



# Diagnosis and Testing of Travel-Associated Dengue, Alameda County, California – 2019

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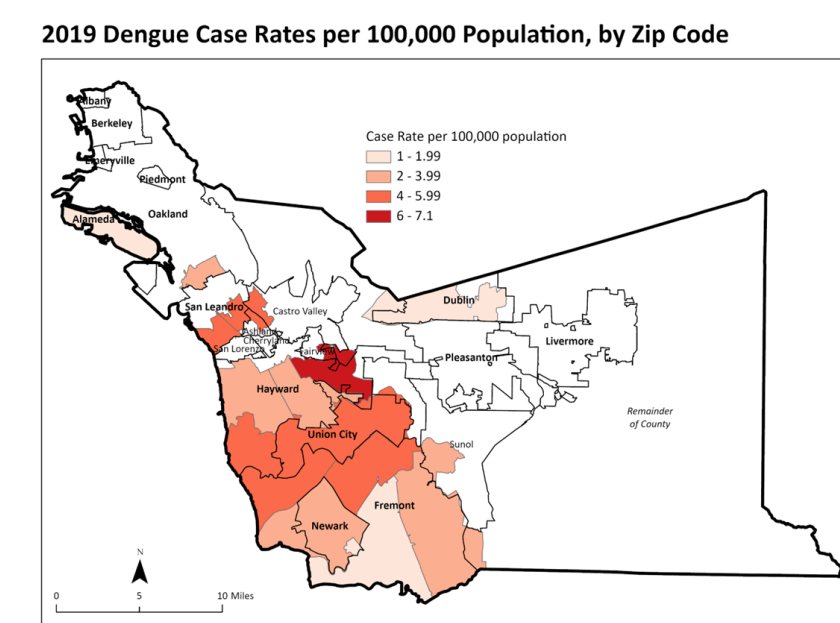
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## Introduction

- Dengue is an acute febrile infection with one of the four dengue viruses transmitted through the bite of mosquitoes<sup>1</sup>.
- Dengue is a communicable disease reportable to public health departments under Title 17 of the California Code of Regulations<sup>2</sup>.
- Alameda County is among the top 5 jurisdictions in California for travel-associated Dengue infection reports<sup>3</sup>.



- CDC recommends PCR or antigen tests in conjunction with IgM tests for diagnosis during the acute phase of Dengue, given that serologic tests for a specific dengue viral strain may cross react with other dengue viruses or flaviviruses. However, IgG testing is not recommended because it remains detectable long after infection<sup>4</sup>.
- In July of 2019, ACPHD issued a health advisory highlighting recommended diagnostics for Dengue<sup>5</sup>, namely the use of Dengue PCR in the acute phase of illness and paired acute and convalescent sera for patients who present >10 days after illness onset.

## Objectives

- To inform best practices for diagnosis and treatment by exploring Dengue reports to ACPHD pre-pandemic.
- To inform whether practices have changed since the July 2019 ACPHD health advisory.

## Methods

- Local public health departments receive positive Electronic Lab Reports (ELR) or Confidential Morbidity Report (CMR) forms when reportable diseases are strongly suspected and submit them to CalREDIE (California Reportable Disease Information Exchange), a secure system of California Department of Public Health (CDPH) for electronic disease reporting and surveillance.
- Possible Dengue infections in 2019 reported via CalREDIE, investigated by public health officials, and classified according to CSTE's Dengue Virus Infections 2015 Surveillance Case Definition<sup>1</sup> were exported for analysis.

- Incidents reported were further categorized into cases or non-cases:
  - Confirmed → case
  - Probable → case
  - Suspected → non-case
  - Not a case → non-case

- Univariate and bivariate analysis were conducted in R.

## Results

- In 2019, 83 reports of possible Dengue infections were received; 23 met the case classification criteria for confirmed (n=8) or probable (n=15) cases (Table 1).
- All cases were symptomatic after travel to an area where Dengue is endemic, notably India (39%), Mexico (17%) and the Philippines (13%) (Table 1).
- Of the cases, 70% visited the Emergency Department and 48% were hospitalized due to concerns for severe Dengue (Table 1). Cases had > 4x odds of being hospitalized (Odds Ratio = 4.89; 95% Confidence Interval = 1.63-14.7, *p* = 0.01) compared to non-cases.

