



Greater Los Angeles County Vector Control and Public Health Community Engagement

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Executive Summary

Context and Background

Although large-scale, sustained outbreaks of Zika have not yet occurred in the United States, transmission is widespread and ongoing throughout much of Latin America and the Caribbean. Limited local transmission has occurred in Southern Florida and Texas. Conditions that increase the risk of local transmission include introduction of the Zika virus by infected travelers arriving from a country experiencing an outbreak and the local presence of *Aedes* mosquitoes that can spread the infection.

Based on the large numbers of travelers from affected countries and the widespread presence of *Aedes* mosquitoes, Los Angeles County was identified by the Centers for Disease Control and Prevention (CDC) as one of the seven jurisdictions in the country most likely to experience a local Zika outbreak. The risk of a local Zika outbreak in Los Angeles County underscores the importance of effective vector control before and during an outbreak.

Vector control strategies differ in effectiveness, cost, timeliness, and acceptability. Aerial adulticide application (i.e., pesticide to kill adult mosquitoes) has seldom been used in the region due to cost and public concerns. Preferred methods such as “dumping and draining” standing water to reduce mosquito breeding requires action by an entire community and is not rapid enough to be used for outbreak response. New technologies are in development to help reduce mosquito breeding and vector-borne illnesses. However, the new technologies are not currently available to local agencies, and other barriers need to be overcome prior to their implementation. As communities face the Zika threat, local agencies must work with residents to prevent future outbreaks and have a feasible and effective strategy available if an outbreak occurs in the near future.

Workshop Objectives and Participants

In December 2016, the Los Angeles County Department of Public Health, Greater Los Angeles County Vector Control District, and San Gabriel Valley Mosquito and Vector Control District, in coordination with the Keystone Policy Center (Keystone), convened five community workshops to inform policy about mosquito control in Los Angeles County. The process focused on informing Los Angeles County’s strategy, investment, and communications for vector control, public health, and preparedness. Workshop objectives included:

- To gather information about community preferences, values, and concerns associated with various mosquito control techniques;
- To gain a greater understanding of community values, motivations, barriers, and decision-making processes that drive individual behavior changes related to mosquito control and exposure; and
- To learn what information about Zika virus infection and mosquito control is needed at the community level, and how this information can best be delivered and disseminated.

Key Findings and Recommendations

Overall, 177 people participated across the five workshops. Participants described a need for more information on Zika risks and illness, mosquito control, and protective behaviors. Once educated, most participants reported intending to “dump and drain” standing water, but were skeptical that neighbors would do so. Concern about pesticide exposure was widespread. In the context of a local Zika outbreak, given the risk of severe birth defects, most participants would accept aerial application to control the outbreak if provided sufficient information and advanced notice when applications would occur. In electronic polling, protecting babies from birth defects and preventing pesticide exposure were considered “very important” by more than 80 percent of participants. When asked whether preventing birth defects or preventing pesticide exposure would be more important during a local Zika outbreak, 58 percent of participants identified preventing birth defects and 42 percent identified

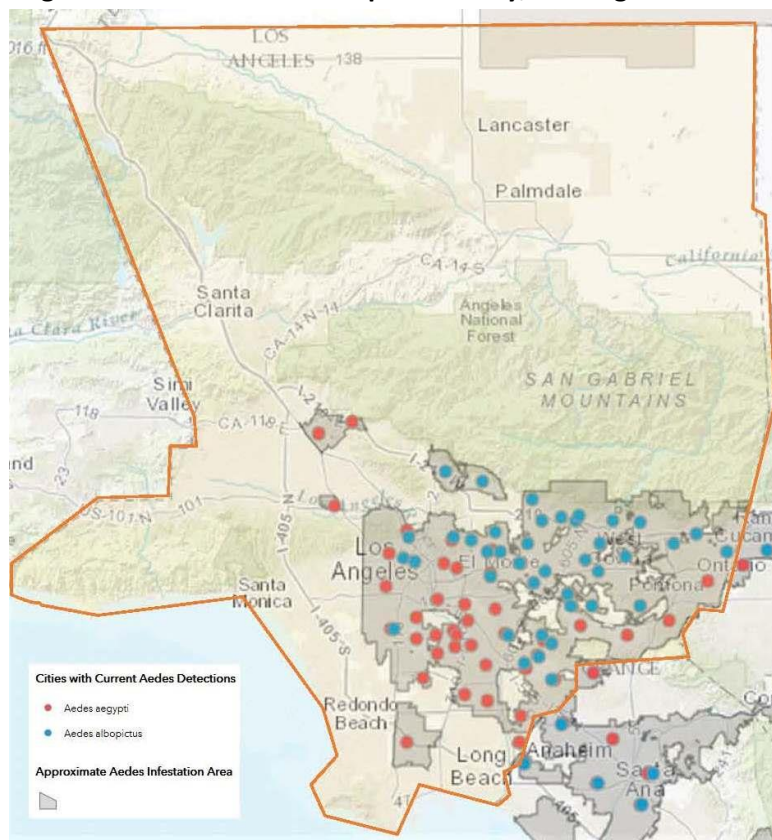
preventing pesticide exposure. (By meeting, the median proportion who valued preventing birth defects over preventing pesticide exposure during a local outbreak was 67 percent.) People also widely support the use of new technologies to reduce the spread of *Aedes* mosquitoes, particularly the release of *Wolbachia*-infected sterile male mosquitoes; County support, including funding to further study this approach and disseminate information about it, would be important if this strategy is to be viable.

Background and Process Context

Zika virus is transmitted from person to person by *Aedes* species mosquitoes that acquire the virus by biting an infected person and then transmit the virus when they bite someone else. Whereas most Zika infections are clinically mild or asymptomatic, if a pregnant woman is infected, her fetus can also become infected, resulting in severe brain abnormalities, microcephaly (a small head circumference), vision and hearing loss, and other defects. Current data from the CDC's Zika pregnancy registry suggests that birth defects occurred in 5 percent of Zika affected pregnancies and in 15 percent when the mother was confirmed to have acquired infection during the first trimester.¹ In addition, severe consequences such as Guillain-Barre syndrome (a type of paralysis), hemorrhage, and death can occur, though rarely, with infection of non-pregnant persons.

