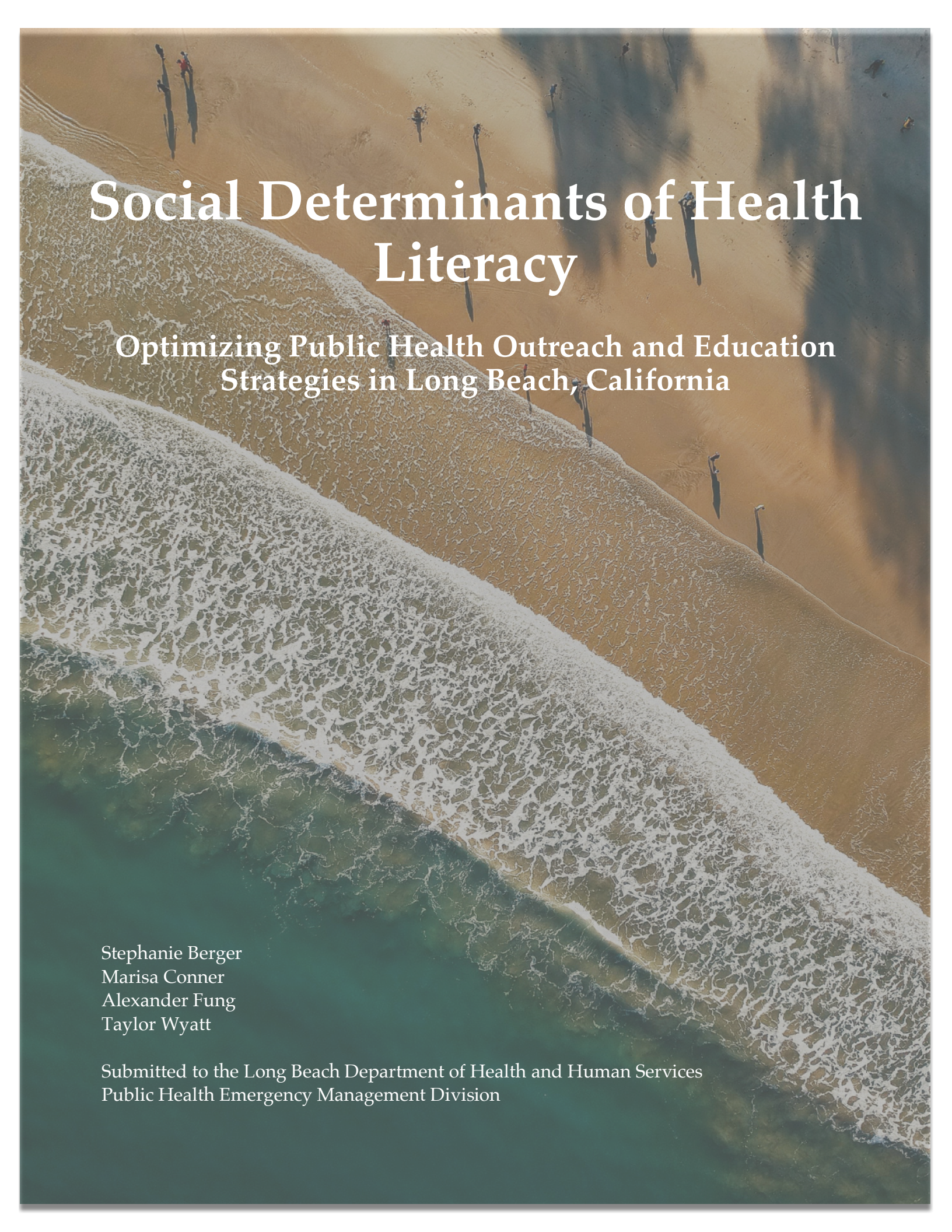




Social Determinants of Health Literacy

Optimizing Public Health Outreach and Education
Strategies in Long Beach, California

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Submitted to the Long Beach Department of Health and Human Services
Public Health Emergency Management Division

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UCLA Luskin School *of* Public Affairs

Department of Public Policy

CLIENT

We prepared this report for Emily Holman, MSc, the Emerging Infectious Disease Response Coordinator at the Public Health Emergency Management (PHEM) Division within the Long Beach Department of Health and Human Services (DHHS). Long Beach DHHS PHEM was established with the goal of creating a thriving and healthy community for the residents of Long Beach, and manages the task of responding to public health emergencies, such as bioterrorism, disease outbreaks, and natural disasters.¹ PHEM organizes outreach initiatives and coordinates public information campaigns regarding such public health emergencies. PHEM funds these efforts with financial support from many entities, such as the Center for Disease Control and Prevention (CDC), the Public Health Foundation Enterprises, and the California Health and Human Services Agency. Additionally, PHEM receives funds and assistance from its partners, such as the Long Beach Police Department and the Long Beach Fire Department, for public health communication efforts.²

¹ "About Us." Long Beach Department of Health and Human Services. Accessed Spring 2018.

² Interview, Ivonne Alarcon, Long Beach Department of Health and Human Services.

GLOSSARY OF TERMS AND ACRONYMS

Terms

All-Hazards plan: an emergency operations plan that “serve(s) as the basis for effective response to any hazard that threatens the jurisdiction”; these plans include mitigation activities and coordination with state- and federal-level response mechanisms.³

Health literacy: “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.”⁴

Local transmission: a form of disease transmission wherein a vector (like a mosquito) bites an individual who is infected with a transmittable disease; this newly-infected mosquito bites a healthy individual, infecting them with the disease.⁵

Microcephaly: “a neurological birth defect where a baby’s head is smaller than expected when compared to babies of the same sex and age, resulting from incomplete brain development.”⁶

Vector-borne disease: “human illnesses caused by parasites, viruses, and bacteria that are transmitted by mosquitoes, sandflies, triatomine bugs, blackflies, ticks, tsetse flies, mites, snails, and lice [...] Since 2014, major outbreaks of dengue, malaria, chikungunya, yellow fever, and Zika have afflicted populations, claimed lives, and overwhelmed health systems in many countries.”⁷

Zika: a vector-borne virus transmitted by the *Aedes* mosquito; causes mild, flu-like symptoms in healthy adults and children; can cause severe microcephaly in a fetus.⁸

³ Federal Emergency Management Agency. “Guide for All-Hazard Emergency Operations Planning.” *State and Local Guide (SLG) 101*, September 1996. Accessed Spring 2018.

⁴ Institute of Medicine (US) Roundtable on Health Literacy. “Measures of Health Literacy: Workshop Summary.” Washington (DC): National Academies Press (US); 2009. 2, An Overview of Measures of Health Literacy. Accessed Spring 2018.

⁵ Centers for Disease Control and Prevention. “Chikungunya, Dengue, or Zika: What is local transmission?” US Department of Health and Human Services. Accessed Spring 2018.

⁶ Centers for Disease Control and Prevention. “Birth Defects.” US Department of Health and Human Services. December 2016. Accessed Spring 2018.

⁷ “Vector-borne Diseases.” World Health Organization. Accessed Spring 2018.

⁸ Centers for Disease Control and Prevention. “Zika Virus: About Zika.” US Department of Health and Human Services. September 2016. Accessed Spring 2018.

Acronyms

ACS: American Community Survey

CASPER: Community Assessment for Public Health Emergency Response

CDC: Centers for Disease Control and Prevention

DHHS: Department of Health and Human Services

GARE: Government Alliance on Race and Equity

MAHKA: Mosquitoes and Health Knowledge Assessment

OCHCA: Orange County Health Care Agency

OFR: Office of Financial Resources - Centers for Disease Control and Prevention

PHEM: Public Health Emergency Management

SES: Socioeconomic Status

STI: Sexually Transmitted Diseases

TANF: Temporary Assistance for Needy Families

WHO: World Health Organization

ZKA: Zika Knowledge Assessment

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EXECUTIVE SUMMARY

Historically marginalized communities tend to have lower health literacy, which can lead to poorer health outcomes.⁹ Therefore, effective, precise, and culturally competent communication strategies are critical in addressing the disparities in levels of health literacy across cities. In particular, public health emergencies demand detailed attention to how individuals come in contact with and retain such information. Following the identification of the Zika virus and its devastating effects on fetuses, public health and emergency services agencies around the world developed communication toolkits to increase awareness of the disease and lower the likelihood of transmission within communities. Beginning in 2016, the Long Beach Department of Health and Human Services Public Health Emergency Management Division (LB DHHS PHEM) created a set of these strategies and used them to disseminate Zika information to Long Beach residents.

To evaluate the effectiveness and equity of its chosen strategies, Long Beach DHHS PHEM conducted a Community Assessment for Public Health Emergency Response (CASPER). Since many of the strategies used to educate the public about Zika have also been used in other public health emergencies and with other emerging health issues, the division believed the CASPER could provide insights into the overall success of its programs (*see Appendix A for further explanation of the design and structure of the CASPER.*)

Long Beach DHHS epidemiologists conducted a preliminary analysis of the CASPER data to identify gaps in public knowledge about the Zika virus. In reviewing the results of this analysis, PHEM realized that many residents were being mis- or under-informed by current education strategies, as evidenced by incorrect answers to questions about mosquitoes, health, and Zika. Furthermore, Long Beach officials were particularly concerned that their efforts systematically under-served historically underrepresented demographic groups, as research has thoroughly documented the association between identification with a marginalized community and low health literacy.¹⁰ The department posed the following question: What strategies can the Long Beach Department of Health and Human Services Public Health Emergency Management Division implement or alter to improve equity in residents' health literacy, knowledge, and information retention?

To develop possible answers to this question, we analyzed the CASPER results in conjunction with census and demographic data, reviewed best practices and analytical

⁹ Paasche-Orlow, MK and MS Wolf. "The causal pathways linking health literacy to health outcomes." *American Journal of Health Behavior*. 31(1): S19-26. September-October 2007. Accessed Spring 2018.

¹⁰ Rudd, Rima. "Health Literacy Skills of US Adults." *American Journal of Health Behavior*. 2007. S8:S18. Accessed Winter 2018.

literature, and conducted key informant interviews. This analysis yielded several possible policy options, including changes in organizational structure and capacity-building, developing and strengthening community partnerships, and improving internal strategies to target specific populations.

We evaluated each policy option based on its theoretical ability to increase the number of people contacted by public health information--specifically those from marginalized communities--, the amount of information retained, the cost of the initiative, and the political and organizational implications of the option.

Our analysis resulted in the following recommendations:

- 1) Create partnerships with community “gatekeepers”
- 2) Improve accessibility of information campaigns and materials
- 3) Strengthen Partnerships with Local Health Organizations and Public Programs

Although the Long Beach Department of Health and Human Services is open to reviewing many different policy options, the three above scored the highest according to the weighted policy evaluation criteria. We believe that these policy recommendations, implemented together or separately, will improve health literacy throughout the City and work toward Long Beach DHHS PHEM's goal of improving health outcomes within the community.

INTRODUCTION

Cities across the United States currently face the pressing issue of inequity in health outcomes, including reduced life expectancy, low birth weight, and high disease incidence. While several factors contribute to this inequity, researchers frequently cite low health literacy as a highly significant predictor of these undesirable health outcomes.¹¹

Although various definitions of health literacy exist in the literature, researchers generally define the concept as an individual's ability to interpret health information and meet their own health needs.¹² In combination with a person's physical and mental capabilities, socioeconomic and demographic factors--such as race, ethnicity, educational attainment, language, citizenship status, income, and age--characterize an individual's level of health literacy.¹³ Consequently, the most disadvantaged community members tend to have less contact with and retention of health information, leading to systematically poorer health outcomes for populations already facing challenges such as poverty, language barriers, or racial discrimination.¹⁴

Health literacy fundamentally underpins a person's ability to engage with topics in the healthcare system (*see Figure 1*). This critical effect renders public health agencies and other actors responsible for the implementation of literacy-sensitive public information campaigns, and strongly suggests the importance of improving health literacy, specifically within disadvantaged communities.¹⁵

When health departments and other public agencies fail to consider the ways in which different socioeconomic and demographic groups access and interpret health information, they further perpetuate the historical structural racism and sociopolitical marginalization facing these populations. Incorporating equitable practices into public health information campaigns can lead to increased levels of health literacy in underrepresented communities, which enable individuals to better access and comprehend such health information. Promoting these health literacy policies can, in turn, lead to more equity in health outcomes across demographic and socioeconomic populations within the City.

¹¹ Nutbeam, Don. "The evolving concept of health literacy." *Social Science & Medicine* 67, no. 12: 2072-078. October 2008. Accessed Spring 2018.

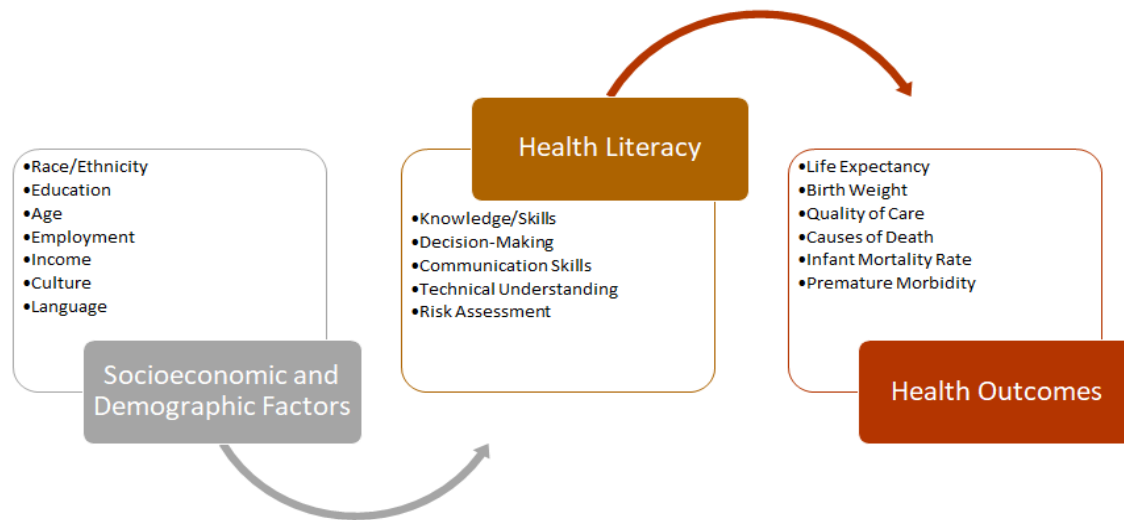
¹² Institute of Medicine (US) Roundtable on Health Literacy. *Measures of Health Literacy: Workshop Summary*. Washington (DC): National Academies Press (US); 2009. 2, An Overview of Measures of Health Literacy. Accessed Spring 2018.

¹³ Office of Disease Prevention and Health Promotion. "National Action Plan to Improve Health Literacy." US Department of Health and Human Services. 2010. Accessed Spring 2018.

¹⁴ Institute of Medicine (US) Roundtable on Health Literacy. *Measures of Health Literacy: Workshop Summary*. Washington (DC): National Academies Press (US); 2009. 2, An Overview of Measures of Health Literacy. Accessed Spring 2018.

¹⁵ Nutbeam, Don. "The evolving concept of health literacy." *Social Science and Medicine*. 67, 2072-2078. October 2008. Accessed Spring 2018.

Figure 1: Predictors of Health Literacy and Health Outcomes Diagram¹⁶



The City of Long Beach, California, serves as a textbook example of a diverse municipality with varying demographic characteristics. As of 2010, the racial makeup of Long Beach was 40.8% Hispanic or Latinx (of any race), 29.4% non-Hispanic White, 13.5% Black or African American, and 12.9% Asian.¹⁷ Of the Asian population, there are nearly 20,000 people of Cambodian descent, which reflects the largest community outside of Cambodia itself.¹⁸ Additionally, 41% of the residents speak languages other than English in the home such as Spanish, Khmer, and Tagalog.¹⁹ These demographic characteristics make Long Beach one of the most diverse cities in Los Angeles County, ranking it 9th among all 272 Los Angeles neighborhoods;²⁰ however, the City also has some of the worst health outcomes in the County. Long Beach residents' average life expectancy is 78.6 years, while the County-wide average is 80.3 years.²¹ Furthermore, the City had a 7.5% low birth weight rate in 2012, in comparison to Los Angeles County's average of 6.9%.²²

Disparities within the City's neighborhoods also exist. As seen in *Figures 2, 3, and 4*, neighborhoods with higher concentrations of Latinx and/or Black residents tend to also

¹⁶ Paasche-Orlow, MK and MS Wolf. "The causal pathways linking health literacy to health outcomes." *American Journal of Health Behavior*. 31(1): S19-26. September-October 2007. Accessed Spring 2018.

¹⁷ "QuickFacts." U.S. Census Bureau QuickFacts: Long Beach City, California. Accessed Spring 2018.

¹⁸ "Quick Facts." The California Endowment: Long Beach. Accessed Spring 2018.

¹⁹ "QuickFacts." U.S. Census Bureau QuickFacts: Long Beach City, California. Accessed Spring 2018.

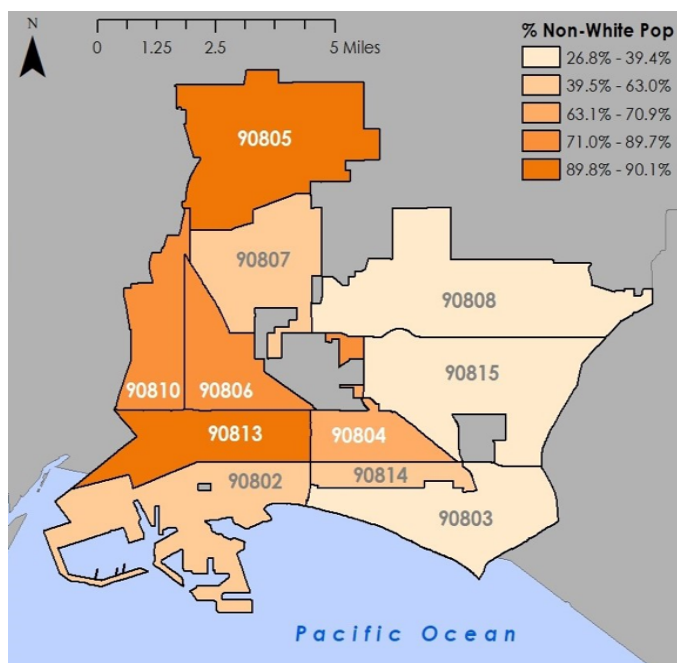
²⁰ "LA Diversity". *Los Angeles Times: Mapping LA*. Accessed Spring 2018.

