professionals in the diffusion of innovations process



### Respondents Who Had Not Used the P&P Materials

Regarding respondents who had not yet used any of the P&P materials, 50% percent of the DOH professionals and 17.4% of the MCD professionals reported they did not know the materials existed and, therefore, had not used them.

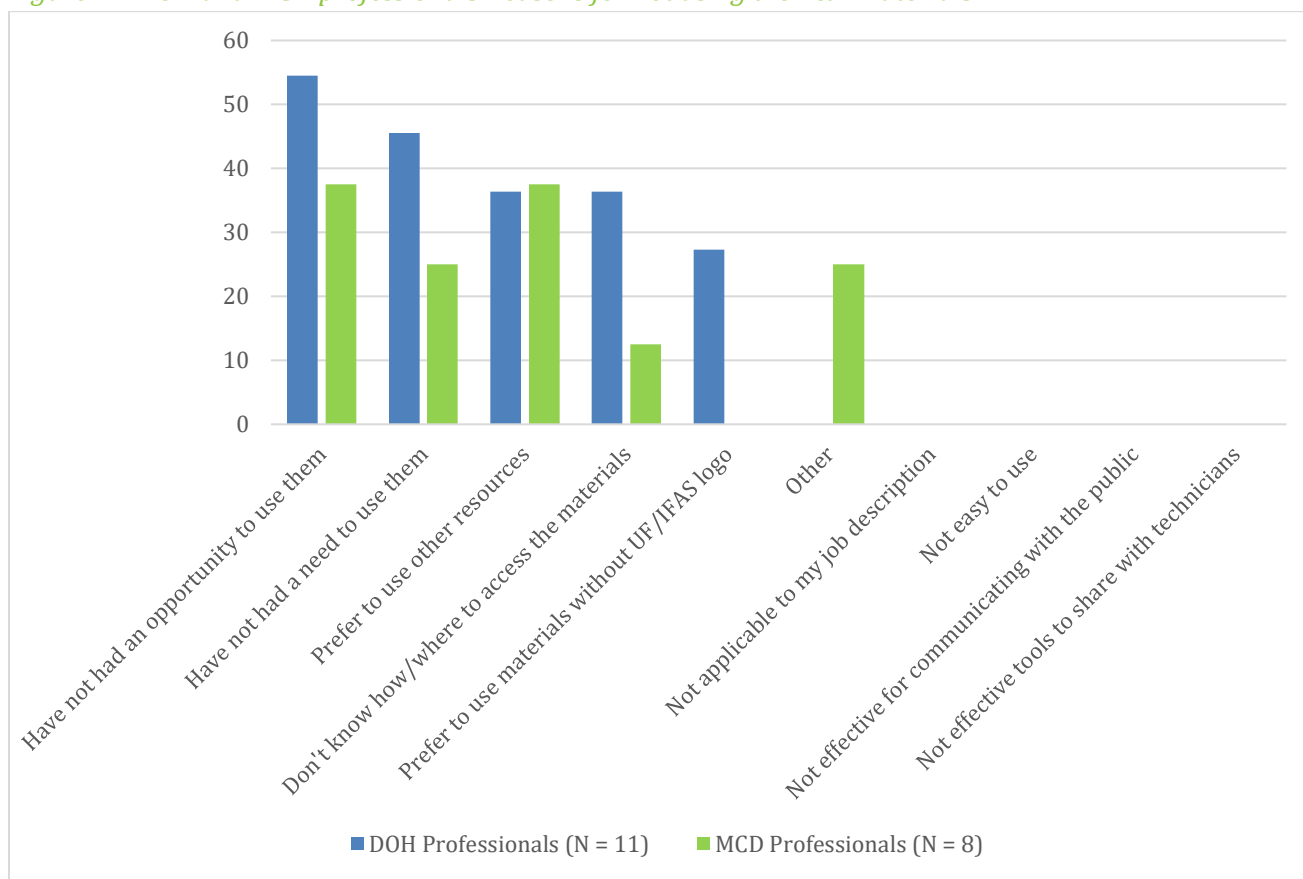
### Reasons for Not Using the P&P Materials

To better understand other reasons why the P&P resources had not been widely adopted, respondents who reported they were aware of the materials but had not used them were asked to indicate the reasons they had not done so (see Figure 16). The primary reasons DOH professionals had not used any of the materials were because they had not yet had an opportunity to them ( $f = 6$ ; 54.5%), had not yet had the need to use them ( $f = 5$ ; 45.5%), and had other resources they preferred to use instead ( $f = 4$ ; 36.4%). The primary reasons MCD professionals had not used any of the materials were because they had not yet had an opportunity to used them ( $f = 3$ ; 37.5%) and had other resources they preferred to use instead ( $f = 3$ ; 37.5%).





Figure 16. DOH and MCD professionals' reasons for not using the P&amp;P materials



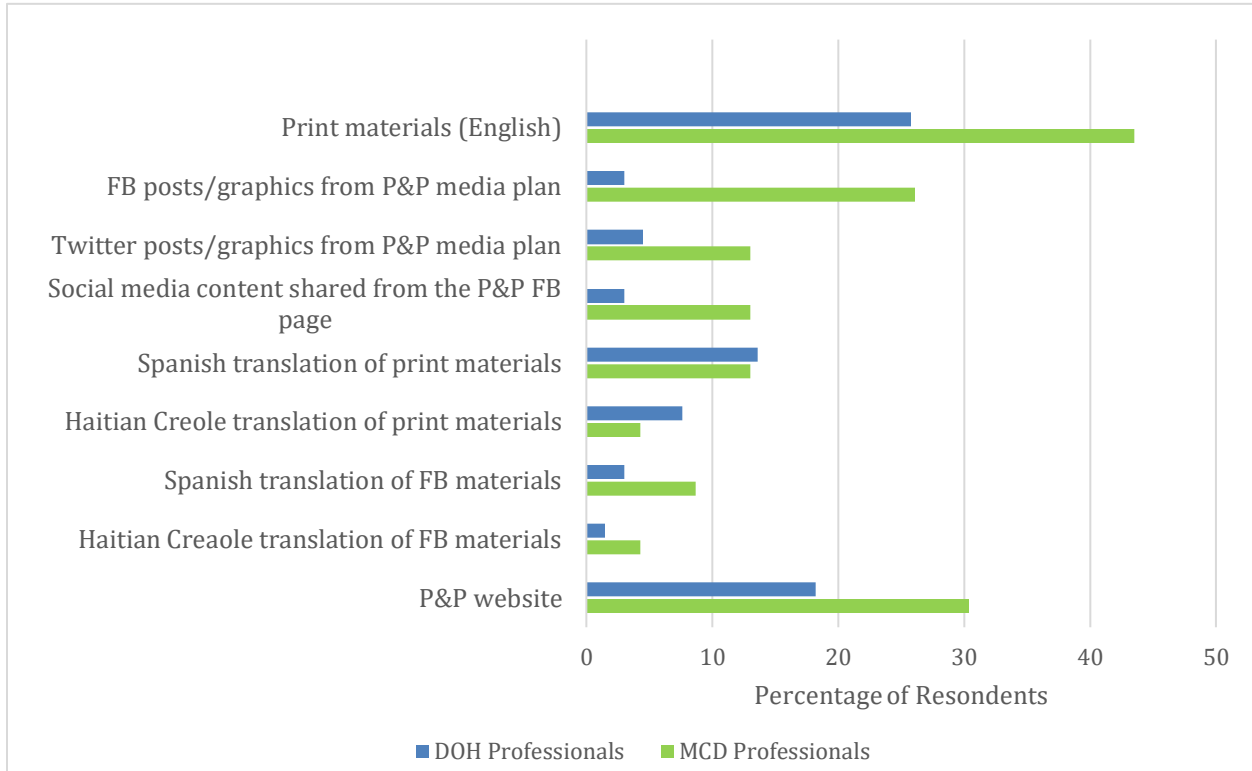
## Respondents Who Had Used the P&P Materials

### Materials Used

Respondents who indicated they had used at least one of the P&P materials were first asked to identify, by checking all that apply, which of the materials/resources they had used. P&P print materials ( $f = 17$ ; 25.8%) and the P&P website ( $f = 12$ ; 18.2%) were the materials used by the largest number of DOH professionals in this study. Similarly, more MCD professionals had used the print materials ( $f = 10$ ; 43.5%) and P&P website ( $f = 7$ ; 30.4%) than the other available P&P resources (see Figure 17).



