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Syndromic surveillance in French Polynesia

Introduction

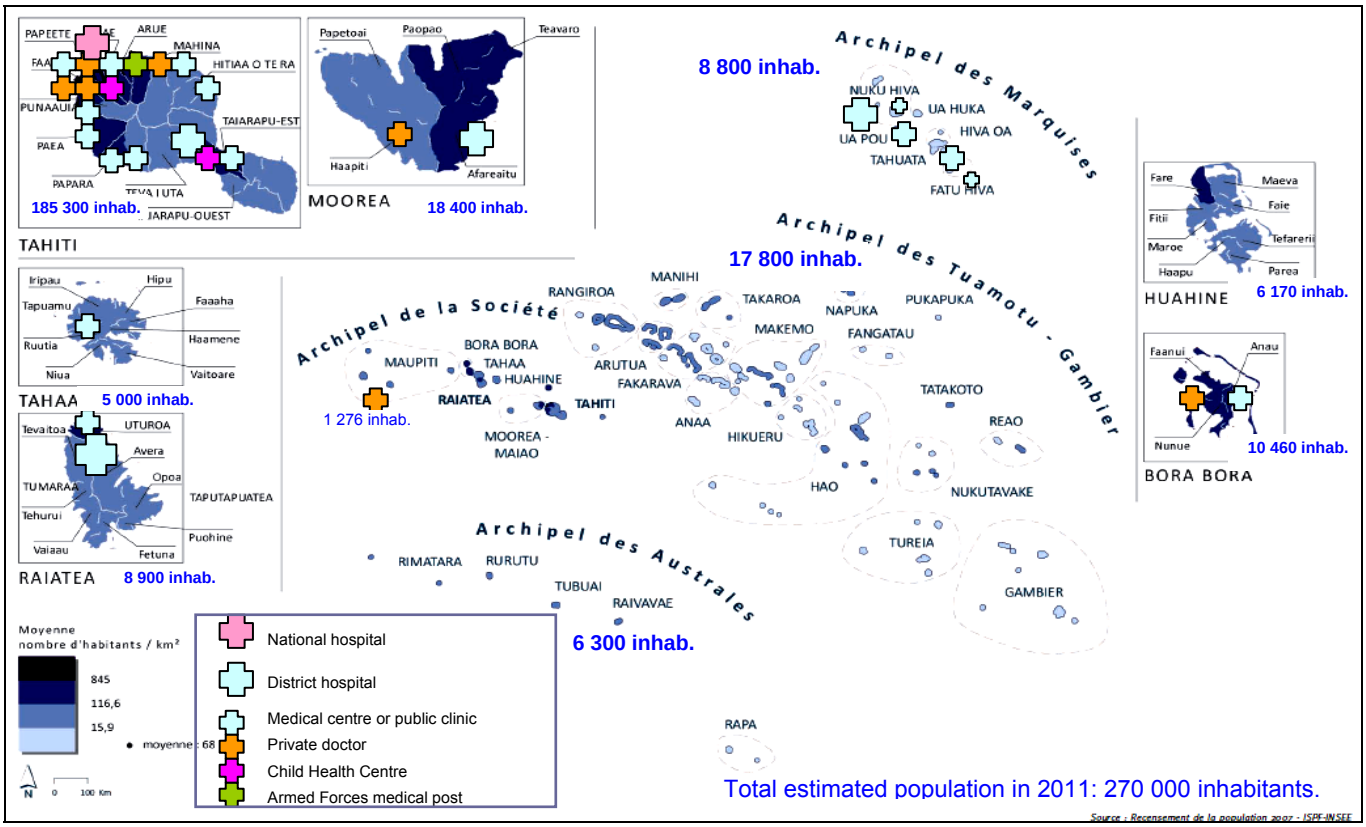
Syndromic surveillance is defined by the Centers for Disease Control and Prevention as 'an investigational approach where health department staff, assisted by automated data acquisition and generation of statistical signals, monitor disease indicators continually (real-time) or at least daily (near real-time) to detect outbreaks of diseases earlier and more completely than might otherwise be possible with traditional public health methods'**.** This paper presents the current syndromic surveillance mechanism in French Polynesia, which is based on the participation of numerous sentinel sites, the results it has provided, and prospects for developing it.