²¹ Office of Health Assessment and Epidemiology. "Life Expectancy in Los Angeles County: How long do we live and why?" County of Los Angeles Public Health. July 2010. Accessed Spring 2018.

²² "Babies with Low Birth Weight." Live Well Long Beach. Updated February 2015. Accessed Spring 2018.

have higher concentrations of poorer and less educated residents. Long Beach residents living in the west and central regions of the City have lower median household incomes (MHI) and educational attainment than their neighbors to the east. Disparate health outcomes exist in conjunction with these varied socioeconomic indicators. As evidenced in *Figures 5 and 6*, communities in Long Beach with more disadvantaged socioeconomic characteristics--and therefore an increased probability of low health literacy--have lower life expectancies and birth weights, on average (*for more information, see Appendix B*).²³

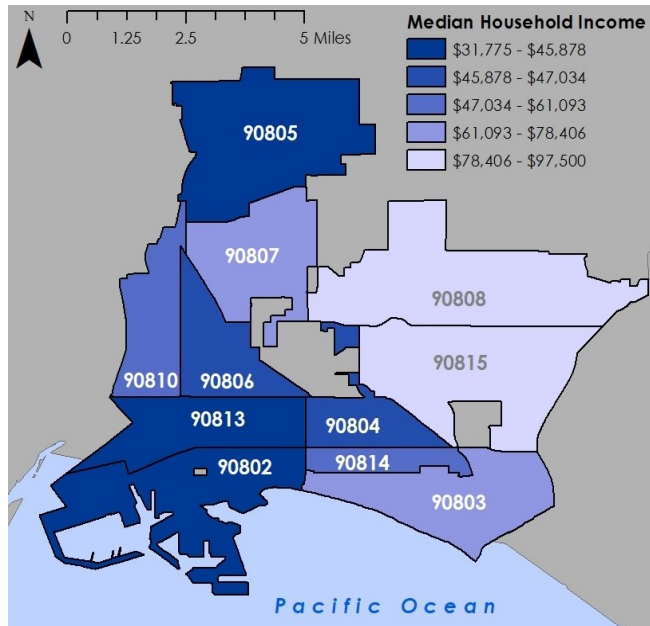
Figure 2: Percentage of Population Non-White by Zip Code



Source: 2016 ACS 5-Year Estimates

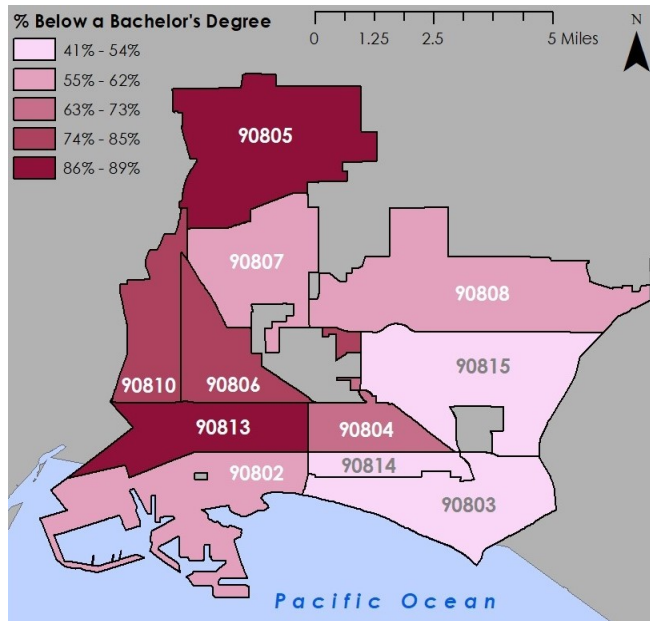
²³ Price, Susan, Mitchell Kushner, S. Michael Johnson, Cheryl Barrit, Nelson Karr, and Darnisa Tyler. "Community Health Assessment." City of Long Beach Department of Health and Human Services. July 2013. Accessed Spring 2018.

Figure 3: Median Household Income by Zip Code



Source: 2016 ACS 5-Year Estimates

Figure 4: Educational Attainment by Zip Code^a



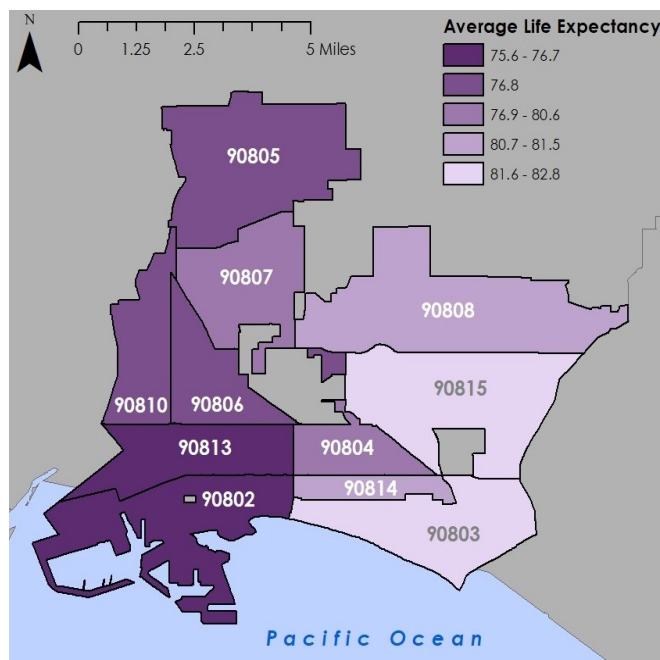
Source: 2016 ACS 5-Year Estimates

^a This represents the percentage of persons 25 years and over attaining less than a bachelor's degree.

Long Beach residents' variations in backgrounds, levels of health literacy, modes of learning, and trust of government agencies may present hurdles in informing the public. The diversity of the City necessitates culturally-sensitive and demographically-informed public health information campaigns to reach out to various communities. This ensures that all residents, regardless of cultural or economic background, have access to health services.

With a “mission to improve the quality of life by promoting a safe and healthy community in which to live, work, and play,” Long Beach Department of Health & Human Services (DHHS) implements a wide range of programs and initiatives to service the needs of its community and engage directly with residents.²⁵ Long Beach DHHS holds a unique position within the City to effectively adopt more equitable public health information outreach strategies. The department houses both the City’s Public Health Emergency Management Division (PHEM), which focuses on preparation for and response to natural disasters, disease outbreak, bioterrorism, and vector-borne diseases, and the Office of Equity, which provides an equity lens on issues throughout the City.

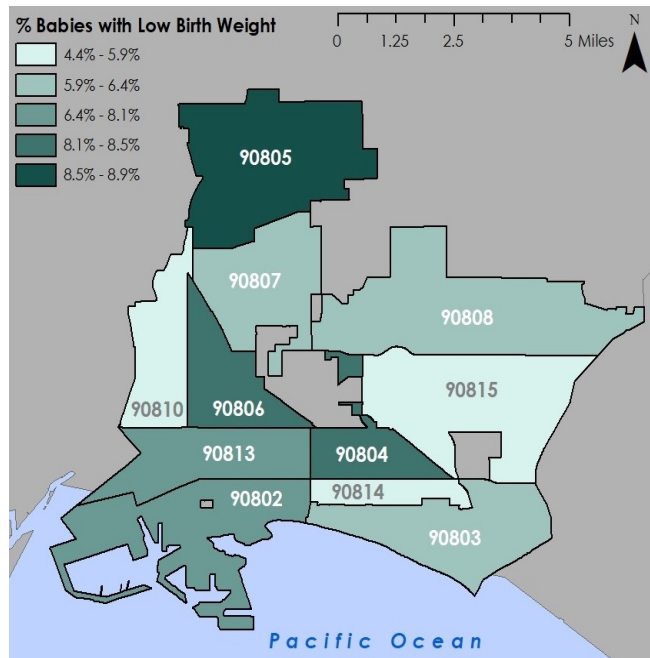
Figure 5: Average Life Expectancy by Zip Code



Source: 2010 Long Beach DHHS

²⁵ “Health & Human Services: Health.” City of Long Beach. Accessed Spring 2018.

Figure 6: % of Babies Low Birth Weight by Zip Code²⁶



Source: 2012 California Department of Public Health

Public Information and the Emergence of Zika

Most health and human services or emergency operations departments use public information “toolkits,” which are staples of their all-hazards plan. Each strategy in the toolkit can be adapted for specific emerging issues ranging from earthquake preparedness, salmonella outbreaks, and heatwave conditions. DHHS develops its toolkit in partnership with neighboring stakeholders, including the Pasadena Public Health Department, Los Angeles County Department of Health Services, Los Angeles County Department of Public Health, and state-level Center for Disease Control and Prevention specialists. These officials work with CDC toolkits to develop locally-oriented campaigns and create cohesiveness in messaging across geographic areas.²⁷ Long Beach DHHS implements various strategies in its toolkits for a myriad of public health emergency communications, including:

- Engaging both intradepartmental (Office of Equity, STI Surveillance, Tuberculosis, etc.) and interdepartmental (Emergency Operations, Department of Water and Power, etc.) entities, community members, and partners on boards or planning groups;

²⁶ This represents the percentage of births in which the newborn weighed less than 2,500 grams (5 pounds, 8 ounces).

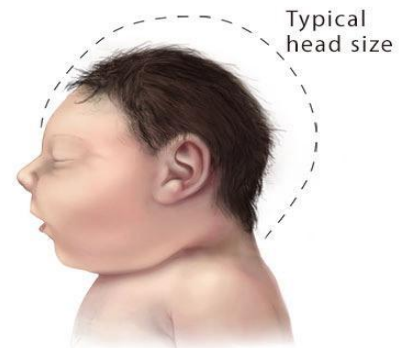
²⁷ Interview with Jennifer Gonzalez, Long Beach Department of Health and Human Services.

- Speaking at community meetings to inform the public about specific emerging issues;
- Working with city councilmembers to increase the visibility of public health issues within communities; and
- Disseminating information using:
 - Social media, such as Facebook, Twitter, Instagram, Nextdoor, etc.,
 - Traditional media, including local television and radio ads, etc.,
 - Physical publications, including flyers (posted at frequently-accessed services like the library), bus advertisements, etc.,
 - A language access program, which translates any public information text into requested languages, and
 - Messaging simplification, to reach individuals with low levels of educational attainment or low levels of health literacy.²⁸

Image 1: Variations in Microcephaly Severity



Baby with Typical Head Size



Baby with Microcephaly



Baby with Severe Microcephaly

Throughout the past five years, one of PHEM's goals was to prevent the spread of the Zika virus. This virus can be transmitted by the *Aedes aegypti* and *Aedes albopictus* mosquitoes, as well as sexual contact with an infected individual (see Appendix C for a history of Zika virus).²⁹ While symptoms of Zika often go unnoticed in most healthy individuals, the most dramatic and severe consequences of the virus occur in pregnant women, whose fetuses can develop severe microcephaly.³⁰ Microcephaly is a neurological disorder that stalls brain development in fetuses, causing smaller head sizes in comparison to babies of the same age and sex (see Image 1³¹); this disorder is

²⁸ Interview with Jennifer Gonzalez, Long Beach Department of Health.

²⁹ Centers for Disease Control and Prevention. "Zika Virus: Preventive Measures." US Department of Health and Human Services. February 2018. Accessed Spring 2018.

³⁰ Centers for Disease Control and Prevention. "Zika Virus: Health Effects." US Department of Health and Human Services. August 2016. Accessed Spring 2018.

³¹ Center for Disease Control and Prevention. "Facts of Microcephaly." US Department of Health and Human Services. December 2016. Accessed Spring 2018.

<https://www.cdc.gov/ncbddd/birthdefects/microcephaly.html>.



linked with other negative health outcomes, such as seizures, developmental delay, intellectual disability, difficulty with muscle movements such as swallowing and walking, and hearing and vision loss.³²

In response to these threats, Long Beach DHHS PHEM adapted many of its existing public health information strategies to educate the public about Zika transmission, protection, and detection, as well as mosquito control. Initial strategies included the following:

- Facilitating ten to fifteen-minute community meetings to present Zika information;
- Implementing a multi-platform approach for large-scale advertisements (including a billboard near the 405 freeway and Zika Hotline information on Long Beach utility bills);
- Cooperation with other city departments to encourage various stakeholders to promote information;
- Translation of public information text into commonly spoken languages, including Spanish, Tagalog, and Khmer;
- Simplification of all written messages to a 4th grade reading level, and the use of visual representation whenever possible;
- Utilizing a multi-level social media campaign using platforms like Facebook, Twitter, Instagram, SnapChat, Nextdoor, etc.;
- Use of CDC toolkits, including training staff on how to properly use any new toolkits;
- Targeting vulnerable populations, including children and families, with community events and partnerships with organizations like local hospitals, WIC centers, etc.³³

In 2016, the CDC identified Southern California as a likely geographic area for the next case of local transmission of Zika. The CDC's assessment was due in large part to the significant quantity of Southern Californians who travel to and from areas of known local transmission, such as Mexico, Central America, and the Philippines (*see Appendix D for a world map of areas with risk of Zika*).³⁴ Consequently, the Long Beach community became more invested in Zika prevention and mitigation, and therefore, public health officials and their strategies were subject to heightened scrutiny.

Furthermore, the discovery of *Aedes* mosquitoes inside the boundaries of the City of Long Beach sparked concerns that local transmission was even more likely, as the vectors for transmission were present in close proximity to possible hosts. To date,

³² Centers for Disease Control and Prevention. "Facts of Microcephaly." US Department of Health and Human Services. December 2016. Accessed Spring 2018.

³³ Interview with Jennifer Gonzalez, Long Beach Department of Health and Human Services.

³⁴ Centers of Disease Control. "World Map of Areas with Risk of Zika." US Department of Health and Human Services. February 2018. Accessed Spring 2018.

epidemiologists have not confirmed any cases of local transmission of Zika within Long Beach. However, seven Long Beach residents have been diagnosed with the disease, which they likely contracted while travelling to and from areas known to have local transmission.³⁵ The confluence of vector identification, residents who tested positive for the virus, and public attention on the issue required redoubling of communication efforts.

Information Campaign Evaluation

In an effort to evaluate the success of its public information campaigns, Long Beach PHEM administered a Community Assessment for Public Health Emergency Response (CASPER) in July 2017. The CASPER contained a set of survey questions to better understand what Long Beach residents knew about Zika, mosquitoes, and public health issues in general (*see Appendix E for CASPER methodology*).³⁶ In analyzing the 197 CASPER survey responses, Long Beach PHEM realized residents had gaps in knowledge acquisition and retention, evidenced by high proportions of incorrect answers to Zika and other health-related questions. Aware of the connections between health outcomes and socioeconomic diversity, Long Beach public health leaders worried that their communication efforts systematically mis- or under-informed specific demographic groups, especially historically underserved populations.

³⁵ "Health & Human Services: Zika Virus." City of Long Beach. Accessed Spring 2018.

³⁶ *Long Beach Zika Community Assessment for Public Health Emergency Response (CASPER)*. Report. July 2017. Accessed Winter 2017.

POLICY PROBLEM AND IMPORTANCE

To optimize public health equity in Long Beach, we were tasked to answer the following policy question: **What strategies can Long Beach Department of Health and Human Services Public Health Emergency Management Division implement or alter to improve equity in residents' health literacy, knowledge, and information retention?** To identify issues and develop possible solutions, PHEM instructed our team to use the Zika CASPER as a case study to analyze its public information strategies. Following this evaluation, we researched best practices in the field of public health emergency communication and conducted interviews with key informants to determine which new policies and improvements would best address these gaps in public health knowledge.

We have oriented our policy recommendations toward improved health literacy and have ensured their applicability in many types of public health emergencies. Ultimately, these recommendations seek to enhance the health literacy of all Long Beach residents, taking into consideration financial, political, and administrative barriers.

METHODS OF DATA COLLECTION

To provide effective, precise, and adequate policy recommendations, we collected qualitative data via interviews with key community stakeholders, and conducted a thorough review of extant literature and best practices publications. We also analyzed the CASPER survey and publicly available U.S. Census American Community Survey (ACS) data.

INTERVIEWS

Our team conducted interviews with Long Beach DHHS personnel as well as other experts in the field (*see Appendix F for a list of interviewees*). These interviews provided insight into a public health agency's general approach to prevention and outreach strategy management.

Our team interviewed a total of eleven stakeholders from Long Beach DHHS, Los Angeles County Department of Public Health, Pasadena Public Health Department, Orange County Health Care Agency, Government Alliance for Race and Equity (GARE), Office of Los Angeles County Supervisor Janice Hahn, Centers for Disease Control and Prevention (CDC), and the California Endowment. These stakeholders can be roughly divided into two groups: those with expertise in public health communications, and those with knowledge in equity and/or politics. All interviewees have significant experience with the political, bureaucratic, or public health dynamics of the Southern California region.

The interviews we conducted with our key informants revealed skills and strategies that have both succeeded and failed in the current political, social, and health environment in Southern California. The vast majority of our interviewees are subject matter experts on emerging public health issues or the sociopolitical climate, but we recognize that the insights gained are limited to their specific experiences and circumstances. While research literature provides us with a broader purview to understand policies and procedures in the surrounding regions, it is essential to consider that any conclusions drawn from these interviews may be limited in scope.

We conducted interviews over the phone, in-person, or via an email questionnaire, based on the needs and availability of the interviewee. Prior to each interview, all team members drafted questions that catered to the specific interviewee. Each informant received the questions via email prior to the interview to review and prepare answers, including any relevant statistics and documents. All of the interviews conducted in-person or over the phone were recorded on electronic devices and then transcribed by our team members. On average, an interview lasted between 20 and 45 minutes.

LITERATURE REVIEW

To inform our framing of the criteria for our policy options, as well as the selection of policy options, we reviewed a wide range of literature on health literacy, the Zika virus, general public health outreach campaigns, the CDC public health communication toolkits, and the health status of underserved populations in Long Beach. These works fit into three categories of evidence: after-action reports, which detail the real world responses to public health emergencies and review the effectiveness of these public information campaigns; scientific articles measuring effectiveness of specific strategies; and directory documents, such as CDC recommendations and toolkits that would be used by health or emergency operations departments.

CASPER

The CASPER survey was conducted by Long Beach DHHS in July 2017 to assess community understanding of and preparedness for the presence of the Zika virus in Long Beach. In analyzing the responses to the survey, Long Beach PHEM discovered that many Long Beach residents were unaware of the public health consequences of Zika transmission, despite the fact that DHHS was already conducting public information campaigns via multiple outlets to educate the public.