Although large-scale, sustained outbreaks of Zika have not yet occurred in the United States, transmission is widespread and ongoing throughout much of Latin America and the Caribbean. Local transmission has occurred in Southern Florida and Texas. Conditions that increase the risk of local transmission include introduction of the Zika virus by infected travelers arriving from a country experiencing an outbreak and the local presence of *Aedes* mosquitoes that can spread the infection. Based on the large numbers of travelers from affected countries and the widespread presence of *Aedes* mosquitoes, Los Angeles County has been identified by the CDC as one of the seven jurisdictions in the country most likely to experience a local Zika outbreak.

Figure 1: Area of *Aedes* mosquito activity, Los Angeles Co.



Limiting the distribution and density of *Aedes* mosquitoes is critical to reducing the risk of a local Zika outbreak or to control a local outbreak once it occurs. Since *Aedes albopictus* was introduced into the County in 2011 and *Aedes aegypti* in 2014, both species have spread despite vector control efforts. Currently, *Aedes* mosquitoes are widespread throughout the San Gabriel Valley and the Southeast part of the county, and based on new locations from which these mosquitoes were identified in 2016, their range appears to be spreading (Figure 1). Still, there also are many parts of Los Angeles County that are not infested, emphasizing the importance of continued rigorous control efforts.

The mainstays of mosquito control are reducing sites where mosquitoes can develop and killing mosquito larvae and adults. Since *Aedes* mosquitoes lay their eggs on the surface of plants or containers that hold standing water, eliminating these container sources is a key preventive measure. The effectiveness of this approach depends on the

efforts of everyone in the county to “dump and drain” — emptying and getting rid of containers that may hold

¹ Reynolds MR, Jones AM, Petersen EE. Vital Signs: update on Zika virus-associated birth defects and evaluation of all U.S. infants with congenital Zika virus exposure — U.S. Zika pregnancy registry, 2016. *Morbidity and Mortality Weekly Report* 2017; 66.

water. While this approach can be very effective, success depends on how widely people in each community comply.

Once the eggs hatch, control is achieved through applying pesticides to kill larvae (“larvicide”) and adult mosquitoes (“adulticide”). EPA-approved pesticides are used. They have been shown to have minimal impacts on human and animal health based on the very low doses that are applied, target-specific modes of action, and the rapidity with which they break down in the environment. In the near future, new technologies also may add to the mosquito control armamentarium. Studies, including one in Los Angeles County, show that releasing sterile male mosquitoes reduces populations of *Aedes* mosquitoes because the eggs of wild female mosquitoes that mate with sterile males never hatch. Further large-scale studies are needed to assess the potential value of this approach.

Pesticides are applied in low volume or ultra-low volume quantities using handheld or, less often, truck mounted equipment. When more widespread control is needed or when the urgency of control is greater, such as during a local Zika outbreak, aerial applications of adulticides can be used in combination with larvicides to immediately reduce the risk of transmission by the existing population of adult mosquitoes and emergence of additional adults. During the Florida Zika outbreak, aerial applications were critical to eliminating local transmission in some areas. However, the prospect of aerial applications and the fear of exposure to pesticides can incite public concern and vocal opposition, which at times has blocked its use. Puerto Rico has not applied pesticides by air, despite thousands of locally acquired Zika cases. Aerial use in Florida was later and more limited than was optimal to control the outbreak. In Southern California, there was opposition to aerial applications of pesticides during the “medfly” infestation in 1989, with several local cities filing actions to prevent aerial spraying in their jurisdictions. This raises the potential that if a local Zika outbreak occurred in Southern California, the public would object and policymakers would be reluctant to use or support this approach. Therefore, to better understand public values and perceptions about mosquito control strategies, as well as preventive behaviors in the context of the Zika virus threat, a series of public workshops were held across Los Angeles County.

Goal and Objectives

The goals of this activity were to provide information on public values and preferences to inform policy about mosquito control in Los Angeles County, and to provide information to the Los Angeles County Department of Public Health and the county’s five vector control districts to improve the effectiveness and acceptability of mosquito and disease prevention and control efforts. The process focused on informing Los Angeles County’s strategy, investment, and communications for vector control, public health, and preparedness.

The workshop objectives were:

- To gather information about community preferences, values, and concerns associated with various mosquito control techniques;
- To gain a greater understanding of community values, motivations, barriers, and decision-making processes that drive individual behavior changes related to mosquito control and exposure; and
- To learn what information is needed at the community level about Zika virus infection and mosquito control, and how this information can best be delivered and disseminated.

Approach: The Value of Community Engagement

Various approaches can be used to obtain information from the public. Most often, data are collected from **surveys or polls**. Advantages of this approach include the ability to reach out to a large, representative sample of the population and obtain quantitative results quickly and at relatively low cost. Limitations include the potential impact of non-response on the validity of the data and the inability to determine the factors that underlie responses. Most importantly, surveys or polls capture people's current attitudes and beliefs; those attitudes and beliefs could be different during an event or policy decision, when information and education are widespread. Thus, uninformed or pre-informed opinions could mislead policymakers about what strategies might be optimal and acceptable at the time a decision needs to be made.

Focus groups, where people convene for short facilitated discussions about a topic, are valuable because they provide a deeper understanding of and rationale for people's attitudes and beliefs. However, the number of participants generally is small and the participants often are not representative of the broader population, providing a weak foundation for policymaking. Moreover, the length of most focus groups (about an hour) does not provide sufficient time to provide information and obtain educated opinions, resulting in the same limitation as for surveys and polls.

Community engagement workshops overcome many of the limitations of the other two methods. The number of participants is greater than for focus groups, and based on how participants are recruited, the participants can be representative of the communities where the workshops occur and of the larger population. Because workshops last for several hours, some education can be provided, resulting in more informed responses that may more closely reflect the values and perceptions that would exist at the time a decision needs to be made. Embedding surveys or polling into the process also can generate semi-quantitative data. For these advantages to accrue, however, the approach to recruitment, the conduct of the meetings, and the questions addressed all must be carefully planned and effectively implemented.

Methods

Planning the Workshops

Individuals from the Los Angeles County Department of Public Health, Greater Los Angeles County Vector Control District, San Gabriel Valley Mosquito and Vector Control District, and Keystone formed a steering committee to provide guidance for this effort and ensure the process developed aligned with the project's objectives. This steering committee developed the meeting approach, materials, recruitment strategies, and logistical considerations for the workshops. The steering committee chose five locations throughout Los Angeles County for the workshops based on previous *Aedes* species mosquito activity, diversity of the local populations, and geography. Prior to the workshops, Keystone provided agency staff with facilitator and notetaking guides and a brief training to ensure consistency across workshops. All meetings were held in public venues such as libraries, community centers, and county buildings.

