MOSQUITO-BORNE DISEASES OF TRAVELERS

SUMMARY DATA				
Disease	Dengue	Chikungunya	Zika	Malaria
Number of Cases	19	9	17	38
Annual Incidence*				
LA County	N/A	N/A	N/A	N/A
California	N/A	N/A	N/A	N/A
United States	N/A	N/A	N/A	N/A
Age at Diagnosis				
Mean	38	38	36	38
Median	34	35	32	37
Range	9–71 years	15–70 years	19–70 years	0–82 years

* Not applicable as there is no local transmission.

DESCRIPTION

Several mosquito-borne diseases affect LAC residents who travel abroad: dengue[1], chikungunya[2], and Zika[3], which are mainly transmitted by *Aedes aegypti* and *A. albopictus* mosquitoes. Malaria[4], which is transmitted by *Anopheles* mosquitoes, is another mosquito-borne disease that affects LAC residents. These diseases are typically found in the tropical and subtropical areas of the world. The mosquito vectors for all four diseases have been found in LAC; however, these diseases are not currently found in mosquitoes in LAC.

The best methods to prevent infection from mosquito-borne diseases is to eliminate mosquito breeding sources and avoid mosquito bites. People visiting or residing in regions where there is risk of mosquito-borne disease should take precautions by using mosquito Environmental Protection Agency (EPA)-approved repellants and wearing protective clothing. Travelers to countries where malaria is endemic should take additional precautions by taking the appropriate antimalarial prophylaxis as prescribed and utilizing bed nets. Unlike malaria, there is no prophylactic medicine or vaccine available to prevent dengue, Chikungunya, or Zika.

Dengue

Dengue, a flavivirus related to the West Nile virus (WNV) and Zika virus, is the most common vector-borne viral disease in the world. Infection with dengue virus has a range of clinical presentations from asymptomatic infection to severe systemic febrile illness. Treatment is supportive.

No cases of dengue acquired within the continental US were reported between 1946 and 1980. Since 1980, locally-acquired outbreaks have been documented in Texas, Florida, and Hawaii. Concern for the reemergence of dengue in Florida, Texas, and Hawaii as well as increases in dengue among returning US travelers over the past 20 years has prompted heightened vigilance among the medical and public health communities.

Dengue was added to the list of Nationally Notifiable Infectious Conditions in 2009; however, it has been a

notifiable condition in California and LAC for several decades. Confirmation of dengue requires that a clinically compatible case be laboratory confirmed with testing of paired serological specimens, a single positive serological specimen confirmed by a plaque reduction neutralization test (PRNT), or by molecular testing. Probable cases require only a single serologically positive specimen. Suspect cases are epidemiologically linked without laboratory evidence.

Chikungunya

The symptoms of chikungunya are similar to those of dengue and Zika; the most common symptoms are fever and joint pain. Other symptoms may include headache, muscle pain, joint swelling, or rash. Treatment is supportive.

Outbreaks have occurred in countries in Africa, Asia, Europe, and the Indian and Pacific Oceans. In late 2013, the chikungunya virus was found for the first time in the Americas on islands in the Caribbean. On July 16, 2014, the first locally-acquired cases in the continental US was identified in Florida.

For purposes of surveillance, confirmation of chikungunya requires that a clinically compatible case be laboratory-confirmed with testing of paired serological specimens, a single positive serological specimen confirmed by PRNT, or by molecular testing. Probable cases require only a single serologically positive specimen.

Zika

Zika virus, a flavivirus related to Dengue and WNV, was first discovered in 1947, and the first human cases were detected in 1952. Since then, outbreaks of Zika have been reported in tropical Africa, Southeast Asia, and the Pacific Islands. In 2014, an outbreak of Zika virus occurred in Brazil and rapidly spread to neighboring countries. The first LAC resident became ill with this virus after returning from El Salvador in late 2015. In 2017, local transmission of Zika virus was reported in Florida and Texas.

The most common symptoms of Zika virus disease are fever, diffuse macular papular rash, joint pain, and conjunctivitis. Other symptoms include muscle pain, headache, pain behind the eyes, and vomiting. The illness is usually mild with symptoms lasting from several days to a week. Severe disease requiring hospitalization is uncommon. Most persons infected with Zika are asymptomatic. Only 20% of infected persons experience symptoms. Increased reports of Guillain-Barré syndrome, a rare post-infectious central nervous system condition, has been linked to previous infections with Zika. Death from Zika is rare.