Although very little demographic data were collected during the CASPER, the survey contains two important demographic variables: language predominantly spoken in the household and age of residents in the household (*see Appendix G for CASPER questionnaire*). These variables are critical to our analysis because scientific literature on health outcomes and health literacy suggest that speaking a language other than English and being over 65 years old are correlated with low health literacy.³⁷

AMERICAN COMMUNITY SURVEY

We supplemented the CASPER survey data with demographic and socioeconomic information from the American Community Survey (ACS). Specifically, we downloaded 2016 ACS 5-year estimates data at the block group level to describe characteristics of the neighborhoods where CASPER survey respondents lived.

Our interviews and literature review informed our decisions about which variables to include in our analyses. Consequently, we collected ACS data on race and ethnicity, educational attainment, nationality, insurance status, SNAP participation, median household income, poverty, and employment status (*see Appendix H for complete list of variables*).

³⁷ Office of Disease Prevention and Health Promotion. "National Action Plan to Improve Health Literacy." US Department of health and Human Services. 2010. Accessed Spring 2018.

METHODS OF DATA ANALYSIS

QUANTITATIVE DATA: CASPER & ACS

We built on Long Beach DHHS' previous analyses of the CASPER data to better understand how Long Beach residents acquire their health information, and how well they retain the information presented to them. To assess retention in surveyed participants, we measured respondents' knowledge of mosquito-transmitted diseases by summing their correct answers to a set of relevant questions, and dividing that sum by the number of questions, to yield a "proportion correct" score on what we call the Mosquitos and Health Knowledge Assessment (MAHKA). We also measured respondents' knowledge of Zika by summing their correct answers to a set of relevant questions, and dividing that sum by the number of questions, to yield a "proportion correct" score on what we call the Zika Knowledge Assessment (ZKA). Thus, we assigned each respondent two "scores" on a scale from 0 to 1: the MAHKA score is the proportion of correct responses on questions 7-21 on the CASPER; the ZKA score is the proportion of correct responses on questions 45-63 (*see Table 1 for relevant questions*). MAHKA questions were asked of all 197 respondents; ZKA questions were only asked of those respondents who had heard of Zika before that day (*see Appendix G for copy of CASPER survey*).

Table 1: CASPER Questions Included in Each Health Literacy Score^a

True or False Questions for MAHKA and ZKA Scores	
MAKHA	ZKA
7. Mosquitoes in Long Beach can cause disease.	45. Zika is preventable
8. Mosquitoes in Long Beach carry West Nile Virus	46. You can get Zika from having sex with someone who has Zika
9. Mosquitoes in Long Beach carry Dengue	47. The mosquitoes that carry Zika only bite during dusk and dawn
10. Mosquitoes in Long Beach carry Zika	48. The mosquitoes that carry Zika have black and white stripes on their legs
11. Mosquitoes in Long Beach carry	49. Zika can be passed from a pregnant

^aLong Beach Zika Community Assessment for Public Health Emergency Response (CASPER). City of Long Beach. July 2017. Accessed Winter 2017.

Chikungunya	mother to her baby
12. Different types of mosquitoes can transmit different types of diseases	50. Zika can be passed to others by breathing the same air as someone who is infected
13. Mosquitoes cannot breed in very small amounts of water	51. Babies born to mothers with Zika may have severe birth defects
14. Mosquitoes can live inside the home as well as outside	52. Travelling to areas that have Zika is safe for pregnant women
15. Mosquito control is important to you and your household members	53. Men can sexually transmit Zika to their partners for up to six months after becoming infected
16. Mosquitoes are usually around the size of a quarter	54. Women can sexually transmit Zika to their partners for up to six months after becoming infected
17. There are ways to prevent mosquitoes from breeding around your home	55. Zika often causes severe illness and death in adults
18. Using mosquito repellent while outdoors can protect from Zika and West Nile Virus	56. Symptoms of Zika virus infection include: fever, rash, joint pain, and red eyes
19. Mosquito repellent is harmful for children to use	57. Most people who get Zika will not have symptoms
20. Mosquito repellent is safe for pregnant women to use	58. There is no treatment for Zika
21. Aerial spraying for mosquitoes is safe for humans	59. There is an available vaccine for Zika
	60. Dogs and cats can become sick from Zika
	61. There is still a lot we don't know about Zika virus
	62. The City of Long Beach has a Zika hotline number for the public to report mosquitoes or ask questions about Zika

	63. Mosquitoes that transmit Zika prefer to lay eggs in large bodies of water
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The MAHKA and ZKA scores serve as measures of contact with health information and health literacy. Both scores evaluate Long Beach residents’ knowledge about mosquitoes, health, and Zika, and all of the questions correspond with public health information that the Long Beach Department of Health and Human Services has distributed. Specifically, MAHKA scores evaluate general knowledge regarding mosquito transmitted diseases, prevention of mosquito breeding in and around the home, and mosquito bite prevention. Furthermore, score ZKA specifically asks respondents who had heard of Zika in the past questions regarding Zika transmission, prevention, and effects. Among all 197 respondents for score MAHKA, the average score was 47.6%; for ZKA, the average score of the 165 respondents was 43.1%. No respondent scored higher than 87% on either “test”. Furthermore, one respondent answered zero questions correct for score MAHKA, and three respondents answered zero questions correct for score ZKA (*see Appendix I*).

Using the literature review as a starting point, we identified demographic and socioeconomic variables within the CASPER survey and the American Community Survey (ACS) that we hypothesized would be associated with Mosquito/Health Knowledge and Zika Knowledge. While the CASPER data were collected at the household level, all ACS data were collected at the block-group, or neighborhood level (*see Limitations for further explanation*). Because the CASPER collected very little demographic information, most of the socioeconomic and demographic data included in the following analyses are from the ACS.

Due to variations in cluster size, the probability with which respondents were sampled differed across neighborhoods. Consequently, we weighted all our analyses with the sampling weights provided by PHEM and adjusted our standard errors for the clustering of respondents within neighborhoods. When examining the association between neighborhood characteristics and respondents’ scores on the knowledge tests, we used multilevel models to account for these clustering effects.

QUALITATIVE DATA: LITERATURE REVIEW AND INTERVIEWS

Literature Review

We structured our literature review thematically, initially including best practices research in public health communication, and eventually expanding to the broader concept of health literacy. This expansion resulted from our realization that even the ‘best’ of the best practices would be rendered futile without understanding measures of health literacy. Unfortunately, the field of health literacy research is relatively new, and

metrics of evaluating these levels within individual communities are ill-defined. Consequently, there exist little data to objectively state the effectiveness of any one public health communications strategy in comparison to another. Rather, the literature suggests a variety of potentially useful options, to be used at the discretion of public health agencies and actors.

Interview Analysis

After recording each interview, our team downloaded the .mp3 file to a personal or university computer. We then uploaded the file(s) to a program called “TunesToTube”, which allows users to match voice recordings to images to create YouTube videos. We uploaded these videos to the personal YouTube channel of one team member, and set it to private to avoid publication of the recordings. We then applied YouTube’s closed captioning capabilities to each interview video upload and then downloaded the transcripts. Although there were errors in the automatic closed captioning system, team members systematically reviewed and edited each transcript for accuracy. Finally, one team member listened to the recording, read the transcript, and noted key themes using the Google Document comments tool. We pooled these comments to identify overarching themes and new strategies, and then incorporated these ideas in the problem and policy options sections of this analysis.

These combined strategies resulted in several findings and aided in the identification of issues within the communication and public information outreach plans for Long Beach DHHS.

FINDINGS: CURRENT STATE OF HEALTH LITERACY, EQUITY, AND PUBLIC HEALTH OUTREACH

Long Beach DHHS recognizes that it serves one of the most diverse cities in the U.S. With such a complex socioeconomic and demographic makeup, Long Beach DHHS strives for cultural sensitivity in all of their public health education campaigns, in addition to providing messaging that is uniform, clear, and concise. Despite these efforts, it has been a challenge for Long Beach DHHS and many other public health agencies across Southern California to help individuals understand that they must continue to take heed of all public health emergencies communications, including those related to preventing local transmission of Zika.³⁹ When asked about the challenges in convincing people to change their behaviors to prevent contracting Zika virus, Nora Barin of Long Beach DHHS replied, “How do you have someone wear insect repellent or long pants when it’s hot outside? Or [have] them abstain from sex when they travel?”⁴⁰ Her reply illustrates the difficulty of maintaining buy-in from residents, especially as the threat recedes in the public consciousness and precautions seem increasingly inconvenient.

Improvements in health literacy can help residents understand the technical aspects of emerging public health issues; these improvements can lead to more thorough adoption of healthy habits and preventive measures, ultimately improving health outcomes across the City. We identified the following issues as possible sources of low health literacy and inequitable health communication in Long Beach.

Issue #1: Limited Scope of the Office of Equity

Long Beach DHHS houses the Office of Equity, a one-person advisory office that works with multiple entities within the City government. Katie Balderas, the Office Manager, works within the health department and across the City to engage leaders in conversations on equity of services to advance socioeconomic justice in Long Beach. The office opened in 2016.

Despite this progressive step, the Office’s role in health equity has been somewhat underutilized. In comparison to the Los Angeles County Department of Public Health and the health departments of demographically diverse cities across the country, Long Beach can do more to advance its efforts towards racial health equity.

Although existing literature cites that further research and evaluation is needed on evidence-based practices and policies that show causal effects in reducing health inequity, state and local efforts are currently underway to build administrative capacity

³⁹ Interview, Jennifer Gonzalez, Long Beach Department of Health and Human Services.

⁴⁰ Interview, Nora Barin, Long Beach Department of Health and Human Services.

in addressing these issues.⁴¹ To alleviate these health disparities and advance racial equity for all California residents, the leaders involved in the California Health in all Policies (HiAP) Task Force, a multi-agency effort to “improve health, equity, and sustainability in California,” have identified a primary objective of increasing the capacity of several state health departments to pursue health equity by way of programming, practices, and guidelines.⁴²

The Los Angeles County Department of Public Health recently launched its new Center for Health Equity; designed to “find solutions, programs, practices, and policies to close such gaps,” the Center aims to ensure that all Los Angeles County residents have the tools and resources to improve their overall health and well-being.⁴³ This office consists of ten full-time staff members in various roles, ranging from workforce development to community partnerships.⁴⁴ While the Center for Health Equity is still new, its impact on health equity and justice is becoming more influential across the County.

Issue #2: Accessibility of Information

Long Beach DHHS strives to communicate with the public effectively and persuasively, ideally convincing community members to adopt healthier behaviors.⁴⁵ To meet this goal, health officials have implemented strategies to make information regarding current health risks clear, concise, and accessible.

For Zika communication efforts, Long Beach DHHS used a multi-pronged approach to deliver public health information to residents, such as traditional media, posting information to the City website and official social media platforms, public signage such as city billboards and advertisements on buses, and distribution of Zika kits at community events.⁴⁶ In addition, the department established a Zika Hotline that residents can call to report the presence of mosquitoes in or around their homes.⁴⁷ These efforts are very similar to those used during other public health campaigns, such as earthquake preparedness and heat wave precautions.

As depicted in *Figure 7*, CASPER analysis reveals that residents of Long Beach access health information from a variety of sources. CASPER surveyors asked each respondent if they had heard of the Zika virus before that day; 165 (83.76%) responded in the

⁴¹ Ostlin, Pirooska, Schrecker, Ted, Sadana, Ritu, Bonnefoy, Josiane. “Priorities for Research on Equity and Health: Towards an Equity-Focused Health Research Agenda.” *PLoS Medicine*. November 2011. Accessed Spring 2018.

⁴² “Equity in Government Practices Action Plan.” *California Health in All Policies Task Force*. January 2018. Accessed Spring 2018.

⁴³ Interview, Heather Jue Northover, Los Angeles County Department of Public Health.

⁴⁴ Interview, Heather Jue Northover, Los Angeles County Department of Public Health.

⁴⁵ Interview, Jennifer Gonzalez, Long Beach Department of Health and Human Services.

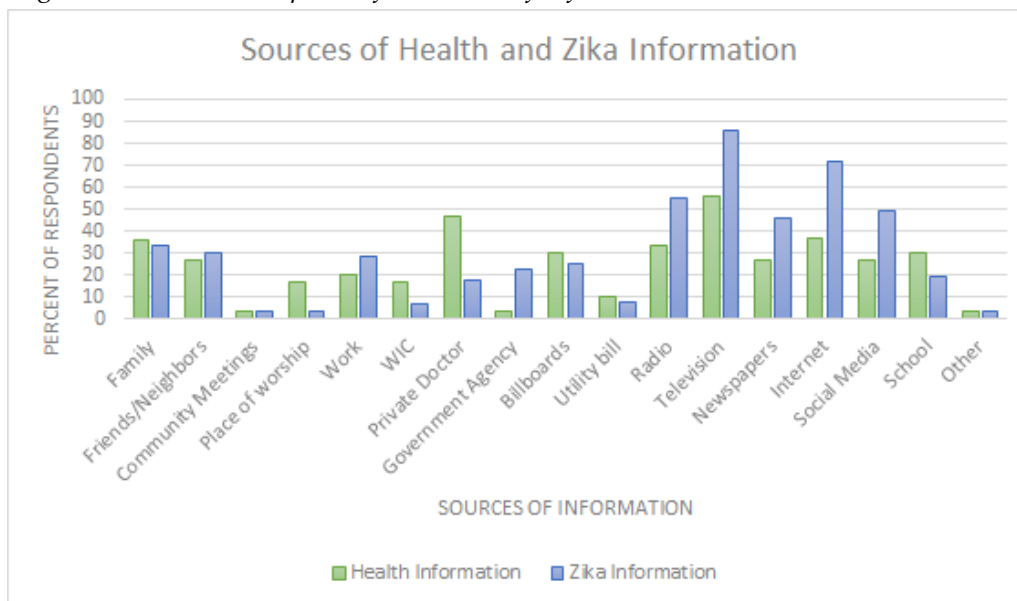
⁴⁶ Interview, Jennifer Gonzalez, Long Beach Department of Health and Human Services.

⁴⁷ Interview, Jennifer Gonzalez, Long Beach Department of Health and Human Services.

affirmative, and 32 (16.24%) reported that they had never heard of the virus. Next, CASPER interviewers asked each Zika-affirmative respondent where they sourced their Zika information. As noted in blue in the graph below, the most frequently cited sources of Zika information were television, internet, radio, social media, and newspapers. Conversely, these volunteers asked each Zika-negative respondent where they sourced their general health information (*see Appendix G for full CASPER questionnaire*). These residents cited television, private doctors, internet, family, and radio, as noted in green. These data inform us that, while media-centered formats of communication--like television and radio--reach the public, more traditional information channels such as doctors and health services agencies insufficiently disseminate information on Zika.

Furthermore, PHEM advertises its Zika Hotline on Long Beach residents' physical utility bills; however, only 7.88% of respondents claimed they had received their Zika information from this source. Additionally, more than 72% of those who had heard of Zika before confirmed they received their Zika information from the internet. This would suggest that adapting this strategy to online utility bills may reach a wider audience.

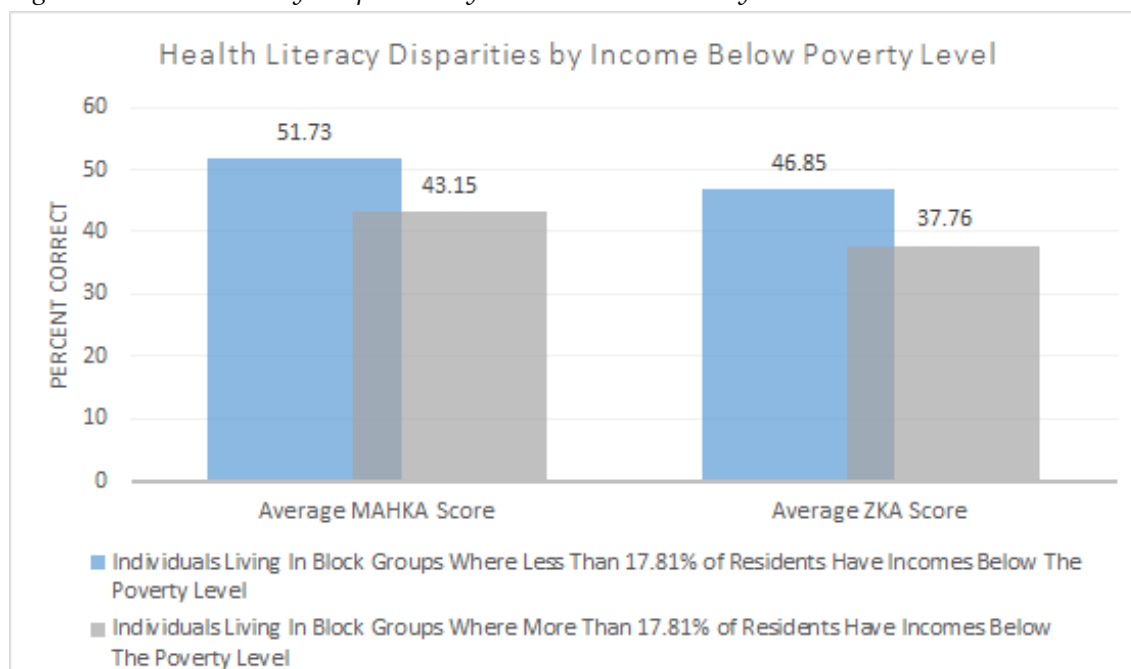
Figure 7: CASPER Responses for Sources of Information



Source: 2017 Long Beach CASPER

Initial analysis also showed that there were distinct disparities in levels of health literacy when analyzed across socioeconomic and demographic factors, including median household income and poverty (see Figure 8).⁴⁸ However, income is not the only identified source of these disparities.

Figure 8: Health Literacy Disparities by Income Below Poverty Level⁴⁹



Source: 2017 Long Beach CASPER & 2016 ACS

We also found an association between low educational attainment and low MAKHA and ZKA scores. Current Long Beach DHHS communications policies underscore the need for low reading levels in text materials, and the use of infographics whenever possible.⁵⁰ However, the data show that these efforts have failed to address the association between low educational attainment and low exposure to and retention of health information. According to the CASPER data, living in a block group with low overall educational attainment (as measured by percentage of the block group with a high school diploma or less) correlated with lower ZKA and MAHKA scores (see Appendix J).^{51,52} Additionally, there are some extreme variations in educational attainment

⁴⁸ As measured by scores MAHKA and ZKA

⁴⁹ 17.81% was chosen due to the fact that this is the median percent of residents below the poverty level in the block groups surveyed.

