CHIKUNGUNYA FEVER

Chikungunya fever is an acute febrile disease caused by the chikungunya virus. The disease is characterised by fever, joint pain with or without swelling, headache, fatigue, nausea and vomiting. Some patients may develop a rash affecting the trunk and limbs. The disease is usually self-limiting. Most symptoms last for three to 10 days although the joint pain may last for weeks to months. The main vector in Singapore is the *Aedes albopictus* mosquito.

A total of 12 laboratory confirmed cases of chikungunya fever were reported in 2020, compared to 58 laboratory- confirmed cases in 2019 (Figure 3.1).

In 2019, out of 58 cases, three cases were indigenous cases and 49 were imported cases, involving 34 Singapore residents and 15 foreign residents. The remaining six cases comprised one tourist and five foreigners seeking medical treatment (Table 3.1). In 2020, out of the 12 cases, two cases were indigenous cases and eight were imported cases, involving seven Singapore residents and one foreign resident. The remaining two cases were foreigners seeking medical treatment (Table 3.1). No deaths due to chikungunya were reported in 2019 and 2020.

Figure 3.1
Weekly distribution of chikungunya fever cases, 2019-2020

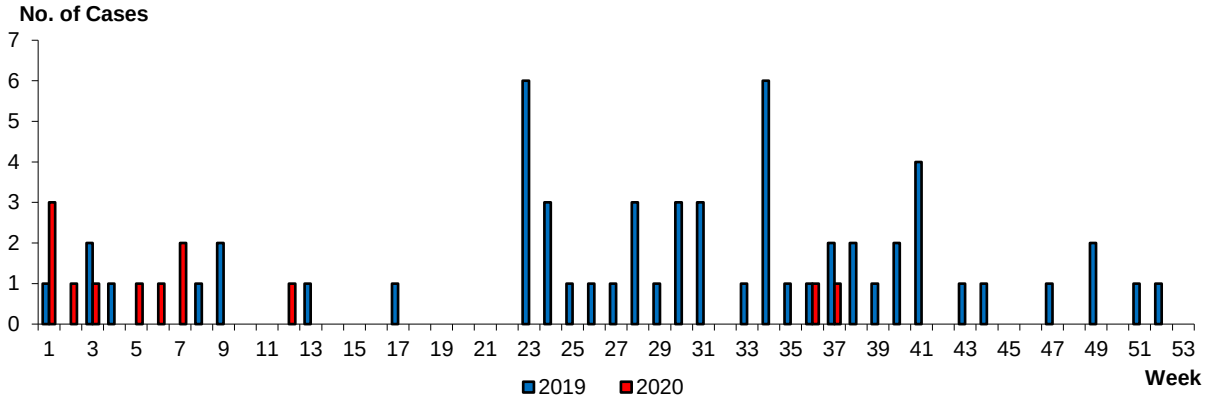


Table 3.1
Total number of notifications* received for chikungunya fever, 2016-2020

Age group	2016		2017		2018		2019		2020	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
0-4	0	0	0	0	0	0	0	0	0	0
5-14	1	0	0	1	0	0	0	0	0	0
15-24	0	1	1	1	1	0	0	7	0	1
25-34	0	7	1	4	1	2	1	8	0	5
35-44	0	12	1	2	0	5	0	16	2	1
45-54	0	6	0	5	1	1	0	12	0	0
55-64	1	1	0	3	0	1	1	5	0	1
65+	0	2	0	1	0	2	1	1	0	0
Total	**2**	**29**	**3**	**17**	**3**	**11**	**3**	**49**	**2**	**8**

*Excluded tourists and foreigners seeking medical treatment in Singapore.

In 2019, of the three indigenous cases, there was one case each in the 25-34, 55-64 and 65 and above age groups (Table 3.2). In 2020, both indigenous cases were in the 35-44 age groups (Table 3.3). Among the three major ethnic groups, Chinese had the highest incidence rates in both 2019 and 2020 (Tables 3.4 and 3.5).

Table 3.2
Age-sex distribution and age-specific resident incidence rate of indigenous chikungunya fever cases^, 2019

Age group	Number of notifications				Incidence rate per 100,000 resident population*
	Male	Female	Total	%	
0-4	0	0	0	0	0
5-14	0	0	0	0	0
15-24	0	0	0	0	0
25-34	1	0	1	33.3	0.2
35-44	0	0	0	0	0
45-54	0	0	0	0	0
55-64	1	0	1	33.3	0.2
65+	1	0	1	33.3	0.2
Total	**3**	**0**	**3**	**100**	-

^ Cases acquired locally among Singapore and foreign residents.
*Rates are based on 2019 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.3
Age-sex distribution and age-specific resident incidence rate of indigenous chikungunya fever cases^, 2020

Age group	Number of notifications				Incidence rate per 100,000 resident population*
	Male	Female	Total	%	
0-4	0	0	0	0	0
5-14	0	0	0	0	0
15-24	0	0	0	0	0
25-34	0	0	0	0	0
35-44	1	1	2	100	0.2
45-54	0	0	0	0	0
55-64	0	0	0	0	0
65+	0	0	0	0	0
Total	**1**	**1**	**2**	**100**	-

^ Cases acquired locally among Singapore and foreign residents.
*Rates are based on 2020 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.4
Ethnic-sex distribution and ethnic-specific incidence rate of indigenous chikungunya fever cases^, 2019

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	2	0	2	66.7	0.1
Malay	0	0	0	0	0
Indian	0	0	0	0	0
Others	1	0	1	33.3	0.8
Foreign residents	0	0	0	0	0
Total	**3**	**0**	**3**	**100**	**0.1**

^ Cases acquired locally among Singapore and foreign residents.
*Rates are based on 2019 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.5
Ethnic-sex distribution and ethnic-specific incidence rate of indigenous chikungunya fever cases^, 2020

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	0	1	1	50	0.1
Malay	0	0	0	0	0
Indian	0	0	0	0	0
Others	1	0	1	50	0.8
Foreign residents	0	0	0	0	0
Total	**1**	**1**	**2**	**100**	**0.04**

^ Cases acquired locally among Singapore and foreign residents.
*Rates are based on 2020 estimated mid-year population.
(Source: Singapore Department of Statistics)

There were 49 (94.2%) imported cases in 2019, and eight (80%) imported cases in 2020 (excluding tourists and foreigners seeking medical treatment), defined as residents and non-residents with a history of travel to chikungunya- endemic countries within 12 days prior to the onset of illness. Majority of imported cases in 2019 had travelled to or came from Myanmar (30.6%) or Thailand (30.6%), whereas majority of imported cases in 2020 had travelled to or came from Malaysia (87.5%) (Table 3.6).

Table 3.6
Imported chikungunya fever cases, 2016-2020^

	2016	2017	2018	2019	2020
Southeast Asia					
Thailand	0	0	2	15	0
Myanmar	1	0	0	15	0
Malaysia	3	3	1	9	7
Indonesia	3	0	0	1	0
Philippines	4	2	2	0	0
East Timor	0	0	0	0	0
South Asia					
Bangladesh	0	11	0	0	0
India	23	9	5	7	1
Sri Lanka	0	0	0	0	0
Maldives	0	0	0	2	0
Americas	0	1	0	0	0
Europe	0	0	0	0	0
Total	**34**	**26**	**10[#]**	**49**	**8**

[#] One case did not provide details of countries visited during the incubation period.
^Excluded tourists and foreigners seeking medical treatment in Singapore.

The geographical distribution of indigenous chikungunya fever cases and *Aedes albopictus* in 2019 and 2020 is as follows (Figures 3.2 and 3.3).

Figure 3.2
Geographical distribution of indigenous chikungunya fever cases and *Aedes albopictus*, 2019
(Source: National Environment Agency)

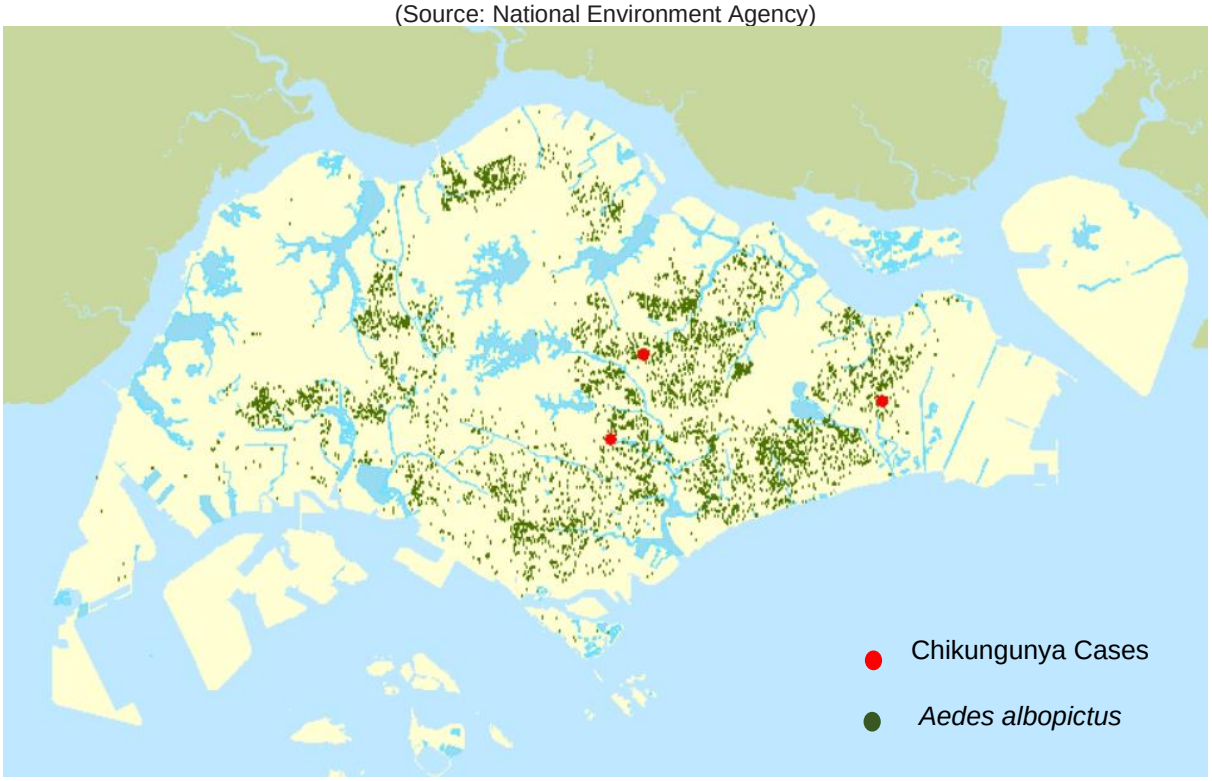
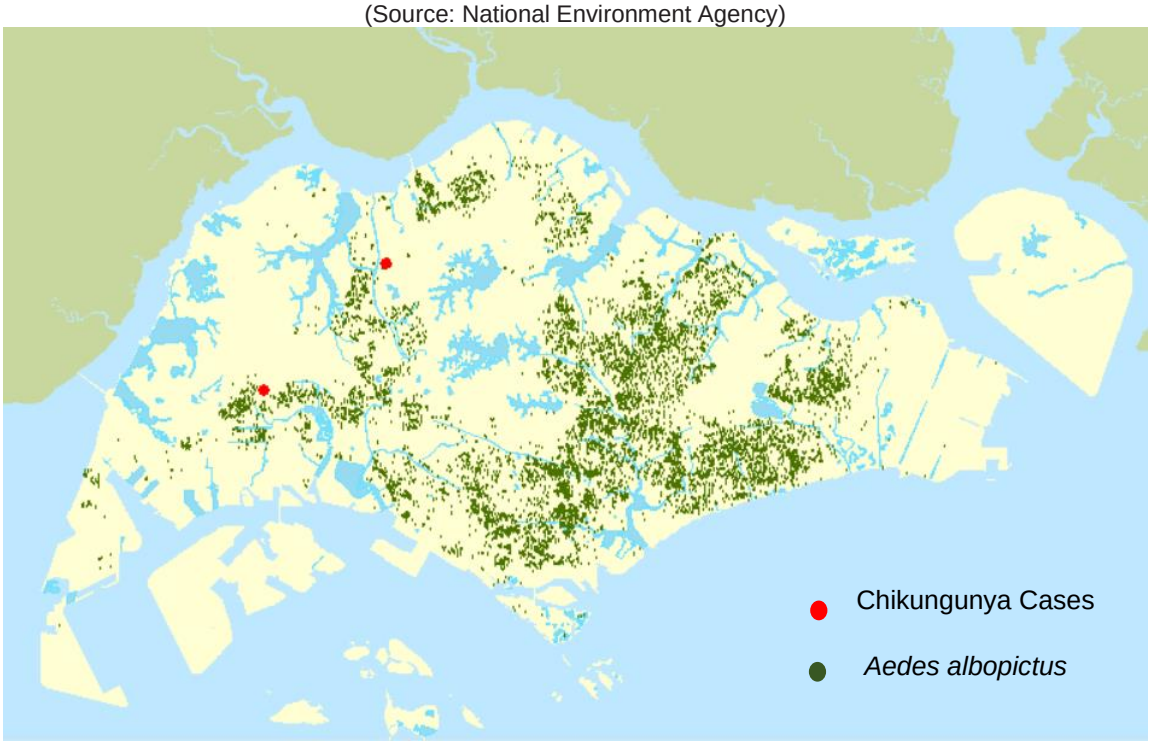


Figure 3.3
Geographical distribution of indigenous chikungunya fever cases and *Aedes albopictus*, 2020
(Source: National Environment Agency)



DENGUE FEVER/DENGUE HAEMORRHAGIC FEVER

Dengue fever (DF) is an acute febrile viral disease characterised by sudden onset of fever for two to seven days, severe headache with retro-orbital pain, joint and muscle pain, skin rashes, nausea, vomiting and bleeding from nose or gums or easy bruising of skin. The infectious agents are flaviviruses comprising four serotypes (DEN-1, DEN-2, DEN-3 and DEN-4) and are transmitted by the *Aedes* mosquito. In some cases, dengue haemorrhagic fever (DHF), a potentially fatal complication characterised by high fever, thrombocytopaenia, haemorrhagic manifestations, and evidence of plasma leakage, may develop.

Dengue cases increased in 2020 as compared to 2019 (Figure 3.4). A total of 35,210 laboratory confirmed cases of dengue (comprising 35,156 cases of DF and 54 cases of DHF) were reported in 2020, a 120% increase from the 15,979 cases reported in 2019 (comprising 15,891 cases of DF and 88 cases of DHF).

In 2019, out of the 15,979 cases, 15,611 cases were indigenous cases and 155 were imported cases involving 86 Singapore residents and 69 foreign residents. The remaining 213 cases comprised tourists or foreigners seeking medical treatment in Singapore (Table 3.7).

In 2020, out of the 35,210 cases, 35,169 cases were indigenous cases and 17 were imported cases involving eight Singapore residents and nine foreign residents. The remaining 24 cases comprised tourists or foreigners seeking medical treatment in Singapore. (Table 3.7).

Figure 3.4
Weekly distribution of DF/DHF cases, 2019-2020

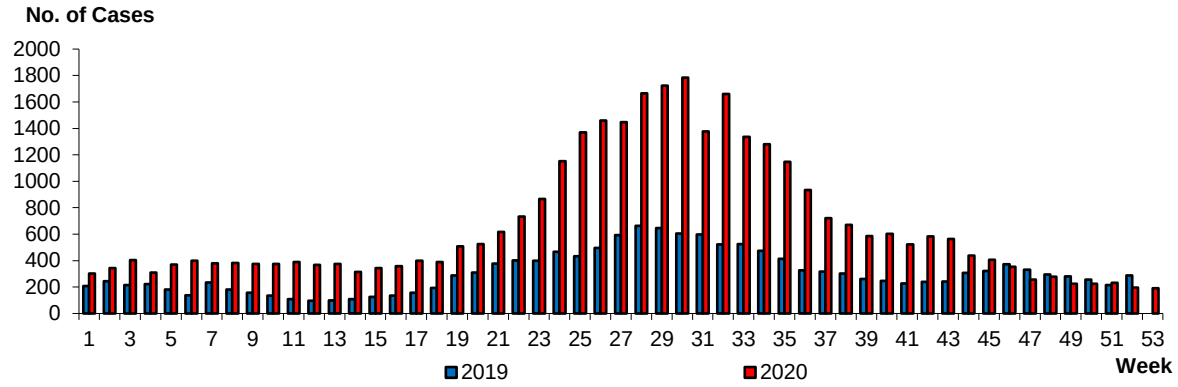


Table 3.7
Total number of notifications* received for DF/DHF cases, 2016-2020

Age group	2016		2017		2018		2019		2020	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
0-4	113	1	27	1	44	3	131	2	216	1
5-14	760	4	123	5	166	1	2,104	12	2,032	2
15-24	2,046	7	313	17	419	18	3,309	47	4,180	2
25-34	3,338	18	620	32	684	23	2,761	44	7,816	8
35-44	2,651	14	459	27	557	24	2,473	27	6,792	3
45-54	1,864	7	352	17	464	21	8,64	6	5,687	0
55-64	1,176	4	296	11	367	6	2,024	8	4,340	1
65+	900	2	328	11	367	3	1,945	9	4,106	0
Total	**12,848**	**57**	**2,518**	**121**	**3,068**	**99**	**15,611**	**155**	**35,169**	**17**

*Excluded tourists and foreigners seeking medical treatment in Singapore.