Unlike the other flaviviruses, Zika can be passed from a pregnant woman to her fetus. Infection during pregnancy can cause microcephaly and other adverse pregnancy and birth outcomes. In addition, infected persons can also spread Zika to their sexual partners. However, this method of transmission accounts for only 1% of cases.

Confirmed cases are those with clinically compatible illness, epidemiological risk factors, and either a single positive serological specimen confirmed by PRNT and negative for other arboviruses, or by molecular testing of urine or plasma specimen. Probable cases have a single serologically positive specimen with or without PRNT testing and are additionally serologically positive for other flaviviruses.

Malaria

About 1,700 cases of human malaria are diagnosed in the US each year. Local transmission has not occurred in Southern California since 1988-89.

Human malaria is an acute or subacute febrile illness caused by one or more protozoan parasites: *Plasmodium vivax, P. falciparum, P. malariae*, and *P. ovale*. The disease is transmitted by the bite of an infected *Anopheles* sp. mosquito and is characterized by episodes of chills and fever every 2–3 days. The more severe symptoms of *P. falciparum* include jaundice, shock, renal failure, and coma. *P. falciparum*

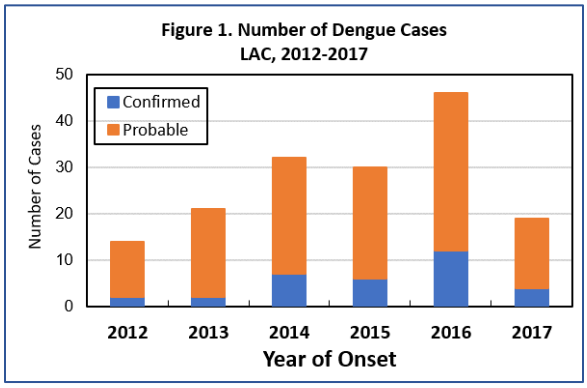
poses the greatest risk of death because it invades red blood cells of all stages and is often drug-resistant.

For the purpose of surveillance, confirmation of malaria requires the demonstration of parasites in thick or thin blood smears or the detection of *Plasmodium* sp. by a polymerase chain reaction (PCR) test regardless of whether the person experienced previous episodes of malaria while outside the country. Cases of malaria identified by the detection of malaria antibodies using rapid diagnostic test (RDT) are classified as suspected cases.

2017 TRENDS AND HIGHLIGHTS

Dengue

- The number of dengue cases in 2017 decreased by 59% from 2016 (19 vs. 46, respectively) and comprised of 4 confirmed and 15 probable cases (**Figure 1**).



  The proportion of confirmed cases remained similar at 21% in 2017 compared to 26% in 2016. Prior to 2015, only 1-2 cases were confirmed per year. The increase in confirmed cases can be attributed to the increase in laboratory evaluation for arboviral diseases due to the emergence of chikungunya and Zika in the Americas in 2014 and 2015, respectively. Because dengue is clinically and epidemiologically similar to both chikungunya and Zika, it is recommended that diagnostic tests for all three arboviruses be conducted together.
- All local cases identified in 2017 reported recent travel to regions endemic for dengue (**Table 1**). The most frequent travel destinations were countries in Asia and the Pacific Islands (63%, n=12).

Chikungunya

- The number of chikungunya cases documented in 2017 remained similar to that in 2016 (9 vs. 8 cases, respectively). All cases in 2017 reported travel to Asia (**Table 1**) including three to Bangladesh and three to India. Notably, an outbreak of chikungunya occurred in South Asia in 2017 and is likely the source of most cases identified in LAC [**1**]. In both 2015 and 2016, the majority of cases reported travel to Mexico or Central America.