⁵⁰ Interview, Jennifer Gonzalez, Long Beach Department of Health and Human Services.

⁵¹ The CASPER survey did not collect educational attainment by household. Therefore, all measures of educational attainment were collected from the 2016 ACS 5-Year Estimates on the block-group level.

across neighborhoods, with some block groups composed of up to 38.7% of residents with less than a high school diploma.⁵³ These individuals require consistent, low reading-level materials to understand and retain relevant health information. Current public health communication efforts by Long Beach DHHS fail to bridge these gaps in educational attainment.

Long Beach's communication efforts also underserve the nearly 180,000 residents who speak a language other than English.⁵⁴ This accounts for almost 38% of the City's total population. Of the non-English speaking residents, around 145,500 speak Spanish, 14,700 speak Khmer, and another 14,000 speak Tagalog.⁵⁵ Best practices in the field recommend that all health information should be disseminated in an easy-to-understand manner in languages that cater to different communities.⁵⁶ Such a high volume of non-English speakers necessitates careful strategizing by Long Beach DHHS to ensure its health communications are easily comprehensible by people with a broad range of linguistic backgrounds and abilities.

In an effort to reach these populations, Long Beach DHHS uses a language access program that provides free translation of city-issued materials and publications upon request.⁵⁷ With this program, translations of any and all city-issued health materials are available to the public. However, these efforts do not seem to be sufficient. For both the ZKA and MAHKA scores, non-English speakers had lower average scores, even when controlling for other neighborhood-level demographic and socioeconomic variables (see Figure 9).^{58,59}

⁵³ Bivariate Mixed Effects regression results of the effect of the percent of a block group with no degree (*PerNoEd*) and a High School degree or GED (*PerHSGED*) on the MAHKA (*score1*) and ZKA (*score2*) were negative and statistically significant

at the $\alpha=0.05$ level; however, coefficients were small. The percent of the block group with a High School diploma or GED continued to be significant after controlling for percent of the block group with an income below the poverty level (*PerYrBPL*) and household language (*HHLang*) in both a survey regression and mixed effects analysis. Percent of the block group with no degree (*PerNoEd*) was no longer statistically significant, but was still negatively correlated.

⁵⁴ Summary statistics of all education variables show that no block group contained an education variable outlier except *PerDoctor*.

⁵⁵ "QuickFacts." U.S. Census Bureau QuickFacts: Long Beach City, California. Accessed Spring 2018. <https://www.census.gov/quickfacts/fact/table/longbeachcitycalifornia/PST045217>.

⁵⁶ "QuickFacts." U.S. Census Bureau QuickFacts: Long Beach City, California. Accessed Spring 2018. <https://www.census.gov/quickfacts/fact/table/longbeachcitycalifornia/PST045217>.

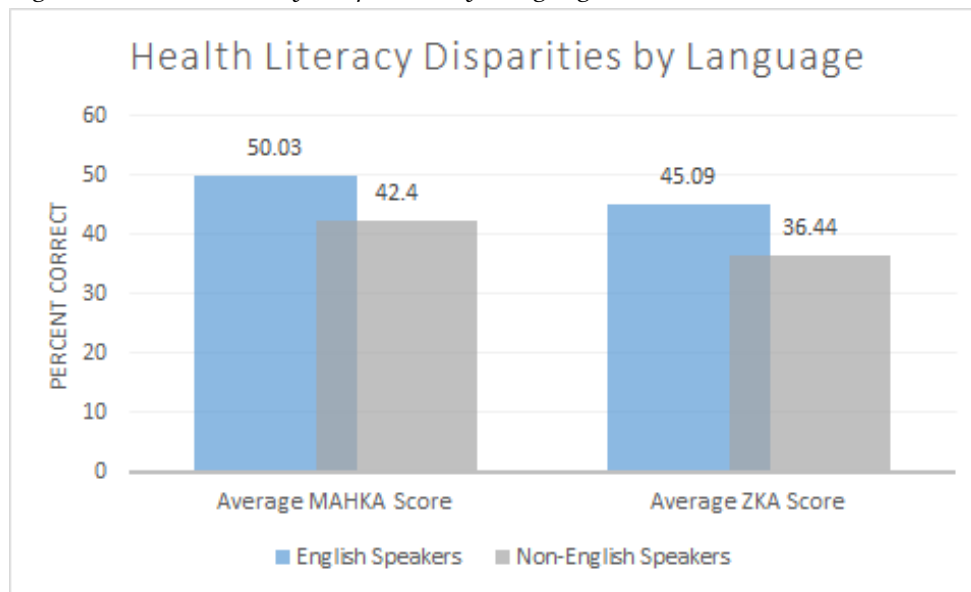
⁵⁷ Covello, Vincent T. "Best Practices in Public Health Risk and Crisis Communication." *Journal of Health Communication* 8 (2003): 5-8. Accessed Spring 2018.

⁵⁸ Interview, Jennifer Gonzalez, Long Beach Department of Health and Human Services.

⁵⁹ The CASPER survey did not collect poverty status, nation of origin, or ethnicity by household. Therefore, all measures of poverty status, nation of origin, and ethnicity were collected from the 2016 ACS 5-Year Estimates on the block-group level.

⁶⁰ When controlling for percent of the block group born outside of United States (*PerForeignB*), percent of the block group with an income below the poverty level (*PerYrBPL*), and percent of the block group identifying as Hispanic/Latinx (*PerHispIND*), household language (*HHLang*) continued to be associated with lower MAHKA and ZKA scores (see Appendix K), however these estimates are no longer significant at the $\alpha=0.05$ level, when analyzed via survey regression with Long Beach DHHS-provided weights.

Figure 9: Health Literacy Disparities by Language



Source: 2017 Long Beach CASPER

This disconnect may be the result of a lack of cultural competency and sensitivity in language translations, which requires a community-level focus.⁶⁰ While public health communications play an essential role in reducing health inequity among diverse populations, creating new materials can be cost-prohibitive. However, in areas with high rates of non-English speakers, well-translated materials are a necessity and must reflect the cultural values of the target audience. Agencies can achieve this by building the capacity to acquire, institutionalize, and incorporate cultural knowledge in all aspects of public health outreach strategies.⁶¹

Other socioeconomic and demographic groups face challenges in accessing and retaining health information. Literature suggests that older individuals tend to have lower health literacy, and also get their health information from physical locations, such as community centers or libraries.^{62,63} Consequently, it is essential to build both a digital

⁶⁰ Bronheim, Suzanne and Sungaya Sockalingam. "A Guide to Choosing and Adapting Culturally and Linguistically Competent Health Promotion Materials." National Center for Cultural Competence. 2003. Accessed Spring 2008.

⁶¹ Bronheim, Suzanne and Sungaya Sockalingam. "A Guide to Choosing and Adapting Culturally and Linguistically Competent Health Promotion Materials." National Center for Cultural Competence. 2003. Accessed Spring 2008.

⁶² Contrary to health literacy literature, our initial quantitative analysis showed a positive correlation between a high percentage of the household being aged 65 or older and higher MAHKA and ZKA scores, but these correlations were not significant at the $\alpha=0.05$ level. Additional research would need to be conducted to understand this counterintuitive correlation; such research is not under the purview of this project.

⁶³ Chesser, A. K., Keene Woods, N., Smothers, K., & Rogers, N. (2016). "Health Literacy and Older Adults: A Systematic Review." *Gerontology and Geriatric Medicine*, 2, 2333721416630492.

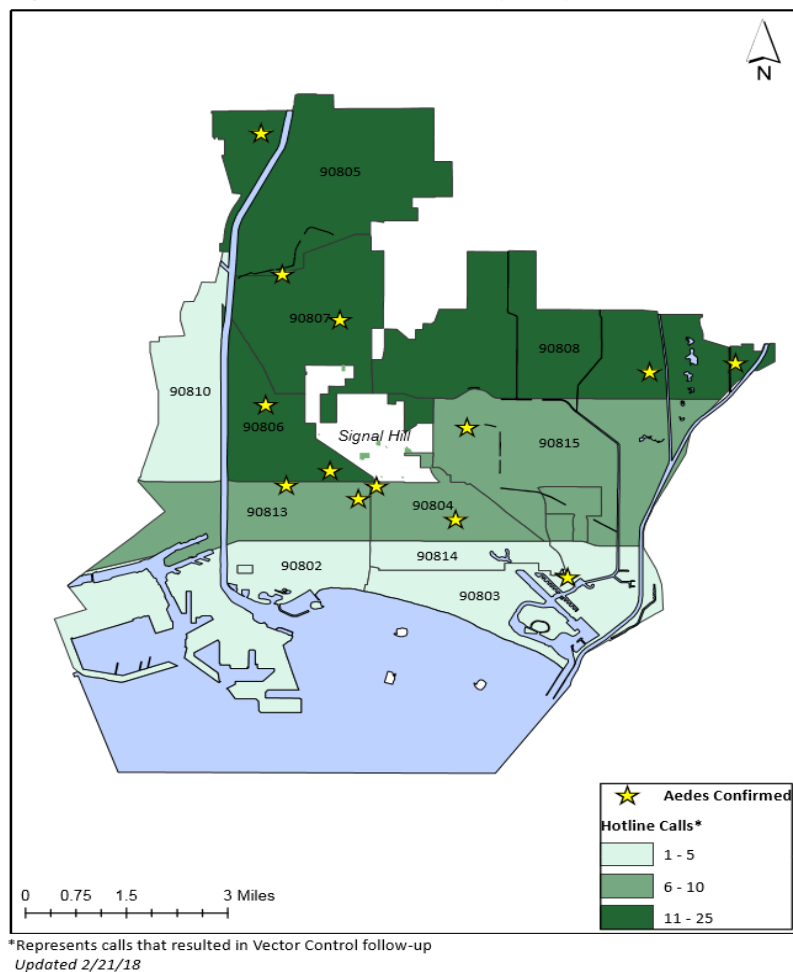
and physical breadth of communication strategies. It is important for Long Beach DHHS to understand these channels to accurately and equitably disseminate health information.

Some of the strategies Long Beach has implemented have proven to be effective. As evidenced in *Figure 10*, residents in the north and central areas of Long Beach made the highest number of mosquito reports to the City's mosquito and Zika hotline; subsequently, the Long Beach DHHS Vector Control Unit identified and mitigated the highest number of *Aedes* mosquito breeding grounds in these areas.⁶⁴ These data show that Long Beach residents will act based on information from public health campaigns.

While the hotline and vector control efforts are important and should be continued, it is clear that improvements can be made more broadly in the accessibility of the information PHEM disseminates. Better translations of city-issued materials, in combination with stronger communications between patients and medical providers, will together begin to bridge the gap in health information understanding between neighborhoods in Long Beach.

⁶⁴ "Health & Human Services: Zika Virus." City of Long Beach. Accessed Spring 2018.

Figure 10: Zika Hotline Calls and Zones of Confirmed *Aedes* Mosquitoes



Source: Long Beach Department of Health and Human Services

Issue #3: Distrust of Health Department and Government by Community Members

Long Beach DHHS works collaboratively with residents, staff, healthcare providers, and other agencies to enhance the strength and efficacy of their outreach strategies. For example, DHHS has distributed over 3,000 Zika kits to Long Beach residents that contain information on mosquitoes, mosquito repellent, condoms, and purifying tablets for standing water. In addition, the department solicits community members for opinions and feedback before launching any public education campaigns.⁶⁵

Building partnerships between community leaders and Long Beach Health is an important factor in establishing trust, specifically in a city that has such a large population of residents who may distrust government institutions. In some of the block groups surveyed, more than half of residents were born in a country outside of the

⁶⁵ Interview, Jennifer Gonzalez of Long Beach Department of Health and Human Services.

United States--a population, according to the literature, that is more likely to be wary of government officials and information.⁶⁶ Even when controlling for other socioeconomic and demographic variables, living in a block group with a high percentage of residents who are immigrants was correlated with lower health literacy, as measured by MAHKA and ZKA scores (*see Appendix K*).^{67 68}

To mitigate these factors, Long Beach DHHS has implemented several strategies to reach out to community leaders and organizations in an effort to deliver critical information. According to interviews with Long Beach DHHS personnel, conducting community presentations at city council in each city council district once a month successfully informed participants about the Zika virus and answering constituents' questions.⁶⁹ These presentations and meetings also provided opportunities for public health agencies to meet and connect with officials at the local, state, and national levels to widen public health outreach efforts.⁷⁰ Furthermore, health officials established information booths at community-based events like "First Fridays Long Beach" and have engaged students in health education by sponsoring and facilitating summer programming, such as day camps.⁷¹ These efforts helped health officials disseminate information to large gatherings of residents in a positive environment.

However, Long Beach DHHS personnel shared in interviews that in future education campaigns, officials should be mindful that these types of gatherings do not attract hard-to-reach, hesitant, or distrusting community members. Furthermore, there are few connections to more formalized organizations within the community, such as activist groups and faith-based organizations. Examples from surrounding health departments indicate that these efforts can be successful when fully leveraged.

According to the Orange County Health Care Agency (OCHCA), churches or faith-based organizations can effectively bridge the gap between health departments and their constituents. Many Vietnamese and Latinx families attend Christian and Catholic churches on a weekly basis. These faith-based communities happily partnered with OCHCA and typically distributed Zika information pamphlets. In discussions with OCHCA, the agency had great success with increasing community trust by building partnerships with faith-based communities.⁷² The Office of Los Angeles County

⁶⁶ Urban Institute. "Barriers to Immigrants' Access to Health and Human Services Programs." *ASPE Issue Brief*. May 2012. Accessed Spring 2018.

⁶⁷ The CASPER survey did not collect educational attainment by household. Therefore, all measures of educational attainment were collected from the 2016 ACS 5-Year Estimates on the block-group level.

⁶⁸ For both ZKA and MAHKA scores, percent of the block group born in another country continued to be correlated with lower scores; however, these associations were only significant at the $\alpha=0.05$ level for score MAHKA, and at the $\alpha=0.10$ level for score ZKA.

⁶⁹ Interview, Nora Barin and Emily Holman, Long Beach Department of Health and Human Services.

⁷⁰ Interview, Matthew Feaster, Pasadena Public Health Department.

⁷¹ Interview, Jennifer Gonzalez, Long Beach Department of Health and Human Services.

⁷² Interview, Dr. Samuel Stratton, Orange County Health Care Agency.

Supervisor Janice Hahn also believes in the potential of this strategy, calling it a “really effective way to reach people” if an agency or organization has “the capacity to do it.”⁷³

As we cite previously, the largest Cambodian population outside of Cambodia calls Long Beach home.⁷⁴ According to knowledgeable health officials, this population may be systematically under-informed by PHEM’s current efforts due to the agency’s lack of formalized connections with race- and ethnicity-based community groups in the City. Gisele Fong of the California Endowment notes that Long Beach DHHS can make greater efforts to forge relationships with cultural groups like the Cambodian community.⁷⁵ By connecting with services that regularly contact systematically underserved populations, DHHS can build a communication network that leverages established and trusted information channels to more equitably disseminate health information throughout the City.

Long Beach PHEM itself has admitted to a need for more informal associations with community leaders. In an interview with Public Information Officer Jennifer Gonzalez, she emphasized the division's growing efforts to establish relationships with these “community gatekeepers.”⁷⁶ Having these trusted members of the community deliver information, or validate the information distributed by the health department, can bring authority to the information and establish bonds between residents and health services officials.

One complicating factor of building this trust is the inherent nature of public health emergencies. According to interviews with Long Beach DHHS, education campaigns and staff are sometimes accused of stoking unnecessary fear among residents.⁷⁷ Public health agencies must strike a balance between a clear call to action and causing widespread panic. Additionally, people often grow complacent with public health threats over time, especially after the initial panic subsides. Currently, many individuals in Long Beach no longer feel threatened by Zika, nor do they view it as an issue of importance.⁷⁸ Establishing relationships can help mitigate both panic and complacency.

Issue #4: Lack of Community-Based Staff Members

One of the most common methods of community health education and information dissemination is by way of community health workers, or “promotoras”. These staff members at health departments are often trained in public health, education, or community health sciences, but also often hail from the communities they serve.

⁷³ Interview, Jessica Ho, Office of Los Angeles County Supervisor Janice Hahn.

⁷⁴ “Quick Facts.” The California Endowment: Long Beach. Accessed Spring 2018.

⁷⁵ Interview, Gisele Fong, The California Endowment.

⁷⁶ Interview, Jennifer Gonzalez, Long Beach Department of Health and Human Services

⁷⁷ Interview, Emily Holman, Long Beach Department of Health and Human Services.

⁷⁸ Interview, Dr. Samuel Stratton, Orange County Health Care Agency.

Therefore, they are seen as more trusted health officials, and have the expertise to accurately and appropriately inform certain populations.

According to relevant literature, these types of health workers serve as trusted community members who act as intermediaries between the community and the health department. Their person-to-person functions include conducting outreach, health education, and translation, often under the guidance of a social worker or nurse.⁷⁹ These types of workers reach communities, especially communities of color, who may not have access to or are disconnected from social media or traditional media outlets. By continuously connecting with local communities, health workers can develop a framework in knowing the proper channels to disseminate health information in times of crisis.⁸⁰

While the Los Angeles County Department of Public Health and OCHCA both employ such community health workers, Long Beach has yet to adopt this popular and effective strategy. Katie Balderas of the Office of Equity suggests that including “promotoras” in Long Beach DHHS’ outreach strategy would result in a more efficient and equitable health information campaign.⁸¹

Issue #5: Underutilization of Some Organizational Connections

Long Beach DHHS currently works in partnership with many formal community actors, such as physicians, hospitals, and other governmental agencies outside the department—such as the Utility Department and Women, Infants, and Children (WIC). However, our analysis indicates that these partnerships are not as effective as officials would hope.

Our analysis of the CASPER survey shows that 46.67% of respondent households who had not heard of Zika obtain their health information from private doctors. Additionally, only 18.18% of the respondent households who have heard of Zika obtain their health information from this source. These statistics are noteworthy given that department staff works with healthcare providers and educates medical personnel on how to best relay Zika information to their patients.⁸² Private doctors should be much more engaged with the public regarding the dangers of Zika. Strengthening the communication between these partners is critical to improving health information contact for residents who usually seek advice from medical professionals.

