

# Annual Report 2006

French Institute for Public Health Surveillance

Surveillance, alert, and prevention

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# Annual Report 2006

French Institute for Public Health Surveillance

# 2006 was a key year for the French Institute for Public Health Surveillance (InVS) and more broadly for health surveillance and alerts. We can draw three main lessons from it.

## 1. Connect health surveillance and scientific research

Chikungunya burst into an epidemic in Réunion and Mayotte in the first weeks of 2006. It is an emerging disease, but not a new one: its virus was discovered in Africa more than 50 years ago. Epidemics had been described in Africa and Asia but none as extensive or severe as the one in Réunion. The regional epidemiology unit (CIRE) for Réunion and Mayotte and the InVS detected and reported the chikungunya outbreak in April 2005 and followed it closely throughout that year. The epidemic exploded at the end of December and peaked in February 2006.

It is no longer sufficient to identify risks; we must be able to estimate the scale of their possible consequences. The lesson we learnt from this crisis is that it is essential to connect health surveillance and research if we are to improve our ability to anticipate not only specific risks to come, but also their health and social consequences. Recognising this lesson, the Prime Minister decided to create a research and science watch center devoted to the emerging infectious diseases of the Indian Ocean. This response furthers the objectives of InVS: the connection of surveillance and research—epidemiologic but also virologic, bacteriological, immunological, therapeutic, entomological, and ecological. The research must examine the health risks affecting humans and animals, fauna and flora—the indissociable world of living things. Protection of its future requires risk analyses conducted cooperatively between all these disciplines.

## 2. Highlight the importance of alert response planning

The second remarkable event of 2006 was the July heat wave. Its strength can be seen especially in the high temperatures of both daytime highs and nighttime lows, its duration—almost 20 days, and its geographic extent (60 districts with alerts declared). Météo-France (the official weather service) labeled it second only to the 2003 heat wave, the worst ever recorded in France. Real health consequences could be measured, excess mortality in particular: There were almost 2000 deaths more than in a normal July.

Analyses of historic data conducted together with the National Institute for Health and Medical Research (INSERM) (Unit 754, Pr Denis Hémon) showed that the scale and duration of this heat wave would have resulted in three times more excess deaths in earlier years. The existence of the heat wave plan, the information provided to citizens, the preventive behaviors they adopted, and

the alert sounded by the health surveillance system probably saved 4000 lives. Further progress is still necessary because the climate and environmental changes that are developing will generate other threats: our tomorrows remain full of uncertainty and "foreseeing the unforeseeable" is still a risky exercise. The threat of H5N1 travels with migratory birds and international trade—legal or not. Avian outbreaks and human cases were tracked through 2006. There was an alert in France, where one chicken farm was contaminated, and domestic avian outbreaks in other European countries. InVS has worked to model these risks to provide evidence on which decisions can be made about, for example, drug supplies and diverse prevention resources. The threat remains real. We continue to prepare actively for it.

## 3. Support the overseas districts and territories (DOM-TOM) as a priority

Health surveillance must identify the most important risks to the health of the most vulnerable and most exposed groups: those who are far from surveillance and health care systems. The populations of the DOM-TOM meet that definition and are a real priority. We devoted our annual Science Meetings to them in 2006. We are reinforcing our surveillance systems and the overseas regional epidemiology units in 2007.

The reduction of territorial health inequalities must be measured by monitoring risk indicators, a task to which InVS can make very diversified contributions. These risks are infectious, environmental, nutritional, and occupational.

Healthcare professionals—those in hospitals and in private practice, schools, maternal and child protection programs, in the workplace, across regional networks, and in regional public health programs: all must contribute to the surveillance of population health.

This surveillance makes it possible to provide expertise about these risks, and its quality and transparency are the guarantee of our credibility to policy-makers and citizens, whose demands in the field of risk measurement and management continue to increase.

This joint commitment is made by the health and safety agencies whose mission is to protect and improve population health.

*Pr Gilles Brückner  
Executive Director, French Institute  
for Public Health Surveillance*



# Chikungunya in 2006: the crisis and its lessons

## THE CRISIS

### What happened in Réunion?

#### **The first phase of the epidemic, March-December 2005: alert function performed**

On 17 March 2005, before the first chikungunya cases in Réunion, InVS launched an alert about the risk to the French territories in the Indian Ocean, based on information from Comoros and from the World Health Organization (WHO).

Between March and April 2005, a special monitoring system was established to collect information from physicians, hospitals and medical laboratories in Réunion and from sentinel physicians from the dengue-influenza network. At the same time, the regional health and welfare bureau (DRASS) of Réunion intensified vector control and amplified information for travelers.

The first imported case was confirmed by a laboratory at the end of April, followed in early May by three native cases. These led to intensified monitoring by a surveillance system coordinated by the regional epidemiology bureau. It depended on a combination of case reports (confirmed cases reported by medical laboratories, suspected cases by physicians, community workers, and from July 2005 onwards, by individuals themselves) and active and retrospective case-seeking around reported cases by the DRASS vector control team as part of their mosquito eradication activities.

The system provided precise surveillance of the epidemic by counting the number of cases and analyzing their time course and geographic extension in order to guide anti-epidemic measures.

#### **The increasing burden of the crisis**

- First serious cases reported in October 2005

At the end of September came the first reports of atypical and of serious cases and of mother-infant vertical transmission.

The system was therefore expanded to include surveillance of serious or emerging hospital cases associated with chikungunya, based initially on reporting by hospital staff physicians.

At the same time, mortality surveillance began, initially by an analysis of death certificates.

- Epidemic explosion of unexpected intensity, December 2005-February 2006

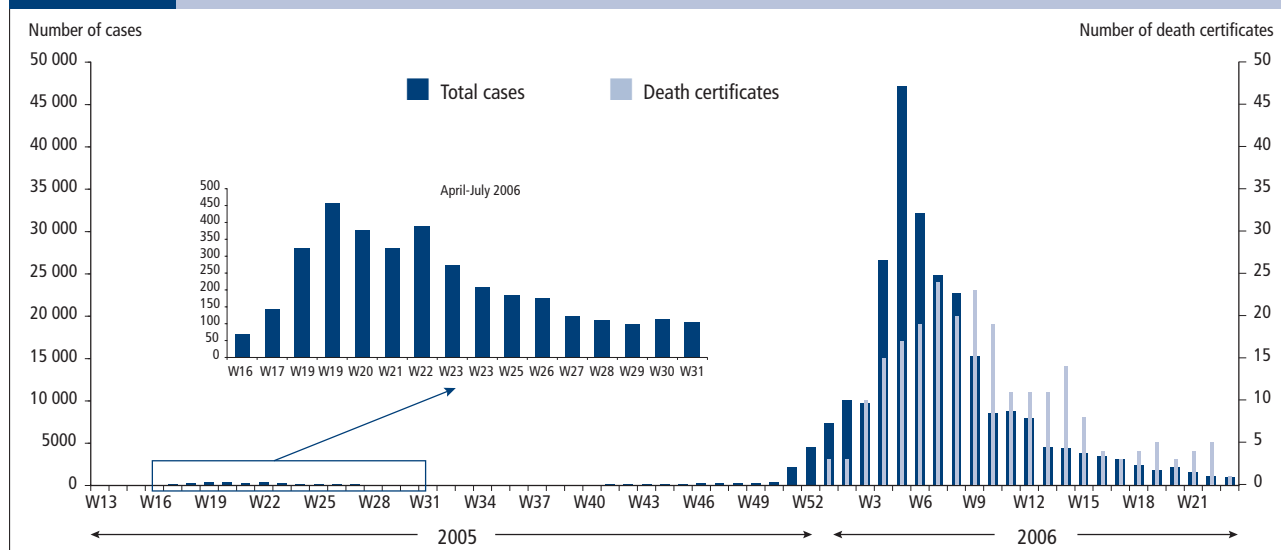
The epidemic began a dramatic acceleration on 19 December 2005. At the end of December, the number of weekly cases jumped from less than 400 to more than 2000. Strategies of surveillance and vector control had to be reviewed. Active case-seeking around each case was no longer possible, and the mosquito eradication activity became more systematic geographically. The objective of surveillance then turned towards comprehensive monitoring of the epidemic. It relied, on the one hand, on the sentinel physician network, and on the other, on the follow-up of other indicators, including but not limited to sick-leaves, hospitalization, and mortality. The change from one system to another entailed some communication problems. The media pointed out the disorganisation, and public confidence in institutional communication eroded still further.

#### **A surveillance system appropriate for monitoring the epidemic and estimating its impact**

Satisfactory epidemic monitoring was nonetheless possible, by weekly estimates of the total number of cases, based on the cases reported by the sentinel network. Comparison with other indicators collected regularly by the CIRE provided internal validation of the results.

FIGURE 1

CHIKUNGUNYA IN RÉUNION, MARCH 2005 – JUNE 2006



The epidemic peaked in early February 2006. Overall, between March 2005 and June 2006, the surveillance system estimated that almost 266 000 people (about 35% of the population) had a clinical form of chikungunya in Réunion (figure 1). In 2006, the regional health bureau processed 254 death certificates that mentioned chikungunya as a cause of death, compared with none in 2005.

At the same time, InVS epidemiologists conducted active case-finding for the emerging hospital forms (involving effects other than the simple combination of fever and joint pain), identifying 878 cases of emerging forms of chikungunya, including 44 maternal-neonatal, 224 pediatric and 610 adult cases. Digestive or cardiovascular involvement was observed most frequently. Overall, 222 hospitalized adults required artificial support of at least one vital function and 11% (65) died.

Finally, mortality surveillance showed that the total number of deaths on the island increased with the epidemic peak. That is, observed mortality was significantly higher than expected for

February (+33%) and March (+25%). This was no longer the case in April (+10%, not statistically significant) or May (+0%). Since June 2006, it has been lower than expected.

Several subsequent population-based surveys confirmed the validity of the surveillance system: 1) an IPSOS survey in February 2006 to estimate the number of people who developed the disease, 2) a seroprevalence survey of 780 pregnant women during the same period, 3) a general population-based seroprevalence study by INSERM of more than 2000 people between August and October 2006, after the end of the epidemic. For each of these study periods, the results of the different studies (see table) were very similar to the data that the surveillance system collected and analyzed continuously and diffused each week.

The decrease in the number of new cases made it possible to return to an exhaustive surveillance system and more targeted mosquito eradication in July 2006.

TABLE

COMPARISON OF THE CHIKUNGUNYA ATTACK RATES DETERMINED BY ONGOING SURVEILLANCE (CIRE/INVS) AND BY SUBSEQUENT STUDIES

Survey	Type of study	Date	Results	Surveillance data
IPSOS	Questionnaire	FEB/06	19.5%	20%
INSERM	Seroprevalence	FEB/06	19%	20%
INSERM	Seroprevalence (questionnaire)	AUGUST- OCT/06	38% (32%*)	34%

\* In brackets: percentage of "clinical" cases, obtained by subtracting the percentage of asymptomatic subjects (who reported no symptoms but had antibodies).

## What happened in Mayotte?

The first cases were reported in Mayotte in April 2005, and the initial epidemic phase ended in June 2005. During this period, the surveillance system set up by the health and social services

(DASS) of Mayotte identified 73 suspected cases. A second epidemic wave began in January 2006 and peaked in mid-March. Over the entire epidemic period, physicians of Mayotte reported 7290 suspected or confirmed cases.

Because of the low rate at which patients sought medical care, this system allowed us to follow the epidemic course but did not reflect at all the real scale of the epidemic. It had to be completed by population-based studies with and without serologic antibody assays. Analysis of serum sampled from pregnant women in October 2005 and in April 2006 showed that between the two periods, the percentage of women who had had the disease rose from 2.5 to 25%.

A survey carried out in May 2006 by InVS, in cooperation with the CIRE, estimated that one quarter of the 170 000 inhabitants reported symptoms compatible with chikungunya. An InVS survey with a blood sample at the end of 2006 showed that 38% had been infected by the virus and that among them one quarter reported that they had not had chikungunya. Therefore, they can be considered asymptomatic.

### What happened in the West Indies?

Both the exchanges between Réunion and the French districts in America and the presence of the *Aedes* mosquito in these areas made the introduction of the virus possible there. Measures implemented once the first imported case was reported in February 2006 were described in a plan<sup>1</sup> with four components:

- encouragement for travelers to report that they had visited an area at risk
- early reporting by all healthcare professionals of suspected and confirmed cases
- systematic intervention by mosquito eradication workers at the home of travelers and cases and reinforcement of mosquito eradication activities, particularly antilarval (communication towards general public, municipal interventions, etc.)
- prevention of transmission in hospitals.

Once the Indian Ocean epidemic began, nine imported chikungunya cases were identified in the French districts in America: three in Martinique, three in Guadeloupe, and three in Guyana. They remained isolated and did not lead to any secondary transmission.

### What happened in metropolitan France?

Neither the geography nor the climate of Europe is similar to those of the overseas districts. Nonetheless, the main virus vector in Réunion, the *Aedes albopictus* mosquito, has been found in several metropolitan districts, especially along the Mediterranean coast and in Haute-Corse (upper Corsica). Given that nearly 300 000 tourists from metropolitan France visit Réunion each year, the imported chikungunya cases must be quantified for assessment of the potential risk of autochthonous transmission in mainland France.

Each month since the beginning of the epidemic in the Indian Ocean, InVS has extracted data from the database of four laboratories that diagnose chikungunya in metropolitan France. Between 1 April 2005 and 30 November 2006, there were

869 cases of chikungunya diagnosed here. The peak in February-March 2006 matched the epidemic peak in Réunion. Except for one case of contamination associated with a healthcare procedure, no case of native chikungunya transmission has been reported in metropolitan France.

The Minister of Health ordered that chikungunya be added to the mandatory reporting list in July 2006, with a reinforced reporting system in Alpes-Maritimes and Corsica as well as in the French West Indies and Guyana.

## LESSONS AND PERSPECTIVES

### Extent of the risk associated with arboviruses in the DOM-TOM

The chikungunya epidemic brutally reminded us that arboviruses are a developing health risk in overseas France because of their potential emergence or extension to new territories or the appearance of still more threatening forms.

### Strategic role of the overseas CIRE in health alerts

The epidemic underlined the key role of the overseas regional epidemiology units, both by their position in the health security system and because of the specificities of overseas France.

- CIRE: head of the health alert network

An effective alert function requires proximity to the health and social units responsible for receiving and analyzing alert signals; this proximity of the CIRE is clearly crucial in the overseas territories.

- Need to rely on all participants of the healthcare system in health crises

The difficulties in the exchange of information during the epidemic show the importance of collaborating with all the actors of the healthcare system, including physicians in private practice for daily surveillance and hospital staff physicians for reports of serious and emerging disease forms, even excluding emergency situations.

- Surveillance appropriate for specific health risks

The health risks associated with infectious diseases in overseas France have several particularities. Numerous vectorborne diseases are rampant there. They include malaria in Guyana and Mayotte, dengue in all the territories (with hemorrhagic forms emerging since the 1980s), Chagas disease in Guyana, West Nile disease in the West Indies, and now chikungunya.

The topicality of these questions led InVS to place them at the heart of its 2006 annual Scientific Meetings, the two principal themes of which were health surveillance overseas and emerging and re-emerging diseases.

<sup>1</sup> Program for surveillance, alert and risk management of the emergence of the chikungunya virus in the French districts of America.

## Role of InVS in public response to the emergence or re-emergence of infectious phenomena

As the head of the public health network, InVS must take actions with different aims:

- Coordinate a health surveillance network structured to optimize the effectiveness of its alert function

While the chikungunya epidemic stayed local, in Réunion and Mayotte, surveillance and risk management quickly concentrated on the other French territories where dissemination was possible: the French districts of America and the districts of Alpes-Maritimes and Haute-Corse. In this setting, active collaboration with laboratories was essential.

- Reinforce the alert function of surveillance systems: nonspecific systems

The chikungunya epidemic showed the importance of being able to follow in almost real time the changes in non specific indicators related to mortality and to hospital activity, especially emergency department visits. This observation illustrates the importance of the efforts InVS has made since 2003 to set up nonspecific surveillance systems that move data between local and national echelons to measure emergency medical activity and mortality.

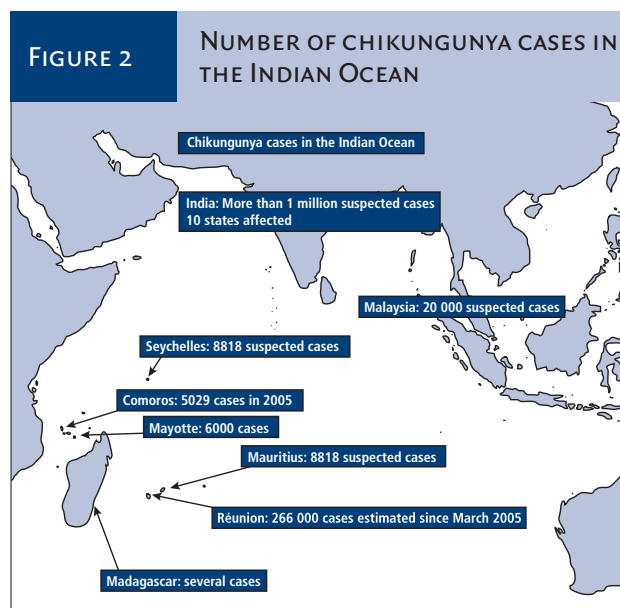
- Be able to provide expert assessments and reinforce the connection of expertise and research

The chikungunya crisis showed the need for a broad capacity of expertise—at the local as well as the national levels—that can react to the questions that emerging or re-emerging health phenomena will undoubtedly present. This expertise, if it is "pluralist" (that is, combines research, public health, and clinical medicine) and multidisciplinary (calling in particular on the social sciences), should allow pertinent and shared analyses of various answers to these questions. The creation in early 2007 of a regional center for Indian Ocean health surveillance and research (CRVOI) in Réunion, as a scientific interest group in which InVS participates, can be considered as a regional response to this need.

## Increasing importance of the international aspect of health surveillance

Attention to health events occurring abroad that might affect the French population is especially important in the overseas districts, which are at the heart of regional environments whose epidemiologic risks they share and with whom they have many population exchanges. This particularity is one of the reasons why InVS created its Department of International and Tropical Diseases (DIT) in 2002.

The Indian Ocean health crisis in 2006 led the countries of this region, including France for Réunion and Mayotte, to propose the creation of a regional network for epidemic alert and response. This project, supported by WHO and the Indian Ocean Commission, should be operational by the end of 2007.



# InVS Health Surveillance Days 2006

The InVS Science Meetings provide an essential moment of dialogue between InVS and its many partners. They are the occasion to present and discuss the results of our work and to hear about the new issues emerging in public health and health surveillance.

In 2006, we devoted these meetings to health surveillance overseas. This section summarizes the general analysis presented at the opening of this meeting.

Alerts were not rare in the overseas districts and territories in 2006. There was chikungunya in Réunion and Mayotte, but also

and always dengue in the West Indies and Guyana, as well as malaria and a resurgence of Chagas disease in Guyana.

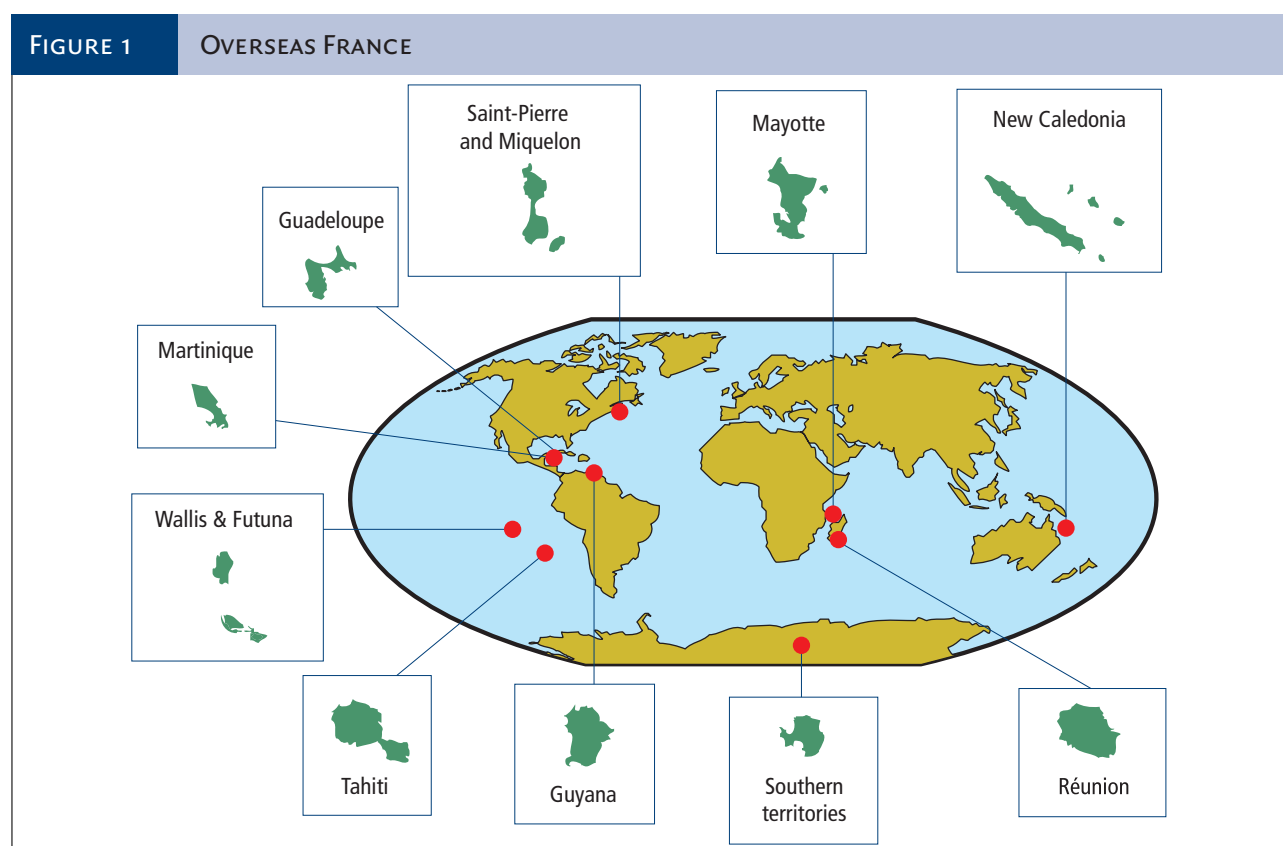
But we cannot limit our vision of the needs of the DOM-TOM to these tropical diseases. There are many unanswered health questions: infectious (HIV, in Guyana especially), nutritional (diabetes in Réunion and the West Indies), environmental (pest control products in Martinique, mercury in the Amerindians of Haut-Maroni), all justifying the reinforcement of overseas health surveillance now underway.

## Overseas France: equitable health surveillance for all

### OVERSEAS FRANCE: DIVERSITY IN DISPERSION

Overseas France is composed of districts, communities and territories dispersed across the entire globe: the districts of

Guadeloupe, Martinique, Guyana and Réunion; the communities of Saint-Pierre-et-Miquelon, Mayotte, Wallis & Futuna, French Polynesia, and New Caledonia; and the French southern and Antarctic territories (islands of Amsterdam, Saint-Paul and Kerguelen, the Crozet archipelago, and the Adelie Coast) (figure 1).



Source: Ministry of Overseas France.

This geographic dispersion raises a set of questions about health surveillance in these areas: Do the epidemiologic characteristics of overseas France differ from those of metropolitan France?

Are these characteristics common to all of overseas France? Does overseas France require specific health surveillance?

## A DIFFICULT SOCIOECONOMIC AND DEMOGRAPHIC CONTEXT

During the past 20 years, the populations of overseas France have grown substantially, especially in Guyana and Mayotte. These populations are notable for their youth: in Guyana and

Polynesia, more than 40% of the population is younger than 20 years. On the other hand, the population in the West Indies, although still young, is aging. With 17% of its population aged 60 years and more in 2005, Martinique has the "oldest" population of the overseas districts (table 1).

TABLE 1	DEMOGRAPHIC CHARACTERISTICS OF OVERSEAS FRANCE*			
	Area Km <sup>2</sup>	Population (Number inhabitants)	Population density	Trends 1999-2006
Saint-Pierre and Miquelon	242	6500	27	-
Guadeloupe	1705	453 000	263	+7.5%
Martinique	1128	395 000	359	+4.5%
Guyana	86 500	184 500		+22.5%
Wallis & Futuna	274	16 000	58	
Polynesia	4167	270 500	65	+12.0%
Réunion	2512	785 000	312	+10.0%
Mayotte	374	165 300	440	+26.0%
New Caledonia	18 575	231 000	12	+17.0%
France	550 000	63 034 000	114	+3.3%

\* Source: INSEE.

Another characteristic of some parts of overseas France is the high percentage of the population from other countries. This population is relatively small in Martinique, accounting for approximately 1% of the total population (principally citizens of Haiti and Saint-Lucie), and foreigners appear to account for 5% of the population in Guadeloupe in the 1999 census (almost half from Haiti). On the other hand, in Guyana, foreigners officially account for 33% of the population, and the length of the frontiers, the ease of crossing natural borders (the Maroni and Oyapock rivers) and activities such as gold mining all promote clandestine immigration.

The economies of overseas France share problems common to insular microeconomies, whether the island is geographic or functional (such as Guyana): uncompetitive exports, specialization in services, importance of natural resources and tourism, environmental fragility, vulnerability to natural catastrophes, strong financial dependence on metropolitan France and lack of openness to the outside. Despite recent progress, the gross domestic product per inhabitant in overseas France thus lags behind that of metropolitan France. These areas may appear to be prosperous compared with most of their neighbours, but their foreign trade is small and their unemployment high, often approaching 20% of the labour force and affecting most especially the young, the less educated, and women. Household budget surveys show that a higher

percentage of households live below the poverty line in the overseas districts than in metropolitan France (20% versus 10%) (table 2).

