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Provisional findings of dengue epidemiological surveillance in French Polynesia 2006

Introduction

Dengue is present in endemo-epidemic transmission mode throughout the year in French Polynesia (FP), with a seasonal intensity that varies from year to year.

After the 2001 (DEN-1) outbreak, which was responsible for some 33,000 cases in the Society Islands and 800 cases in the other three island groups, French Polynesia experienced a period of low-level endemism from 2002 to 2005. A recrudescence of cases (DEN-1) has occurred since early 2006.

Surveillance methods

Febrile syndrome sentinel surveillance network
This network, in operation since 1997, comprises 15 volunteer doctors from the public and private sectors. Every week, these doctors notify the Health Department's Bureau of Infectious Diseases of any cases of fever seen during consultations. If dengue is suspected, the doctor completes an information form and attaches it to the request for testing. The specific tests performed are covered under an agreement between the Health Department and the Malardé Institute (ILM). The monitoring of suspected cases by sentinel doctors is, however, not very representative, as it is limited to the doctors' catchment areas.

Virological surveillance by the Malardé Institute
The medical testing laboratory (LABM) of ILM is the only one in FP performing dengue virus detection and typing on early specimens (< day 6 of illness). It also centrally processes requests for confirmation coming from the private and public sectors in FP (infirmaries, dispensaries, outlying public hospitals, private laboratories and clinics). The laboratory of FP's Main Hospital performs its own serology, but passes on requests for confirmation on early specimens to ILM.

Until recently, LABM was offering IgM (PanBio) serology for late specimens (≥ day 6 of illness), and direct detection by RT-PCR[i] or by viral isolation for early specimens. Viral isolation has now been discontinued because of the delay in obtaining results, the complicated procedure and the cost. It has recently been replaced by NS1 antigen testing (Bio-Rad). This test makes it possible to perform the dengue diagnosis in a few hours and with very good sensitivity, during the first 4–5 days of illness – in other words, before the appearance of IgM-type antibodies. Because of its easy use, it is now the first-line technique for early diagnosis (< day 6 of illness). The detection of the NS1 antigen is followed by an RT-PCR procedure, because the former test does not permit viral typing.

This diagnostic activity is complemented by scientific work in the medical virology research laboratory (LRVM) of ILM. Downstream, this laboratory takes particular responsibility for the molecular epidemiology of the viruses isolated by LABM. Upstream, it is currently setting up a programme of entomo-virological surveillance, funded by the French overseas ministry.

Surveillance of hospitalised dengue cases
This is performed through the notification of hospitalised cases to the Health Department (Bureau of Infectious Diseases). Such notifications mostly come from the Main Hospital's Paediatrics Department and less frequently from other hospital departments, the two private clinics in Papeete and outlying hospitals.

Case definition
The clinical definition of suspected cases requires at least all of the following:
- high fever (≥ 38.5°C), with sudden onset, since less than 10 days;
- algic syndrome: headaches (retro-orbital pain in particular), arthralgia/myalgia; and
- absence of any other major infectious entry point.