Figure 17. P&amp;P materials used by DOH and MCD professionals



### Perceived Complexity, Compatibility, and Relative Advantage of P&P Materials

Respondents who had used at least one of the materials were then asked a series of questions to assess their perceptions of the complexity, compatibility, and relative advantage of those materials.

*Complexity* refers to the degree to which an individual perceives an innovation as being difficult to use or understand. The more complex an innovation is perceived to be, the lower the rate of adoption of that innovation. *Compatibility* is the degree to which an individual perceives an innovation as being consistent with his or her values, experiences, and needs. A higher degree of compatibility is associated with higher rates of adoption. *Relative advantage* pertains to the degree to which an innovation is perceived as being better than what is currently being used by the individual. An innovation is more likely to be adopted if it is perceived to be more advantageous than the idea it supersedes (Rogers, 2003).

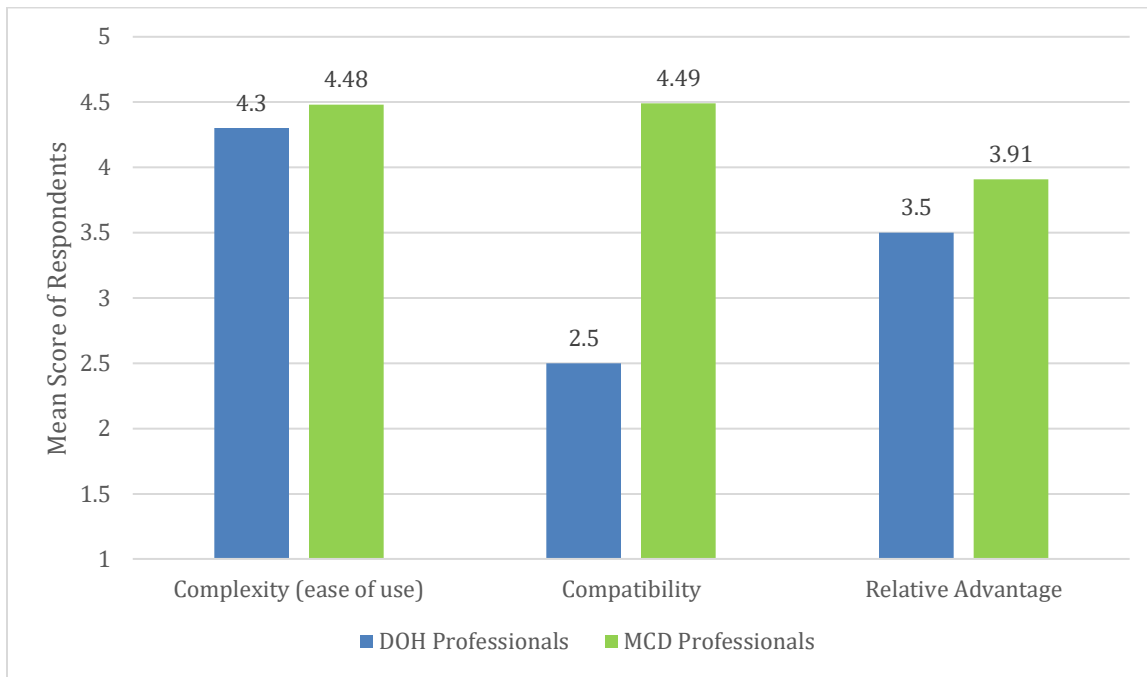
To assess perceived complexity, respondents were asked to rate the P&P materials on a 5-point semantic differential scale between six sets of descriptors (e.g. difficult for me to use/easy for me to use). Compatibility was assessed using the same design with seven sets of descriptors (e.g. do not help me do my job well/help me to my job well) following the single stem: “based on my experience with the materials so far, I believe the Prevent and Protect materials...” Relative advantage was measured using seven sets of bipolar descriptors following the stem: “compared to the communication/education resources I have used or are currently using, the Prevent and Protect materials are ...” Construct means were computed to provide an overall score for perceived complexity ( $\alpha = .92$ ), compatibility ( $\alpha = .94$ ), and relative advantage ( $\alpha = .97$ ).

Overall, DOH professionals perceived the P&P materials as easy to use (i.e. complexity) and relatively advantageous compared to the resources they were currently using. However, DOH respondents did not perceive the P&P materials to be very compatible with their current job practices/activities. MCD respondents perceived the



P&P materials as easy to use, compatible with their current job practices/activities, and relatively more advantageous than the materials they were previously using. Results for each attribute are displayed in Figure 18.

*Figure 18. DOH and MCD professionals' perceived complexity, compatibility, and relative advantage of the P&P materials*



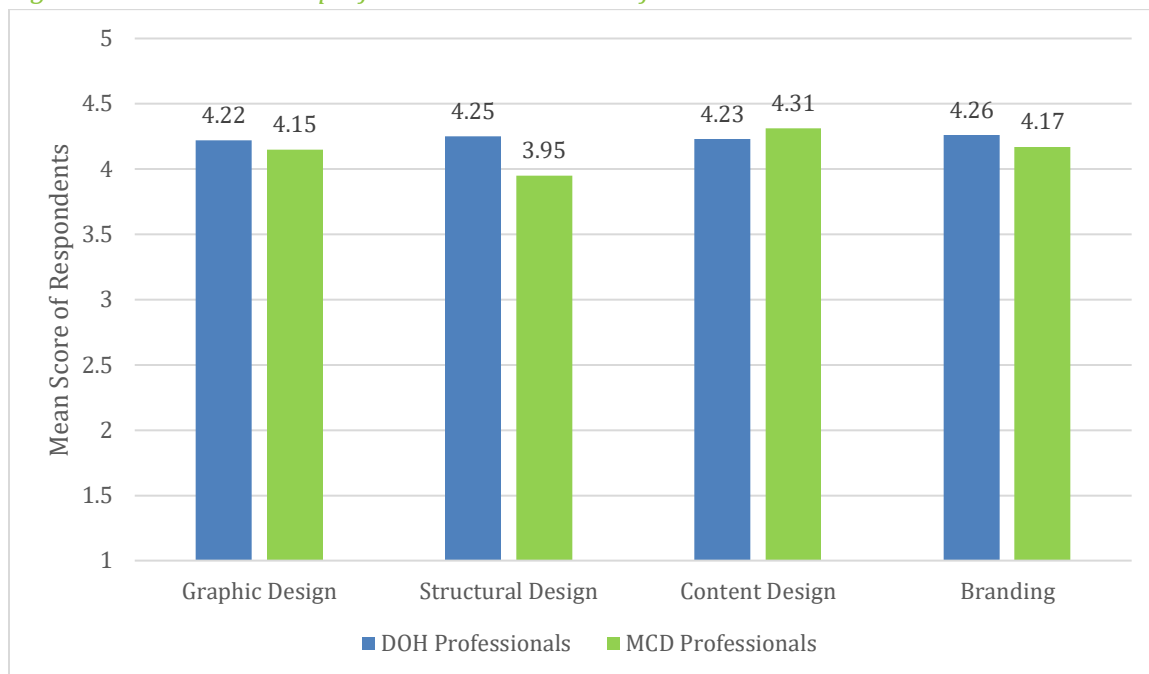
### Evaluation of P&P Website

Lastly, respondents were asked if they would be willing to take a few moments to browse the P&P website ([preventmosquitoes.org](http://preventmosquitoes.org)) and provide feedback. Twenty-nine (43.9%) DOH respondents and 19 (82.6%) MCD respondents provided feedback.