TABLE 2	ECONOMIC CHARACTERISTICS OF OVERSEAS FRANCE*	
	GNP (euros/inhabitant)	Unemployment rate
Saint-Pierre and Miquelon		
Guadeloupe	14 108 (2002)	26.0 (2005)
Martinique	15 600 (2002)	21.7 (2005)
Guyana	12 800 (2002)	26.5 (2005)
Wallis & Futuna	3800 (2004)	15.2 (2003)
Polynesia	17 500 (2004)	15.0 (2001)
Réunion	11 990 (2005)	31.9 (2005)
Mayotte	3960 (2001)	29.3 (2002)
New Caledonia	14 800 (2003)	17.1 (2006)
France	23 740 (2000)	
	27 611 (2005)	9.5 (2006)

\* Source : INSEE.

This socioeconomic context directly influences the health of the population. Basic health indicators testify that the populations of overseas France are still in a phase of

demographic transition, with low mortality (due to the age pyramid) and high fecundity (table 3).

TABLE 3 DEMOGRAPHIC CHARACTERISTICS OF OVERSEAS FRANCE*			
	Life expectancy	Crude birthrate/1000*	Crude mortality/1000
Saint-Pierre and Miquelon			
Guadeloupe	74-81	18	6.4
Martinique	76-82	15	6.9
Guyana	72-79	31	4.0
Wallis & Futuna	74.3	21	5.9
Polynesia	69-74	20	4.6
Réunion	71-79	21	5.4
Mayotte	72-76	39	3.0
New Caledonia	73.4	17	4.8
France	77-84	13	9.0

\* Source: *Bulletin of the Institut national des études démographiques (National Institute of Demographic Studies, INED)*.

## HEALTH RISKS IN THE MIDST OF CHANGE

In recent decades, the lifestyle of the overseas French regions has become more westernized as contact and exchanges grow with metropolitan France and the rest of the world. For example, imported food has progressively replaced traditional food and methods of food storage have changed dramatically. These gradual transformations, accentuated by globalization, have very clear consequences on health risk factors.

**Chronic diseases:** While vectorborne infectious diseases and parasites used to be the principal health risks, chronic diseases—diabetes, overweight or obesity, and hypertension—are increasing continuously and strongly and have become the new epidemics of overseas France, with incidence rates sometimes much higher than in metropolitan France (for example, obesity). This overall change can hide strong inequalities in access to food, as a beriberi epidemic in Mayotte illustrated in 2004: 29 cases in less than two months including 18 deaths. Transformations in cancer rates are bringing the epidemiologic profiles of metropolitan and overseas France closer together.

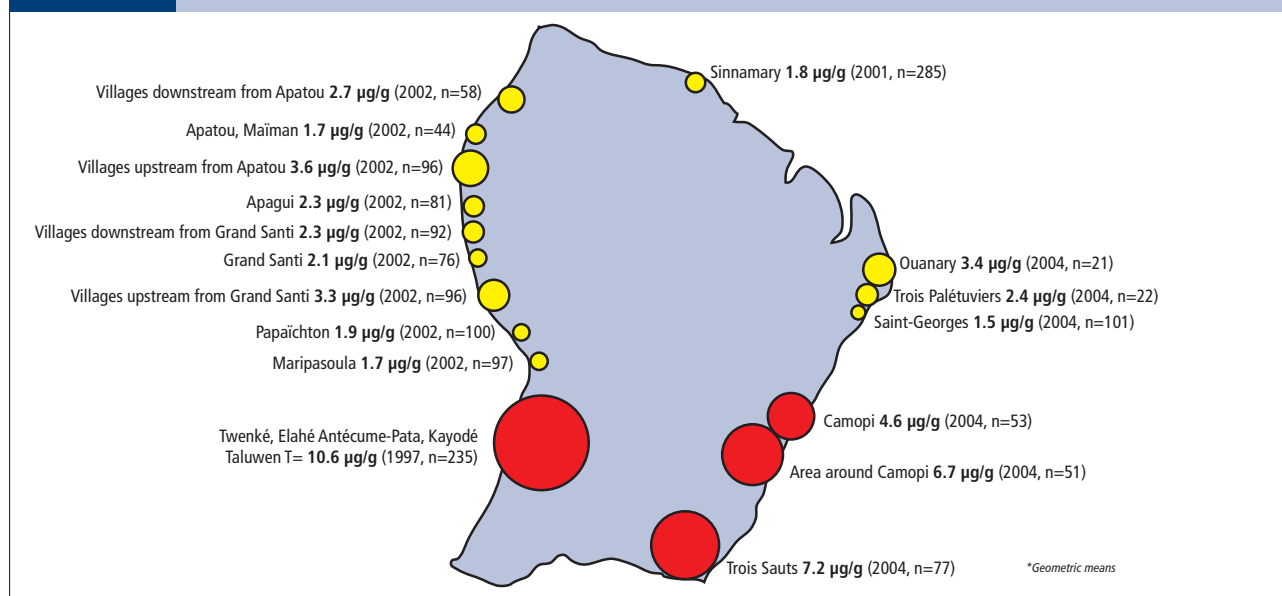
**Environmental risks:** Overseas France, most often situated in the tropics, is faced with particularly high environmental risks. This is the case, for example, for waterborne diseases—bacterial (typhoid), viral (hepatitis A) or parasitic—that are directly linked

to problems of access to drinkable water, especially in Mayotte and Guyana. It is also true for diseases associated with pollen or molds, such as pollinoses and asthma, both of which have a high prevalence in overseas France. Some zoonoses, such as leptospirosis, are also characteristic of these regions, both in their frequency and their modes of exposure, which are very different from those in metropolitan France.

Some risks of chemical origin are also due to particularities of overseas France. These chemicals include pesticides, which are intensively used for growing bananas (West Indies, Réunion) and to which some population groups have been substantially exposed. In Guyana, mercury is another risk: the massive use of methylmercury in illegal gold mining activities has strongly polluted the environment and the food chain, exposing the Amerindian populations, which eat high quantities of fish, to burdens exceeding WHO guidelines (figure 2). In New Caledonia, another historic particularity is the use of tremolite (a form of asbestos) to whitewash homes, which has resulted in a mesothelioma epidemic.

Finally, the high proportion of insalubrious homes is another characteristic common to all these French overseas regions. These homes concentrate infectious, chemical, and physical risks and expose to them populations that are already the most economically disadvantaged.

FIGURE 2

MEAN CONCENTRATIONS OF MERCURY IN  $\mu\text{g/g}$  OF HAIR IN THE POPULATION OF GUYANA (2001-2004)\*

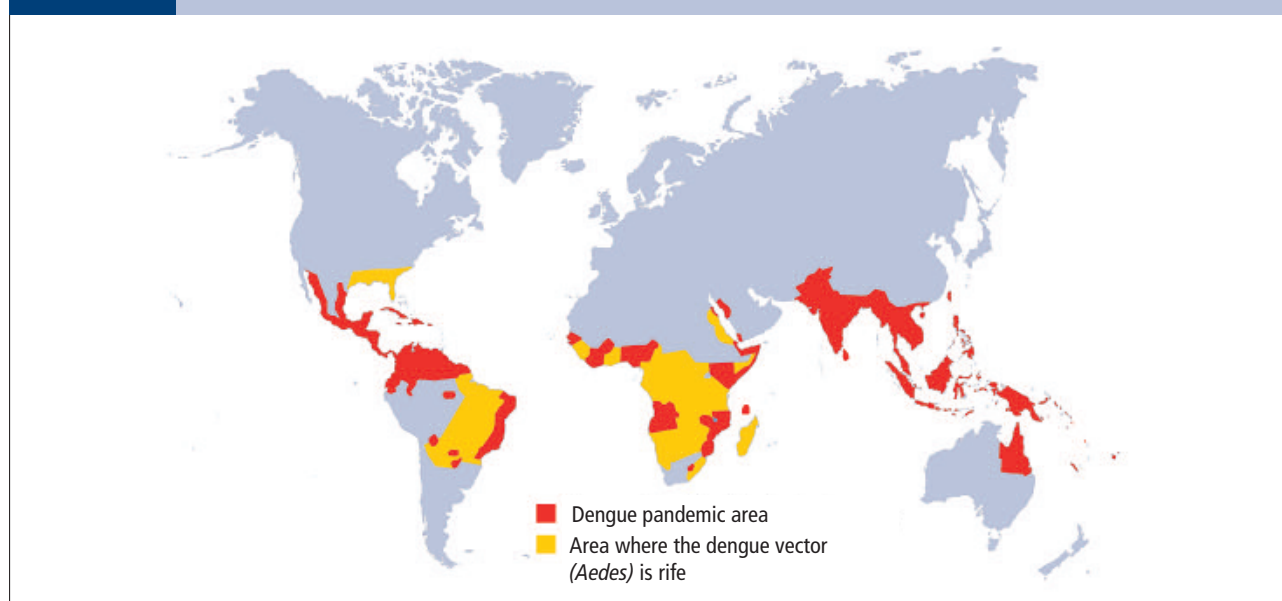
\* Source: West Indies-Guyana CIRE.

**Vectorborne diseases:** Globally, despite regional differences, vectorborne infectious diseases (dengue, malaria, and Chagas and West Nile diseases) are on the upsurge throughout the

intertropical area. Dengue, for example, is currently the most common arbovirosis in the world and now affects two-fifths of the world population, that is, about 2.5 billion people (figure 3).

FIGURE 3

## DENGUE IN THE WORLD (2005)\*



\* Source: WHO.

In the Americas, in 2001 alone, there were more than 609 000 cases of dengue, including 15 000 of dengue haemorrhagic fever. Dengue epidemics are thus changing in the Caribbean area, becoming more frequent and more severe, now that all four serotypes circulate there.

This evolution reminds us that most of overseas France is located in the intertropical convergence zone and that the arrival of modernity in these territories does not necessarily protect their

inhabitants from vectorborne risks. The chikungunya epidemic in Réunion in 2006 pointed this out dramatically, affecting as it did nearly 250 000 people in several months (see previous article).

**HIV-AIDS:** the situation for this disease varies highly in overseas France. In Réunion, the epidemic is controlled and patient management is satisfactory. In the French districts of America (West Indies and Guyana), on the other hand, the rates of

infection and of new AIDS cases are much higher than in metropolitan France. In Guyana, the epidemic is uncontrolled and touches the entire population.

## REINFORCEMENT OF HEALTH SURVEILLANCE IN OVERSEAS FRANCE IN 2006

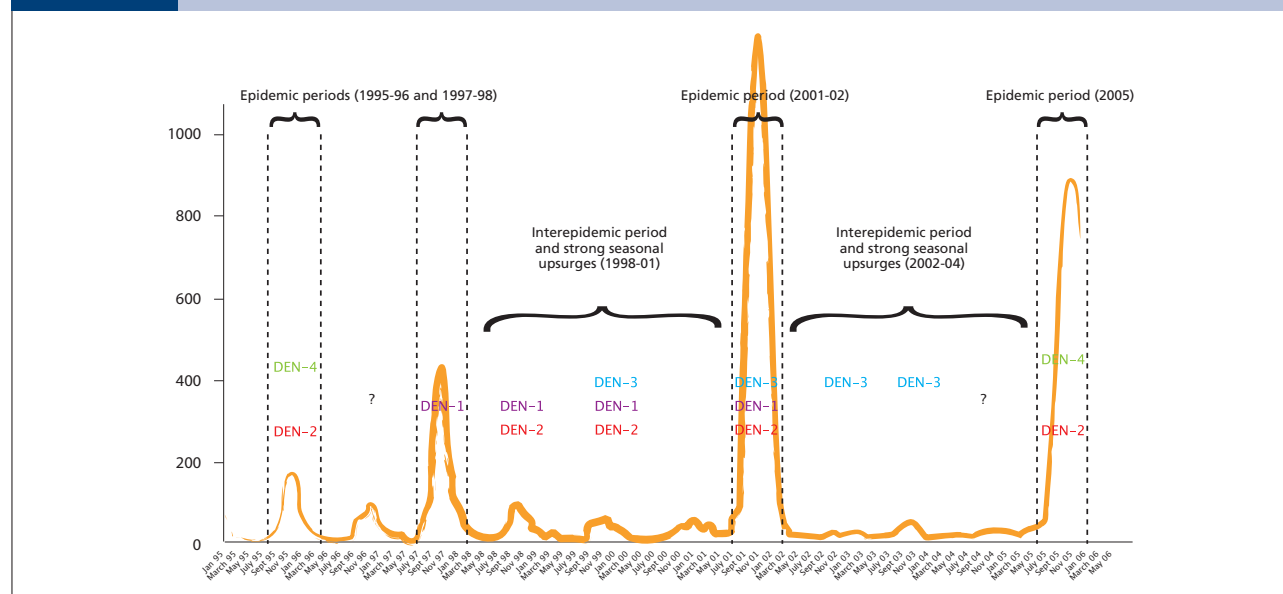
In view of recent health events, the reinforcement of health surveillance in overseas France in 2006 dealt mainly with vectorborne diseases.

In Réunion, the first wave of chikungunya in mid-2005 resulted in strengthening the epidemiologic surveillance system, in order to monitor the epidemic course and severity and bring health surveillance and vector control together as necessary.

Three large epidemics have struck the French West Indies since dengue haemorrhagic fever arrived in the Caribbean—in 1997, 2001 and 2005, each linked to the circulation of one or two predominant serotypes (figure 4).

FIGURE 4

DENGUE EPIDEMICS IN MARTINIQUE, 1995-2006\*



\* Source: West Indies-Guyana CIRE.

This situation led to the adoption in July 2006 of a surveillance alert and management programme (called a PSAGE) for dengue epidemics. The aims of this dengue programme are threefold: 1) to organize and formalize contractually the role and tasks of each partner involved with dengue; 2) to furnish the tools necessary for the different activities in the domains of epidemiologic and entomological surveillance, mosquito eradication, communication and patient management; 3) to integrate epidemiologic surveillance activities with the public health response. This program thus proposes graduated strategies of dengue surveillance and control according to the epidemic risk level, assessed from epidemiologic surveillance results.

Because of the risk that the chikungunya virus might be introduced into the West Indies and Guyana, a chikungunya program began in February 2006, its design based on the experience acquired with dengue. It made it possible to react without waiting for the mandatory reporting adopted in the summer of 2006.

**In Guyana:** The severe dengue epidemic linked to serovar 2 was also the occasion, as in Réunion, to reinforce the epidemiologic surveillance system. This activity was part of the more general reinforcement of the surveillance of the main

infectious diseases of Guyana through the progressive deployment of a regional master plan for health information systems.

**In Mayotte:** The chikungunya surveillance system allowed us to follow the trends of the 2006 epidemic, but its real scale could only be estimated from complementary studies conducted during and after the epidemic. Information collected during this chikungunya epidemic is helping to design a surveillance system for infectious and parasitic diseases to be implemented in Mayotte.

## PERSPECTIVES FOR HEALTH SURVEILLANCE

The health issues encountered overseas, their high, often epidemic, incidence, their swift modification due to social, economic and demographic changes—all show a specific epidemiologic situation that requires a significant buttressing of health surveillance in these regions going beyond infectious diseases alone.

This should facilitate the precise monitoring of the evolution of the issues specific to the overseas territories, identification of

the arrival of new risks, detection or even prediction of the emergence of epidemic phenomena and identification of the populations or population subgroups especially at risk. Health inequality, measured by numerous indicators, is yet another issue in overseas France. Health surveillance there must also make it possible to monitor basic indicators such as vaccination coverage and the milestones of the national nutritional health programmes (PNNS) and thus evaluate prevention programmes by assessing expected improvements.

This reinforcement of health surveillance requires a regional anchorage of national health surveillance policies and specific, appropriate support adapted to the different situations encountered overseas. It also requires the assertive presence of overseas France in regional networks (Oceanian network for public health surveillance, Caribbean network, etc.) to open up these territories, and detach them from their too centripetal relationship with metropolitan France. Vigorous effort in two directions is thus required: on one hand, the association of health surveillance with excellent regional research centers in clinical medicine, biology, epidemiology, and entomology, and on the other hand, the deployment of modern health information systems integrated with the national master plan for health surveillance.

## Reference sites

• Guadeloupe	<a href="http://www.guadeloupe.pref.gouv.fr">http://www.guadeloupe.pref.gouv.fr</a>
• Guyane	<a href="http://www.guyane.pref.gouv.fr/">http://www.guyane.pref.gouv.fr/</a>
• Martinique	<a href="http://www.martinique.sante.gouv.fr">http://www.martinique.sante.gouv.fr</a>
• New Caledonia	<a href="http://www.dass.gouv.nc">http://www.dass.gouv.nc</a>
• Polynesia	<a href="http://www.sante.gov.pf/">http://www.sante.gov.pf/</a>
• Réunion	<a href="http://www.reunion.sante.gouv.fr">http://www.reunion.sante.gouv.fr</a>
• Wallis & Futuna	<a href="http://www.wallis.co.nc">http://www.wallis.co.nc</a>



## Emerging Infections in France in 2006

### What is an emerging infection?

In the 1990s in the United States, emerging infectious diseases were defined as previously unknown diseases or known diseases whose incidence in humans had significantly increased in the past two decades or threatened to increase in the near future.

In 1997, WHO defined them as diseases caused by new and previously unknown infections, representing a public health problem at a local or international level and re-emerging diseases as those caused by the resurgence or increase of known infections that had ceased being considered public health problems because of their minor importance.

A more specific definition was proposed in 2005 in the United Kingdom: an emerging infectious disease is a clinical entity of infectious origin—newly identified or a known infectious disease, the incidence of which has increased in a given place or population.

In France in 2006, a multidisciplinary group of researchers and experts from major research institutes—including INSERM, INRA (the French Agronomic Research Institute), the Pasteur Institute, and IRD (Development Research Institute), from AFSSA (French Food Safety Agency) and InVS, working together in a unit coordinating emerging infectious diseases (created by the Ministry of Research in 2006 after the Réunion chikungunya epidemic) developed the following definition:

"An infectious (or presumed to be infectious) phenomenon unexpected in terms of its intrinsic properties or knowledge of its biology, affecting humans, animals or both. It may involve a newly appearing or identified clinical entity of infectious origin, a known abnormal infectious entity the incidence of which is increasing in a given place or group, or a qualitative or quantitative modification of the characteristics of the agent, disease or population affected and of its environment. It may involve an identified disease for which the conditions of expansion are becoming favorable. Usually, there is a real or perceived uncertainty about its potential for development, its control or its effect on human or animal public health".

This definition includes a social dimension in the equation, together with the conditions propitious to its emergence, thus adding a perspective of anticipation, which is essential for future management.

## NOTABLE EMERGING INFECTIONS IN FRANCE IN 2006

Last year, three emerging infections strongly affected public health and the social situation in France. The first was the chikungunya epidemic in Réunion (see section one of this report). This vectorborne arboviral infection was previously known in Africa and Asia. Introduced from the Comoros into the highly susceptible populations of Réunion and Mayotte, it gave rise to a huge epidemic, affecting about 35% of the population over several months. The population, the healthcare system and the entire society were severely afflicted. The epidemic also revealed the lack of detailed knowledge of this arbovirus, its ecology and its vector control.

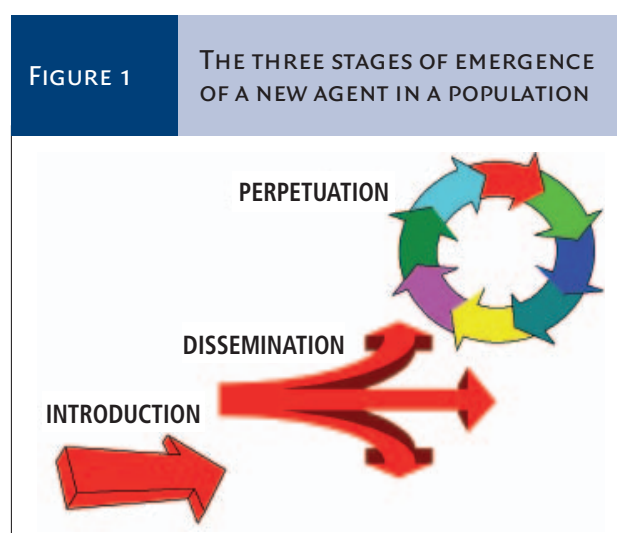
Another emergence of a completely different nature took place in 2006: an epidemic of nosocomial infection by *Clostridium difficile* 027 in healthcare facilities in the region of Nord Pas-de-Calais (see Alert section in this report). Linked to an infectious agent that appears to have acquired particularly pathogenic factors, this *C. difficile* 027 infection has spread across the northern hemisphere from the United States and Canada to reach Europe, arriving first in the United Kingdom, the Netherlands and Belgium. It appeared in northern France in 2006. Use of antibiotics, especially fluoroquinolones, facilitated its dissemination in the most vulnerable hospitalized populations. Its swift diffusion between hospitals in the districts of Nord and Pas-de-Calais appears related to the especially high circulation of patients from one facility to another in this region. We used the knowledge and experience acquired in North America to start anticipatory work in the nosocomial infection alert network (RAISIN) and thus develop protocols for its surveillance and control. We established a capacity to distinguish the 027 strain from other *C. difficile* infections, a capacity essential to combating epidemics. Particularly difficult to control, this epidemic showed the difficulty hospitals have in coping with this emergent infection, for which the control measures involve very strict rules for hand-washing, patient isolation, and cleaning and disinfecting surfaces.

Finally, after more than three years of progression of the avian epizootic, the risk of an H5N1 influenza pandemic remains starker than ever. While nothing so far indicates that the avian virus has evolved to adapt to humans, the epizootic resumed its spread in the second half of 2006. Migration of wild birds played a role on several occasions, but dissemination among poultry farms appears connected especially to commerce.

## PHASES OF EMERGENCE

The emergence of infectious agents goes through three phases (figure 1): the introduction of the agent into the human population, its dissemination and its perpetuation. Public health actions must seek to prevent the progression from introduction or dissemination to perpetuation. The silent introduction of HIV in the 1970s was quickly followed by its international dissemination and perpetuation, especially in Africa. Severe acute respiratory syndrome (SARS) began by introduction of

the coronavirus in China, followed by its swift international dissemination. The mobilization against SARS, which has so far been effective, seems to indicate that its dissemination has been controlled and its perpetuation probably prevented. Every appearance of a new agent in humans does not necessarily lead to dissemination, especially when this new agent is not adapted to humans. For chikungunya in Réunion, the introduction of the infection led to widespread dissemination in the population of Réunion and, at least for now, perpetuation, since residual transmission still occurs. *C. difficile* 027 does not appear to have been perpetuated after its dissemination to healthcare facilities in Nord Pas-de-Calais, since it is currently in clear regression and has not spread outside the region.



## DETERMINANTS OF EMERGING INFECTIOUS DISEASES

The dynamics of infections and their capacity to evolve and "emerge" in a new or unusual form are due not only to the infectious agent itself but also to the environment (including social and political), the host, animal or human, and especially the interactions between these three fundamental factors (figure 2). A final factor to be considered in the response but also as a source of emergence, is the system of public health care.

### Infectious agent

Emergence or re-emergence may be due to modifications of the infectious agent, as we have seen in the threat of H5N1 pandemic and *C. difficile* 027 infections.

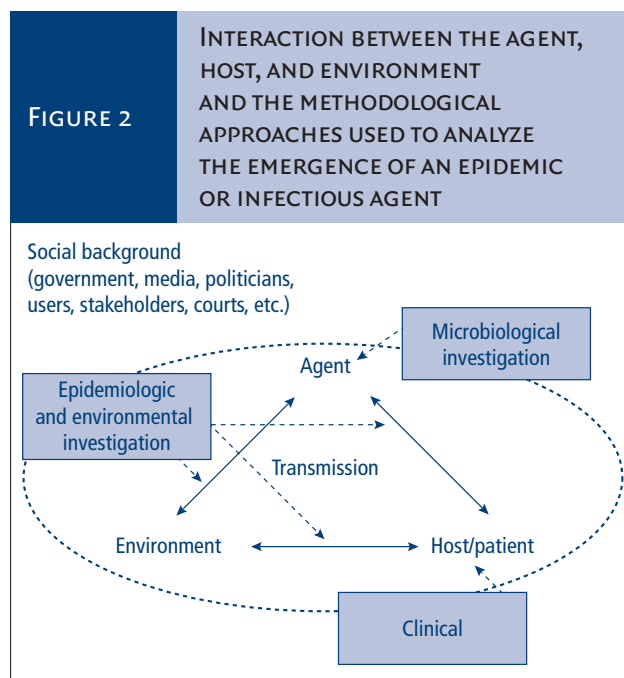
### Environment

The environmental aspects—tropical and urban—promoting the pullulation of the *Aedes albopictus* vector thus played a key role in chikungunya in Réunion from its initial introduction onto the island. Environment is also very important for the avian

H5N1 epizootic. The health care system, especially antibiotic use, creates an environment propitious to the emergence of infectious diseases, as illustrated by the nosocomial *C. difficile* infection epidemic in Nord-Pas-de-Calais.

## Host

Host modifications are equally important, especially those that change its susceptibility to infections, because of age, intercurrent diseases, immunosuppressive treatments... Social and environmental relations also affect the host, as can be seen for chikungunya or especially avian influenza, where the interaction between humans and poultry is important.



The dotted oval underlines the importance of the social context in which emergence occurs.

## Health care system

The capacity of an affected country's public health care system to cope with a large infectious emergence is another important determinant of the dissemination and control of the avian epizootic and the onset of human cases, as is its socioeconomic status. The gap between the scale of the avian epizootic and the response capacity of the country is illustrated with particular acuity for Indonesia and the countries of Africa.

The emergence of a new infectious phenomenon is very often due to the simultaneous occurrence of several factors. This multifactorial dimension can be seen in the three emerging infectious risks discussed above.