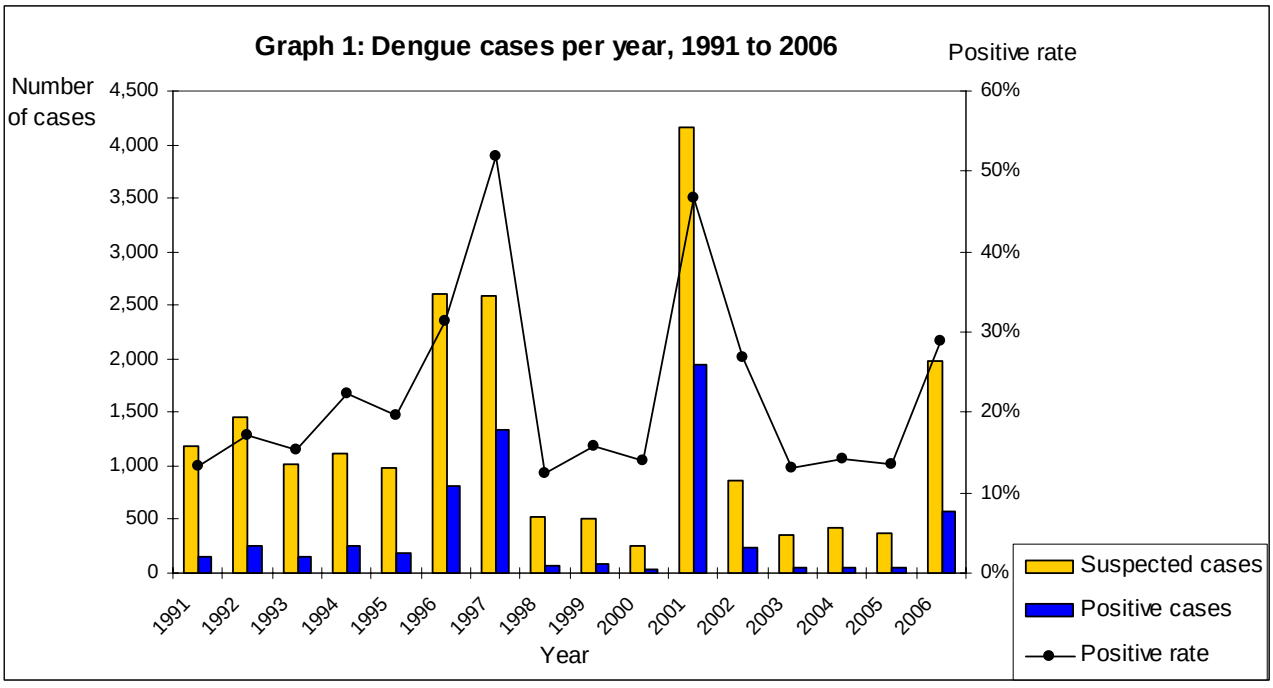
For the purpose of the following analysis, all the patients for whom a request for laboratory dengue testing was made by the consulting physician are considered as suspected cases. Only a few of these test requests came from the sentinel doctor network.

When a positive test result (RT-PCR+, NS1+, viral isolation or IgM+) is obtained, the patient becomes a **positive case**. Positive cases are reported as either **probable** (IgM+ on a single specimen) or **confirmed** (RT-PCR+, NS1+, viral isolation or sero-conversion on two repetitive specimens). Data from the suspected and positive cases are sent in by the laboratories of ILM and the Main Hospital, and are dealt with centrally by the Bureau of Infectious Diseases.

Results and analysis

Evolution in the number of dengue cases from 1991 to 2006

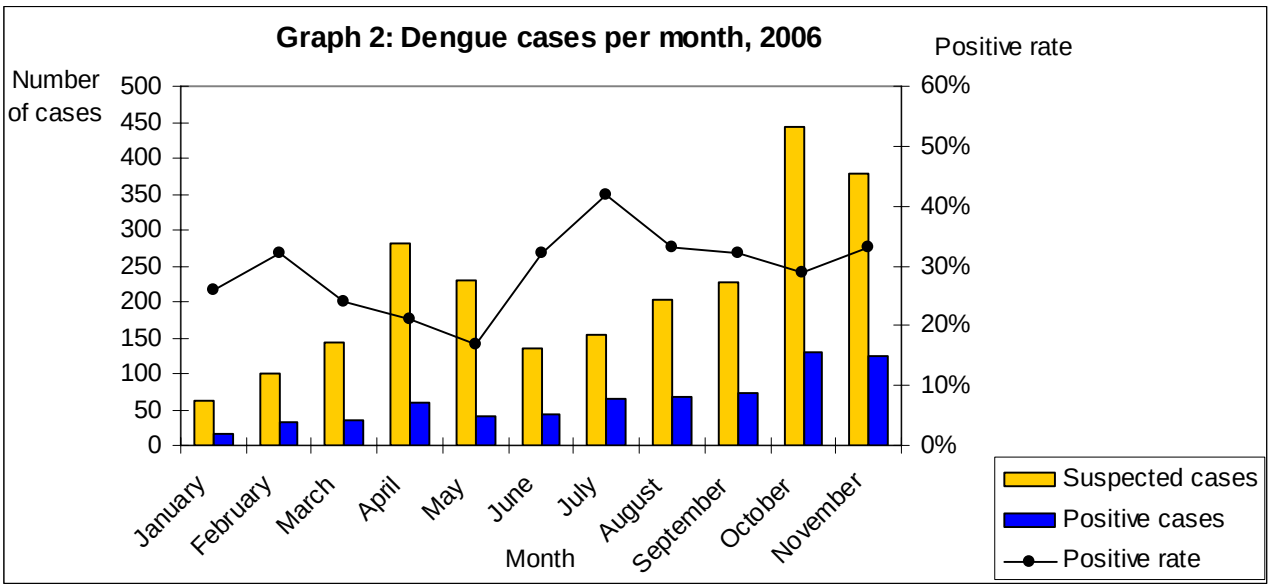
Graph 1: Dengue cases per year, 1991 to 2006