Recruitment

In order to reach a diverse group of participants from the local areas where each meeting was held, the steering committee recruited participants through different channels and methods. Over a third of the participants heard about the workshop by seeing a flyer posted in a community location (e.g., library, community center, or health clinic). Another third heard about the workshops from friends, family, or co-workers who were either attending the workshop or had seen the flyer posted. Other means of recruitment occurred through outreach to

community organizations, posts on social media platforms (e.g., Facebook and Twitter), notices on agency websites, and information shared through neighborhood communication systems (e.g., Nextdoor.com). The steering committee disseminated recruitment materials in both English and Spanish, and the materials produced indicated that three of the meetings would be held in both English and Spanish. All recruitment materials included a link to register for a meeting (encouraged because of room capacity) and a toll-free line for interested parties to ask questions and register. To remove financial barriers to participation, the a \$25 stipend was provided to all participants and an additional stipend was available, on request, to defray childcare expenses. The steering committee also informed the Health and Field Deputies to the Los Angeles County Board of Supervisors of the meetings so that if questions arose from constituents, the deputies would be able to respond.

Format of Meetings

All three-hour community workshops included education sessions, small group discussions, and a group polling exercise. Workshops were designed to gauge participant values, preferences, and concerns both for individuals and their communities. This format gave participants a common baseline of information about Zika, its transmission, and vector control approaches; allowed participants to engage in in-depth discussions with one another in facilitated small group discussions; and solicited quantitative individual perspectives in electronic polling. Trained facilitators following a standard discussion guide led the small group discussions.

At the beginning of the workshops, public health and vector control staff presented a brief overview of the emergence of Zika, how the virus is transmitted, the clinical features of illness, the severe birth defects that may occur in newborns, the presence in Los Angeles County of the *Aedes* mosquitoes that transmit the disease, and approaches to prevention. Keystone then engaged participants in dialogue on risk, personal precautions, and the impact of Zika on individual and community behaviors. In a second presentation, public health and vector control staff provided a more in-depth overview of vector control methods. The small group discussions that followed gauged participants' preferences and concerns related to various control methods. Following all presentations and throughout the discussions, participants were encouraged to ask questions of public health and vector control staff. At the conclusion of the meetings, participants participated in a polling exercise to anonymously register their views and view the results in real time.

Data Collected Before and At the Meetings

Recruitment materials encouraged participants to register via an online survey that was available in English and Spanish. The materials also provided a toll-free number to allow participants to call and register over the phone in English or Spanish. Both the survey and the phone registration solicited demographic information to provide agency staff a better understanding of the neighborhoods represented, as well as an understanding of whether the demographic makeup of the workshops aligned with Los Angeles County as a whole.

Upon arrival, participants completed a pre-workshop survey answering demographic questions and questions to rate their knowledge and beliefs on issues surrounding vector-borne illness and vector control, current measures they use to protect themselves and their families from mosquitoes, and where they receive trusted information on vector control and diseases spread by mosquitoes. Following the workshops, participants completed a post-workshop survey that gauged the knowledge they acquired during the workshop and how their attitudes changed educational presentations and hearing from neighbors. The post-workshop survey also solicited feedback on the workshop and presentations.

A facilitator, assisted by a notetaker, led most small group discussions. In workshops with more participants, the facilitator led the discussion and took notes. Facilitators and note takers used a guide to ensure consistent discussions and notes, which captured important themes and key points.

During the final segment of the meeting, participants answered 16 questions using electronic polling devices, with aggregate results displayed for the group. Most responses were on a 10-point scale (from “Very Unimportant” to “Very Important” or from “Very Unlikely” to “Very Likely”) and others requested participants to select which of two options they preferred.

All materials from the meetings — presentations, Zika scenarios, discussion guides, surveys, and polling questions — are available on request.

Approach to Analyzing/Summarizing Meeting Data

Keystone staff reviewed all notes from the small group discussions to identify and aggregate key themes and meeting results. This workshop summary includes only major themes across the five workshops. Keystone staff also analyzed pre- and post-workshop surveys and compared between the two. For polling results for questions that used a 10-point scale, Keystone staff categorized 1-3 as Very Unimportant/Unlikely, 4-7 as Intermediate, and 8-10 as Very Important/Likely. Results are presented as mean, median, and range across the five meetings. All surveys and polls were voluntary, so not all participants chose to answer each question.

Community Workshop Results

Participant Demographics and Prior Knowledge and Beliefs

Overall, 177 people participated in the five community workshops. The number of participants per workshop ranged from 16 to 59. Demographic information was provided during the pre-workshop survey by 145 participants. Table 1 shows this self-reported information with aggregate numbers, compared with all Los Angeles County as a reference. Participants’ race and ethnicity generally reflected the population of their community and overall are similar to the Los Angeles County population. Workshop participants tended to be older and were more likely to be female compared with the entire county population. Four of the five communities where meetings were held were sites where *Aedes* mosquitoes — the vectors that may transmit Zika virus infections — had previously been identified.

Table 1. Demographics of workshop participants as self-reported in pre-workshop survey and comparison to Los Angeles County population

	Van Nuys (n=23)	San Gabriel (n=14)	Silver Lake (n=18)	East LA (n=47)	South LA (n=43)	Total Community Meetings (n=145)	LA County (Reference) ^{2,3}
Race/ethnicity							
- Latino	50%	29%	11%	85%	85%	62%	49%
- White	36%	29%	71%	9%	0%	18%	28%
- Asian	0%	35%	6%	0%	3%	5%	11%
- African American	9%	0%	6%	2%	12%	9%	9%
- Other	5%	7%	6%	2%	0%	6%	3%
Age group (years)							
- 18 to 25	15%	0%	11%	13%	17%	13%	13%
- 26 to 39	5%	29%	17%	29%	12%	18%	29%
- 40 to 49	40%	7%	22%	18%	5%	16%	19%
- 50 to 59	20%	21%	39%	24%	0%	19%	16%
- 60 and older	20%	43%	43%	16%	66%	34%	22%
Gender							
- Female	78%	50%	83%	70%	79%	74%	51%
- Male	22%	50%	17%	30%	26%	26%	49%
<i>Aedes</i> Mosquito Activity	No	Yes	Yes	Yes	Yes		

From pre- and post-meeting surveys, participants rated their knowledge of mosquito control approaches on a 10-point scale. Before the workshops, 27 percent of participants rated their knowledge of mosquito control as >5 compared with 91 percent afterwards. Using the same scale, 10 percent of participants rated their knowledge of mosquito control as 8 or greater before the workshop, suggesting that some participants may have participated because of an interest in vector control issues. From the outset of the workshop, several participants expressed deep skepticism about and mistrust of government and science.