Zika

- A total of 17 cases occurred in 2017, a dramatic decline from 100 in 2016. This reflects the decline in Zika transmission occurring globally.
- Cases were either detected with Zika RNA (41%) or Zika acute phase antibodies (59%). Cases were primarily Latino (76%) (**Figure 2**) with an average age of 35.8 years (range: 19-70 years). Also, cases resided throughout the county. Due to heightened concern for women of child-bearing age to be diagnosed and reported to public health, Zika infection was overwhelmingly reported among those 15-34-years-old, accounting for 53% of cases (**Figure 3**). Zika cases were primarily female (82%) for this reason.
- A total of eight of the cases were asymptomatic (47%); however, none were detected among blood donors. None of the symptomatic cases were hospitalized.
- A total of 12 infants were born to Zika cases. All had negative Zika virus test results and appeared healthy in follow-up assessments up to 12 months of age.
- Most cases traveled to a Zika endemic region prior to their illness (94%) (**Table 1**). The majority of cases traveled to Mexico (58%) and Central America (29%). One instance of sexual transmission of Zika virus was identified (6%) where the spouse reported travel to Mexico. This was the first case of sexual transmission of Zika detected in LAC.

Malaria

- The number of reported malaria cases had been declining in LAC since it peaked in 2003 with 60 cases, but since 2013, there has been an increase of cases (**Figure 4**).
- All cases had a known history of recent travel to a country where malaria is endemic (**Table 1**). The majority of cases reported recent travel to countries in Africa (71%, n=27). Nigeria was the most common African destination (67%, n=18). Over half of the malaria cases (63%, n=24) were due to *P. falciparum*.
- Among the 36 cases who were not recent immigrants, eight (22%) used a CDC recommended prophylaxis during their travels (**Figure 5**). Only one case reported completing their regimen. The CDC recommends the following for use as chemoprophylaxis: atovaquone/proguanil, chloroquine, doxycycline, mefloquine, or primaquine. The CDC recommends taking these as prescribed and to completion.

Summary

- Mosquito-borne diseases not found in local mosquitoes are documented among LAC residents returning from travel every year and in every month of the year. A majority of three quarters of cases occurred in the latter half of the year (**Figure 6**).
- Mosquito-borne diseases of travelers can affect persons of all ages. The age of cases ranged from 0 to 82-years-old. The mean ages ranged from 35.8 to 37.9-years-old in 2017. Overall, most cases occurred among those in the 15-34-year-age group (**Figure 4**).
- Travel-associated mosquito-borne diseases affected mainly individuals of non-White race/ethnicities. This trend is likely due to current disease transmission rates at travel destinations and the frequency of travel of these race/ethnicity groups to areas from which they or their families originate. Notably, in 2016, 75% of chikungunya cases were Hispanic/Latino, and all traveled to Mexico and Central America. Whereas, in 2017, 67% of chikungunya cases were Asian, and 75% traveled to South Asia.
- Local infestations of *A. aegypti* have been detected in LAC since 2014 and *A. albopictus* since 2011 and have spread to many cities throughout LAC. With the vectors of dengue, chikungunya, and Zika present in the county, there is heightened concern and vigilance for possible local transmission of these diseases. Consequently, LAC DPH has enhanced collaboration with vector control districts in the county. Cases of Zika, dengue, and chikungunya are shared with vector control agencies in order to enhance surveillance of *Aedes* sp. mosquitos and to encourage local clean-up efforts by residents.
- In 2017, LAC DPH intensified educational outreach to promote awareness and prevention of Zika and other mosquito-borne diseases. A pilot approach to collaborate with two of the highest risk cities for Zika to amplify LAC DPH messaging was implemented. Additionally, a weeklong countywide campaign was conducted to distribute campaign materials to over 14,000 public venues. Evaluation of the outreach efforts found that there was increased awareness and knowledge of Zika among residents who were exposed to campaign materials. Materials in the form of news articles, posters, and social media posts were most effective at conveying prevention messages.

REFERENCES

1. Hossain, Mohammad Sorowar, et al. “Chikungunya Outbreak (2017) in Bangladesh.” *Neglected Tropical Diseases*, Public Library of Science, 6 June 2018, journals.plos.org/plosntds/article?id=10.1371%2Fjournal.pntd.0006561.