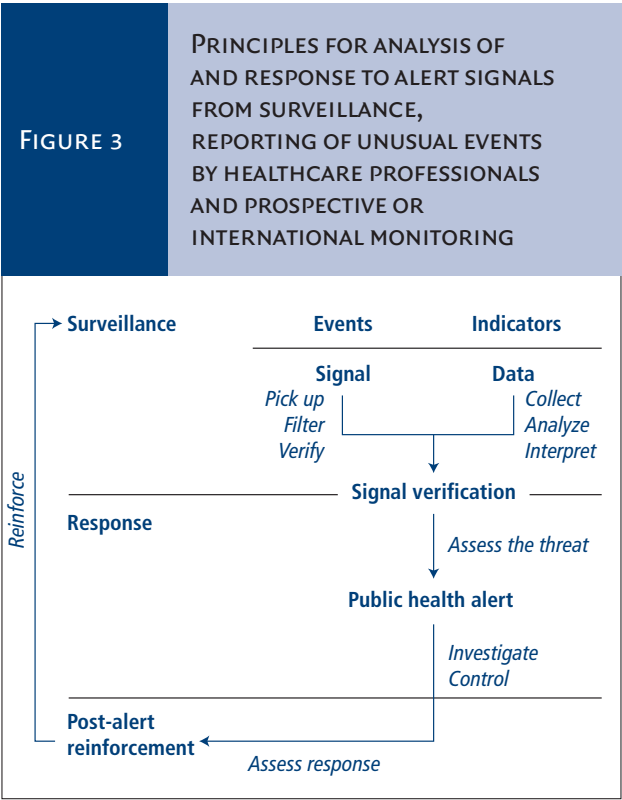
## FIGHTING EMERGING INFECTIONS

### Surveillance, anticipation, monitoring, response and research as key tools.

It is difficult to prevent the emergence of an infectious problem that is not yet recognized. Using the research and experience of recent decades to understand the emergence or re-emergence of infectious diseases must enable us to anticipate risks by early activities, such as combating antibiotic misuse to prevent the emergence of new resistant infections, preparing plans against specific diseases (influenza pandemic plan), developing appropriate vector control, and so on. Beyond these specific activities, what is essential is a public health infrastructure that can react to provide decision-makers with operational epidemiologic and microbiological surveillance and investigation of a high scientific level and which can be mobilized at any moment. InVS organizes and coordinates this mission in France. The microbiological capacity essential to the surveillance, alert, investigation and characterization of new or old infectious threats is handled by a network of 47 national reference centers (CNRs).

Signals emitted by specific, nonspecific and syndromic surveillance systems and from clinical, epidemiologic and biological reports from general practitioners in the field, the district health and social bureaus (DDASS), the CNRS, clinicians, nosocomial infection control coordination centers (CCLIN), epidemiologic surveillance centers from other countries and from WHO—from all of these the CIRE and InVS set up alert and scientific investigation procedures to provide systematic and routine decision-making input (figure 3), in close collaboration with the reference centers and, where appropriate, numerous other bodies (hospital departments, Ministry of Agriculture, health and safety agencies, etc.). The objectives are to identify the source, mode of transmission and potential factors of risk and progression and thus to be able to suggest to the health authorities scientifically justified prevention and control measures. In some situations, scenario analysis and modeling may have to be added to these field investigations. The alert for chikungunya in Réunion was thus sounded in April 2005, because cases were known to have occurred on the neighboring Grand Comoros Island. Clinical recognition and very early confirmation by the national reference center (CNR) of the first cases in Réunion thus became possible. A surveillance system was immediately established. The need to adapt it to the developing characteristics of the epidemic indicates the flexibility necessary for surveillance in emergency situations. Retrospectively, it appears that a multidisciplinary scenario analysis in the last quarter of 2005 would have been useful in anticipating the epidemic progression in 2006 and possibly in identifying the plausibility of a large-scale epidemic scenario.

To detect as early as possible and especially to anticipate new infectious threats to public health, prospective monitoring must rely on close collaboration with the world of infectious disease and microbiology research, in both humans and animals. This collaboration made possible the anticipation of and preparation for the *C. difficile* 027 epidemic in 2006.



Surveillance, anticipation and response must now more than ever be comprehensive and coordinated at the European and international levels. The creation of the European Center for Disease Prevention and Control (ECDC) in Stockholm illustrates this political will in Europe. The revision of the International Health Regulations (IHR), approved in 2005 by the International Health Assembly, is another positive development in the international system against infectious diseases with a potential for international dissemination. Based on an approach favoring analysis of health phenomena that may be a threat to public health, it allows broad and complete coverage of risks, unlike the previous limited list of mandatory reporting diseases. To be effective, the new IHR requires that all member states be able of sufficient surveillance, although many poor countries are not. The importance of international collaboration must be stressed, especially for training.

Finally, anticipation, detection and management of emerging diseases will not progress substantially without ambitious investments in research about infectious agents and in public health, including social sciences, or without strong interaction between this research and health surveillance. The chikungunya epidemic revealed, in France but also in Europe, the inadequacy of investment in viral, especially arboviral infectious disease research. Vectorborne diseases are expanding in the nations of the South and the ever more urgent perspective of global warming threatens to have a substantial impact on their dynamics in a relatively brief period. The epidemic at Réunion and Mayotte also showed the importance of social determinants in the disease process, perception and management as well as in prevention behavior. For InVS, this is an important lesson for the investigations of similar events in the future. The creation of CRVOI at the end of 2006 is one aspect of a multidisciplinary response in the intermediate and long terms.

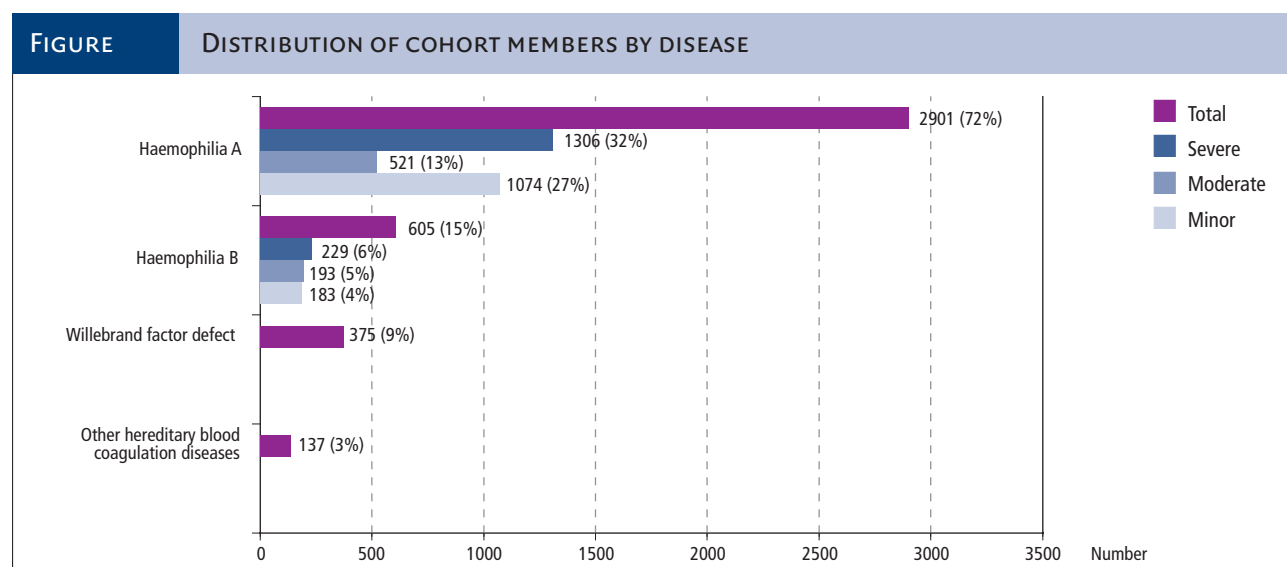
## Example of the FranceCoag network

FranceCoag is the French cohort of patients with hereditary blood coagulation defects, including haemophilia A and B. This cohort was established in 1994 by an INSERM unit (EMI0214-U720) and then transferred to InVS on 1 January 2004. The role of the "sentinel" population of haemophilia patients in the first years of the HIV pandemic underlines the value of epidemiologic surveillance of a rare disease for the entire field of public health. The first analysis of all the information collected by FranceCoag was published in spring 2006. This cohort included 4018 patients in October 2005; they had undergone 14 176 follow-up visits at 43 French centers. This made it possible to analyze several health indicators for the population (figure). Data on the circumstances and age at diagnosis show that the earlier the

diagnosis, the more severe the defect. Patient management was analyzed as a function of birth cohort, type of deficiency, and severity. The overall frequency of inhibitor (that is, the anticoagulation factor antibody that is the most severe treatment complication today) depends on the type of defect and severity, reaching 25% in severe haemophilia A, but only 7% in severe haemophilia B and 8% in moderate haemophilia A (table). Since blood derivatives were made safe, there have been no contaminations by hepatitis C virus (HCV) or human immunodeficiency virus (HIV). The older contaminations affect mainly patients with severe haemophilia A and B, nearly half of whom are seropositive for HCV and almost 15% of whom carry HIV (table).

TABLE INHIBITORS AND HIV AND HCV INFECTION ACCORDING TO TYPE AND SEVERITY OF HAEMOPHILIA				
	Patient who developed an inhibitor (%)	HIV-infected patients (%)	HCV-infected patients (%)	Coinfected with HIV and HCV (%)*
<b>Haemophilia A</b>				
Severe (n=1306)	25.8	20.1	50.3	20.1
Moderate (n=521)	7.9	8.2	47.8	8.3
Minor (n=1074)	5.1	1.7	22.1	1.7
Total (n=2901)	14.9	11.2	39.4	11.1
<b>Haemophilia B</b>				
Severe (n=229)	7.0	15.7	57.2	15.3
Moderate (n=193)	0.5	5.7	36.8	5.7
Minor (n=183)	-	3.3	21.8	2.3
Total (n=605)	2.8	8.8	40.0	8.4

\* 98% of HIV-infected patients are coinfecting with HCV.



The FranceCoag network thus gathers information crucial for health surveillance but also for pharmacoepidemiologic evaluations, basic research, and medical economics research. This data analysis allowed us to assess the exhaustiveness of the cohort's recruitment, estimated at 70% of patients alive at the end of 2005. Very clear progress has occurred over the past three years. Exhaustive recruitment, essential to ensure that the indicators monitored are not biased, is now a feasible objective for this network, and funding has been provided for file monitoring to help reach this goal.

Rare diseases, defined by a prevalence of less than one patient per 2000 inhabitants, are currently the object of a public health plan, the first theme of which is epidemiologic surveillance. InVS, by its involvement in the management of this cohort, helps to highlight a more general issue in the surveillance of rare diseases, above and beyond blood coagulation defects.

The objectives of a rare disease surveillance system are different from those for infectious epidemic diseases or chronic diseases preventable at least in part (cancer, cardiovascular diseases, and diabetes). The incidence of rare diseases is most often set

by their genetic origins and is not a priority objective of surveillance. The issues here are evaluation of access to diagnosis (which conditions access to care), management and complications, to the extent that those determine the patients' health status. The FranceCoag system, very similar to that of a registry and including longitudinal follow-up of patients, is a long-term investment at a cost per patient necessarily higher than that for a cancer or cardiovascular registry. The extension of such systems to other rare diseases requires comprehensive analysis of the most important health indicators to be collected and of the diseases appropriate for surveillance. Criteria for suitability include prevalence, premature mortality, usefulness of early diagnosis, possibility of increased life expectancy through treatment, and the possibility of genetic counseling. InVS is currently conducting this analysis. The information selected as most pertinent will then be collected, either from existing systems (medical-administrative databases such as the national medical informatics program, PMSI) or from health insurance data and death certificates, or de novo. Reference centres and care networks are essential partners of this system.

### Promoting regional networks of occupational physicians

Improving the surveillance and monitoring of health at workplace requires most especially improving our use of data from occupational medicine. Obtaining additional value from the clinical activity of some 6000 occupational physicians, by pooling the data they collect for population health surveillance, is a key issue in occupational risk prevention.

During 2006, epidemiologic surveillance networks launched in earlier years with volunteer occupational physicians were reinforced and stabilized. These networks will help to quantify the burden of diseases known to be associated with occupational activity, by monitoring their development and their distribution by occupation or industry and by identifying possible regional characteristics. Moreover, this surveillance will help to identify possible emerging risks and promote the culture of reporting health problems in the workplace.

Towards this end, the Occupational Health Department (DST) has developed networks of volunteer occupational physicians in several regions. These networks are organized around themes, including musculoskeletal diseases, asthma and respiratory allergies, mental health at work, ionizing radiation, and healthcare workers.

#### EXAMPLE OF A REPORTING NETWORK

From 2002 to 2004, a pilot project in the Pays de la Loire region, conducted in close collaboration with physician-inspectors from the regional labor department office (MIRMO), set up a network of volunteer occupational physicians reporting work-related diseases during "data collection weeks". This network will be expanded nationally in the next four years.

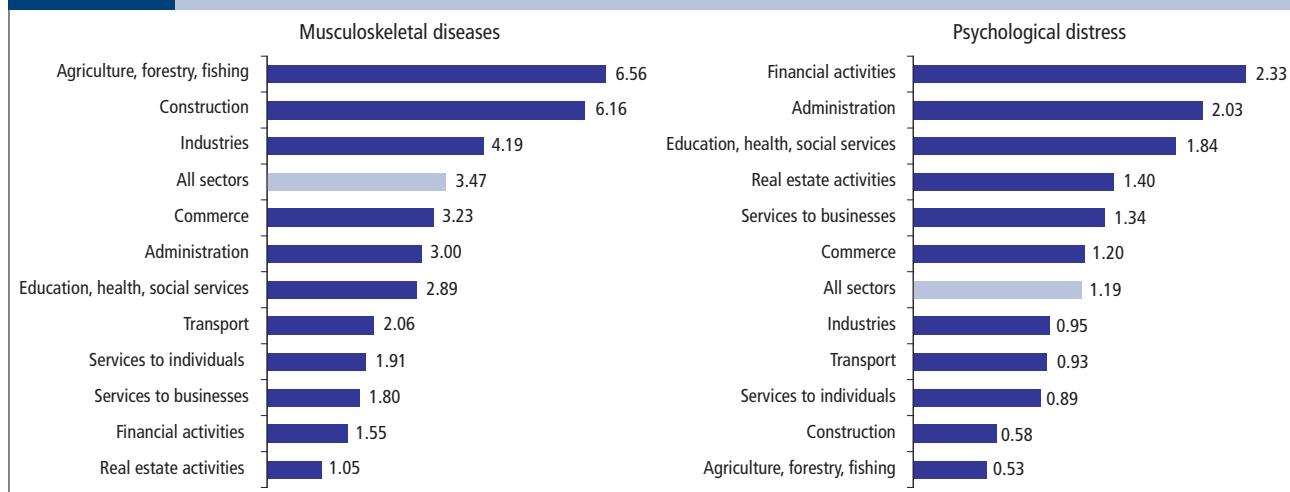
This network of clinical occupational medicine practitioners relies on their expertise. They are especially qualified to assess the imputability of a disease or symptom to work activities. The network improves our awareness and knowledge of diseases that may be attributable to work and should also contribute to the identification of emerging phenomena. The data collected through this system also make it possible to assess the undercompensation of occupational diseases and to analyze some of its causes, especially underreporting by the victims themselves.

The first network, in the Pays de la Loire, has already made it possible to analyze more than 1500 reports by more than 200 occupational physicians, that is, 5% of the work-related diseases reported among the employees followed by these volunteers. It has helped to identify the high frequency of musculoskeletal diseases among workers, in particular of the shoulder. These data confirm observations of specific surveillance programs for musculoskeletal diseases coordinated by InVS.

The statistics of compensation for occupational diseases are not consistent with these observations; carpal tunnel syndrome (CTS), a wrist disease, is the leading osteoarticular disease for which workers receive compensation. The only enumeration of these compensated occupational diseases does not reflect at all the reality of occupational risks. These data also show that musculoskeletal diseases reported by occupational physician are very largely attributable to postural constraints and carrying heavy loads: the constraints of work rhythm and cadence rank third. These data make it possible to rank industries and occupations according to the frequency of occupational diseases.

FIGURE 1

## PREVALENCE (%) OF THE TWO LEADING OCCUPATIONAL DISEASES REPORTED, ACCORDING TO INDUSTRY



These preliminary results were published in a report in November 2006 (*Experimental epidemiologic surveillance network for musculoskeletal diseases in the Pays de la Loire: prevalence of work-related diseases. Results of the first three "Occupational Disease weeks". October 2003, April and October 2004*). They have been reported at several scientific and occupational meetings.

Moreover, this network showed that nearly half of all musculoskeletal diseases that should have been reported as compensable occupational diseases because they meet the requirements of table n°57 were not reported because the employees refused. That is, the financial benefit of compensation cannot always compete with the consequences of reporting an occupational disease (in particular, losing one's job).

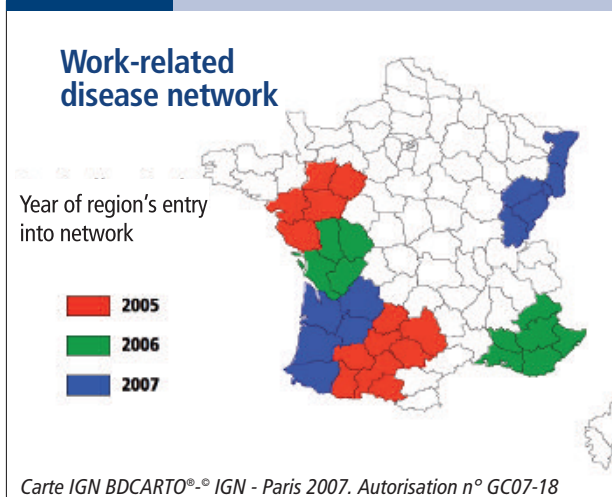
This program has also shown that mental distress associated with work ranks second among reported work-related diseases.

In 2006, this network was extended to four new regions: Franche-Comté, Midi-Pyrénées, Provence-Alpes-Côte d'Azur (PACA), and Poitou-Charentes, regions in which the MIRTMO inspectors, who are its regional relays, volunteered to meet our request; Alsace and Aquitaine will complete this system in 2007. The experimental protocol in the Pays de la Loire was adapted, and the volunteer physicians are asked to report the work-related diseases encountered in their medical practice during two predefined weeks during the year.

The regions are at different stages in the program, since only PACA, Poitou-Charentes, Midi-Pyrénées and Pays de la Loire collected data in 2006; the others were still at a preparatory stage. InVS has made a major effort to reinforce local and

FIGURE 2

## MAP OF OCCUPATIONAL DISEASE NETWORKS, 2005-2007



regional resources for coordination and leadership of occupational physician networks; four half-time staff people have already been hired for this, in the Pays de la Loire, Midi-Pyrénées, Franche-Comté and PACA; the Poitou-Charentes region turned the analysis and management of its regional data over to its regional health observatory (ORS). The network already includes more than 800 occupational physicians. The first assessment of participation is very positive and results for all six regions will be published in 2007.

Several of these regions have included this surveillance program in their regional public health plans (PRSP) and regional workplace health plans (PRST). The regional repercussions of such networks of occupational physicians should also make it possible to implement prevention policies quickly when needed and to evaluate their effectiveness. The Directorate-General of Labor (DGT) of the Ministry of Labor has also strongly supported this program through an annual contract with InVS.

## TOWARDS A NATIONAL PROTOCOL

The system validity will be analyzed in 2007-2008, so that we can propose a national protocol quickly and include new regions.

These networks can function correctly provided that a true MIRTMO-epidemiologist team is set up and that the regional labour and occupational training offices (DRTEFP) participate in the system. This is the case in the regions of PACA, Franche-Comté, Pays de la Loire and Midi-Pyrénées, where protocols hiring epidemiologists at half-time to lead the networks have been signed by the DRTEFP and InVS and, in some cases, the regional health and welfare services. The maintenance of such systems requires a real willingness to commit the resources

necessary to run them. The pooling of information collected by occupational physicians will thus enrich our knowledge of occupational risks.

At the same time, the InVS DST has continued to develop occupational physician networks intended to improve our knowledge of some occupational risks: examples include the Sentasm network studying occupational asthma, the Samotrace network studying mental health at work, the TMS network studying musculoskeletal diseases and their occupational risk factors, and the RIMED network intended to monitor health care personnel exposed to ionizing radiation.

On 20 November 2006, InVS, in collaboration with the DGS and the DGT, organized a public symposium to present the work DST has completed in its first years of operation. It brought together more than 250 people, including those working in the fields of occupational and public health, and in workplace prevention programs, representatives of the agencies concerned, and of management, labor, and civil society. Very fruitful exchanges took place. Abstracts of the papers presented are accessible on the InVS internet site, together with the DST's principal publications from 2006 ([http://www.invs.sante.fr/publications2006/sante\\_travail.html](http://www.invs.sante.fr/publications2006/sante_travail.html)).

## Example of the July 2006 heat wave

### Excerpt\*

"With *Canicula*<sup>2</sup>, sometimes summer days turn into dog days."

Didier Houssin, Director-General of Health

BEH n°19-20/2006

After the heat wave of August 2003, better knowledge for better prevention.

\*From the editorial: Lessons of the heat wave.

A serious heat wave struck France in July 2006. Although it did not reach the intensity of the August 2003 heat wave, it nonetheless set a number of weather records. According to Météo-France, the summer of 2006 was the second hottest since 1950 (behind 2003) and July 2006 was the hottest July during this period, with a temperature 4.2°C higher than normal (figure 1).

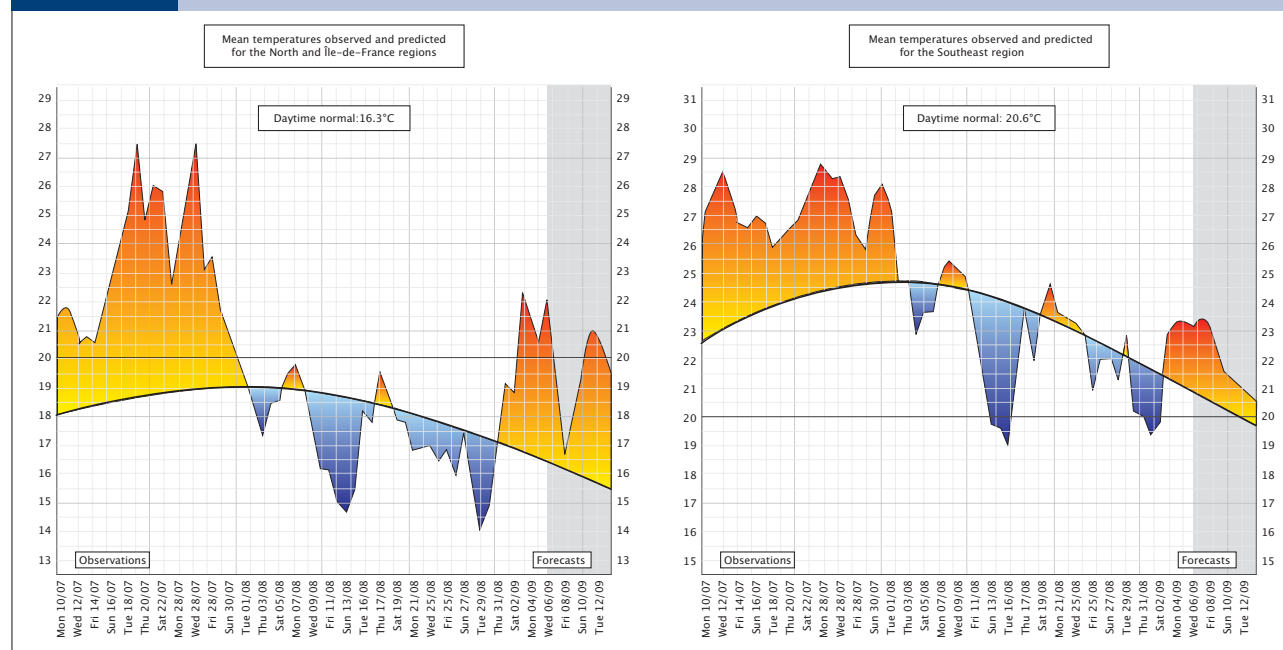
The first heat wave alerts were launched in late June, with a short hot period covering the end of June and the beginning of July,

and then the main heat wave hit during the second half of July. Overall, 73 districts were affected to different degrees and for varying periods (2-27 consecutive days) by the heat wave alerts.

This heat wave, arriving only three years after the catastrophe of 2003, was less intense but longer. Unlike 2003, however, this time the health authorities were prepared. In 2004, in collaboration with Météo-France, InVS set up a heat wave health alert system (SACS), as part of the national heat wave plan (PNC).

FIGURE 1

OBSERVED (WHITE PART OF GRID) AND PREDICTED (GRAY PART) TEMPERATURES FOR THE NORTH AND ÎLE-DE-FRANCE REGIONS AND THE SOUTHEAST REGION IN JULY-AUGUST 2006 AND THEIR DEVIATION FROM NORMAL DAILY TEMPERATURES



Source: Météo-France.

<sup>2</sup> From the Latin *canicula*, "small female dog", which also designates the star *Sirius*, also called *Stella Canicula*, the dog star, Alpha of the great dog, or Orion's dog. In Antiquity, the Egyptians had noticed that during the summer the hottest days generally began when *Sirius* and the sun rose and set at the same time (from July 24 to August 24).

## SACS - THE NATIONAL HEAT WAVE AND HEALTH ALERT SYSTEM

### Meteorologic alert indicators

SACS relies on biometeorologic alert indicators constructed from a study of the relation between mortality and different meteorologic indicators over a 30-year period. It showed that the most relevant indicator was the mean of minimum and maximum temperatures for three consecutive days. Alert thresholds were then defined for a sentinel city in each metropolitan district. These thresholds correspond to a risk of excess mortality of 50% in the large metropolitan areas and 100% in the other cities.

From the first summer of operation, it quickly became obvious that a temperature threshold could not be a sufficient criterion to declare alerts. Other indicators must be taken into account, in particular, Météo-France's level of confidence in its forecasts, humidity and wind, chemical air pollution, which can aggravate the impact of heat, and calendar-related factors such as the dates of heavy vacation traffic.

### Indicators for health monitoring

Throughout the summer, regional epidemiology bureaus collect and analyze the activity of firefighters and rescue workers, the number of cases dealt with by emergency mobile medical services, and the number of emergency department visits in hospitals.