The validity of qualitative findings and polling results depends on the validity and neutrality of the presentations and the neutrality of discussion facilitators. The post-workshop surveys assessed whether participants believed the information presented was “fair, balanced, and credible.” Eighty-one percent of participants strongly agreed

² Census Reporter, retrieved from: <https://censusreporter.org/profiles/16000US0644000-los-angeles-ca/>. Accessed February 27, 2017.

³ Suburban Stats, Current Los Angeles County, California Population, Demographics and Stats in 2016, 2017, retrieved from: <https://suburbanstats.org/population/california/how-many-people-live-in-los-angeles-county>. Accessed February 27, 2017.

that the information was fair, balanced, and credible, 14 percent agreed, and 5 percent were neutral, somewhat disagreed, or strongly disagreed.

Qualitative and Quantitative Findings

In small group discussions, participants expressed different opinions and beliefs, reflecting the diversity of neighborhoods and populations. Within and across meetings, however, several key themes emerged. The strongest theme was the importance of having information. This includes more information about mosquito-borne diseases; the risks associated with Zika; measures individuals and communities can take to reduce the number of mosquitoes and protect themselves from bites; and other mosquito control approaches and their benefits and risks. There was a widespread sentiment that if information was provided completely and fairly, residents could balance options and make good choices for their communities. Participants identified interactive approaches, such as community meetings, as an optimal way to share information — in part because participants could then share the information in their communities. Recognizing the large population of Los Angeles County, participants also identified various media as good information sources. Most participants identified public health, vector control, and medical personnel as the most credible sources of information, with trusted media personnel and political leaders also frequently mentioned. Participants suggested that these trusted individuals disseminate simple tools, such as checklists of what one can do to protect against mosquito bites and how to reduce mosquito breeding.

Participants expressed confidence in the ability of individuals and communities to control mosquitos by eliminating sites where mosquitoes can breed (“dumping and draining” containers where water can collect and mosquitoes lay their eggs). Participants often described behaviors they would adopt and said they could work with others in their community to change behavior more broadly. These beliefs were most strongly expressed at the meetings in East and South Los Angeles, and to a somewhat lesser extent in San Gabriel. At the same time, participants at all meetings understood that not everyone in the community would take action, and thus supported enforcement authority by vector control agencies and policies to help reduce mosquito breeding (e.g., regulations on rain barrel design).

When considering application of pesticides for mosquito control, most participants expressed concerns — many voicing strong concerns — about the potential impacts on human and animal health. There was skepticism that even if no data suggest pesticide exposure is unsafe, there may be effects that are not known, and that the risk may be greater for children and pets. Participants often cited broad concerns about chemical exposure. Several participants, especially in Van Nuys and Silver Lake, expressed deep mistrust of government and said they rely on alternate sources of scientific information, contributing to strong beliefs that pesticides are harmful and that the risks associated with Zika are exaggerated. A substantial majority of participants considered, small scale, local pesticide application acceptable if needed for mosquito control, because exposure could be avoided. Opposition to aerial application centered on the difficulty avoiding being exposed. At the same time, understanding that aerial application is a rapidly effective strategy for widespread mosquito control, most participants indicated that on balance, they would accept aerial pesticide application during a local Zika outbreak if there was ample warning of when the applications would occur and if there was information about what they could do to best avoid exposure for their families and pets. Participants generally — though not universally — trusted public health and vector control agencies to decide if aerial application was needed and to provide information to the public.

At the beginning of the workshops, few people knew of the health risks associated with Zika virus infection. Following the presentation and discussion of the scenario describing the local spread of Zika in one neighborhood, participants voiced concern about the risk of birth defects and the challenges faced by couples

who wanted to become pregnant. At the same time, because of the likely small number of pregnant women who would become infected and have severely affected newborns, many wanted to ensure that the response would be limited to affected neighborhoods and seemed relatively unconcerned if their neighborhood was not the affected area. There was also some concern about the economic impacts of a Zika outbreak, if travel to Los Angeles decreased, but the economic risks were considered secondary to the human costs. In general, participants expressed confidence in the ability of public health and vector control agencies to define where the outbreak was occurring and to provide information so people could protect themselves. Participants also suggested free Zika testing, particularly for pregnant women. They strongly expressed the need for information during an outbreak, including where the outbreak was occurring and how they could reduce their risk.

Across all workshops, there was strong support for further investigation of new mosquito control strategies. Participants widely favored the release of sterile male mosquitoes (so the eggs of female mosquitoes with which they mate would not hatch). Of the several strategies for sterilizing male mosquitoes, participants preferred using a “natural” approach of infecting mosquitoes with *Wolbachia* bacteria to genetic modification. However, participants also wanted more information on the new technologies, including on the effectiveness of different strategies and their possible effects on the ecosystem.

Figure 2: Common themes across workshops

Protection behaviors	<ul style="list-style-type: none">• Participants preferred to protect themselves by using repellent, wearing long sleeves and pants, and dumping and draining standing water on their properties.• Participants wanted a checklist of personal protection methods to have in their homes.• After dumping and draining, participants preferred targeted applications over widespread aerial applications, especially prior to a local outbreak. There was interest in <i>Wolbachia</i>-infected sterile male mosquitoes as a method to prevent the spread of mosquitoes and related diseases.
Expectations of local agencies	<ul style="list-style-type: none">• Local Public Health should communicate information about outbreaks early and often, provide free testing, and share information on preventing the spread of Zika.• Local Vector Control should investigate areas where outbreaks occur to prevent further spread, inform the community prior to any pesticide application, and provide information about the application and instructions to follow as necessary.
Additional information needed	<ul style="list-style-type: none">• Personal prevention techniques and how to stop Zika before local spread occurs.• Applications available to Vector Control — more science, acceptable levels of pesticides, chemical breakdown, etc.• Information on Zika symptoms, longterm effects of Zika, and the link between Zika and birth defects.• Services available from both Vector Control and Public Health before and during an outbreak.• Education available in multiple languages and through different platforms to reach the largest number of community members.