In 2019, the resident incidence rate among indigenous cases was highest in the 15-24 age group, with an overall male to female ratio of 1.2:1. In 2020, the resident incidence rate was highest in the 45-54 age group, with an overall male to female ratio of 1.3:1 (Tables 3.8 and 3.9). Among the three major ethnic groups, the incidence was highest among Chinese in both 2019 and 2020 (Tables 3.10 and 3.11).

Table 3.8
Age-sex distribution and age-specific resident incidence rate of indigenous DF/DHF cases^, 2019

Age group	Number of notifications				Incidence rate per 100,000 resident population*
	Male	Female	Total	%	
0-4	73	58	131	0.8	56.1
5-14	512	352	864	5.5	185.4
15-24	1,266	838	2,104	13.5	362.6
25-34	1,958	1,351	3,309	21.2	302.9
35-44	1,513	1,248	2,761	17.7	293.9
45-54	1,268	1,205	2,473	15.8	331.3
55-64	1,033	991	2,024	13.0	325.5
65+	929	1,016	1,945	12.5	317.5
Total	**8,552**	**7,059**	**15,611**	**100**	**-**

^Cases acquired locally among Singapore and foreign residents.
*Rates are based on 2019 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.9
Age-sex distribution and age-specific resident incidence rate of indigenous DF/DHF cases^, 2020

Age group	Number of notifications				Incidence rate per 100,000 resident population*
	Male	Female	Total	%	
0-4	110	106	216	0.6	97.8
5-14	1,141	891	2,032	5.8	431.7
15-24	2,475	1,705	4,180	11.9	697.7
25-34	4,837	2,979	7,816	22.2	661.1
35-44	3,869	2,923	6,792	19.3	654.6
45-54	3,221	2,466	5,687	16.2	727.7
55-64	2,279	2,061	4,340	12.3	685.6
65+	2,023	2,083	4,106	11.7	637.1
Total	**19,955**	**15,214**	**35,169**	**100.0**	**-**

^Cases acquired locally among Singapore and foreign residents.
*Rates are based on 2020 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.10
Ethnic-sex distribution and ethnic-specific incidence rate of indigenous DF/DHF cases^, 2019

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	4,764	4,410	9,174	58.8	306.4
Malay	735	619	1,354	8.7	250.4
Indian	428	313	741	4.7	204.3
Others	344	267	611	3.9	473.3
Foreigner residents	2,281	1,450	3,731	23.9	222.4
Total	**8,552**	**7,059**	**15,611**	**100**	**273.7**

^Cases acquired locally among Singapore and foreign residents.
*Rates are based on 2019 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.11
Ethnic-sex distribution and ethnic-specific incidence rate of indigenous DF/DHF cases^, 2020

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	9,573	8,424	17,997	51.2	545.1
Malay	1,130	779	1,909	5.4	284.1
Indian	774	511	1,285	3.7	289.1
Others	1,840	2,276	4,116	11.7	3235.1
Foreign residents	6,638	3,224	9,862	28.0	600.8
Total	**19,955**	**15,214**	**35,169**	**100.0**	**618.5**

^Cases acquired locally among Singapore and foreign residents.
*Rates are based on 2020 estimated mid-year population.
(Source: Singapore Department of Statistics)

There were 368 (2.3%) and 41 (0.1%) imported cases in 2019 and 2020, respectively, with a history of travel to dengue endemic countries within seven days prior to onset of illness. Majority of the cases were from Southeast Asian countries (68.8% in 2019, 73.2% in 2020) followed by South Asia and other regions (Table 3.12).

Table 3.12
Imported DF/DHF cases, 2016-2020

	Year				
	2016	**2017**	**2018**	**2019**	**2020**
Southeast Asia					
Brunei	1	0	0	0	0
Cambodia	3	4	19	24	0
East Timor	0	1	0	1	0
Indonesia	99	43	42	94	12
Laos	0	1	0	1	0
Malaysia	33	49	31	54	13
Myanmar	2	17	5	12	0
Philippines	12	22	11	25	2
Thailand	10	11	29	29	1
Viet Nam	7	10	5	13	2
South Asia					
Bangladesh	5	6	15	6	0
India	10	61	30	58	6
Maldives	1	2	3	5	0
Nepal	0	0	0	1	0
Pakistan	0	1	2	2	0
Sri Lanka	2	11	5	2	0
East Asia					
China	0	1	1	1	0
Other Regions	10	9	17	40	5
Total	**195**	**249**	**215**	**368**	**41**

Residents from Housing and Development Board (HDB) flats accounted for most of the indigenous cases in both 2019 (64.7%) and 2020 (57.3%). The highest incidence was seen among residents in landed properties in both 2019 (1032.6 per 100,000) and 2020 (2519.1 per 100,000). The incidence rate of residents from landed property was between 4.2 times and 5.6 times higher than residents from HDB flats in 2019 and 2020 (Tables 3.13 and 3.14).

Table 3.13
Incidence rate of reported indigenous DF/DHF cases by housing type^ for Singapore residents, 2019

Housing Type	**No.**	**%**	**Incidence rate per 100,000 population***
HDB Flats	7,698	64.7	244.0
Landed Properties (including shop houses)	2,572	21.6	1,032.6
Condominiums	1,603	13.5	272.7
Others	20	0.2	57.6
Total	**11,893**	**100**	**295.4**

^Based on reported cases with known housing type.
*Rates are based on 2019 estimated mid-year of population.
(Source: Singapore Department of Statistics)

Table 3.14
Incidence rate of reported indigenous DF/DHF cases by housing type^ for Singapore residents, 2020

Housing Type	No.	%	Incidence rate per 100,000 population*
HDB Flats	14,136	57.3	448.4
Landed Properties (including shop houses)	6,269	25.4	2,519.1
Condominiums	2,286	9.3	376.0
Others	1,970	8.0	5628.6
Total	**24,661**	**100**	**609.8**

^Based on reported cases with known housing type.
*Rates are based on 2020 estimated mid-year of population.
(Source: Singapore Department of Statistics)

A total of 1,529 clusters involving 11,895 epidemiologically linked cases were identified in 2019, of which 207 clusters (13.5%) had 10 or more cases (Table 3.15). Areas with more than 50 cases are listed in Table 3.16. The median number of cases was three and the median duration of transmission was 12 days (Table 3.15).

A total of 3,127 clusters involving 29,858 epidemiologically linked cases were identified in 2020, of which 462 clusters (14.8%) had 10 or more cases (Table 3.15). Areas with more than 50 cases are listed in Table 3.17. The median number of cases was three and the median duration of transmission was 13 days (Table 3.15).

Table 3.15
Dengue clusters identified, 2016-2020

Year	No. of indigenous cases	No. of clusters*	No. of cases in cluster area (% of indigenous cases)	No. of clusters with ≥10 cases (% of total clusters)	Median no. of cases per cluster	Median duration of transmission (days)
2016	12,848	1,432	6,875 (53.3)	104 (7.3)	3	8
2017	2,518	197	770 (30.4)	11 (5.6)	2	10
2018	3,068	243	1,524 (49.7)	29 (11.9)	3	10
2019	15,611	1,529	11,895 (75.7)	207 (13.5)	3	12
2020	35,169	3,127	29,858 (84.6)	462 (14.8)	3	13

*A cluster is defined as two or more cases epidemiologically linked by place [within 150m] and time (within 14 days).

Table 3.16
Dengue clusters identified, 2019 (50 or more cases)

S/No.	Locality	No. of cases	Month of Cluster Formation
1	Woodlands Ave 6 (Blk 718-720, 723-725, 762,788-793)/ Circle (Blk 721, 726-729, 731-733, 735, 738, 744, 745, 764, 766-767) / Cres (Blk 777, 780F, 787B-E, 788B-E) /Dr 40 (Blk 701)/ Dr 60 (Blk 769, 770, 772-773, 786B-D) / Dr 70 (Blk 714-717) / Dr 72 (Blk 794-798)	216	Apr
2	Choa Chu Kang Ave 2 (Blk 248-252, 254, 271, 272, 274, 276, 287, 294-296B, 296D, 296E, 297, 297A, 297C, 297D) / Choa Chu Kang Ave 3 (Blk 282-286, 288, 290-293, 401, 402, 404-406, 408, 409, 411-413) /Choa Chu Kang Ave 4 (Blk414-426, 428-431, 438, 439) / Choa Chu Kang Ctrl (Blk 236, 239, 353-355) / Hong San Walk, Ter	201	May

S/No.	Locality	No. of cases	Month of Cluster Formation
3	Begonia Dr, Ln, Rd, Ter, Walk / Kasai Rd / Lilac Dr, Walk / Mimosa Cres, Dr, Rd, Ter, Vale, View, Walk / Mimosa Rd (Mimosa Pk) / Nim Rd / Saraca Dr, Pl, Rd, Ter, View, Walk / Stratton Green / Tamarind Rd	183	Oct
4	Geylang Rd / Guillemard Rd / Lor 4, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23 Geylang / Sims Ave / Westerhout Rd	177	Apr
5	Woodlands Ave 6 (Blk 677, 678, 679, 693A) / Dr 62 (Blk 681B, 681C, 681D, 682A, 682B, 683A, 683B, 683C, 683D, 684C, 691C, 694A, 694B) / Dr 73 (Blk 682C, 682D, 684A, 684B, 684D, 685B, 685C, 686A) /Dr 75 (Blk687A, 687B, 687C, 688A, 688C, 688D, 689A, 689B, 689E, 690C, 690F, 691D) / Ring Rd (Blk 636)	162	Apr
6	Elias Rd / Elias Rd (Stratum) / Pasir Ris Ave / Pasir Ris Dr 3 (Blk 626) / Pasir Ris Hts / Pasir Ris Ln / Construction site @ Pasir Ris Rd / Pasir Ris Rd / Pasir Ris Ter / Pasir Ris View / Pasir Ris Way / Riverina Cres / Riverina View / Riverina Walk	154	Oct
7	Jln Bangau/ Jln Chermai/ Jln Jarak/ Jln Jitong/Jln Joran/ Jln Kelulut/ Jln Kenarah/ Jln Keruing/ Jln Lakum/ Jln Lekub/ Jln Pelajau/ Jln Peradun/ Jln Redop/ Jln Rengas/ Jln Selaseh/ Jln Sindor/ Kelulut Hill/ Neram Rd / Seletar Cres, Ct, Hills Dr, Rd, Ter	148	Oct
8	Chai Chee Ave (Blk 29, 29A, 30, 32) / Chai Chee Dr (Blk 55, 56, 58) / Chai Chee Ln / Chai Chee Rd / Chai Chee Rd (Blk 2, 19, 20, 21, 22, 24, 25, 27, 59, 61, 62, 63, 803, 804, 805, 807A, 808C) / Chai Chee St	145	May
9	Jln Eunos / Jln Ismail / Jln Kechot / Jln Rahmat / CS @ Jln Yasin / Jln Yasin / Lengkong Tiga (Blk 102, 104, 106, 110, 111, 112, 113, 114) / Lor Marican / Lor Marzuki / Lor Melayu / Lor Mydin / Lor Sarina / Lor Sarina (Casa Sarina)	130	Jun
10	Jln Lembah Thomson / Jln Pelatina / Soo Chow Dr / Soo Chow Gdn Rd / Soo Chow Rise / Soo Chow View / Soo Chow Way / Taman Permata / Thomson Ridge / Upp Thomson Rd (Lakeview)	129	May
11	Pasir Ris Dr 3 (Eastvale Condo) / Pasir Ris Dr 4 (Blk 460, 478, 480, 481, 485) / Pasir Ris Dr 6 (Blk 405, 406, 408-421, 423, 427, 428, 451, 454, 467, 468, 469, 470, 472, 473, 474, 476, 476A) / Pasir Ris St 41 (Blk 466)	128	Jun
12	Aljunied Rd / Geylang Rd / Guillemard Rd / Jln Molek, Suka / Lor 22, 23, 24, 24A, 25, 25A, 26, 27, 27A, 28, 29, 30, 31, 32, 33, 34, 35, 36 Geylang / Sims Ave	127	Apr
13	Ang Mo Kio Ave 3 (Blk 428) / Ang Mo Kio Ave 10 (Blk 402, 403, 406, 407, 411, 412, 414, 416, 418 - 421, 435, 436, 439, 441 - 445, 449, 452, 463, 469 - 476) / Ang Mo Kio Ind Pk 1	123	Dec
14	Choa Chu Kang Ave 4 (Blk 307, 432, 435) / Choa Chu Kang Loop (Northvale, The Warren)	107	May
15	Gangsa Rd (Blk 163, 164) / Jelebu Rd (Blk 182, 185) / Jelebu Rd (Hillion Residences) / Petir Rd (Maysprings) / Upp Bt Timah Rd (The Linear)	106	Nov
16	Changi Rd / Joo Chiat Ave / Joo Chiat Pl / Joo Chiat Walk / Lor 100 Changi / Lor G Telok Kurau / Lor H Telok Kurau / Lor J Telok Kurau / Lor K Telok Kurau / Lor L Telok Kurau / Telok Kurau Rd	102	May
17	Flora Dr (Carissa Pk Condo, Dahlia Pk Condo) / Flora Rd (Avila Gdns, Estella Gdns, The Gale) / Jln	96	Jul

S/No.	Locality	No. of cases	Month of Cluster Formation
	Batalong / Jln Chelagi / Jln Kelempong / Loyang Rise, View / Mariam Way		
18	Ang Mo Kio Ave 3 (Blk 427, 428) / Ang Mo Kio Ave 10 (Blk 411-421, 432, 435-438, 440, 441, 443-445, 447, 449, 451, 458, 461, 465, 468-470) / Ang Mo Kio St 44 (Blk 455A)	91	Jul
19	Bt Mugliston / Gerald Cres, Dr, Ter / Gerald Dr (Seletar Springs Condo) / Jln Kechubong / Mugliston Gdns, Pk, Walk	91	Oct
20	Commonwealth Ave (Blk 7, 7A) / Commonwealth Cres (Blk 113) / Holland Ave (Blk 2, 8-10, 12) / Holland Cl (Blk 1, 3, 3A, 4, 5, 6, 30A) / Holland Dr (Blk 11, 13, 40-43)	91	Jul
21	Jln Kembangan / Jln Paras / Jln Selamat / Jln Senang / Jln Senyum / Lengkong Dua, Empat, Enam, Satu, Tiga / Lengkong Tiga (Starville) / Lengkong Tujoh / Lengkong Tujoh (Vacanza @ East) / Lor Kembangan / Senang Cres / Taman Selamat	86	Oct
22	Jurong East Ave 1 (Blk 20, 240A) / Jurong East St 21 (Blk 209, 212, 213, 229, 230, 231, 233, 234, 236, 237, 238, 239, 240) / Jurong East St 24 (Blk 241, 246, 247, 248, 249, 250, 251, 252, 257, 258, 261, 263, 264)	85	May
23	Cashew Rd (Cashew Hts) / Gangsa Rd (Blk 109, 146, 148, 152, 154, 155, 164-166, 170, 171) / Hazel Pk Ter / Lompang Rd (Blk 174, 175, 179) / Pending Rd (Blk 113, 115, 116, 118-120, 127, 128) / Petir Rd (Blk 136,137,139-144,149-151)	81	Nov
24	Jln Grisek / Jln Krian / Jln Lapang / Jln Sayang / Jln Selamat / Jln Senang / Jln Sentosa / Jln Senyum / Jln Waringin / Waringin Pk	76	Sep
25	Jurong West St 61 (Blk 623, 625, 637, 639, 640, 641, 642, 643, 644, 645, 646, 647, 647A, 648C, 648D, 650A, 650C) / Jurong West St 65 (Blk 617)	75	Sep
26	Aroozoo Ave / Hougang St 11 (Blk 154, 155, 156, 158, 161) / Hougang St 11 (The Minton, Central View) / Jln Geneng / Kg Sireh / Lor Ah Soo (Blk 140, 141, 144) / Surin Ave / Surin Ln / Surin Rd / Taman Sireh / Upp S'goon Rd	74	May
27	Cuff Rd / Desker Rd / Hindoo Rd / Jln Berseh (Blk 25, 26) / Kelantan Ln / Kelantan Rd (Blk 30) / Klang Ln (Blk 671B, 672A) / Norris Rd / Rowell Rd / Rowell Rd (Blk 639-642) / Syed Alwi Rd / Upp Weld Rd / Veerasamy Rd (Blk 632-637)	74	Jun
28	Woodlands Ave 4(Blk 610, 612-615) / Woodlands Dr 42(Blk 601-604) / Woodlands Dr 50 (Blk 895A, 896A, 896C, 897A, 898A, 898B, 899A, 899B, 899C) / Woodlands Ring Rd (Blk 606, 607, 609, 611, 652, 653, 655, 656, 658, 665-669)	73	Apr
29	Berwick Dr / Blandford Dr / Bloxhome Dr / Bodmin Dr / Borthwick Dr / Boundary Cl / Braemar Dr / Brockhampton Dr / Burghley Dr / Chartwell Dr / Chuan Dr / Conway Circle / Crowhurst Dr / Moreton Cl / S'goon Gdn Pl	72	Dec
30	Bishan St 22 (Blk 241, 243, 245-256)	69	Jun
31	Bedok Rd / Chempaka Kuning Lk (The Springfield) / Jln Chempaka Kuning / Jln Chempaka Puteh / Jln Pari Burong / Upp Changi Rd (Palm Woods) / Upp Changi Rd East (Summer Gdns)	63	Jun
32	Bishan St 11 (Blk 145, 146) / Bishan St 11 (Bishan Loft) / Bishan St 12 (Blk 123, 126, 127, 134, 142) /	63	Jul

