



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 in 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 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 in order to be effective and is not rapid enough to be used for outbreak response. New technologies are in development to help reduce mosquito breeding and vectorborne illnesses. However, the new technologies are not available at this time 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 one 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, convened five community workshops to inform policy about mosquito control in Los Angeles County. The process ultimately focused on helping inform 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 is needed at the community level about Zika virus infection and mosquito control, 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% of participants. When asked what would be more important during a local Zika outbreak, 58% of participants identified preventing birth defects and 42% preventing pesticide exposure (by meeting, the median proportion who valued preventing birth defects over preventing pesticide exposure during a local outbreak was 67%). People also widely support the use

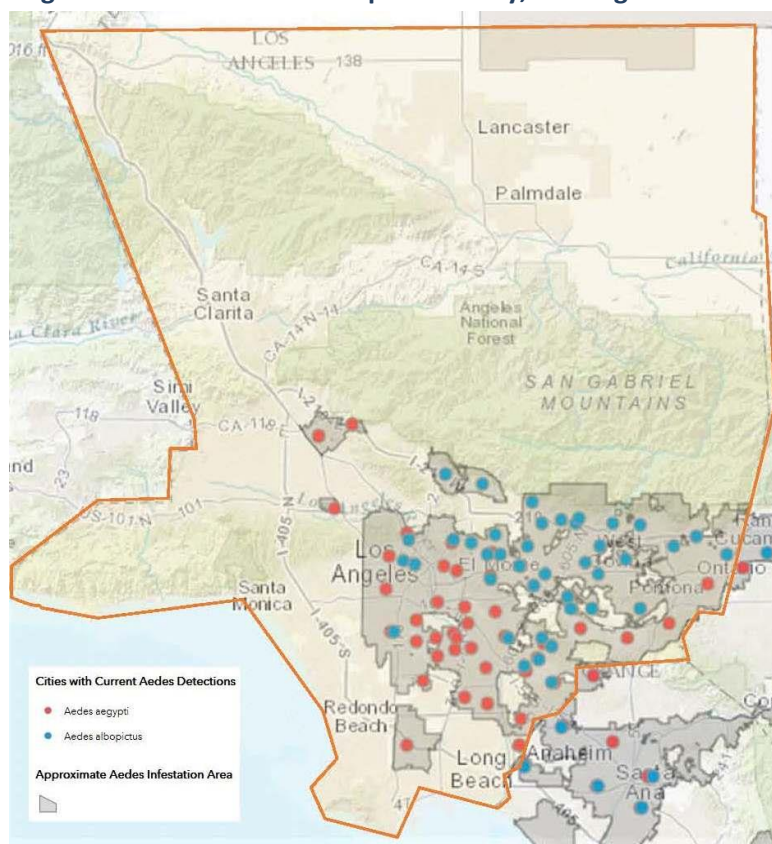
of new technologies to reduce the spread of *Aedes* mosquitoes, particularly the release of *Wolbachia*-infected sterile male mosquitoes; County support including funding to further study this approach and share information would be important if this strategy is to be a viable option.

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 Center for Disease Control and Prevention's (CDC) Zika pregnancy registry suggests that birth defects occurred in 5% of Zika affected pregnancies and in 15% 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 rarely occur 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 in 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 Centers for Disease Control and Prevention (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). Yet, at this time, there are also many parts of Los Angeles County that are not infested, emphasizing the priority 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

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:

effectiveness of this approach depends on the efforts of everyone in the county to “tip and toss” — emptying and getting rid of containers that may hold 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, for example 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 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 and its use in Florida was later and more limited than might have been optimal to control the outbreak. Opposition to aerial applications of pesticides in Southern California occurred with response to the “medfly” infestation in 1989, with several local cities filing actions to prevent aerial spraying in their jurisdictions. This raises the potential that should a local Zika outbreak occur, 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 ultimately focused on helping inform Los Angeles County’s strategy, investment, and communications for vector control, public health, and preparedness.

Our 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, with each having advantages and drawbacks. 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 learn in-depth, the factors that underlie responses. Most importantly, surveys or polls capture people's current attitudes and beliefs, and may not reflect their thoughts at the time of an event or policy decision when information and education are much more 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 come together 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 they often are not representative of the broader population, providing a weak foundation for policy-making. Moreover, the short duration of most focus groups, generally one hour, does not provide sufficient time to provide information and obtain educated opinions resulting in the same limitation as described above.