⁷⁹ Zuvekas, Ann, Lea Nolan, Carol Tumaylle, and Laura Griffin. “Impact of Community Health Workers on Access, Use of Services, and Patient Knowledge and Behavior.” *The Journal of Ambulatory Care Management*. October 1999. Accessed Spring 2018.

⁸⁰ Interview, Amalia Morris, Government Alliance for Race and Equity.

⁸¹ Interview, Katie Balderas, Office of Equity, Long Beach Department of Health & Human Services.

⁸² *Long Beach Zika Community Assessment for Public Health Emergency Response (CASPER)*. City of Long Beach. July 2017. Accessed Winter 2017.

Furthermore, experts from our interviews suggest that connections with programs like WIC and SNAP can improve the likelihood that individuals with lower socioeconomic status come in contact with critical health information.⁸³ Long Beach DHHS currently has a partnership with WIC in which they provide pregnant women and families with information on how to prevent breeding sites of mosquitoes and detect the symptoms of the Zika virus. However, Long Beach does not have partnerships with many other public programs, and therefore is underserving other vulnerable populations, such as those who access SNAP services, community health clinics, Head Start, and Housing Assistance.⁸⁴

Issue # 6: Absence of Targeted Homeless Outreach

According to the 2017 Long Beach Homeless Count, the City of Long Beach has 1,843 residents experiencing homelessness on any given night.⁸⁵ The homeless population is especially vulnerable to mosquito bites and contracting the Zika virus, due to the fact that they spend the majority of their time outdoors and unprotected from mosquitoes (see Figure 11). However, Long Beach DHHS currently does not have any specific outreach strategies for communicating public health information to this population.⁸⁷ DHHS also admits that it “needs to do more” to reach this socioeconomic group.⁸⁸

During an interview, Dr. Samuel Stratton of the Orange County Health Care Agency (OCHCA), identified the homeless population as one of Orange County’s target populations for outreach. He stated that the majority of the homeless population who live in cars, recreational vehicles, or campers are families with mothers who may become pregnant in the near future.⁸⁹ Although communications with people who are experiencing homelessness poses a unique and often difficult challenge, OCHCA identified that these families frequent food banks and armories located in Orange County. Due to their consistent use of these resources, OCHCA strategically posts information and distributes infographics at these locations. The agency also stations public health nurses that give advice and answer questions about Zika in these areas. According to Dr. Stratton, these direct, concerted outreach practices have achieved

⁸³ Interview, Emily Holman, Long Beach Department of Health and Human Services.

⁸⁴ The CASPER survey did not collect educational attainment by household. Therefore, all measures of educational attainment were collected from the 2016 ACS 5-Year Estimates on the block-group level.

⁸⁵ Analysis of the ACS data and CASPER scores showed that the proportion of the block group accessing SNAP services almost always mitigated the effect of income on scores MAKHA and ZKA (see Appendix K). However, Long Beach DHHS does not currently have a formalized partnership with SNAP services; in this analysis we use SNAP as a proxy for WIC services because individuals who are eligible for SNAP services are also likely to qualify for WIC services.

⁸⁶ City of Long Beach Public Information Office. “PRESS RELEASE: Homeless Count Declines in Long Beach.” Accessed Spring 2018.

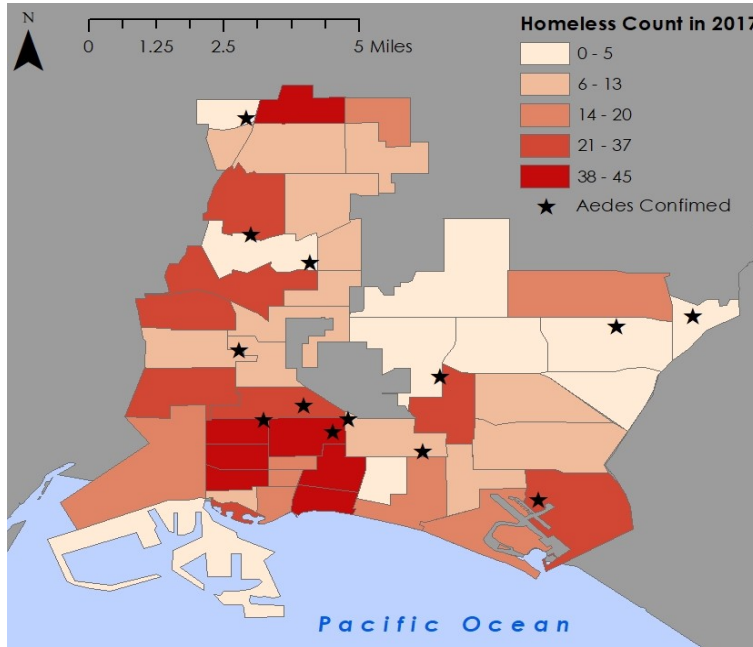
⁸⁷ Interview, Nora Barin, Long Beach Department of Health and Human Services.

⁸⁸ Interview, Emily Holman, Long Beach Department of Human and Human Services.

⁸⁹ Interview, Dr. Samuel Stratton, Orange County Health Care Agency.

widespread success in his jurisdiction. The agency also uses text messages to communicate health information to those who are experiencing homelessness and has found this strategy to be effective.⁹⁰

Figure 11: 2017 Homeless Count & Confirmed Aedes Mosquitoes by Census Tract



Source: 2017 Long Beach Department of Health and Human Services

⁹⁰ Interview, Dr. Samuel Stratton, Orange County Health Care Agency.

POLICY OPTIONS

To address the challenges inherent in equitable public health outreach, our team developed the following policy options to improve Long Beach DHHS' education strategies. Of the listed policy options, several alternatives may be beyond DHHS' sphere of influence or politically infeasible. The following analysis includes six policy options.

Option #1: Expand the Scope and Influence of the Office of Equity

This option includes a broad expansion of the capacity of the Long Beach Office of Equity. Currently, this office only includes a single employee with limited authority or jurisdiction within the City of Long Beach. Our recommendation includes increasing the number of employees staffing this department to expand its capacity, increasing the number of Health Department divisions and programs with which the Office of Equity has partnerships, and allowing Equity personnel to conduct trainings and provide feedback on the ways in which other divisions can improve the equity of their materials, programming, and outreach. Other similar equity offices—within the State of California and across the country—have performed tasks and conducted programming such as:

- Conducting systematic evaluation of health literacy within the City;
- Establishing a health literacy education program;
- Implementing comprehensive equity training for city staff; and
- Creating a public health information campaign “equity approval” process, wherein the Office establishes a formalized role in assessing the equity of all city public information campaigns.

Pursuing and implementing some of these initiatives within this expanded equity office would allow individual divisions to continue conducting their own education and outreach initiatives, but be supported by an “equity review” process to ensure that equitable policies and procedures are adhered.

Option #2: Improve Accessibility of Information Campaigns and Materials

Our analysis suggests that Long Beach DHHS should take a proactive approach to ensure that all language translations are accurate and culturally competent. This strategy can be improved upon by ensuring communications are consistent and singular in their message and at a standard educational reading level. These efforts will increase accessibility of public health information.

Additionally, accessible sources of information are critical. Non-English speakers can be better reached via radio and television public service announcements on channels that

specifically serve these communities, and are delivered in languages like Spanish, Khmer, and Tagalog. Distributing physical materials at heavily trafficked areas like libraries and community centers can contact the older population, who is less likely to utilize new media. A multi-level media strategy can increase the number of individuals contacted; in particular, we can see an example in the publication of the Zika Hotline information on City physical utility bills. Diversifying these efforts could include publishing the same information in online bills, reaching a likely younger and more tech-savvy audience.

Option #3: Create Partnerships with Community “Gatekeepers”

Another alternative is for Long Beach DHHS to create partnerships with faith-based communities and activist organizations. These partnerships can be very effective in reaching many different groups. In the case of Orange County, partnerships with faith-based communities strengthen OCHCA’s outreach efforts to Vietnamese and Latinx populations, since many members of these marginalized groups attend churches on a weekly basis. Partnerships can include community outreach events, wherein health officials share critical information with leaders and trusted community members, who relay this knowledge to the broader community.

Option #4: Hire Community Health Workers

Another policy option is for Long Beach DHHS to consider hiring community health workers and including them in its communication team. These health workers would operate as trusted messengers who can communicate effectively within their communities. They also can act in partnership with public information officers (PIOs) to disseminate information in a more effective and equitable manner.

These community health workers would distribute health information door-to-door, at community events, within schools, and at other locations frequented by individuals who are less likely to engage with government-sponsored health information.

Additionally, having more community health workers can help Long Beach DHHS to understand Long Beach communities better. These health workers can work to continuously leverage DHHS’ relationships with different communities. Hiring more community health workers can engage community leaders and provide them with the capacity to convey accurate health information to underserved groups.

Option #5: Strengthen Partnerships with Local Health Organizations and Public Programs

Long Beach DHHS should consider improving and expanding upon previously established partnerships with doctors, hospitals, and community clinics to build and maintain productive working relationships and ensure that healthcare workers accurately convey Zika and other health information to their patients. Implementing these considerations will lead to more comprehensive and appropriate information distribution to targeted populations.

While the Department of Health and Human Services currently maintains partnerships with healthcare professionals, the data suggests that current strategies do not yield accurate information dissemination. Increasing oversight and evaluation on the fidelity of the partners' exchange of information processes and procedures is critical to reaching the populations who rely on traditional health information channels to learn about Zika and other emerging threats.

Additionally, Long Beach Health should expand upon its partnerships with other governmental entities, specifically focusing on social services. Partnering with these organizations can effectively help the department reach vulnerable populations who may be less likely to come in contact with health information, and consequently may have lower health literacy.

Option #6: Develop Targeted Outreach Strategy for Population Experiencing Homelessness

Our final alternative advises Long Beach DHHS to combine Orange County Health Care Agency's homeless outreach strategy with its current policy of distributing Zika kits. It would be important to identify what resources the homeless population already makes use of (such as food banks), and then utilize those locations as dissemination points for Zika kits and informational publications. Although individuals experiencing homelessness in Long Beach comprise a small portion of the total population, homelessness is a constantly evolving issue in Los Angeles County and the Southern California region. This is an issue that should be addressed sooner rather than later.

CRITERIA FOR EVALUATION, WEIGHTS, AND CRITERIA ALTERNATIVE MATRIX

We analyzed each identified policy option by way of the following criteria:

#1 Contact: This criterion evaluated policy options based on the increased number of residents who would come in contact with health information. Policy options that would result in increasing the number of individuals contacted by DHHS received higher scores.

#2 Retention: This criterion evaluated policy options based on the increased rate of health information retention. Policy options that would result in improved information retention scored higher on this criterion.

#3 Equity: This criterion evaluated policy options based on the increase in health information exposure and retention among populations of concern, including non-white, low educational attainment, non-English speaking, foreign-born, impoverished, and elderly populations. Policy options that would result in a positive effect on the health equity of the Long Beach population scored higher.

#4 Cost: Cost is assessed by the increase in dollars spent on public health initiatives. However, it is important to note that adding any additional costs is highly undesirable given that PHEM lacks funding for additional high-cost initiatives.⁹¹ Despite this budgetary constraint, there may be specialized grants available to fund specific resources. Policy options that require fewer additional implementation costs would receive higher scores.

#5 Administrative Burden: This criterion evaluated policy options based on PHEM's administrative authority and operational capacity to implement the recommended policy options. Policy options that could be implemented under PHEM's current authority and capacity received higher scores.

⁹¹ Interview, Ivonne Alarcon, Long Beach Department of Health and Human Services.

Weights and Ratings

Table 2: Policy Criteria Weights and Ratings

	Weight	Rating for Cost/Burden	Rating for Contact/Retention/Equity
1	Low Priority	High Cost/Burden	Low Contact/Retention/Equity
2	Medium-Low Priority	Medium-High Cost/Burden	Medium-Low Contact/Retention/Equity
3	Medium Priority	Medium Cost/Burden	Medium Contact/Retention/Equity
4	Medium-High Priority	Medium-Low Cost/Burden	Medium-High Contact/Retention/Equity
5	High Priority	Low Cost/Burden	High Contact/Retention/Equity

Option #1: Expand the Scope and Influence of the Office of Equity

- Contact (4):** Given that the expanded Office of Equity would be initiating new policies and procedures that work to reach vulnerable populations, we believe this option would significantly increase the quantity of individuals contacted by DHHS' public information materials. Staff members in this office would be responsible for developing techniques that reach specific socioeconomic or demographic groups that have previously been underserved by DHHS' efforts. If successful, the Office of Equity would likely help increase the percentage of Long Beach residents who come in contact with city government-sponsored health education materials.
- Retention (4):** We also believe that this expansion would increase health information retention rates. By implementing tactics that evaluate and improve health literacy across the City, the Office of Equity would effectively improve the ability of Long Beach residents to retain health information. Collaboration with Public Health Emergency Management's public information team could improve the accessibility of health information for specific population groups. These combined tactics would result in higher levels of health knowledge retention.
- Equity (5):** While there has been little evidence in the literature to show causality between U.S. jurisdiction's increased health equity personnel and increased

health literacy, the country of Sweden has shown success by infusing equity into its national government practices. By creating a division of gender equality within its national administration, the government increased its community's overall levels of health equity.⁹² In addition, as exemplified by the Los Angeles Center for Health Equity, having a division within a health department that solely focuses on ensuring health equity across communities clearly redefines priorities. Expanding the scope of this office would emphasize the focus on equity both in workplace environment and health communication policies. Furthermore, with staff members focused singularly on bringing an equity lens to the actions of DHHS, and with increased authority of these staff members, our team believes this option would have a dramatic effect on the health literacy equity of the Long Beach population.

- **Cost (1):** This option is likely the most expensive of all of the alternatives posed. Expanding this office would include the hiring of multiple staff members, expansion of resources and funding for projects and initiatives, and possibly integration of these staff members into other arms of DHHS.
- **Administrative Burden (1):** This alternative could also be burdensome on DHHS staff and resources. As the newly expanded Office of Equity would likely need to be integrated into the organizational structure of the Health Department, there may be difficulties in redefining job roles, restructuring chains of command, and training new staff. Furthermore, it may be politically infeasible to suggest these changes to the Director of the Health Department or City management. The department currently includes values of equity and inclusion in its mission statement; adopting this policy option may be seen as an acknowledgment that the department currently undervalues the office already established to meet these goals.

Option #2: Improve Accessibility of Information Campaigns and Materials⁹³

- **Contact (3):** By diversifying the conduits through which information is delivered (billboards, libraries, city website, etc.) and increasing the type of health

⁹² Blas, Erik, Gilson, Lucy, Kelly, Michael, Labonte, Ronald, et. al. "Addressing social determinants of health inequities: what can the state and civil society do?" *The Lancet*. November 2008. Accessed Spring 2018.

⁹³ The last national survey of health literacy was conducted in 2003. Since this time, there has been significant theoretical research into the demographic and socioeconomic factors that contribute to lower health literacy. Despite the fact that many health agencies have attempted to mitigate these effects of these factors on health literacy to improve health outcomes within communities, there have been very few analytical studies on the effectiveness of these measures. Therefore, we have analyzed this policy option according to the available theoretical framework. No data exist illustrating how effective these measures have been in similar communities. We encourage the Long Beach Department of Health and Human Services Office of Equity to implement strategies to measure residents' health literacy and track changes over time.

information dispersed (digital, flyers, etc.), Long Beach DHHS may be able to improve the quantity of individuals contacted by PHEM. Additionally, further utilizing non-English sources of information could increase contact with some residents who are not currently being reached by predominantly English-language information, or who have difficulty understanding culturally incompetent translations. However, this recommendation involves promoting techniques already implemented by PHEM, and therefore may result in the same residents being contacted a higher amount of times, instead of contacting underserved residents for the first time.

- **Retention (4):** Improving the cultural competency of language translations, expanding sources of information, and standardizing the grade level at which written materials are published is likely to have a positive impact on information retention. Through these efforts, more residents will be able to thoroughly understand the materials that they are receiving. This more thorough understanding will allow for repetition and recall. Every time a person hears information about a specific health issue, they will recall what they learned from DHHS sources, further increasing retention rates.
- **Equity (4):** Our team believes that the policy suggestions included in this alternative--especially those dealing with increased cultural competency and reach of non-English information--will have a significant effect on health literacy equity across the City. Programs like these in neighboring cities and counties, as well as those evaluated in the literature, show that new and diverse audiences are reached with these methods, and that information presented in a culturally competent and accessible way leads to higher proportions of vulnerable populations contacting and remembering the information.^{94,95} For example, in order to reach the high number of non-English speakers in the area, the Orange County Health Care Agency (OCHCA) has successfully aired radio spots for Spanish and Vietnamese speakers to disseminate public health information.⁹⁶ Public service announcements on television in multiple languages would also likely be helpful, as 86% of CASPER respondents who had heard of Zika before the survey reported that they obtained their Zika information from television, and 56% of respondents who had never heard of Zika reported they received their health information from this source as well.
- **Cost (4):** While not completely cost-free, this alternative places little economic burden on the Public Health Emergency Management budget. Most of the policies implemented in this option are already used in PHEM's toolkit, and are

⁹⁴ Interview, Dr. Samuel Stratton, Orange County Health Care Agency.

⁹⁵ Interview, Matthew Feaster, Pasadena Public Health Department.

⁹⁶ Interview, Dr. Samuel Stratton, Orange County Health Care Agency.

only being improved upon using best practices knowledge. Some of the items that may incur increased costs include new radio and television spots--especially in languages other than English--, increased materials distribution at physical locations, and perhaps staff training on the core concepts of culturally competent translations.

- **Administrative Burden (3):** These policies may result in increased pressure on current PHEM staff to be more diligent about educational levels in materials, to contact additional and diverse physical distribution areas, and to spend more time and effort analyzing translated materials for culturally sensitive material and linguistics. However, Long Beach Health has informed us of strong intradepartmental organizational connections and staff capabilities--including the hiring of unpaid interns--and therefore our team believes this alternative would not present an undue burden on staff.