Graph 1 shows that the positive rates are all below 25% during inter-outbreak periods and above 25% during outbreak and peri-outbreak periods: 31% and 52% for 1996 and 1997 (DEN-2 outbreak), 47% and 27% for 2001 and 2002 (DEN-1 outbreak). The provisional positive rate for 2006 is 31%.

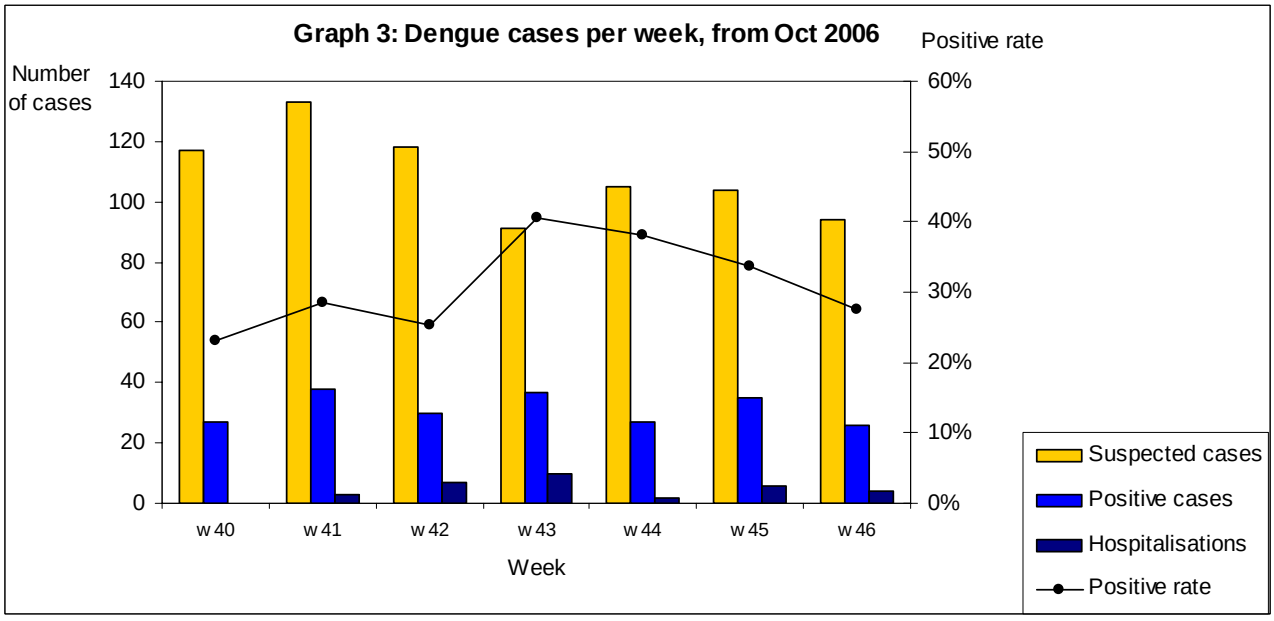
Note that during the 2001 outbreak (DEN-1), 4158 tests were performed and 1942 cases were confirmed. However, as the tests were no longer done systematically during the outbreak period, the total number of cases was estimated at 33,000 in the Society Group and 800 in the other three island groups.

Graph 2 illustrates the monthly transmission of dengue in 2006.



Viral circulation remained high throughout the year, with a recrudescence in July and a positive rate of over 30% after June. The number over 100 of positive dengue cases in the months of October and November can partly be explained by the dengue control committee's decision to place FP on pre-outbreak alert (on the basis of a document entitled *Dengue Outbreak Surveillance, Alert and Management Programme* from Martinique, which we wish to adapt to our setting), which raised awareness among the public and professionals and increased the number of testing requests.