This mechanism allows us to contribute to the regional weekly syndromic surveillance system and exchange epidemiological surveillance information with our colleagues and partners in other Pacific Island countries and territories (PICTs) on a regular basis.

The expected **scientific objectives** of such a system are:
- detecting unexpected health events;
- estimating the impact of environmental or societal events;
- early detection of specific health events, such as seasonal outbreaks, in order to measure their impact and consequences;
- monitoring diseases outside specific events.

The **target population** is all the inhabitants of five island groups in French Polynesia, i.e. some 270,000 people, spread out over 3521 sq km. Travellers and visitors are also included in the surveillance system. Two island groups are not currently covered, i.e. the Tuamotu-Gambier and Austral groups, but they only have some 24,000 inhabitants, i.e. 8.8% of French Polynesia's population. The distribution of active sentinel sites is shown in Map 1.

Map 1 – French Polynesia: population densities and syndromic surveillance sentinel sites



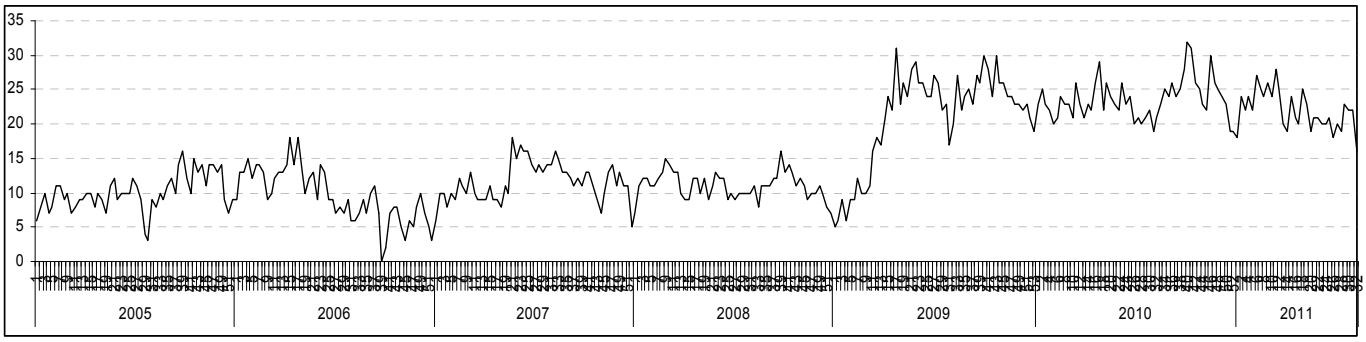
Methods and results

- ***Sentinel doctor network***

The febrile-syndrome sentinel surveillance network was created in December 1997 at the French Polynesia Health Department, using volunteer general practitioners from the public and private sectors to provide early warning about outbreaks (influenza, dengue fever, measles) and monitor outbreak dynamics. It was revised in 1999 to make warnings more specific and improve feedback, and revised again in 2007, following recommendations from specialists at the French National Health Surveillance Office (*Institut de veille sanitaire français*).

In 2009, the arrival of a lead physician from the Health Surveillance Office and an epidemiologist helped revive the network and improve its effectiveness. Greater awareness among doctors and enrolment of new practitioners improved geographic coverage, particularly in the Society Islands group, which is home to 88% of French Polynesia's population. The private sector is also better covered, although its numbers are still too low (eight out of about 120 general practitioners) since it is difficult to motivate these doctors and ensure their regular participation, even though they serve a large population that is often quite different from that served by the public system. On the other hand, most of the Health Department's medical clinics do take part (18 out of about 27), noting that the public sector is the only source of medical care available in three island groups, i.e. Marquesas, Austral and Tuamotu-Gambier. From the time the network was reactivated during Week 11-2009 through to Week 32-2011, the average total number of doctors responding each week was 23 (Figure 1).