S/No.	Locality	No. of cases	Month of Cluster Formation
	Bishan St 13 / Bishan St 13 (Blk 170-173, 175-178, 180, 181, 184, 185, 186, 187, 193, 197)		
33	Sunrise Ave, Cl, Dr, Ln, Pl, Ter, Way / Sunrise Ave (Sunrise Gdns)	61	Oct
34	Begonia Dr / Dedap Rd / Kasai Rd / Upp Neram Rd / Yio Chu Kang Rd	58	Jul
35	Bishan St 22 (Blk 232-236) / Bishan St 23 (Blk 213, 220, 223-225, 227-231) / Bishan St 24 (Blk 269, 270, 271, 272, 273A, 279, 288, 289, 291) / Bishan St 25 (Clover By The Park)	56	Jul
36	Bedok Reservoir Rd (Blk 118, 123, 635, 636, 637, 640-644) / Jln Damai (Blk 661, 665, 670, 671) / Jln Tenaga (Blk 645, 647-654, 656, 658, 659)	53	Sep
37	East Coast Rd / Jln Baiduri / Joo Chiat Pl / Lor Bandang / Lor J Telok Kurau / Lor K Telok Kurau / Lor L Telok Kurau / Lor M Telok Kurau / CS @ Lor N Telok Kurau / Lor N Telok Kurau / Telok Kurau Rd	53	May
38	Hougang Ave 1 (Blk 113, 115, 120, 124, 125, 165, 167, 168, 170, 172, 174A, 174D) / Lor Ah Soo (Blk 128-132, 134, 135, 137)	53	Jun
39	Woodlands Circle (Blk 721) / Woodlands Cres / Woodlands Cres (Blk 774, 775, 776, 777, 779, 780A, 780D, 780F, 782E) / Woodlands Dr 60 (Blk 770, 771, 772, 778, 786B, 786C, 786D, 786E, 786F)	53	Jan
40	Rivervale Cres (Blk 148, 150, 152, 185A, 185C) / Rivervale Dr (Blk 186A, 186B, 186C, 186D, 187A, 188A, 188B, 188C, 188D, 189C,191B, 192A, 192B, 192C)	52	Sep
41	Jurong East St 13 (Blk 101, 102, 103, 104, 105, 106, 109, 110, 111, 112, 113, 116) / Jurong East St 13 (Ivory Hts)	51	Oct
42	Hougang Ave 6 (Blk 424, 426, 522, 524, 525, 526, 527, 528, 529, 530, 531, 532)	50	Jan

Table 3.17
Dengue clusters identified, 2020 (50 or more cases)

S/No.	Locality	No. of cases	Month of Cluster Formation
1	Aljunied Rd / Geylang Rd / Geylang East Ave 1,2 / Geylang East Ave 1 (Blk 132, 133, 134) / Geylang East Ctrl (Blk 120, 122) / Guillemard Rd / Jln Molek / Jln Suka / Lor 22, 24, 24A, 25, 25A, 26, 27, 27A, 28, 29, 30, 32 Geylang / Sims Ave	384	Feb
2	Arnasalam Chetty Rd / Devonshire Rd / Dublin Rd / Jln Kuala / Jln Rumbia / Killiney Rd / Kim Yam Rd / Leonie Hill / Leonie Hill Rd / Lloyd Rd / Martin Pl / Mohd Sultan Rd / Oxley Gdn, Rd, Rise, Walk / River Valley Cl, Gr, Rd / River Valley Cl, Green / Robertson Quay / Rodyk St / St.Thomas Walk / Tong Watt Rd / Unity St	381	Jun
3	Bt Panjang Ring Rd (Blk 533, 537, 539, 541, 545, 609, 611, 613, 615, 617, 619, 620)/Jelapang Rd (Blk 528, 530, 532, 536, 538, 540, 542-544) / Senja Lk (Blk 652, 653)/ Senja Rd (Blk 601-608, 610, 612, 614, 616, 618, 621-625, 627, 629-631) /Woodlands Rd	332	May
4	Aljunied Rd / Geylang Rd / Guillemard Rd / Lor 4, 6-23 Geylang / Lor Bachok / Lor Tahar / Lor Tahar (Angsana@21) / Sims Ave, Way / Westerhout Rd	323	May

S/No.	Locality	No. of cases	Month of Cluster Formation
5	Arthur Rd / Construction site @ Arthur Rd / Bournemouth Rd/ Broadrick Rd / Clacton Rd / Cres Rd / Fort Rd / Jln Nuri / Jln Seaview / Jln Sedap / Margate Rd / Mayfield Ave / Meyer Pl, Rd / Mountbatten Rd / Peach Gdn / Ramsgate Rd / Ringwood Rd / Walton Rd	321	May
6	Geylang East Ave 1 (Blk 124, 125, 127, 128, 130, 131) / Geylang East Ave 2 (Blk 129)/ Geylang East Ave 2, 3/ Geylang Rd / Guillemard Rd/ Lor 31-40, 42 Geylang/ Paya Lebar Rd/ Sims Ave	250	May
7	Brighton Cres / Chepstow Cl / Chuan Gdn / Lichfield Rd / Ripley Cres / S'goon Gdn Way / Construction site @S'goon Nth Ave 1 / S'goon Nth Ave 1 (Blk 119-127, 142-149) / S'goon Nth Ave 2 (Blk 131, 135, 136, 138-141, 151) / Construction site @S'goon Nth View / Walmer Dr	243	May
8	Ang Mo Kio Ave 2 / Ang Mo Kio Ave 2 (The Panorama) /Jln Chengam / Jln Gelenggang / Jln Leban / Jln Kuras / Jln Tarum / St. Nicholas View / Sembawang Hills Dr / Serenade Walk / Thomson Cl, Green, Hts, Hill, Ter, View, Walk / Thomson Hills Dr	226	Apr
9	Woodleigh Cl (8@Woodleigh, Blossoms @ Woodleigh, Euro-Asia Pk, Parc Mondrian) / Construction site @ Woodleigh Ln / Woodleigh Ln, Pk / Youngberg Ter (Avon Pk)	218	Mar
10	Leicester Rd / Leicester Rd (Intero) / Meyappa Chettiar Rd / Potong Pasir Ave 1 (Blk 101, 102, 104-109, 121-127, 129-131, 133, 146, 148) / Potong Pasir Ave 2 / Potong Pasir Ave 2 (Blk 143-145) / Potong Pasir Ave 3 (Blk 134-142) / Woodsville Cl (Woodsville 28)	202	Apr
11	Tampines Pl	194	Nov
12	Changi Rd / Chiku Rd / Duku Ln, Rd / Everitt Rd / Everitt Rd Nth / Joo Chiat Ln, Pl, Ter / Koon Seng Rd / Langsat Rd / Lor 105-108 Changi / Lor Nangka / Mangis Rd / Pulasan Rd / Rambai Rd / Rambutan Rd / Still Rd / Teng Tong Rd	193	May
13	Bedok Nth Ave1 (Blk 423, 424) / Bedok Nth Ave 2 (Blk 411, 413, 414, 416) / Bedok Nth Ave 3 (Blk 401, 402) / Bedok Nth Rd (Blk 421, 422 425,426,430A) / Chai Chee Ave (Blk 29A) / Chai Chee Rd (Blk 1, 2, 10, 11, 19-24, 27, 59, 61-63, 804, 805, 807A-C, 808A-B) / Chai Chee St (Blk 41-45, 52)	190	May
14	East Coast Rd / Jln Baiduri / Joo Chiat Ave, Pl, Walk / Kurau Gr, Pl, Ter / Lor J, K, L, M, N Telok Kurau / Still Ln / Telok Kurau Rd	190	Jun
15	Jurong West St 91 (Blk 902, 904-911, 913, 914, 915, 916, 917, 918, 919, 933, 935, 936, 938, 940, 947, 949)/ Jurong West St 92 (Blk 920, 921, 922, 923, 924, 925, 926, 928, 929, 930, 931, 932) / Yunnan Cres / Yunnan Rd / Yunnan Walk 2 / Yunnan Walk 3	189	Jan
16	Bartley Rd /Eden Gr / Gambir Walk / Jln Labu Ayer, Manis, Merah / Jln Rindu / Lor Gambir / Lor Penchalak / S'goon Ave 1 (Blk 401-408) / S'goon Ctrl (Blk 412) / SunshineTer / Upp S'goon Rd	180	Jun
17	Balam Rd (Blk 19-21, 23, 24, 27-33) / Circuit Rd (Blk 17A, 17B, 18B, 18D, 27, 34-45, 47-51, 57-59, 61, 63-67, 69, 70, 71, 72, 82A, 82B, 83B, 85, 87, 88) / Paya Lebar Rd (Le Crescendo) / Paya Lebar Way (Blk 91, 93) / Pipit Rd (Blk 53, 54, 56, 90, 94)	179	May

S/No.	Locality	No. of cases	Month of Cluster Formation
18	Desker Rd / Dalhousie Ln / Dunlop St / Hindoo Rd / Jln Besar / Kelantan Rd / Kitchener Rd / Lembu Rd / Norris Rd / Perak Rd/ Rowell Rd/ Rowell Rd (Blk 639-642) / S'goon Rd / Sam Leong Rd / Syed Alwi Rd / Upp Weld Rd / Verdun Rd / Veerasamy Rd/ Veerasamy Rd (Blk 632, 633, 635, 637)	177	Jun
19	Tamp Ave 7 (Blk 390-394, 396) / Tamp St 32 (Blk 310, 324, 325, 328, 330, 331, 334, 336, 337, 381, 383-388) / Tamp St 33 (Blk 311, 312, 322, 323, 340, 341, 343, 352, 353, 354, 356-358) / Tamp St 34 (Blk 359, 361, 363, 364, 366-368, 370-374) / Tamp St 34 (The Eden at Tampines) / Tamp St 45 (Blk 497H)	170	Apr
20	Chiltern Dr/Clifton Vale/Croucher Rd/Jln Girang, Lateh, Ria, Riang, Sukachita/ Lor Biawak, Selangat/ Matlock Rise/ Melrose Dr/ S'goon Ave 2,3/ S'goon Ave 3 (Blk 329,334, 335)/ Sommerville Rd,Walk/ Sundridge Pk, Rd/ Upp S'goon Rd/ Vaughan Rd/ Wolskel Rd	162	Apr
21	Dakota Cres (Blk 58, 60, 62, 70) / Dakota Cres (Dakota Residences, Waterbank At Dakota) / Jln Dua (Blk 93, 97) / Old Airport Rd (Blk 93, 95, 99)	162	Jun
22	Cassia Cres (Blk 28, 30, 32, 34, 36, 42, 52, 54, 56) / Guillemard Rd / Guillemard Rd (Cassia View) / Construction site @ Jln Satu / Jln Tiga (Blk 39, 43, 45, 47, 49) / Old Airport Rd (Blk 21) / Pine Cl (Blk 1, 9)	161	Jun
23	Kaki Bt Ind Ter / Kaki Bt Pl, Rd 1, 3	161	May
24	Pavilion Circle / Pavilion Green / Pavilion Gr / Pavilion Pl / Pavilion Rise / Pavilion St / Pavilion View	153	Feb
25	Construction site @Tampines Nth Dr 2 / Construction site @Tampines St 62	151	Oct
26	Ang Mo Kio Ave3 (Blk 101-103, 132-134)/ Ang Mo Kio Ave 4 (Blk 105-116, 118, 163, 170, 175, 254-258)/ Ang Mo Kio Ave 5 (Blk 179)/ Ang Mo Kio St 11 (Blk 104A, 104B)/ Ang Mo Kio St 21 (Blk 206A, 253, 260B)/ Ellington Sq / Mayflower Ave, Cres, Ln, Pl, Rise, Rd, Ter, Way/Shangri-La Walk	148	May
27	Potong Pasir Ave 1 (Blk 113, 114, 115, 116, 117, 118, 119, 120) / Sorby Adams Dr	144	May
28	Mei Chin Rd (Blk 150A) / Mei Ling St (Blk 143, 145-151, 153-157, 160, 162) / Stirling Rd / Stirling Rd (Blk 42, 43, 45-50, 52, 53, 56, 163, 181, 183, 184) / Stirling Rd (Queens)	140	Jul
29	Balmoral Cres, Rd / Bt Timah Rd / Ewe Boon Rd / Keng Chin Rd / Sarkies Rd	135	Jun
30	Chu Lin Rd / Chu Yen St / Elizabeth Dr / Elizabeth Dr (Hillvista) / Hillview Ave (Chantilly Rise, Hillbrooks, Hillview 128, Hillview Residence) / Jln Dermawan / Jln Gumilang / Jln Intan / Jln Remaja / Jln Zamrud / Lor Kemunchup	134	Mar
31	Adis Rd / Handy Rd / Mt Emily Rd / Mt Sophia / Niven Rd / Sophia Rd / Upp Wilkie Rd / Wilkie Rd, Ter	132	May
32	Carpmael Rd / Ceylon Rd / CheowKeng Rd / Ean Kiam Pl / East Coast Rd / Fowlie Rd / Haig Rd / Jln Beringin, Binjai, Gajus / Joo Chiat Rd / Marshall Rd / Mugliston Rd / Onan Rd / Pennefather Rd / Seraya Rd / Tembeling Rd	132	Jun
33	Kensington Pk Dr (Kensington Pk Condo) / S'goon Nth Ave 1 (Blk 106, 108, 109, 111, 113, 114, 115, 116, 117, 118, 152, 153, 154)	125	Jun

S/No.	Locality	No. of cases	Month of Cluster Formation
34	Carmen St / Elite Pk Ave / Elite Ter / Figaro Gdns, St / Hacienda Gr / Jln Jamal / Jln Tanah Puteh / Jln Tua Kong / Jln Ulu Siglap / Lor Abu Talib / Palm Dr / Siglap Rd / Third St / Tosca Ter / Tua Kong Pl, Walk / Upp East Coast Rd / Woo Mon Chew Rd	121	Jul
35	Geylang Rd / Guillemard Rd / Lor 14 Geylang (Ctrl Imperial, Wing Fong Ct, Wing Fong Mans) / Lor 20 Geylang (# 1 Suites)/ Lor 4, 6, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 20 Geylang / Lor Bachok / Westerhout Rd	120	Nov
36	Ang Mo Kio Ave 3 (Blk 422, 424, 425, 427-430) / Ang Mo Kio Ave 10 (Blk 410-412, 414-417, 419, 420, 432, 433, 435, 436, 438-440, 442-447, 449, 453, 457-460, 463, 465-471, 473-476) / Ang Mo Kio St 44 (Blk 455A-B)	119	May
37	Braddell Rd / Clifton Vale / Croucher Rd / Daisy Ave, Rd / Jln Lateh / Lor Selangat / Mackerrow Rd / Sommerville Rd, Walk	118	May
38	Lor 1 Toa Payoh (Blk 148-149, 155-157, Oleander Twrs)/ Lor 1A Toa Payoh (Blk 138A-C, 139A-B)/ Lor2 Toa Payoh (Blk 83, 84, 84B, 141, 143-147, 152-154)/ Lor 4 Toa Payoh (Blk 80, 80A-B, 81, 81A-B, 82, 82A-B, 85, 85A-C)/ Toa Payoh Ctrl (Blk 79A, 79C-E, 177, 178, 179)	118	May
39	Pasir Ris Dr 10 (Blk 642-646, 650, 700-706, 736-739) / Pasir Ris St 72 (Blk 711, 713-725)	116	Sep
40	Construction site @Bidadari Pk Dr / Construction site @Woodleigh Lk	115	May
41	Bishan St 11(Blk 145, 148, 149, 150A, 501, 503, 506)/ Bishan St 11 (Bishan Loft)/ BishanSt12/ Bishan St 12 (Blk 103, 105, 109, 110, 112, 114,117, 122, 123, 125, 126, 128, 130-135, 137, 138, 140, 141)/ Bishan St 13 (Blk 154-156, 161, 164, 166, 170-172, 176-178, 180, 181, 194, 195)	112	Jun
42	Ang Mo Kio Ave 4 (Blk 607, 609, 610, 612-619, 624, 626, 629, 632, 641, 644) / Ang Mo Kio Ave 5 (Blk 605, 608, 611, 642, 643, 648) / Ang Mo Kio Ave 6 (Blk 635, 636, 640, 645-647) / Ang Mo Kio Ave 9 (Blk 622, 625, 627)	109	Jul
43	Elliot Rd / Elliot Rd (Elliot At The East Coast) / Jln Sempadan / Jln Sempadan (Villa Marina) / Kee Sun Ave / Siglap Rd / Siglap Rd (Siglap Ct) / Tay Lian Teck Dr, Rd / Tay Lian Teck Rd (Dong Xing Ct, Eastbay) / Upp East Coast Rd	109	May
44	Carpmael Rd / Ceylon Ln / Changi Rd / Everitt Rd / Everitt Rd Nth / Haig Rd (Blk 6, 8, 9, 10, 11) / Joo Chiat Ln, Pl, Rd, Ter / Joo Chiat Rd (Blk 3, 4) / Langsat Rd / Lor 101, 102 Changi / Onan Rd / Tembeling Ln, Rd	106	Jun
45	Florissa Pk / Construction site @Lentor Dr / Lentor Cres, Green, Gr, Ln, Lk, Loop, Pl, Rd, St, Ter, Vale, Walk, Way / Yio Chu Kang Rd (Thomson Gr)	106	Apr
46	Tampines St 11 (Blk 106, 107, 108, 109, 111, 125, 126, 127) / Tampines St 22 (Blk 272, 273, 274, 275, 276, 277, 278, 279, 280, 282)	105	Sep
47	Westwood Ave / Westwood Ave (Westwood Residences)/ Westwood Cres / Westwood Dr / Westwood Rd / Westwood Ter / Westwood Walk	105	Feb
48	Bt Batok Ctrl (Blk 228) / Bt Batok East Ave 2 / Bt Batok East Ave 3 (Blk 229, 230) / Bt Batok East Ave 4 (Blk 256-257, 259, 261) / Bt Batok East Ave 5 / Bt	104	Jun