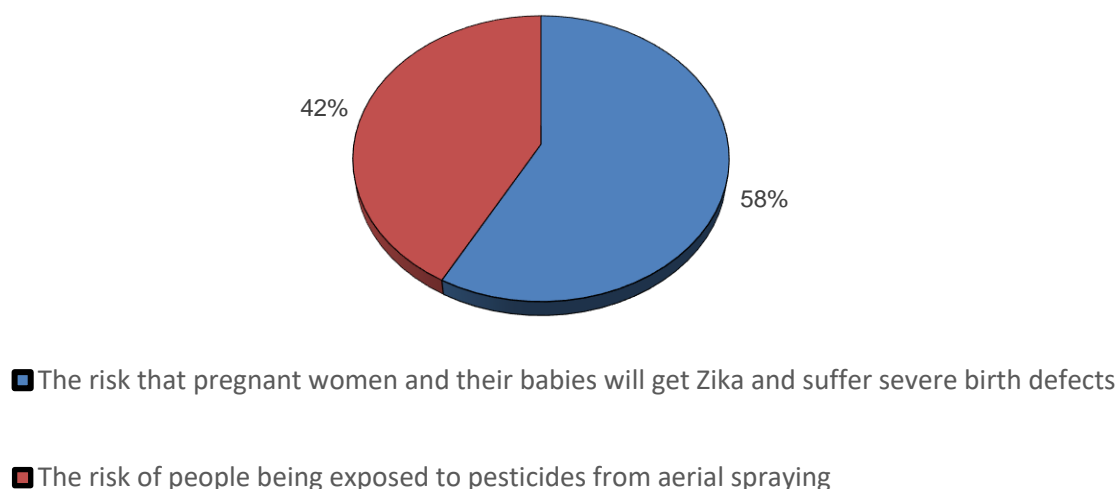
Following the education and small group discussions, participants participated in a polling exercise. (Please see Appendix A for complete polling results by meeting and in the aggregate.) In an initial series of questions, a facilitator read a series of statements and asked participants to rate the importance of each on a 10-point scale. More than 80 percent of participants considered preventing birth defects among newborns, preventing risks associated with pesticide exposure, and the effectiveness of a mosquito control method “very important” (score 8-10) percent . Participants rated the costs of the mosquito control method and preventing impacts on other insect populations lower in importance, though 60 percent still considered them very important percent .

“I’m concerned about microcephaly and what will happen to the babies born with it. Who will help those families?”

—Meeting Participant

When participants were asked to rate importance of different values, they identified many desirable outcomes (e.g., preventing birth defects, avoiding pesticide exposure, etc.). Therefore, facilitators followed these initial questions by asking participants to balance between outcomes they value. Specifically, participants were asked which is more important to them during a local Zika outbreak: the risk of birth defects from Zika or the risk of exposure to pesticides. Overall, the risk of birth defects was rated as more important by 58 percent to 42 percent (Figure 3).

Figure 3. During a Zika outbreak in Los Angeles County, which is more important?



Recognizing that preferences for mosquito control strategies are likely to differ before a local Zika outbreak and during a local Zika outbreak, participants were polled on their support of different methods at each of those time periods (Figures 4). Before a local Zika outbreak, only 45 percent indicated that they were very likely to support aerial pesticide application (score of 8-10 on a 10-point scale). However, during an outbreak, preferences shifted, with 60 percent of participants indicating they would very likely support aerial application. By contrast, both before and during an outbreak, about two-thirds were very likely to support a sterile mosquito strategy (Figure 5).

Figure 4. Support (and lack of support) for aerial spraying before and during a Zika outbreak in Los Angeles County

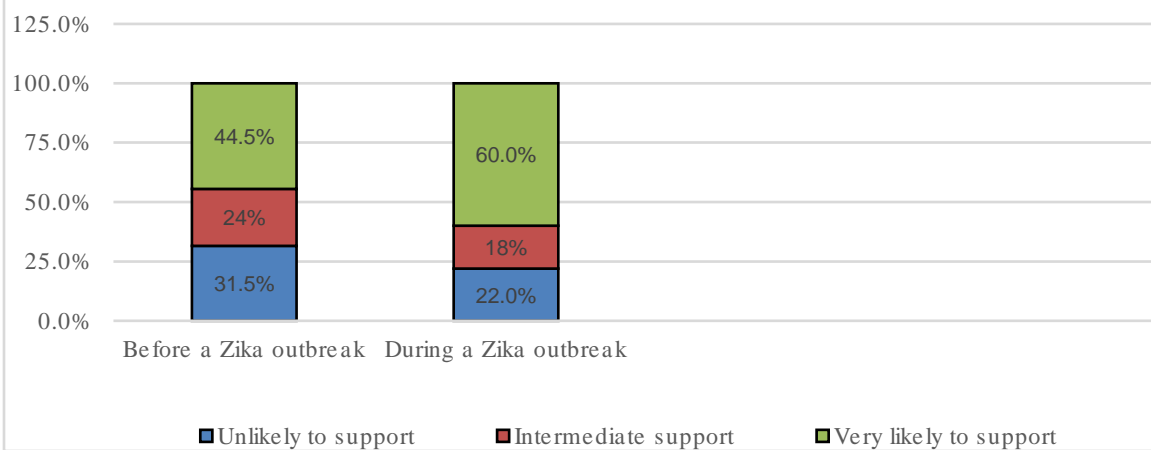
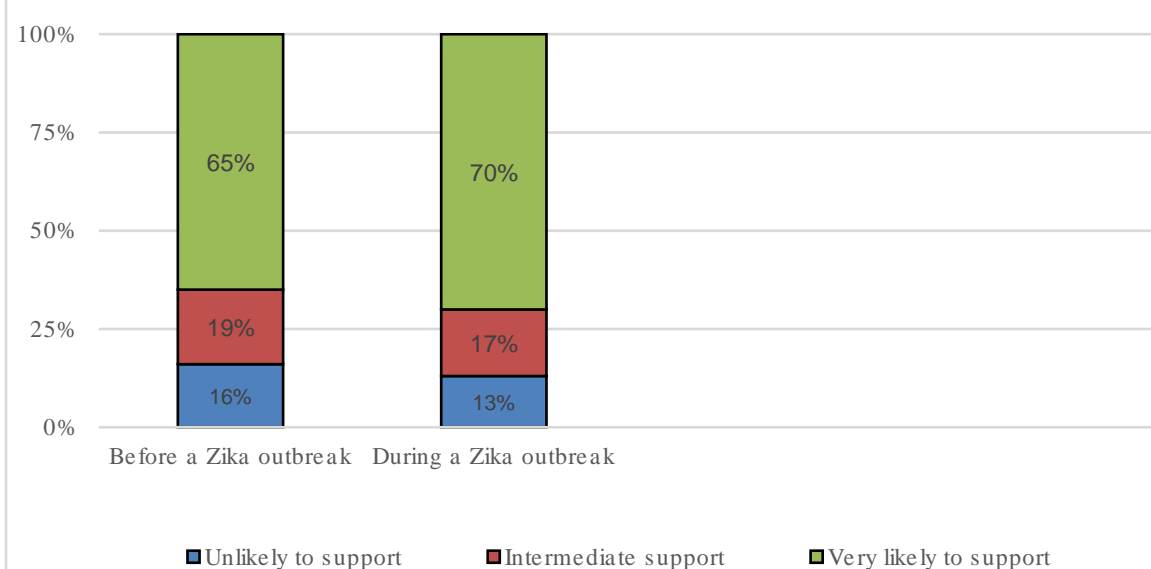
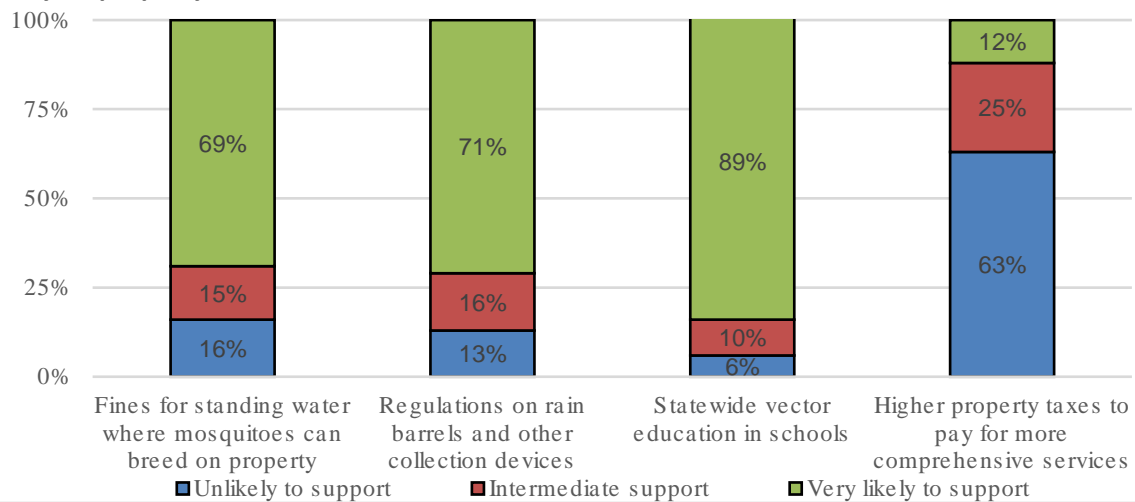