Figure 1 – Weekly number of doctors participating in the sentinel network from W1-2005 to W32-2011



In practice, at the beginning of each week, each sentinel doctor sends the Health Surveillance Office, by fax or email, an aggregate surveillance data collection sheet covering the previous week.
Four syndromes are monitored on an on-going basis, differentiating between the < 4 years old ≥ 4 years old age groups. They correspond to precise case definitions:

- **Fever** (other than dengue fever and influenza): high fever (> 38°C) for more than three days, with no obvious cause;
- **Dengue-like syndrome**: sudden onset of high fever (≥ 38.5°C) for less than eight days, accompanied by a pain syndrome, i.e. headaches, joint or muscle pain, with no entry point for an infection (particularly respiratory);
- **Influenza-like illness (ILI)**: sudden onset of high fever (≥ 38.5°C) together with muscle pain or fatigue and respiratory or ENT symptoms;
- **Diarrhoea**: at least three liquid or soft stools per day, for less than 14 days, leading to a visit to the doctor.

Since August 2011, the **male urethritis** syndrome, i.e. recent appearance of dysuria and/or recent purulent, mucopurulent or mucoid urethral discharge, was added in order to have an indicator for sexually transmitted infections.

This report is supposed to be submitted, even when there are no cases, and includes the total number of patients seen that week, as well as any other syndromes when necessary, e.g. conjunctivitis, bronchiolitis. The data are entered and then analysed by the Health Surveillance Office each week using an Excel monitoring chart.

The indicator used is the average weekly number of cases per syndrome per sentinel site. This sentinel surveillance system is particularly well adapted to outbreak-prone seasonal illnesses likely to cause a large number of cases, particularly dengue fever and influenza.

- ***Hospital emergency ward network***

The hospital emergency wards in French Polynesia (one reference hospital and three outlying hospitals) also take part in the syndromic surveillance system.

In 2008, 38,000 patients (90% residing in Tahiti) were seen at the emergency ward of the French Polynesia Hospital (CHPf), including 7900 who were hospitalised. Since 2005, virtually all these visits are categorised by codes using the International Classification of Diseases (ICM10) in real time by the CHPf's Medical Information Office (SIM). A singe code is used for each visit, corresponding to the main diagnosis issued during that visit.

The weekly data for six diagnoses are extracted and sent to the Health Surveillance Office by the SIM, i.e. suspected cases of dengue fever (code ICM10 A90-A91), ILI (J11), isolated fever (R509), diarrhoea (A02 to A09), male urethritis (N34) and ciguatera (T610). Clinical diagnosis takes into account simple laboratory tests carried out immediately, particularly the full blood count. So, although dengue fever is a clinical diagnosis without absolute virogical proof, it has a solid basis. Isolated fever is, in principle, a default diagnosis, i.e. when there is no indication of dengue fever or influenza.

Since 2009, the emergency wards of the Health Department's three outlying hospitals — Taravao (Tahiti Iti), Uturoa (Raiatea, Leeward Islands) and Taiohae (Nuku-Hiva, Marquesas) hospitals — have also been taking part in this surveillance, but they use the same syndrome definitions as the sentinel doctors (as ICM 10 coding is not used in these facilities).