S/No.	Locality	No. of cases	Month of Cluster Formation
	Batok East Ave 5 (Blk 231, 236-239, 241-243, 244-250) / Bt Batok St 52 (Blk 501, 503-511)		
49	Lucky Cres, Gdns, Hts, Rise, View / Parbury Ave (Parbury Hill Condo) / Sennett Ave, Dr, Ln, Rd, Ter / Upp East Coast Rd / Upp East Coast Rd (The Summit) / Wiltshire Rd	104	Apr
50	Bedok Reservoir Rd (Blk 104, 108, 112-114, 116-117, 120-121, 123-125, 126, 130, 132, 133, 139, 609, 633-635, 638, 640-643)/Foo Kim Lin Rd (Tropika East)/ Jln Damai (Blk 661, 665, 667, 671)/ Jln Punai/Jln Singa/Jln Tenaga(Blk 645, 647-652, 654, 655, 658, 659)/ Kaki Bt Cres	103	Jun
51	Bloxhome Dr / Brockhampton Dr / Brothwick Dr / Cardiff Gr / Carisbrooke Gr / Chiselhurst Gr / Chuan Dr, Lk, Ter, View, Walk / Colchester Gr / Coniston Gr / Conway Circle / Conway Gr / Cooling Cl / Jln Nira / Jln Pacheli / Li Hwan Ter, Walk	103	Jun
52	Cambridge Rd (Blk 41)/ Dorset Rd (Blk 48, 48A, 49, 50)/ Gloucester Rd (Blk 9, 10)/ Joo Ave/ Kent Rd (Blk 53)/Mergui Rd/ Owen Rd/ Owen Rd (Blk 44, 46, 47)/ Oxford Rd/ Race Course Rd/ Race Course Rd (Blk 681, 682, 684, 685)/ Rangoon Ln, Rd/ Sing Ave/ Sing Joo Walk/ Starlight Rd/Tessensohn Rd (Blk 683)	103	Jun
53	Lor 1 Toa Payoh (Blk 98, 100, 103, 104, 106, 117, 118, 124, 125, 126, 128) / Lor 2 Toa Payoh (Blk 99A, 99B, 99C, 101A, 101B, 116, 121, 122) / Lor 3 Toa Payoh (Blk 91, 96, 97) / Lor 3 Toa Payoh (Trevista) / Lor 4 Toa Payoh (Blk 92, 95)	103	May
54	Cheng Soon Gdn / Eng Kong Cres / Eng Kong Dr / Eng Kong Gdn / Eng Kong Ln / Eng Kong Ter / Kismis Ave / Kismis Green / Kismis Rd / Lor Kismis / Toh Yi Dr	102	Jul
55	Pasir Ris Dr 3 (Eastvale) / Pasir Ris Dr 6 (Blk 405, 406, 409-429) / Pasir Ris St 11 (Blk 109, 117)	102	Jul
56	Bunga Rampai Pl / Harrison Rd / Harvey Rd / Jln Bunga Rampai / Shaw Rd / Upp Paya Lebar Rd	101	Jul
57	Dix Rd/ Eaton Pl/ Ee Teow Leng Rd/ Flower Rd/ Hendry Cl/ Highland Cl, Rd / Hillside Dr, Ter / Jansen Rd/ Jansen Rd (Jansen28)/ Jln Sahabat / Kovan Cl, Rd/ Lange Rd / Palm Gr Ave / Sirat Rd/ Upp S'goon Rd / Yio Chu Kang Rd / Yio Chu Kang Rd (Residences Botanique)	101	Jun
58	Woodlands Ave 4 (Blk 750, 844)/ Ave 9 (Blk 877)/ Circle (Blk 730, 731, 732, 734-737, 740, 742, 744, 746)/ Dr 40 (Blk 701-703, 705, 706)/ Dr 70 (Blk 708, 709, 712, 717B)/ St 82 (Blk 839, 840, 842, 845, 849, 850, 879, 880)/ St 83 (Blk 832, 833, 835, 836, 851, 853, 854, 856-859, 861, 863, 864)	101	Jun
59	Birch Rd/ Buffalo Rd/ Buffalo Rd (Blk 661-663)/ Chander Rd/ Chander Rd (Blk 668)/ Farrer Pk Rd (Blk 11-13, 15) / KintaRd / Kinta Rd (Kinta Suites) / Klang Ln (Blk 671A, 671B, 672A, 672B) / Race Course Ln (28 RC Suites, City Studios) / Race Course Rd / Roberts Ln / S'goon Rd	99	Jun
60	Boon Lay Pl (Blk 208, 211, 213, 214) / Jurong West Ave 1 (Blk 537, 538, 540, 541) / Jurong West St 41 (Blk 456) / Jurong West St 42 (Blk 450, 453-455, 551, 552) / Jurong West St 52 (Blk 523, 525, 527-531, 533-536)	94	Aug
61	Cheng Soon Cres / Kismis Ave / Toh Yi Dr / Toh Yi Dr (Blk 1, 6, 8, 9, 11, 12, 13, 14, 15, 16, 17) / Toh Yi	94	Jul

S/No.	Locality	No. of cases	Month of Cluster Formation
	Dr (Toh Yi Ct) / Toh Yi Rd / Toh Tuck Rd (High Oak Condo)		
62	Fernvale Rd / Fernvale Rd (Blk 453B-D) / Jln Kayu / Jln Kayu (Blk 446A-B, 447B) / Sengkang West Ave (Blk 455A-B) / Sengkang West Rd (Blk 456A-B, 457A-B, 458A-C) / Construction site @ Sengkang West Way / Sengkang West Way (Blk 448A-B, 450B-C, 451A, 452A, 452B, 458C)	94	Aug
63	Jln Bt Merah (Blk 140-146) / Construction site @Silat Ave / Silat Ave (Blk 147-149) / Construction site @Spooner Rd / Spooner Rd (Blk 1, 2)	91	Aug
64	Jln Chermat/ Lew Lian Vale (Jade Residences)/ Lor Lew Lian (Blk 1, 2, 3, 4, 6, 7)/ Lor Lew Lian (Cherry Gdns, Cherry Hill Condo)/ Lor Ong Lye (Rosalia Pk)/ S'goon Ave 1 (Blk 425)/ S'goon Ctrl (Blk 409, 411, 414-424, 427)/ Upp Paya Lebar Rd	87	Jun
65	Marine Cres (Blk 27, 28, 29, 30, 32, 33, 35, 43, 44, 45, 46, 47) / Marine Ter (Blk 3, 6, 8, 12, 13, 15, 16, 17, 18, 19, 20, 51, 52, 54, 55, 58, 59)	87	May
66	Jln Bunga Rampai (Oasis Gdn) / Jln Kemajuan, Muhibbah, Mulia, Setia / Joo Seng Rd (Blk 9-21) / Mt Vernon Rd / Upp Aljunied Ln (Blk 4, 5, 7, 9) / Vernon Pk	86	Jun
67	Butterworth Ln / Dunman Ln, Rd / DunmanRd / Haig Rd / Haig Rd (Blk 2-4, 22, 23) / Ipoh Ln / Parkstone Rd / Poole Rd / Rose Ln / Swanage Rd / Tg Katong Rd / Thiam Siew Ave / Wareham Rd	84	Jun
68	Da Silva Ln / Florence Cl / Kovan Rd / Kovan Rd (Kovan Melody, Kovan Residences) / Kovan Rise (Kovan Regency) / Lowland Rd / Simon Ln, Pl, Rd, Walk / Simon Ln (Bliss @ Kovan)	84	Apr
69	Chun Tin Rd / Jln Jurong Kechil / Jln Jurong Kechil (Terrene At Bt Timah) / Lor Pisang Asam / Lor Pisang Batu / Lor Pisang Emas / Lor Pisang Hijau / Lor Pisang Udang / Upp Bt Timah View / Upp Bt Timah View (Bt Regency) / Yuk Tong Ave	81	Mar
70	Construction site @Tampines St 22 / Tampines St 22 (Blk 283, 284, 285, 286, 287, 288, 289, 290, 291, 294, 299B)	81	Oct
71	Tampines St 23 (Blk 210, 225) / Tampines St 41 (Blk 429,430,431) / Tampines St 42 (Blk 444, 446, 450A, 450C, 450D, 450E, 450G, 451-453, 455-460)/ Tampines St 43 (Blk 433, 434, 436, 437, 440, 443) / Tampines St 44 (Blk 461, 465, 467, 468, 470)	81	Jul
72	Woodlands Dr 14 (Blk 516, 520) / Woodlands Dr 50 (Blk 886B, 886C, 886D, 889A, 889B, 889D, 891A, 891B, 892B, 893A, 893B, 893C, 893D, 894A, 894B, 894C, 894D, 895A, 895B, 896B)	81	Jun
73	Da Silva Ln / Florence Rd / Florence Rd (The Florentine) / Jln Tani / Kang Choo Bin Rd / Kovan Rise (Kovan Regency) / Lim Ah Pin Rd / Poh Huat Rd / Simon Ln, Pl / Upp S'goon Rd	80	May
74	Ang Mo Kio Ave 3 (Blk 422, 423, 424, 425, 426, 429, 430) / Ang Mo Kio Ave 10 (Blk 432, 434)	78	Feb
75	Berwick Dr / Bloxhome Dr / Bridport Ave / Cowdray Ave / Farleigh Ave / Hemsley Ave / Huddington Ave / Kingswear Ave / Portchester Ave / S'goon Gdn Rise / S'goon Gdn Way	77	Jun
76	Havelock Rd (River Pl) / Jln Kukoh (Blk 1-3, 8-10) / Jln Minyak (Blk 4-6) / York Hill (Blk 11-13)	77	Jul
77	Construction site @Margaret Dr / Margaret Dr	76	Jul

S/No.	Locality	No. of cases	Month of Cluster Formation
78	Ah Hood Rd / Balestier Rd / Boon Teck Rd / Jln Ampas / Jln Kemaman / Jln Rajah / Jln Rama Rama / Kim Keat Ln, Rd / Lor Ampas, Limau	75	Jul
79	Commonwealth Dr (Blk 50) / Tanglin Halt Rd (Blk 24-32, 89-91)	75	Jul
80	Alkaff Cres (Blk 115, 115A, 115C, 118A) / Construction site @Bidadari Pk Dr / Bidadari Pk Dr (Blk 102A, 102B, 105, 105A, 105B, 106A, 106B) / Pheng Geck Ave (Nin Residence) / Wan Tho Ave	74	Apr
81	Hougang Ave 1 (Blk 101, 103, 106, 108, 110, 112, 113, 114, 116, 120, 122, 123, 124, 125, 126, 165, 166, 167, 169, 170, 171, 172, 173, 147A, 174B, 174C, 174D) / Lor Ah Soo (Blk 128, 129, 130, 132, 133, 134, 137)	74	Jul
82	Ah Soo Gdn / Jln Kelichap, Lokam / Lor Ah Soo / Paya Lebar Cres, Pl, Walk / Paya Lebar Cres (Tangerine Gr) / Tai Keng Ave, Gdns, Ln, Ter / Upp Paya Lebar Rd	73	Jun
83	Bedok South Ave 1 (Blk 3, 4) / Bedok South Ave 2 (Blk 5, 6, 9, 10D, 10E, 12, 14, 31, 32, 33, 34, 35, 36, 37) / Bedok South Rd (Blk 13, 15, 18, 19, 38, 39, 41, 42, 43) / New Upp Changi Rd (Blk 28, 29, 30, 51, 53, 60, 62)	73	Jun
84	Lor 7 Toa Payoh (Blk 4, 5, 8, 9, 10, 12, 13, 14, 14A, 14B, 15, 17, 19, 20) / Lor 8 Toa Payoh (Blk 11, 225, 227, 228, 229, 230, 231, 232, 233, 235) / Toa Payoh Ind Pk	73	Jun
85	Lor 4 Toa Payoh (Blk 60, 62, 62B, 66, 73) / Lor 5 Toa Payoh (Blk 31, 34, 36, 37, 43-46, 48-50, 53, 55, 57, 59, 61, 63, 64, 68) / Lor 6 Toa Payoh (Blk 47, 51, 52) / Toa Payoh East (Blk 262)	71	Jun
86	Bristol Rd / Cambridge Rd / Carlisle Rd / Hertford Rd / Keng Lee Rd / Keng Lee Rd (The Merlot) / Norfolk Rd / Truro Rd	69	May
87	Hemmant Rd (Versailles) / Green Ln / Green Ln (Signature Residence) / Lim Ah Woo Rd / Lor 40 Geylang (The Sunny Spring, The Waterina) / Sandy Ln / Tg Katong Rd (Eastside Loft)	69	Jun
88	Bideford Rd (Richmond Pk) / Jln Elok / Jln Jintan / Jln Jintan (Kim Sia Ct) / Jln Kayu Manis / Jln Lada Puteh / Mt Elizabeth (Elizabeth Twrs) / Orchard Rd (Lucky Plaza) / Scotts Rd (Scotts Sq)	68	Apr
89	Boundary Rd / Joon Hiang Rd / Recreation Ln, Rd / S'goon Ctrl (Blk 201-210)	68	Jul
90	Jln Jarak / Jln Jitong / Jln Lebat Daun / Jln Peradun / Neram Rd / Nim Cres, Dr, Green, Rd / Saraca Rd / Seletar Cl, Ter / Stratton Dr, Pl	67	Jun
91	Senja Rd (Blk 625, 626, 627, 629, 630, 631, 632A, 632B, 633B, 633C, 633D, 634A, 634B, 635A, 635B, 636A, 636B, 636C)	67	Jun
92	Jln Jurong Kechil / Jln Jurong Kechil (Charisma View, Sherwood Condo) / Jln Kakatua / Jln Layang Layang / Jln Rajawali / Jln Rajawali (Grand Chateua, Palm Residence, Regis Mans) / Jln Selanting / Jln Selanting (Selanting Green)	65	Mar
93	Jln Limau Bali / Jln Limau Manis / Jln Limau Nipis / Jln Limau Purut / Kew Dr, Hts, Ter, Walk / Limau Gdn (Kew Gate) / Limau Gdn, Rise / Salam Walk / Salam Walk (Casa Flora)	65	Jul

S/No.	Locality	No. of cases	Month of Cluster Formation
94	Marine Dr (Blk 60, 61, 62, 63, 64, 65, 66, 67, 71, 72, 73, 74, 75, 76, 77, 78, 79) / Marine Parade Ctrl (Blk 81, 82)	65	Apr
95	Bedok Nth Ave 1 (Blk 548, 550) / Bedok Nth St 3 (Blk 534, 536, 540, 541, 542, 543, 544, 545, 546, 547, 556)	64	Dec
96	Bowmont Gdns / Burnfoot Ter / East Coast Ave, Rd, Ter / East Coast Ter (Finland Gdns) / Ettrick Ter / Fernwood Ter / First St / First St (Siglap V) / Frankel Pl / Jedburgh Gdns / Siglap Gdns, Rd	64	Jun
97	Construction site @ How Sun Dr / How Sun Walk / Jln Kesoma / Jln Rindu / Lor Ong Lye / Lor Ong Lye (Casa Rosa) / Lor Penchalak / Pillai Rd / S'goon Ave 1 / S'goon Ln, Ter / Upp Paya Lebar Rd	63	Jun
98	Chapel Cl / Cheow Keng Rd / Duku Ln / Duku Pl / Duku Rd / Duku Rd (Cannaville, The Lush) / Joo Chiat Rd / Lor Stangee / Lor Stangee (Chapel Lodge) / Stangee Cl / Stangee Pl / Construction site @Still Rd / Tembeling Rd / Tembeling Rd (Katong Gdns)	62	Jan
99	Chuan Cl / Lor Chuan (Chuan Pk) / S'goon Ave 3 (Chiltern Pk Condo, The Scala, The Springbloom)	62	May
100	Hougang Ave 4 (Blk 603-605, 607, 608) / Hougang Ave 8 (Blk 609, 610, 611, 613, 614, 620, 622, 624, 627-633, 635-637, 641-643, 649, 658, 669, 671, 677-681) / Hougang St 92 (Blk 939, 940, 944)	61	Jul
101	Jln Berjaya / Jln Pemimpin / Marymount Ter (Boonview, Tresalveo) / Pemimpin Dr (Marymount View, Seasons View) / Pemimpin Dr, Pl, Ter	59	Jun
102	Braddell Rd / Clifton Vale / Cotswold Cl / Dunsfold Dr / Lynwood Gr / Mackerrow Rd / Muswell Hill	58	May
103	Angklong Ln (Faber Gdn Condo) / Bright Hill Rd / Fulton Ave, Rd / Lor Puntong (Country Grandeur) / Sin Ming Ave (Blk 402, 403, 404, 405, 406, 408, 410)	57	Apr
104	May Rd / Mcnair Rd / Mcnair Rd (Blk 108, 108B, 108C, 109-112, 113A, 113B, 113D) / Towner Rd / Towner Rd (Blk 101, 103, 105-107)	57	Jun
105	Changi Rd / Chin Cheng Ave / Joo Chiat Pl / Kg Eunos / Lor G, H Telok Kurau / Lor Marzuki	56	Jun
106	Woodlands St 81 (Blk 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 824, 870, 871, 872) / Woodlands St 82 (Blk 821, 822, 874, 875) / Woodlands St 83 (Blk 829)	56	Jul
107	Yishun Ring Rd / Yishun Ring Rd (Blk 849, 853, 854) / Yishun St 81 (Blk 850, 851, 852, 866, 868, 870, 871, 873, 874, 875, 876, 879)	55	Jul
108	Coldstream Ave / Dunbar Walk / East Coast Rd / East Coast Rd (Coastarina, Ocean Pk) / Greenfield Dr / Jln Azam / Jln Buloh Perindu / Jln Dondang Sayang / Jln Keris / Jln Puteri Jula Juli / Jln Selendang Delima / Keris Dr	54	Jun
109	Eunos Ave 8 / Eunos Cres (Blk 13, 15, 18-25)	53	Jun
110	Haig Ave, Rd / Haig Ave (Eis Residences, Rose Maison) / Haig Rd (D'Focus Apts, Haig Ct, Haig Residences, Taipan Regency) / Seraya Ln / Seraya Ln (Seraya 9, Seraya Ct, Seraya Ville)	53	Jul
111	Woodlands Ave 6 (Blk 626, 627) / Woodlands Dr 52 (Blk 624A, 624B) / Woodlands Ring Rd (Blk 628A, 628B, 629, 630, 631)	53	May
112	Aroozoo Ave / Hougang Ave 1 (Blk 230, 232, 234, 236) / Hougang St 21 (Blk 208, 210, 211, 221, 231,	52	Jun