Option #3: Create Partnerships with Community “Gatekeepers”

- **Contact (4):** Trusted members of vulnerable communities, especially those in activist, faith-based, and community organizations, are more likely to be able to reach individuals currently not served by the health department. These informal partners would also reach individuals who are wary of trusting governmental organizations or staff members, such as undocumented individuals and people experiencing homelessness.
- **Retention (3):** While the Health Department would be tasked with providing these informal partners with accurate and relevant information, it would be difficult for health officials to determine how adequately these partners were relaying the knowledge. Additionally, these individuals are not trained public health educators, and therefore would not necessarily be aware of best practices for encouraging knowledge retention or improving health literacy. Therefore, this option is given a medium score for knowledge retention.
- **Equity (4):** As stated above, these gatekeepers are likely to reach groups and individuals who are currently underserved by Long Beach DHHS' efforts. Analysis of current techniques and the case study of the Zika CASPER show that those who live in areas with high proportions of residents from historically underrepresented groups, are more likely to have lower contact with and retention of health information distributed by Long Beach DHHS.⁹⁷ Therefore, our

⁹⁷ The CASPER survey did not collect demographic data by household, except for variables household language (*HHLang*) and age of residents (measured in *PerOld*).. Therefore, all other demographic and socioeconomic measures were collected from the 2016 ACS 5-Year Estimates on the block-group level.

team believes this option would increase equity of information contact and retention.

- **Cost (5):** Since this alternative suggests establishing informal partnerships with local community leaders, and not the incorporation of formalized staff working in the community, the cost of this option would be minor and predominantly associated with the additional staff time spent on communicating with and training these partners. We evaluate these time and labor costs in *administrative burden* below.
- **Administrative Burden (3):** Staff within the Public Health Emergency Management Division would be required to devote some work hours and resources to coordinating, facilitating, and evaluating these partnerships. Furthermore, it would be critical that Long Beach DHHS carefully determine which organizations to create such partnerships with, to avoid political or social backlash from other community members displeased with certain choices.

Option #4: Hire Community Health Workers

- **Contact (3):** Community health workers effectively disseminate pertinent health information to populations who may not otherwise be contacted. By walking through neighborhoods and knocking on doors, these staff members start conversations with residents and are able to form lasting bonds. These individuals also often have connections within the communities where they work, thereby increasing the opportunities to reach underserved populations. While “promotoras” may have community connections, they are also considered staff members of the health organization. Community members who distrust government entities may view them with skepticism. Due to these considerations, community health workers may end up contacting individuals who already feel comfortable receiving their health information from sources like their local government. Furthermore, these individuals are more likely to have already been contacted by this information. Therefore, hard to reach populations may still be disproportionately ignored
- **Retention (4):** Persons who learn about public health information from trusted messengers such as community health workers or “promotoras” are more likely to remember this knowledge in the long-run. When the Los Angeles County Department of Public Health conducted its West Nile prevention outreach campaign, department staff chose to have promotoras distribute mosquito prevention and abatement information to the community. The campaign focused on simple messaging that would be easy to remember: “The main message was

don't get bitten."⁹⁸ These staff members are often trained in public health education strategies and best practices, which can result in higher information retention rates for those who interact with community health workers, in comparison to informal partnerships.

- **Equity (3):** According to literature, community health workers are effective in increasing access to health knowledge, and access to care, specifically among historically disenfranchised populations.⁹⁹ Although they provide services that can reach these community members, their consistency and quality of service is sometimes rendered ineffective in improving health outcomes; this is often due to inadequate training and lack of continuous support.¹⁰⁰ Since these populations are of specific importance to Long Beach due to their historical underrepresentation, a medium equity score is applied to this alternative.
- **Cost (2):** Given that community health workers and promotoras are highly skilled professionals, this option would require Long Beach DHHS PHEM to hire new employees who can perform this function. Therefore, this alternative represents a relatively large economic cost to DHHS. Costs would include standard salary and insurance costs, as well as training, materials, and professional development.
- **Administrative Burden (2):** Hiring additional staff would burden current Long Beach DHHS staff due to time spent on developing the roles and responsibilities of the new staff members, taking part in the hiring process, and integrating the new staff into the department.

Option # 5: Strengthen Partnerships with Local Health Organizations and Public Programs

- **Contact (3):** Expanding Long Beach DHHS' reach to other health-related institutions in the City can begin to bridge gaps in health education and outreach. Improving the relationships with physicians, hospitals, and community clinics would allow Long Beach DHHS to create streamlined channels of communication between the health department and health institutions. In addition, partnering with social services such as SNAP and WIC

⁹⁸ Interview, Heather Jue Northover, Center for Health Equity, Los Angeles County Department of Public Health.

⁹⁹ Swider, Susan M. "Outcome Effectiveness of Community Health Workers: An Integrative Literature Review." *Public Health Nursing*, 19:1. March 2002. Accessed Spring 2018.

¹⁰⁰ "Community health workers: What do we know about them? The state of the evidence on programmes, activities, costs and impact on health outcomes of using community health workers." *World Health Organization*. January 2007. Accessed Spring 2018.

can allow Long Beach's most vulnerable populations to come into contact with greater amounts of public health information.

- **Retention (4):** Accessing health information from trusted institutions increases the likelihood of information recall and retention. Furthermore, because doctors' offices, clinics, and social services facilities are locations where individuals often repeatedly visit, officials in these areas are given the opportunity to repeatedly inform their populations. As the literature reports, individuals are more likely to recall information that is repeated to them on several occasions, reinforcing the facts multiple times.¹⁰¹
- **Equity (3):** Because vulnerable populations are more likely to access services like SNAP, WIC, and TANF, this option may bring disadvantaged populations in contact with more health information. However, this alternative mostly consists of improving initiatives Long Beach PHEM already has in place, which may limit the possibility of new populations being served by these strategies.
- **Cost (4):** While Long Beach DHHS currently has partnerships with these types of organizations, our team recommends putting greater efforts towards strengthening these bonds. Limited costs would be involved with expanding these efforts.
- **Administrative Burden (3):** A few staff hours would need to be refocused towards interacting with these organizations, and there may be organizational rules and policies dealing with distributing information at social service sites. However, we believe the staff burden would be limited.

Option # 6: Develop Targeted Outreach Strategy for Population Experiencing Homelessness

- **Contact (2):** Although Los Angeles County's homeless population is growing, the Long Beach homelessness population has seen a 21% reduction in recent years.¹⁰² According to the 2017 Biennial Long Beach Homeless Count, people experiencing homelessness in Long Beach only represent approximately 0.4% of the total population.¹⁰³ One objective of Long Beach DHHS' outreach campaigns was to increase the number of individuals who come in contact with public health information. Because the homeless population in Long Beach is small, a

¹⁰¹ Safeer, Richard S., M.D., and Jann Keenan, ED.S. "Health Literacy: The Gap Between Physicians and Patients". *American Family Physician* 72(3): 463-468. August 2005. Accessed Spring 2018.

¹⁰² City of Long Beach Public Information Office. "PRESS RELEASE: Homeless Count Declines in Long Beach." Accessed Spring 2018.

¹⁰³ City of Long Beach Public Information Office. "PRESS RELEASE: Homeless Count Declines in Long Beach." Accessed Spring 2018.

limited amount of individuals would benefit from Long Beach DHHS' outreach efforts.

- **Retention (1):** People experiencing homelessness who are unsheltered live in street encampments, RVs, vehicles, and tend to be more transient than people who have stable housing. Retention of details often requires individuals to hear the same pieces of information repeatedly. Due to the transient nature of the lives of people experiencing homelessness, it may be difficult for staff members to reinforce this information and increase retention.
- **Equity (2):** While reaching the population of individuals experiencing homelessness is critical--especially considering their increased likelihood of exposure to health issues like mosquito-borne diseases and heatwaves--it is important to remember the small size of this population within the City. Although this alternative does increase equity of health information contact for one specific population, this criterion is evaluated on increases in equity of health information contact and retention across all residents. Therefore, this alternative is given a lower equity score.
- **Cost (3):** Long Beach DHHS distributed Zika prevention kits to residents of Long Beach during its Zika public health information campaign, and has developed similar kits filled with information pertaining to other public health issues. Allocating a portion of these kits for the homeless population would not represent a substantial increase in costs. In addition, this option also does not require hiring additional staff members. However, there may be marginal costs in developing new types of materials to speak specifically to the experiences and vulnerabilities of these populations in the context of public health emergencies.
- **Administrative Burden (3):** In discussions with Long Beach DHHS PHEM, one of its internal conclusions after its Zika public health information campaign is to consider incorporating the needs of the homeless population into their services and outreach. Currently Long Beach DHHS has the administrative authority and institutional buy-in to implement a homeless services outreach plan. Furthermore, Long Beach DHHS staff can consult with OCHCA to learn from their experiences and expertise in coordinating public health outreach efforts catered to this population. Significant staff hours may be needed to develop and coordinate these efforts.

Table 3 summarizes our evaluation of each of these policy options:

Table 3: Policy Options Criteria Alternative Matrix

Decision Matrix		Expand Office of Equity		Improve Accessibility		Gatekeeper Partnerships		Community Health Workers		Connections with Orgs/ Programs		Homeless Outreach	
Criterion	Weight	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Contact	4	4	16	3	12	4	16	3	12	3	12	2	8
Retention	3	4	12	4	12	3	9	4	12	4	12	1	3
Equity	3	5	15	4	12	4	12	3	9	3	9	2	6
Cost	5	1	5	4	20	5	25	2	10	4	20	3	15
Admin. Burden	2	1	2	3	6	3	6	2	4	3	6	3	6
Total Score			50		62		68		47		59		38

RECOMMENDATIONS

In the analysis of our alternatives, we determined that the following options had the highest scores:

- 1. Create partnerships with community “gatekeepers”**
- 2. Improve accessibility of information campaigns and materials**
- 3. Strengthen partnerships with local health organizations and public programs**

These three options would result in the greatest impact at the lowest cost, and would have some influence on equity of health information exposure and retention. However, it is important to note that these recommendations are not mutually exclusive, and also do not inherently preclude the options with lower scores. These three options also represent changes that can be made to PHEM’s PIO toolkit with little effect on organizational structure.

The first and third recommendations focus on overhauling the City’s relationship to its constituents. While these recommendations do not require new staff, they do require new “team members” in the sense of broadening the City’s reach within the community. Rather than build a communication network from scratch, we encourage the City to leverage extant information channels-- ones already trusted by hard-to-reach community members. Doctors and other healthcare workers, in addition to social services like SNAP and WIC, have the ability to connect with users of all backgrounds and demographics. Meanwhile, community gatekeepers can strengthen communication between the City and groups who may not access government or health services for various reasons, including language or cultural barriers, government distrust, or immigration status.

Our second recommendation focuses on how the City can better communicate with its constituents directly and without an intermediary like a promotora, doctor, or social services worker. The City already implements policies geared toward effective communication, such as clear, low-reading-level language and simple visuals on city-issued materials. However, we posit that the City will find greater success by providing accurately translated and culturally competent materials as part of all health information campaigns, with no constituent request required.

As the priorities, organizational capacity, and budget of the Public Health Emergency Management Division shift with time, each option can be analyzed in the context of future environments. Because we found that all of our policy options will likely have a positive impact on information exposure and retention, as well as equity, each option’s viability depends heavily on future fluctuations in financial and labor resources.

LIMITATIONS

The CDC developed the CASPER toolkit for the purposes of assisting health departments from local, state, or federal jurisdictions in assessing public health needs. To capture this information, the CASPER's objectives involve obtaining household-level data to evaluate the effectiveness of a health department's education efforts. The CASPER that Long Beach DHHS conducted surveyed 30 "clusters" or blocks, yielding a total of 197 survey responses. In addition, the CDC recommends that the CASPER data be used mainly to produce descriptive statistics.¹⁰⁴ Since we used the CASPER data for bivariate and some multivariate analyses, readers should treat our estimates as suggestive. In addition, since the CASPER conducted household surveys in only 30 census blocks or "clusters" and did not collect data on certain social, economic, and demographic variables that were of interest to our team, we supplemented the CASPER survey information with data from the American Community Survey (ACS). However, the ACS has certain limitations; the lowest geographic area publicized is at the block group level, and the block group level data is only available in the ACS 5-year estimates (as opposed to annually). Our team merged the ACS block group data with the CASPER block level responses because the neighborhood characteristics we needed for our analysis were not available at the block level.

¹⁰⁴ Centers for Disease Control and Prevention: Community Assessment for Public Health emergency Response (CASPER). Accessed Spring 2018.

CONCLUSIONS

While the challenge of improving equity in health outcomes is immense in both its scope and importance, the Long Beach Department of Health and Human Services Public Health Emergency Management Division has success within reach. Based on analysis of the 2017 Zika CASPER, American Community Survey data, literature review, and interviews, we recommend that the City undertake improvements in community relationships, both with formal and informal actors, which will aid in information dissemination into the hardest-to-reach corners of the City. We also recommend the City provide more accessible materials, including accurately and culturally-competent translated public information materials and greater diversity in sources of material. All together, these changes will open the doors of DHHS wider than ever before, providing each resident of Long Beach the opportunity to improve their health literacy, and access services in the manner specific to their needs.

These recommendations have been developed based on an analysis of contact, retention, equity, cost, and administrative burden. Essentially, we sought to bring forward policy recommendations that will increase the effectiveness of the City's public health information campaigns, while remaining within the practical and financial scope available to DHHS and PHEM. In the future, as funding sources change and resources fluctuate, we hope that the equity lens will be applied more broadly to the City of Long Beach's operations, and that longer-term projects, such as an assessment of the City's health literacy rates, will commence in the interest of further analyzing how the City can improve health outcomes for its residents. While our findings illustrate some areas of opportunity for the City, these are only a few limited findings from a much larger picture. A more thorough assessment will require additional time, labor, and financial resources.

To effectively and equitably serve the public, health officials charged with educating the public about mitigation and recovery efforts must understand both the socioeconomic and demographic nuances of their constituent populations. As vulnerable or marginalized populations become more threatened by environmental, political, and institutional stressors, all health departments, Long Beach DHHS included, must recognize their roles as catalysts of change in the pursuit of health equity.

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APPENDICES

APPENDIX A: LONG BEACH CASPER DESIGN AND STRUCTURE

The bulk of our quantitative data come from a Community Assessment for Public Health Emergency Response (CASPER). The CASPER contains questions from a survey used by Long Beach DHHS to ascertain how much residents know about Zika and mosquitoes. The CASPER final report can be found on the City of Long Beach's website and contains the survey questions as well as preliminary analysis of responses.

Long Beach DHHS conducted the CASPER in July of 2017, collecting data from 30 randomly selected census blocks within city limits. These data gave PHEM insight into what residents of Long Beach know about Zika, mosquitoes, health preventions measures, and other general health knowledge. DHHS organized the survey questions into five sections: Pre-Interview, Demographics, Mosquito Prevention, Zika Assessment, and Travel. The CASPER survey questions are available in *Appendix G*.

The first section, Pre-Interview, recorded the date of the survey, start time of the interview, team name of the surveying volunteers, cluster number of the responding household, survey number, the interviewer's initials, and the type of household structure. The interviewers, who were volunteers, recorded answers to these questions.

The second section, Demographics, contained survey questions 1-4 and recorded the responding household's basic information, such as the household's language spoken, the amount of individuals living in the household, and the ages of individuals living in the household.

The third section, Mosquito Prevention, contained survey questions 5-41. Respondents were asked a series of questions regarding mosquitos around their homes and their knowledge about mosquito breeding and mosquito prevention. Within this section, survey questions 7-21 tested a respondent's knowledge regarding mosquitoes. The interviewer read a set of statements regarding mosquitos and the respondents provided "true," "false," "don't know," or "refused to answer" as answers to these statements. Additionally, survey questions 22-31 focused on the actions taken by respondents to prevent mosquitoes from breeding around their homes, and survey questions 32-41 focused on the potential breeding locations themselves.

The fourth section, Zika Assessment, contained survey questions 42-73. Survey question 42 asked respondents if any members of their households had heard of the Zika virus before the interview was conducted. If the respondent chose "yes," the interviewer asked follow-up questions regarding the respondent's sources Zika information. If the respondent chose "no," the interviewer asked about where the respondent's household

members usually hear about health information. In addition, survey questions 45-63 tested the respondent's knowledge about the Zika virus and survey questions 64-71 tested the respondent's knowledge about the actions that can help people to avoid contracting the virus. Questions 45-63 were only asked of respondents who reported they had heard of the Zika virus before that day.

The fifth section, Travel, asks about a respondent's travel to areas outside of the United States. The section included questions such as "What was the main reason for travel?" and "To what countries did they travel?"

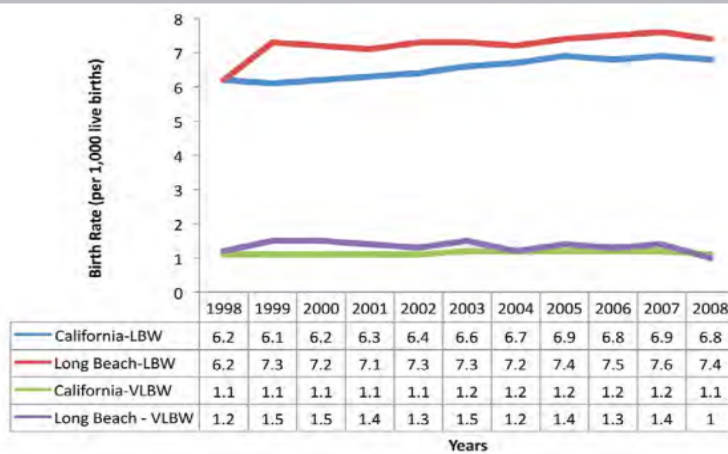
In total, 197 interviews were completed. Interviewees did not collect any identifying data about household respondents (names, addresses, race, ethnicity, etc.). From these interviews, PHEM gathered a significant amount of information about Long Beach's knowledge of Zika and other health issues. CASPER data show that many individuals were under-educated about Zika, as many respondents answered "Don't Know" or gave incorrect responses in the survey.

APPENDIX B: BIRTH WEIGHT DISPARITIES BY GEOGRAPHY AND RACE/ETHNICITY

Comparison of Birth Weight: Long Beach vs. California¹⁰⁵

Figure 59. UCSF, FHOP, 2008

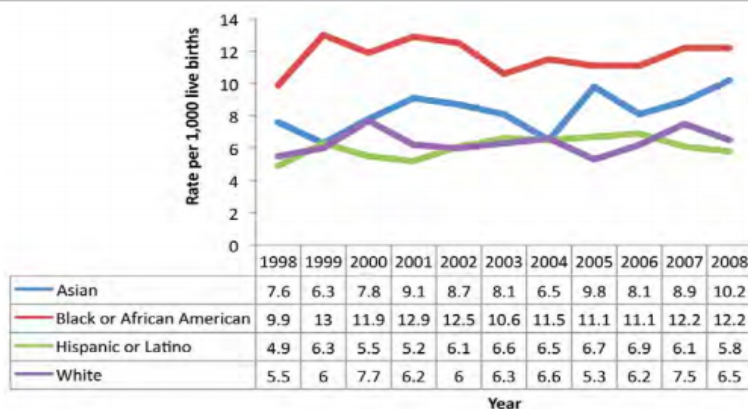
Low (LBW) and Very Low (VLBW) Birth Weight Rate by Year
California, Long Beach, 1998-2008



Comparison of Birth Weight: Among Races/Ethnicities¹⁰⁶

Figure 60. UCSF, FHOP, 2008

Low Birth Weight (less than 2500 grams) Rate by Race/Ethnicity
Long Beach, 1998-2008



¹⁰⁵ Price, Susan, Mitchell Kushner, S. Michael Johnson, Cheryl Barrit, Nelson Karr, and Darnisa Tyler. "Community Health Assessment." City of Long Beach Department of Health and Human Services. July 2013. Accessed Spring 2018.