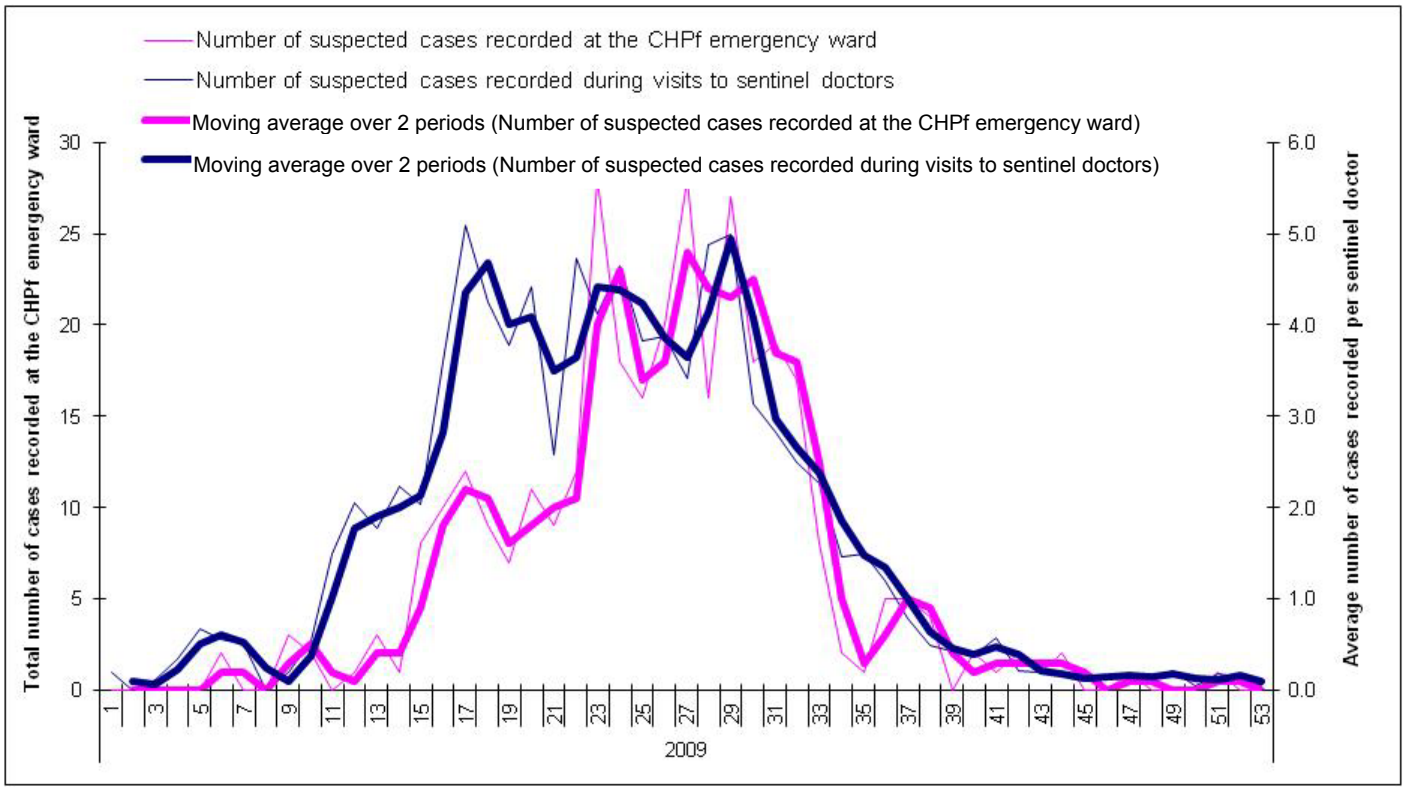
The total weekly number of visits to the emergency wards of the four hospitals is also recorded by the Health Surveillance Office.

- ***Using syndromic surveillance to detect outbreaks***

Dengue 4 outbreak in 2009 (Figure 2)

The last time the DEN-4 serotype had caused an outbreak in French Polynesia, as in other PICTs, was in 1979–1980. It reappeared in the region in 2008 and began to affect several PICTs. In May 2009, surveillance by the laboratory network detected the first two endemic cases in Tahiti and therefore alerted the participants of the dengue-fever syndromic surveillance system (sentinel network, emergency ward network). While the very first imported cases were later identified retrospectively as having been introduced in February 2009, the sentinel doctor network made it possible to rapidly detect the beginning of the outbreak and then to follow its spread in the Leeward Island group (Bora-Bora, Tahaa), then on Tahiti, and gradually to the rest of the islands and groups.
At the CHPf emergency ward, the weekly number of visits reported for suspected cases of dengue fever contributed, along with the sentinel doctor network, to proactive monitoring of this outbreak. (However, this indicator did not make it possible to detect the beginning of the outbreak as early [Figure 2]).