S/No.	Locality	No. of cases	Month of Cluster Formation
	233, 235, 237) / Jln Lepas / Jln Pelikat (The Promenade @ Pelikat) / Jln Songket		
113	Bedok Nth St 1 (Blk 202) / Chai Chee Ave (Blk 29, 29A, 30, 31, 32, 33, 34, 35, 36, 38, 40) / Chai Chee Rd (Blk 25, 26, 32, 34)	52	Jun
114	Chuan Hoe Ave / Jln Limbok / Limbok Ter / Parry Ave / Parry Rd / Parry Ter / Parry View / Parry Walk / Poh Huat Rd (Fontaine Parry) / Poh Huat Rd West (Nouvelle Pk, The Water Line) / Poh Huat Ter	50	Jun
115	Flanders Sq / Jln Besar / Kitchener Lk (City Sq Residences) / Kitchener Rd / Marne Rd (Studios @ Marne) / Somme Rd / Somme Rd (Parc Somme)	50	Jun

Dengue deaths

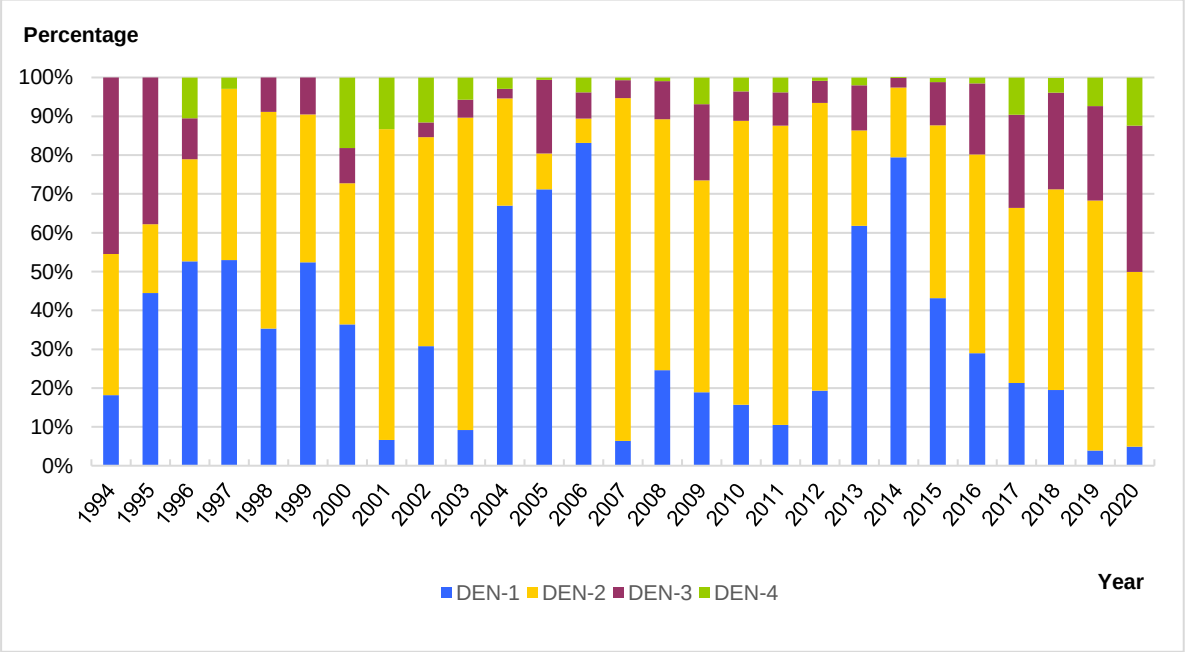
A total of 21 and 32 fatal cases were reported in 2019 and 2020 respectively. All were classified as indigenous. Among the fatal cases, 15 (71.4%) and 27 (84.3%) cases were residing in an active dengue cluster in 2019 and 2020 respectively.

Laboratory surveillance

All reported cases of DF/DHF were confirmed by one or more laboratory tests including anti-dengue IgM antibody, enzyme linked immunosorbent assay (ELISA), and polymerase chain reaction (PCR).

A total of 7,151 and 7,764 blood samples obtained from both inpatients and outpatients tested positive for dengue virus by PCR in 2019 and 2020, respectively. DEN-2 was the predominant circulating serotype since 2016 (Figure 3.5).

Figure 3.5
Percentages of dengue virus serotypes, 1994-2020



***Aedes* mosquito vectors surveillance and control**

Suppressing the *Aedes* mosquito vector population is the key to dengue control. The National Environment Agency (NEA) adopts an evidence-based integrated approach for the surveillance and control of *Aedes* vectors comprising of surveillance, control, community engagement, enforcement, and research.

Surveillance is built on the current regime of inspecting premises and conducting ground surveys for mosquito breeding. Vector surveillance is integrated with epidemiological surveillance and laboratory-based virus surveillance, to generate risk maps that are used to guide vector control efforts. This is complemented by adult mosquito surveillance using Gravitraps, which capture female mosquitoes. The Gravitrap surveillance system monitors the *Aedes* mosquito population in HDB housing estates around Singapore. Data collected from the Gravitrap surveillance system helps to provide insights on mosquito population and distribution and informs operational deployment.

Source reduction is central to Singapore's *Aedes* mosquito vector control efforts. NEA actively engages the community to do their part to prevent mosquito breeding in their premises. Through the Inter-Agency Dengue Taskforce, NEA coordinates source reduction efforts in partnership with stakeholders in the public, private and people sectors. Since 2006, this has been augmented by Intensive Source Reduction Exercise (ISRE) that takes place at the start of the year. This operation to systematically search and destroy potential breeding habitats helps to reduce the vector population to a low level before the onset of the peak season for dengue transmission, which typically falls between June and October.

To control the vector population in dengue clusters, NEA carries out search and destroy of mosquito breeding sources complemented by space spraying of insecticides to kill adult mosquitoes. Gravitraps are also used to monitor the extent of control efforts and direct officers to search and destroy at locations with higher *Aedes* mosquito populations.

NEA's Environmental Health Institute (EHI) has studied various novel mosquito control methods since 2010, and has assessed the *Wolbachia* suppression technology to be the most suitable for augmenting Singapore's dengue control programme. *Wolbachia* is a naturally occurring bacterium found in more than 60% of insects, including *Aedes albopictus* mosquitoes but not in *Aedes aegypti* mosquitoes. The strategy involves the release of male *Wolbachia*-carrying *Aedes aegypti* mosquitoes. When these mosquitoes mate with urban *Aedes aegypti* female without *Wolbachia*, their resulting eggs do not hatch as such mating are biologically incompatible. Thus, the continual release of male *Wolbachia*-carrying *Aedes aegypti* is expected to lead to a decline in the *Aedes aegypti* population over time. The strategy is species-specific i.e. release of male *Wolbachia*-carrying *Aedes aegypti* will only impact the *Aedes aegypti* population in the field, and no other insect.

NEA is adopting a systematic phased approach with field trials, to allow for the building of invaluable knowledge for deployment of the technology, especially in a tropical, urbanised, high-rise landscape. The field studies have grown from covering 3,941 households in October 2016 to 104,876 households in December 2021.

Currently at Phase 5 of the field study, NEA aims to cover the entire HDB towns of Tampines and Yishun town by first half of 2022. With this roll-out, NEA will determine if suppression across whole towns can be sustained with fewer male *Wolbachia-Aedes* mosquitoes released. As of June 2021, NEA saw up to 98% suppression of the *Aedes aegypti* mosquito population and up to 88% reduction in dengue cases in core areas of study sites with at least one year of release[1]. The positive outcome of the field studies showed that continued releases of male *Wolbachia-Aedes* mosquitoes can successfully suppress the female urban *Aedes aegypti* mosquito population. The good progress achieved thus far also reflected the strong support from the community. A house-to-house survey conducted between July 2019 to February 2020 reported 96% of residents having no objection to the releases[2].

In addition to the gradual roll-out at Yishun and Tampines to cover the entire towns, NEA also began testing a different approach of more targeted releases of the male *Wolbachia-Aedes* mosquitoes in dengue high-risk neighbourhoods at Choa Chu Kang and Bukit Batok towns since May 2020. Ongoing releases in parts of Choa Chu Kang, Keat Hong and Hong Kah North have reduced the urban *Aedes aegypti* population, with most areas having fewer than 10 mosquitoes caught per 100 traps per week. With the promising results, NEA has expanded and carried out releases at other high-risk areas in Choa Chu Kang and Keat Hong in Oct 2021 and will continue bringing *Wolbachia-Aedes* mosquitoes to other

1The Project Wolbachia – Singapore Consortium & Ng, LC. (2021). Wolbachia-mediated sterility suppresses Aedes aegypti populations in the urban tropics.

[2] Soh, LT., Ong, Z., Vasquez, K., Chen, I., Li, X., Niah, W., Panchapakesan, C., Sheldenkar, A., Sim, S., Ng, LC., and Lwin, M. (2021). A household-based survey to understand factors influencing awareness, attitudes, and knowledge towards *Wolbachia-Aedes* technology. *Int. J. Environ. Res. Public Health,* 18, 11997.

parts of Bukit Batok towns. The targeted strategy in these areas remain unchanged, which meant releases will be conducted in pockets of areas with perennially high *Aedes aegypti* mosquito populations and persistent dengue transmission.

Moving beyond HDB residential estates, NEA will also be developing the use of *Wolbachia* technology for high-risk landed residential estates. Marine Parade landed residential estates, being a dengue high-risk neighbourhood with consistently high *Aedes aegypti* mosquito population, has been selected for small-scale releases which were carried out from October to December 2021. Data gathered on the behaviour, distribution and longevity of the male *Wolbachia-Aedes* mosquitoes, will help to guide future deployment for larger scale releases in the area.

In 2019, NEA inspected about 900,000 premises. These included residential premises, construction sites, schools, dormitories, factories and other premises types. The geographical distribution of dengue cases, *Aedes aegypti* and *Aedes albopictus* mosquito breeding habitats are shown in Figures 3.6, 3.7 and 3.8 respectively. The overall *Aedes* House Index (HI) was 1.11%, with landed houses showing the highest HI among the residential premises (Figure 3.12).

The top five breeding habitats for *Aedes aegypti* were domestic containers (29.9%), ornamental containers (10.9%), flower pot plates/trays (10.7%), covered perimeter drains (4.6%) and covered carpark drains (1.9%) (Figure 3.13). As for *Aedes albopictus*, the most common breeding habitats were domestic containers (10.5%), covered perimeter drains (10.2%), flower pot plates/trays (9.4%), discarded receptacles (7.4%), and gully traps (4.8%) (Figure 3.14).

In 2020, NEA inspected about one million premises. These included residential premises, construction sites, schools, dormitories, factories and other premises types. The geographical distribution of dengue cases, *Aedes aegypti* and *Aedes albopictus* mosquito breeding habitats are shown in Figures 3.9, 3.10 and 3.11 respectively. The overall *Aedes* House Index (HI) was 1.20%, with landed houses showing the highest HI among the residential premises (Figure 3.12).

The top five breeding habitats for *Aedes aegypti* were domestic containers (28.8%), flower pot plates/trays (10.3%), ornamental containers (9.9%), covered perimeter drains (3.2%) and discarded receptacles (1.8%) (Figure 3.15). As for *Aedes albopictus*, the most common breeding habitats were discarded receptacles (9.5%), domestic containers (9.4%), covered perimeter drains (7.9%), flower pot plates/trays (7.6%) and plants (hardened soil and plant axils) (4.5%) (Figure 3.16).

Figure 3.6
Geographical distribution of dengue cases, 2019

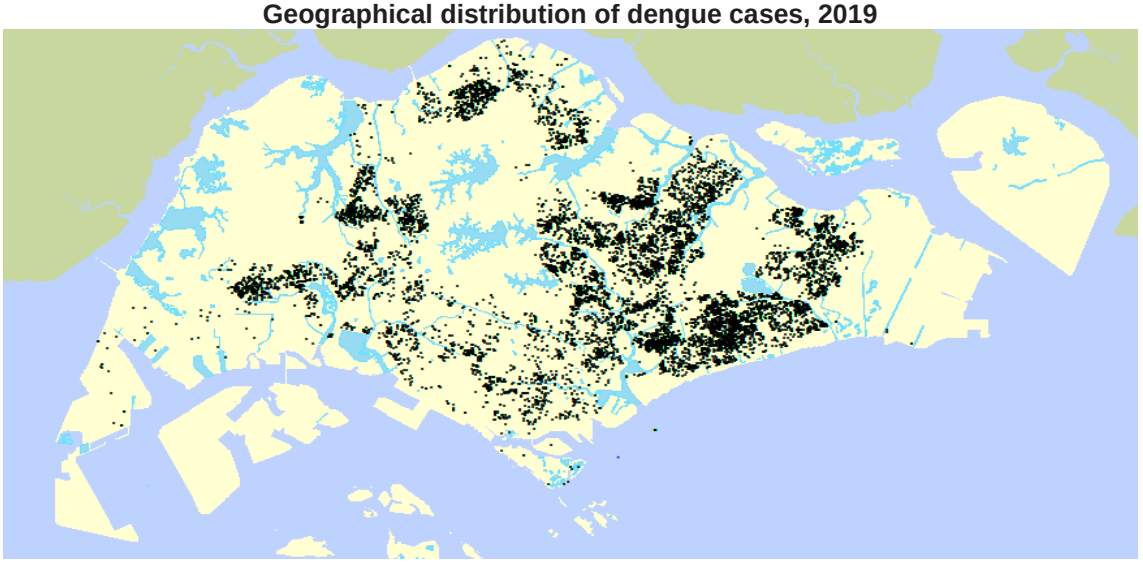


Figure 3.7
Geographical distribution of *Aedes aegypti* breeding habitats detected, 2019

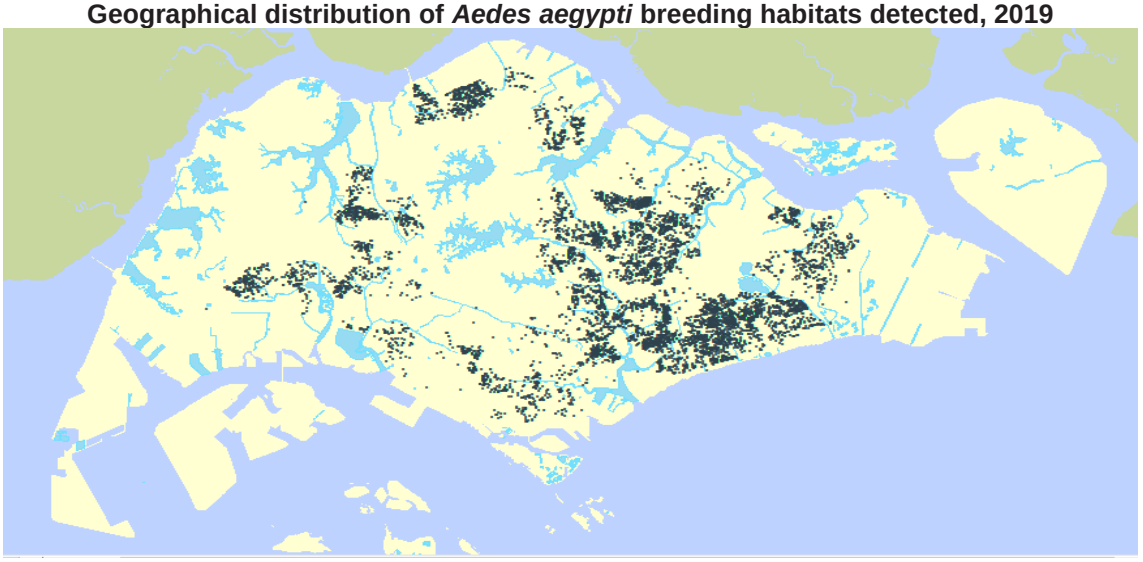


Figure 3.8
Geographical distribution of *Aedes albopictus* breeding habitats detected, 2019