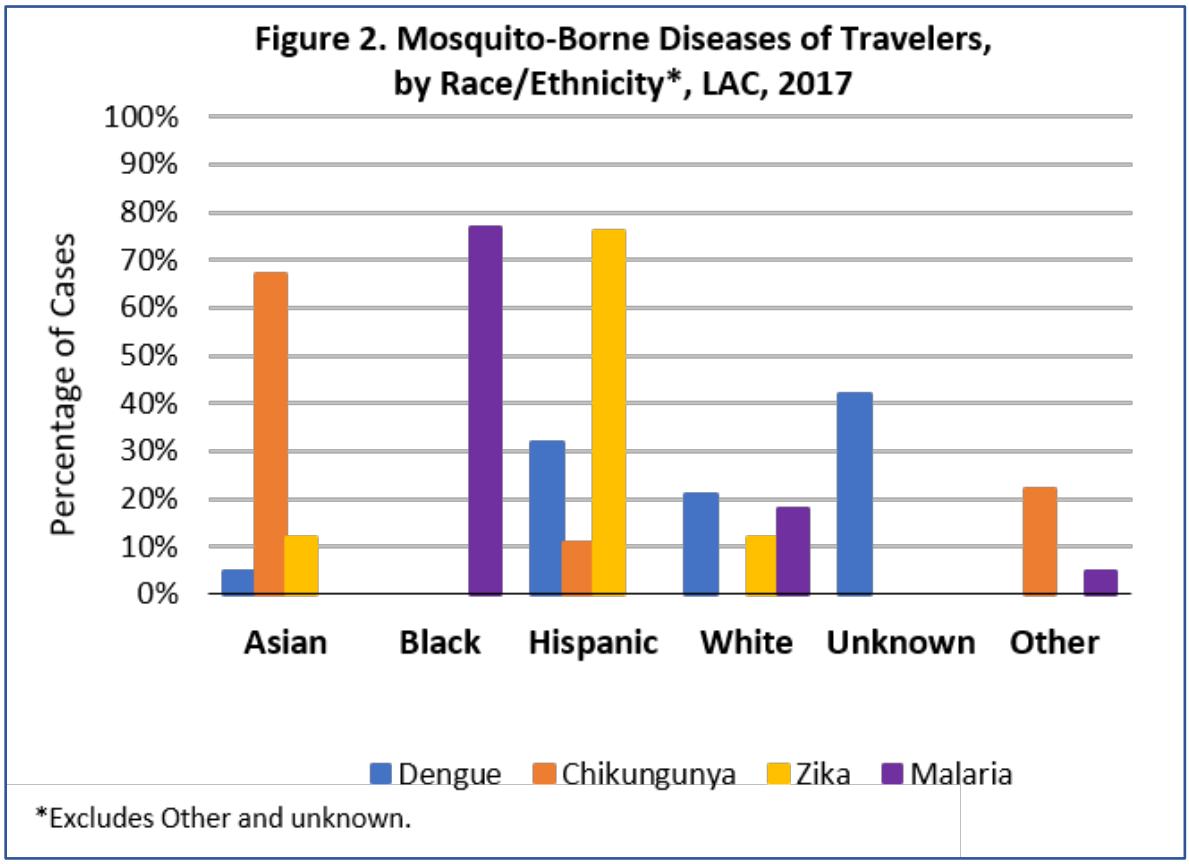


Figure 2. Mosquito-Borne Diseases of Travelers, by Race/Ethnicity*, LAC, 2017
Percentage of Cases
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Asian
Black
Hispanic
White
Unknown
Other
Dengue
Chikungunya
Zika
Malaria
*Excludes Other and unknown.