¹⁰⁶ Price, Susan, Mitchell Kushner, S. Michael Johnson, Cheryl Barrit, Nelson Karr, and Darnisa Tyler. "Community Health Assessment." City of Long Beach Department of Health and Human Services. July 2013. Accessed Spring 2018.

APPENDIX C: HISTORY OF THE ZIKA VIRUS

Scientists first identified the Zika virus in Ugandan monkeys in 1947.¹⁰⁷ Five years later, in 1952, researchers discovered the virus also affects humans. In the first five decades following the recognition of the virus, scientists recorded few outbreaks, and the virus appeared to pose little serious threat. In 2007, the first mass outbreak of the virus occurred on the island of Yap in Micronesia.¹⁰⁸ Puzzled by a spate of patients who tested positive for Dengue fever, but also exhibited new and varying symptoms, local doctors provided samples to the Centers for Disease Control and Prevention.¹⁰⁹ CDC analysis revealed that the Zika virus was behind these curious symptoms. Researchers further found that *Aedes aegypti* and *Aedes albopictus* mosquitoes transmit the disease, which causes mild symptoms such as rash, fever, joint pain, muscle pain, and red eyes.¹¹⁰¹¹¹ Due to the mild nature of these symptoms and the low likelihood of death, public health officials did not consider Zika an emerging public health issue at this juncture.

Slowly, however, the dangerous reality of Zika came to light. Outbreaks continued in multiple countries as mosquitoes migrated from place to place.¹¹² In 2013, researchers found that Zika can be transmitted sexually.¹¹³ The concept of Zika as a sexually transmitted infection has yet to become well known in public discourse, causing potential victims of the disease to be undereducated about prevention methods. In May of 2016, Zika became a public health emergency when scientists found that pregnant women can transmit the virus to their fetus, resulting in microcephaly, a serious neurological disorder. Microcephaly causes significant fetal brain injury and delayed development.¹¹⁴ Confirmation of the connection between Zika and microcephaly spurred a flurry of research, public health emergency management outreach, and efforts to increase prevention.

¹⁰⁷ "The History of Zika Virus." World Health Organization. Accessed Spring 2018.

¹⁰⁸ "The History of Zika Virus." World Health Organization. Accessed Spring 2018.

¹⁰⁹ Duffy, Mark R., Tai-Ho Chen, et. al. "Zika Virus Outbreak on Yap Island, Federated States of Micronesia." *The New England Journal of Medicine* 360. 2536-2543. June 11, 2009. Accessed Spring 2018.

¹¹⁰ Vogel, Gretchen. "Scientific sleuths hunt for Zika-carrying mosquitoes." *Science Magazine*. June 1. 2016. Accessed Spring 2018.

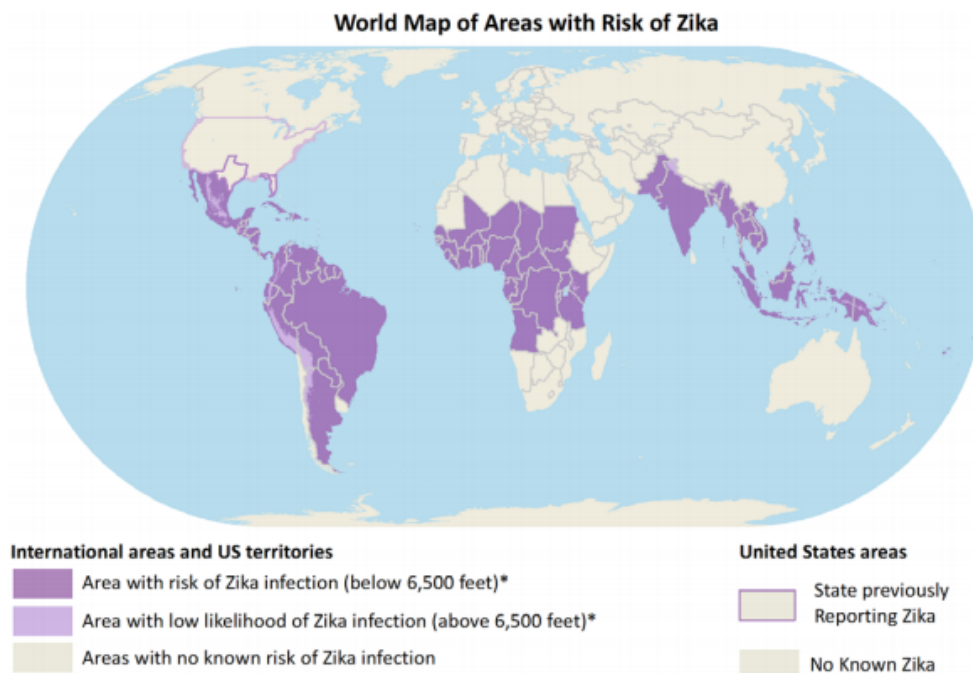
¹¹¹ Centers for Disease Control and Prevention. "Zika Virus: Symptoms." US Department of Health and Human Services. May 1, 2017. Accessed Spring 2018.

¹¹² "The History of Zika Virus." World Health Organization. Accessed Spring 2018.
<http://www.who.int/emergencies/zika-virus/timeline/en/>.

¹¹³ Musso, Didier, Claudine Roche, et. al. "Potential Sexual Transmission of Zika Virus." *Emerging Infectious Diseases* 21(2) 359-361. February 2015. Accessed Spring 2018.

¹¹⁴ Miakar, Jernej, Misa Korva, et. al. "Zika Virus Associated with Microcephaly." *The New England Journal of Medicine* 374. 951-958. March 10 2016. Accessed Spring 2018.

APPENDIX D: WORLD MAP OF AREAS WITH RISK OF ZIKA¹¹⁵



*Mosquitoes that can spread Zika usually live in places below 6,500 feet. The chances of getting Zika from mosquitoes living above that height are very low.

Areas with Risk of Zika

Asia: Bangladesh, Burma (Myanmar), Cambodia, India, Indonesia, Laos, Malaysia, Maldives, Pakistan, Philippines, Singapore, Thailand, Timor-Leste (East Timor), Vietnam

The Pacific Islands: Fiji, Marshall Islands, Papua New Guinea, Samoa, Solomon Islands, Tonga

The Caribbean: Anguilla; Antigua and Barbuda; Aruba; Barbados; Bonaire; British Virgin Islands; Cuba; Curaçao; Dominica; Dominican Republic; Grenada; Haiti; Jamaica; Montserrat; the Commonwealth of Puerto Rico, a US territory; Saba; Saint Kitts and Nevis; Saint Lucia; Saint Martin; Saint Vincent and the Grenadines; Sint Eustatius; Sint Maarten; Trinidad and Tobago; Turks and Caicos Islands; US Virgin Islands

North America: Mexico

Central America: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama

South America: Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Venezuela

Africa: Angola, Benin, Burkina-Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Congo (Congo-Brazzaville), Côte d'Ivoire, Democratic Republic of the Congo (Congo-Kinshasa), Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Mali, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Sudan, Sudan, Tanzania, Togo, Uganda

Technical note: Because of variations in laboratory and surveillance capacity internationally, data are not available to define levels of risk. CDC, the World Health Organization, and the European CDC have jointly reviewed the scientific literature to define a Zika virus country classification scheme. CDC provides travel recommendations for countries/territories/subnational areas falling into Category 1, Category 2, and the Category 4 sub-group within the classification framework.

Current as of: February 2, 2018

¹¹⁵ Centers of Disease Control. "World Map of Areas with Risk of Zika." US Department of Health and Human Services. February 2, 2018. Accessed Spring 2018.

APPENDIX E: CASPER METHODOLOGY AND IMPLEMENTATION

The California Department of Public Health (CDPH) selected clusters for the CASPER via a two-stage sampling method. In the first stage, CDPH chose Long Beach as the sampling frame (because the residents of this city were PHEM's population of concern). Within that frame, CDPH randomly selected 30 census blocks (referred to as clusters) using an ArcGIS toolkit developed by the CDC.

The second stage of systematic random sampling occurred within these clusters. Interview teams assigned to each cluster were handed a CDPH-developed map of the cluster, which included the "starting point" of their interviews (i.e. northwest corner, southeast corner, etc.), and a designated "n"th unit the team should interview. CDPH determined these starting points by assigning each corner a number (i.e., southwest = 1, northwest = 2, etc.) and using a random number generator to assign each cluster a starting point number. The "n"th designation told interviewers how many houses to count between interviews. This number was determined by dividing the total quantity of households in the cluster by 7 (as PHEM hoped to complete seven interviews per cluster). Thus, if cluster 17 had 28 households, and the interview group started at the southeast corner, they would interview the first household on the southwest corner, count 4 houses (their "n"th designation), and interview the 4th house.

APPENDIX F: LIST OF STAKEHOLDERS INTERVIEWED

Stakeholders Interviewed		
Stakeholder	Organization	Field or Specialization
Ivonne Alarcon	Long Beach Department of Health and Human Services	Finance & Budgeting
Katie Balderas, MPH	Long Beach Department of Health and Human Services	Health Equity
Nora Barin, MPH	Long Beach Department of Health and Human Services	Epidemiology
Matthew Feaster, MPH, PhD(c)	Pasadena Public Health Department	Epidemiology
Gisele Fong, MA, PhD	The California Endowment	Building Healthy Communities: Long Beach
Jennifer Gonzalez	Long Beach Department of Health and Human Services	Public Health Information
Jessica Ho, RD, MSPH	Supervisor Janice Hahn's Office	Senior Health Deputy
Emily Holman, MSc	Long Beach Department of Health and Human Services	Disease Surveillance
Heather Jue Northover, MPH	Los Angeles County Department of Public Health	Health Equity
Amalia Morris	Government Alliance on Race and Equity (GARE)	Government Equity
Samuel Stratton, MD, MPH	Orange County Health Care Agency	Emergency Medical Services

APPENDIX G: CASPER QUESTIONNAIRE¹¹⁶



Appendix III: Zika CASPER Questionnaire

SECTION 1: PRE-INTERVIEW

Date:	Start time:	Team Name:
Cluster Number:	Survey Number:	Interviewer Initials:
Type of Structure: ☐ Single family ☐ Multiple Unit ☐ Mobile Home ☐ Other (specify) _____		

SECTION 2: DEMOGRAPHICS

1. Did you or members of your household hear about this survey prior to us talking to you today?

- ☐ Yes → **[GO TO Q1a]**
☐ No
☐ Don't Know
☐ Refused

- 1a. How did you or your household members hear about it? **(List options. Check all that apply)**

- ☐ Social Media
☐ Flyer
☐ Word of mouth
☐ NextDoor **[a social network app for your neighborhood]**
☐ Other (specify) _____
☐ Don't Know
☐ Refused

2. What is the main language spoken in your household? **(Select one)**

- ☐ English
☐ Spanish
☐ Khmer (Cambodian)
☐ Other (specify) _____
☐ Refused

3. Including yourself, how many people live in your household? _____

4. Including yourself, how many people living in your household are:

- a. Less than 2 years old: _____
b. Between 2-17 years old: _____
c. Between 18-64 years old: _____

¹¹⁶ Long Beach Zika Community Assessment for Public Health Emergency Response (CASPER). City of Long Beach. July 2017. Accessed Winter 2017.

d. 65 years old and over: _____

SECTION 3: MOSQUITO PREVENTION

[PROMPT] Now I am going to ask you about mosquitoes around your home.

5. Have you or any household members been bitten by mosquitoes in or around your home within the past month?

- ☐ Yes → **[GO TO Q5a]**
☐ No
☐ Don't Know
☐ Refused
- [GO TO Q6]**

5a. What time of day were you or your household members bitten? **(List options. Check all that apply)**

- ☐ Early morning (5am-7am)
☐ Day time (7am-4pm)
☐ Evening (4pm-8pm)
☐ Night (8pm-5am)
☐ Don't Know
☐ Refused

6. In the last 30 days, have you or members of your household used mosquito repellent?

- ☐ Yes → **[GO TO Q6a]**
☐ No
☐ Don't Know
☐ Refused
- [GO TO Q7]**

6a. Which type? **(List options. Check all that apply)**

- ☐ DEET
☐ Picaradin
☐ Oil of lemon/eucalyptus
☐ Other (specify) _____
☐ Don't Know
☐ Refused

Common mosquito repellent with DEET:

- Off! Deep Woods (Green bottle)
- Repel 100 / Repel Max
- Ultrathon
- Sawyer Premium Ultra Insect Repellent
- Cutter Backwoods

Common mosquito repellent with Picaradin

- Off! Family Care (Orange bottle)
- Sawyer Premium Insect Repellent with 20% Picaradin
- Avon Skin So Soft Bug Guard Plus Mosquito Repellent

[PROMPT] I'm going to read you a set of statements about mosquitoes. Please tell me whether you or your household members believe the statement is TRUE or FALSE:

7. Mosquitoes in Long Beach cause disease	☐ True	☐ False	☐ Don't Know	☐ Refused
8. Mosquitoes in Long Beach carry West Nile Virus	☐ True	☐ False	☐ Don't Know	☐ Refused
9. Mosquitoes in Long Beach carry Dengue	☐ True	☐ False	☐ Don't Know	☐ Refused
10. Mosquitoes in Long Beach carry Zika	☐ True	☐ False	☐ Don't Know	☐ Refused

11. Mosquitoes in Long Beach carry Chikungunya [PRONOUNCED: CHI-kan-GUUN-ya]	☐ True	☐ False	☐ Don't Know	☐ Refused
12. Different types of mosquitoes can transmit different types of diseases	☐ True	☐ False	☐ Don't Know	☐ Refused
13. Mosquitoes cannot breed in very small amounts of water	☐ True	☐ False	☐ Don't Know	☐ Refused
14. Mosquitoes can live inside the home as well as outside	☐ True	☐ False	☐ Don't Know	☐ Refused
15. Mosquito control is important to you and your household members	☐ True	☐ False	☐ Don't Know	☐ Refused
16. Mosquitoes are usually around the size of a quarter	☐ True	☐ False	☐ Don't Know	☐ Refused
17. There are ways to prevent mosquitoes from breeding around your home	☐ True	☐ False	☐ Don't Know	☐ Refused
18. Using mosquito repellent while outdoors can protect from Zika and West Nile Virus	☐ True	☐ False	☐ Don't Know	☐ Refused
19. Mosquito repellent is harmful for children to use [Interviewer prompt: When repellent is used as directed]	☐ True	☐ False	☐ Don't Know	☐ Refused
20. Mosquito repellent is safe for pregnant women to use [Interviewer prompt: When repellent is used as directed]	☐ True	☐ False	☐ Don't Know	☐ Refused
21. Aerial spraying for mosquitoes is safe for humans [Interviewer prompt: Aerial spraying means using airplanes to treat very large areas with insecticides to kill adult mosquitoes]	☐ True	☐ False	☐ Don't Know	☐ Refused

[PROMPT] In the past 30 days, have any of the following actions been done to prevent mosquito breeding around your home [Interviewer prompt: Outside means: balcony, porch, terrace, and yard]? Please answer YES or NO.

22. Cleaned roof gutters	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
23. Dumped outdoor containers holding water	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
24. Covered outdoor containers holding water	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
25. Scrubbed the inside of containers (i.e. buckets, fountains, bird baths) to remove mosquito eggs	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
26. Used full screens on all open windows and doors	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
27. Kept screens on windows and doors in good repair (no holes).	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
28. Sprayed or fumigated for mosquitoes around the home	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
29. Applied chemical, larvicide, or mosquito dunks directly to water	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
30. Used insect light traps	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
31. Other	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A

[If YES to Q31]

→ Which mosquito removal method did you use?

[PROMPT] There are many places where mosquitoes can breed. Are any of the following items currently outside of your home? **[Interviewer prompt: Outside means: balcony, porch, terrace, and yard]**

Please answer **YES** or **NO**.

32. Bird baths	☐ Yes	☐ No	☐ Don't Know	☐ Refused
33. Tires	☐ Yes	☐ No	☐ Don't Know	☐ Refused
34. Pet water dish	☐ Yes	☐ No	☐ Don't Know	☐ Refused
35. Flower pots	☐ Yes	☐ No	☐ Don't Know	☐ Refused
36. Fountain	☐ Yes	☐ No	☐ Don't Know	☐ Refused
37. Buckets	☐ Yes	☐ No	☐ Don't Know	☐ Refused
38. Rain barrel	☐ Yes	☐ No	☐ Don't Know	☐ Refused
39. Pool or hot tub	☐ Yes	☐ No	☐ Don't Know	☐ Refused
40. Kiddie pool	☐ Yes	☐ No	☐ Don't Know	☐ Refused
41. Children's toys	☐ Yes	☐ No	☐ Don't Know	☐ Refused

SECTION 4: ZIKA ASSESSMENT

[PROMPT] Next, I would like to ask you some questions about your household's knowledge of Zika virus.