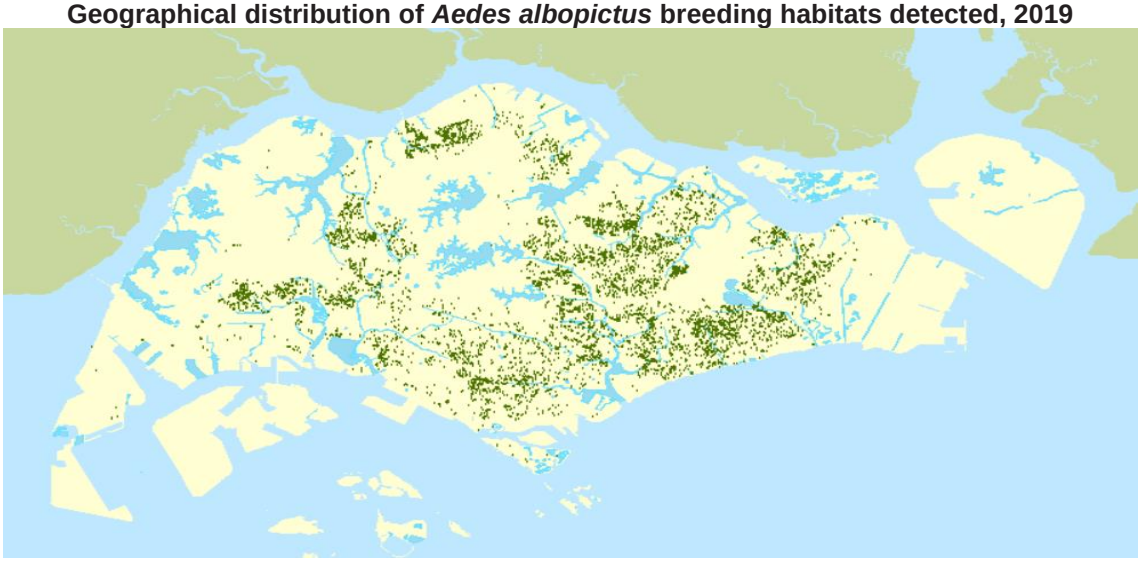


Figure 3.9
Geographical distribution of dengue cases, 2020

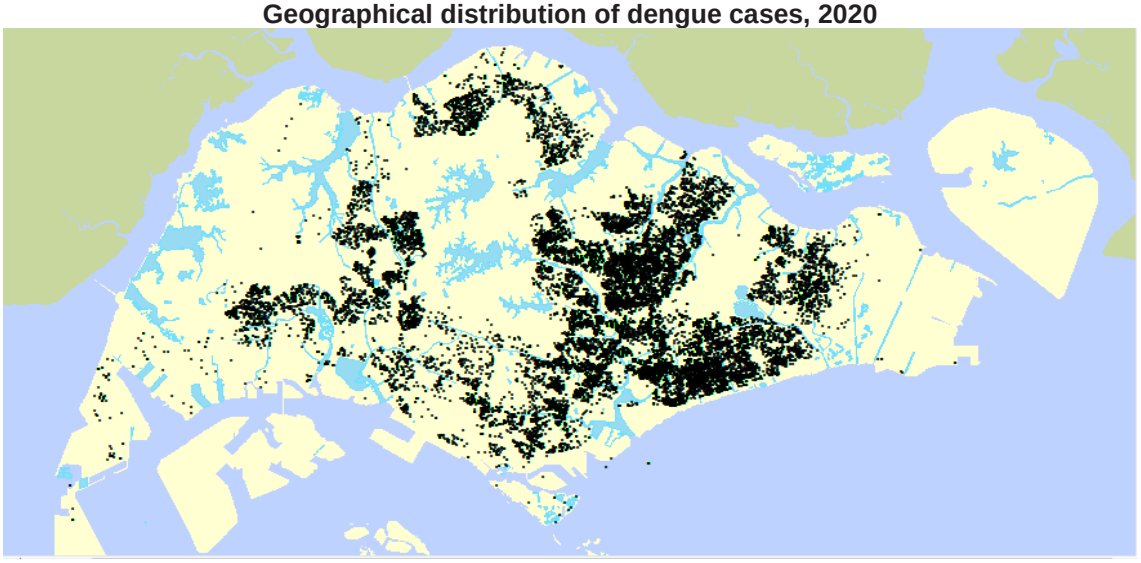


Figure 3.10
Geographical distribution of *Aedes aegypti* breeding habitats detected, 2020

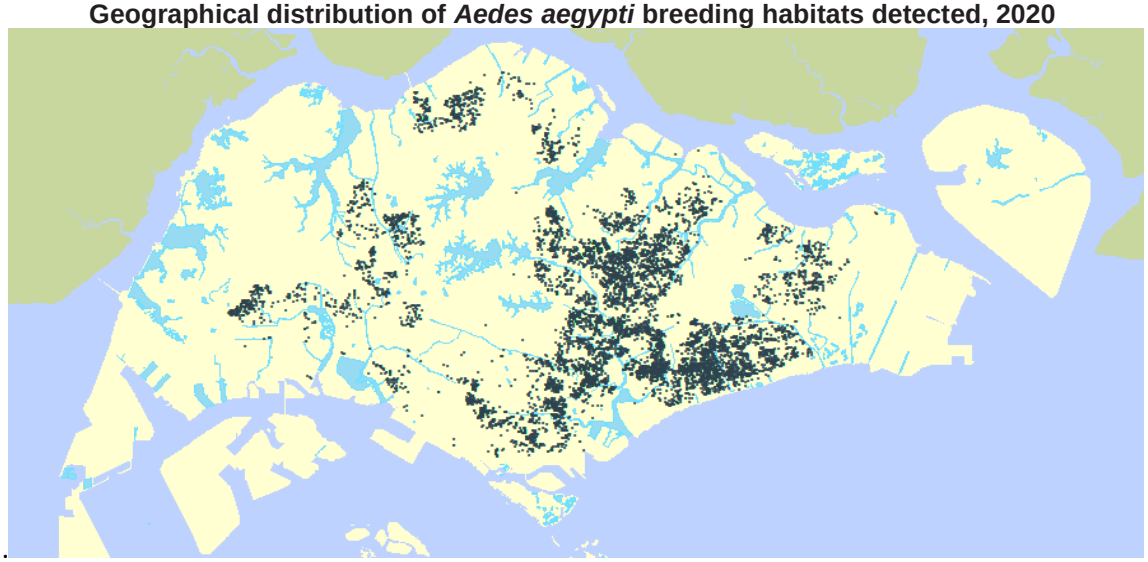


Figure 3.11
Geographical distribution of *Aedes albopictus* breeding habitats detected, 2020

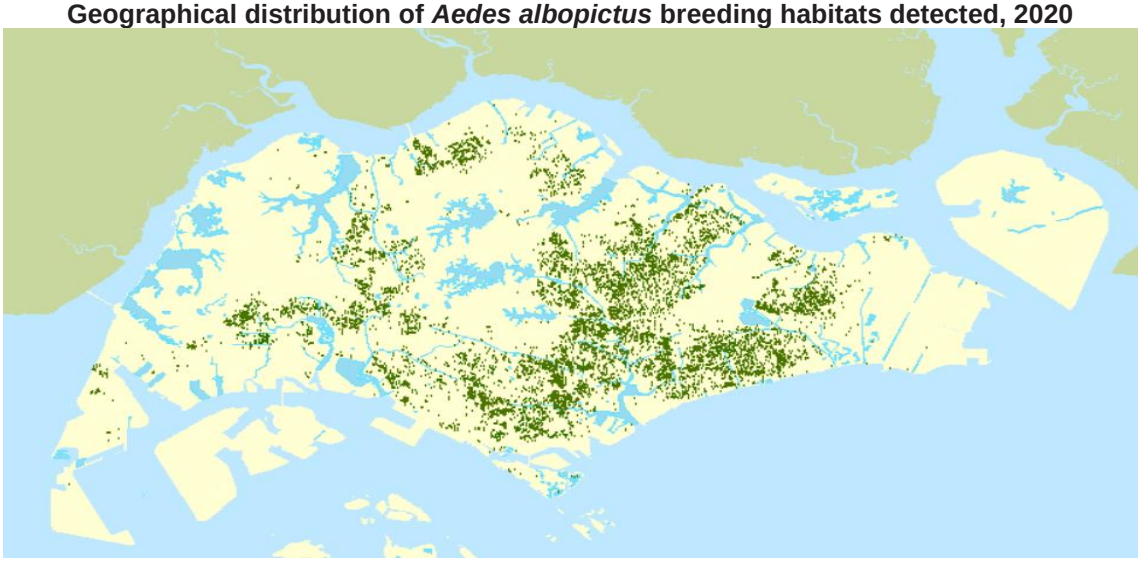


Figure 3.12
***Aedes* House Index, 2016-2020**

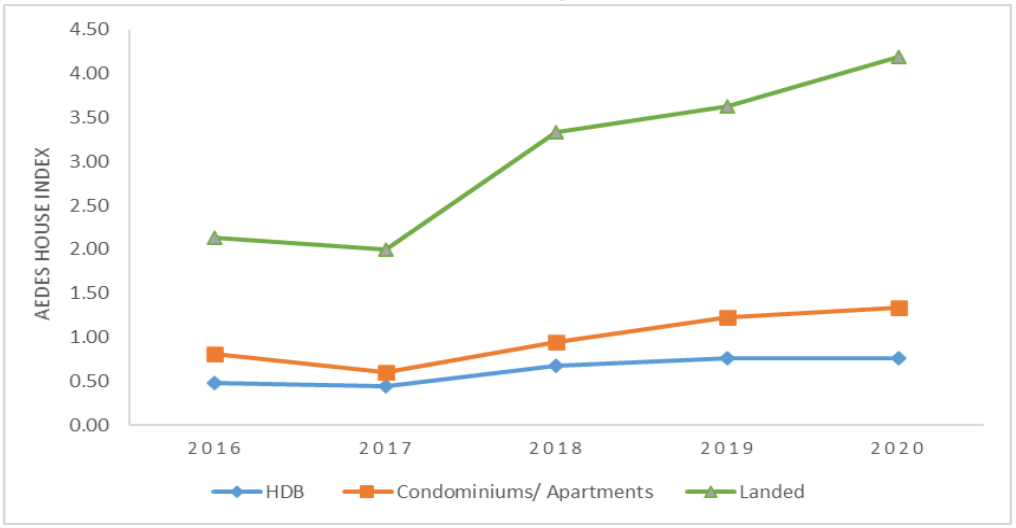


Figure 3.13
Distribution of *Aedes aegypti* top five breeding habitats, 2019

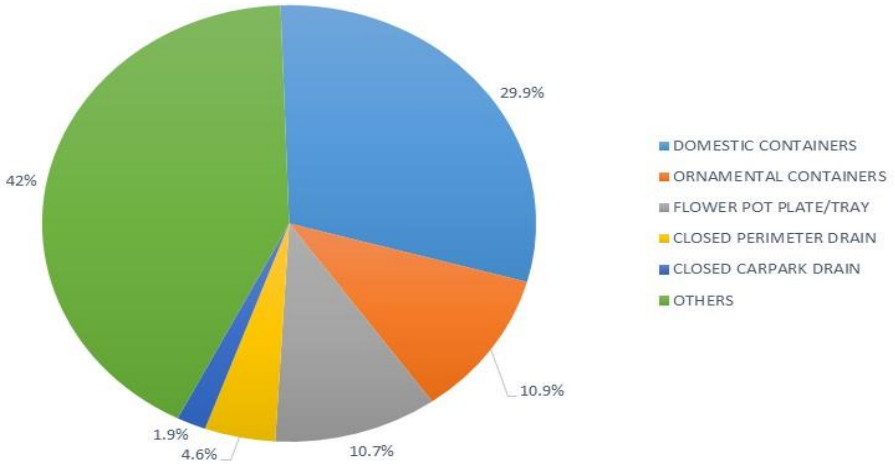


Figure 3.14
Distribution of *Aedes albopictus* top five breeding habitats, 2019

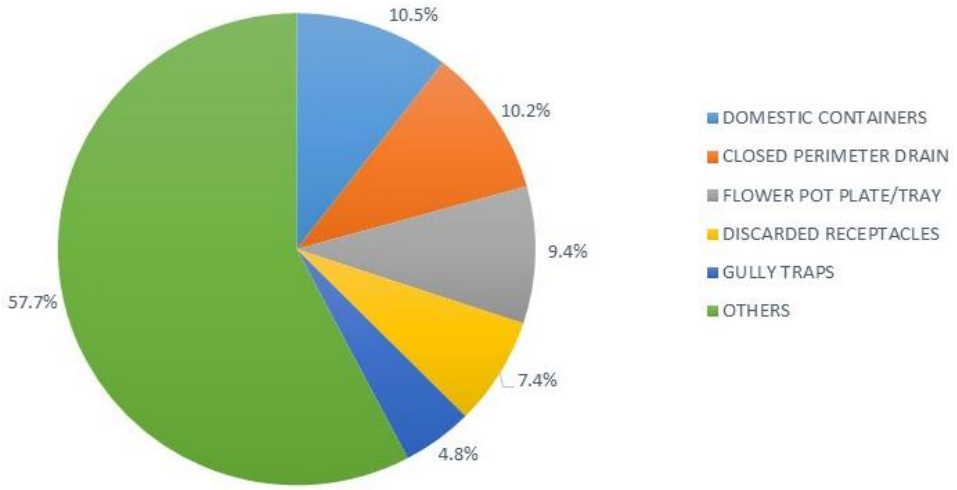


Figure 3.15
Distribution of *Aedes aegypti* top five breeding habitats, 2020

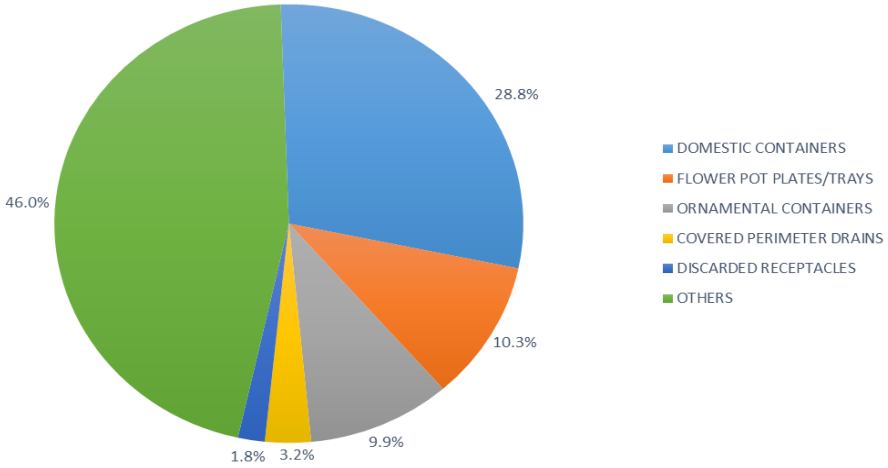
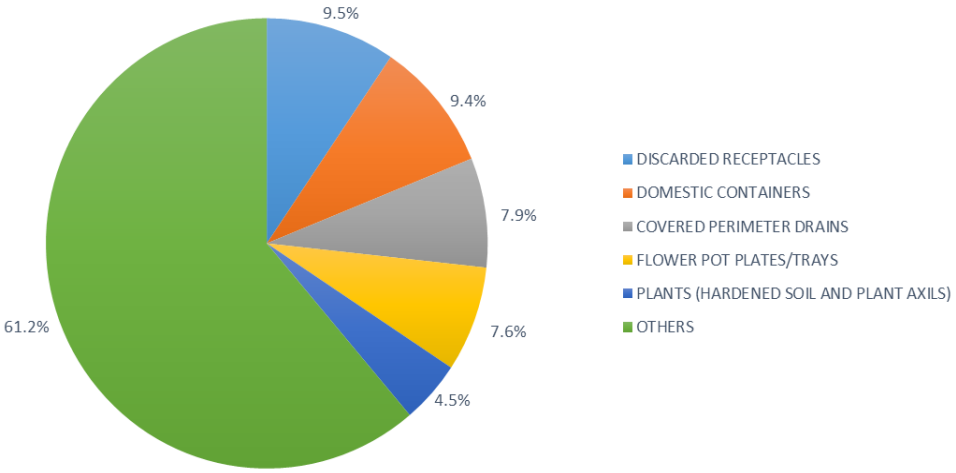


Figure 3.16
Distribution of *Aedes albopictus* top five breeding habitats, 2020



LEPTOSPIROSIS

Leptospirosis is a zoonotic bacterial disease of variable clinical manifestations. The common presenting symptoms are fever, headache, chills, severe myalgia and conjunctival suffusion. The aetiologic agent *Leptospira* is a spiral organism and a member of the order *Spirochaetales* found mainly in infected wild and domestic animals (e.g. rodents, dogs, horses, cattle and pigs). The mode of transmission is through direct contact of the skin (especially if broken) or mucous membranes with the urine or bodily fluids (except saliva) tissues of infected animals. Contact with soil or vegetation contaminated by infected animals may also cause infection. Occasionally, leptospirosis has occurred following the ingestion of food contaminated by the urine of infected rats.