InVS and the CIRE receive from the national statistics institute (INSEE) the number of deaths recorded in municipalities whose vital records data are computerized. Experience showed that this automated reporting was not fast enough for estimating excess mortality during the heat wave. The only information potentially available each day is thus the number of deaths reported by healthcare professionals as possibly associated with the heat, either directly or indirectly. Although these reports are far from exhaustive, InVS requested their collection and transmission to it during the July 2006 heat wave.

These reports do not allow us to measure the excess mortality associated with the heat wave. They nonetheless made it possible to sensitize the public and attract attention to these deaths in workers, athletes and people with specific diseases.

Between 12 July 2006 and 2 August 2006, 133 deaths were reported, 80 among the elderly, 12 workers, four athletes, three homeless people and one child. The mean age of the elderly people who died was 85 years; 46% were men and 54% women. The causes of death directly associated with the heat and mentioned most often were hyperthermia (66 cases) and dehydration (29 cases). In 27 cases, the subjects were on medication at the time of death (antidepressants, neuroleptics, antiparkinson drugs or oral antidiabetic agents).

The number of workers who died during this period—almost 10% of the total deaths—should be mentioned. These were all men aged between 40 and 63 years, and prolonged exposure to heat was reported for almost all of them.

### How it works

The heat wave plan is divided into three parts: seasonal surveillance from 1 June through 31 August; warnings and measures to be implemented when a heat wave is forecast or arrives; and the maximum mobilization required when the heat's consequences extend beyond the scope of health.

Each day, InVS receives observed and predicted temperature data from Météo-France. Together with Météo-France forecasters, InVS analyzes this information and the overall weather situation. It considers the other indicators (air pollution, heavy traffic days, health indicators) and, depending on the situation, proposes an alert to the Ministry of Health. These proposals are discussed at headquarters with various heat wave plan participants, both national and local. Each prefect decides whether to declare a heat wave alert in his or her district.

### Health impact of the July 2006 heat wave

After the July 2006 heat wave, InVS estimated the excess mortality taking into account all possible causes.

The 2006 data for all metropolitan municipalities were compared with data for the same period in preceding years (2001-2005, excluding 2003).

The study period was estimated by considering the days during which alert thresholds were exceeded in at least one district, that is, 18 days from 11 July to 28 July. During this period, 1388 additional deaths were recorded, corresponding to a relative excess of 6%. The older than 75 years were most strongly affected, with an increase of +10%.

An INSERM team (Anne Fouillet, Grégoire Rey, Éric Jouglu, and Denis Hémon) developed a model to predict excess mortality nationwide as a function of daily mean temperatures. This model allowed them to predict excess mortality from pre-2003 data; it therefore estimated this excess independently of the heat wave plan established in 2004 and of the social impact of the 2003 heat wave. For the population as a whole, this model predicted an excess mortality between 11-28 July totalling 4388 deaths more than the number finally recorded. Collaboration with this team thus enabled us to conclude that important progress had been made. This benefit can be interpreted as a reduction in the population's vulnerability to summer heat waves, attributable (in proportions impossible to specify at this stage) to the assessment and consideration of heat-related risks since the 2003 heat wave, to the preventive measures put into place by the authorities and to the SACS.

InVS looked at the morbidity in emergency departments participating in the OSCOUR network for emergency department surveillance data (most of them in the Paris metropolitan region) and found an increase in visits of about 10% for 18-25 July compared with 2005 and of 20-30% for the older than 75 years. Hospital admissions also increased markedly (from 10 to 30% for the general population and 60% for the older than 75 years). Specific heat-related diseases—hyperthermia, malaise, hyponatremia, and dehydration—were more prevalent from mid-July through the end of the month.

This analysis underlines the importance of very reactive health surveillance, able of daily analysis of short-term weather forecasts and of assessing population health risks in order to alert the authorities. The year 2006 was marked by a substantial heat wave in July, the first to test the operation and impact of the heat wave plan. Subsequent analyses have underlined the actual importance of this alert and prevention plan.

### Perspectives

Further work should help to improve these prevention plans:

- improvement of knowledge of relations between heat and mortality and between heat and morbidity
- methodological research to estimate precisely the health impact of high temperature episodes (especially limited in time or space) in the general population and to assess the prevention activities set up
- better knowledge of morbidity in sensitive populations—the elderly but also children and persons with neuropsychological diseases
- better knowledge of morbidity imputable to heat in nursing homes
- better knowledge of mortality displacement phenomena (harvesting effect) after hot spells...

This work to reinforce prevention is, more than ever, a public health priority because during next years, our society will be faced ever more sharply with the risk of excess mortality due to heat waves, for two principal reasons:

- the predictable aging of the population with a growing proportion of very old people
- the consequences of global warming.

**Martine Ledrans**

BEH n°19-20/2006

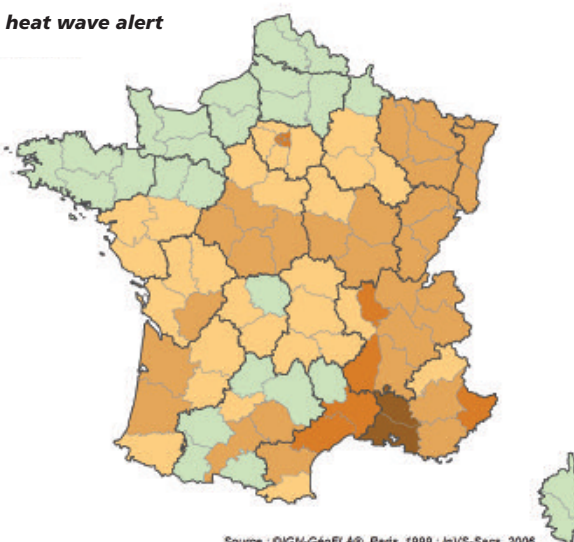
After the heat wave of August 2003, better knowledge for better prevention.

**FIGURE 2** EXTENT OF THE HEAT WAVE

**Metropolitan districts on heat wave alert during July 2006**

**Total number of days of alert per district**

- None
- 1 - 7
- 8 - 14
- 15 - 21
- 22 - 31



Source : IGN-GéoFLA®, Paris, 1999 ; InVS-Séca, 2006.  
Autorisation n° GC07-18

## Example of municipal solid waste incinerators

France has the largest number of municipal solid waste incinerators (MSWI) in the European Union (EU), with 128 plants counted in 2006. Substantial efforts have gone into improving them in recent years. Nonetheless, while there are no longer any MSWIs in France that do not meet European norms, many have caused significant pollution in the past.

Concern of neighbouring populations have on several occasions led the authorities to have local studies conducted to identify more in detail the risks to these populations. Gilly-sur-Isère is the best example.

### INCIDENCE STUDY OF GILLY-SUR-ISÈRE

The Rhône-Alpes regional epidemiology unit conducted this study, which took five years (2002-2006), because of severe anxiety by local residents about their health. This CIRE compared the incidence rates of cancer in the population exposed to the incinerator plume (48 000 inhabitants in 30 municipalities) with the expected rate, taking data from cancer registries as reference.

Compiling a list of all cancers in the study area between 1994 and 2002 required major health data research from multiple

sources. It finally counted 2055 cancer cases, and its quality resembled the registry lists in exhaustiveness and validity. The study did not find any statistically significant excess cancer risk in the exposed area, either for all cancers or for those most often reported to be associated with exposures to incinerators or dioxins.

**It quickly became clear that it would be inefficient and ineffective to conduct this type of study around each incinerator with worried neighbours.** Local conditions are not always optimal. The Gilly-sur-Isère incinerator, for example, is located in a district without a cancer registry and it was therefore necessary to conduct a difficult retrospective survey to find all of the cancer cases that occurred between 1994 and 2002. Moreover, each exposed population is relatively small. The studies thus lack the power necessary to show relatively small differences in risks of exposed and unexposed populations.

In 2002, InVS and AFSSA recommended that two types of studies be performed around MSWIs: one of the dioxin burden of the local population and the other a multicenter study of cancer incidence near the facilities.

Two studies were funded through the national cancer plan.

#### Why a study of incinerators and cancer?

Around the turn of the century, several local health crises, which received very extensive media coverage, alerted the authorities and the population to the possibility of an increased cancer risk among people living in the vicinity of incinerators: Gilly-sur-Isère, Cluny, Maincy, Nivillac, and more. The environmental pollution around these incinerators, often very high, was revealed by occasional, even one-time, measurements, because small systems were exempt from regulation at that time. A French study, performed at Besançon by J.-F. Viel's team (Floret N, Mauny F, Challier B, Arveux P, Cahn J.-Y, Viel J.-F. 2003. Dioxin emissions from a solid waste incinerator and risk of non-Hodgkins lymphoma. *Epidemiology* 14:392) showed an excess risk of non-Hodgkins lymphoma in the cantons (rural administrative subdivisions) exposed to emissions from the local incinerator. Since the dioxin at Seveso was classified as a confirmed carcinogen for humans by the International Agency for Research on Cancer, the risks of exposure through incinerator dust and gases to this family of substances and of the long-term effect of low doses on local residents were a legitimate question. Other pollutants emitted by incinerators might also be involved, including heavy metals, PAHs (polycyclic aromatic hydrocarbons), and dust.

Existing studies on the subject were analyzed as part of an InVS report (Incinerators and Health, InVS 2003) that concluded that the available knowledge was insufficient and that a national study was necessary. The available studies have mainly been performed on workplaces, that is, in high-exposure situations, and their results have been contradictory: some conclude that an excess risk is present, while others do not.

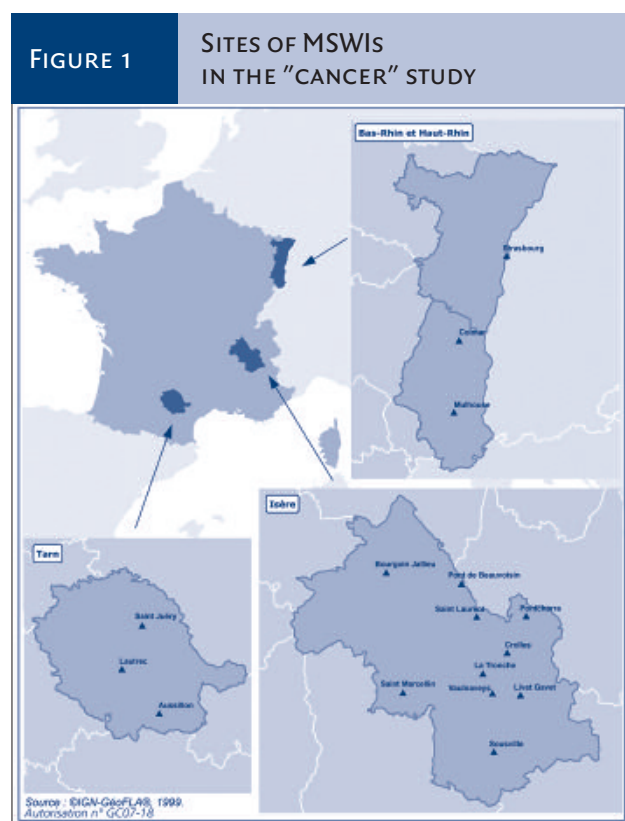
### Study of cancer and incinerators

The objective of the cancer study was to analyze the relation between cancer risk and past exposure to MSWIs for the populations living near them. In this ecological retrospective

incidence study, we looked for cancer cases diagnosed during a past period (1990-1999); population exposure to MSWIs was estimated only as a function of the geographic zone of residence.

The geographic zones used as statistical units were census blocks, called IRIS (Ilots Regroupés pour l'Information Statistique) in INSEE terminology. A rich set of social and demographic information is available for every block, each of which has a relatively homogenous population of approximately 2000 inhabitants. Five possible confounding factors mentioned in the literature could therefore be taken into account: urban density, the urban or rural character of the place of residence, socioeconomic status, airborne traffic pollution, and industrial pollution.

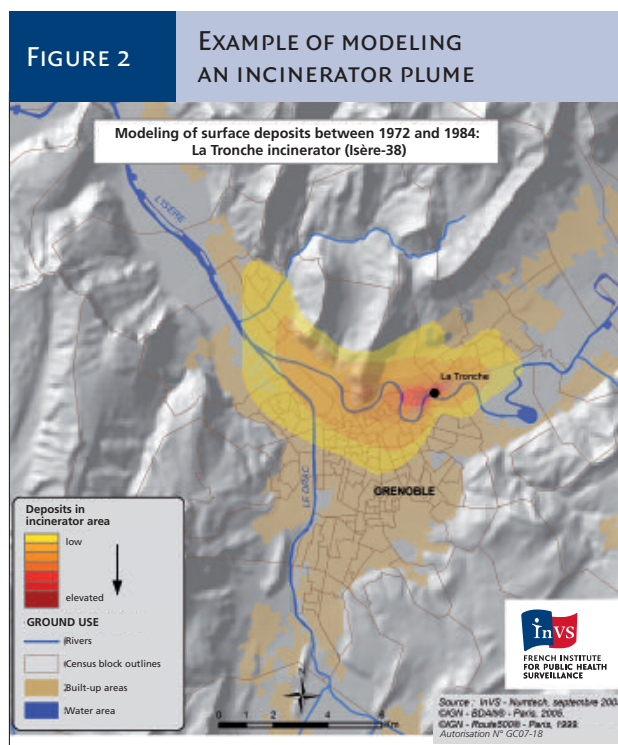
The study period, that is, the period for which health data were collected, covered 1 January 1990 through 31 December 1999. The study area included four districts: Isère, Haut-Rhin, Bas-Rhin, and Tarn (figure 1). These districts were selected because they have general cancer registries old enough to cover the study period. On the other hand, 16 incinerators had emitted pollutants even before this period. This early emission period corresponded to the period of local population exposure. It was defined to make the subsequent development of cancer plausible. This exposure period ranges from 1972 at the earliest to 1985, as a function of emission dates for these different incinerators.



Due to the few number of measurement data available, it was necessary to estimate the MSWI emissions as precisely as

possible to characterize exposure levels retrospectively. These estimates, based on the judgment of experts, took the technical characteristics of each incinerator into account.

Next, the dispersion of each incinerator's plume was simulated by computer (figure 2), taking into account meteorologic and topographic indicators (roughness, relief) and using the most recent techniques (second-generation Gaussian models).



The cancer incidence rates observed in the census blocks were related to the expected reference incidence rate from cancer registry data (in the study districts, as well as in Doubs and Hérault). We compared the standardized incidence rates obtained in the census blocks with the highest, intermediate, and lowest exposure levels. Excess risks could thus be calculated according to exposure.

Overall, the study analyzed 135 567 cases of cancer in 2272 census blocks. The early results show a statistically significant linear exposure/risk relation for some cancer sites.

The excess risk for persons living in highly exposed census blocks compared with those living in slightly exposed blocks was 6.8% for liver cancer, 1.9% for non-Hodgkins lymphoma, 9.1% for soft-tissue sarcoma, 2.8% for all cancers in women, and 4.9% for breast cancer. On the other hand, we found no statistical relation for lung cancer or bladder cancer (table).

TABLE EXCESS RISK OF CANCER, BY SITE, FOR INHABITANTS OF CENSUS BLOCKS WITH INTERMEDIATE AND HIGH EXPOSURE, COMPARED WITH RESIDENTS OF SLIGHTLY EXPOSED CENSUS BLOCKS			
Sites	Excess risk for residents of census blocks with intermediate exposure (50 <sup>th</sup> percentile) compared with the 2.5 <sup>th</sup> percentile)	Excess risk for residents of census blocks with high exposure (90 <sup>th</sup> percentile) compared with the 2.5 <sup>th</sup> percentile)	P values
Liver cancer (both sexes)	6.8% (0.1–14.1)	9.7% (0.1–20.3)	p<0.05
Malignant non-Hodgkins lymphoma (both sexes)	1.9% (0.0–3.8)	8.4% (0.2–17.2)	p<0.05
Soft-tissue sarcoma (both sexes)	9.1% (-1.7–20.9)	12.9% (-2.3–30.6)	p=0.1
All cancers in women	2.8% (0.7–5.1)	4.0% (0.9–7.2)	p<0.05
Breast cancer in women	4.8% (2.0–7.7)	6.9% (2.9–11.0)	p<0.05

The strength of this study lies in the precision of its exposure measurements with many data points collected and analyzed with the most advanced techniques for statistical modeling and taking into account the potential confounding factors that could be measured at a collective scale. The other remarkable point is the precision and reliability of the health data collected, due to the cooperation of the cancer registries and the georeferencing of cases.

By itself, an ecological study cannot establish a causal relation between exposure to incinerator fumes and the cancers mentioned. The excess risks measured are relatively low, but the study also establishes a linear exposure/risk relation, which is compatible with causality. This is the first study to show such a result for breast cancer.

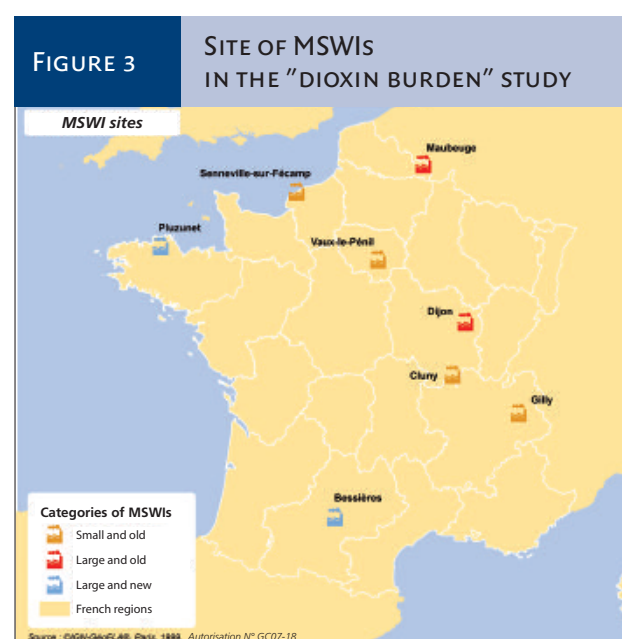
It must be stressed that the risk detected reflects old exposure situations—from 1972 through 1985—not currently transposable because of the major reduction in incinerator emissions since the 1990s. Interpretation of these data requires still more analysis and cannot at this stage provide guidelines for risk management.

### The "dioxin burden" study of the populations living under incinerator plumes

The objective of this study was to establish whether the populations living around MSWIs had abnormally high blood dioxin levels and to analyze in detail the determinants of the dioxin burden. It was conducted in partnership with AFSSA, implemented by InVS, and coordinated locally by the regional epidemiology units.

The first stage involved selecting incinerators with different emission profiles: small old incinerators that had been major polluters, large old incinerators that had been polluters, and large new incinerators that meet the new standards. Next we selected the incinerators around which we might be able to identify populations eating locally grown or raised products who might therefore have been contaminated by incinerator emissions. Food is the principal source of dioxin exposure.

Eight sites near incinerators were chosen (figure 3). For each site exposed to incinerator emissions, an unexposed site in the same region was chosen to maximize the comparability of the populations.



At each site, subjects were randomly selected, and those who agreed to participate were included. In a face-to-face interview, they answered a questionnaire about their individual characteristics, their food habits, and their domestic environment. Finally blood samples for dioxin and PCB (polychlorinated biphenyls) assays were taken and sent for analysis to the reference laboratory at the University of Liège in Belgium (CART laboratory).

Overall 1053 people aged 30-65 years participated in this study, of the 2069 randomly selected. They had to have lived in the study area for at least ten years, have no occupational exposure to dioxins and not have breast-fed (or very briefly).<sup>3</sup>

AFSSA, Aria Technology and the National Institute of the Environment and Industrial Risks (INERIS) modeled the plumes to assess incinerator exposure. The results showed that globally the mere fact of living near an incinerator did not increase blood dioxin or PCB concentrations to a statistically significant degree. Nonetheless, farmers living in exposed areas who ate fats from home-raised animals and vegetables they grew themselves had a statistically significantly higher burden than similar farmers in unexposed areas.

The principal determinant of dioxin burden related to incinerators is therefore eating local food products. On the other hand, the study did not show any difference among people who did not eat local products and therefore provided no evidence of airborne contamination.

These differences were not found around recent incinerators meeting EU standards. The results about locally grown food are consistent with the literature. They cover a more recent exposure situation than that of the cancer study, since the assays in 2005 reflect exposure during the 1990s, at a time when emissions had already been reduced.

**Overall:** in Gilly-sur-Isère, the overall cancer incidence is low in the study area, and the "dioxin burden" study also showed a low blood concentration. It therefore appears that in these conditions the possible contribution of the incinerator, if it exists, cannot be observed.

The cancer study showed a statistical association (exposure/risk relation) between residing under **old** incinerator plumes and the onset of several cancers (of the liver and the breast, as well as non-Hodgkin lymphoma and soft-tissue sarcoma). This association is expressed by significant excess risks, although they are low compared with those for many other risk factors of cancer (increased risk on the order of 5-10% for those highly exposed compared with the least exposed).

The burden study shows that the dioxin concentrations measured nowadays in the blood of persons living near incinerators are not statistically higher than in nonexposed persons. We note nonetheless that the farmers eating local animal products (meat, dairy products, eggs) and living near old highly polluting incinerators had a statistically higher blood dioxin concentration than those who were unexposed. This difference was not found around the incinerators meeting EU standards.

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<sup>3</sup> Breast milk is a pathway for the elimination of dioxins. Nursing mothers therefore have lower dioxin levels.

# Invasive meningococcal disease in Seine-Maritime: the role of health surveillance in public action

## BACKGROUND

In early 2003, InVS was alerted about an increased incidence of invasive meningococcal disease (IMD) in the Seine-Maritime district. This came a few years after a similar outbreak, which InVS had investigated and reported in 1997. The mean annual incidence rate of IMD in Seine-Maritime from 2003 to 2006 was  $3.0/10^5$ , twice as high as for the rest of France. This hyperendemic condition is associated mainly with the circulation of a meningococcus strain group B, serovar 14 and subtype P1.7.16 (B:14:P1.7.16) and belongs to clonal complex ST-32 (figure). It affects mainly the city of Dieppe and its surrounding municipalities. From 2003 through 2006, 48 confirmed B:14:P1.7.16 cases were reported to the district health and social service (DDASS). Children younger than 5 years and adolescents aged 15-19 years were most affected. The high lethality of the confirmed cases (10 deaths, 21%) reveals the virulence of the strain.

## FROM ALERT TO VACCINATION CAMPAIGN

Reinforced epidemiologic surveillance began in 2003, based on the reactive exchange of information between clinicians and clinical pathologists, the DDASS, the upper Normandy CIRE, the CNR and InVS.

Locally, measures were taken to optimize prevention in subjects' contacts and to reinforce physicians' recognition and early management of cases: adapting protocols for intervention around cases, information for healthcare professionals and raising awareness in the population. The CIRE carried out periodic epidemiologic analyses, available on the DRASS/DDASS and InVS websites.

InVS regularly informed the Directorate-General of Health (DGS) of the epidemiologic trends, especially of case clusters, upsurges in cases, and increased lethality, and the decision support unit met three times a year in average. On several occasions, InVS presented epidemiologic analyses to experts at the French High Council of Public Hygiene (CSHPF).

At the end of 2004, the CNR for meningococci reported exciting news: the sera of subjects immunized with a vaccine developed by the Norwegian Institute of Public Health (from outer membrane vesicles against a strain of the same subtype) had bactericidal activity against the strain in Normandy. After a specific report by experts at the French drug agency (AFSSAPS), the High Council decided in mid-2005 to support the use in

Seine-Maritime of the MenBvac vaccine™, which was available only in Norway.

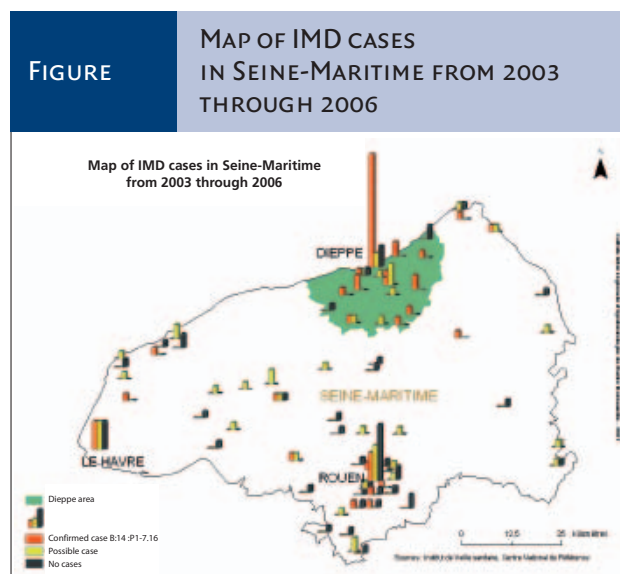
Several cases of IMD occurred in September, October, and November, and three patients died. In December experts developed vaccination strategies (targeted by age and geographic area) from epidemiologic data, and the High Council recommended their implementation.

The Minister of Health followed this recommendation for MenBvac™ vaccination, despite its lack of marketing authorization, for Seine-Maritime residents aged 1 to 19 years. Vaccination consists of three doses followed by a booster.

This public health operation is being carried out in successive stages because of the limited production capacity of the Norwegian Institute. In June 2006, the first phase used the vaccine stock already available to target the population most affected, children aged 1-5 years in three cantons of Dieppe.

## CONCLUSION

Reinforced epidemiologic follow-up and close collaboration between the different surveillance partners made it possible to identify and implement exceptional control measures, necessary for the local IMD hyperendemic situation, including vaccination of the most vulnerable groups with a vaccine not available in France.



*Confirmed case: case of IMD B:14:P1-7.16.*

*Possible case: case of IMD B of unknown serovar or subtype or IMD of unknown serogroup, so that it was impossible to rule out the B:14:P1-7.16 strain.*

TABLE

NUMBER OF CASES AND MEAN ANNUAL INCIDENCE RATES (PER 100 000) OF CONFIRMED AND POSSIBLE B:14:P1.7.16 CASES IN SEINE-MARITIME BY GEOGRAPHIC SECTOR (2003-2006)

	Dieppe area (84 500 inhabitants)	Seine-Maritime outside Dieppe (1 154 600 inhabitants)	Total district
Number of confirmed B:14:P1.7.16 cases	30	18	48
Number of possible cases*	10	36	46
Mean annual incidence rate of confirmed and possible cases per 10 <sup>5</sup>	11.8	1.2	1.9

\* IMD B of unknown serovar or subtype or IMD of unknown serogroup, so that it was impossible to rule out B:14:P1-7.16 strain.