Table 1: Patient Characteristics of 2019 Dengue Case Reports by Case Resolution Status

	Non-Cases, n(%)		Cases, n(%)		Reports, n(%)
	Not A Case (N=32)	Suspect (N=29)	Probable (N=15)	Confirmed (N=8)	
<b>Sex</b>					
Male	24 (75 %)	12 (43 %)	5 (33 %)	4 (50 %)	45 (54 %)
Female	8 (25 %)	16 (57 %)	10 (67 %)	4 (50 %)	38 (46 %)
<b>Age (years)</b>					
Mean (SD)	43 (± 14)	43 (± 13)	44 (± 18)	31 (± 16)	42 (± 15)
<b>Race/Ethnicity</b>					
Hispanic or Latino	1 (3 %)	4 (14 %)	4 (27 %)	3 (38 %)	12 (14 %)
Non-Hispanic Asian	15 (47 %)	11 (39 %)	4 (27 %)	3 (38 %)	33 (40 %)
Non-Hispanic Black	4 (12 %)	0 (0 %)	1 (7 %)	0 (0 %)	5 (6 %)
Non-Hispanic White	2 (6 %)	0 (0 %)	3 (20 %)	0 (0 %)	5 (6 %)
Other	2 (6 %)	1 (4 %)	0 (0 %)	0 (0 %)	3 (4 %)
Unknown	8 (25 %)	12 (43 %)	3 (20 %)	2 (25 %)	25 (30 %)
<b>Symptomatic</b>					
Yes	19 (59 %)	28 (100 %)	15 (100 %)	8 (100 %)	70 (84 %)
No	2 (6 %)	0 (0 %)	0 (0 %)	0 (0 %)	2 (2 %)
Unknown	11 (34 %)	0 (0 %)	0 (0 %)	0 (0 %)	11 (13 %)
<b>ER Visit</b>					
Yes	11 (34 %)	10 (36 %)	11 (73 %)	5 (62 %)	37 (45 %)
No	14 (44 %)	18 (64 %)	4 (27 %)	2 (25 %)	38 (46 %)
Unknown	7 (22 %)	0 (0 %)	0 (0 %)	1 (12 %)	8 (10 %)
<b>Hospitalization</b>					
Yes	6 (19 %)	3 (11 %)	7 (47 %)	4 (50 %)	20 (24 %)
No	19 (59 %)	25 (89 %)	8 (53 %)	3 (38 %)	55 (66 %)
Unknown	7 (22 %)	0 (0 %)	0 (0 %)	1 (12 %)	8 (10 %)
<b>PCR or Antigen Test Results</b>					
Positive	0 (0 %)	0 (0 %)	0 (0 %)	7 (88 %)	7 (8 %)
Negative	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)	0 (0 %)
Not Done	32 (100 %)	28 (100 %)	15 (100 %)	1 (12 %)	76 (92 %)
<b>Immunoglobulin M Test Results</b>					
Positive	2 (6 %)	0 (0 %)	13 (87 %)	5 (62 %)	20 (24 %)
Negative	16 (50 %)	12 (43 %)	2 (13 %)	0 (0 %)	30 (36 %)
Not Done	14 (44 %)	16 (57 %)	0 (0 %)	3 (38 %)	33 (40 %)
<b>Immunoglobulin G Test Results</b>					
Positive	31 (97 %)	27 (96 %)	11 (73 %)	6 (75 %)	75 (90 %)
Negative	0 (0 %)	0 (0 %)	1 (7 %)	0 (0 %)	1 (1 %)
Not Done	1 (3 %)	1 (4 %)	3 (20 %)	2 (25 %)	7 (8 %)
<b>Recent Travel to Dengue Endemic Area</b>					
India	10 (31 %)	19 (68 %)	5 (33 %)	4 (50 %)	38 (46 %)
Mexico	2 (6 %)	4 (14 %)	3 (20 %)	1 (12 %)	10 (12 %)
Philippines	2 (6 %)	3 (11 %)	3 (20 %)	0 (0 %)	8 (10 %)
Other	8 (25 %)	2 (7 %)	4 (27 %)	2 (25 %)	16 (19 %)
None	4 (12 %)	0 (0 %)	0 (0 %)	0 (0 %)	4 (5 %)
Unknown	6 (19 %)	0 (0 %)	0 (0 %)	1 (12 %)	7 (8 %)

- Most cases (61%) were reported between the months of July and October (Figure 1).