Figure 5. Support (and lack of support) for *Wolbachia*-infected or GMO mosquitoes before and during a Zika outbreak in Los Angeles County



The final polling questions engaged participants in more policy-focused questions and asked them to rate their level of support on potential control initiatives that would place more responsibility on property owners and renters, such as fines for standing water and regulations on rain barrels. Overall, 69 percent and 71 percent of participants said they were very likely to support these potential initiatives, respectively percent . In addition, 89 percent of participants across meetings said they would very likely support statewide vector control education in schools. Participants also indicated that they would be very unlikely to support a higher property tax for more comprehensive vector control services. However, follow-up conversations with participants made clear that they were unaware of the current tax level. In addition, since the amount of the property tax increase was not specified, participants may have had different perceptions of the size of the increase (Figure 7).

Figure 6. Support (and lack of support) for mosquito control techniques that place responsibility on property owners/renters



Discussion

The introduction and spread of *Aedes* species mosquitoes in Los Angeles County since 2011 and the threat of local transmission of Zika virus infections have elevated the importance of mosquito control across the country. Currently, the five Los Angeles County vector control agencies use an integrated strategy that combines reducing sites where mosquitos can be breed with targeted pesticide application (larvicide and adulticide). Pesticides generally are applied using backpack sprayers, allowing the most direct targeting at sites where larvae and adult mosquitoes are present. Resident education is also a large component of mosquito control, enabling people to reduce mosquito breeding on their property and increase personal protective behaviors to reduce bites.

“When rain barrels are sold, mosquito control education should be provided at the same time.”

—Meeting Participant

The emergence of Zika raises two important issues:

- How can the intensity and effectiveness of vector control be increased before a local outbreak occurs?
- What strategies should be employed to control a local outbreak?

This process sought public input to better understand the acceptability of different strategies and information needs, and to inform policy discussions. This approach of using public workshops to generate qualitative and semi-quantitative data does not appear to have been used in other jurisdictions to address these issues.

Aerial pesticide application to control mosquito-borne infections has been a controversial strategy. Some jurisdictions, including Sacramento, California, use aerial spraying to reduce the risk of endemic mosquito-borne disease, such as meningitis and encephalitis from West Nile virus infection. In southern Florida, aerial application was one component of the response to the 2016 local Zika outbreak. But in Puerto Rico, aerial application has not been used, despite more than 35,000 reported Zika infections and a new CDC study that estimates that nearly 13 percent of the population, or about 470,000 individuals, have been infected.⁴ Although the CDC

⁴ Chevalier MS, Biggerstaff DJ, Dasavaraju SV, et al. Use of blood donor screening data to estimate Zika virus incidence, Puerto Rico, April – August 2016. *Emerg Infect Dis* 2017;23.

identifies aerial applications as an effective component of an integrated mosquito management program that is safe for human health, public concerns about the technique are widespread. Certain websites allege numerous serious health risks from pesticide exposure, including cancer, nervous system damage, and autism.

Community meeting participants across Los Angeles County expressed an interest in preventing exposure to pesticides and, before a Zika outbreak, a majority considered the risk of pesticide exposure to be of higher importance than the risk of Zika-associated birth defects. However, preferences changed in the context of a local Zika outbreak, with the majority indicating that they would be very likely to support aerial pesticide application. For many, this support was contingent on receiving information on the effects of pesticide spraying, when the applications would take place, and how to avoid pesticide exposure. Others remained strongly opposed to pesticide use at any time, particularly those who were more skeptical of government and mainstream research. These vocal participants with strongly held beliefs were influential to their peers, making information sharing from trusted sources before and during an event critical.