Figure 2 – Dynamics of the DEN-4 outbreak in French Polynesia in 2009



Following that outbreak, an outbreak threshold was formulated, using emergency ward surveillance data. If there are more than five visits for suspected cases of dengue fever per week, an outbreak alert is considered. Retrospectively, this threshold was exceeded in Week 15-2009 (eight cases). For the sentinel network, a significant increase in the number of cases was noted in Week 11.

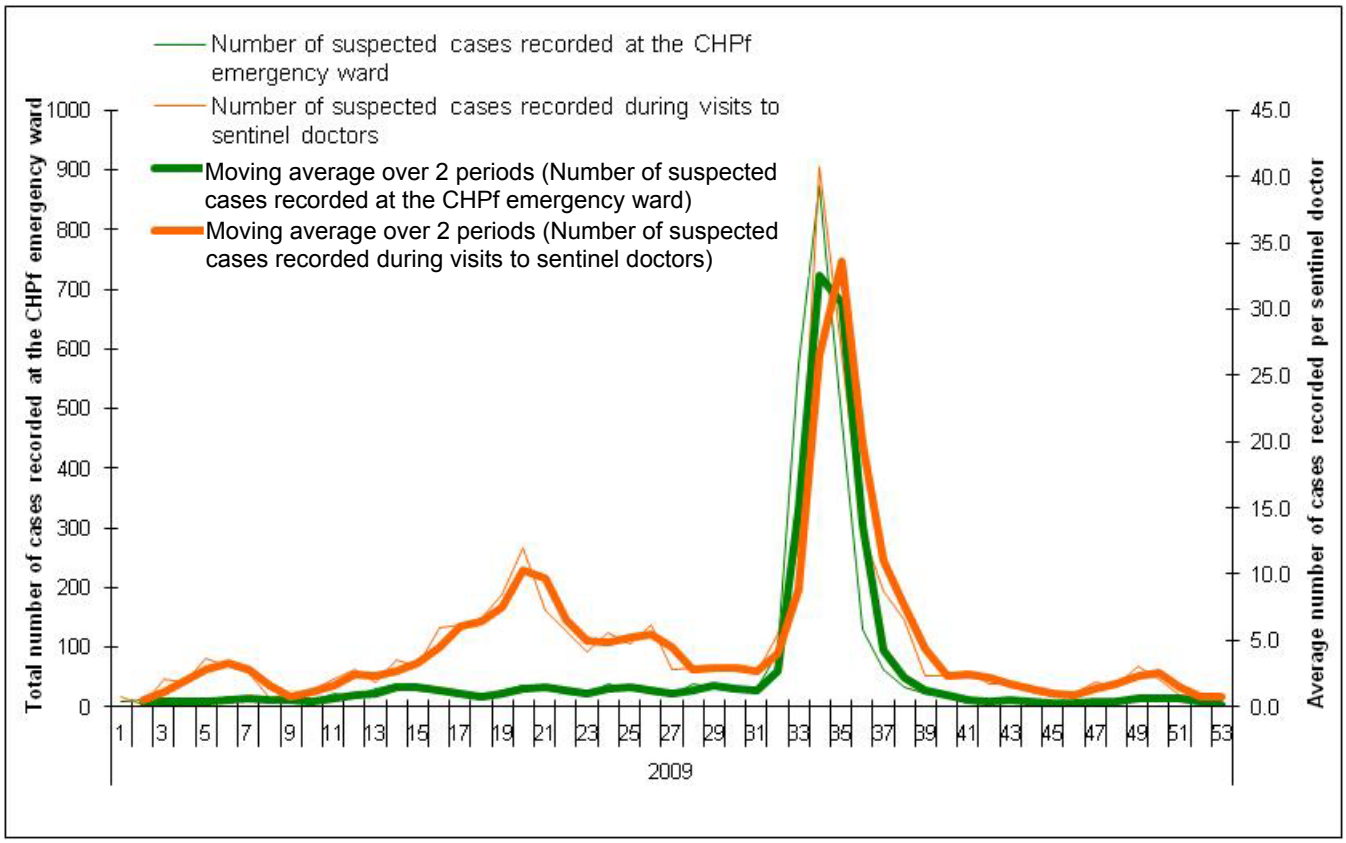
Influenza A (H1N1) outbreak in 2009 (Figure 3)

Increased participation by health professionals in surveillance networks during the Dengue 4 outbreak in 2009 led to the network rapidly detecting the Influenza A (H1N1) that followed.