## Clostridium difficile: the role of health surveillance in quality of care

### THE FIRST EPIDEMIC OF *C. DIFFICILE* 027 INFECTION IN FRANCE

- In March 2006, a hospital in the Nord district reported case clusters of *Clostridium difficile* infections (CDI) to InVS: the survey by the Paris North nosocomial infection control coordination center (CCLIN) identified 41 cases of CDI. The laboratory at Saint-Antoine hospital in Paris characterized the strains of 22 patients: 16 were type 027. The first CDI 027 epidemic in France was detected in a region bordering two countries already involved in this epidemic (Belgium and the Netherlands - see box).

- In December 2006, 36 healthcare facilities and three nursing homes in Nord Pas-de-Calais reported one or more CDI cases, and strain 027 was found in 27 facilities. These 39 episodes involved 449 cases, 436 (97%) of which were reported by the establishments. The infected patients were mainly elderly, hospitalized in an acute-care hospital department (most often geriatrics) or in follow-up and rehabilitation facilities. The infection contributed to the death of 23 patients.

In December, the epidemic slowed markedly in the region (figure 1). In the rest of the country, 61 healthcare facilities reported one or more CDI cases, none directly associated with those in Nord Pas-de-Calais (figure 2).

FIGURE 1

CASES OF *CLOSTRIDIUM DIFFICILE* INFECTION HOSPITALIZED IN NORD PAS-DE-CALAIS, BY WEEK AND TYPE OF CASE, JANUARY-DECEMBER 2006 (N=425, DATA AS OF 05/12/2006)

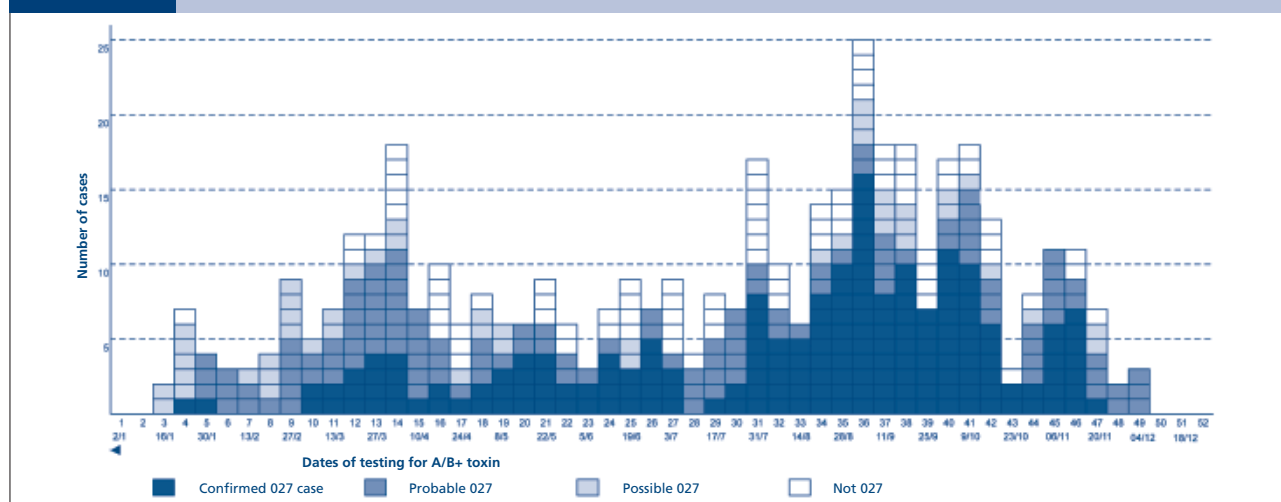
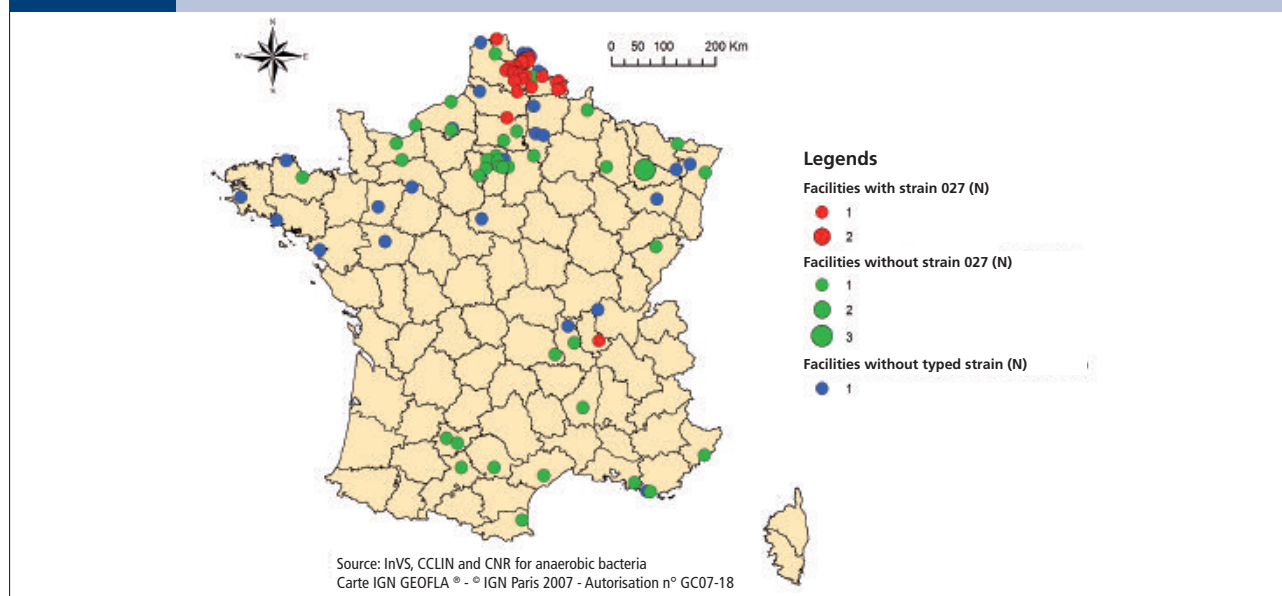


FIGURE 2

EPISODES OF *CLOSTRIDIUM DIFFICILE* INFECTIONS REPORTED, BY TYPE OF STRAIN, FRANCE, 2006  
(N=97) (DATA INVS/RAISIN/CNR ON 05/12/2006)



## PREVENTING *C. DIFFICILE* INFECTIONS AND LIMITING THEIR DISSEMINATION

The emergence of strain 027 offered an occasion to sensitize healthcare professionals to the diagnosis and prevention of nosocomial diarrheas. Surveillance guidelines by RAISIN were augmented by prevention and control guidelines issued by the advisory committee on nosocomial and iatrogenic infections (CTINILS) (<http://nosobase.uhc-lyon.fr/Actualites/annexeCTINILS.pdf>).

Prevention of CDI requires above all a reinforced policy of appropriate antibiotic usage. Control of its dissemination depends on rapid diagnosis and the application of hygiene precautions. If

the infection is severe or occurs as part of an epidemic, the healthcare facility must report it to the CCLIN and to the DDASS and have the strain characterized by a laboratory of the Anaerobic Bacteria CNR.

The combination of nosocomial infection reporting and expert capacities in microbiology made it possible to detect the emergence of CDI 027 in France. The control measures implemented by the institutions, highly mobilized, have so far limited its dissemination. The reporting system has thus provided a fundamental contribution to health surveillance and to improving the quality of care. Vigilance remains essential and specific surveillance of CDI will complete this alert system in 2007.

### Anticipation

*Clostridium difficile* is a bacteria that causes post-antibiotic diarrhea and pseudomembranous colitis. It is the leading cause of nosocomial infectious diarrhoea in adults. Since 2003, the incidence and proportion of severe CDI has risen in Canada and in the United States, accompanying the emergence and dissemination of a particular clone called "027", resistant to some antibiotics and a hyperproducer of toxins. First detected in North America, this clone spread in 2005 into Great Britain, Belgium, and the Netherlands.

This emergence abroad led InVS to several anticipatory activities to promote the rapid detection of CDI 027 in France and limit its dissemination: regular verification of reporting data, collaboration with laboratories with expertise in this microorganism (anaerobic CNR and the Saint-Antoine Hospital laboratory in Paris), information of the CCLIN and healthcare facilities to diagnosis of nosocomial diarrhoea, drafting guidelines for CDI diagnosis, reporting and surveillance (InVS report, *Management: diagnosis, investigation, surveillance and principles of prevention and control of Clostridium difficile infections*, 2006, 42p - [http://www.invs.sante.fr/publications/2006/guide\\_raisin/index.html](http://www.invs.sante.fr/publications/2006/guide_raisin/index.html)), organization of a network of expert laboratories with the CNR and collaboration with ECDC).

## Role of the CIRE in the alert management plan

The drafting and implementation of the PRSP in 2006 has moved the organization of public health in France significantly forward, especially by reinforcing its regional activities. The PRSP are programs that meet regional priorities and adapt the national plans (for cancer, environmental health, occupational health, nutritional health, etc.) to them, based on a diagnosis of the region's health and social situation.

An innovative aspect of the PRSP, indicative of the legislature's desire to improve the organization of alert response, is the mandate to develop an action plan for management of alerts and emergency health situations (PRAGSUS).<sup>4</sup>

The CIRE, the regional epidemiology units that are InVS's regional relays, were naturally enough assigned to develop these plans. In recent years, their mission has clearly turned towards surveillance and response to health alerts. Besides providing simple methodological support to the devolved agencies, especially for investigations of epidemics and case clusters, the CIRE set up surveillance systems, issue and respond to reports and health alerts, and lead surveillance networks.

Developing these plans is a real challenge for InVS, which must ensure that they fit into a coherent national and international framework for alert organization, but also for the CIRE, which must produce a document that is a useful reference tool for regional participants in surveillance.

In 2005, a guidance document<sup>5</sup> taking into account the basic international orientations (ECDC and WHO) defined the principles and organization of health alerts in France. This guide provides a structured outline for the CIRE to develop the action plans—their priority for 2006.

The CIRE worked hard to develop these plans, but they could not do it alone: the plan includes sections about alerts for and management of health emergency situations, and the latter are mainly the responsibility of the district health and social offices (DDASS). The CIRE's positioning in this field of action and their status as the regional InVS office allowed them to play a dynamic leadership role.

The development process for these plans cannot be summarized uniformly because of the diversity of regional priorities. The inclusion of the major objectives by all the regions nonetheless demonstrated the consistency of the activities defined and the utility of the national guidance document. The example of the PACA region shows the work involved in developing this document and describes the results as well as the difficulties of the process.

The process concentrated on three themes:

- work with professionals in the field of alerts to design the plan
- work with participants to inventory the organization of surveillance and alerts
- analyze the documents available about health risks and existing surveillance systems in the region.

A small working group, including public health officers, health engineers, and health inspectors responsible for emergency plans at the DDASS, DRASS and regional hospital agencies (ARH), was set up at the outset. The CIRE proposed that either the event risk management unit (GRE) or the Biotox unit of the DRASS co-direct the document development process. The CIRE and the GRE were responsible for the actual drafting.

To assess the current organization of health surveillance, meetings were organized in the district health services with representatives of its management, of the departments of environmental health, health actions, and health surveillance, and in some offices, the social work department. Interviews discussed the organization of report handling and alerts in these departments, analyzing precisely the periods of the week and on-call periods, but also the procedures and tools used for alerts, alert management, and links with partners.

It became clear that the procedures—from receiving a report to lifting the alert—were not formalized. The DDASS uses numerous tools (including directories and quick reference sheets) during on call periods, and these are not updated systematically. Development of these tools and keeping them up to date is a heavy burden, especially in small offices. Alert management is better standardized in the DDASS that have had experience with them.

Accordingly, while the strong points of organization that deserve sharing were noted by some DDASS, most asked that the procedures for treating reports and alerts be formalized, that experiences and documents be shared, and that work with some partners also be made more formal.

Development of the action plans required assessment of the health risks and surveillance systems in the region. Several documents were studied, including some produced by InVS, the DRASS, the ORS and the DRTEFP. This work took the longest time because of the diversity of the information sources and the great number of systems, structures, departments, and associations related in some way to surveillance. A census of health risks, not guaranteed to be exhaustive, was thus developed and helped define surveillance priorities.

<sup>4</sup> Article L.3110-6 of the Public Health Code.

<sup>5</sup> *Health Alerts in France, Principles and Organization*, May 2005.

After this preparation, the document was drafted pragmatically, with a limited number of objectives, and organized according to three themes: the organization of a surveillance and alert network, training and development, and adaptation and reinforcement of surveillance systems. Three objectives were presented in regional health conferences and validated by the DDASS management:

- structure the system of health surveillance and the treatment of alerts. This objective had two components: it sought to develop modalities of surveillance and alert and make them operational in the DDASS and the DRASS, and it aimed to produce procedures and ensure they are kept up to date, by developing and updating the tools necessary for surveillance and alert (such as quick instruction sheets and informatics tools);
- training of participants. These organizational activities must be accompanied by training activities in treating alert reports and management, working towards a global improvement in response capacity;

- improve the early detection of signals and alerts and the leadership of a network of regional partners: reinforce especially the system for mandatory-report diseases and the regional surveillance systems implementing the national guidelines, and develop a nonspecific surveillance system based on the OSCOUR and ARH systems.

Generally, the concepts of organizing the system, leading surveillance, and training staff were clear priorities in the action plans.

Drafting these imposed a substantial workload on the CIRE. In PACA, the working group may be enlarged to other partners in order to allow the CIRE to evolve towards a more supervisory role as action progresses. A substantial investment by the DDASS and partners will be necessary for these activities to come to fruition.

For InVS, the regional epidemiology units are essential as leaders of the networks of health surveillance partners in the regions and regional coordinator of surveillance systems implementing national directives.

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## Alert about possibly contaminated oysters in Arcachon Bay

During the past 20 years, Arcachon Bay has been struck by episodes of shellfish contamination by a phycotoxin responsible for a diarrhoea syndrome in humans and produced by a toxic type of microalgae of the genus *Dinophysis*. These algae come from the open sea, penetrate into the bay where they can propagate after several days but do not develop there.

Surveillance of Arcachon Bay is conducted in part by the French sea research institute (IFREMER), which coordinates microbiological, chemical, and hydrologic surveillance systems. This surveillance detected episodes of toxicity in 2005, then in May and August of 2006. Nonetheless, neither the toxic substance nor the phytoplankton species producing it could be identified. This suggested the possibility of a new type of toxic algae.

### QUESTIONS ABOUT THE MOUSE BIOTEST

The sale of oysters from Arcachon Bay was banned several times during August 2006 because of positive results on the standard mouse biotest. According to AFSSA, this test, which is part of the national surveillance system for phycotoxins (that is, algae toxins), is the best way to identify general toxicity by all toxin families. It is also considered the only test that can routinely detect new or emerging toxins. It involves injecting an extract of the oysters into three mice; the results are considered positive

if two or three of them die within 24 h. This indicates that the shellfish contain quantities of toxin exceeding healthy limits, do not meet regulatory standards, and are unfit for consumption. A test is negative if at most one of the three mice dies within 24 h of injection. A negative mouse test is not necessarily equivalent to a total absence of toxicity, since there is a threshold below which the toxin level is undetectable.

### EPIDEMIOLOGIC SURVEILLANCE

The bans following positive mouse tests had extensive local economic implications and led to a debate about the validity of the test used as well as of the health impact that might be associated with consumption of these oysters. Accordingly, later in August, the DDASS of the Gironde and the Aquitaine CIRE were asked to organize epidemiologic surveillance of health events associated with Arcachon Bay oysters. It was uncertain if epidemiologic surveillance was either feasible or relevant, since neither the possible toxic agent nor its human health effects had been identified.

Nonetheless, nearly all phycotoxins induce gastrointestinal symptoms, sometimes accompanied by other signs or symptoms. It was thus agreed to monitor gastroenteritis cases as an indicator of possible food poisoning by contaminated shellfish.

The Aquitaine CIRE relied on data from a syndromic surveillance system based on reports of house calls by SOS Médecins Bordeaux, which it has coordinated since 2004 (see box). Each day, they reported the number of gastroenteritis diagnoses as well as their course. This analysis shows the seasonality of this mainly wintertime disease, but also its continuous background level (figure). This number was also compared with other indicators such as activity data from hospital emergency departments (number of visits) in the region and more specifically those around Arcachon Bay. Finally, direct contacts with healthcare professionals provided qualitative data. This crossing of epidemiologic information was intended to identify as quickly as possible any unusual health event or an upsurge in the number of gastroenteritis cases in the Bordeaux area or around Arcachon Bay.

At the same time, the Gironde DDASS asked general practitioners to be particularly vigilant with patients consulting for gastrointestinal disorders that occurred within several hours of consumption of oysters or other shellfish from the bay. They were asked to complete a mandatory notification form for suspected food poisoning.

Finally, a campaign was conducted to sensitize physicians to mandatory notification of diseases, including foodborne illness outbreaks. These reports lead to an investigation by the health or veterinary health department, intended to identify the food responsible for the outbreak so that specific measures can be taken to prevent recurrences. Such a procedure was particularly appropriate to the issue of shellfish contamination and to the identification of its causal agent.

## TWO DEATHS SUSPECTED OF ASSOCIATION WITH OYSTER CONSUMPTION

On 6 September, 2006, the Ministries of Agriculture and Health announced two deaths of tourists visiting the Arcachon Bay area. The identified common point was that both ate oysters in the 48 h before they were hospitalized. The Gironde DDASS and the Aquitaine CIRE immediately began investigations to identify the cause of these deaths, and the ARH set up an expert

assessment. At the same time, InVS activated a nationwide toxicity monitoring system, in collaboration with the poison centers (CAP) throughout France.

The immediate opening of a criminal investigation greatly limited access to information about these two patients. Nevertheless, in light of all the results, Arcachon Bay oysters were exonerated from any role in the first death by 8 September. The results of autopsies ordered by the investigating judge were not known before several months and, the 1 December 2006, the attorney general of the Bordeaux Appeal Court announced that no charges would be filed.

## ORGANIZED AND REACTIVE REGIONAL HEALTH SURVEILLANCE

This health question mobilized a large number of public health actors, both local and national. The work of investigation and the coordination of surveillance systems are the structural foundations of the regional health surveillance networks established by the regional action plans. The quantity and quality of the information produced shows the capacity of the regional network to provide help in emergency management within relatively brief delays. The investigations conducted during the summer of 2006 and the data produced by the surveillance systems coordinated by Aquitaine CIRE did not find any unusual activity or epidemic involving gastroenteritis. These results were reinforced by their consistency with the InVS and DGS results at the national level.

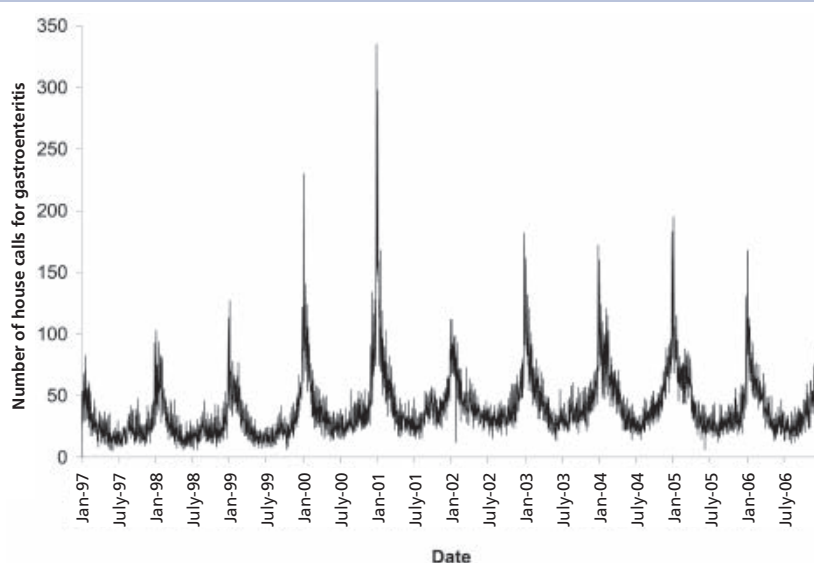
Prudence is required in accepting this interpretation. It was reasonable to think that contamination of oyster production in Arcachon Bay could create a serious health risk. The surveillance systems must be able to identify deteriorating health conditions. Moreover, a causal link with possible oyster consumption is difficult to show by surveillance systems alone. Epidemiologic investigations, such as case-control studies, should provide the necessary additional information. In any event, the epidemiologic results of the surveillance systems coordinated by Aquitaine CIRE do not in any way challenge the validity of the mouse tests or the interpretation of their results.

### SOS Médecins: a syndromic surveillance system

The Aquitaine CIRE, in collaboration with SOS Médecins Bordeaux, which provides emergency house call services, set up a health surveillance system based on house calls by this association of 60 physicians. They make an average of 400 house calls daily in an area including 70 municipalities, with a population of 800 000 inhabitants, almost 60% of the district. Each day, the Aquitaine CIRE collects, analyzes and interprets the number of visits by SOS Médecins Bordeaux and diagnostic information for each visit; this information is then distributed to the regional health surveillance partners. Daily analysis of these data makes it possible to follow trends in the Bordeaux area, identify epidemics (such as influenza, gastroenteritis, and bronchiolitis), and investigate specific topics.

FIGURE

TRENDS IN THE NUMBER OF HOUSE CALLS FOR GASTROENTERITIS BY SOS MÉDECINS BORDEAUX IN THE BORDEAUX AREA FROM 1 JANUARY 1997 TO 31 DECEMBER 2006



Source: SOS Médecins Bordeaux.

## Monitoring mortality in real time

The events of the summer 2003 heat wave showed that InVS must have access—in as close to real time as possible—to health data if it is to provide reactive surveillance. Therefore it chose to develop an information system that takes daily updated morbidity and mortality data into account. To be able to identify new threats not necessarily defined in advance, it also decided that these sources of information should be nonspecific and sensitive. Morbidity surveillance is based on data from hospital emergency services, while mortality surveillance is based on the recording of deaths by INSEE from computerized civil records.

### INSEE DATA: ROUTINE DATA TRANSMISSION

INSEE has transmitted mortality data to InVS daily since June 2004. These data come from 1152 municipalities throughout France, including overseas districts. This sample includes all municipalities with computerized civil records, and covers more than two-thirds of daily French mortality and more than 1000 deaths a day. It is sufficiently representative to identify episodes of excess mortality that may be due to an epidemic or climate event of national or regional scale. It is not, however, sufficient to measure the total impact of these events.

INSEE has also made its historic mortality data available to InVS. These allow more precise mortality comparisons: calculation of the number of expected deaths provides a reference to compare with the number of deaths observed by unit of time (day, week, month).

The data transmitted to InVS come from death reports recorded electronically at municipal civil records. They are transmitted to INSEE's headquarters in Nantes, which centralizes the nation's demographic data. This information is sent to InVS daily, after processing (at the end of the night).

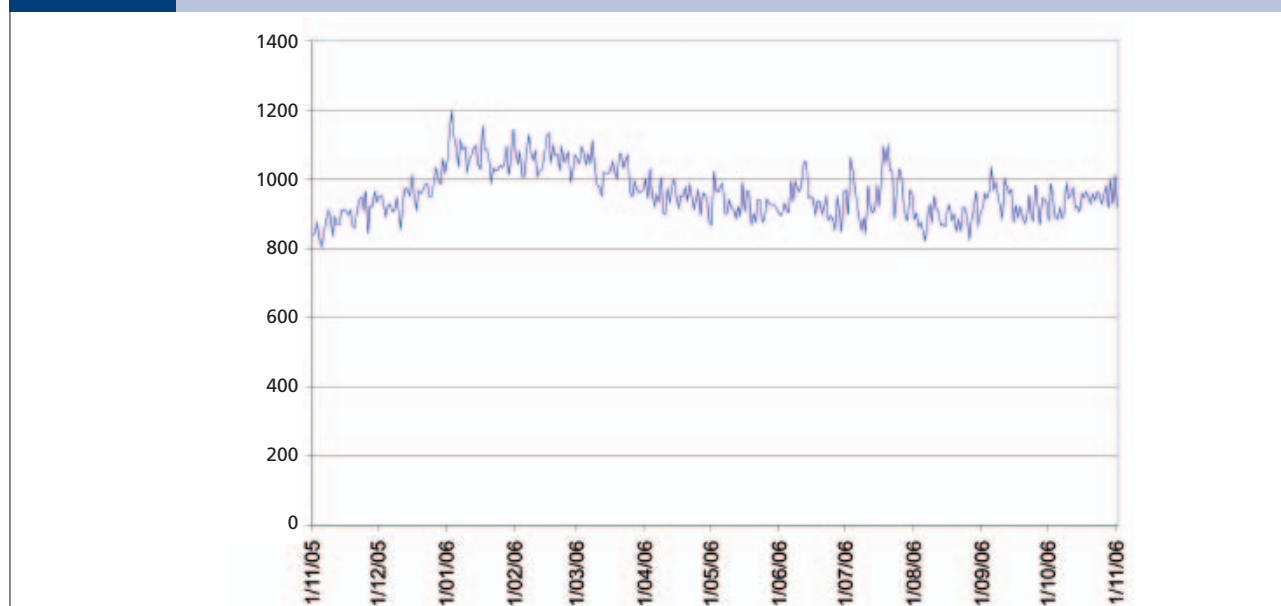
This internet transmission uses data encryption. The following variables are communicated to InVS for each death:

- date of death
- municipality of death
- district of death
- year of birth
- sex.

The graph below illustrates the normal trends in French mortality for a little longer than one year. Mortality usually peaks in winter, during the influenza epidemic. This surveillance system has recorded more than 730 000 deaths since it was implemented.