Evolution of the number of weekly cases



A weekly report has been produced since the end of September 2006 (starting date of the pre-alert). It shows a relatively stable number of weekly cases, with 25–35 positive dengue cases per week and a positive rate stabilising around the high level of 30% (see Graph 3).

Weekly monitoring of dengue cases has been performed since the beginning of the outbreak pre-alert. At this time the surveillance of hospitalised cases was reactivated and the hospitalisation data gathered were included in this graph, but these are not sufficiently reliable for the preceding period and thus are not shown in the other graphs.

Geographical origin of cases

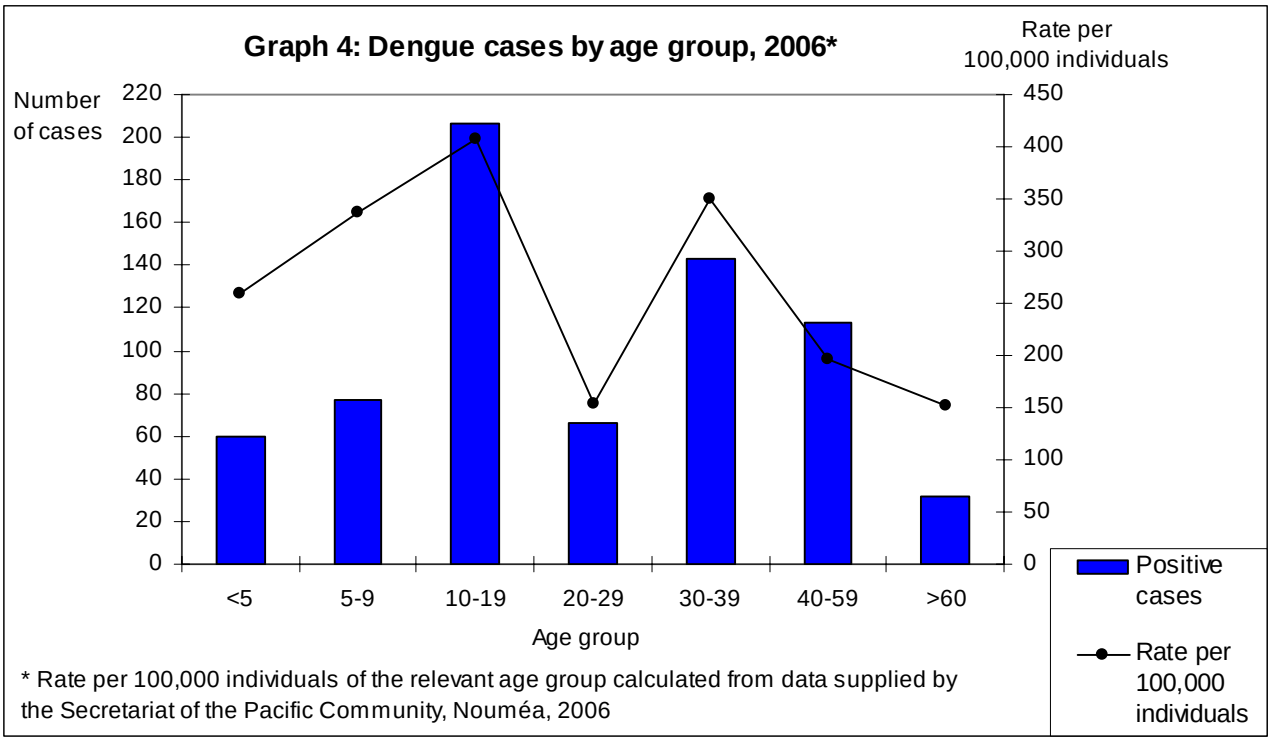
Figure 1: Geographical origin of cases

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	**TOTAL**	Total number of cases per 100,000 population*
Windward Islands (Iles du Vent)	**12**	**19**	**11**	**26**	**21**	**25**	**40**	**46**	**52**	**102**	**76**	**430**	**234**
TAHITI	10	9	8	22	20	25	36	43	51	98	71	393	232
MOOREA	2	10	3	4	1	0	4	3	1	4	5	37	256
Leeward Islands (Iles sous le Vent)	**)0**	**1**	**6**	**2**	**2**	**4**	**3**	**3**	**7**	**13**	**5**	**46**	**152**
HUAHINE	0	0	0	1	0	1	0	1	0	0	0	3	52
RAIATEA	0	0	2	1	1	3	2	1	3	4	2	19	170
TAHAA	0	0	0	0	0	0	0	1	0	0	0	1	21
BORABORA	**0**	1	4	0	1	0	0	1	4	9	3	23	311
MAUPITI	0	0	0	0	0	0	0	0	0	0	0	0	0
AUSTRALS (AUSTRALES)	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**2**	**1**	**5**	**79**
TUAMOTU-GAMBIER	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**3**	**19**
MARQUESAS (MARQUISES)	0	1	0	0	0	0	0	0	0	0	0	**1**	**12**
UNDETERMINED	**1**	**7**	**8**	**20**	**10**	**0**	**2**	**1**	**0**	**10**	**3**	**62**	**-**

* Rate calculated per 100,000 individuals per island group from the 2006 demographic data of the Institut de Statistiques de la Polynésie Française (ISPF)

Figure 1 shows that the majority of positive cases come from the Leeward Islands, where 75% of the population of PF is concentrated. All the municipal areas of Tahiti are affected. We did not analyse the socio-cultural affiliations of the positive cases, but it is nevertheless clear that the population of newcomers from mainland France (teachers, gendarmes, military) is proportionally most affected. Bora Bora, the entry point into FP for the majority of tourists and where the 2001 outbreak began, is subject to particularly close surveillance.

Distribution by age group



All age groups are affected, which would appear to correspond to a partial renewal of the population (see Graph 4). The most recent outbreaks of DEN-1 occurred in 1975, 1989 and 2001. We have no explanation for the relatively low attack rate in the age group 20–29 years.

Virological data

Of the 1919 requests for virological confirmation of dengue performed by LABM between 1 January and 30 November 2006, 595 (31%) were positive. Of these, 458 specimens were considered as confirmed cases because they tested positive under RT-PCR, NS1 antigen testing or viral isolation. All these sera were then typed and only the DEN-1 serotype was isolated.