Figure 3. Mosquito-Borne Diseases of Travelers, by Age Group, LAC, 2017

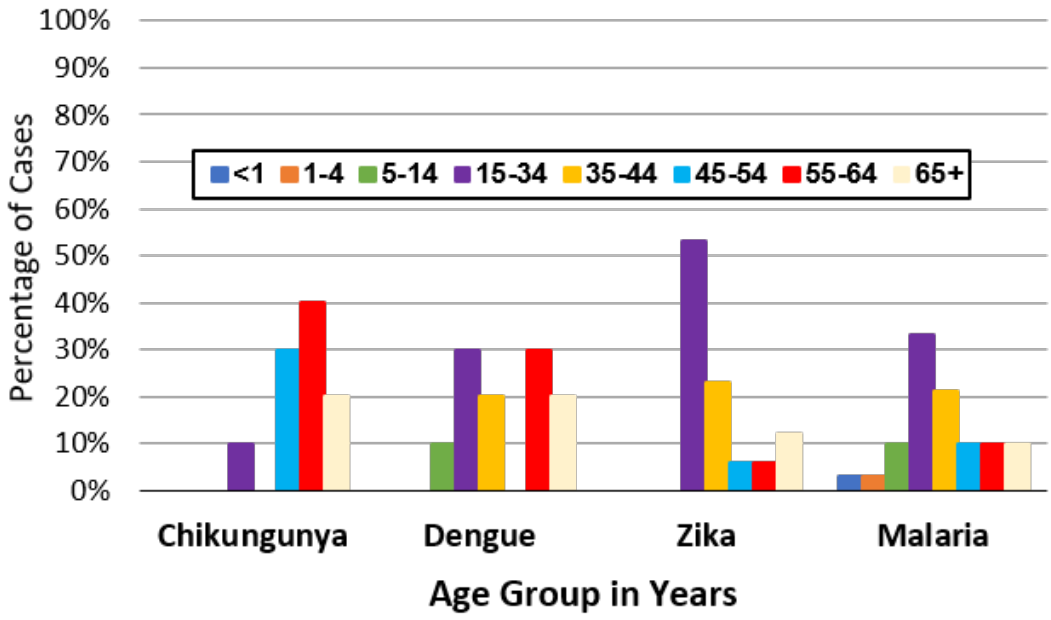


Figure 4. Number of Malaria Cases LAC and US, 2000-2017

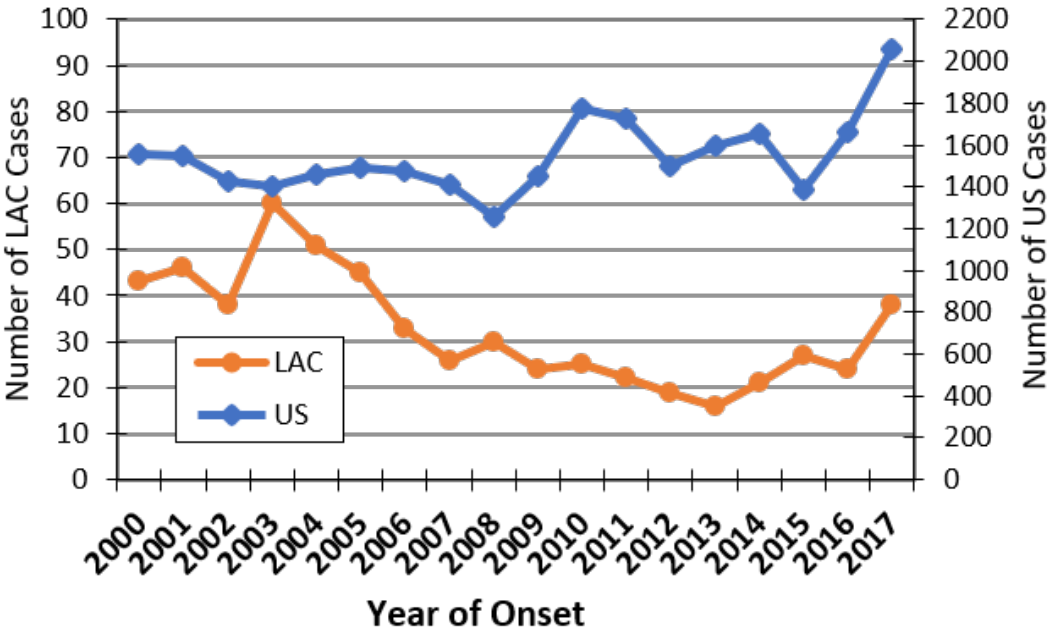
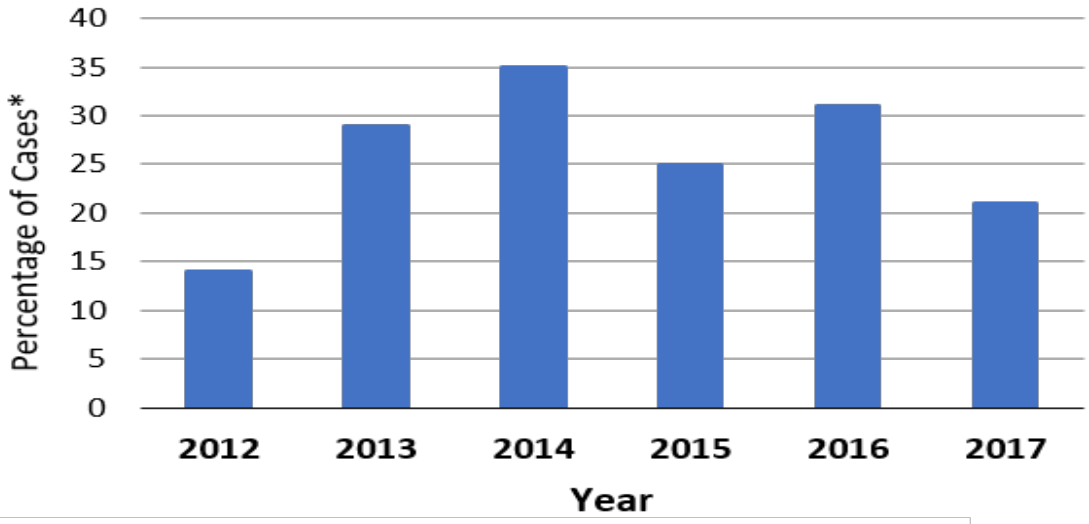