Figure 1: 2019 Dengue Epidemic Curve by Case Status

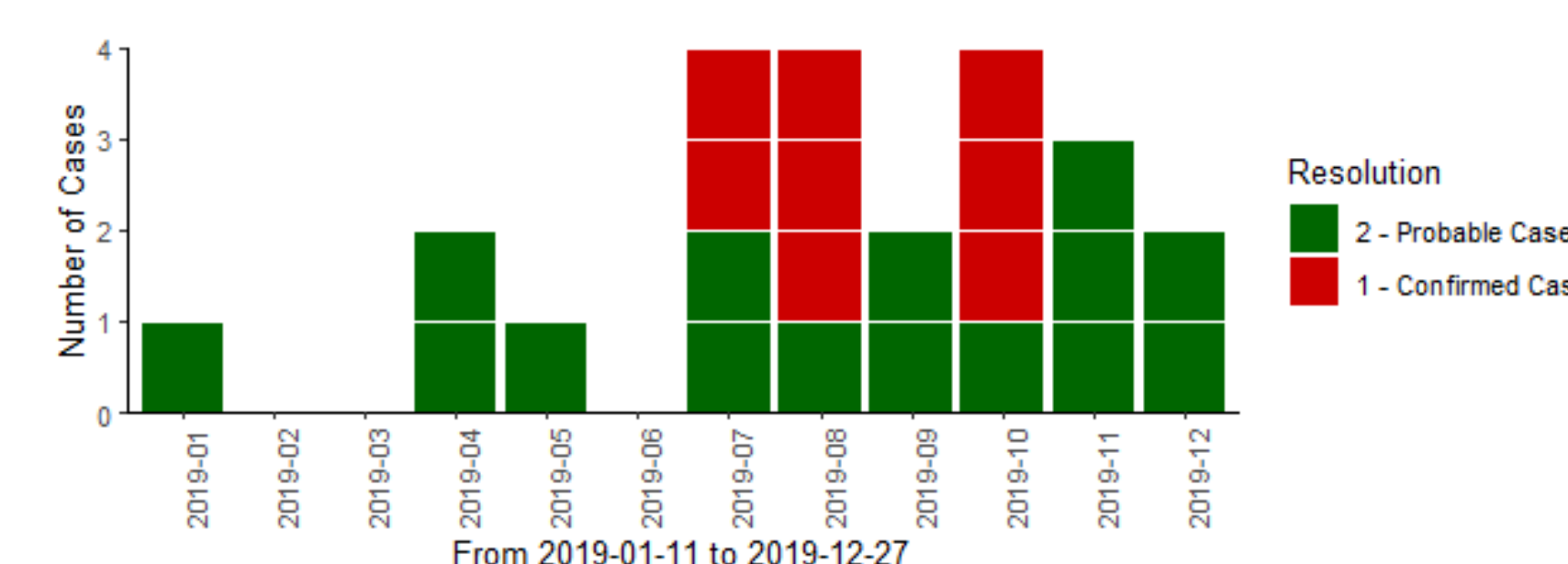


Table 2: Laboratory Testing Practices for 2019 Dengue Cases with Laboratory Tests Submitted within 7 days of Symptom Onset

	Total (N=18)	Probable (N=11)	Confirmed (N=7)
<b>Time from Onset of Symptoms to Collection of Lab Test</b>			
Mean (SD)	3.9 (± 1.6)	4.2 (± 1.5)	3.4 (± 1.7)
<b>PCR or Antigen Test</b>			
Done	7 (39 %)	0 (0 %)	7 (100 %)
Not Done	11 (61 %)	11 (100 %)	0 (0 %)
<b>IgM Test</b>			
Done	15 (83 %)	11 (100 %)	4 (57 %)
Not Done	3 (17 %)	0 (0 %)	3 (43 %)
<b>IgG Test</b>			
Done	14 (78 %)	9 (82 %)	5 (71 %)
Not Done	4 (22 %)	2 (18 %)	2 (29 %)

- Seventy-eight percent of cases were tested for Dengue within 1 week from symptom onset, but of those, only 39% had a PCR or antigen test while 83% had an IgM test and 78% had an IgG test (Table 2). Interestingly, though most (88%) confirmed cases had a PCR or antigen test reported, none of probable cases did.
- Fifteen (65%) cases were diagnosed after July 2019, with eleven (73%) tested within 1 week of symptoms. Of those, 5 (45%) had PCR or antigen testing and 6 (55%) had IgM testing, but only 3 (27%) had the recommended combined PCR or antigen test with IgM testing.

## Recommendations

- Based on pre-pandemic surveillance in Alameda County, Dengue should be strongly suspected in patients who present with an acute febrile illness and history of travel to Dengue endemic areas such as India, Mexico, and the Philippines.
- Health care providers should obtain PCR or antigen tests in conjunction with IgM testing for all suspected cases of Dengue during the acute phase of illness but avoid IgG testing.
- More outreach efforts are needed to educate health care providers on providing timely and adequate testing to travelers, thereby improving diagnosis of travel-associated Dengue.



## References

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