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, 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

A steering committee of 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 Policy Center was formed 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. Five locations throughout Los Angeles County were chosen for the workshops based on previous *Aedes* species mosquito activity, diversity of the local populations, and geography. Prior to the workshops, agency staff were provided with facilitator and notetaking guides and a brief training to allow for 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, participants were recruited through different channels and methods. Over a third of the participants heard about the workshop by seeing a flyer posted in a community location (library, community center, health clinic). Another third heard about the workshops from friends, family, or co-workers who were either attending the workshop or

had seen it posted. Other means of recruitment occurred through outreach to community organizations, posts on social media platforms (Facebook, Twitter), notices on agency websites, and information shared through neighborhood communication systems such as *Nextdoor*. Recruitment materials were disseminated in both English and Spanish, and for highlighted that for three of the meetings, presentations and discussions would be held in both English and Spanish. A link to register (encouraged because of room-capacity) was on all recruitment materials, as was a toll-free line for interested parties to ask questions and register. To remove financial barriers to participation, a \$25 stipend was provided to all participants and an additional stipend was available, on request, to defray childcare expenses. Information was also shared with the Health and Field Deputies to the Los Angeles County Board of Supervisors informing them of the meetings so if questions arose from constituents, they 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 personally and within their respective communities. This format was chosen to give participants a common baseline of information about Zika, its transmission and vector control approaches; allow participants to engage in in-depth discussions with one another in facilitated small group discussions; and share their individual perspectives in electronic polling. Small group discussions were led by a trained facilitator who followed a standard discussion guide.

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 an overview of approaches to prevention. Participants were then engaged in dialogue on the risk, personal precautions they may take, and the impact of Zika on their behavior and their community. A second presentation followed in which participants received a more in-depth overview of vector control methods. The following small group discussion gauged participants' preferences and concerns related to various control methods. Following all presentations and throughout the discussions, participants were given the opportunity to ask questions of public health and vector control staff. At the conclusion of the meetings, participants were asked to participate in a polling exercise. This activity allowed participants to register their views anonymously and view the results in real time.

Data collected before and at the meetings

Participants were encouraged to register via an on-line registration survey in English or Spanish. A toll-free number was also provided to allow participants to call and register orally. Staff were available for Spanish speaking participants. Voluntary demographic information was collected at the time of registration to provide agency staff a better understanding of the neighborhoods represented as well as an understanding of whether or not the demographic makeup of the workshops aligned with Los Angeles County as a whole.

Upon arrival, participants were asked to fill out a pre-workshop survey answering both demographic questions as well as 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 were asked to fill out a post-workshop survey to gain an understanding of knowledge acquired during the workshop, concerns after receiving education and hearing from neighbors, as well as to provide feedback on the workshop and the educational presentations.

Each small group discussion was led by a facilitator and included a note taker. In a few instances, the facilitator also took notes due to the size of the workshop and the staff available. Facilitators and note takers were provided with a set of questions on a guide to ensure consistency of discussions and note taking. Notes captured important themes and key points that emerged during the discussions. 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 scenario, discussion guides, surveys, and polling questions are available on request.

Approach to analyze/summarize meeting data

All notes from the small group discussions were reviewed by Keystone staff. Themes that emerged from each discussion were identified and results aggregated across meetings; this workshop summary includes only major themes across the five workshops. Pre- and post-workshop surveys were analyzed and where appropriate, data compared between the two. Polling results for questions that used a 10-point scale were categorized as: 1-3 Very unimportant/unlikely, 4-7 Intermediate, and 8-10 Very important/likely. Results are presented as mean, median, and range among the five meetings. All information that was asked on the pre-and post-workshop surveys as well as the polling exercise were voluntary, therefore 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. This self-reported information is shown in Table 1 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 somewhat older and were much 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%
Aedes 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% of participants rated their knowledge of mosquito control as >5 compared with 91% afterwards. Using the same scale, 10% 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. Several participants from the onset of the workshop also expressed deep skepticism about and mistrust of government and science.

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.

The validity of qualitative findings and of polling results depends on the information shared during the two brief presentations being factual and unbiased, and the discussion facilitators not interjecting their own perspectives into the conversation. Participants' perspectives were assessed in the post-workshop survey regarding whether they thought the information presented was "fair, balanced, and credible." Eighty-one percent of participants strongly agreed and 14% agreed; 5% of participants were neutral, somewhat disagreed, or strongly disagreed with the statement.

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. Interactive approaches, such as community meetings, were identified as an optimal way to share information — with participants then being able to share the information in their communities. Recognizing the large population of Los Angeles County, various media also were identified 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. Use of simple tools such as checklists of what one can do to protect against mosquito bites and how to reduce mosquito breeding was one suggestion.