The website attributes examined were organized into four categories: (a) graphic design (e.g. visual appeal, layout, font); (b) structural design (e.g. organization, working links, user friendliness); (c) content design (e.g. usefulness of information, accuracy of information); and (d) branding (e.g. webpage description, trustworthiness of associated persons). Responses for each section were collected using a 5-point semantic differential scale (1 = lowest rating for the characteristic; 5 = highest rating for the characteristic). Construct means were computed to represent the overall score for each category. The website received high marks from both DOH and MCD professionals in each of the four categories (see Figure 19)



Figure 19. DOH and MCD professionals' evaluation of the P&amp;P website



## Conclusions and Recommendations

- P&P print materials should continue to be provided to MCD professionals due to their use of print materials and community events as the primary methods used to communicate information to the public.
- Digital P&P materials should be provided to DOH professionals, who indicated primarily using DOH webpages to communicate with the public.
- As the majority of DOH and MCD professionals had not used the P&P materials, efforts are needed to increase their awareness of and attitudes toward such materials.
- DOH professionals who had used the P&P materials perceived they were easy to use (i.e. complexity) and relatively advantageous compared to the resources they were currently using. However, DOH respondents did not perceive the P&P materials to be very compatible with their current job practices/activities. As such, it is recommended that further investigation be conducted with DOH professionals to better understand their communication needs and identify future edits to the P&P materials that would allow for more compatibility with current practices.
- MCD respondents perceived the P&P materials as easy to use, compatible with their current job practices/activities, and relatively more advantageous than the materials they were previously using. MCD professionals who have used the materials should be identified and encouraged to serve as opinion leaders to help facilitate the adoption of the P&P materials among their colleagues.
- The P&P website received high marks from both DOH and MCD professionals in terms of graphic design, structural design, content design, and branding. As such, it is recommended that the website be shared among MCD and DOH professionals.



## Focus Groups with Florida Public

The methodology, results, and recommendations pertaining to the focus groups conducted with the Florida public are included in the sections below. For a breakdown of identified themes by location, see Appendix A.

### Methods

Focus group data was collected in April through May 2019 from Florida residents in Pensacola, Jacksonville, Orlando, and Miami. Two focus groups were held at each location, for a total of eight groups. Participants were recruited through third-party research firms and were offered a monetary incentive, which yielded a total of 70 participants. The moderator guide utilized in the focus groups was reviewed by a panel of experts consisting of faculty and specialists from the UF/IFAS Department of Agricultural Education and Communication (AEC); Department of Family, Youth, and Community Science; Department of Entomology and Nematology; Florida Department of Agriculture and Consumer Services (FDACS); and the CDC Southeastern Center of Excellence in Vector Borne Diseases. Member checking at the conclusion of each focus group was used to ensure credibility of the findings (Lincoln & Guba, 1985). Data were analyzed using a constant comparison method to develop themes identified in the following section of this report.

### Description of Participants

Recruitment efforts yielded a total of 70 participants. Twelve participants attended the two Pensacola focus groups, 13 attended in Jacksonville, 24 attended in Orlando, and 21 attended in Miami.

#### Age

Participants were asked to identify the age bracket they are included in. Fifty-three percent of the participants fell between the ages of 18 and 34. Forty-six percent of participants were between the ages of 45 and 74 (see Table 11).

#### Education

The participants were asked to identify the highest level of education they have completed. The majority of the participants surveyed had obtained at least a two-year college degree (see Table 11).

#### Race/Ethnicity

Of the 70 participants, only 10 (14%) identified themselves as Hispanic. Regarding race, more participants identified as White ( $f=45$ ; 64.3%) or Black/African American ( $f=19$ ; 27.1%) than any other race. Participants who selected more than one race were regrouped into the multi-racial category (see Table 11).

#### Total Family Income

Next, participants were asked to disclose their total family income for 2018. This income amount should include all sources of income and should be before taxes. Seventy-six percent of the participants made between \$25,000 and \$149,999 (see Table 11).

*Table 11. Demographic characteristics of focus group participants (N = 70)*

Demographic Characteristic	<i>f</i>	%
Age <sup>a 1</sup>		
18-24	7	10.0
25-34	16	22.9
35-44	14	20.0
45-54	11	15.7
55-64	14	20.0



65-74	7	10.0
75+	0	0.0
Education <sup>b 1</sup>		
<12 <sup>th</sup> grade	2	2.0
High school graduate	3	4.3
Some college, no degree	19	27.1
2-year college degree	10	14.3
4-year college degree	26	37.1
Graduate or professional degree	9	12.8
Ethnicity <sup>c 1</sup>		
Hispanic	10	14.0
Non Hispanic	59	84.3
Race <sup>d 1</sup>		
White	45	64.3
Black/African American	19	27.1
Multi-racial	2	2.9
Other	2	2.9
Asian or Pacific Islander	1	1.4
American Indian/Alaska Native	0	0.0
Income <sup>e 2</sup>		
<\$25,000	9	12.9
\$25,000-\$49,999	18	25.7
\$50,000-\$74,999	19	27.1
\$75,000-\$149,999	16	22.9
\$150,000-\$249,999	3	4.3
\$250,000+	3	4.3

<sup>a</sup> Responses missing from 1 participant

<sup>b</sup> Responses missing from 1 participant

<sup>c</sup> Responses missing from 1 participant

<sup>d</sup> Responses missing from 1 participant

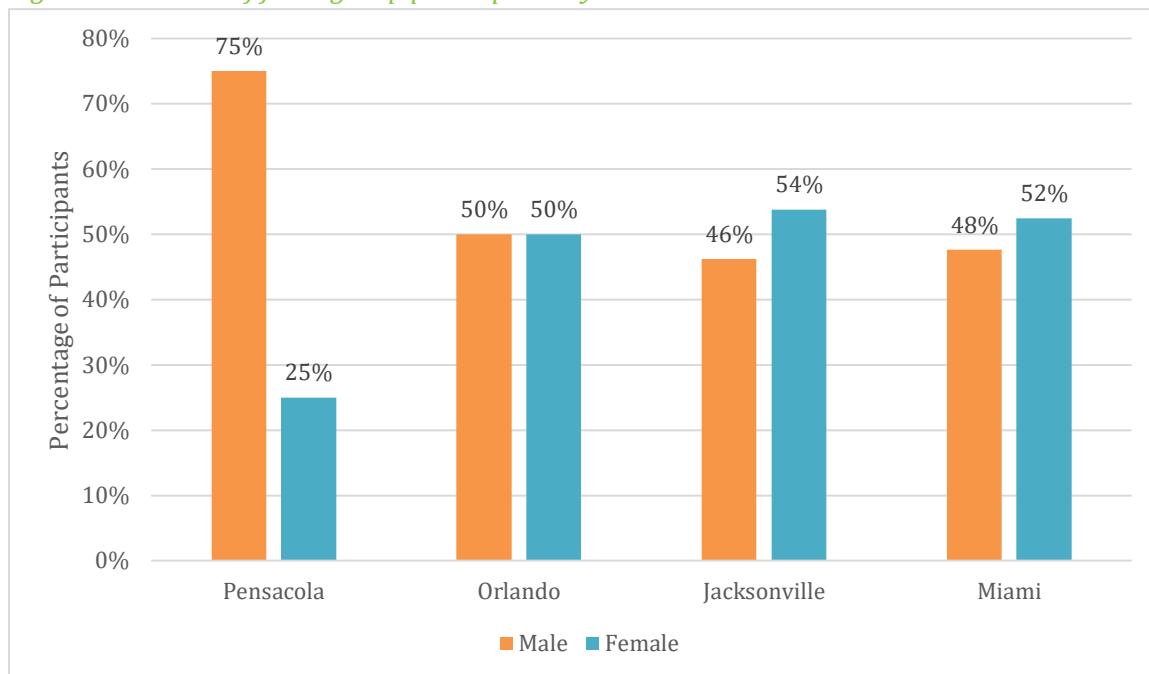
<sup>e</sup> Responses missing from 2 participants

## Gender

Overall, 53% of the participants were male and 47% were female. However, some locations had different gender splits (see Figure 20).