FIGURE 1

DAILY DEATHS OVER TIME—BASED ON 1152 COMPUTERIZED MUNICIPALITIES



Source: InVS/INSEE.

The principal limitation of this system is that it relies on raw mortality data that do not specify the causes of death. It is thus impossible to know if an episode of excess mortality is related to a particular phenomenon (similar or identical causes of death) or is simply a cluster of unassociated deaths.

Nonetheless, when the number of deaths is rising, other sources of information available to InVS make it possible to consider an association with a cause (environmental or epidemic or other). Rapid knowledge of cause of death will be possible soon, as electronic death certification is progressively extended (see box).

## USING MORTALITY DATA: AN EXAMPLE

In 2006, a chikungunya epidemic battered the island of Réunion. The disease struck more than 260 000 people. Surveillance of this epidemic had to measure its impact on mortality. No epidemic of this scale had ever been described before, nor had its lethality been studied.

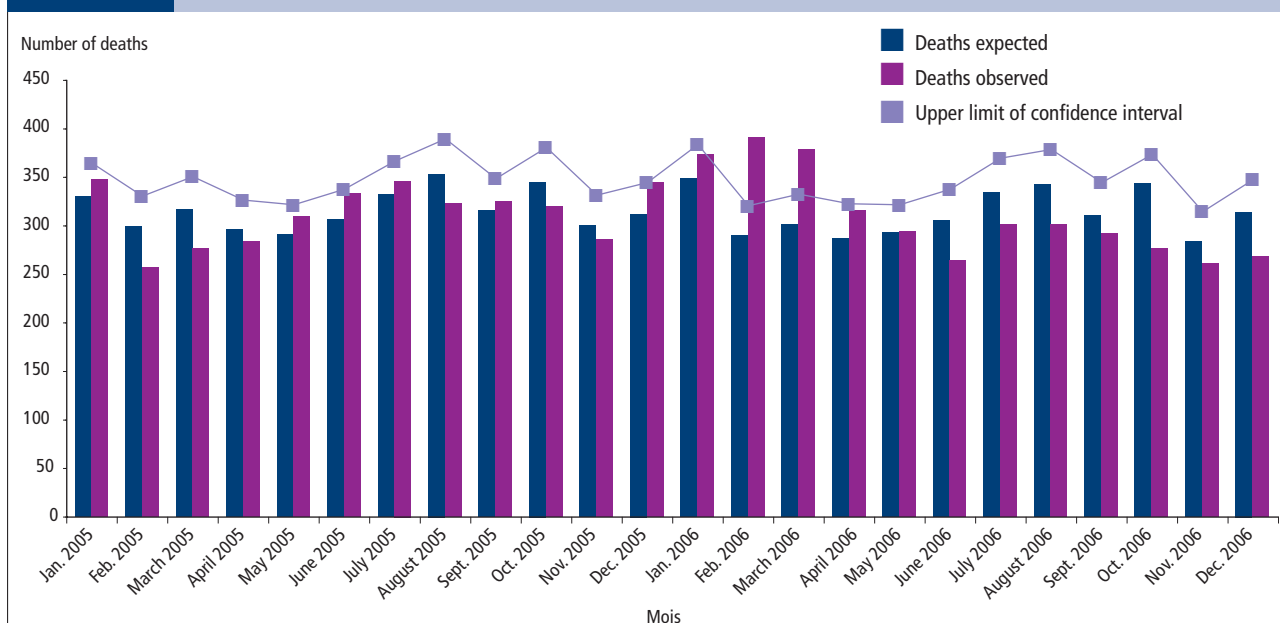
The computerized vital records offices of Réunion cover nearly 90% of the deaths on the island, so that this surveillance is representative.

The historic death series provided to InVS by INSEE allowed us to calculate the number of expected deaths for the island and then compare this theoretical number with the number of deaths actually recorded.

This regular follow-up of deaths for two years made it possible to identify a period of excess mortality perfectly consistent with the epidemic course during the first quarter of 2006, as the graph shows. The phase of excess mortality was then followed by a period of mortality markedly lower than usual. Overall, the number of deaths recorded in 2006 is almost equivalent to the number of expected deaths. It is nonetheless difficult to interpret this lower than normal mortality as a harvesting or displacement effect because we do not know how mortality would have developed normally without the epidemic.

FIGURE 2

COMPARISON OF EXPECTED AND OBSERVED DEATHS IN RÉUNION IN 2005/2006,  
BASED ON DATA FROM 13 COMPUTERIZED VITAL RECORDS OFFICES



Source: InVS/INSEE.

#### Electronic death certification: a major step forward<sup>6</sup>

The establishment of electronic death certification by INSERM (CépiDc) is an important development for health surveillance. The architecture of the system developed by INSERM planned for InVS to have access to causes of death within several hours of the physician's certification. This system is currently being tested in some hospitals and medical institutes. It will be progressively extended and aims to replace paper death certificates completely in hospitals ([http://www.certdc.inserm.fr/accueil\\_public.php](http://www.certdc.inserm.fr/accueil_public.php)).

This major development will free mortality surveillance from its two main difficulties: delays in transmission from civil records, which is sometimes several days, and lack of precision about causes of death.

<sup>6</sup> Decree n° 2006-938 dated 27 July 2006 about death certificates and modifying the general community code (regulatory section).

## HIV/AIDS surveillance in 2006 - After three years of mandatory reporting

After the introduction in 1996 of powerful combinations of antiretroviral treatments, AIDS reporting no longer reflected the epidemic's dynamics. Several years of collaboration, especially among healthcare professionals and civil society, including patients' groups, were necessary to develop an HIV reporting system in France that all parties accepted and that adequately protected patients' anonymity (figure 1). The complexity of this system nonetheless results in under-reporting (between 30 and 40%) substantially higher than that observed at the end of the 1990s (15%). Despite this limitation, the system is very innovative, especially in its virological surveillance of recent infections and circulating viruses, which has been combined with the mandatory HIV notification from the onset of the new system (box 1).

What lessons can we draw about this new system three years after its launching?

- The results of HIV reporting and virologic surveillance bolster those of surveys among homosexuals and injecting drug users (figure 2). Periodic surveys of homosexuals show that sexual risk behaviors have increased since 2000. They have caused an upsurge of sexually-transmitted infections (STI) (box 2) and a large and growing number of new diagnoses of HIV infection: almost 1500 French homosexuals discover they are seropositive each year. In 2005, they accounted for one quarter of the new diagnoses. Virologic surveillance gives us something else to worry about as well: nearly half of homosexuals (45%) were infected in the 6 months

preceding their diagnosis. This high proportion reflects new contamination. It also illustrates, by the way, the importance of screening practices in the homosexual community. The very low number of new diagnoses among drug users since 2003 similarly confirms the results of HIV seroprevalence surveys in this population.

- The data on HIV reporting, like the AIDS data, underline the large proportion of new diagnoses in people from sub-Saharan Africa (30% in 2005: table). This proportion reflects partly migration from countries where HIV prevalence is often elevated. Nonetheless, the virologic surveillance now provides two new pieces of information that suggest that these contaminations are also occurring in France. Nearly 10% of the Africans who discover their HIV seropositivity in France were infected in the six months before diagnosis, and nearly one quarter of the Africans are infected by an HIV-1 subtype B virus that historically is predominant in western Europe and almost absent from Africa. At the same time, 32% of French heterosexuals are infected by non-B subtypes, which predominate in West Africa. The combination of these two phenomena suggests intermixing between the French and African populations.

This system makes it possible to estimate the number of people found to be newly seropositive each year (6700 in 2005) and to improve our monitoring of the epidemic. Soon we will also be able to estimate the annual number of new infections, that is, the incidence of HIV in France.

### Box 1: Methods

#### Mandatory reporting of HIV infection and AIDS

Mandatory reporting of HIV in adults begins with biologists, who report all confirmed positive serology results new to their laboratory (even though a positive diagnosis may have been made previously elsewhere). Reporting uses a unique irreversible anonymous code for the person. Software furnished by InVS creates the code from the date of birth, first name, initial of last name and sex. The physician then completes the epidemiologic and clinical information on a medical form.

Only physicians report AIDS, according to the definition revised in 1993. AIDS is reported with the anonymous code, also created with the InVS-furnished software.

The HIV and AIDS reports are sent to the DDASS public health physicians, who match the HIV forms completed by the biologist and patient's doctor and then transmit them to InVS. The DDASS or InVS must often send a reminder or validation letter to the physicians, because the "clinician" segment is not always sent for HIV or some information is missing from questionnaires for HIV or AIDS.

#### Virologic surveillance

Virologic surveillance applies only to HIV diagnoses of adults. It relies on voluntary reporting by the biologist and the patient (the clinician must state on the mandatory reporting form if the patient disagrees).

This surveillance makes it possible to determine the type of virus (HIV-1 or HIV-2), the group and sub-type, and to assess whether HIV-1 contamination is recent ( $\leq 6$  months), with a "detuned" test for recent infection. These tests are performed by the HIV CNR.

BEH n°48/2006

Surveillance of HIV infection and AIDS in France, 2005

### Box 2 – Excerpt\*

Through the end of the 1990s, STDs seemed to have become a rarity from another time, before AIDS and its prevention. Syphilis, lymphogranuloma venereum (LGV) and chancroid had become so rare in France that no surveillance system followed them.

Between 2002 and 2004, more than 1200 cases of syphilis, 65% in the Paris region, were identified and described by a surveillance network established after this re-emergence. Of 328 cases of chlamydial rectitis diagnosed at centers voluntarily participating in a surveillance network, 244 (74%) were due to *Chlamydiae* type L2. This confirmed the LGV diagnosis.

The re-emergence of these two diseases within the gay population accompanied a deterioration in prevention indicators assessed by repeated behavioral surveys (Presse Gay and Baromètre Gay surveys). The proportion of men having sex with men who had unprotected anal sex with an occasional partner at least once over the past 12 months has not stopped growing since the end of the 1990s and has reached approximately 35%, in both the 2004 Presse Gay and the 2005 Baromètre Gay surveys.

While no final conclusions about the relation between ongoing deterioration of prevention and HIV incidence are yet possible, it is certainly true that new completely avoidable HIV infections continue to occur by the hundreds each year among gay men. Despite the progress in treatment, its consequences on their lives remain disproportionately severe.

**Jean-Claude Desenclos, Department of Infectious Diseases, French Institute for Public Health Surveillance**

BEH n°25/2006

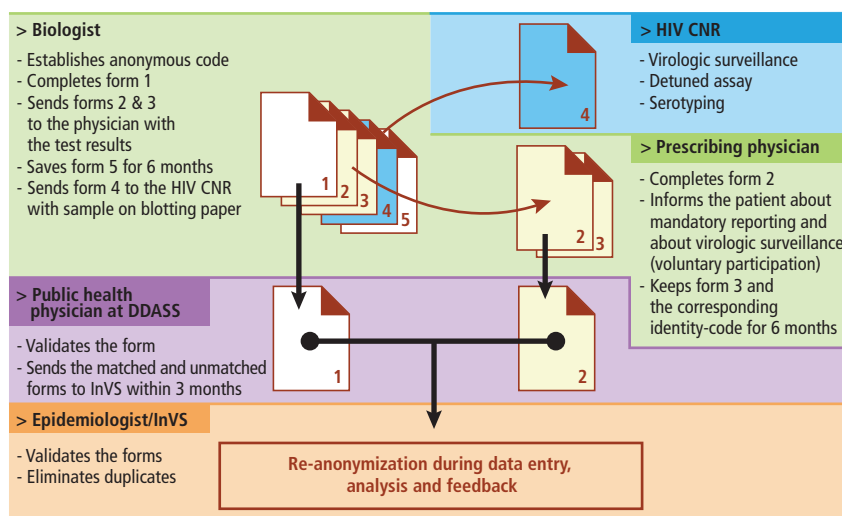
*Sexually transmitted diseases and HIV: Risk behaviors still topical!*

*\*from the editorial: What about prevention?*

**FIGURE 1**

### REPORTING SCHEME FOR HIV INFECTION IN ADULTS AND ADOLESCENTS 13 YEARS AND OLDER

#### Reporting of HIV infection in adults and adolescents older than 13 years



TABLE

# NEWLY DISCOVERED HIV SEROPOSITIVITY IN 2005\* BY NATIONALITY AND SEX (FRANCE, DATA AS OF 31/12/2005)

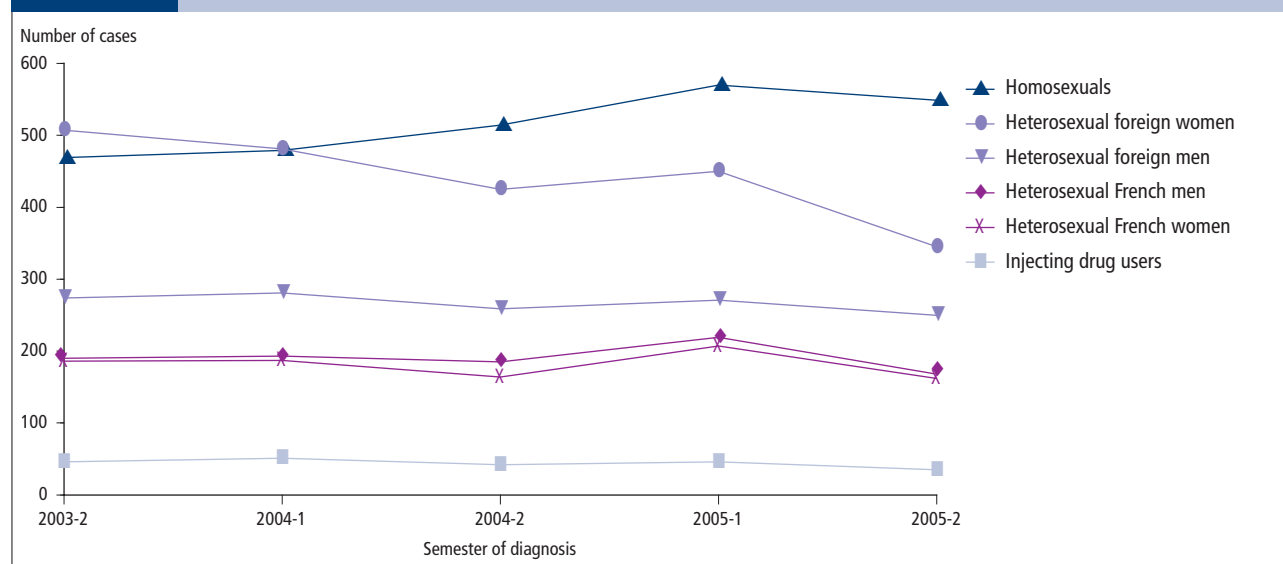
Nationality	Women		Men		Total	
	n	%	n	%	n	%
France	323	26.7	1160	58.4	1483	46.4
Sub-Saharan Africa	589	48.7	382	19.2	971	30.4
America	61	5.0	79	4.0	140	4.4
Europe	18	1.5	49	2.5	67	2.1
North Africa	18	1.5	43	2.2	61	1.9
Asia	13	1.1	21	1.1	34	1.0
Unknown**	188	15.5	253	12.7	441	13.8
Total	1210	100.00	1987	100.00	3197	100.00

\* Provisional numbers because of delayed reports.

\*\* Unknown by the clinician.

FIGURE 2

# NUMBER OF NEWLY DISCOVERED CASES OF HIV SEROPOSITIVITY ACCORDING TO MODE OF TRANSMISSION, SEX, NATIONALITY, AND SEMESTER OF DIAGNOSIS (FRANCE, DATA AS OF 31/03/2006, ADJUSTED FOR REPORTING DELAYS)

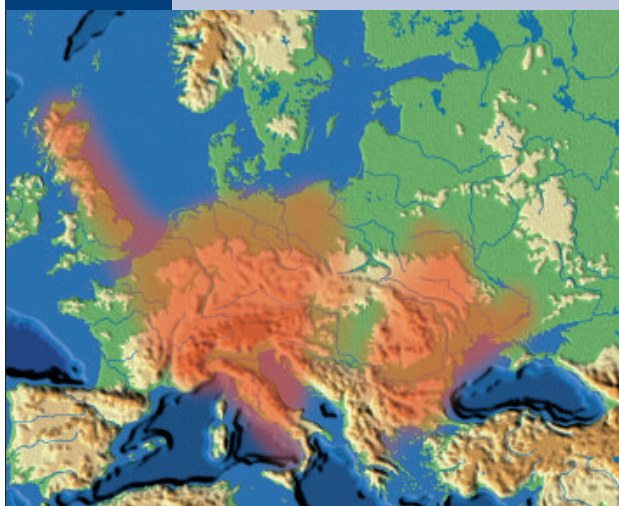


## Surveillance of thyroid cancer: 20 years after Chernobyl

Since 2000 the Department of Chronic Diseases and Injuries (DMCT) has led a national multidisciplinary study of the possible health effects in France of the 1986 accident at Chernobyl. InVS has concentrated on thyroid cancer because it is the only health impact scientifically demonstrated in the countries most exposed, with an epidemic first in children and now in young adults. The eastern regions of France were exposed to 8 to 10 times more radioactivity than the western regions, but to 100 times less than Belarus.

FIGURE 1

RADIOACTIVE CLOUD FROM  
CHERNOBYL - 2 MAY 1986



### EPIDEMIOLOGY OF THYROID CANCERS IN FRANCE—WHAT WE KNOW SO FAR

In 2000, thyroid cancers accounted for 4-5000 new cancers in France. Their incidence has been rising continuously since 1975. This increase began before Chernobyl and does not seem to have accelerated since then. It has also been observed in most western European countries and in the United States, which was not affected by Chernobyl fallout. The rate of increase in France and in the US is very similar. Indeed, the east-west distribution of this increase in France makes it even less plausible that it is related to Chernobyl.

### HOW CAN WE EXPLAIN THIS INCREASE?

Ever smaller cancers are discovered incidentally while exploring and treating the thyroid for benign diseases. This leads to an overall increase in the incidence of thyroid cancer. For example, in Marne-Ardenne the percentage of thyroid cancers of a diameter less than 5 mm at diagnosis has increased from 7% in 1975 to 27% in 2005.

### SOME SPECIFIC RESULTS WORTH POINTING OUT

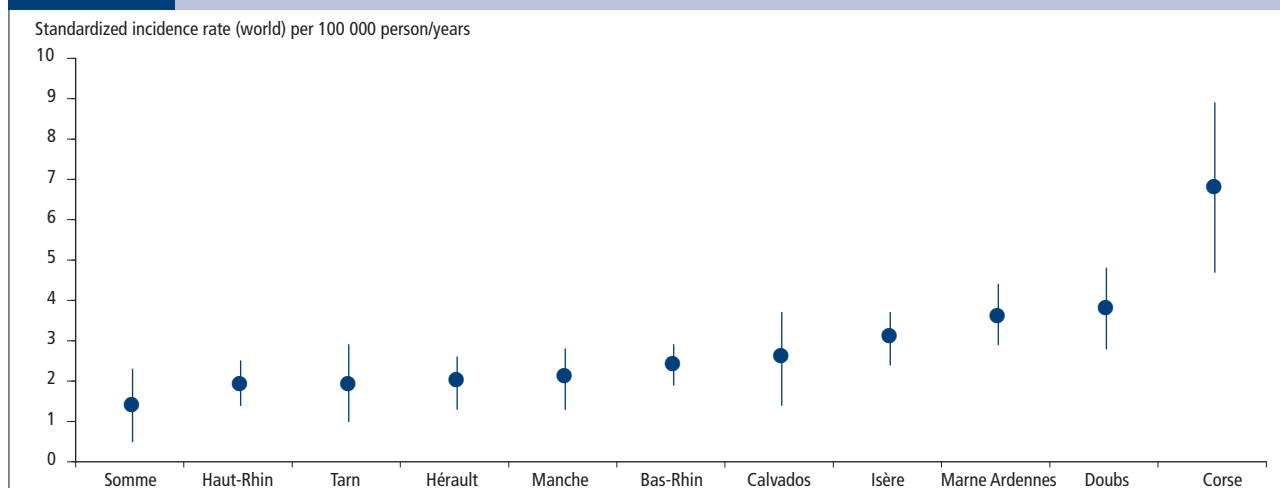
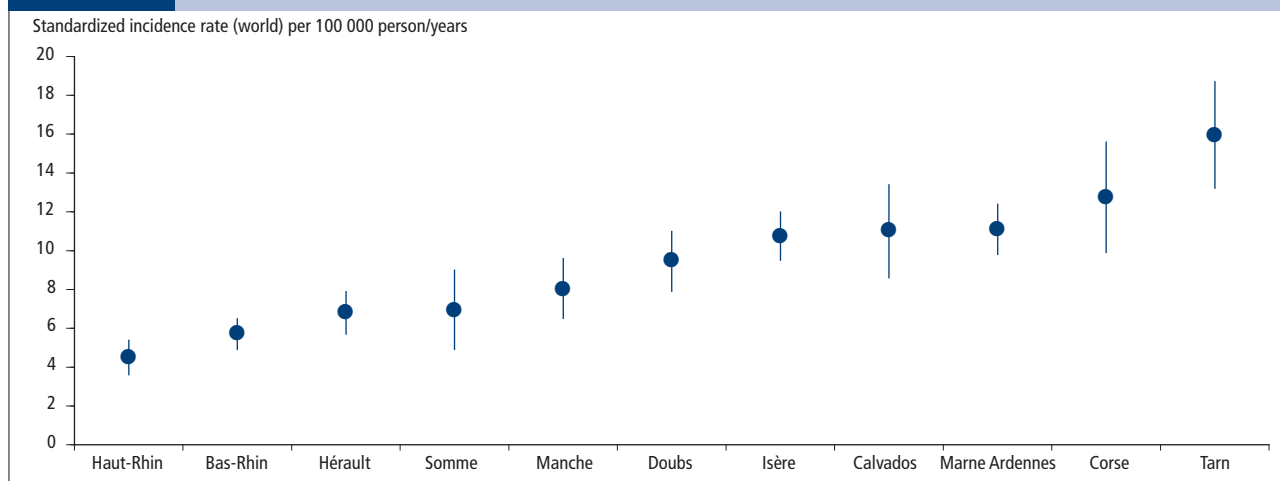
#### Incidence in children and adolescents

Thyroid cancers are rare in children: 0.5 to 2 per million children younger than 15 years, that is, a maximum of 25 cases a year in all of France. This rate is of the same order of magnitude as those observed elsewhere in Europe and in the United States. A trend towards an increase in these cancers has been observed in France over the past 20 years, but also in the United States. It is not significant but is difficult to interpret because of the substantial random fluctuations relative to the small number of cases.

#### Incidence in men in Corsica

An initial analysis covered 1998-2001. The rate in women was not significantly different from those found on the mainland by the French cancer registry network (FRANCIM): 12.7/100 000 person-years in Corsica, 15.9 in the Tarn. On the other hand, the rate in men was significantly higher than the highest rate observed by FRANCIM (6.8 in Corsica compared with 3.8 in the Doubs). The study did not however have information about whether the subjects with cancer had lived in Corsica in 1986.

InVS will continue its incidence estimates for Corsica for the 2002-2005 period to verify whether these early results are confirmed. Four studies of risk factors for thyroid cancers in France are underway. One of them, conducted by INSERM, concerns children and adolescents who lived in eastern France in 1986. The results are expected in 2008. InVS has also reconsidered the pertinence of its cancer surveillance systems and is currently modifying them to adapt them to the new issues. A multisource system of cancer surveillance (SMSC) is under development and will complete the current registry-based system.

**FIGURE 2**
**FIGURE 2: GEOGRAPHIC DISTRIBUTION OF THE WORLDWIDE STANDARDIZED INCIDENCE RATE OF THYROID CANCER IN MEN (CORSICA, 1998-2001; FRANCIM REGISTRIES 1997-2001)**

**FIGURE 3**
**FIGURE 3: GEOGRAPHIC DISTRIBUTION OF THE WORLDWIDE STANDARDIZED INCIDENCE RATE OF THYROID CANCER IN WOMEN (CORSICA, 1998-2001; FRANCIM REGISTRIES 1997-2001)**


### Excerpt\*

... Through the coordination of various participants involved in data collection and enhancement (CepiDc, FRANCIM network of cancer registries, InVS, Hospices civils de Lyon), France now has a vast and growing data bank of cancer epidemiology data containing nearly 250 000 records (more than 200 000 of which have usable survival data) constantly enriched by new data collected in more than 20 French districts by the cancer registries of the FRANCIM network. This national data bank has already enabled a detailed analysis of the estimated cancer incidence in France between 1978 and 2000, available on the InVS website. It has also made it possible to produce regional estimates of incidence, available on the site of the national federation of regional health observatories (FNORS).

... Of course, the national estimates produced from observations in a dozen French districts have limitations. Some problems of classification and coding make it difficult to produce specific figures for some sites, such as the central nervous system and malignant blood diseases. Some cancers, such as cervical cancers and uterine cancers, raise specific problems when national incidence estimates are based on mortality...

... The national database of cancer incidence and survival will continue to grow. The analysis and enhancement of these data are important in improving our knowledge and ability to control cancer in the years to come. The national institutions responsible for cancer observation, screening and management, InVS and the National Cancer Institute (INC), and FRANCIM must continue to work to optimize the collection and use of these data. Intelligent management of this national database in the years to come will facilitate not only better knowledge and surveillance of the trends in its incidence and survival rates, but essential information about the conditions and modalities of cancer diagnosis and treatment in France...

**Professor Guy LAUNOY**

BEH n°9-10/2007

Cancer surveillance in France: inventory and perspectives in 2007

\* from the editorial by Professor Guy LAUNOY – BEH n°9-10/2007

## General population surveys

### Example of the national nutritional health study (ENNS)

This study was designed to provide descriptive data on food intake, nutritional status, and physical activity of the general population in France. These results will be used in the follow-up of the National Nutritional Health Plan and the objectives of the Public Health Act of August 2004.

The concerted development of the protocols for ENNS and INCA-2 (a survey by AFSSA) will furnish comparable regional data for the indicators collected, while the specificity of each study enables each agency to carry out its own missions.