Confidence in the capabilities of individuals and communities also was expressed through the preferred strategy for mosquito control: eliminating sites where mosquitoes can breed ("tip and toss" containers where water can collect and mosquitoes lay their eggs). Participants often described behaviors they would adopt and also expressed the belief that 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 participants expressed strong support for enforcement authority by vector control agencies and for policies that help reduce mosquito breeding, for example, 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. Broad concerns about chemical exposure often were cited. Several participants, especially in Van Nuys and Silver Lake, expressed deep mistrust of government and rely on alternate sources of scientific information contributing to strong beliefs that pesticides are harmful and that the risks associated with Zika are exaggerated. For a substantial majority, small scale, local pesticide application was considered 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 they would on balance, 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. Public health and vector control agencies generally — though not universally — were trusted 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, there was confidence in the ability of public health and vector control to define where the outbreak was occurring and to provide information so people could protect themselves. Free Zika testing, particularly for pregnant women, also was suggested. Participants strongly expressed the need for information during an outbreak on 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. Release of sterile male mosquitoes, so the eggs of female mosquitoes they mate with would not hatch, was widely favored. Of the several strategies for sterilizing male mosquitoes, using a “natural” approach of infecting mosquitoes with *Wolbachia* bacteria was preferred to genetic modification. However, participants also wanted more information on the new technologies including possible effects on the ecosystem, as well as effectiveness of the strategy.

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 check-list of personal protection methods to have in their homes.• After dumping and draining, participants preferred targeted applications over wide-spread 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 the outbreak early and often, provide free testing, and share information on preventing the spread of Zika.• Local Vector Control should investigate the area where the outbreak occurred to prevent further spread, inform the community prior to any application, and provide information about the application and instructions to follow as necessary.
Additional information needed	<ul style="list-style-type: none">• More information on personal prevention techniques and how to stop Zika before local spread occurs.• More information on applications available to Vector Control - more science, acceptable levels of pesticides, chemical breakdown, etc.• More information on Zika - symptoms, long-term effects, 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.

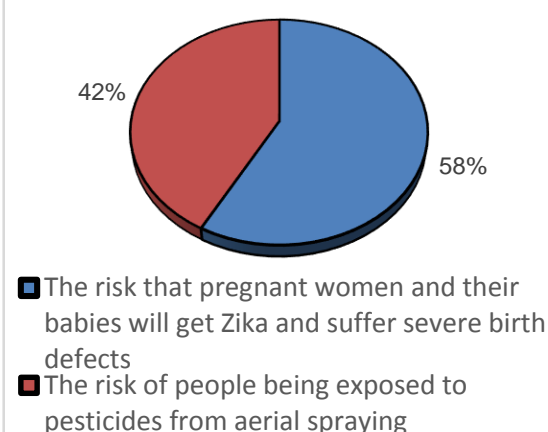
Following the education and small group discussions, participants participated in a polling exercise (please see Appendix A for complete polling results by meeting and in the aggregate). In an initial series of questions, a facilitator read a series of statements and asked participants to rate the importance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

“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, we 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% to 42% (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% 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% indicating they would very likely support to 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