Figure 20. Gender of focus group participants by location



## Results

### Mosquito Knowledge

Focus group participants expressed that they knew little to a moderate amount of information regarding mosquitoes. However, upon asking follow-up questions, several of the groups knew more information than they had originally expressed. Knowledge expressed included factual information regarding mosquitoes, diseases that mosquitoes carried, tips on avoiding mosquitoes, and some misinformation regarding mosquitoes and mosquito control.

### Mosquito Control Knowledge

Overall knowledge of mosquito control was low. Many participants in all eight of the focus groups spoke of seeing mosquito trucks spraying when they were younger growing up in Florida, but quickly stated that they had not seen trucks in many years. They also discussed the lack of notifications letting them know when spraying would happen in their communities. Several participants stated that they had seen treatments in their areas but spoke of its effectiveness because the mosquito population in their communities seemed lower. A minority of participants stated that they had seen mosquito control including using pellets in areas with standing water and that they had searched for information regarding spraying in their area.

The majority of group participants agreed that they support mosquito control in their communities to protect themselves and their pets. These results were in-line with findings from the general public survey where, on average, Florida residents agreed that controlling the mosquito population in Florida is important because it protects Florida residents and their pets from mosquito-borne illnesses.

### Personal Mosquito Control

Discussions regarding mosquito control in their communities quickly led to a discussion of individual methods practiced by participants. Some of the personal methods that were stated include sprays, citronella candles, Skin-So-Soft, emptying and/or treating standing water in yards, wearing long-sleeved clothing, keeping windows and



doors closed, armbands, tiki torches, mosquito nets, and commercial fans and fog machines. These results were similar to the findings from the general public survey where at least half of Florida residents said they practiced mosquito control methods during peak mosquito seasons.

The majority of the focus group participants expressed that some combination of personal mosquito control efforts and mosquito control programs provided by the government would be the most effective way to control the mosquito population in Florida.

### Overall Concerns Regarding Mosquito Control

Overall participants were not very concerned about mosquito control, had not really thought about mosquito control, and most had not actively researched information regarding mosquito control in their communities. Several groups discussed that they knew they could call their county to come out and provide treatment if needed. All eight groups expressed a concern over the chemicals used by mosquito control and the impact the chemicals used may have on humans, animals, environment, and other insects, including the long-term impacts. The groups differed on perceptions of effectiveness with truck versus aerial spraying and stated that they would like to know more information about both efforts. All groups stated they would like to know a schedule of spraying and when it would occur in their area.

### Transmitted Disease Knowledge

Focus group participants were aware that mosquitoes carried diseases and were able to name some of the diseases that they carried including West Nile, Yellow Fever, Malaria, Chikungunya, Encephalitis, Dengue, and heartworms. Interestingly, groups in central and south Florida were quick to mention Zika without being prompted, but groups in north and northwest Florida did not mention Zika immediately and one group did not mention it at all until prompted. One participant stated that he had not heard of Zika. The majority of the participants agreed that mosquito control was needed because mosquitoes do carry these types of diseases. When further discussing diseases that mosquitoes carry, several participants in each of the groups indicated that their interest and concern with mosquitoes and mosquito control would intensify if there was a disease outbreak in their community or if they knew someone that had contracted a disease from a mosquito. These results are similar to the findings from the general public survey where on average Florida residents agreed most that controlling the mosquito populations in Florida is important because it protects Florida residents from mosquito-borne illnesses. Through further prompts, participants indicated that an outbreak in their communities would spur them to search out further information as well. Although the majority of groups did not know that one could have the Zika virus and not show symptoms (south Florida groups were aware), their concern over Zika was low unless they were starting a family or had a loved one who was pregnant.

### Sources of Information about Mosquito Control Topics

When asked where focus group participants would look for information on mosquitoes and mosquito control, all groups answered with Google, local news, and word of mouth. The majority of focus group participants had not actively sought out information regarding mosquitoes or mosquito control. Similarly, findings from the general public survey show the majority of residents in the general public survey rarely or never sought out information about mosquitoes or mosquito control. All groups agreed that education regarding mosquitoes, mosquito control efforts, and the impact of efforts was needed and would increase their confidence. Groups suggested information be disseminated on social media, including Facebook, Twitter, NextDoor App, weather apps, and via phone, e-mail, regular mail, through children's school, stickers, local news, alerts, and text messages. Trusted sources of information included government, medical professionals, and scientists.





### Evaluation of P&P Materials

Overall, most of the groups had a positive opinion of the mosquito control materials created by the PIE Center. Similarly, findings from the general public survey show overall residents had positive attitudes toward the PIE Center mosquito control materials. The majority of focus group participants liked the larger information card due to the heavier card stock and expressed it was easier to read. They liked the infographics, information, and layout of information on both the larger card and the rack cards. They also indicated the materials were informative and useful.

Suggestions for improvement included adding sources of information, a website to go to for more information, adding a QR code, adding Department of Health logo, and adding contact information. Several of the groups also indicated that the cards needed to be designed to indicate danger in order to grab attention such as adding the colors red, black, and yellow.

### Messages

Overall, the groups liked the messages *Fight the Bite* and *Prevent & Protect*. The majority of groups chose *Fight the Bite*.

### Recommendations

- Broadly provide more information on when spraying and control methods are being done within communities. Focus group participants indicated that social media and local news were top for sources of information. Working with local media on broadly publicizing methods may be helpful in making community members aware of efforts.
- Respondents do have an interest in learning more about the spraying and the chemicals used.
- Information should include data, statistics, and facts with sources and where to find additional information. Infographics and general information should be distributed to homes once a year. One recommendation is to provide information before “mosquito season” begins in Florida.
- Suggestions for improvement to materials included adding sources of information, a website to go to for more information, adding a QR code, adding Department of Health logo, and adding contact information. Several of the groups also indicated that the cards needed to be designed to indicate danger in order to grab attention such as adding the colors red, black, and yellow.
  - *\*Note: Website and source information have been added, and additional information regarding aerial spraying has been added to the materials.*



## High School and Middle School Instructional Units

### Methods

An instructional unit on mosquito/mosquito control topics was developed for high school and middle school students by UF faculty, staff, students, and subject matter experts in entomology. A panel of experts consisting of faculty and specialists from the UF/IFAS Department of Agricultural Education and Communication (AEC); Department of Family, Youth, and Community Science; Department of Entomology and Nematology; Florida Department of Agriculture and Consumer Services (FDACS); and the CDC Southeastern Center of Excellence in Vector Borne Diseases reviewed the unit lessons, activities, and assessments for content validity to ensure the unit objectives were met. The final unit consisted of two weeks of lesson plans, pre- and post- knowledge assessments, and pre- and post- attitudinal assessments.

The unit of instruction was provided to UF AEC agricultural education student interns teaching in the Spring 2019 semester. All student interns received instructions and training about implementing the unit in their classrooms. At the end of the two-week instructional period, the student interns submitted the data collected from the pre- and post-unit instruction assessments. After student interns returned to campus, they provided feedback regarding the unit of instruction. Based on their feedback, final edits were made to the unit of instruction. Such edits included slight additions to the content (e.g. further definitions of terms). Only students who completed both pre- and post-assessments were included in the data analysis. Paired samples t-tests were employed to examine differences in students' knowledge and attitudes regarding mosquito control topics. A significance level of  $p = .05$  was established a priori.