#### Communication campaign for the launch of the national nutrition health study (pilot phase) 2004



ENNS: first study of the dietary habits and nutritional status of the population. Your participation is essential!

#### DEMAND FOR METHODOLOGICAL QUALITY

After a pilot study in 2004, InVS chose to hire all the staff necessary for data collection. This staff includes an administrative team, physicians, dieticians, and nurses, totaling more than 80 people. A collaboration has also been set up with the health examination centers (CES) of the national health insurance fund (approximately 70) to perform the health examinations planned by the protocol.

Intended to last for one year in order to take food seasonality into account, inclusions began at the end of January 2006 and

were completed in February 2007. After sending an informational mailing to selected households in 180 geographic areas randomly distributed throughout metropolitan France, the study physicians contacted the potential subjects (one adult or one child per household) to propose their participation. If they agreed, a dietician visited the home to explain the study in detail. Data collection began with a food survey, with three 24-h lists over a 15-day period. The dietician then returned to the subject's home to collect the self-administered questionnaires and ask questions about social and demographic characteristics and some behavior, including physical activity. They explained the procedure for the clinical and laboratory testing for adults.

The latter, performed either in a CES or at home by a nurse, included physical measurements, blood pressure, and the taking of blood, urine, and hair samples. Standard testing of some of the samples took place in the CES laboratories, while the rest was centralized at the nutritional surveillance and epidemiology unit (USEN) for subsequent analyses.

## APPROPRIATE LOGISTICS

This national study, intended to include 4000 adults and 2000 children, required the implementation of a large-scale logistical organization. The study required all resources allocated as well as the mobilization of InVS support services for its optimal performance. The flow of information continually exchanged between the various participants involved, especially for organizing appointments, made it possible to obtain good quality information.

## AN ESSENTIAL DATABASE

This study, which combines behavioral data and clinical and laboratory measurements, will yield a very rich nutritional database that can be used for purposes beyond the PNNS indicators or the Public Health Act. For example, analyses can

be used for surveillance programs of cardiovascular diseases and diabetes, or for the biosurveillance program of the Department of Environmental Health (DSE).

## REMARKABLE ACCEPTABILITY

Finally, the ENNS study is a first example of a national survey with a routinely proposed health examination for adults. The acceptance rate of the food survey is around 65% for adults and 70% for children. The acceptance rate for the health examination by those who agreed to the food survey is around 85% (figures not final). Nonetheless, the recruitment by InVS of the entire survey staff raised the question of the impact on the number of total full-time equivalent staff positions, which is limited.

## RESULTS FOR 2007

The principal results of the ENNS study will be disseminated at the end of 2007, jointly with AFSSA, during a symposium organized by the DGS. The overall results will be useful both for national agencies directing the continuation of the PNNS and for diverse local participants who may launch initiatives to improve nutrition locally.

**The French Institute for Public Health Surveillance—a public agency reporting to the Ministry of Health, was created by L.98-535 dated 1 July 1998 to reinforce health surveillance and the safety of products intended for human use. Its missions were restated by the Public Health Policy Act of 2004.**

InVS is responsible for:

- surveillance of population health
- detecting all threats to public health
- alerting the public authorities
- recommending appropriate measures to control and prevent these threats
- gathering critically assessing, and promoting knowledge of health risks, their causes and their changes over time
- carrying out or supporting all activities (investigations, studies, expert appraisals, etc.) that may contribute to these health surveillance duties.

### A WIDE-RANGING FIELD OF ACTION...

These tasks are performed in a wide-ranging field that covers different aspects of public health:

- infectious diseases (HIV, HCV, sexually transmitted infections, foodborne infections such as listeriosis or salmonellosis), zoonoses (infectious diseases transmissible from vertebrate animals to humans), vaccine-preventable diseases (such as meningitis and hepatitis B), nosocomial infections and antibiotic resistance, and imported respiratory infections (such as tuberculosis or legionellosis)
- effects of the environment on health: risks related to pollution of the air, exposure to chemical toxic substances and ionizing radiation, waterborne risks, physical hazards, risks related to extreme weather conditions, etc.
- workplace health, also called occupational risks: occupational cancers, effects of asbestos and substitution fibres, musculoskeletal disorders, chemical exposures, etc.
- chronic diseases and injuries: cancer, diabetes, nutrition, respiratory diseases, mental health, rare diseases, accidents and injuries...

### ... WITHIN A NETWORK OF HEALTH AGENCIES

InVS is one of the health agencies created in the 1990s to strengthen the capacity for independent expert scientific advice on public health issues. Its orientation—both generalist and cross-sectional—leads it to collaborate regularly with most of the other health agencies:

- the French Health Products Safety Agency (AFSSAPS)
- the French Food Safety Agency (AFSSA)
- French National Authority for Health (HAS)
- French Institute for Radioprotection and Nuclear Safety (IRSN)

- French Blood Agency (EFS)
- French Biomedicine Agency (formerly the French transplantation agency)
- French Agency for Environmental and Occupational Health Safety (AFSSET).

## REGIONAL RELAYS

InVS depends for its action on regional and interregional units. The 16 regional epidemiology bureaus (CIRE) are under the direct scientific supervision of InVS. Hosted by the regional health and social affairs units, they carry out the field activities for InVS and transmit pertinent local information by leading the network of local participants. The CIRE also have close relations with the district health and social affairs bureaus (DDASS).

## NUMEROUS PARTNERS

Surveillance of population health conditions relies on a dense network of partners:

- national reference centres (CNR): responsible for expert analysis of suspicious biological samples, assessed and financed by InVS since 2005
- morbidity registries

- networks for the control of nosocomial infections
- healthcare professionals—both hospital-based and in private practice (mandatory notification of some diseases)
- hospital departments, for monitoring of some diseases (such as pertussis and hepatitis C)
- public and private microbiological laboratories (surveillance of gonococcal diseases, of invasive bacterial infections and meningitis, etc.)
- some networks of healthcare professionals, such as the Sentinelles network of general practitioners and the network of occupational physicians.

## STRONG INTERNATIONAL PRESENCE

The effectiveness of its surveillance also depends on the presence of InVS in European and international health networks. Until the European Center for Disease Prevention and Control (ECDC)—established in 2005—is fully up to speed, InVS continues to coordinate several European networks: EuroHIV (HIV/AIDS), EuroTB (tuberculosis), and APHEIS (effects of air pollution on health). It also coordinates European information activities through the Eurosurveillance bulletin. InVS also maintains close ties with WHO. It participates in different international networks, especially the global epidemic alert and response network (GOARN). Together with the Foreign Affairs Ministry, it also provides technical support to third countries.

# InVS, in a few figures

## INVS ACTIVITIES

- Reports published: 99
- Number of alerts covered in the 2006 daily alert bulletins, BQAs: 88
- Number of issues of BEH published: 37
- Cooperation activities carried out abroad: 27
- Press releases issued: 31

## INVS HUMAN RESOURCES

- Staff (full-time equivalents on 31 December 2006): 399.3
- New jobs created in 2006 to enhance work capacity: 9
- Distribution by occupation:
  - epidemiologists: 186
  - other scientists: 93
  - managers: 42
  - administrative and support staff: 96

## INVS FINANCIAL RESOURCES

- InVS operating budget in 2006: €49 740 874
- InVS investment budget in 2006: €5 189 911

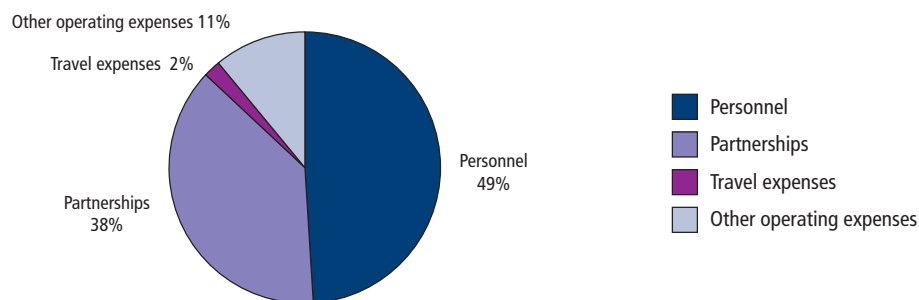
- Increase in operating budget 2006/2005 +9.34%
- Increase in investment budget 2006/2005 +240.9%

## NETWORKS AND PARTNERS

- Number of CIRE: 16
- CIRE staff (on 31/12/2006, in FTE-InVS): 53
- Number of CNRs: 77
- Budgetary resources allocated to CNRs (in millions of €): 9.1
- Number of morbidity registries: 41
- Budgetary resources allocated to (all) registries (in millions of €): 3.5
- Number of emergency departments participating in the OSCOUR network: 46
- Number of municipal civil records offices participating in the transmission of death certificates: 1152
- Number of collaboration agreements and memoranda of understanding reached with partners: 186
- Number of States participating in EuroHIV and EuroTB: 52

EXPENSES PER ITEM	
Expense categories	Total budget (in K€)
Personnel	24 244.36
Partnerships	19 037.11
Travel expenses	1113.13
Other operating expenses	5346.28
<b>2006 Total expenses</b>	<b>49 740.88</b>
<b>Personnel</b>	remuneration, taxes on remuneration, social charges
<b>Partnership contracts</b>	subsidies to partners, financial support of registries, financial support of CNR, subcontracting services associated with scientific projects
<b>Travel expenses</b>	transportation, expenses, conference registration fees
<b>Other operating expenses</b>	printing and distribution of reports, expenses for organization of conferences, rent, maintenance of buildings and vehicles, telecommunications, staff training, hiring, supplies, and documentation

## DISTRIBUTION OF INVS EXPENSES BY TYPE OF EXPENSE/FISCAL YEAR 2006

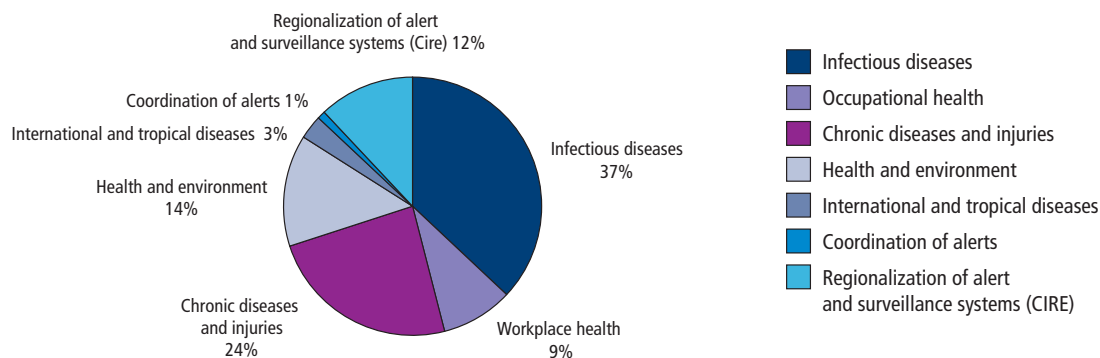


## EXPENSES BY SURVEILLANCE TOPIC

Topic	Total expenditures (in K€)
Infectious diseases	18 709.58
Occupational health	4306.73
Chronic diseases and injuries	11 973.88
Health and environment	6820.70
International and tropical diseases	1332.41
Coordination of alerts	584.84
Regionalization of alert and surveillance systems (CIRE)	6012.73

\* Including management and support.

## EXPENSES BY SURVEILLANCE TOPIC



# InVS organization and organizational chart 2006

Pr Gilles Brucker is the Director-General of InVS. It is organized in five scientific departments and five corporate services. The Directorate-General includes a strategy and development mission.

## SCIENTIFIC DEPARTMENTS

### Department of Infectious Diseases Jean-Claude Desenclos

It is divided into five specific units:

- HIV, HCV, and sexually transmitted diseases
- enteric and foodborne infections and zoonoses
- vaccine-preventable infections
- nosocomial infections and antibiotic resistance
- airborne infections (legionellosis, tuberculosis) and imported diseases.

It also manages two important European programmes: the European HIV-AIDS surveillance programme, EuroHIV, and the tuberculosis surveillance programme, EuroTB.

### Department of Environmental Health Martine Ledrans

It is organized in three functional units:

- the methods and investigations unit, which, apart from methodological development, provides technical support for the regional epidemiologic units, and responds to extreme climate events
- the risk knowledge and surveillance unit, which includes all of the national and international epidemiologic surveillance programmes (air and health; toxic products and substances and health; allergic diseases and asthma, etc.)
- the "information and statistics systems" unit.

### Department of Occupational Health Ellen Imbernon

It is composed of three units:

- the workplace health surveillance programme (PSST)
- a unit dealing with the epidemiologic analysis of national databases and development of occupational health indicators (Abisat)
- the occupational exposure evaluation unit (EVEP).

It is responsible for the epidemiologic surveillance of occupational risks: occupational cancers (especially asbestos-related mesothelioma), musculoskeletal disorders, occupational

asthma, and mental health in the workplace. It establishes basic tools that will make it possible to assess mortality by occupation and exposures associated with occupational factors.

### Department of Chronic Diseases and Injuries Juliette Bloch

It is organized in three units and five programmes:

- the cancer unit, responsible for cancer surveillance and evaluation of screening programmes
- nutritional epidemiology surveillance unit (USEN), a mixed unit staffed by personnel from InVS and from the Institute for Nutritional Sciences and Techniques (ISTNA)
- the everyday accidents surveillance unit (household, sports, and hobbies)
- the respiratory disease surveillance programme
- the diabetes surveillance programme
- the respiratory disease surveillance programme
- mental health surveillance programme
- surveillance of rare diseases programme, including the "FranceCoag" network, which monitors coagulation defects.

This department provides, jointly with INSERM, the technical secretariat for the national disease registries committee.

### Department of International and Tropical Diseases Christophe Paquet

Its missions are principally cross-sectional:

- managing the international surveillance for early detection of health events occurring abroad that might affect France
- monitoring tropical diseases such as malaria and dengue in metropolitan France and the overseas districts
- participating in activities and missions of the global epidemic alert and response network coordinated by WHO
- developing collaborations with similar institutions in partner countries and conduct technical assistance activities at the request of the Foreign Affairs Ministry.

## CORPORATE SERVICES

### Communication Service Isabelle Tréma

In collaboration with the Directorate-General, scientific departments, and corporate services, it develops the external and internal communication policy for the Institute.

Its work is divided into three units:

- the editing–publishing unit, which sees to the production of the assorted media in which InVS disseminates content
- the weekly epidemiological bulletin (BEH)
- the unit for external communications (including press relations, the *Prevalence* journal, editorial responsibility for the institute website) and for internal communication (intranet, etc.).

## **Finance, Logistics and Economy Service** **Olivier Bachellery**

It is divided into two sections, one unit, and management control.

- the budgetary and accounting section develops the budget and ensures its execution
- the logistic section: purchasing, procurement, and logistics, which develops a purchasing policy ensuring the quality of competitive procedures; they also manage InVS real estate and the daily life of the establishment
- the program management unit, which works with the activity programs from their initial conception and ensures the legal aspects of their implementation and follow-up, in particular, all contracts and agreements
- the management control section functions as an interface between the Directorate-General and this department.

## **Information Systems Service** **Daniel Dubois**

It is composed of two units:

- the administration and operations unit, which manages the computer and telephone systems, maintains them, and plans their future development
- the design and development unit ensures the consistency of the information systems, develops surveillance applications, and administers and develops the Internet and intranet sites as well as the databases necessary for health surveillance activities.

## **Human Resources Service** **Béatrice André**

The Human Resources Department defines together, with the Directorate-General, the institute's strategy of human resources development. It helps to ensure that the institute has a skilled and competent staff, by its policies in hiring, and dynamic permanent training. It performs and checks the operations of administrative personnel management. It provides support and advice to supervisors and to staff members, by advice and by making available procedures, methods, and tools for human resource management. It contributes to the management of social relations and in-house communication.

## **Documentation Service** **Judith Benrekassa**

The mission of the InVS Documentation Department is to provide to all InVS departments and services, and to the CIRE, the

scientific information necessary for the implementation and functioning of the scientific programs. The department maintains an ongoing scientific review, relying on different resources: national and international scientific journals, books, bibliographic and factual databases, internet sites, etc.

## **STRATEGY MISSION AND THE ALERT COORDINATION COMMITTEE**

Reporting directly to Pr. Brückner, the strategy mission staff is ruled by project leaders. It implements regional development and coordinates both European activities and the construction of the national public health network. Together with the Information Systems Department, it is also in charge of developing the master plan for the information systems.

The Alert Coordination Committee is responsible for the cross-sectional management of the Biotox plan and of alerts that are either unspecific or of undetermined origin. It collaborates with all InVS departments; it manages a surveillance system for nonspecific events based on hospital emergency services and mortality data. It produces the daily alert bulletin, which is transmitted to the Minister of Health and the Director-General of Health. It is setting up a trial on the transmission of notifications of serious adverse events associated with health care.

## **THE INFORMATION SYSTEM MASTER PLAN**

The system of health, surveillance, and alert relies on a dense network of partners that requires an especially effective, open and secure information system. After a diagnostic examination that showed the compartmentalization of its information system and its technological lag in some cases, in spring 2006 InVS adopted its information system master plan. As a result of an analysis lasting several months with the assistance of specialized consultants, this document is intended to structure the development of the information systems. Its strategic orientations are the following:

- an information system that cooperates with the health information systems of national and international partners:
  - an information system that facilitates the collection of data and health events and relies on advanced technologies,
  - an information system that takes into account the multiplicity and diversity of information sources, is able to identify duplicates from different information sources to minimize as much as possible the duplication of information, and can consolidate information (geographic, pathologic, etc)
- an information system that guarantees the availability, confidentiality, integrity, and traceability of information, since the confidence of different participants (patients and healthcare professionals) in the system is necessary for the optimal use of its information:
  - a national information system for all national and local participants
  - for the enhancement of partnerships with data suppliers, the information system must offer added value to these collaborators
  - surveillance results should be actively disseminated to all identified targets.

Most of the information systems at InVS should therefore be radically overhauled by 2011.

The organizational chart for the Directorate-General for Health and Safety is structured as follows:

- Directorate-General** (Central Authority)
  - Reporting to Directorate-General:**
    - Board of Directors
    - Scientific board
  - Internal Services (SERVICES):**
    - Management control
    - Communication
    - Documentation
    - Information systems
    - Human resources
    - Finance, logistics and economy
  - Missions:**
    - Strategy and development mission
      - European mission
      - Regional development (connected to Interregional epidemiology units (CIRE) via a dashed line)
      - Training mission
    - Alert coordination
- Departments (Reporting to Directorate-General):**
  - Department of Infectious Diseases
  - Department of Environmental Health
  - Department of Occupational Health
  - Department of Chronic Diseases and Injuries
  - Department of International and Tropical Diseases

- Interregional epidemiology units (CIRE)** (External Unit, connected to Regional development via a dashed line)

## JANUARY 2006

- Le cancer colorectal en France - Évaluation 2002 à 2004
- Système de surveillance hebdomadaire de la mortalité par grippe : saison 2003-2004
- Le recours tardif aux soins des personnes séropositives pour le VIH - Modalités d'accès et contextes socioculturels
- La prévention du syndrome hémolytique et urémique chez l'enfant âgé de 15 ans en France

## FEBRUARY 2006

- Évaluation quantitative des risques sanitaires liés aux épandages de phytosanitaires utilisés dans la lutte contre la pyrale du maïs
- Étude des facteurs individuels et des comportements ayant pu influencer la santé des personnes âgées pendant la vague de chaleur de 2003
- La surveillance des infections invasives à méningocoques en France en 2000 - Évaluation quantitative par la méthode de capture-recapture à 3 sources
- Pratiques des DDASS devant un cas isolé de légionellose non nosocomiale et non thermale en 2002
- Le radon en Corse : évaluation de l'exposition et des risques associés
- Investigation d'une épidémie de syndromes grippaux dans un centre de long séjour des Pyrénées-Atlantiques

## MARCH 2006

- Dépistage du saturnisme dans la commune de Saint-Laurent-le-Minier (Gard), mai 2005
- Surveillance épidémiologique du paludisme en Guyane
- Cas groupés d'infections à *Enterobacter sakazakii* chez des nouveau-nés, associées à la consommation d'une préparation en poudre pour nourrissons, France, octobre à décembre 2004 - Rapport d'investigation
- Surveillance of Tuberculosis in Europe - EuroTB - Report on tuberculosis cases notified in 2004

## APRIL 2006

- Conséquences sanitaires de l'explosion de l'usine "AZF" le 21 septembre 2001 - Rapport final sur les conséquences sanitaires chez les enfants toulousains
- Programme de dépistage du cancer du sein en France - Résultats 2003

- Enquête nationale de prévalence 2006 des infections nosocomiales - Mai-juin 2006 - Protocole national
- Enquête nationale de prévalence 2006 des infections nosocomiales - Mai-juin 2006 - Guide de l'enquêteur
- Le programme Matgéné - Matrices emplois-expositions en population générale - État d'avancement - septembre 2005
- Surveillance sanitaire en France en lien avec l'accident de Tchernobyl (plaquette)
- Surveillance en France en lien avec Tchernobyl
- Rapport APHEIS - Phase 1 - Phase 2 - Phase 3

## MAY 2006

- Incendie de l'usine SBM Formulation à Béziers - Évaluation de l'impact sanitaire immédiat de l'exposition par voie respiratoire
- Lettre d'information des participants à la cohorte santé AZF n°3/2006
- Le dispositif de surveillance sanitaire renforcée mis en place à l'occasion des Jeux mondiaux des transplantés, Nancy, juillet 2003
- Labville : réseau de surveillance nationale de la résistance aux antibiotiques à partir des laboratoires de ville
- Cohorte française des patients atteints de maladies hémorragiques par déficits héréditaires en protéines de la coagulation

## JUNE 2006

- Évaluation de l'impact sanitaire de la pollution atmosphérique urbaine - Agglomération d'Agen - Impact à court et long terme
- Évaluation de l'impact sanitaire de la pollution atmosphérique urbaine - Agglomération de Pau - Impact à court et long terme
- Évaluation de l'impact sanitaire de la pollution atmosphérique - Agglomération de Bordeaux - Impact à court et long terme
- Évaluation de l'impact sanitaire de la pollution atmosphérique - Agglomération de Périgueux - Impact à court et long terme
- Dépistage du saturnisme de l'enfant en France de 1995 à 2002
- Investigation d'une épidémie de gastro-entérites aiguës sur la zone de Pulligny (Meurthe-et-Moselle), avril 2006
- Exposition aérienne aux pesticides des populations à proximité de zones agricoles - Bilan et perspectives du programme régional intercirc

- Surveillance du VIH/sida en France - Rapport n°3 - Données au 30 juin 2005
- Investigation de cas groupés de folliculites à *Pseudomonas aeruginosa* dans un hôtel de la Corse-du-Sud
- Le baromètre gay - réponse flash 2005 sur votre sexualité

## JULY 2006

- Évaluation de l'impact sanitaire de la pollution atmosphérique - Agglomération de Bayonne - Impact à court et long terme
- Évaluation de l'impact sanitaire de la pollution atmosphérique urbaine - Agglomération de Besançon - Impact à court et long terme
- Les chutes accidentelles de grande hauteur d'enfants en Île-de-France entre mai et septembre 2005
- Étude "Hepaig 2006" - Hépatites aiguës C chez les homosexuels masculins atteints par le VIH - Protocole d'étude
- Cancers prioritaires à surveiller et étudier en lien avec l'environnement (rapport et synthèse)
- Guide d'investigation environnementale des cas de saturnisme de l'enfant
- Enquête permanente sur les accidents de la vie courante - Réseau Epac - Résultats 2004 / *Permanent study on home ans leisure injuries - Epac Network - Results 2004*
- Enquête méthodes diagnostic des *E. coli*

## AUGUST 2006

- Évaluation de l'impact sanitaire de la pollution atmosphérique urbaine - Unité urbaine de Nîmes - Impact à court et long terme
- Signalement de cancers pulmonaires parmi le personnel d'une compagnie d'autobus à Bordeaux, 2004-2005
- Recommandations pour le codage des emplois dans le cadre d'études épidémiologiques
- Une épidémie de syndromes des bâtiments malsains parmi le personnel de la mairie de Villejuif (2004-2005) - Rapport d'investigation
- Évaluation de la surveillance du syndrome hémolytique et urémique typique ou post-diarrhéique en France, 1996-2003
- Surveillance épidémiologique en entreprise : analyse sur 20 ans de la mortalité des travailleurs et ex-travailleurs d'EDF-GDF
- Réseau BMR-RAISIN - Surveillance des bactéries multirésistantes dans les établissements de santé en France
- HIV/AIDS - Surveillance in Europe n°72
- Les systèmes d'information des régimes de sécurité sociale relatifs aux accidents de travail et aux maladies professionnelles : vers un entrepôt national de données ?
- Le Programme national de surveillance du mésothéliome (PNSM)

- Programme de dépistage du cancer du sein en France - Résultats 2004
- Les infections à méningocoques : guide d'investigation

## SEPTEMBER 2006

- Détection précoce automatisée des épidémies de gastro-entérites d'origine hydrique à partir des données de vente ou de remboursement des médicaments
- Dépistage du cancer du sein - Rapport d'évaluation du suivi épidémiologique - Données 2003
- Investigation d'une suspicion d'agrégat d'aplasies médullaires en Ille-et-Vilaine
- Les conséquences sanitaires de l'explosion de l'usine "AZF" à Toulouse, le 21 septembre 2001
- Épidémie de salmonellose à *Salmonella enterica* sérotype Agona chez des nourrissons liée à la consommation de poudres de lait infantile, France, janvier-mai 2005
- Contaminations professionnelles par le VIH, le VHC et le VHB chez le personnel de santé en France - Données au 31 décembre 2005
- Analyse de la mortalité et des causes de décès par secteur d'activité de 1968 à 1999 à partir de l'échantillon démographique permanent - Étude pour la mise en place du programme Cosmop : cohorte pour la surveillance de la mortalité par profession