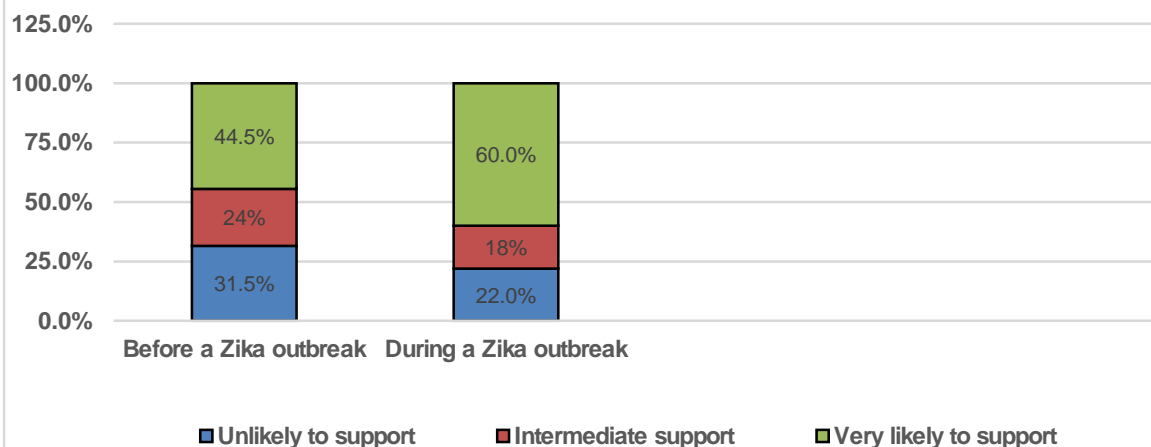
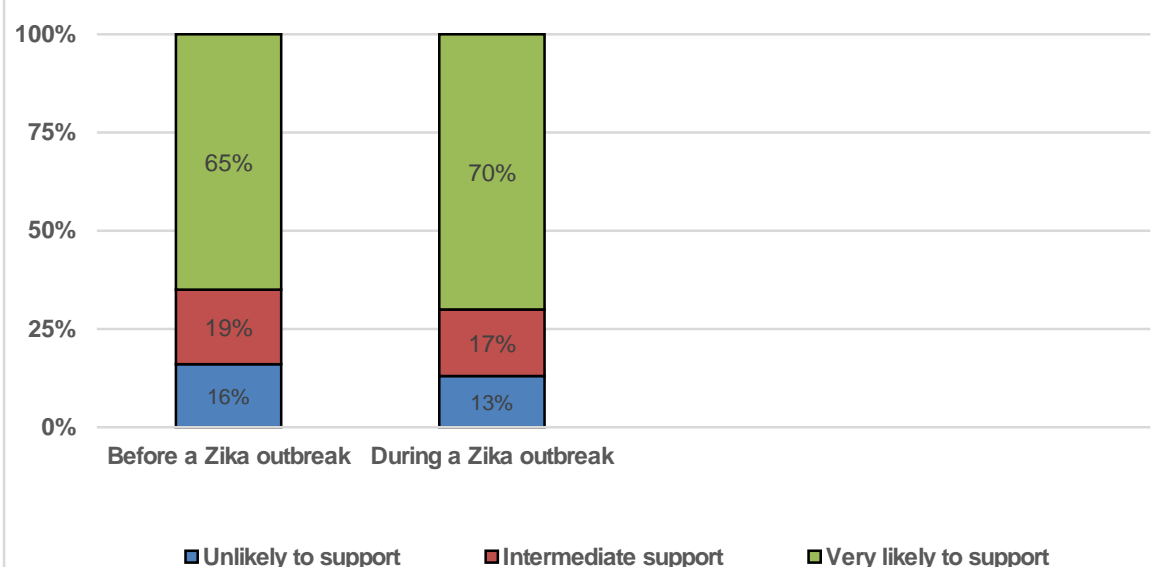
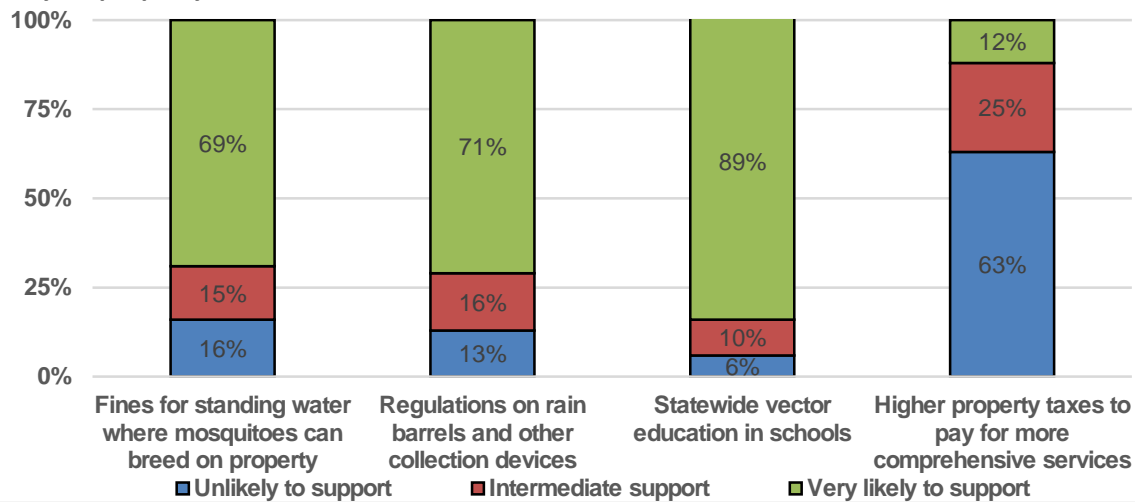


Figure 5. Support (and lack of support) for *Wolbachia*-infected or GMO mosquitoes before and during a Zika outbreak in Los Angeles County



The final polling questions, engaged participants in more policy focused questions and asked them to rate their level of support on a number of 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, participants offered a high level of support for both types of potential initiatives with 69% and 71%, respectively, indicating they were very likely to support the initiative. In addition, 89% of participants across meetings 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, it was clear through follow up conversations with participants 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. Education of residents also is a large component of mosquito control enabling people to take action to reduce mosquito breeding on their property and to increase personal protective behaviors to reduce bites. 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?