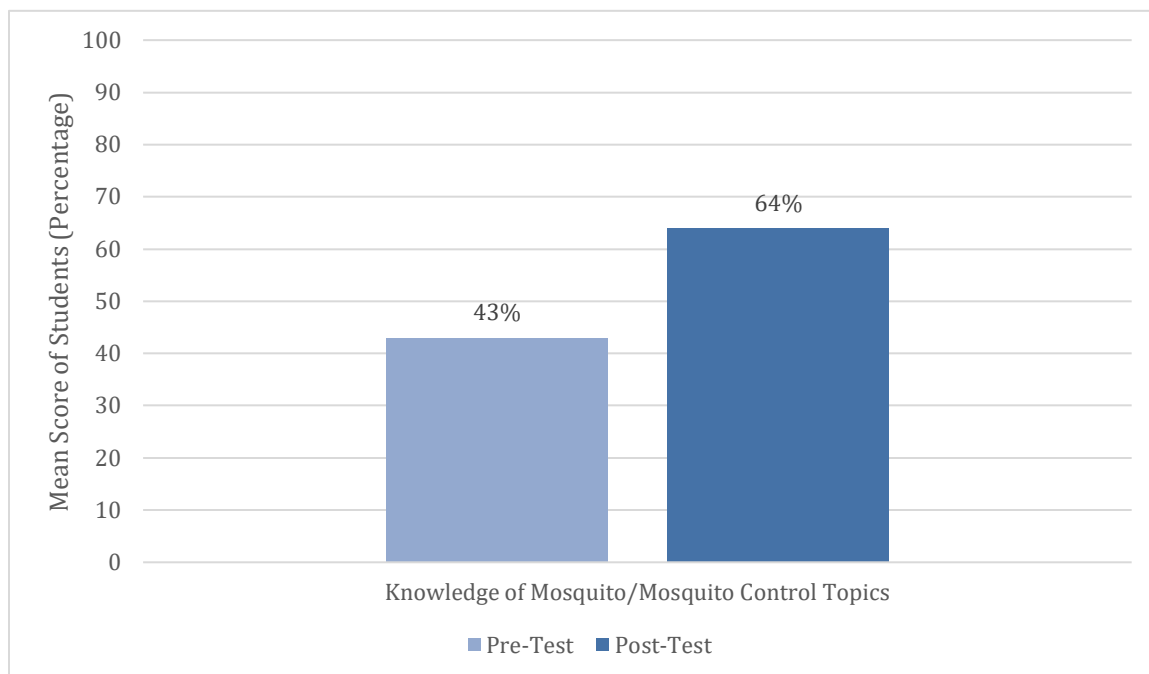
### Results

#### Knowledge Gain

Useable data from the knowledge pre- and post-assessments were collected from 431 high school and middle school students. Comparisons of students' scores revealed significant differences in their knowledge of mosquitoes/mosquito control topics before and after the unit of instruction. Students' demonstrated a higher degree of knowledge on the post-test ( $M = .64$ ;  $SD = .21$ ) than the pretest ( $M = .43$ ;  $SD = .18$ );  $t(431) = -16.71$ ,  $p = .000$  (see Figure 21).



Figure 21. Students' pre- and post-test knowledge scores.



### Attitude Change

Pre- and post-assessments were also conducted to assess students' attitudes toward mosquito control topics before and after the unit of instruction, including (a) their attitudes toward source reduction (i.e. using at home methods of mosquito control), (b) their perceptions of mosquito-borne illnesses, (c) their perceptions of the mosquito control practices used by mosquito control programs in Florida, and (d) their perceived importance of using at-home methods of mosquito control. Useable pre- and post-test data for the attitude assessment was collected from 272 high school and middle school students.

Attitudes toward source reduction was measured using a 5-point semantic differential scale between nine sets of descriptors following a single stem: "my use of at-home methods of mosquito protection and control is..." A mean score was computed to represent their overall attitudes. The pre-test internal reliability estimate for this scale was  $\alpha = .92$ ; the post-test reliability estimate was  $\alpha = .88$ . Students demonstrated slight, but statistically significant differences in their attitudes toward source reduction before ( $M = 3.72$ ;  $SD = 1.23$ ) and after ( $M = 3.90$ ;  $SD = .90$ ) the unit of instruction;  $t(272) = -16.71$ ,  $p = .025$  (see Figure 22).

Students' perceptions of mosquito-borne illnesses were assessed using a 5-point semantic differential scale between eight sets of descriptors (e.g. not dangerous/dangerous) following a single stem: "mosquito-borne illnesses are..." A mean score was computed to represent their overall attitudes. The pre-test internal reliability estimate for this scale was  $\alpha = .90$ ; the post-test reliability estimate was  $\alpha = .83$ . There were no statistically significant differences observed between students' attitudes toward mosquito-borne illnesses before ( $M = 4.02$ ;  $SD = 1.17$ ) and after ( $M = 4.09$ ;  $SD = .90$ ) the unit of instruction;  $t(272) = -1.01$ ,  $p = .321$  (see Figure 22).

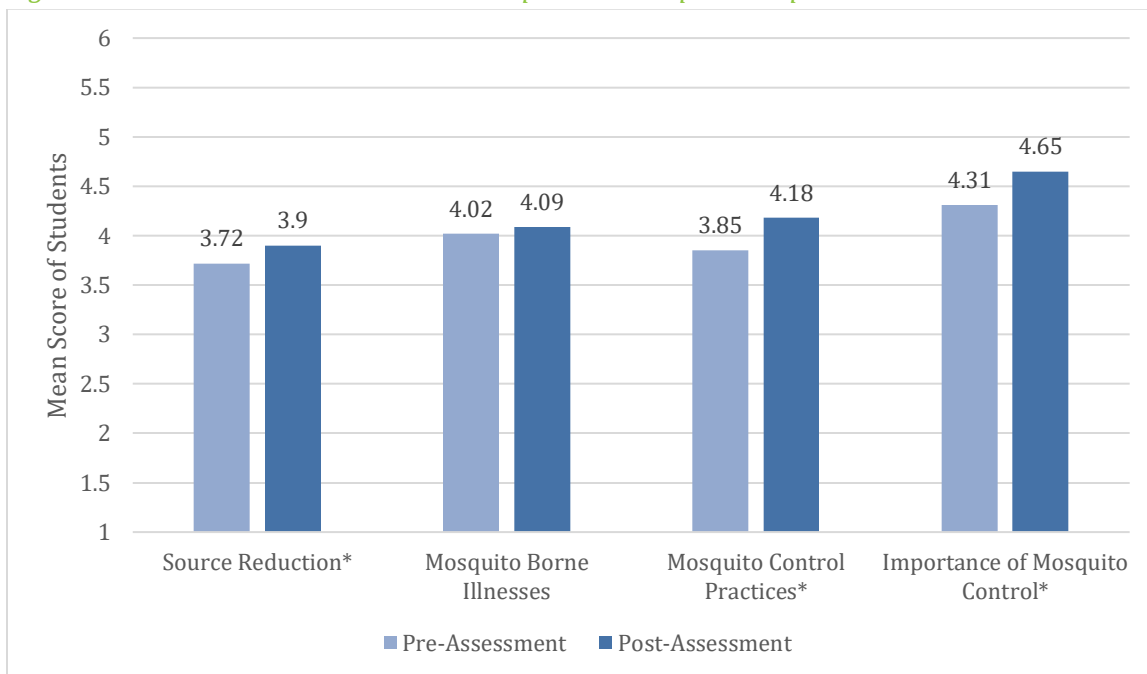
Students' attitudes toward the mosquito control practices used by mosquito control programs were assessed using a 5-point semantic differential scale between nine sets of descriptors (e.g. bad/good, harmful/safe) following a single stem: "mosquito control practices currently used by mosquito control programs in Florida are..." A mean score was computed to represent their overall attitudes toward such practices. The pre-test internal reliability



estimate for this scale was  $\alpha = .94$ ; the post-test reliability estimate was  $\alpha = .96$ . Statistically significant differences were observed between students' attitudes toward mosquito control practices used by mosquito control programs before ( $M = 3.85$ ;  $SD = 1.24$ ) and after ( $M = 4.18$ ;  $SD = 1.33$ ) the unit of instruction;  $t(272) = -3.48, p = .001$  (see Figure 22).