Figure 5. Prophylaxis Use Among Malaria Cases* LAC, 2012-2017



*Among cases who were not recent refugees/immigrants to the US.

Figure 6. Mosquito-Bornes Diseases of Travelers, by Month of Onset, LAC, 2017

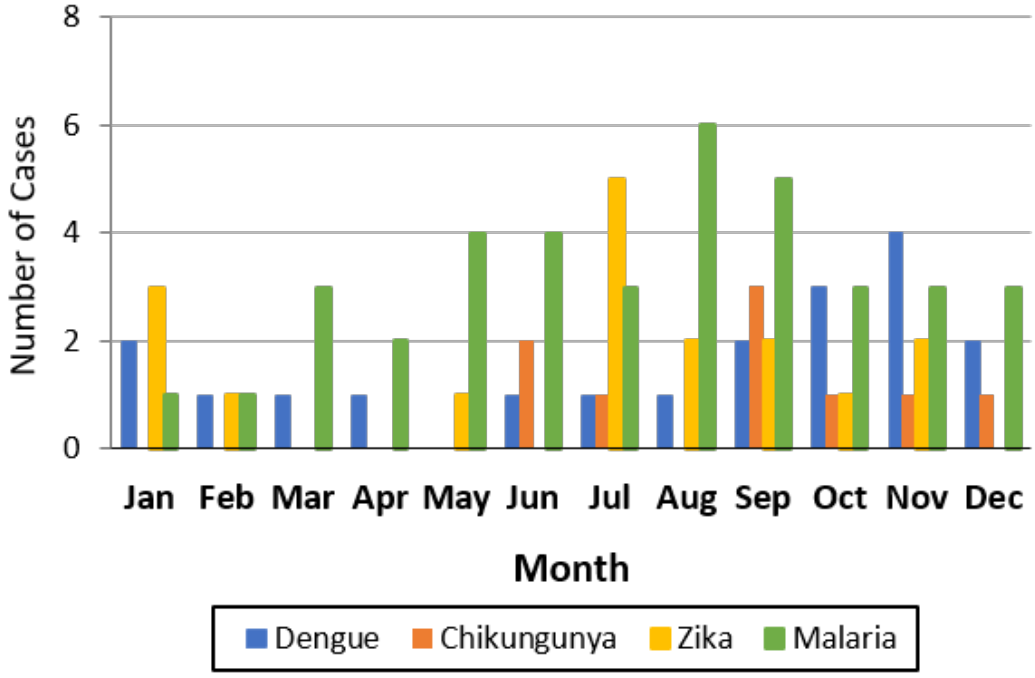


Table 1. Regions of Travel Reported by Cases of Mosquito-Borne Diseases of Travelers LAC, 2017

Region	Dengue (N=19)	Chikungunya (N=9)	Zika (N=16)*	Malaria (N=38)
Africa	1	0	0	27
Asia and Pacific Islands	12	9	2	5
Central America and Mexico	4	0	14	0
South America	1	0	0	2
Caribbean	1	0	0	0
Unknown	0	0	0	4

*One case was sexually-transmitted.