42. Have you or members of your household heard of Zika virus before today?

- ☐ Yes → **[GO TO Q43]**
☐ No
☐ Don't Know
☐ Refused
- [COMPLETE Q42a THEN GO TO Q74 (TRAVEL SECTION)]**

42a. **[If NO to Q42]** Where do you and your household members usually hear health information? I will read a list of sources, please answer Yes or No for each.

a. Family	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
b. Friends and/or neighbors	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
c. Community meetings	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
d. Place of worship	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
e. Work	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
f. Women, Infants, and Children Program (WIC)	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
g. Private doctor	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
h. Government agency	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
i. Billboards	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
j. Utility bill	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
k. Radio	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
l. Television	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
m. Newspapers	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
n. Internet	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
o. Social Media	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
p. School	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
q. Other	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A

[If YES to "other"]

Specify: _____

[NOTE: SKIP QUESTIONS 43-73 IF NO TO Q42]

43. From which sources have you and your household members heard information about Zika? I will read a list of sources, please answer **YES** or **NO** for each.

a. Family	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
b. Friends or neighbors	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
c. Community meetings	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
d. Place of worship	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
e. Work	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
f. Women, Infants, and Children Program (WIC)	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
g. Private doctor	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
h. Government agency	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
i. Billboards	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
j. Utility bill	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
k. Radio	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
l. Television	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
m. Newspapers	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
n. Internet	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
o. Social Media	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
p. School	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A
q. Other	☐ Yes	☐ No	☐ Don't Know	☐ Refused	☐ N/A

[If YES to "Other"]

Specify: _____

44. Do you and your household members think Zika is an important issue in your community?

- ☐ Yes
- ☐ No
- ☐ Don't Know
- ☐ Refused

[PROMPT] Please answer **TRUE** or **FALSE** to the following statements about Zika virus:

45. Zika is preventable	☐ True	☐ False	☐ Don't Know	☐ Refused
46. You can get Zika from having sex with someone who has Zika	☐ True	☐ False	☐ Don't Know	☐ Refused
47. The mosquitoes that carry Zika only bite during dusk and dawn	☐ True	☐ False	☐ Don't Know	☐ Refused
48. The mosquitoes that carry Zika have black and white stripes on their legs	☐ True	☐ False	☐ Don't Know	☐ Refused
49. Zika can be passed from a pregnant mother to her baby	☐ True	☐ False	☐ Don't Know	☐ Refused
50. Zika can be passed to others by breathing the same air as someone who is infected	☐ True	☐ False	☐ Don't Know	☐ Refused
51. Babies born to mothers with Zika may have severe birth defects	☐ True	☐ False	☐ Don't Know	☐ Refused
52. Traveling to areas that have Zika is safe for pregnant women	☐ True	☐ False	☐ Don't Know	☐ Refused
53. Men can sexually transmit Zika to their partners for up to six months after becoming infected	☐ True	☐ False	☐ Don't Know	☐ Refused
54. Women can sexually transmit Zika to their partners for up to six months after becoming infected	☐ True	☐ False	☐ Don't Know	☐ Refused
55. Zika often causes severe illness and death in adults	☐ True	☐ False	☐ Don't Know	☐ Refused
56. Symptoms of Zika virus infection include: fever, rash, joint pain, and red eyes	☐ True	☐ False	☐ Don't Know	☐ Refused
57. Most people who get Zika will not have symptoms	☐ True	☐ False	☐ Don't Know	☐ Refused
58. There is no treatment for Zika	☐ True	☐ False	☐ Don't Know	☐ Refused
59. There is an available vaccine for Zika	☐ True	☐ False	☐ Don't Know	☐ Refused
60. Dogs and cats can become sick from Zika	☐ True	☐ False	☐ Don't Know	☐ Refused
61. There is still a lot we don't know about Zika virus	☐ True	☐ False	☐ Don't Know	☐ Refused
62. The City of Long Beach has a Zika hotline number for the public to report mosquitoes or ask questions about Zika	☐ True	☐ False	☐ Don't Know	☐ Refused
63. Mosquitoes that transmit Zika prefer to lay eggs in large bodies of water	☐ True	☐ False	☐ Don't Know	☐ Refused

[PROMPT] Please answer **YES** or **NO** if you or your household members think the following action can help people avoid getting Zika.

64. Wear long sleeved shirts and pants	☐ Yes	☐ No	☐ Don't Know	☐ Refused
65. Use mosquito repellent	☐ Yes	☐ No	☐ Don't Know	☐ Refused
66. Avoid travel to Zika affected areas	☐ Yes	☐ No	☐ Don't Know	☐ Refused
67. Use a condom or abstain from sex after traveling to Zika affected areas	☐ Yes	☐ No	☐ Don't Know	☐ Refused
68. Wear a face mask around those infected with Zika	☐ Yes	☐ No	☐ Don't Know	☐ Refused
69. Turn over, cover, or clean items that hold water	☐ Yes	☐ No	☐ Don't Know	☐ Refused
70. Install, repair, or use window and door screens	☐ Yes	☐ No	☐ Don't Know	☐ Refused
71. Other	☐ Yes	☐ No	☐ Don't Know	☐ Refused

Specify: _____

[If YES to "other"]

72. Are you or members of your household concerned with diseases that mosquitoes may carry?

- ☐ Yes
☐ No
☐ Don't Know
☐ Refused

73. **[Open ended question]** What additional information would you and your household like to receive about Zika? _____ ☐ Don't Know ☐ Refused

SECTION 5: TRAVEL

[PROMPT] Now, I am going to ask you about travel:

74. Have you or anyone in your household traveled outside of the U.S. in the past three months?

- ☐ Yes → **[GO TO Q74a-d]**
☐ No
☐ Don't Know
☐ Refused } **[GO TO Q75]**

74a. To what countries did they travel? _____

74b. What was the main reason for travel? **(Choose one)**

- ☐ Vacation
☐ Visit family
☐ Work
☐ Other (specify): _____

74c. Were any of the travelers pregnant women?

- ☐ Yes
☐ No
☐ Don't know
☐ Refused

74d. **[ONLY IF YES TO Q42]** Does that country currently have Zika virus transmission?

- ☐ Yes
☐ No
☐ Don't know
☐ Refused

75. Are you or anyone in your household planning to travel outside of the U.S. in the next three months?

- ☐ Yes → **[GO TO Q75a-d]**
☐ No
☐ Don't Know
☐ Refused } **[GO TO CLOSING STATEMENT]**

75a. To what countries will they travel? _____

75b. What is the main reason for travel? **(Choose one)**

APPENDIX H: ACS VARIABLES

The variables of interest are identified as follows¹¹⁷:

- *PerNotHispIND*: Percent of total population in a block group who identify as Hispanic or Latinx.
- *PerWhiteIND*: Percent of total population in a block group who identify as White.
- *PerBlackIND*: Percent of total population in a block group who identify as Black.
- *PerAmerIndIND*: Percent of total population in a block group who identify as American Indian.
- *PerHawaiiIND*: Percent of total population in a block group who identify as Native Hawaiian or Pacific Islander.
- *PerOtherIND*: Percent of total population in a block group who identify as Other Race.
- *PerTwoPlusIND*: Percent of total population in a block group who identify as Two or More Races.
- *PerHispIND*: Percent of total population in a block group who identify as Hispanic or Latinx.
- *PerHispWhiteIND*: Percent of total population in a block group who identify as Hispanic or Latinx and White.
- *PerHispBlackIND*: Percent of total population in a block group who identify as Hispanic or Latinx and Black.
- *PerHispAsianIND*: Percent of total population in a block group who identify as Hispanic or Latinx and Asian.
- *PerHispAmerIndIND*: Percent of total population in a block group who identify as Hispanic or Latinx and American Indian.
- *PerHispHawaiiIND*: Percent of total population in a block group who identify as Hispanic or Latinx and Native Hawaiian.
- *PerHispOtherIND*: Percent of total population in a block group who identify as Hispanic or Latinx and Other Race.
- *PerHispTwoPlusIND*: Percent of total population in a block group who identify as Hispanic or Latinx and Two or More Races.
- *PerYrBPL*: Percent of households in a block group who had an income in the past 12 months that was below the poverty line.
- *peryesSNAP*: Percent of households who used the federal SNAP (Supplemental Nutrition Assistance Program) in the past 12 months.
- *PerUnempl*: Percent of 16 years and over population who are not in the labor force.
- *PerNoIns*: Percent of population who do not have health insurance.
- *YrMHI*: Median Household Income in the past 12 months by 2016 inflation-adjusted dollars.
- *PerNoEd*: Percent of population 25 years and over who have no education.

¹¹⁷ “American FactFinder.” U.S. Census Bureau. Accessed Spring 2018.

- *PerNoDeg*: Percent of population 25 years and over who do not have a high school degree.
- *PerHSGED*: Percent of population 25 years and over who have a high school population, GED or alternative criteria.
- *PerCollNoDeg*: Percent of population 25 years and over who attended some college but do not have a four-year university degree.
- *PerCollNoDegAss*: Percent of population 25 years and over who attended some college but possesses an associate's degree.
- *PerCollDeg*: Percent of population 25 years and over who have a four-year bachelor's degree.
- *PerMaster*: Percent of population 25 years and over who have a Master's degree.
- *PerForeignB*: Percent of population who are native or foreign born.

American Community Survey Tables¹¹⁸:

- B03002 HISPANIC OR LATINO ORIGIN BY RACE: Total Population
- B15003 EDUCATIONAL ATTAINMENT FOR THE POPULATION 25 YEARS AND OVER: Population 25 years and over
- B17017 POVERTY STATUS IN THE PAST 12 MONTHS BY HOUSEHOLD TYPE BY AGE OF HOUSEHOLDER: Households
- B19013 MEDIAN HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2016 INFLATION-ADJUSTED DOLLARS): Households
- B22010 RECEIPT OF FOOD STAMPS/SNAP IN THE PAST 12 MONTHS BY DISABILITY STATUS FOR HOUSEHOLDS: Households
- B23025 EMPLOYMENT STATUS FOR THE POPULATION 16 YEARS AND OVER: Population 16 years and over
- B27010 TYPES OF HEALTH INSURANCE COVERAGE BY AGE: Civilian noninstitutionalized population
- B99051: ALLOCATION OF CITIZENSHIP STATUS: Total Population

¹¹⁸ "American FactFinder." U.S. Census Bureau. Accessed Spring 2018.

APPENDIX I: DESCRIPTIVE STATISTICS¹¹⁹

Table 3: Descriptive Statistics of Relevant Variables

Variable	Min %	Max %	Median	Mean	Std Dev
score1	0	.8666667	.4666667	.4755137	.158483
score2	0	.8421053	.4210526	.4304802	.1817754
PerWhiteIND	.6147541	76.10405	19.28058	31.56196	25.28068
PerBlackIND	0	40.26667	10.32532	11.97065	8.345656
PerAsianIND	1.304181	40.44053	9.427443	11.50692	9.898567
PerAmerIndIND	0	1.633166	0	.1034505	.3230144
PerHawaiiIND	0	4.840271	0	.6477127	1.375537
PerOtherIND	0	.6238004	0	.0382985	.1269025
PerTwoPlusIND	0	18.63765	1.649405	3.60671	4.958366
PerHispanicWhiteIND	24.8366	90.32258	60.18576	58.58243	17.20142
PerHispanicBlackIND	0	15.26882	0	1.291588	3.663926
PerHispanicAsianIND	0	32.36715	0	1.3447	6.037737
PerHispanicAmerIndIND	0	19.80676	0	1.07605	3.763803
PerHispanicHawaiiIND	0	2.339901	0	.0831437	.4342724
PerHispanicOtherIND	2.657005	75.1634	35.47297	32.10207	17.97332
PerHispanicTwoPlusIND	0	22	4.891641	5.520016	5.686801
PerNoEd	0	18.03156	2.4	4.867311	5.542081
PerNoDeg	0	38.68687	7.671958	13.16055	11.77919
PerHSGED	4.088889	31.20729	16.70897	17.26469	7.224557

¹¹⁹ The variable YrMHI does not represent a percentage; it is measured in absolute terms of income.

PerCollNoDeg	20.66116	49.95357	33.33333	34.66868	8.594313
PerCollDeg	4.040404	43.67909	13.7666	17.52616	11.08149
PerMaster	0	39.73333	5.363036	11.57183	11.25877
PerDoctor	0	5.637982	0	.9407642	1.303787
PerUnempl	15.60024	55.40623	33.77805	32.40192	11.53648
peryesSNAP	0	38.92045	12.47485	13.8689	11.06415
PerNoIns	1.010101	45.17986	14.22081	16.00316	9.64241
PerForeignB	8.127915	55.53957	24.285	25.37997	12.08887
PerOld	0	1	0	.1684281	.345504
PerYrBPL	0	41.83673	17.81327	18.84089	12.07657
YrMHI	20980	165521	49940	59699.48	29941.46

APPENDIX J: MIXED EFFECTS BIVARIATE REGRESSION RESULTS

Table 4: Mixed Effects Bivariate Regression Results¹²⁰

Variable	MAHKA p-value	MAHKA coefficient	ZKA p-value	ZKA coefficient
PerNotHispanicIND	0.001	0.0019863	0.000	0.002494
PerWhiteIND	0.000	0.0015394	0.000	0.0021055
PerBlackIND	0.321	-0.0011356	0.334	-0.0016848
PerAsianIND	0.255	-0.0011387	0.078	-0.002271
PerAmerIndianIND ¹²¹	0.058	-0.0387604	0.001	-0.0708294
PerHawaiiIND ¹²²	0.628	0.0034206	0.337	0.0107678
PerOtherIND	0.749	-0.0106574	0.188	-0.0938603
PerTwoPlusIND	0.003	0.0040045	0.024	0.0041695
PerHispanicIND	0.001	-0.0019863	0.000	-0.002494
PerHispanicWhiteIND	0.691	0.000272	0.008	0.0020467
PerHispanicBlackIND	0.673	0.0009117	0.246	-0.004382
PerHispanicAsianIND	0.459	-0.0004312	0.137	-0.0009009
PerHispanicAmericanIND	0.500	0.0013107	0.981	-0.0000413

¹²⁰ P-values in blue indicate significance at the $\alpha=0.10$ level; Coefficients in red indicate a change in score with an absolute value greater than or equal to 0.01 (or a 1% change in score).

¹²¹ The maximum percentage of Non-Hispanic Native American persons in the block groups surveyed was 1.63%. Therefore, correlation estimates may be biased.

¹²² The maximum percentage of Non-Hispanic Hawaiian persons in the block groups surveyed was 4.84%. Therefore, correlation estimates may be biased.

PerHispHawaii IND	0.250	-0.0070797	0.221	-0.0089161
PerHispOtherI ND	0.187	-0.0008278	0.026	-0.001736
PerHispTwoPl usIND	0.032	0.0052826	0.565	0.0016929
PerNoEd	0.063	-0.0041086	0.145	-0.0036182
PerNoDeg	0.006	-0.0029153	0.002	-0.0036358
PerHSGED	0.000	-0.0074341	0.000	-0.0080858
PerCollNoDeg	0.375	0.0012692	0.994	0.000012
PerCollDeg	0.008	0.0024331	0.012	0.0029385
PerMaster	0.000	0.0038851	0.000	0.0049825
PerDoctor ¹²³	0.018	0.0219294	0.025	0.0275861
PerUnempl	0.052	-0.002559	0.193	-0.0017541
peryesSNAP	0.005	-0.0024639	0.010	-0.0033725
PerNoIns	0.030	-0.0036553	0.005	-0.0031681
HHLang ¹²⁴	0.001	-0.0737361	0.004	-0.088892
PerForeignB	0.002	-0.0035803	0.001	-0.003128
PerOld ¹²⁵	0.062	0.064451	0.231	0.0394894
PerYrBPL	0.000	-0.0031723	0.001	-0.0034764
YrMHI	0.009	0.00000126	0.009	0.00000105

¹²³ The maximum percentage of Doctorate degree-holding persons in the block groups surveyed was 5.64%. Therefore, correlation estimates may be biased.

¹²⁴ Survey regression with weights provided by Long Beach DHHS were used for all household level data, including HHLang.

¹²⁵ Survey regression with weights provided by Long Beach DHHS were used for all household level data, including PerOld.

APPENDIX K: MIXED EFFECTS MULTIVARIATE REGRESSION RESULTS

Table 5: Regression of Score1 and PerNoEd With and Without Controls (HHLang, PerYrBPL)

Bivariate P-Value	Bivariate Coefficient	Multivariate P-Value	Multivariate Coefficient
0.063	-0.0041086	0.681	0.0012

Table 6: Regression of Score2 and PerNoEd With and Without Controls (HHLang, PerYrBPL)

Bivariate P-Value	Bivariate Coefficient	Multivariate P-Value	Multivariate Coefficient
0.145	-0.0036182	0.452	0.0033

Table 7: Regression of Score1 and PerNoDeg With and Without Controls (HHLang, PerYrBPL)

Bivariate P-Value	Bivariate Coefficient	Multivariate P-Value	Multivariate Coefficient
0.006	-0.0029153	0.762	-0.0005

Table 8: Regression of Score2 and PerNoDeg With and Without Controls (HHLang, PerYrBPL)

Bivariate P-Value	Bivariate Coefficient	Multivariate P-Value	Multivariate Coefficient
0.002	-0.0036358	0.317	-0.0018

Table 9: Regression of Score1 and PerHSGED With and Without Controls (HHLang, PerYrBPL)

Bivariate P-Value	Bivariate Coefficient	Multivariate P-Value	Multivariate Coefficient
0.000	-0.0074341	0.007	-0.0062

Table 10: Regression of Score2 and PerHSGED With and Without Controls (HHLang, PerYrBPL)

Bivariate P-Value	Bivariate Coefficient	Multivariate P-Value	Multivariate Coefficient
0.000	-0.0080858	0.000	-0.0065

Table 11: Regression of Score1 and HHLang With and Without Controls (PerForeignB, PerYrBPL, PerHispIND)

Bivariate P-Value	Bivariate Coefficient	Multivariate P-Value	Multivariate Coefficient
0.001	-0.0737361	0.138	-0.03918

Table 12: Regression of Score2 and HHLang With and Without Controls (PerForeignB, PerYrBPL, PerHispIND)

Bivariate P-Value	Bivariate Coefficient	Multivariate P-Value	Multivariate Coefficient
0.004	-0.088892	0.312	-0.0339612

Table 13: Regression of Score1 and PerForeignB With and Without Controls (YrMHI)

Bivariate P-Value	Bivariate Coefficient	Multivariate P-Value	Multivariate Coefficient
0.002	-0.0035803	0.048	-0.002205

Table 14: Regression of Score1 and PerForeignB With and Without Controls (YrMHI)

Bivariate P-Value	Bivariate Coefficient	Multivariate P-Value	Multivariate Coefficient
0.001	-0.003128	0.072	-0.0025662

Table 15: Regression of Score1 and YrMHI With and Without Controls (peryesSNAP)

Bivariate P-Value	Bivariate Coefficient	Multivariate P-Value	Multivariate Coefficient
0.009	0.00000126	0.079	0.00000123

Table 16: Regression of Score2 and YrMHI With and Without Controls (peryesSNAP)

Bivariate P-Value	Bivariate Coefficient	Multivariate P-Value	Multivariate Coefficient
0.009	0.00000105	0.439	-0.000000229