Confirmed cases are individuals who have clinically compatible symptoms with confirmatory laboratory findings such as detection of *Leptospira* via PCR. Suspected cases are individuals who have clinically compatible symptoms with either a positive *Leptospira* IgM antibodies or epidemiological risk factors.

A total of 40 suspected cases of leptospirosis were reported in 2020, compared to 26 suspected cases in 2019 (Figure 3.17). There were no confirmed cases of leptospirosis reported in 2019 and 2020.

In 2019, out of 26 suspected cases, 12 were indigenous cases and 11 were imported cases, involving six Singapore residents and five foreign residents. The remaining three cases were foreigners who came to Singapore for medical treatment (Table 3.18). In 2020, out of the 40 suspected cases, 33 were indigenous cases and four were imported cases, involving two Singapore residents and two foreign residents. The remaining three cases were foreigners who came to Singapore for medical treatment (Table 3.18).

Figure 3.17
Weekly distribution of confirmed and suspected leptospirosis cases, 2019-2020

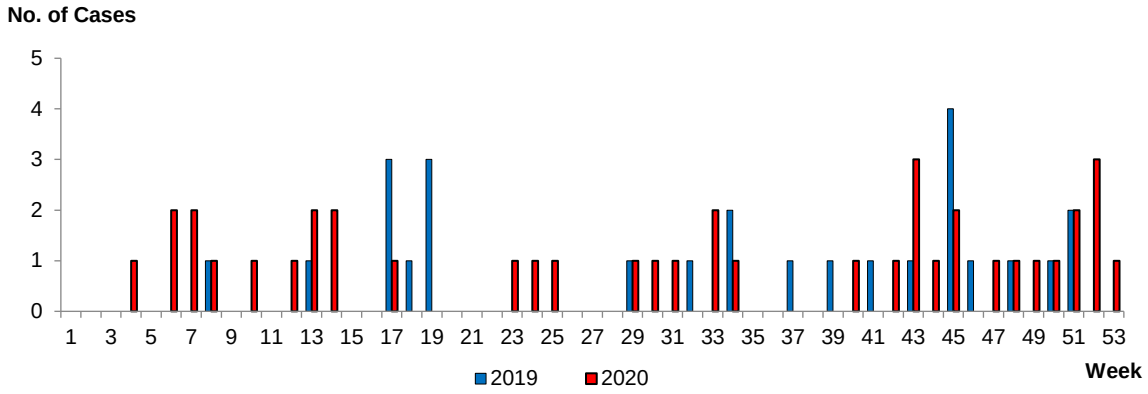


Table 3.18
Total number of notifications* received for confirmed and suspected leptospirosis cases, 2016-2020

Age group	2016^		2017		2018#		2019		2020	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
0-4	0	0	0	0	0	0	0	0	0	1
5-14	0	0	2	2	1	0	0	0	0	1
15-24	5	2	12	5	5	2	1	3	4	0
25-34	2	1	6	4	11	4	3	2	13	2
35-44	2	1	2	4	5	1	2	4	5	0
45-54	0	0	6	2	8	0	5	1	3	0
55-64	0	0	0	1	2	0	1	0	5	0
65+	0	0	1	0	0	0	0	1	3	0
Total	**9**	**4**	**29**	**18**	**32**	**7**	**12**	**11**	**33**	**4**

*Excluded foreigners seeking medical treatment in Singapore.
^Leptospirosis was added to the list of notifiable disease on 28 September 2016.
#Case definition was updated w.e.f from 1 January 2018.

In 2019, the resident incidence rate was highest in the 15-24 years age group with an overall male to female ratio of 1.6:1. In 2020, the resident incidence rate was highest in the 25-34 years age group with an overall male to female ratio of 1.8:1 (Tables 3.19 and 3.20). Among the three major ethnic groups, the incidence was highest among Malays in both 2019 and 2020 (Tables 3.21 and 3.22).

Table 3.19
Age-sex distribution and age-specific resident incidence rate of reported leptospirosis cases^, 2019

Age group	Number of notifications				Incidence rate per 100,000 resident population*
	Male	Female	Total	%	
0-4	0	0	0	0.0	0
5-14	0	0	0	0.0	0
15-24	1	3	4	17.4	0.8
25-34	3	2	5	21.7	0.3
35-44	5	1	6	26.1	0.3
45-54	4	2	6	26.1	0.7
55-64	1	0	1	4.3	0.2
65+	0	1	1	4.3	0.2
Total	**14**	**9**	**23**	**100.0**	-

*Excluded three foreigners seeking medical treatment in Singapore.
*Rates are based on 2019 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.20
Age-sex distribution and age-specific resident incidence rate of reported leptospirosis cases^, 2020

Age group	Number of notifications				Incidence rate per 100,000 resident population*
	Male	Female	Total	%	
0-4	1	0	1	2.7	0
5-14	0	1	1	2.7	0.2
15-24	2	2	4	10.8	0.7
25-34	9	6	15	40.5	0.9
35-44	5	0	5	13.5	0.2
45-54	1	2	3	8.1	0.5
55-64	4	1	5	13.5	0.8
65+	2	1	3	8.1	0.5
Total	**24**	**13**	**37**	**100.0**	-

*Excluded three foreigners seeking medical treatment in Singapore.
*Rates are based on 2020 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.21
Ethnic-sex distribution and ethnic-specific incidence rate of reported leptospirosis cases^, 2019

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	1	2	3	13.0	0.1
Malay	2	5	7	30.4	1.3
Indian	1	0	1	4.3	0.3
Others	2	1	3	13.0	2.3
Foreign residents	8	1	9	39.1	0.5
Total	**14**	**9**	**23**	**100.0**	**0.4**

^Excluded three foreigners seeking medical treatment in Singapore.
*Rates are based on 2019 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.22
Ethnic-sex distribution and ethnic-specific incidence rate of reported leptospirosis cases^, 2020

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	8	7	15	40.5	0.5
Malay	3	1	4	10.8	0.7
Indian	1	1	2	5.4	0.6
Others	0	0	0	0.0	0
Foreign residents	12	4	16	43.2	1.0
Total	**24**	**13**	**37**	**100**	**0.7**

^Excluded three foreigners seeking medical treatment in Singapore.
*Rates are based on 2020 estimated mid-year population.
(Source: Singapore Department of Statistics)

MALARIA

Malaria is a disease caused by a protozoan parasite, *Plasmodium*. The disease is transmitted via the bite of an infective female *Anopheles* mosquito. There are four species that cause disease in humans, namely *P. vivax, P.malariae, P. falciparum* and *P. ovale*. In recent years, *P. knowlesi* – a species that causes malaria among monkeys and occurs in certain forested areas of Southeast Asia – has also caused several human cases of malaria. Symptoms of malaria include fever, headache, chills and vomiting.

In 2020, a total of 13 laboratory confirmed cases were reported, a decrease of 60.6% as compared to the 33 cases reported in 2019 (Figure 3.18).

In 2019, out of 33 cases, 20 cases were imported, involving six residents and four foreign residents. The remaining 13 cases comprised of seven tourists and six foreigners who came to Singapore for medical treatment (Table 3.23). In 2020, out of 13 cases, 10 cases were imported, involving two residents and eight foreign residents. The remaining three cases comprised of two tourists and one foreigner who came to Singapore for medical treatment (Table 3.23).

Figure 3.18
Weekly distribution of reported malaria cases, 2019-2020

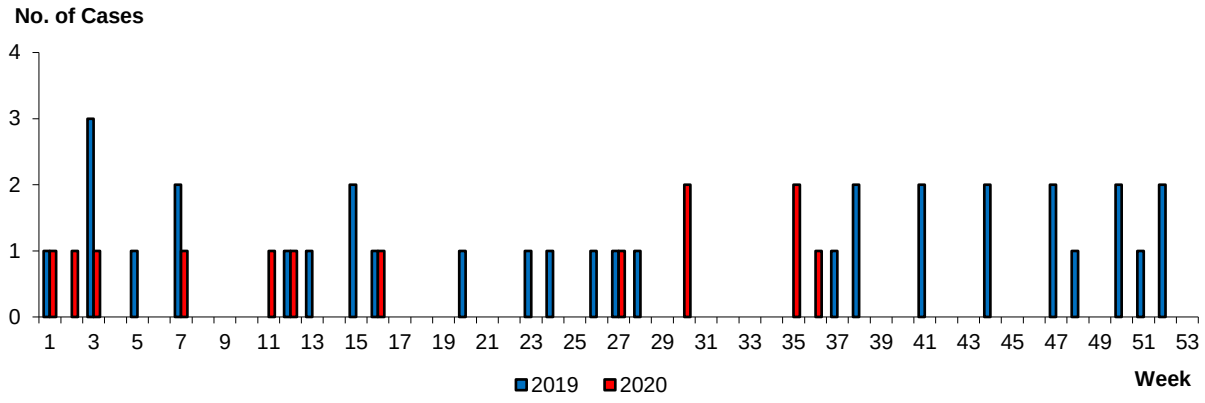


Table 3.23
Total number of notifications* received for malaria cases, 2016-2020

Age group	2016		2017		2018		2019		2020	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
0-4	0	0	0	0	0	0	0	0	0	0
5-14	0	0	0	0	0	0	0	1	0	0
15-24	0	6	0	2	0	2	0	2	0	4
25-34	0	11	0	10	0	10	0	5	0	3
35-44	0	1	0	7	0	6	0	2	0	2
45-54	0	2	0	2	0	5	0	6	0	1
55-64	0	1	0	1	0	1	0	2	0	0
65+	0	0	0	0	0	1	0	2	0	0
Total	**0**	**21**	**0**	**22**	**0**	**25**	**0**	**20**	**0**	**10**

*Excluded tourists and foreigners seeking medical treatment in Singapore

In 2019, among the imported cases, the resident incidence rate was highest in the 35-44 and 45-54 years age groups, with an overall male to female ratio of 5.7:1 (Table 3.24). In 2020, among the imported cases, the resident incidence rate was highest in the 35-44 and 45-54 years age groups, with an overall male to female ratio of 4:1 (Table 3.25). In 2019, foreign residents had a higher incidence rate compared to Singapore residents, while Singapore residents had a higher incidence rate compared to foreign residents in 2020 (Tables 3.26 and 3.27).

Table 3.24
Age-sex distribution and age-specific resident incidence rate of reported malaria cases^, 2019

Age group	Number of notifications				Incidence rate per 100,000 resident population*
	Male	Female	Total	%	
0-4	0	0	0	0	0
5-14	0	1	1	5	0
15-24	1	1	2	10	0.2
25-34	4	1	5	25	0
35-44	2	0	2	10	0.3
45-54	6	0	6	30	0.3
55-64	2	0	2	10	0.2
65+	2	0	2	10	0
Total	**17**	**3**	**20**	**100**	-

^Excluded 13 tourists and foreigners seeking medical treatment in Singapore.
*Rates are based on 2019 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.25
Age-sex distribution and age-specific resident incidence rate of reported malaria cases^, 2020

Age group	Number of notifications				Incidence rate per 100,000 resident population*
	Male	Female	Total	%	
0-4	0	0	0	0	0
5-14	0	0	0	0	0
15-24	2	2	4	40	0
25-34	3	0	3	30	0
35-44	2	0	2	20	0.2
45-54	1	0	1	10	0.2
55-64	0	0	0	0	0
65+	0	0	0	0	0
Total	**8**	**2**	**10**	**100**	-

^Excluded three tourists and foreigners seeking medical treatment in Singapore.

*Rates are based on 2020 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.26
Ethnic-sex distribution and ethnic-specific incidence rate of reported malaria cases, 2019

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	1	1	2	10	0.1
Malay	3	0	3	15	0.6
Indian	1	0	1	5	0.3
Others	0	0	0	0	0
Foreign residents	12	2	14	70	0.8
Total	**17**	**3**	**20**	**100**	**0.4**

^Excluded 13 tourists and foreigners seeking medical treatment in Singapore.
*Rates are based on 2019 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.27
Ethnic-sex distribution and ethnic-specific incidence rate of reported malaria cases, 2020

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	1	0	1	10	0.1
Malay	0	0	0	0	0
Indian	0	0	0	0	0
Others	1	0	1	10	0.8
Foreign residents	6	2	8	80	0.5
Total	**8**	**2**	**10**	**100**	**0.2**

^Excluded three tourists and foreigners seeking medical treatment in Singapore.
*Rates are based on 2020 estimated mid-year population.
(Source: Singapore Department of Statistics)

Malaria parasite species

In 2019, the distribution of cases by parasite species, for *P. vivax, P. falciparum, P. ovale, P. malariae, and P. knowlesi* were 39.4%, 45.5%, 3.0%, 6.1%, and 6.1% respectively (Table 3.28).

In 2020, the distribution of the cases by parasite species, for *P. vivax* and *P. falciparum* were 69.2% and 30.8% respectively (Table 3.29).

Table 3.28
Classification of reported malaria cases by parasite species, 2019

Classification	Parasite species					Total (%)
	P.v.	P.f.	P.o.	P.m.	P.k.	
Imported	13	15	1	2	2	33 (100)
Introduced	0	0	0	0	0	0
Indigenous	0	0	0	0	0	0
Cryptic	0	0	0	0	0	0
Induced	0	0	0	0	0	0
Total	**13**	**15**	**1**	**2**	**2**	**33 (100)**

P.v. - *Plasmodium vivax* P.f. - *Plasmodium falciparum* P.o. - *Plasmodium ovale*
P.m. - *Plasmodium malariae* P.k. - *Plasmodium knowlesi*

Table 3.29
Classification of reported malaria cases by parasite species, 2020

Classification	Parasite species					
	P.v.	P.f.	P.o.	P.m.	P.k.	Total (%)
Imported**	9	4	0	0	0	13 (100)
Introduced	0	0	0	0	0	0
Indigenous	0	0	0	0	0	0
Cryptic	0	0	0	0	0	0
Induced	0	0	0	0	0	0
Total	**9**	**4**	**0**	**0**	**0**	**13 (100)**

P.v. - *Plasmodium vivax* P.f. - *Plasmodium falciparum* P.o. - *Plasmodium ovale*
P.m. - *Plasmodium malariae* P.k. - *Plasmodium knowlesi*
**Included relapsed cases that were imported.

Imported malaria cases

In 2019, the majority of cases who had acquired malaria overseas were infected in India (27.3%) and Africa (45.5%). *P. vivax* accounted for 78% of the infections acquired in India, and *P. falciparum* accounted for 86.7% of the infections acquired in the African region (Table 3.30).

In 2020, the majority of cases who had acquired malaria overseas were infected in India (53.8%) and Africa (30.8%). *P. vivax* accounted for 100% of the infections acquired in India, and *P. falciparum* accounted for 100% of the infections acquired in the African region (Table 3.31).

Table 3.30
Imported malaria cases by country/ region of origin and by parasite species, 2019

	Parasite species					
	P.v.	P.f.	P.o.	P.m.	P.k.	Total (%)
Southeast Asia						
Indonesia	3	0	0	0	1	4 (12.1)
Malaysia	0	0	0	0	1	1 (3.0)
Myanmar	1	0	0	0	0	1 (3.0)
South Asia						
India	7	2	0	0	0	9 (27.3)
Africa						
Angola	0	1	0	0	0	1 (3.0)
Cameroon	0	2	0	0	0	2 (6.1)
Democratic Republic of the Congo	0	1	1	0	0	2 (6.1)
Ghana	0	1	0	0	0	1 (3.0)
Madagascar	0	1	0	0	0	1 (3.0)
Mozambique	0	1	0	0	0	1 (3.0)
Nigeria	0	3	0	1	0	4 (12.1)
Sierra Leone	0	1	0	0	0	1 (3.0)
Tanzania	0	1	0	0	0	1 (3.0)
Uganda	0	1	0	0	0	1 (3.0)
Other countries						
Papua New Guinea	2	0	0	1	0	3 (9.1)
Total	**13**	**15**	**1**	**2**	**2**	**33 (100)**

P.v. - *Plasmodium vivax* P.f. - *Plasmodium falciparum* P.o. - *Plasmodium ovale*
P.m. - *Plasmodium malariae* P.k. - *Plasmodium knowlesi*

Table 3.31
Imported malaria cases by country/ region of origin and by parasite species, 2020

	Parasite species					
	P.v.	**P.f.**	**P.o.**	**P.m.**	**P.k.**	**Total (%)**
South Asia						
India	7	0	0	0	0	7 (53.8)
Southeast Asia						
Indonesia	1	0	0	0	0	1 (7.7)
Myanmar	1	0	0	0	0	1 (7.7)
Africa						
Ghana	0	1	0	0	0	1 (7.7)
Kenya	0	1	0	0	0	1 (7.7)
Mozambique	0	1	0	0	0	1 (7.7)
Namibia	0	1	0	0	0	1 (7.7)
Total	**9**	**4**	**0**	**0**	**0**	**13 (100)**

P.v. - *Plasmodium vivax* P.f. - *Plasmodium falciparum* P.o. - *Plasmodium ovale*
P.m. - *Plasmodium malariae* P.k. - *Plasmodium knowlesi*

In 2019, most of the cases (71.9%) had onset of fever within two weeks of entry into Singapore (Table 3.32). For *P. vivax* malaria, 58.3% of cases did not develop symptoms until more than two weeks after entry, while for *P. falciparum,* 100% of cases developed symptoms less than two weeks into Singapore.