Participants widely supported individual and community-wide efforts to reduce mosquito breeding sites, which has also been reported from other jurisdictions. A survey of Key West, Florida residents in 2015 also identified draining standing water to reduce mosquito breeding as the preferred strategy.⁵ Despite the confidence of many meeting participants that they could successfully “tip and toss” containers where water may collect on their property, and that they could convince many of their neighbors, there was a recognition that enforcement options needed to be available, such as the ability to fine owners or renters for not removing standing water on their property. Recognizing limitations on the effectiveness of a strategy solely focused on reducing mosquito breeding sites, the Environmental Protection Agency notes that an integrated strategy is the most effective approach to controlling mosquitoes, targeting every stage of a mosquito life cycle. They also note that despite efforts in Puerto Rico to control mosquitoes that transmit Zika, mosquito populations have been increasing and that additional methods are needed.⁶

Limitations

The workshops and this report are not intended to be statistically representative of the entire greater Los Angeles region, though the steering committee for this process attempted to recruit participants who reflected their community and the Los Angeles County population. Recruitment strategies to enhance representativeness included posting information in a variety of public locations and working with community-based organizations; holding meetings at public venues; having several meetings in the evenings; presenting and holding discussions in both English and Spanish; and compensating participants for their time and childcare costs.

Each workshop included participants from different cultures, and with different baseline knowledge, interest, and reasons for attending. Some participants likely attended because of their strong beliefs about risks of pesticide exposure. While the demographics of participants are similar to those for Los Angeles County, there are many differences in attitudes and beliefs within demographic groups, so demographic similarities alone do not imply representativeness.

Community workshops allow for education and enable participants to express more informed beliefs and preferences, potentially mimicking a situation where an outbreak has occurred and agencies have widely

⁵ Adalja A, Sell TK, McGinty M, Boddie C. Genetically modified (GM) mosquito use to reduce mosquito-transmitted disease in the US: a community opinion survey PLOS Current Outbreaks 2016; doi: 10.1371/current.outbreaks.1c39ec05a743d41ee39391ed0f2ed8d3.

⁶ U.S. Environmental Protection Agency. Success in mosquito control: an integrated approach. <https://www.epa.gov/mosquitocontrol/success-mosquito-control-integrated-approach> (accessed 4/4/17)

disseminated information through multiple communications channels. However, the validity of workshop results depends on the accuracy of the information presented. To reduce this risk, presentations were carefully reviewed for accuracy. Keystone's role and reputation as a neutral facilitator and its experience with public engagement served as an additional check. From the post-meeting survey, 96 percent of participants agreed or strongly agreed that the information presented was fair, balanced, and credible and 95 percent agreed or strongly agreed that they felt comfortable voicing their opinions and thoughts during the discussion.

Finally, the summaries of the qualitative data for this report relied on the notes from the English- and Spanish-speaking facilitators and notetakers, all of whom were trained before the workshops. Wherever possible, notetaking was a separate role from facilitating. The similarities in the electronic polling and the qualitative results suggest that the qualitative information was appropriately recorded and summarized.

Recommendations and Conclusions

The following recommendations for public health, vector control, and policymakers stem from the community workshops, including small group discussions and polling information.

Communication & Outreach

- Build additional community awareness through local champions and relationships. Build partnerships with health professionals, city councils, places of worship, and community leaders to share appropriate messages.
 - Better utilization of community-specific champions and community-targeted messaging can help information reach more members of the community.
- Because neighborhoods have had different experiences with both public health and vector control, agencies need to approach neighborhoods through different platforms, using trusted officials and sources and culturally/linguistically appropriate messages. "Tip and toss" messaging should be less individually focused and more neighborhood/community-focused (i.e., "If we all do it, it will be more effective.").
- Build additional awareness around vector control capabilities, community resources, and the small property tax payer investment that supports vector control.
 - As community expectations increase, vector control must more effectively communicate its role and value, as well as need for appropriate resources.

Public Engagement

- Engage elected officials at the county and city levels about the threat of local Zika transmission; potential response strategies, including aerial application of pesticides and the scientific data on effectiveness and potential adverse effects; and the results from these meetings, which suggest the acceptability of the full range of vector control approaches.
- Develop "just in time" educational messages and materials. Recognizing that acceptability of vector control strategies will differ before and during a Zika outbreak, having materials and communications strategies immediately available when an outbreak occurs may be the most effective approach to inform the public.

Strategic Planning

- Community-based planning can help improve messaging and the effectiveness of prevention.
 - Because many of the preventative methods rely on entire communities, include neighborhood-level activities in planning prevention strategies and building awareness that broader applications may be needed during an outbreak.

Policy

- County and city policies should support and prioritize effective application of community-based strategies to reduce mosquito breeding.
 - County and city policies should place more responsibility on homeowners and renters, with fines for standing water, excessive trash, or unmaintained backyard pools and ponds.
 - Policies related to the distribution and use of rain barrels should ensure that barrel design does not promote mosquito breeding. During community rain barrel distribution, residents should be educated about proper use, draining, and cleaning.
 - Individual- and community-based control practices should be prioritized in future policy strategy. The decision to use a pesticide application should be weight with the concerned of the community and risk of disease transmission and associated birth defects.
- Look for additional opportunities for vector control education in schools (e.g., support the introduction of a brief curriculum for elementary and middle school students as part of health education).
- Support additional work by vector control agencies to evaluate new strategies, such as the release of sterile male mosquitoes (preferably using *Wolbachia*-infected mosquitoes).
- Before a Zika outbreak, public health and vector control should work with emergency managers and elected leaders to review emergency preparedness and response plans and become familiar with the proposed vector control approaches

Appendix A: Polling Results

Question 1	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
The cost to the government of the approach to mosquito control	1-3	1 (5%)	1 (6%)	7 (32%)	17 (33%)	7 (15%)	33 (21%)
	4-7	10 (45%)	4 (25%)	8 (36%)	5 (9)	8 (18%)	35 (22%)
	8-10	11 (50%)	11 (69%)	7 (32%)	30 (58%)	30 (67%)	89 (57%)
		22	16	22	52	45	157
Question 2	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
The effectiveness of the approach to mosquito control	1-3	2 (9%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)	3 (2%)
	4-7	5 (23%)	1 (6%)	1 (5%)	5 (9%)	6 (12%)	18 (11%)
	8-10	15 (68%)	15 (94%)	20 (95%)	49 (91%)	42 (86%)	141 (87%)
		22	16	21	54	49	162
Question 3	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
Preventing babies in LA County from having severe birth defects caused by Zika	1-3	3 (13%)	0 (0%)	3 (14%)	1 (2%)	0 (0%)	7 (4%)
	4-7	1 (5%)	1 (6%)	0 (0%)	3 (6%)	1 (2%)	6 (3%)
	8-10	18 (82%)	15 (94%)	18 (86%)	49 (92%)	49 (98%)	149 (92%)