Lastly, students' perceptions of the importance of at-home mosquito control efforts were assessed using four items pertaining to the use such methods (e.g. using at-home methods of mosquito control helps protect my neighbors from mosquito-borne illnesses). Responses were collected using a 6-point Likert-type scale: 1 = *strongly disagree*; 2 = *disagree*; 3 = *slightly disagree*; 4 = *slightly agree*; 5 = *agree*; 6 = *strongly agree*. A composite score was computed to represent their overall perceived importance. The pre- and post-test internal reliability estimates for this scale was  $\alpha = .90$ . Statistically significant differences were observed between students' perceived importance of at-home methods of mosquito control before ( $M = 4.31$ ;  $SD = 1.52$ ) and after ( $M = 4.65$ ;  $SD = 1.34$ ) the unit of instruction;  $t(272) = -3.30, p = .001$  (see Figure 22).

Figure 22. Students' attitudes toward mosquito control pre- and post-instruction



Note. \* = significant at  $p < .05$

## Conclusions and Recommendations

- Following the unit of instruction, students demonstrated significant gains in knowledge about mosquito control topics, as well as more positive attitudes toward the topic. As such, it is recommended that this curriculum be used in agriculture and science courses alike.
- It is recommended that teachers create additional activities for their students to engage in based on their specific students' cognitive abilities and interests in the subject matter.
- As with any "pick up and use" curriculum, it is recommended that teachers adapt any and all materials for their specific learning objectives and strategies.



- Lesson plans should be further reviewed, further explanations of terminology should be provided, and efforts should be made to ensure the instructor/teacher knows how to pronounce correctly the scientific names/language.
- Pre- and post-tests should be graded and incorporated into the students' grades for class to help ensure that the students/learners apply themselves when answering the assessments. It could also be noted that a teacher could utilize data-driven-decision making for instruction and use gain scores in place of the formative assessment alone.
- As is always good practice, the PowerPoints that are provided should be reviewed prior to instruction. There is a possibility to utilize handouts and the PowerPoints act as an instructional guide for the instructor/teacher, provided that the instructor utilizes handouts as guided notes with students/learners.
- Lastly, due to the length of the individual lesson plans, it is recommended that teachers using this curriculum plan enough time accordingly.



## Electronic Field Trips

In partnership with the Streaming Science project ([streamingscience.com](http://streamingscience.com)), UF faculty and graduate students on the grant created and conducted the “Scientist Online: The Science of Mosquitoes” program. The methods, results, and recommendations pertaining to this component of the project are included in the following sections.

### Methods

A partnership with Skype in the Classroom was secured to use the platform for advertising, registering, and connecting with PK-12 schools across the country. As part of the initial phases of the program development, new Streaming Science and Skype in the Classroom pages, social media, and teacher emails were created and promoted to advertise the program, recruit, and register teachers. Materials created and resources used to promote the program included the following:

- Social media posts on the new Streaming Science Facebook and Twitter pages (see Appendix B)
- A promotional video created by UF students ([Link to promotional video](#))
- Media coverage on the IFAS/College of Agriculture and Life Science blog ([Link to IFAS/CALS blog](#)) and WUWF ([Link to WUWF coverage](#))
- Streaming Science informational site ([Link to Streaming Science informational site](#))
- Skype in the Classroom registration site ([Link to Skype in the Classroom registration](#))

In April 2019, the UF faculty and graduate student team streamed a live, interactive electronic field trip (EFT) via Skype to one classroom in Canada, two classrooms in Pennsylvania, one classroom in Florida, and one men’s boarding school in Pakistan. The EFTs featured UF entomologists Dr. Andrea Lucky, Casey Parker, and Rachel Atchison dialoguing in real-time with the elementary to high school-aged students. Four primary learning components were included in the EFT: (1) an introduction to mosquitoes; (2) the mosquito life cycle; (3) mosquito-borne illnesses prevention and protection; and (4) career in entomology.

The research team assessed the EFT by conducting student and teacher post-surveys (see Appendix C), as well as interviews with the participating scientists about their experiences.

### Results

Overall, the participating students appreciated viewing research labs, interacting with scientists in real-time, and viewing visual examples and models of concepts taught. Students expressed their interests in science and asked the entomologists many detailed questions about mosquitoes and their research. Preliminary anecdotal feedback from the teachers is that their students had positive attitudes toward the program and enjoyed the live dialogue with entomologists. Preliminary analysis of student post-surveys shows most students found the topic interesting and agreed the scientists did a good job communicating with them. Additionally, students listed the top three concepts they learned from the program, and the majority of the students’ lists included mentions of the mosquito life cycle, that some mosquitoes are deadly, and prevention methods such as, “You can wear long sleeve shirts to prevent mosquitoes biting you.”

### Recommendations & Future Plans

Researchers will continue to transcribe and analyze the data this fall to be submitted for presentation at the Association of Communication Excellence (ACE) conference next year, as well as for publication in the Journal of Science Education and Technology. Based on the data and observation thus far, the following conclusions and recommendations have been made:



- Skype in the Classroom is a viable and effective platform for real-time dialogue and engagement.
- Scheduling with international schools provides time zone challenges and requires specific email/phone contact with teachers outside of the Skype registration system and should be considered in future programs.
- Scientists should be prepared to communicate their research at varying levels, as a variety of ages and groups connect via Skype



## Content Analysis of Mosquito Control Programs' Websites/pages and Facebook Sites

### Methods

Content analysis is a research method used to quantify qualitative data related to a particular topic published online. This method was employed to assess the current content used on Florida mosquito control programs' websites, web pages, and Facebook pages.

A list of Florida mosquito control programs was obtained in January 2019 from the Florida Mosquito Control Association. The list was entered into Excel and included the name of the program, the county associated with the program, and the web address provided by the Florida Mosquito Control Association. A Google search was also conducted to ensure the inclusion of all websites or webpages associated with the programs. The original list consisted of 71 mosquito control programs; however, only 53 programs were included in the final population. Eighteen programs were eliminated from the study because they did not have a website or web page. A Facebook search was also conducted on all 71 mosquito control programs, and only 13 programs had Facebook accounts that were associated with the program name.

Researchers analyzed the websites, web pages, and Facebook pages using a set of two different coding sheets created based on previous content analysis studies of agricultural and natural resources-related content (Rumble, Settle, & Irani, 2012; McLeod, McKee, Woodall, McKee, & Rumble, 2018). The coding sheets were used to guide the researchers through the analysis and decision-making process. The coding sheet used to analyze the websites and webpages consisted of questions related to name of the program, modification dates, social media, photo characterization, media types, call to action, and pre-determined frames. The pre-determined frames included fear, personal benefits, community benefits, prevention, economy, and nuisance. The coding sheet used to analyze the Facebook pages consisted of questions related to name of the program, number of likes, contact information, modification dates, external links, and media types. A code book was developed to define the coding protocol and assist the researchers in making consistent decisions. Qualtrics was used to input the coding sheets.

The two coders established inter-coder reliability through protocol training. Inter-coder reliability is important, because it ensures that the coders are consistent in their decision making and improves the accuracy of the data collected. Two coders underwent training on the coding protocol that had been established for the study. Coders coded 20% (n=10) of the project sample. To ensure coding consistency, the reliability score was calculated. A desirable reliability score is typically .80 (Riffe et al., 2005). The two coders achieved an inter-coder reliability score of .94. Coders then divided the remainder of the sample and proceeded to code the information. This part of the process was completed within two weeks. After the coding was completed, the data was analyzed using SPSS.

### Results

#### Websites and Pages Analyses

Fifty-three mosquito control programs were included in this study; 38 programs had web pages located on other websites, such as county or city websites, and 15 programs had websites. The URL extension was also analyzed to determine what extensions were used most often. Of the 53 websites and pages included in this study, 18 included .org, 13 included .gov, 12 included .com, six included .net, and four included .us.