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

—Meeting Participant

Public input was sought to better understand the acceptability of different strategies, information needs, and to inform policy discussions. To our knowledge, this approach of using public workshops to generate qualitative and semi-quantitative data has not been used in other jurisdictions to address these issues.

Aerial pesticide application has been a controversial strategy to control mosquito-borne infections. 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 other areas, such as southern Florida, aerial application was one component of the response to the 2016 local Zika outbreak. In other areas, such as Puerto Rico, aerial application has not been used despite more than 35,000 reported Zika infections and a new CDC study that estimates nearly 13% of the population, or about 470,000 individuals, have been infected.⁴ Although the CDC identifies aerial applications as an effective component of an integrated mosquito

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.

management program that is safe for human health, public concerns are widespread and websites allege numerous serious health risks from pesticide exposure, including cancer, nervous system damage, and autism.

Similar to other areas, 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 considering preventing Zika more important and 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, 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.

Individual and communitywide efforts to reduce mosquito breeding sites was widely supported and this finding also has 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. Attempts were made to recruit participants who reflected their community and in aggregate, were similar to 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 as well as for 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 that demographic similarities alone do not imply representativeness.

A strength of community workshops is that they allow for education of participants enabling them to express more informed beliefs and preferences — perhaps similar to a situation where an outbreak has occurred and

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)

information has been widely shared by public health, vector control and others through multiple communications channels. However, the validity of workshop results depends on the information presented being accurate, so as not to bias participants. To reduce this risk, presentations were carefully reviewed for accuracy. The Keystone Policy Center's role and reputation as a neutral facilitator and their experience with public engagement served as an additional check. From the post-meeting survey, 96% of participants agreed or strongly agreed that the information presented was fair, balanced, and credible and 95% agreed or strongly agreed that they felt comfortable voicing their opinions and thoughts during the discussion.

Finally, in summarizing the qualitative data for this report, we relied on the notes from the English and Spanish-speaking facilitators and note-takers. We attempted to improve the quality of note-taking through training before the workshops and having note taking separate from facilitation. The similar findings from the electronic polling and the qualitative analysis suggest that the qualitative information was appropriately recorded and summarized.

Recommendations and Conclusions

The following are recommendations for public health, vector control, and policymakers stemming 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.
 - By better utilizing community specific champions and more community targeted messaging, information can more effectively reach diverse members of the community.
- As neighborhoods have had different experiences in the past 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 to reach the diverse populations throughout the area. Pivot "tip and toss" (reduction of mosquito breeding sites) messaging to be less individual focused and more neighborhood/community focused — i.e. If we all do it, it helps to increase effectiveness.
- 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 regarding the threat of local Zika transmission, potential response strategies including aerial application of pesticides, the scientific data on effectiveness and potential adverse effects, and the results from these meetings suggesting 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 in building awareness that broader applications may need to take place during an outbreak to mitigate the spread of disease.

Policy

- Policies in the county and cities should support effective application of community-based strategies to reduce mosquito breeding (tip and toss) as a high priority.
 - Policies that place more responsibility on home owners/renters such as fines for standing water, excessive trash, or unmaintained backyard pools and ponds would be widely supported if the rationale is clear to the public.
 - Policies supporting distribution and use of rain barrels should ensure that the design of the barrels does not promote mosquito breeding, and during community rain barrel distribution, residents should be educated about their proper use, draining, and cleaning.
 - Individual and community-based control practices should be a high priority in a strategy moving forward. The decision to use a pesticide application should be weighed with the concerns 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 introduction of a brief curriculum for elementary and middle school students as part of health education.
- Consider supporting additional work by the vector control agencies to evaluate new strategies such as release of sterile male mosquitoes (preferably using *Wolbachia*-infected mosquitoes though other strategies also may be supported).
- In advance of 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 that would be an effective component of an outbreak response and with their public acceptability.

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 to 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