A preliminary study on the sequencing of the *env* gene concerning some of the viruses isolated in 2006 was performed by LRVM. It suggested that the virus had not changed much since 2001. Phylogenetic analysis showed a variation of only 0.6% in the *env* gene and classified the viral isolates of 2001 and 2006 within the same genotype (IV).

Prevention activities

In French Polynesia, the Centre for Hygiene and Public Sanitation (CHSP) is responsible for vector control but does not yet have any counterparts at the municipal level. Municipal councils have no mosquito control operatives and are not involved in mosquito control. The CHSP vector control operation has very limited human resources (five vector control staff) and equipment, although recently some further insecticide treatment equipment has been supplied to CHSP under a state–country agreement.

The vector control strategy in outbreak periods is to eliminate breeding sites on a community collaboration basis, and this is being introduced in two pilot municipalities (Faa'a and Papeete) with specific larval control work in areas where the risk of transmission is high. Chemical control by the spraying of insecticide aerosols targeting adult mosquitoes is reserved for specific case clusters and peri-focal control when there is the emergence of a new serotype.

During early outbreak and outbreak periods, the control strategy is chemical control in the most affected neighbourhoods.

The vector control action after the detection of resurgence of Type 1 cases in September 2006 can be described as follows:

- visits to homes and institutions in connection with clusters of confirmed cases to identify and destroy breeding sites. The visits are accompanied by awareness campaigns for the destruction of *Aedes* breeding sites in the areas concerned; and
- in some cases, small-scale neighbourhood treatment using adulticides applied in 'ultra-low-volumes' (ULV). The treatments are carried out after giving the population in these neighbourhoods prior warning with the support of municipal communication officers.

Conclusion

The Type 1 virus that has been circulating in French Polynesia since the 2001 epidemic and that kept a low profile over the 2002–2005 period has caused a surge in the number of cases since the beginning of 2006. In the absence, therefore, of the introduction of a new serotype, we are witnessing a recrudescence in DEN-1 (genotype IV), which has been in circulation for five years. The current situation is particularly favourable to the establishment of another serotype.

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[i] Lanciotti et al. 1992. Rapid detection and typing of dengue viruses from clinical samples by using reverse transcriptase-polymerase chain reaction. Journal of Clinical Microbiology 30(3):545–551.