To determine current information on the mosquito control program websites and pages used in this study, the last recorded date the content was modified was coded. Only 15 websites or pages displayed a modification date. Of those 15 websites or webpages, eight were modified within the past week.

Coders also determined if the websites or pages provided contact information. Of the 53 websites or pages included in this study, 50 provided contact information. Only 19 websites or pages included an up-to-date spray schedule. To be considered “up-to-date,” the schedule needed to be present/upcoming. The websites and pages were also analyzed for educational and information resources shared by the mosquito control program. Of the 53 websites or pages analyzed, 47 included educational or information resources pertaining to mosquito-related topics.

The types of media used on the landing page of the website or the web page were also analyzed. Of the 53 websites and pages, 42 included photos, 21 included videos, 11 included PDFs, nine included a picture slideshow, four included a link to a mobile app, and one included audio.

The websites and pages were coded to determine what calls to action were present. A call to action encourages audiences to do something, usually related to a specific mission. Websites and pages could include more than one call to action. There were 27 website and pages that included a call to action related to prevention or protection and 23 that included a call to action related to contacting the mosquito control program. Only seven websites or pages included a call to action related to downloading an app or interacting with the program on social media and two that included a call to action related to providing feedback to the program.

Coders also analyzed the frames that were present among the websites and pages included in this study. Websites and pages could include more than one frame. There were 48 websites and pages that included the prevention frame, 34 that included the fear frame, 33 that included the community benefits frame, 25 that included the nuisance frame, seven that included the personal benefits frame, and six that included the economic frame.

Websites and webpages were coded to determine if social media links were present and, if so, which ones. Of the 52 websites and pages, 11 included links to at least one social media page. Of those 11 social media links, 11 linked to Facebook, seven linked to Twitter, six included an RSS feed, one linked to YouTube, and one linked to Google+.

### Facebook Analysis

A separate content analysis was conducted on all Facebook pages associated with local Florida mosquito programs. A Facebook search of all the programs included in the original list of 71 mosquito control programs was conducted to determine 13 Florida mosquito control programs had Facebook pages. The amount of Likes each Facebook page had ranged from eight to 6,240 with the average number of Likes being 1,301. All 13 Facebook pages included contact information for the mosquito control program and linked to the program’s website or page.

The Facebook pages were also analyzed to determine how often content was being updated. Of the 13 Facebook pages, 7 were updated within the past week, 2 were updated within the past month, 1 was updated in the past 6 months, 2 were updated in the past year, and 1 was updated over a year ago.

Of the 13 Facebook pages, 11 included information or educational resources or linked to other resources. Resources used on the Facebook pages included materials from the Department of Health, the Centers for Disease Control, *Prevent & Protect*, World Health Organization, Institute of Food and Agricultural Sciences, and various local and national news outlets.



Media used on the Facebook pages were also analyzed. Of the 13 Facebook pages, 13 included photos, 12 included graphics, nine included videos, eight included events, seven included only text, three included polls, and two included graphical interchange format images (or GIFs). None of the Facebook pages included podcasts or webinars.

## Recommendations

- Based on the findings, it is recommended that mosquito control programs in Florida improve their web and social media presence.
  - Mosquito control programs could start by creating independent websites for their programs, which would grant each program more control over the information they have available. This could allow them more opportunities to communicate with and educate the public about mosquitoes.
- Florida's mosquito programs should also make an effort to have an up-to-date spray schedule available for their community. This recommendation is supported by the findings from the focus groups conducted with the Florida public, during which participants expressed the desire for such information. Having an available up-to-date spray schedule will allow residents in the community to be prepared, and allow them a chance to reach out to their local mosquito control program to have their questions about treatments answered.
- Most websites and webpages examined in this study did not link to their social media. Linking to social media may yield more traffic on programs' social media pages and, therefore, help boost mosquito awareness.
- With only 18% of mosquito control programs having a presence on Facebook, it is recommended that online and in-person trainings be created to help demonstrate to mosquito control program communicators the usefulness and effectiveness of social media. This may also provide the opportunity to inform mosquito control programs of the free P&P resources, which they can use on websites, webpages, and social media.
- Future research should seek to delve deeper into the resources that mosquito control programs are promoting on their websites and webpages. This would allow an opportunity to promote trustworthy and accurate sources of information, such as those in the P&P campaign.
- Future research should also analyze mosquito control programs' content and use of other popular media channels, such as Twitter, Instagram, and YouTube. Having access to mosquito control programs' web and social media demographics and analytics would create future research opportunities.



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## Appendix A: Thematic Breakdown of Focus Groups by Location

	Orlando	Jacksonville	Pensacola	Miami
<b>Themes</b>				
<b>Mosquito Knowledge</b>				
Only one sex bites	X	X		X
UF created love bugs to counteract	X	X		X
FSU love bugs to counteract			X	
Worse in summer	X			
Worse after rains	X		X	
Know they breed in standing water	X	X	X	X
Carry disease	X	X	X	X
Heartworms in pets are carried by mosquitos	X	X	X	
<b>Mosquito Control Knowledge</b>				
Remember "trucks" from when younger	X	X	X	X
Want notifications of spraying	X	X	X	X
Do not have a problem in county			X	
Truck spraying preferred over aerial spraying		X	X	
Both spraying methods preferred for differing circumstances	X		X	X
Unaware of current methods	X	X	X	X
Counties have their own programs	X		X	
Spray in the middle of the night	X		X	
Have not seen mosquito control in their area	X	X		
Genetic modification has been used for control methods	X	X		
Bats are a natural predator	X	X	X	
Treating water		X	X	X
Government responsible for mosquito control	X		X	X
Mosquito control programs should educate	X	X	X	X
<b>Personal Mosquito Control</b>				
Would prefer own methods over mosquito control efforts		X		
Use sprays/repellents, wrist bands, foggers	X	X	X	X
Use Citronella	X	X	X	X
Dumping standing water	X	X	X	
Use Protective clothing	X	X	X	X



Keeping doors closed	X		X	X
<b>Overall Concerns about Mosquitos and Mosquito Control</b>				
Very little concern		X	X	
Would like to know impacts of chemicals being sprayed	X	X	X	X
Perceive a negative impact of chemicals being sprayed		X	X	
More concern if there is an outbreak	X	X	X	
More concerned after a hurricane	X		X	
There is a community health costs to not having control methods	X	X	X	
There is a quality of life costs to not having control methods	X	X	X	X
There was an economic cost to not having control methods	X	X	X	X
Concern is local mosquito control could protect entire county	X			
Support for mosquito control efforts	X	X	X	X
Takes both individual & governmental efforts to control	X	X	X	X
There is a need for more sustainable efforts (i.e. bat houses)	X	X	X	
More reputable research is needed re: effects of mosquito control efforts	X			X
<b>Transmitted Disease Knowledge</b>				
Aware of Zika	X	X	X	X
Aware of West Nile	X	X	X	X
Aware of other diseases	X	X	X	X
Greater concern if outbreak in area		X	X	
Concern for children & older adults being bitten	X			X
Worry about Zika if pregnant or pregnant loved one	X		X	
Did not know individuals could be Zika carriers	X	X	X	
Concern on the effects of tourism	X		X	X
<b>Sources of Information for Mosquito Control Information</b>				
Social media (FB, NextDoor, Twitter)	X	X	X	X
Local media (television, radio, newspapers, billboards, 311)	X	X	X	X
Word of mouth	X	X	X	X
Medical community	X	X		X