		22	16	21	53	50	162
Question 4	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
Preventing any risk of side effects from exposure to pesticides	1-3	0 (0%)	1 (6%)	1 (5%)	3 (6%)	0 (0%)	5 (3%)
	4-7	0 (0%)	3 (19%)	2 (10%)	3 (6%)	1 (2%)	9 (6%)
	8-10	20 (100%)	12 (75%)	17 (85%)	47 (88%)	49 (98%)	145 (91%)
		20	16	20	53	50	159
Question 5	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
Preventing possible unknown risks from pesticides that scientists may not know about	1-3	0 (0%)	1 (6%)	2 (10%)	4 (7%)	0 (0%)	7 (4%)
	4-7	2 (9%)	7 (44%)	3 (14%)	5 (10%)	0 (0%)	17 (11%)
	8-10	20 (91%)	8 (50%)	16 (76%)	45 (83%)	49 (100%)	138 (85%)
		22	16	21	54	49	162
Question 6	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
Protecting honey bees and other insects	1-3	3 (14%)	2 (13%)	1 (4%)	3 (6%)	2 (4%)	11 (7%)
	4-7	4 (18%)	3 (19%)	6 (29%)	4 (7%)	3 (6%)	20 (12%)

	8-10	15 (68%)	11 (68%)	14 (67%)	47 (87%)	43 (90%)	130 (81%)
		22	16	21	54	48	161
Question 7	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
During a Zika outbreak in LA County, which of these two is more important to you?	Birth defects	8 (40%)	13 (81%)	14 (67%)	21 (44%)	29 (71%)	85 (58%)
	Pesticides	12 (60%)	3 (19%)	7 (33%)	27 (56%)	12 (29%)	61 (42%)
		20	16	21	48	41	146
Question 8	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
Before a Zika outbreak in LA County, which of these is more important to you?	Birth defects	11 (69%)	16 (94%)	14 (67%)	31 (65%)	37 (77%)	109 (73%)
	Pesticides	5 (31%)	1 (6%)	7 (33%)	17 (35%)	11 (23%)	41 (27%)
		16	17	21	48	48	150
Question 9	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
Before a Zika outbreak in LA County, how likely would you be to support the use of aerial pesticide spraying as a	1-3	11	4	9	17	10	51 (31.5%)
	4-7	5	7	5	15	7	39 (24%)
	8-10	6	5	8	19	34	72 (44.5%)

method to control mosquitoes and prevent Zika in your community?		22	16	22	51	51	162
Question 10	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
During a Zika outbreak in LA County, how likely would you be to support the use of aerial pesticide spraying as a method to control the spread of Zika in your community?	1-3	8 (35%)	1 (6%)	7 (32%)	18 (34%)	3 (6%)	37 (22%)
	4-7	8 (35%)	2 (13%)	2 (9%)	8 (15%)	9 (18%)	29 (18%)
	8-10	7 (30%)	13 (81%)	13 (59%)	27 (51%)	38 (76%)	98 (60%)
		23	16	22	53	50	164

Question 11	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
Before a Zika outbreak in LA County, how likely would you be to support the use of <i>Wolbachia</i> -infected	1-3	5 (22%)	1 (6%)	7 (32%)	7 (13%)	6 (12%)	26 (16%)
	4-7	8 (35%)	6 (38%)	3 (14%)	7 (13%)	7 (14%)	31 (19%)
	8-10	10 (43%)	9 (56%)	12 (54%)	40 (74%)	36 (74%)	107 (65%)

mosquitoes or GMO mosquitoes as a method to control and prevent the spread of Zika in your community?		23	16	22	54	49	164
Question 12	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
During a Zika outbreak in LA County, how likely would you be to support the use of <i>Wolbachia</i> -infected mosquitoes or GMO mosquitoes as a method to control and prevent the spread of Zika in your community?	1-3	4 (17%)	1 (6%)	5 (23%)	7 (13%)	4 (8%)	21 (13%)
	4-7	4 (17%)	3 (19%)	3 (13%)	8 (16%)	10 (20%)	28 (17%)
	8-10	15 (66%)	12 (75%)	14 (64%)	37 (71%)	36 (72%)	114 (70%)
		23	16	22	52	50	163
Question 13	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
How likely would you be to support other mosquito control initiatives that place more responsibility on	1-3	4 (18%)	4 (25%)	5 (23%)	13 (24%)	1 (2%)	27 (16%)
	4-7	4 (18%)	3 (19%)	4 (18%)	12 (23%)	2 (4%)	25 (15%)
	8-10	14 (64%)	9 (56%)	13 (59%)	28 (53%)	48 (94%)	112 (69%)

property owners/renters? Such as: Fines for having standing water where mosquitoes can breed on property?		22	16	22	53	51	164
Question 14	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
How likely would you be to support other mosquito control initiatives that place more responsibility on property owners/renters? Such as: Regulations on Rain barrels and other water collection devices?	1-3	6 (26%)	2 (12%)	3 (14%)	9 (17%)	2 (4%)	22 (13%)
	4-7	4 (17%)	4 (25%)	2 (9%)	10 (19%)	6 (12%)	26 (16%)
	8-10	13 (57%)	10 (63%)	17 (77%)	34 (64%)	43 (84%)	117 (71%)
		23	16	22	53	51	165
Question 15	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
How likely would you be to support other mosquito control initiatives that place more responsibility on	1-3		2 (13%)	1 (5%)	2 (3%)	1 (2%)	6 (4%)
	4-7		1 (6%)	1 (5%)	3 (6%)	5 (10%)	10 (7%)
	8-10		13 (81%)	20 (90%)	48 (91%)	46 (88%)	127 (89%)

property owners/renters? Such as: statewide vector education in schools?			16	22	53	52	143
Question 16	Score	Van Nuys	San Gabriel	Silver Lake	East LA	South LA	Aggregate
How likely would you be to support other mosquito control initiatives that place more responsibility on property owners/renters? Such as: Higher property taxes to pay for more comprehensive vector services?	1-3		12 (75%)	11 (55%)	38 (73%)	25 (50%)	86 (63%)
	4-7		3 (19%)	5 (25%)	10 (19%)	17 (34%)	35 (25%)
	8-10		1 (6%)	4 (20%)	4 (8%)	8 (16%)	17 (12%)
			16	20	52	50	138