In 2020, 50% of the cases had onset of fever within two weeks of entry into Singapore (Table 3.33). For *P. vivax* malaria, 75% of cases did not develop symptoms until more than six weeks after entry, while for *P. falciparum,* 100% of cases developed symptoms less than two weeks into Singapore.

Table 3.32
Imported malaria cases by interval between period of entry and onset of illness[#] and by parasite species, 2019

Interval in weeks	**Parasite species**					
	P.v.	**P.f.**	**P.o.**	**P.m.**	**P.k.**	**Total (%)**
<2	5	15	0	1	2	23 (71.9)
2-3	2	0	0	0	0	2 (6.3)
4-5	1	0	0	1	0	2 (6.3)
6-7	1	0	0	0	0	1 (3.1)
8-9	0	0	0	0	0	0
10-11	1	0	1	0	0	2 (6.3)
12-13	0	0	0	0	0	0
14-15	1	0	0	0	0	1 (3.1)
16-17	0	0	0	0	0	0
18-19	0	0	0	0	0	0
20-23	0	0	0	0	0	0
24-27	0	0	0	0	0	0
28-31	0	0	0	0	0	0
32-35	0	0	0	0	0	0
36-39	0	0	0	0	0	0
40+	1	0	0	0	0	1 (3.1)
Total	**12**	**15**	**1**	**2**	**2**	**32* (100)**

P.v. - *Plasmodium vivax* P.f. - *Plasmodium falciparum* P.o. - *Plasmodium ovale*
P.m. - *Plasmodium malariae* P.k. - *Plasmodium knowlesi*

*Excluding one asymptomatic *P. vivax* case which was detected during blood screening.

Table 3.33

Imported malaria cases by interval between period of entry and onset of illness# and by parasite species, 2020

Interval in weeks	Parasite species					
	P.v.*	P.f.	P.o.	P.m.	P.k.	Total (%)
<2	2	4	0	0	0	6 (50)
2-3	0	0	0	0	0	0 (0)
4-5	0	0	0	0	0	0 (0)
6-7	0	0	0	0	0	0 (0)
8-9	0	0	0	0	0	0 (0)
10-11	0	0	0	0	0	0 (0)
12-13	0	0	0	0	0	0 (0)
14-15	0	0	0	0	0	0 (0)
16-17	2	0	0	0	0	2 (16.7)
18-19	1	0	0	0	0	1 (8.3)
20-23	1	0	0	0	0	1 (8.3)
24-27	0	0	0	0	0	0 (0)
28-31	0	0	0	0	0	0 (0)
32-35	0	0	0	0	0	0 (0)
36-39	2	0	0	0	0	2 (16.7)
40+	0	0	0	0	0	0 (0)
Total	**8**	**4**	**0**	**0**	**0**	**12* (100)**

P.v. - *Plasmodium vivax* P.f. - *Plasmodium falciparum* P.o. - *Plasmodium ovale*
P.m. - *Plasmodium malariae* P.k. - *Plasmodium knowlesi*

*Excluding one asymptomatic *P. vivax* case which was detected during blood screening.

In both 2019 and 2020, majority of the imported cases were work permit/employment pass holders, comprising 30.3% and 46.2% of the cases, respectively (Table 3.34).

Table 3.34
Classification of imported malaria cases, 2019-2020

Classification	2019		2020	
	Cases	%	Cases	%
Local residents				
Singapore residents	6	18.2	2	15.4
Work permit/Employment pass holders	10	30.3	6	46.2
Student pass holders	0	0	2	15.4
Other foreigners	4	12.1	0	0
Foreigners seeking medical treatment	6	18.2	1	7.6
Tourists	7	21.2	2	15.4
Total	**33**	**100**	**13**	**100**

Of the six Singapore residents who contracted malaria overseas in 2019, three were on work-related travel, two were on volunteer or missionary work and one was on social visit or holiday. Three of the travelers did not complete their chemoprophylaxis, and the remaining three were not known to have taken chemoprophylaxis. In 2020, both Singapore residents who contracted malaria overseas were on social visits or holiday. Both were not known to have taken chemoprophylaxis (Tables 3.35 and 3.36).

Table 3.35
Purpose of travel for Singapore residents who contracted malaria overseas, 2016-2020

Purpose of Travel	2016	2017	2018	2019	2020
Social visits/holidays	0	4	6	1	2
Business	1	1	3	0	0
Military service	0	0	0	0	0
Volunteer/Missionary work	0	0	1	2	0
Employment	0	0	2	3	0
Total	**1**	**5**	**12**	**6**	**2**

Table 3.36
History of chemoprophylaxis for Singapore residents who contracted malaria overseas, 2016-2020

Chemoprophylaxis	2016	2017	2018	2019	2020
Took complete chemoprophylaxis	0	0	0	0	0
No chemoprophylaxis	1	5	12	3	2
Irregular/incomplete chemoprophylaxis	0	0	0	3	0
Total	**1**	**5**	**12**	**6**	**2**

MURINE TYPHUS

Murine typhus is a bacterial disease caused by *Rickettsia typhi* (formerly known as *Rickettsia mooseri)* and *Rickettsia felis.* The symptoms of murine typhus may include fever, rash, myalgia, abdominal pain, vomiting and nausea. The mode of transmission is by infective rat fleas that defecate rickettsiae while sucking blood from its host. This contaminates the bite site and other fresh skin wounds. Occasionally, cases occur following the inhalation of dried infective flea faeces.

Confirmed cases are individuals who have clinically compatible symptoms with either four-fold or greater increase in total antibody titre or *Rickettsia typhi* detected via PCR, immunohistochemistry (IHC) or culture. Suspected cases are individuals who have clinically compatible symptoms with either a positive immunoflorescent antibody test or epidemiological risk factors.

A total of seven suspected cases of murine typhus were reported in 2020, compared to six suspected cases reported in 2019 (Figure 3.19). There were no confirmed cases in both 2019 and 2020.

In 2019, of the six suspected cases, five were indigenous and one was imported (Table 3.37). Two were Singapore residents, and the remaining four were foreign residents. In 2020, all the seven suspected cases were indigenous cases (Table 3.37). One was a Singapore resident and the remaining six cases were foreign residents.

Figure 3.19
Weekly distribution of confirmed and suspected murine typhus cases, 2019-2020

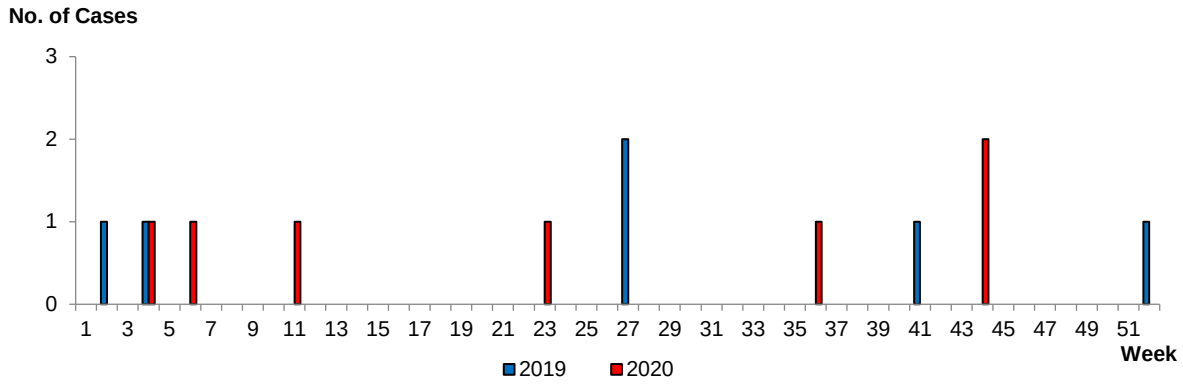


Table 3.37
Total number of notifications* received for confirmed and suspected murine typhus cases, 2016-2020

Age group	2016^		2017		2018#		2019		2020	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
0-4	0	1	0	0	0	0	0	0	0	0
5-14	0	0	3	0	1	1	0	0	0	0
15-24	3	0	1	0	1	0	0	0	0	0
25-34	4	1	5	1	5	0	0	1	4	0
35-44	0	0	1	0	1	0	3	0	2	0
45-54	2	0	1	0	3	2	2	0	0	0
55-64	1	0	0	0	1	0	0	0	0	0
65+	0	0	0	0	0	0	0	0	1	0
Total	**10**	**2**	**11**	**1**	**12**	**3**	**5**	**1**	**7**	**0**

*Excluded tourists and foreigners seeking medical treatment in Singapore.
^Murine typhus was added to the list of notifiable disease on 28 September 2016.
#Case definition was updated w.e.f from 1 January 2018.

In 2019, all the cases were male, and the resident incidence rate was highest for the 35-44 years age group (Table 3.38). In 2020, majority of the cases were male, and the resident incidence rate was highest for the 65-years-old (Table 3.39). In 2019, Singapore residents had the higher incidence rate compared to foreign residents, while foreign residents had the higher incidence rate compared to Singapore residents in 2020 (Tables 3.40 and 3.41).

Table 3.38
Age-sex distribution and age-specific resident incidence rate of reported suspected murine typhus cases, 2019

Age group	Number of notifications				Incidence rate per 100,000 resident population*
	Male	Female	Total	%	
0-4	0	0	0	0	0
5-14	0	0	0	0	0
15-24	0	0	0	0	0
25-34	1	0	1	16.7	0
35-44	3	0	3	50	0.3
45-54	2	0	2	33.3	0
55-64	0	0	0	0	0
65+	0	0	0	0	0
Total	**6**	**0**	**6**	**100**	-

*Rates are based on 2019 estimated mid-year population.
(Source: Singapore Department of Statistics

Table 3.39
Age-sex distribution and age-specific resident incidence rate of reported suspected murine typhus cases, 2020

Age group	Number of notifications				Incidence rate per 100,000 resident population*
	Male	Female	Total	%	
0-4	0	0	0	0	0
5-14	0	0	0	0	0
15-24	0	0	0	0	0
25-34	3	1	4	57.1	0
35-44	2	0	2	28.6	0
45-54	0	0	0	0	0
55-64	0	0	0	0	0
65+	1	0	1	14.3	0.2
Total	**6**	**1**	7	**100**	-

*Rates are based on 2020 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.40
Ethnic-sex distribution and ethnic-specific incidence rate of reported suspected murine typhus cases, 2019

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	0	0	0	0	0
Malay	1	0	1	16.7	0.2
Indian	1	0	1	16.7	0.3
Others	0	0	0	0	0
Foreign residents	4	0	4	66.6	0.2
Total	**6**	**0**	**6**	**100**	**0.1**

*Rates are based on 2019 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.41
Ethnic-sex distribution and ethnic-specific incidence rate of reported suspected murine typhus cases, 2020

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	1	0	1	14.3	0.1
Malay	0	0	0	0	0
Indian	0	0	0	0	0
Others	0	0	0	0	0
Foreign residents	5	1	6	85.7	0.4
Total	**6**	**1**	**7**	**100**	**0.1**

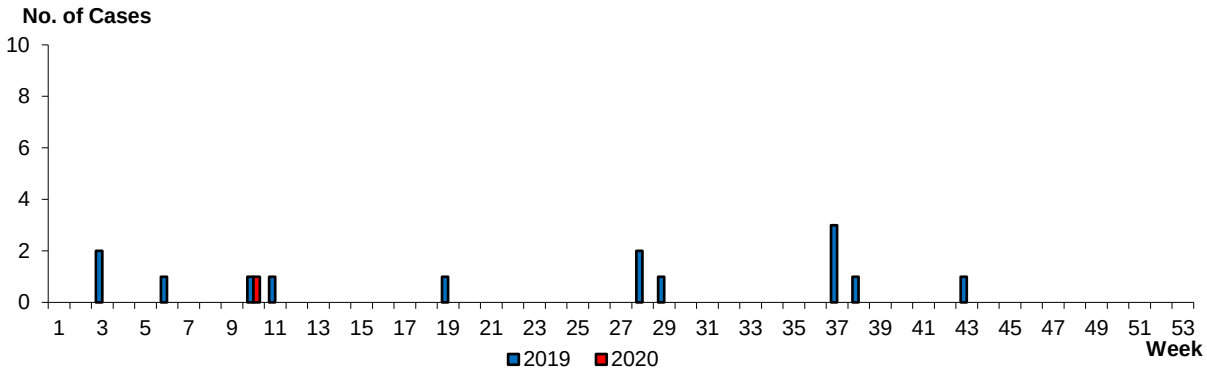
*Rates are based on 2020 estimated mid-year population.
(Source: Singapore Department of Statistics)

ZIKA VIRUS INFECTION

Zika virus infection is transmitted by *Aedes* mosquitoes, similar to dengue. Only about one in five infections are symptomatic. The disease is usually self-limiting, although rarely, serious neurological complications have been reported. The disease is characterised by fever, rashes, joint pain, muscle pain, headache and conjunctivitis. Most symptoms last for four to seven days. The main vector in Singapore is the *Aedes aegypti* mosquito.

One laboratory confirmed case of Zika virus infection was reported in 2020, compared to 14 laboratory confirmed cases in 2019 (Figure 3.20). Of the 14 cases in 2019, 11 were indigenous cases and three were imported cases, involving one Singapore resident and two foreign residents. In 2020, the single case was indigenous.

Figure 3.20
Weekly distribution of reported Zika cases, 2019-2020



In 2019, the 45-54 years age group had the highest incidence rate, while among the three major ethnic groups, Chinese had the highest incidence. (Tables 3.42 and 3.44). There was one Zika cluster in 2019. In 2020, the single case was a male foreign resident in the 35-44 years age group (Tables 3.43 and 3.45).

Table 3.42
Age-sex distribution and age-specific resident incidence rate of indigenous Zika cases^, 2019

Age group	Number of notifications				Incidence rate per 100,000 resident population*
	Male	Female	Total	%	
0-4	0	0	0	0.0	0.0
5-14	0	0	0	0.0	0.0
15-24	2	0	2	18.2	0.4
25-34	1	0	1	9.1	0.2
35-44	0	0	0	0.0	0.0
45-54	2	2	4	36.4	0.7
55-64	2	0	2	18.2	0.3
65+	0	2	2	18.2	0.3
Total	**7**	**4**	**11**	**100**	-

^Cases acquired locally among Singapore and foreign residents.
*Rates are based on 2019 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.43
Age-sex distribution and age-specific resident incidence rate of indigenous Zika cases^, 2020

Age group	Number of notifications				Incidence rate per 100,000 resident population*
	Male	Female	Total	%	
0-4	0	0	0	0	0
5-14	0	0	0	0	0
15-24	0	0	0	0	0
25-34	0	0	0	0	0
35-44	1	0	1	100	0.2
45-54	0	0	0	0	0
55-64	0	0	0	0	0
65+	0	0	0	0	0
Total	**1**	**0**	**1**	**100**	-

^Cases acquired locally among Singapore and foreign residents.
*Rates are based on 2020 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.44
Ethnic-sex distribution and ethnic-specific incidence rate of indigenous Zika cases^, 2019

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	4	4	8	72.7	0.3
Malay	0	0	0	0.0	0
Indian	0	0	0	0.0	0
Others	3	0	3	27.3	2.3
Foreign residents	0	0	0	0.0	0
Total	**7**	**4**	**11**	**100**	**0.2**

^Cases acquired locally among Singapore and foreign residents.
*Rates are based on 2019 estimated mid-year population.
(Source: Singapore Department of Statistics)

Table 3.45
Ethnic-sex distribution and ethnic-specific incidence rate of indigenous Zika cases^, 2020

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	0	0	0	0	0
Malay	0	0	0	0	0
Indian	0	0	0	0	0
Others	0	0	0	0	0
Foreign residents	1	0	1	100	0.06
Total	**1**	**0**	**1**	**100**	**0.0**

^Cases acquired locally among Singapore and foreign residents.
*Rates are based on 2020 estimated mid-year population.
(Source: Singapore Department of Statistics)

There was one zika cluster notified in 2019. The cluster had four cases. The rest of the cases were sporadic cases that did not form a cluster.

Zika Cluster at Hemsley Avenue

On 12 September 2019, the Ministry of Health (MOH) was notified of a locally transmitted Zika case residing at Hemsley Avenue. Within a week, another three cases were notified in the area. Epidemiological investigations and vector control operations were carried out upon the notification of the cases. A total of four cases were reported in the cluster. The cases had symptoms onset dates between 6 September 2019 and 16 September 2019.

All four cases were Singapore residents. Two were working adults and two were students. The male to female ratio was 3:1.

A total of 12 mosquito breeding habitats were detected and destroyed. 58% of the mosquito breeding habitats were detected in residential premises and 42% were found in outdoor areas. Common mosquito breeding habitats detected in the cluster area include drains and domestic containers e.g. pails plastic container, toilet brush holder. Overall the mosquito breeding detected comprised of 67% *Aedes aegypti*, 8.% *Aedes albopitcus,* 17% *Culex quinquefasciatus* and 8% mixed breeding consisting of *Aedes albopictus* and *Culex quinquefasciatus.*