CDC			X	
DOH	X	X	X	
Have not actively sought out information	X	X	X	
Neighborhood Association	X		X	
County Extension				
PSAs			X	
Google	X	X	X	X
E-mail	X		X	X
Kids' schools	X	X	X	X
Mailings (electric bill, etc.)	X	X	X	
Text messages	X	X		X
Stickers/Flyers on doors	X	X		X
Homeowners Association		X	X	
Would like to know more information	X	X	X	X
Trust information from government	X	X		X
Trust information from scientist	X	X	X	X
Did not trust pest control services	X	X	X	X
<b>Mosquito Control Materials</b>				
Prefer large format vs. rack cards	X	X	X	X
Prefer rack cards vs. large format	X		X	
Like the layout	X	X	X	X
Piece was informative	X	X	X	X
Wanted more info. re chemicals section		X		
Trusted information due to sources on documents	X	X	X	
Would like a web page and/or QR code to go to for more information	X	X	X	X
Would like to have a downloadable format	X			X
Would use the information	X	X	X	X
Would like a local logo (i.e.- county)		X		X
Would like more information including data & statistics	X			X
Add a FAQ to document				X
Change colors to something that indicated more urgency		X	X	X
<b>Messages</b>				
Fight the Bite	X	X	X	X
Prevent & Protect	X	X	X	X

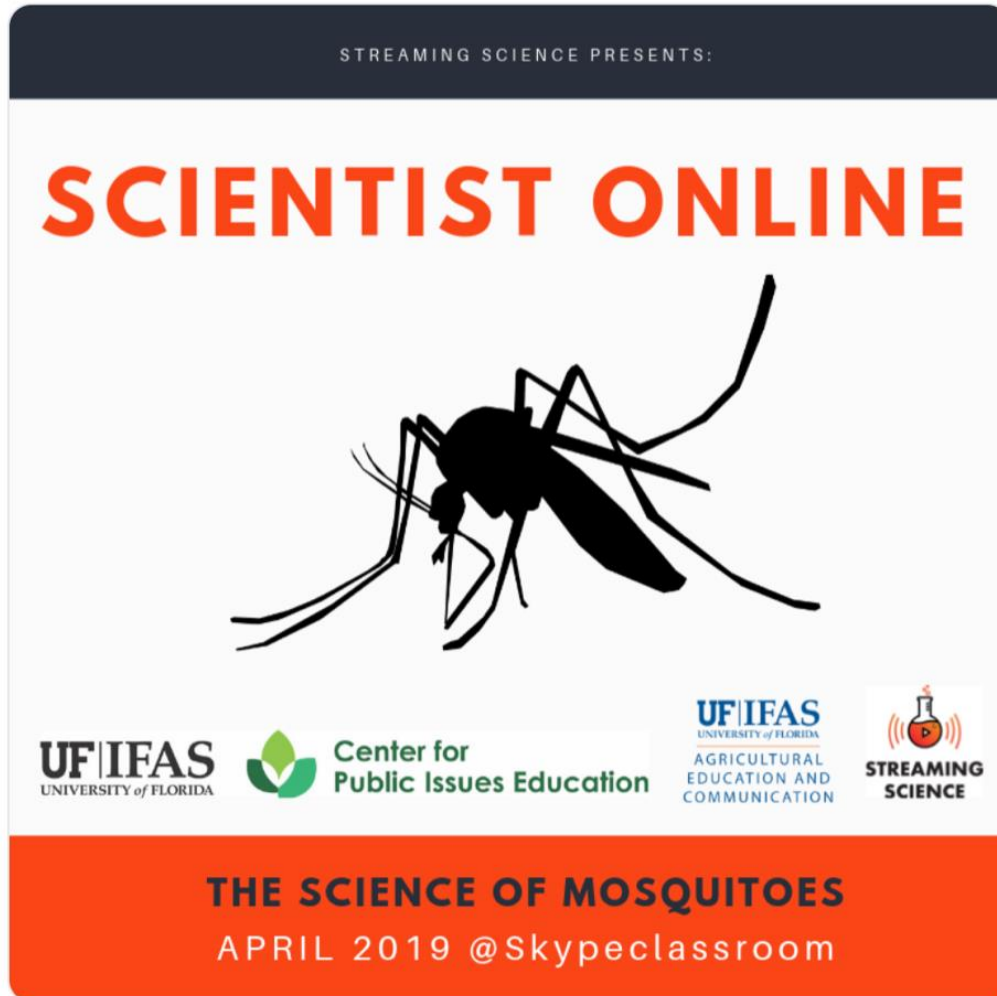


## Appendix B: Electronic Fieldtrip Recruitment Materials



**Streaming Science** @Streaming\_Sci · Mar 6

BIG NEWS: We're starting a new interactive video call series in April! Register your class now for 'Scientist Online: The Science of Mosquitoes'. Connect w/ @UFEntomology scientists studying mosquito-borne illnesses: [education.microsoft.com/ssmosquitoes](http://education.microsoft.com/ssmosquitoes) @PIECenter @UFAEC @SkypeClassroom



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**Streaming Science** @Streaming\_Sci · Apr 11



Spread the word! We have openings and need more schools to participate in our The Science of Mosquitoes @SkypeClassroom program Monday 1pm & 2pm EST and Wednesday 2pm EST! Let us know if you're interested. @EducationFL, @AlachuaSchools, @FLVS, @UF\_IFAS, @PIECenter #scicomm







## Streaming Science



Published by Jamie Loizzo [?] · March 19 · 🌐

We're three weeks away from our first 'Scientist Online: The Science of Mosquitoes' interactive Skype call! Meet one of the participating [UF Entomology & Nematology](#) graduate students in this preview video. Make sure to sign up for one of our April programs at: <https://education.microsoft.com/ssmosquitoes>

Video produced by AEC graduate students [Christine Krebs](#), [Teresa Suits](#), and [Kevin Kent](#).

[UF IFAS Center for Public Issues Education](#)  
[UF Department of Agricultural Education and Communication](#)  
[UF IFAS Solutions](#)  
[UF College of Agricultural and Life Sciences](#)  
[Skype in the classroom](#)  
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YOUTUBE.COM

### Science of Mosquitoes

Introduce your students to a University of Florida entomologist and graduate students investigating mosquitoes and mosquito-borne illnesses.



**1,862**

People Reached

**178**

Engagements

[Boost Post](#)



Christine Krebs, Morgan Vance and 4 others

11 Shares



## Appendix C: EFT Student Survey

**STREAMING SCIENCE**

SCIENTIST ONLINE: THE SCIENCE OF MOSQUITOES - STUDENT SURVEY



School Name

Grade Level

Please share your thoughts on 'The Science of Mosquitoes' Skype in the Classroom call:

<i>I thought...</i>	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The topic was interesting.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The scientist was interesting.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The scientist talked about something I did not already know.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The scientist communicated at a level that I understood.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The scientist did a good job answering questions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The scientist gave an interesting demonstration to explain mosquito research.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The scientist was knowledgeable about the topic.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is important that we learn about mosquitoes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is important to learn about mosquito-borne illnesses.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I learned about careers in Entomology from the scientist.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like entomology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The program was easy to see.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The program was easy to hear.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would recommend this program to other classes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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**Please write short answers for each of the following questions:**

■ What are the top three things you learned from the program?

1

2

3

■ Where do mosquitoes live?

■ What are two actions you can do to protect yourself from mosquito-borne illness?

■ What did you find the MOST interesting about the scientist's presentation and why?

■ What did you find the LEAST interesting about the scientist's presentation and why?

■ What could have been improved about the scientist's presentation?



**For each topic in the left half of the table, rank your knowledge BEFORE the program. For each topic in the right half of the table, rank your knowledge NOW, AFTER the program.**

	My knowledge BEFORE 'The Science of Mosquitoes'				My knowledge NOW, AFTER 'The Science of Mosquitoes'			
	None	Low	Medium	High	None	Low	Medium	High
Mosquitoes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mosquito life cycle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mosquito-borne illnesses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mosquito-borne illness prevention and protection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Entomology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Entomology careers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Please select what you intend to do as a result of "The Science of Mosquitoes" Skype call program:**

<i>I intend to...</i>	Yes	Maybe	No	Already doing it	Not applicable
Share my knowledge about mosquitoes with others.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apply the knowledge I learned to prevent the growth of mosquitoes in my community.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apply the knowledge I learned to protect myself from mosquito bites.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Learn more about entomology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Learn more about entomology careers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