The first confirmed case of H1N1 in FP, which was imported from the United States, was recorded on 2 June (fever detected by thermal imaging camera at the airport) in Week 23. The first clustered cases were detected via reports from doctors in Week 29 and involved young people returning from language-study trips, particularly from New Zealand.

In Week 30, six of the sentinel network sites were selected to take samples in suspected cases and, in that way, detect transmission of the virus in the Territory. Local transmission was revealed via the network in Week 34, i.e. three weeks after the virus began being transmitted in the population and one week after the new school year began. A rapid decrease in the number of cases was observed over the following four weeks and the end of the outbreak was confirmed in Week 39.

Figure 3 - Dynamics of the influenza A (H1N1) outbreak in French Polynesia in 2009



- ***Feedback***

It is important to show the value of the surveillance data collected, so the Health Surveillance Office provides feedback each week to all surveillance system participants and to institutional and international partners. It is presented in the form of a three-page automated newsletter. The newsletter was created in 2009 when the Health Surveillance Office was strengthened, first in the form of one newsletter for each disease and then, in 2010, one newsletter on all the data collected.

Conclusion and prospects

Over a period of several years, various sources of data, each independent from the others, have been used to gradually build an infectious disease surveillance network for all of French Polynesia. The complex nature of this network arises from the large number of data sources, indicators and means of transmitting the data collected (Table 1).

Syndromic surveillance itself is based on several networks, i.e. the private sentinel doctor network, public clinic doctors, the emergency wards of the outlying hospitals and the national hospital's emergency ward. While these arrangements are obviously more complex and difficult to manage, they have improved the data's representativeness against the background of a territory that is spread out over a large number of island groups. In addition, as health care differs between the various structures, the sentinel doctor network is often more sensitive than the major hospital network.

Table 1 – Epidemiological surveillance mechanism of infectious diseases in French Polynesia

Data sources	Geographic zone	Number of units	Type of data	Time unit	Variables collected	Syndromes or diseases	Transmission channel
Sentinel doctors	All of FP	23	Aggregate	Weekly	Number of clinically suspected cases	ILLI Dengue-like syndrome Diarrhoea Fever Male urethritis	Fax, email
Hospitals	Tahiti Nui and Iti, Raiatea, Nuku Hiva	4	Aggregate	Weekly	Number of emergency ward visits	ILI Dengue-like syndrome Diarrhoea Fever Male urethritis Ciguatera	Email
Public and private lab network	Tahiti	5	Individual and aggregate	Weekly and quarterly	Number of laboratory confirmed cases	Dengue Influenza Chikungunya Filariasis Leptospirosis Adenovirus, rotavirus Chlamydiae Tuberculosis Gonorrhoea Trichomoniasis Salmonellosis Campylobacter Shigellosis	Email
Notifiable disease reports	All of FP		Individual	As needed	Number of cases	Tuberculosis HIV/AIDS Hospitalised dengue Leptospirosis Meningitis ARF	Fax, email or phone

In 2011, as part of the French Government/French Polynesia project contracts, the Health Monitoring Office suggested collaborating with a company (a partner of the Health Surveillance Office in France) in order to develop a dedicated information system for infectious disease surveillance in French Polynesia. This platform will make it possible to improve reaction time and trigger earlier alerts while optimising the resources needed for its operations, since the Health Surveillance Office recently had its human resources reduced. The specific objectives of this information system are 1) to optimise the process of collecting, transmitting and entering data, along with the data processing, analysis and editing stages and, 2) to improve linkages between health surveillance and epidemiological surveillance partners in French Polynesia.

This syndromic surveillance system will then have to be evaluated on the basis of well-defined criteria, such as those of the CDC of Atlanta, with nine criteria given in the guidelines for evaluating health surveillance systems: simplicity, flexibility, stability, data quality, sensitivity, predictive value positive, representativeness, reactivity and acceptability.

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