## OCTOBER 2006

- Conséquences sanitaires de l'explosion survenue à l'usine "AZF", le 21 septembre - Rapport final sur les conséquences sanitaires dans la population toulousaine
- Cas groupés de légionellose, Rennes (35), décembre 2005-janvier 2006

## NOVEMBER 2006

- Résumés des interventions, 3<sup>e</sup> Journée scientifique du Département santé travail - Risques professionnels : quelle veille sanitaire ?
- Pertinence et faisabilité d'une étude de la prévalence et des caractéristiques du diabète à Mayotte
- Réseau expérimental de surveillance épidémiologique des troubles musculo-squelettiques dans les Pays de la Loire
- Rapport du Comité national d'experts sur la mortalité maternelle (CNEMM)
- Étude nationale nutrition santé : 1<sup>ère</sup> étude sur les habitudes alimentaires et l'état nutritionnel de la population (enfants et adultes)
- Incinérateur de Gilly-sur-Isère, principaux résultats des quatre études locales
- Programme de surveillance du Programme national de surveillance des effets sur la santé
- Surveillance de la maladie de Lyme – Départements de l'Ain, de la Loire et de la Haute-Savoie

- Étude d'imprégnation par les dioxines des populations vivant à proximité d'usines d'incinérations d'ordures ménagères
- Incidence des cancers à proximité des usines d'incinération d'ordures ménagères
- Évaluation de l'impact sanitaire de la pollution atmosphérique à court et à long terme en Aquitaine. Agglomérations d'Agen, Bayonne, Bordeaux, Pau et Périgueux
- Épidémie de gastro-entérites liée à une compétition de chars à voile, Hermanville-sur-Mer, mars 2006
- Dépistage anonyme et gratuit du VIH/Profil des consultants de CDAG en 2004 - Enquête épidémiologique transversale

## DECEMBER 2006

- HIV/AIDS - Surveillance in Europe n°73
- Faisabilité d'une évaluation de l'impact sanitaire de la pollution atmosphérique urbaine – Agglomération de Montbéliard

## BEH

## JANUARY 2006

1

- Éditorial. Une information en santé exigeante, scientifiquement juste et accessible à tous
- Renago 2004 : gonococcies en hausse, progression importante de la résistance des souches à la ciprofloxacine
- Mise au point sur le traitement antibiotique probabiliste des urétrites et cervicites non compliquées
- Observatoires régionaux du pneumocoque : surveillance des sérotypes et de la résistance aux antibiotiques des souches de *Streptococcus pneumoniae* isolées en France, 2003

### 2-3 - Numéro thématique - Risques infectieux : approches méthodologiques de la veille et de l'aide à la décision en santé publique

- Éditorial. Investiguer et surveiller les maladies infectieuses en France : savoir-faire et innovation
- Infections sévères à *Enterobacter sakazakii* chez des nouveau-nés ayant consommé une préparation en poudre pour nourrissons, France, octobre-décembre 2004
- Utilisation de tests salivaires dans l'investigation d'une épidémie d'hépatite A, Auvergne, décembre 2004
- Estimation du nombre total de méningites à pneumocoque de l'enfant, par la méthode capture-recapture à 3 sources, France, 2001-2002
- Évaluation de l'impact des mesures prises dans les élevages aviaires sur l'incidence des salmonelloses en France

- Sciences sociales et épidémiologie : des approches méthodologiques qui se complètent, à propos de la question des pratiques à risques chez les usagers de drogues
- Évaluation *a priori* des stratégies de contrôle d'une pandémie grippale
- Estimation du nombre de transmissions du VHC de soignants à soignés et évaluation des stratégies de dépistage des soignants en France, 2005-2020

4

- Apport du certificat de décès néonatal à la connaissance de la mortalité en France
- Incidence des leucémies de l'enfant aux alentours des sites nucléaires français entre 1990 et 1998
- Bronchiolites, épidémiologie au Centre hospitalier régional universitaire de Tours, 1997-2005
- Prophylaxie antirétrovirale après une exposition non professionnelle au VIH en Provence-Alpes-Côte d'Azur, 2001 et 2002

### Hors série - Numéro spécial - Infection par le virus Chikungunya à l'Île de la Réunion

- Éditorial. Aux côtés de la mobilisation des professionnels, la contribution active de la population est indispensable
- Épidémiologie de l'infection par le virus Chikungunya à l'Île de la Réunion : point de la situation au 8 janvier 2006
- Comment se protéger des piqûres de moustiques vecteurs de Chikungunya
- Principales caractéristiques du virus Chikungunya

## FEBRUARY 2006

### 5-6 - Numéro thématique - La santé des personnes âgées

- Éditorial. Personnes âgées, vieillissement, grand âge et santé
- Aspects démographiques du vieillissement
- Disparités du niveau de la mortalité des personnes de plus de 64 ans dans les pays de l'Union européenne, année 2000
- Épidémiologie des démences et de la maladie d'Alzheimer
- Le dispositif institutionnel d'aide et de soins aux personnes âgées
- La contribution et le vécu de l'aide informelle
- Le vieillissement de la population va-t-il submerger le système de santé ?

7

- Le tétanos en France en 2002-2004
- Renforcement de la surveillance des cancers thyroïdiens chez l'enfant et l'adolescent sur le plan national : étude de faisabilité

- Trypanosomiase humaine africaine : recensement des cas d'importation observés en France, 1980-2004

## 8-9 - Numéro thématique -

### Surveillance de la pathologie coronaire en France : l'après MONICA

- Éditorial. Les efforts de prévention primaire doivent s'intensifier
- Le gradient Nord-Sud de la morbidité et de la mortalité coronaires en France : données récentes des registres français des cardiopathies ischémiques, 1997-2002
- Baisse globale de la mortalité mais pas de l'incidence de la maladie coronaire en France de 1997 à 2002
- Létalité de l'infarctus du myocarde des patients hospitalisés et son évolution dans les trois registres français des cardiopathies ischémiques, 1997-2002

## MARCH 2006

10

- Impacts du vieillissement de la population et de l'obésité sur l'évolution de la prévalence du diabète traité : situation de la France métropolitaine à l'horizon 2016
- Incidence et caractéristiques des amputations de membres inférieurs chez les personnes diabétiques en France métropolitaine, 2003
- Les infections invasives à méningocoques en France en 2004

## 11-12 - Numéro thématique -

### Surveillance nutritionnelle des populations défavorisées : premiers résultats de l'étude Abena

- Éditorial. Une situation très critique
- Caractéristiques sociodémographiques des personnes recourant à l'aide alimentaire, étude Abena, 2004-2005
- Consommations alimentaires et place de l'aide alimentaire chez les personnes incluses dans l'étude Abena, 2004-2005
- Marqueurs de l'état nutritionnel des personnes recourant à l'aide alimentaire, étude Abena, 2004-2005
- Les usages de l'aide alimentaire à la lumière des liens sociaux : un aspect du volet socio-anthropologique de l'étude Abena

13

- Les entérocoques résistants aux glycopeptides : situation en France en 2005
- Avis du Comité technique des infections nosocomiales et des infections liées aux soins relatif à la maîtrise de la diffusion des entérocoques résistants aux glycopeptides dans les établissements de santé français, 6 octobre 2005
- Recommandations du Comité de l'antibiogramme, Société française de microbiologie, 18 novembre 2005
- Évaluation de la qualité d'un réseau de surveillance de la tuberculose résistante en Île-de-France en 2001-2002 (réseau Azay-mycobactéries)

## APRIL 2006

14

- Le score Epices : un score individuel de précarité. Construction du score et mesure des relations avec des données de santé, dans une population de 197 389 personnes
- Épidémie de trichinellose à *Trichinella nativa* due à la consommation de viande d'ours, France 2005
- Recherche des germes pathogènes multirésistants dans les cabinets de médecine générale, France, septembre 2003-février 2004

## 15-16 - Numéro thématique -

### Exposition aux radiations ionisantes d'origine médicale

- Éditorial. Améliorer la connaissance de l'exposition de la population
- Exposition médicale aux rayonnements ionisants à visée diagnostique de la population française : état des lieux fin 2002 en vue de la mise en place d'un système de surveillance
- Des patients particulièrement exposés : premiers résultats de deux études sur les prématurés et les enfants/adolescents atteints de mucoviscidose
- Une enquête de faisabilité sur les radiodermites secondaires à un geste de radiologie interventionnelle
- Controverse : les faibles doses de radiations ionisantes sont-elles carcinogéniques ?

17

- Renacoq : surveillance de la coqueluche à l'hôpital en 2004
- La leishmaniose viscérale de l'enfant dans les Alpes-Maritimes, 1975-2004
- Cas groupés de tularémie, Vendée, août 2004

## MAY 2006

18

- Les cas de tuberculose déclarés en France en 2004
- Cas groupés de shigellose dans l'Aude, juin 2004
- Point sur une maladie oubliée : le syndrome de Lemierre

## 19-20 - Numéro thématique -

### Après la vague de chaleur d'août 2003, une meilleure connaissance au service d'une meilleure prévention

- Éditorial. Leçons de la canicule
- Impact sanitaire de la vague de chaleur de l'été 2003 : synthèse des études disponibles en août 2005
- Impact sanitaire de la vague de chaleur du mois de juin 2005

## 21-22 - Numéro thématique -

### Journée mondiale sans tabac, 2006

- Éditorial. Il faut aller plus loin
- Le défi de la prise en charge du tabagisme péri-opératoire
- Grossesse et tabac : évaluation objective des effets du

tabagisme par la mesure du monoxyde de carbone expiré, résultats de 13 330 mesures lors de l'accouchement

- Le tabagisme des jeunes dans sept pays européens
- Le tabagisme des adolescents en France, suite aux récentes hausses des prix

## JUNE 2006

### 23-24 - Numéro thématique - Santé des voyageurs et recommandations sanitaires 2006

- Éditorial. Médecine des voyages : mortalité accidentelle, morbidité infectieuse
- Recommandations sanitaires pour les voyageurs
- Enquête sur les Centres de vaccinations internationales en France métropolitaine : état des lieux et propositions
- Les décès de Français lors d'un séjour à l'étranger et leurs causes
- Problèmes de santé des migrants africains qui voyagent au pays
- Pathologies observées au retour ou au décours de voyages en pays tropicaux
- Étiologie des fièvres au retour des tropiques : particularités du recrutement dans une étude de 613 cas hospitalisés à Marseille, 1999-2003
- Exposition et protection solaire de voyageurs de longue durée dans des pays à fort ensoleillement

### 25 - Numéro thématique - Infections sexuellement transmissibles et VIH : les comportements à risque toujours d'actualité !

- Éditorial. Quid de la prévention ?
- Baromètre gay 2005 : enquête auprès des hommes fréquentant les lieux de rencontre gay franciliens
- Émergence de la lymphogranulomatose vénérienne rectale en France, 2004-2005
- Surveillance de la syphilis en France, 2002-2004 : divergences d'évolution entre l'Île-de-France et les autres régions
- Notification obligatoire du VIH/sida chez les homosexuels : données au 30 juin 2005

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- Les légionelloses survenues en France en 2005
- Santé et isolement des résidents de 60 ans et plus dans les foyers Sonacotra du Rhône
- Investigation d'une épidémie de pneumopathies à *Mycoplasma pneumoniae* en milieu scolaire, Loiret, printemps 2005

## JULY 2006

### 27-28 - Numéro thématique - Les zoonoses en France

- Éditorial. Zoonoses : définir les priorités

- Définition de priorités et actions réalisées dans le domaine des zoonoses non alimentaires, 2000-2005
- Étude descriptive et prospective de l'incidence de la leptospirose en Aquitaine, 2004-2006
- Prévalence de l'infection des tiques *Ixodes ricinus* par *Borrelia burgdorferi* *sl* en Alsace, corrélation avec l'incidence de la maladie

- Données épidémiologiques sur la maladie de Lyme en Alsace, Limousin et Rhône-Alpes

- Étude de séroprévalence de la chlamydia aviaire chez certains professionnels avicoles en Bretagne et Pays de la Loire, 2001-2002

- Surveillance de l'échinococcose alvéolaire en France : bilan de cinq années d'enregistrement, 2001-2005

- Surveillance de la grippe aviaire chez l'homme en France

- Surveillance des infections à influenza virus chez les oiseaux en France

### 29-30 - Calendrier vaccinal 2006

et autres avis du Conseil supérieur d'hygiène publique de France relatifs à la vaccination

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- Les personnes originaires d'Afrique subsaharienne en accès tardif aux soins pour le VIH : données de l'enquête Retard, France, novembre 2003-août 2004
- Déterminants de la vaccination antigrippale parmi le personnel de deux centres hospitaliers français en 2004
- Épidémiologie de l'asthme à la Réunion : analyse de la mortalité (1990-1998) et de la morbidité hospitalière (1998-2002)

## AUGUST 2006

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- Paludisme d'importation en France métropolitaine : données épidémiologiques 2001-2004
- Surveillance du paludisme à la Réunion en 2003-2004 : tendances et perspectives d'action
- Situation épidémiologique du paludisme à Mayotte en 2003 et 2004
- Paludisme importé en France en 2005 dans 11 hôpitaux de France métropolitaine : prophylaxie, chimiorésistance et efficacité thérapeutique

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- Éditorial. Le BEH fait peau neuve
- Estimation de la séroprévalence du VIH et du VHC et profils des usagers de drogues en France, étude InVS-ANRS Coquelicot, 2004

- Épidémie de salmonellose à *Salmonella enterica* sérotype Agona liée à la consommation de poudres de lait infantile, France, janvier-mai 2005

### 34-35 - Numéro thématique - Alcool et santé en France, état des lieux

- Éditorial - Alcool et santé : un bilan pour renforcer une politique de santé efficace
- Indicateurs de la morbidité et de la mortalité liées à l'alcool en France
- Consommation annuelle d'alcool déclarée, France, 2005
- Alcool et insécurité routière : quelques enseignements de l'étude nationale SAM, France, 2001-2003
- Consommation d'alcool parmi les jeunes en France et en Europe
- Premier état des lieux de l'application des règlements interdisant la vente d'alcool aux mineurs de moins de 16 ans, France, 2005

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- Séquelles majeures en traumatologie routière, registre du Rhône, 1996-2003

## OCTOBER 2006

### 37-38 - Numéro thématique - *Chlamydia trachomatis* : études de prévalence dans des structures de médecine à vocation préventive

- Éditorial - Dépistage systématique des infections à *Chlamydia trachomatis* : il est temps d'agir
- Dépistage de l'infection à *Chlamydia trachomatis* dans un Centre de planification familiale et d'orthogénie, Bordeaux, France, 2005
- Prévalence des infections génitales basses à *Chlamydia trachomatis* chez les femmes consultant les Centres de planification familiale du Val-de-Marne, France, 1999
- Dépistage des infections à *Chlamydia trachomatis* dans les Centres de planification familiale de Seine-Saint-Denis et intérêt de l'auto-prélèvement, France, 2005
- Prévalence de *Chlamydia trachomatis* chez des étudiants de l'Université Paris 5, France, 2003-2005
- Enquête de prévalence de l'infection urogénitale à *Chlamydia trachomatis* dans une population d'étudiantes de l'Université Paris 10, Nanterre, France, 2004-2005
- Dépistage de l'infection à *Chlamydia trachomatis* dans la population d'étudiantes des universités de Bordeaux, France, 2004

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- Premier état des lieux du suivi de la population hémophile en France (Cohorte FranceCoag), 1994-2005
- Séroprévalence de la varicelle chez les femmes enceintes dans le Rhône, France, 2005
- Résultats de l'Enquête permanente sur les accidents de la vie courante, Île de la Réunion, France, 2005

### 40-41 - Numéro thématique - La surveillance de la santé au Québec

- Éditorial - Ensemble vers une santé publique plus efficiente et plus équitable
- L'utilisation des données médico-administratives et leur jumelage : l'approche privilégiée en surveillance des maladies chroniques au Québec
- Le fichier des tumeurs du Québec : un outil pour soutenir la surveillance du cancer et la recherche
- La surveillance des maladies infectieuses au Québec
- Surveillance épidémiologique du VIH et du VHC chez les utilisateurs de drogues par injection au Québec : faits saillants des observations du réseau SurvUDI
- Système d'information, d'enregistrement et de surveillance des maladies à déclaration obligatoire attribuables à un agent chimique ou physique au Québec
- Surveillance de l'infection par le virus du Nil occidental au Québec, 2003-2006
- Surveillance de la santé en milieu de travail au Québec
- La surveillance des troubles musculo-squelettiques liés au travail au Québec

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- Classification internationale des maladies : listes de référence pour l'analyse des causes de décès par traumatisme en France
- Mortalité par accident de la vie courante en France métropolitaine, 2000-2002

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### 43-44 - Numéro thématique - Fièvres hémorragiques virales

- Éditorial - Faut-il avoir peur des fièvres hémorragiques virales ?
- Les FHV dans le monde : le point des dix dernières années
- Réponse aux crises sanitaires internationales : épidémie de fièvre hémorragique Marburg, Province de Uíge, Angola, 2005
- Problématique des fièvres hémorragiques virales pour les armées
- Prise en charge d'un cas suspect de FHV à bord d'un navire au large de la Guyane française
- Réflexions sur la prise en charge des patients suspects de fièvre hémorragique virale en France
- Principale leçon du 1<sup>er</sup> cas de fièvre hémorragique virale (FHV) importé en France : la nécessité de disposer de recommandations réalistes

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- Relations entre caractéristiques socio-économiques et état de santé, recours aux soins et qualité des soins des personnes diabétiques, Entred 2001

- Lèpre dans la collectivité départementale de Mayotte en 2005
- Streptocoque du groupe B en pathologie humaine : origine des isolats et sensibilité aux antibiotiques

#### 46-47 - Numéro thématique -

##### Risques professionnels : quelle veille sanitaire ?

- Éditorial - Surveillance de la santé au travail : une mission d'envergure
- Surveillance épidémiologique des risques professionnels : pourquoi et comment ?
- Cosmop : analyse de la mortalité par secteurs d'activité économique
- Surveillance des expositions d'origine professionnelle en population générale : le programme Matgéné
- Surveillance post-professionnelle : à la recherche des retraités ayant été exposés à des cancérogènes
- Mise en place d'un système de surveillance de la santé mentale au travail : le programme Samotrace

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- Surveillance de l'infection à VIH-sida en France, 2005
- Causes de décès en France en 2005 des adultes infectés par le VIH et évolution par rapport à 2000

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- Les infections invasives à méningocoques en France en 2005
- Hospitalisations causées par des événements indésirables liés aux soins, résultats de l'étude Eneis dans les établissements de santé français, 2004

#### 50 - Numéro thématique -

##### La mortalité maternelle en France : bilan et perspectives

- Éditorial - Une nouvelle étape dans la surveillance de la mortalité maternelle
- Épidémiologie de la mortalité maternelle en France, de 1996 à 2002 : fréquence, facteurs et causes
- La mortalité maternelle en France : considérations épidémiologiques et cliniques (1999-2001) et recommandations
- Accouchement par césarienne et mortalité maternelle du postpartum, France, 1996-2000

#### 51-52 - Bilans réguliers de surveillance - Maladies infectieuses

- Surveillance épidémiologique et virologique de la grippe en France : saison 2005-2006
- Le signalement des infections nosocomiales, France, 2001-2005
- Surveillance épidémiologique des donneurs de sang homologues et risque résiduel en France entre 2003 et 2005

- Surveillance nationale de l'hépatite C à partir des pôles de référence volontaires : années 2001-2004
- Les toxi-infections alimentaires collectives en France entre 1996 et 2005

#### EXTRAPOL

- 28 - Pollution atmosphérique et reproduction. Juin 2006
- 29 - Effets à long terme de la pollution atmosphérique : études européennes. Septembre 2006
- 30 - Effets à long terme de la pollution atmosphérique : études nord-américaines. Décembre 2006

#### PRÉVALENCE

- 14 - Santé publique en Europe. Janvier 2006
- 15 - Alimentation et état nutritionnel des bénéficiaires de l'aide alimentaire – Premiers résultats de l'étude Abena. Avril 2006
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#### InVS-INFOS

3 numéros de la lettre électronique bimensuelle

# Abbreviations & Acronyms

<b>AFSSA</b>	French Food Safety Agency (Agence française de sécurité sanitaire des aliments)	<b>DIT</b>	Department of International and Tropical Diseases (Département international et tropical)
<b>AFSSAPS</b>	French Health Products Safety Agency (Agence française de sécurité sanitaire des produits de santé)	<b>DMCT</b>	Department of chronic diseases and injuries (Département des maladies chroniques et traumatismes)
<b>AIDS</b>	Acquired immunodeficiency syndrome	<b>DOM-TOM</b>	Overseas districts and territories (départements d'outre-mer et territoires d'outre-mer)
<b>APHEIS</b>	Air pollution and health: European information system	<b>DRASS</b>	Regional health and social services office (Direction régionale des affaires sanitaires et sociales)
<b>ARH</b>	Regional hospital agency (Agence régionale d'hospitalisation)	<b>DRTEFP</b>	Regional labour and occupational training offices (Directions régionales du travail et de la formation professionnelle)
<b>BEH</b>	Weekly epidemiological bulletin (Bulletin épidémiologique hebdomadaire)	<b>DSE</b>	Department of Environmental Health (Département santé environnement)
<b>BQA</b>	Daily alert bulletin (bulletin quotidien d'alerte)	<b>DST</b>	Department of Occupational Health (Département santé travail)
<b>CAP</b>	Poison centers (centres anti poison)	<b>ECDC</b>	European Centre for Disease Prevention and Control
<b>CCLIN</b>	Nosocomial infection control coordination centre (Centre de coordination de la lutte contre les infections nosocomiales)	<b>EU</b>	European Union
<b>CDI</b>	<i>Clostridium difficile</i> infection	<b>EuroHIV</b>	European HIV-AIDS surveillance programme
<b>CepiDc</b>	Epidemiology centre on medical causes of death (Centre d'épidémiologie des causes médicales de décès)	<b>EuroTB</b>	European tuberculosis surveillance programme
<b>CES</b>	Health examination centres (Centre d'examens de santé)	<b>FNORS</b>	National federation of regional health observatories (Fédération nationale des observatoires régionaux de santé)
<b>CIRE</b>	Regional epidemiology units (Cellules interrégionales d'épidémiologie)	<b>FRANCIM</b>	French cancer registry network (France-cancer-incidence et mortalité)
<b>CNR</b>	National reference centre (Centre national de référence)	<b>GOARN</b>	Global epidemic alert and response network
<b>CRVOI</b>	Regional centre for Indian Ocean health surveillance and research (Centre régional de veille et de recherche de l'Océan Indien)	<b>GRE</b>	Event risk management unit (Gestion des risques exceptionnels)
<b>CSHPF</b>	French High Council of Public Hygiene (Conseil supérieur d'hygiène publique de France)	<b>HIV</b>	Human immunodeficiency virus
<b>CTINILS</b>	Advisory committee on nosocomial and iatrogenic infections (Comité technique des infections nosocomiales et des infections liées aux soins)	<b>HCV</b>	Hepatitis C virus
<b>DASS</b>	Health and social services office (Direction des affaires sanitaires et sociales)	<b>IFREMER</b>	French sea research institute (Institut français de recherche pour l'exploitation de la mer)
<b>DDASS</b>	District health and social services office (Direction départementale des affaires sanitaires et sociales)	<b>IHR</b>	International health regulations
<b>DGS</b>	Directorate-General of Health (Direction générale de la santé)	<b>IMD</b>	Invasive meningococcal disease
<b>DGT</b>	Directorate-General of Labour (Direction générale du travail)	<b>INC</b>	National Cancer Institute (Institut national du cancer)
		<b>INED</b>	National Institute of Demographic Studies (Institut national des études démographiques)
		<b>INERIS</b>	National Institute of the Environment and Industrial Risks (Institut national de l'environnement industriel et des risques)
		<b>INRA</b>	French Agronomic Research Institute (Institut national de la recherche agronomique)

<b>INSEE</b>	National Statistics and Economic Studies Institute (Institut national des statistiques et des études économiques)	<b>PNC</b>	National heat wave plan (Plan national de gestion de la canicule)
<b>INSERM</b>	National Institute for Health and Medical Research (Institut national des statistiques et des études économiques)	<b>PNNS</b>	National nutritional health programme (Programme national nutrition santé)
<b>InVS</b>	French Institute for Public Health Surveillance (Institut de veille sanitaire)	<b>PRAGSUS</b>	Action plan for management of alerts and health emergency situations (Plan d'action relatif à l'alerte et à la gestion des situations d'urgence sanitaire)
<b>IRD</b>	Development Research Institute (Institut de recherche pour le développement)	<b>PRSP</b>	Regional public health plan (Plan régional de santé publique)
<b>IRIS</b>	Census blocks (Ilots regroupés pour l'information statistique)	<b>PRST</b>	Regional workplace health plan (Plan régional de santé au travail)
<b>ISTNA</b>	Institute for Nutritional Sciences and Techniques (Institut scientifique et technique de la nutrition et de l'alimentation)	<b>PSAGE</b>	Surveillance, alert, and management programme (Programme de surveillance, d'alerte et de gestion)
<b>MIRTMO</b>	Physician-inspectors of the regional labour office (Médecin inspecteur du travail et de la main d'œuvre)	<b>RAISIN</b>	Nosocomial infection alert network (Réseau d'alerte de surveillance et d'investigation des infections nosocomiales)
<b>MSWI</b>	Municipal solid waste incinerators	<b>SACS</b>	Heat wave and health alert system (Système d'alerte canicule et santé)
<b>ORS</b>	Regional health observatory (Observatoire régional de la santé)	<b>SARS</b>	Severe acute respiratory syndrome
<b>OSCOUR</b>	Network for emergency department surveillance data (Organisation de la surveillance coordonnée des urgences)	<b>STD</b>	Sexually transmitted diseases
<b>PACA</b>	Provence-Alpes-Côte d'Azur	<b>USEN</b>	Nutritional surveillance and epidemiology unit (Unité de surveillance et d'épidémiologie nutritionnelle)
<b>PAH</b>	Polyaromatic hydrocarbons	<b>WHO</b>	World Health Organization
<b>PMSI</b>	National medical informatics program (Programme de médicalisation des systèmes d'information)		





